

**SPECIFICATION
FOR
440-1612-0
CBI High Mast Lighting Replacement**

'ISSUED FOR TENDER'

April 22, 2022

Prepared for:

CORRECTIONAL SERVICE CANADA

Prepared by:

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JLR No. 31473-000

PART 1 - GENERAL

1.1 Professional Seals

.1 Electrical Engineer

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used

END OF SECTION

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01 11 00	Summary of Work
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26 05 34	Conduits, Conduit Fastenings and Conduit Fittings
26 05 00	Lighting

END OF SECTION

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract consists of general and electrical work to remove existing and install new high mast lights and associated systems at 1455 Bath Road, Kingston, ON, K7L 4V9.
- .2 Prior to shop drawing preparation, contractor is to perform comprehensive site investigations to confirm and document existing conditions, which will also help form the basis of requirements for the new lighting and power systems along with additional requirements noted on the drawings and specifications.

1.2 CONTRACT METHOD

- .1 Construct Work under a single contract.

1.3 WORK BY OTHERS

- .1 Cooperate with other Contractors in carrying out their respective works and carry out instructions from Consultant.
- .2 Coordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Consultant, in writing, any defects which may interfere with proper execution of Work.

1.4 WORK SEQUENCING AND SCHEDULING

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Coordinate Progress Schedule and coordinate with Owner during construction.
- .3 Contractor to prepare Systemized Method of Operations for all activities.
- .4 Contractor to prepare detailed schedule for all work and submit to Consultant and Owner for review. Identify all potentially disruptive work on the detailed schedule for review and approval by the Owner.
- .5 Provide temporary site lighting to be operational after hours for the duration of the loss of power to any high mast light standards. Temporary lighting to be sufficient to provide minimum light levels as prescribed by CSC.
- .6 Temporary site lighting plan to be reviewed by CSC site security prior to de-energization of any existing light standards.
- .7 Unless otherwise noted, all potentially disruptive work is to be performed after hours at times acceptable to the Owner, and shall take into consideration the occupied hours of the building. Examples of work that could be potentially disruptive includes but is not limited to the following activities:

- .1 Shutdowns of any electrical equipment or systems

1.5 CONTRACTOR USE OF PREMISES

- .1 Coordinate use of premises under direction of Owner/Building Management.
- .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.6 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.7 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Building Management to facilitate execution of work.

1.8 EXISTING SERVICES

- .1 Notify Building Management of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Building Management minimum 14 days notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.
- .4 Submit schedule to and obtain approval from Building Management for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services when directed by Consultant to maintain critical building and tenant systems.
- .6 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Record locations of maintained, re-routed and abandoned service lines.

1.9 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety Related Documents.
 - .11 Other documents as specified.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Owner to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Owner will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Owner to facilitate execution of work.

1.4 EXISTING SERVICES

- .1 Notify, Owner and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Owner ten (10) business days of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for pedestrian and vehicular traffic.

1.5 SPECIAL REQUIREMENTS

- .1 Carry out noise generating Work after hours only.
- .2 Submit schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.
- .3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Coordinate delivery of materials with Owner.

1.6 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
 - .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
 - .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
 - .3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
 - .4 Contractor's personnel will require CSC Reliability Status security screening in order to complete Work in premises and on site.
- .3 Security escort:
 - .1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
 - .2 Submit an escort request to Owner at least 14 days before service is needed.
 - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1- GENERAL

1.1 REFERENCE STANDARDS

- .1 Owner/Contractor Agreement.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2, Stipulated Price Contract.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

- .1 Refer to CCDC 2.
- .2 Make applications for payment on account as provided in Agreement as Work progresses.
- .3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .4 Submit to Consultant, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

1.3 SCHEDULE OF VALUES

- .1 Refer to CCDC 2.
- .2 Provide schedule of values supported by evidence as Consultant may reasonably direct and when accepted by Consultant, be used as basis for applications for payment.
- .3 Include statement based on schedule of values with each application for payment.
- .4 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Consultant may reasonably require to establish value and delivery of products.

1.4 PROGRESS PAYMENT

- .1 Refer to CCDC 2.
- .2 Consultant will issue to Owner, no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Consultant determines to be due. If Consultant amends application, Consultant will give notification in writing giving reasons for amendment.

1.5 SUBSTANTIAL PERFORMANCE OF WORK

- .1 Refer to CCDC 2.
- .2 Prepare and submit to Consultant comprehensive list of items to be completed or corrected and apply for a review by Consultant to establish Substantial Performance of Work or substantial performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion which Owner agrees to accept separately is substantially performed. Failure to include items on list does not alter responsibility to complete Contract.
- .3 No later than 10 days after receipt of list and application, Consultant will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.
- .4 Consultant: state date of Substantial Performance of Work or designated portion of Work in certificate.
- .5 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Consultant, establish reasonable date for finishing Work.

1.6 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

- .1 Refer to CCDC 2.
- .2 After issuance of certificate of Substantial Performance of Work:
 - .1 Submit application for payment of holdback amount.
 - .2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.
- .3 After receipt of application for payment and sworn statement, Consultant will issue certificate for payment of holdback amount.
- .4 Where holdback amount has not been placed in a separate holdback account, Owner will, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Owner and Contractor.
- .5 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. Owner may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of Work, other third party monetary claims against Contractor which are enforceable against Owner.

1.7 PROGRESSIVE RELEASE OF HOLDBACK

- .1 Refer to CCDC 2.
- .2 Where legislation permits, if Consultant has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Owner will pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.
- .3 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.8 FINAL PAYMENT

- .1 Refer to CCDC 2, GC 5.7.
- .2 Submit application for final payment when Work is completed.
- .3 Consultant will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Consultant will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.
- .4 Consultant will issue final certificate for payment when application for final payment is found valid.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of CSC Departmental Representative or Consultant.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and affected parties not in attendance.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 CSC Departmental Representative, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.

- .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Delivery schedule of specified equipment.
- .5 Site security.
- .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .7 Owner provided products.
- .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

- .1 During course of Work and prior to project completion, schedule progress meetings monthly.
- .2 Contractor, major Subcontractors involved in Work, Consultant, CSC Departmental Representative and Owner are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 2 days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.

- .11 Review proposed changes for affect on construction schedule and on completion date.
- .12 Other business.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five (5) day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Consultant to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times

of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Consultant within 15 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Consultant within 5 working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Consultant will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Electrical.
 - .6 Testing and Commissioning.
 - .7 Supplied equipment long delivery items.

1.6 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities

considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

- .2 Weather related delays with their remedial measures will be discussed and negotiated.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE

- .1 Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .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 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 coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow five (5) days for Consultant's review of each submission.
- .4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

- .5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .6 Accompany submissions with transmittal letter 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.
- .7 Submissions 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 Contractor's 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.
- .8 After Consultant's review, distribute copies.
- .9 Submit an electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .10 Submit an electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Submit an electronic copy of certificates for requirements requested in specification Sections and as requested by Consultant.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .12 Submit an electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.

- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .13 Submit an electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.
- .14 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .15 Submit one copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.
- .16 Delete information not applicable to project.
- .17 Supplement standard information to provide details applicable to project.
- .18 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .19 Provide shop drawings for the following items:
 - .1 Light Fixtures
 - .2 High Mast Lighting Assemblies
 - .3 Lighting Control Devices

1.3 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

- 1.1 Purpose .1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.
- 1.2 Definitions .1 "Contraband" means:
- .1 An intoxicant, including alcoholic beverages, drugs and narcotics.
 - .2 Tobacco or associated tobacco products.
 - .3 An igniting device, lighter or matches.
 - .4 A weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization.
 - .5 An explosive or a bomb or a component thereof.
 - .6 Currency over any applicable prescribed limit, \$25 when possessed by an inmate, visitor or contractor without prior authorization.
 - .7 Any item not described in paragraphs 1.2.1.1 to 1.2.1.6 that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
- .2 "Unauthorized Smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.
- .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .4 "CSC" means Correctional Service Canada.
- .5 "Project Authority" means, Director, Warden or Superintendent of the Institution as applicable.
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- 1.2 Definitions
(Cont'd)
- .6 "Construction Employees" means persons working for the General Contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Departmental Representative" means the project manager from Correctional Services Canada.
- .8 "Perimeter" means the fenced or walled area of the Institution that restrains the movement of the inmates.
- .9 "Construction Limits" means the area as shown on the contract drawings that the Contractor will be allowed to work. This area may or may not be isolated from the security area of the Institution.
- 1.3 Preliminary
Proceedings
- .1 Prior to the commencement of work, the Contractor shall meet with the Project Authority or his/her representative to:
- .1 Discuss the nature and extent of all activities involved in the Project.
 - .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.
- .2 Contractor shall:
- .1 Ensure that all Construction Employees are aware of the security requirements.
 - .2 Ensure that a copy of the security requirements is always prominently on display at the job site.
 - .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all Construction Employees.
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- .3 The Project Authority may require that facial photographs may be taken of Construction Employees and these photographs may be displayed at appropriate locations in the Institution or in an electronic database for identification purposes. The Project Authority may require that Photo ID cards be provided for all Construction Employees. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the Construction Employees' clothing at all time while Construction Employees are in the institution.
 - .4 Construction Employees are to report to the Principal Entrance building anytime they enter or leave the institution.
 - .5 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
 - .6 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
 - .1 Appear to be under the influence of alcohol, drugs or narcotics.
 - .2 Behave in an unusual or disorderly manner.
 - .3 Are in possession of contraband.
 - .7 Smoking is prohibited anywhere on CSC property.
-

- 1.5 Vehicles
- .1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.
 - .2 Gas caps on all vehicles and motorized equipment shall be lockable.
 - .3 The Project Authority may limit at any time the number and type of vehicles allowed within the institution.
 - .4 Drivers of delivery vehicles for material required by the project will not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The Project Authority will require that these vehicles be escorted by Institutional Staff or Commissionaires while in the Institution.
 - .5 If the Project Authority permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter shall be locked when not in use.
- 1.6 Parking
- .1 Parking area(s) to be used by Construction Employees will be designated by the Project Authority. Parking in other location will be prohibited and vehicles may be subject to removal.
- 1.7 Shipments
- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the Institution's own shipments. The Contractor must have his/her own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material, equipment or tools.
-

- 1.8 Telephones
- .1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the Institution unless prior approval of the Project Authority is received.
 - .2 The Project Authority will ensure that approved telephones, facsimile machine and computers with internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an internet connection to unauthorized personnel.
 - .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, Blackberries, telephone used as 2-way radios, are not permitted within the Institution unless approved by the Project Authority. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.
 - .4 The use of two way radios are not permitted.
- 1.9 Work Hours
- .1 Work hours within the Institution are: Monday to Friday, 07:30 hrs to 16:00 hrs.
 - .2 Work will not be permitted during weekends and statutory holidays without the permission of the Project Authority. A minimum of seven (7) days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Project Authority.
-

1.10 Overtime Work .1 No overtime work will be allowed without permission of the Project Authority. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such as work to make the construction safe and secure, the Contractor shall advise the Project Authority as soon as this condition is known and follow the directions given by the Project Authority. Costs to the Crown for such events may be attributed to the Contractor.

.2 When overtime work, weekend, or statutory holiday work is required and approved by the Project Authority staff members may be posted by the Project Authority or his/her designate, to maintain the security surveillance. The Departmental Representative may post extra staff for inspection of construction activities. The actual cost of this extra staff may be subject to reclamation by the Crown.

1.11 Tools and Equipment .1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.

.2 Throughout the construction project maintain up-to-date the list of tools and equipment specified above.

.3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.

.4 Store all tools and equipment in approved secure locations.

.5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the Contractor. Scaffolding shall be secured and locked when not erected and when erected, will be secured in a manner agreed upon with the Institutional designate.

- 1.11 Tools and Equipment
(Cont'd)
- .6 All missing or lost tools or equipment shall be reported immediately to the Project Authority.
- .7 The Project Authority will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:
- .1 At the beginning and conclusion of every construction project.
 - .2 Weekly, when the construction project extends longer than a one week period.
 - .3 The Contractor may be subject to random checks by security staff to ensure proper storage and security of tools throughout the project.
- .8 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The Contractor will be given at the beginning of the day, a quantity that will permit on day's work. Used blades/cartridges will be returned to the Project Authority's representative at the end of each day.
- .9 If propane or natural gas is used for heating the construction, the Institution will require that an employee of the Contractor supervise the construction site during non-working hours.
- .10 If torches or grinders are required tools to perform Work, Contractor must complete a Hot Work Permit as supplied by CSC. Completed original form(s) are copied and posted on the work site in a conspicuous location. Original documents are to remain with the Institutional Fire Chief.
- 1.12 Keys
- .1 Keys:
- .1 The Contractor will use standard construction cylinders for locks for his use during the construction period.
 - .2 The Contractor will issue instructions to his employees and sub-trades, as necessary to ensure safe custody, of the construction set of keys.
-

- 1.12 Keys (Cont'd)
- .1 (Cont'd)
 - .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
 - .1 Prepare an operational keying schedule.
 - .2 Accept the operational keys and cylinders directly from the lock manufacturer.
 - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
 - .2 Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the Security Maintenance Officer (SMO) and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the CSC construction escort.
- 1.13 Prescription Drugs
- .1 Employees of the Contractor who are required to take prescription drugs during the workday shall obtain approval of the Project Authority to bring a one day supply only into the Institution.
- 1.14 Smoking Restrictions
- .1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
 - .2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
 - .3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Project Authority.
-

- 1.15 Contraband
- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on Institutional Property.
 - .2 Discovery of Contraband on the construction site and the identification of the person(s) responsible for the Contraband shall be reported immediately to the Project Authority.
 - .3 Contractors shall be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of Contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
 - .4 Presence of arms and ammunition in vehicles of Contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

- 1.16 Searches
- .1 All vehicles and persons entering Institutional property may be subject to search.
 - .2 When the Project Authority suspects, on reasonable grounds, that an employee of the Contractor is in possession of Contraband or unauthorized items, he/she may order that person to be searched.
 - .3 All employees entering the Institution may be subject to screening of personal effects for traces of Contraband drug residue.

- 1.17 Access to and Removal from Institution Property
- .1 Construction personnel and commercial vehicles will not be admitted to the Institution after normal working hours, unless approved by the Project Authority.
-

1.18 Movement of
Vehicles

- .1 Escorted commercial vehicles will not be allowed to enter or leave the Institution after normal working hours, unless approved by the Project Authority.
 - .2 Construction vehicles shall not leave the Institution until an inmate count is completed.
 - .3 The Contractor shall advise the Project Authority twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
 - .4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC Staff or Commissionaires working under the authority of the Project Authority.
 - .5 Commercial Vehicles will only be allowed access to Institutional property when their contents are certified by the Contractor or his/her representative as being strictly necessary to the execution of the construction project.
 - .6 Vehicles shall be refused access to Institutional property if, in the opinion of the Project Authority, they contain any article which may jeopardize the security of the Institution.
 - .7 Private vehicles of Construction Employees will not be allowed within the security wall or fence of medium or maximum security Institutions without the permission of the Project authority.
 - .8 With prior approval of the Project authority, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the institution the remainder of the day.
-

1.18 Movement of Vehicles (Cont'd) .9 With the approval of the Project authority, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The project authority may require that the equipment be secured with a chain and padlock to another solid object.

1.19 Movement of Construction Employees on Institutional Property .1 Subject to the requirements of good security, the Project authority will permit the contractor and his/her employees as much freedom of action and movement as is possible.

.2 However, notwithstanding paragraph above, the Project authority may:

.1 Prohibit or restrict access to any part of the Institution.

.2 Require that in certain areas of the Institution, either during the entire construction project or at certain intervals, Construction Employees only be allowed access when accompanied by a member of the CSC security staff.

.3 During the lunch and coffee/health breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room.

1.20 Surveillance and Inspection .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.

.2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among Construction Employees and maintained throughout the construction project.

- 1.21 Stoppage of Work
- .1 The Project authority may request at any time that the Contractor, his/her employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The Contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.
 - .2 The Contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

- 1.22 Contact with Inmates
- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk to them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his/her security clearance revoked.

- 1.23 Completion of Construction Project
- .1 Upon completion of the construction project, or when applicable, the takeover of facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

PART 2 - PRODUCTS

- 2.1 Not Used
- .1 Not used.

PART 3 - EXECUTION

- 3.1 Not Used
- .1 Not used.
-

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END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .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, c.0.1, as amended and O. Reg. 213/91, latest version.
- .3 MOL - Lead on Construction Projects.
- .4 MOL - Silica on Construction Projects.
- .5 Canadian Electrical Code, latest edition.
- .6 Owner/facility specific COVID-19 requirements (dynamic).
- .7 Canadian Impact Assessment Act.
- .8 Canadian Environmental Protection Act.
- .9 Species at Risk Act.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan within seven (7) working 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 copies of Contractor's authorized representative's work site health and safety inspection reports on a weekly basis as per CSC requirements.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors. Provide copies to CSC Departmental Representative.
- .5 Submit copies of incident and accident reports within twenty-four (24) hours to CSC. Verbally notify CSC Departmental Representative immediately.
- .6 Submit GHS Safety Data Sheets (SDS) for all products.
- .7 Submit Work Permits on a weekly basis. A minimum of one (1) week's notice is required for all work permit submittals. Work may not commence unless work permit approvals are provided by CSC Departmental Representative.
- .8 Owner will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven (7) days after receipt of plan.

Revise plan as appropriate and resubmit plan to owner within seven (7) days after receipt of comments from Owner.

- .9 Consultant'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.
- .10 Medical Surveillance:
 - .1 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 Consultant.
- .11 On-site Contingency and Emergency Response Plan:
 - .1 Address standard operating procedures to be implemented during emergency situations. Emergency procedures are to be coordinated and implemented with the existing facility ERP.

1.3 SAFETY ASSESSMENT

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

1.4 MEETINGS

- .1 Schedule and administer Health and Safety meeting with owner prior to commencement of Work.

1.5 PROJECT/SITE CONDITIONS

- .1 It is not anticipated that asbestos or other hazardous materials will be impacted by the scope of work of this project. If such materials are encountered unexpectedly:
 - .1 Contractor shall stop work immediately.
 - .2 Obtain Designated Substance Report (DSR) from Owner and coordinate efforts with Owner.

1.6 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Consultant or CSC Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- .3 Upon award, the Contractor is required to complete and submit the following:
 - .1 CSC required Health and Safety project package will be sent out to awarded General Contractor by CSC Health and Safety Coordinator representative.
 - .2 All items requested (CSC Facility Hazard Assessment/OHS Plan review

and signature, Contractor Handbook review and signature, Weekly Work Permits, Health and Safety Plan submission, Project Specific Health and Safety Plan completion and submission, Notice of Project), and any additional requested information must be provided to CSC far in advance to commencement of work for approval, prior to arrangement of site access.

- .3 Weekly Work Permit to be submitted and approved prior to the start of each week.
 - .4 All Certifications/Training records, SDS forms, etc. that are requested must be submitted by awarded GC prior to start of work.
- .4 Contractor shall install proper site separation and identification in order to maintain time and space constraints at all times throughout the life of the project.

1.7 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 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor as described in the Ontario Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .4 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.

1.8 COMPLIANCE REQUIREMENTS

- .1 Comply with latest version of all applicable codes and standards, including but not limited to those referenced in the project specifications or drawings.
- .2 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.
- .3 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .4 Comply with Occupational Health and Safety Regulations.
- .5 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 COVID-19

- .1 Contractor will be required to increase Health and Safety requirements for the project site to include Site Specific Safety Plan enhancements related to COVID-19 Safety Requirements. Refer to Canadian Construction Association COVID-19 Standardized Protocols for All Canadian Construction Sites for minimum requirements.

1.10 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety coordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.
- .3 The scope of the project should not initiate concerns/interaction with designated substances. Contractor shall be responsible for reviewing all existing facility DSS documentation in advance of site work. Should unforeseen conditions with designated substances be encountered, Contractor shall initiate a stop work order and compare methodology against the site DSS/Re-Assessments. Contractor shall notify CSC representative immediately and shall not resume work without CSC approval.

1.11 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 Province having jurisdiction, and in consultation with Consultant.
- .2 All construction signage is to be posted in both English and French.

1.12 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction, Consultant, or CSC Departmental Representative.
- .2 Provide Consultant and CSC Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Consultant or CSC Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.13 BLASTING

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

1.14 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices are not permitted for use on site without approval from CSC Departmental Representative.

1.15 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.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.2 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.3 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant and CSC Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant and CSC Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant and CSC Departmental Representative.

1.4 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws. Smoking is not permitted within the building or on building rooftops. See site for designated exterior smoking areas.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and

Contract Documents, based on General Conditions of Contract and the following:

- .1 Regulatory requirements and fees in force on date of Bid submission, and
- .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.

1.2 INSPECTION

- .1 Refer to CCDC 2, GC 2.3.
- .2 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

- .1 Refer to CCDC, GC 2.4.

- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.6 REPORTS

- .1 Submit pdf copy of inspection and test reports to Consultant.
- .2 Provide copy to subcontractor of work being inspected or tested.

1.7 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical and electrical systems.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1- GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2, Stipulated Price Contract.
- .2 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY

- .1 Refer to CCDC 2.
- .2 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .3 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .4 Defective products, whenever identified prior to completion of Work, 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.
- .5 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .7 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products

are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

- .2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 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 seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store materials on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Consultant.
- .9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.

1.6 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 will 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 re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, 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 anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.8 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Consultant if there is interference. Install as directed by Consultant.

1.10 REMEDIAL WORK

- .1 Refer to CCDC 2 and Section 01 73 00 - Execution Requirements.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

- .2 Inform Consultant of conflicting installation. Install as directed.

1.12 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Consultant.

1.15 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.

- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 Provide firestopping in accordance with Section 07 84 00 - Firestopping to maintain the integrity of fire separations, including:
 - .1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.
 - .2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

CSC 440-1612-0

CBI HIGH MAST LIGHT REPLACEMENT

JLR No. 31473-000

EXECUTION

Section 01 73 00

Page 3 of 3

Issued for Tender

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Building Management. Do not burn waste materials on site.
- .3 Provide on-site containers for collection of waste materials and debris.
- .4 Provide and use marked separate bins for recycling.
- .5 Dispose of waste materials and debris off site.
- .6 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

- .1 Refer to CCDC 2, GC 3.14.
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris other than that caused by Owner or other Contractors.

- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Building Management.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, and walls.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .15 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Consultant's inspection.
 - .2 Consultant's Inspection:
 - .1 Consultant and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, balanced and fully operational.
 - .4 Certificates required by ESA: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Consultant.
 - .2 When Work incomplete according to Owner and Consultant, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
 - .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
 - .7 Final Payment:
 - .1 When Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to CCDC 2: when Work deemed incomplete by Consultant, complete outstanding items and request re-inspection.
 - .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting two weeks prior to contract completion with Contractor's Representative and CSC Representative and to:
 - .1 Verify project requirements.
 - .2 Review warranty requirements.
 - .2 Consultant to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable response time.
- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, one (1) final copy of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT

- .1 Provide 1 hard copy binder and searchable PDF copy of Operations and Maintenance (O&M) Manuals upon project completion. O and M Manuals are to be assembled in a 1" or greater 3 ring binder labelled on the front cover and on the binder edge with the: Building Name and address, project name, project number, completed date (ex. October 2016). O and M Manuals are to be indexed / sectioned as follows:
 - .1 Binder Cover, Edge and Title Page: Project Name, Building Name, address, project number (GOC#), Project Completion Date.
 - .2 Table of Contents: Project Name, Building Name, address, project number (GOC#), Project Completion Date and table of contents.
 - .3 Tab A - Contact Information: Include contact information for Consultant, General Contractor and all Sub-Contractors. Contractor

Information: name, address, telephone number of manufacturer, installing contractor, 24-hour number for emergency service for all equipment in this section identified by equipment.

- .4 Tab B - Signed Letter of warranty: Signed and dated general contractor, and all sub-contractors, letter of Warranty which includes project name, project number (GOC#), location, warranty start date (to be the date of Substantial Completion as declared by Consultant), and all manufacturer and extended warranties.
- .5 Tab C - Shop Drawing: A copy of all Shop Drawings reviewed by the Consultant and or Commissioning Agent.
- .6 Tab D - All Reports: Copies of all TAB reports, pre-functional tests, start-up reports, completed performance verification forms and permits or certifications from Authorities having jurisdictions.
- .7 Tab E - Sequences of Operation: Provide Designers and / or the Manufactures operating instructions and sequence of operations.
- .8 Tab F - Maintenance and Service Procedures: Specific service and maintenance manuals, preventative and corrective maintenance, with service procedures and schedules.
- .9 Tab G - As-Built Drawings: Marked in red ink, by the Contractor and/or sub-contractor, and reviewed by the Consultant. Provide both a hardcopy and CAD electronically.
- .10 Tab H - RP1 - Equipment Data Collection Forms (CMMS): All equipment which is to be deleted, removed, added or replaced from site is to have a CMMS inventory sheet completed and included in the O&M manual.
- .11 Tab I - Site Inspection Reports: Inspection report(s) conducted during the implementation of the project.
- .12 Tab J - Training Materials: Include CSC training document and any other training resources used to deliver training.
- .13 Tab K - Final Commissioning Report: Narrative of commissioning activities and challenges that occurred during each phase of the project. Confirmation letter identifying that all performance verification tests have met the requirements of the specification document, basis of design (if applicable) and requirement of the project.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project:
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.5 AS-BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, at site for Consultant, one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .3 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .4 Keep record documents and samples available for inspection by CSC Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of opaque drawings, provided by Consultant.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.

- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, on non-conformance with Contract documents.

1.8 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and

recommended quantities to be maintained in storage.

- .14 Include test and balancing reports as specified in Sections 01 45 00 - Quality Control and 01 91 13 - General Commissioning Requirements.
- .15 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

- .1 Building products, applied materials and finishes: include product data with catalogue number, size, composition and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specification sections.

1.10 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site; place and store.

- .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Consultant.

1.12 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan 30 days before planned pre-warranty conference to CSC Representative and Consultant.
- .3 Warranty management plan to include required actions and documents to assure that CSC Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and containing sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.
- .6 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .7 Leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint four (4) and nine (9) month warranty inspection, measured from time of acceptance, by CSC Representative or Consultant.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items to include HVAC equipment.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:

- .1 Name of item.
- .2 Model and serial numbers.
- .3 Location where installed.
- .4 Name and phone numbers of manufacturers or suppliers.
- .5 Names, addresses and telephone numbers of sources of spare parts.
- .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
- .7 Cross-reference to warranty certificates as applicable.
- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Contractor's plans for attendance at four (4) and nine (9) month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

1.13 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 This Section specifies roles and responsibilities of Commissioning Training.

1.2 TRAINEES

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTORS

- .1 Consultant will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 TAB and PV Reports.
- .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
 - .1 Transparencies for overhead projectors.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
 - .4 Equipment models.

1.6 SCHEDULING

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training outside of regular working hours, training sessions to be 2 hours in length.
- .3 Training to be completed prior to acceptance of facility.

1.7 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 Consultant will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Owner.

1.8 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls. Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .5 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .6 Maintenance and servicing.
 - .7 Trouble-shooting diagnosis.
 - .8 Inter-Action among systems during integrated operation.
 - .9 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.9 VIDEO-BASED TRAINING

- .1 Manufacturer's videotapes to be used as training tool with Consultant's review and written approval 2 months prior to commencement of scheduled training.
- .2 On-Site training videos:
 - .1 Videotape training sessions for use during future training.
 - .2 To be performed after systems are fully commissioned.
 - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be high quality.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.
- .3 Provide commissioning for the equipment provided under the following specification sections:
 - .1 26 05 00 - Lighting

1.2 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

- .1 Cx to be a line item of Contractor's cost breakdown.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .4 Consultant will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Consultant.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Consultant, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or holdback assessments.

1.5 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review Contract Documents, confirm by writing to Consultant.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to Consultant.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to Consultant for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Consultant in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Consultant before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Cx representative.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
- .3 Request in writing to Consultant for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
- .4 Submit proposed Cx procedures to Consultant where not specified and obtain written approval at least 8 weeks prior to start of Cx.
- .5 Provide additional documentation relating to Cx process required by Consultant.

1.8 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 13.16 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Consultant to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Consultant.

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: 01 32 16.19 - Construction

Progress Schedule - Bar (GANTT) Chart and as specified herein.

- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage. Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart. Contractor to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Consultant, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.
- .2 Electrical testing to comply with NETA acceptance.

1.12 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Consultant to witness start-up and testing.
- .3 Contractor to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems.
- .2 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

- .2 Verify with manufacturer that testing as specified will not void warranties.
- .3 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Consultant after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Consultant. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Consultant.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Consultant.
 - .3 If evaluation report concludes that major damage has occurred, Consultant shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

- .1 Assemble start-up documentation and submit to Consultant for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit

Consultant to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit to Consultant for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

- .1 Notify CSC Representative and Consultant at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

- .1 Submit to Consultant for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.

- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.

1.21 WITNESSING COMMISSIONING

- .1 Consultant to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Owner within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.24 EXTRAPOLATION OF RESULTS

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Consultant in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.25 EXTENT OF VERIFICATION

- .1 Provide manpower and instrumentation to verify up to 100% of reported results, unless specified otherwise in other sections.
- .2 Number and location to be at discretion of Consultant.
- .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .4 Perform additional commissioning until results are acceptable to Consultant.

1.26 REPEAT VERIFICATIONS

- .1 Assume costs incurred by CSC Representative and Consultant for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Consultant's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Consultant deems Contractor's request for second verification was premature.

1.27 SUNDRY CHECKS AND ADJUSTMENTS

- .1 Make adjustments and changes that become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

1.28 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Consultant.
- .2 Report problems, faults or defects affecting Cx to Consultant in writing. Stop Cx until problems are rectified. Proceed with written approval from Consultant.

1.29 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Consultant.

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.31 TRAINING

- .1 In accordance with Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and

special tools as specified in contract.

1.33 OCCUPANCY

- .1 Cooperate fully with CSC Representative and Consultant during stages of acceptance and occupancy of facility.

1.34 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Consultant.

1.35 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 5% of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/-2% of recorded values.

1.36 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Consultant will not relieve Contractor from compliance with specified start-up and testing procedures.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1- GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Description of overall structure of Plan and roles and responsibilities of commissioning team.
- .2 Provide commissioning for the equipment provided under the following specification sections:
 - .1 26 50 00 - Lighting

1.2 REFERENCE STANDARDS

- .1 Underwriters' Laboratories of Canada (ULC)

1.3 GENERAL

- .1 Provide fully functional:
 - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 Facility users and O&M personnel have been fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet Owner's requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.
 - .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 WHMIS Safety Data Sheets (SDS).
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.

- .7 TAB - Testing, Adjusting and Balancing.
- .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
 - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 95% completed before added into Project Specifications.
- .2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .3 Submit completed Cx Plan to Consultant and obtain written approval.

1.5 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every (2) months during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Consultant for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Contractor to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
 - .1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.

- .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
- .3 Protection of health, safety and comfort of occupants and O&M personnel.
- .4 Monitoring of Cx activities, training, development of Cx documentation.
- .5 Work closely with members of Cx Team.
- .3 Consultant is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Ensuring implementation of final Cx Plan.
 - .6 Performing verification of performance of installed systems and equipment.
- .4 Construction Team: contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-To-Day operation and maintenance of facility.

1.7 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
- .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
- .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
- .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.

- .5 Client: responsible for intrusion and access security systems.
- .6 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.
 - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
 - .1 Redistribution of electrical services.
 - .2 Modifications of high mast lighting systems.
- .7 Provide names of participants to Consultant and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.8 EXTENT OF CX

- .1 Commission electrical systems and equipment:
 - .1 High Mast Lighting System.

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
 - .1 Compile English documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 WHMIS Safety Data Sheets (SDS).

1.10 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed installation checklists (ICL).

- .4 Completed product information (PI) report forms.
- .5 Completed performance verification (PV) report forms.
- .6 Results of Performance Verification Tests and Inspections.
- .7 Description of Cx activities and documentation.
- .8 Description of Cx of integrated systems and documentation.
- .9 Tests performed by Owner/User.
- .10 Training Plans.
- .11 Cx Reports.
- .12 Prescribed activities during warranty period.

1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by Consultant prior to permission to start up and rectification of deficiencies to Consultant's satisfaction.
 - .2 Include completed documentation with Cx report.
 - .3 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections.
 - .4 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ELECTRICAL:
 - .1 Lighting systems: Testing to include a verification of the As-Built light levels at grade in the general area illuminated by the new high mast lighting fixtures.

1.12 START-UP

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 All new or modified switchboards, distribution panels, and branch circuit panels.
- .3 Performance Verification (PV):
 - .1 Contractor to perform.
 - .1 Repeat when necessary until results are acceptable to Consultant.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Consultant to approve completed PV reports.
 - .4 Consultant reserves right to verify up to 100% of reported results at random.
 - .5 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by Consultant and approved by Consultant.
- .2 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report

using approved PV forms.

1.14 INSTALLATION CHECK LISTS (ICL)

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.15 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.16 PERFORMANCE VERIFICATION (PV) REPORT

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 CX SCHEDULES

- .1 Prepare detailed Cx Schedule and submit to Consultant for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28days after contract award, and before construction starts.
 - .3 Contractor's credentials: 60 days before start of Cx.
 - .4 Cx procedures: 3 months after award of contract.
 - .5 Cx Report format: 3 months after contract award.
 - .6 Discussion of heating/cooling loads for Cx: 3 months before start-up.
 - .7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .8 Notification of intention to start TAB: 21 days before start of TAB.
 - .9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .10 Notification of intention to start Cx: 14 days before start of Cx.
 - .11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .12 Identification of deferred Cx.
 - .13 Implementation of training plans.
 - .14 Cx of smoke management/control systems: after Cx of related systems is completed and 7 days before proposed date of Cx these systems.
 - .15 Cx stair shaft pressurization systems: before issuance of occupancy certificateat same time as emergency evacuation exercises.
 - .16 Cx reports: immediately upon successful completion of Cx.

- .17 Emergency evacuation exercises: after 80% occupancy and at same time as Cx of stair shaft pressurization systems.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
- .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Consultant, Contractor, and Owner will monitor progress of Cx against this schedule.

1.18 CX REPORTS

- .1 Submit reports of tests to Consultant who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.

1.19 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of Lighting systems.

1.20 TESTS TO BE PERFORMED BY OWNER/USER

- .1 None are anticipated on this project.

1.21 TRAINING PLANS

- .1 Refer to Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be complete for equipment, system and integrated system.

1.2 INSTALLATION/ START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Consultant supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Consultant. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Consultant's approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems.

1.5 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Consultant provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by Consultant.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide CSC Representative and Consultant with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.
 - .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1, Canadian Electrical Code, latest edition, Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No. 18.
 - .3 CAN3-C235-83, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .4 Where obsolete codes or standards are referenced in the drawings or specifications, the contractor is to comply with the latest version of the code or standard.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for starters, breakers, disconnect switches and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .4 If changes are required, notify Consultant of these changes before they are made.
- .4 Certificates:
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for

- approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.
- .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

- .5 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

- .6 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect equipment and material from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

- .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.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English and French.
- .4 Use one nameplate or label for each language.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction.
- .2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
 - .2 Sizes as follows:

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: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative and Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. " as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 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.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Other Security Systems	Red	Yellow

2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish.
 - .2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
- .2 Examine the existing building, site, and local conditions during the tender period and report any condition, defect, or interference that could prevent execution of the work. Contractor is to thoroughly review all accessible areas within the project scope of work including but not limited to mechanical and electrical rooms, above ceiling tiles, on top of building roofs, and within access doors of shafts/chases. No claims for extra payment will be allowed for work, difficulties, or expense due to conditions which were visible upon examination of the site during the tender period.
- .3 Electrical Contractor is to thoroughly review the complete set of contract documents during the tender period, including the work of all other disciplines, to obtain an understanding of the overall scope of the project. Any errors, omissions, discrepancies, or ambiguities in the contract

documents are to be issued as an RFI during the tender period for clarification by the consultant. No claims for extra payment will be allowed for work, difficulties, or expense due to items that are readily discoverable or reasonably inferable from an examination of the contract documents during the tender period.

- .4 Coordinate with the other disciplines during the tender period to ensure that division of work is clear and all work required for complete working systems is included within the overall tender price. No claims for extra payment will be allowed for work, difficulties, or expense due to lack of coordination between disciplines for work which is clearly required within the project for a complete working system.

3.2 WORK IN EXISTING BUILDING

- .1 Relocate existing pipes, ducts, conduits, wires, or any other equipment or services as required to accommodate the work.
- .2 Any services which pass through the renovation area but feed areas outside of the project scope of work are to be existing to remain, unless otherwise noted.
- .3 Where an electrical device to be demolished is on the same circuit as device(s) that are existing to remain, contractor shall provide new conduit and wire to existing device(s) as required to maintain device(s) in working condition.
- .4 Coordinate shutdowns with the Owner:
 - .1 Provide sufficient notice and communicate all required shutdowns in writing to the Owner.
 - .2 All shutdowns are to be performed at times indicated by the Owner. Obtain written approval from the Owner prior to performing all shutdowns.
 - .3 Work is to be performed to minimize duration of all shutdowns. Provide multiple crews if required to minimize shutdown durations.
 - .4 All shutdowns which affect areas outside of the project scope of work shall be performed after hours.
 - .5 All shutdowns which affect Owner equipment which is existing to remain shall be performed after hours.

3.3 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.4 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.5 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.7 SYSTEM STARTUP

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .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 aspects of its care and operation.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section ready for new construction.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

1.3 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:
 - .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and

- Disposal.
- .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Owner's continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Federal Workers' Compensation Service and Provincial/Territorial Workers' Compensation Boards/Commissions
 - .2 Government of Canada, Labour Program: Workplace Safety and Provincial/Territorial Occupational Health and Safety Standards and Programs

1.7 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Existing Hazardous Substances: Owner has performed a hazardous substances assessment and identified materials requiring abatement as follows:
 - .1 Hazardous substances are as defined in Hazardous Products Act.
 - .2 Hazardous substances will be removed by Owner as a part of separate Contract before starting Work.
- .3 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Departmental Representative and Consultant if materials suspected of containing hazardous substances are encountered and perform following activities:
 - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in Hazardous Products Act.
 - .3 Stop work in area of suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Hazardous substances will be removed by Owner under a separate contract or as a change to Work.
 - .6 Proceed only after written instructions have been received from Consultant.

1.8 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Owner's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .2 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety

of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
- .2 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
- .3 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
- .4 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .5 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
- .6 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
- .7 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International:
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA).

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper and copper alloy sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper and copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Bolts for copper conductors.
 - .4 Sized for conductors as required.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connector installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.

- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure-type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No. 65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No. 65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with NEMA.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

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

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 00 - Cleaning.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 12 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600, 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, RWU90 XLPE.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes,

and termination points.

- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e., common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1, Canadian Electrical Code, Part 1 (latest Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper short barrel compression connectors to CSA C22.2 No.65 as required sized for conductors. Execution

2.2 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of CSC Departmental Representative.

- .2 Inform CSC Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

2.3 INSTALLATION

- .1 Install connectors and terminations in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2 No.41.

2.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1- GENERAL

1.1 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar

- ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
 - .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
 - .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
 - .8 For surface mounting of two or more conduits use channels at 1000 mm on centre spacing.
 - .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
 - .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
 - .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
 - .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
 - .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1- GENERAL

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No. 18), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
- .2 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

- .3 Each coil or reel of cable to contain only one continuous cable without splices.
- .4 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 CSA C22.2 No. 83, with couplings.
- .3 CSA C22.2 No. 211.2.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .5 CAN/CSA-C22.2 No. 227.3

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1000 mm on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Use rigid hot dipped galvanized steel threaded conduit where subject to damage and as indicated.
- .4 Use electrical metallic tubing (EMT) indoors unless indicated otherwise.
- .5 Use rigid pvc conduit in corrosive areas.
- .6 Use flexible metal conduit for connection to motors in dry areas.
- .7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .8 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .9 Minimum conduit size: 19 mm.
- .10 Mechanically bend steel conduit over 19 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.

- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F 1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

1.2 ACTION AND SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.
 - .3 Photometric data to include: VCP Table where applicable, spacing criterion.
 - .4 Fixture type, lumen output, lighting distribution and other characteristics to be modified as required to meet the Security Lighting Requirements section 5.1 of the Correctional Service Canada - Technical Criteria document SP-4 attached to this specification.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

Part 2 Products

2.1 LAMPS

- .1 All new light fixtures to be supplied by one manufacturer.
- .2 All new fixtures to be LED as indicated.
- .3 Fixtures to be supplied with integral drivers for LEDs.
- .4 Fixtures must not have any visible flicker after installation across the full dimming range.

2.2 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.3 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.4 LUMINAIRES

- .1 As indicated in luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Aim fixtures in accordance with contractor provided lighting study.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as required.

3.3 LUMINAIRE SUPPORTS

- .1 As specified.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires in accordance with the lighting study.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

3.6 COMMISSIONING

- .1 Using a photometer, record spot measurements throughout the area where Security Lighting is to be provided. Sufficient measurements are to be recorded to confirm that the lux levels meet or exceed the levels identified in the photometrics study.
- .2 Test Report: provide a report identifying the measurements recorded, the As-Built fixture types and the As-Left lumen output settings of the installed fixtures.
- .3 Following the study, modify the lumen output settings on the fixtures to improve light levels as directed by CSC and the Consultant.

END OF SECTION

SP-4 SITE – EXTERIOR LIGHTING

1. SCOPE

This section outlines the requirements for site lighting including perimeter fence lighting and provides design guidelines for the following:

- Type of lighting systems and standards.
- Recommendations for lighting levels.
- Quality of illumination.
- Recommendations for control of glare.
- Recommendations for uniformity and brightness control of the environment.

• RELATED SECTIONS

SP-2 – Fences

SP-5 – Traffic Circulation

E-1 – General Electrical Engineering and Electrical Distribution

E-7 – Emergency Electrical

ST-1 – Guard Towers

2. GENERAL REQUIREMENTS

- 3.1 Exterior lighting is provided for safety and security within institutional grounds; to assist in the visual detection of escape attempts, and to permit the use of exterior amenities after daylight.
- 3.2 Exterior lighting shall be situated to minimize light entering sleeping areas.
- 3.3 Exterior lighting systems shall be designed to cast a practicably uniform level of lighting, free of shadows or dark spots and with minimal glare.
- 3.4 Energy saving features and systems shall be used in accordance with government policy.
- 3.5 Levels of illumination herein presented refer to average and avg./min. ratio values for either horizontal, ground level, or vertical illumination, unless otherwise stated. Local conditions may make it necessary to adjust values.
- 3.6 Lighting is provided to assist CCTV and vehicle patrol monitoring on the perimeter.
- 3.7 Systems shall be designed to withstand a wind velocity of 160 km/h and ice loading characteristic of the area in which the institution is located.
- 3.8 All security lighting systems shall be equipped with automatic control and manual override. The manual override shall reset itself to the automatic mode after it has been left in the manual mode for 24 hours. Recreational lighting controls shall be manual only.

3. APPLICATIONS

Exterior lighting is designed to provide illumination of the following:

- Signage
- Entranceways and exits, including exterior stairways and ramps
- Pedestrian walks
- Institutional Grounds
- Parking lots and roadways
- Outdoor amenity areas
- Perimeter fences (and walls).

4. PERFORMANCE REQUIREMENTS

5.1 *Security Lighting*

5.1.1 Lighting requiring Emergency Power Source

5.1.1.1 Perimeter Fence Lighting System - Special requirements for the perimeter system are covered in item 5.2.

5.1.1.2 Medium and Maximum security institutions. – the entire area within the inner perimeter fence illuminated to 10 lx average to allow silhouetting surveillance.

5.1.2 Illumination

5.1.2.1 Entrances and Sally Ports shall be illuminated to allow recognition of persons entering the institution after daylight hours. Fixture placement shall not impede optimal visibility. The Entrance and Sally Ports shall generally have an illumination level matching that of the perimeter fence.

5.1.2.2 Glare Control -.Lighting system shall be engineered to ensure that spill light will not produce a glare problem without affecting the minimum illumination levels.

5.1.2.3 Uniformity – The placement of the luminaires should be arranged so as to ensure good uniformity of illumination over the area illuminated. Uniformity is expressed as the ratio of average illumination to minimum. In the area between perimeter fences the ratio should not exceed 3:1.

5.1.2.4 Luminaires – Exterior security lighting fixtures shall be based on the following requirements:

- a) Shatterproof lenses and vandal resistant housings
- b) Non yellowing lenses
- c) Pole, luminaires and brackets capable of withstanding the force of 160 km/h wind
- d) Lighting fixtures location to facilitate replacement of components.

5.1.2.5 Electrical System – The electrical system must meet the following minimum requirements.

- a) The security lighting system including the perimeter fence lighting shall be connected to the standby power system for continuity of service.
- b) Grounding methods shall meet the requirements of the Canadian Electrical Code, *CSA C22.1 2012*¹.
- c) Protect each phase with dedicated single phase circuit breaker. This will prevent the possibility of a fault on one phase affecting the other two.

5.1.2.6 Codes and Standards – Installation shall comply with the latest edition of the Canadian Electrical Code, Part 1, *CSA C22.1-2012* (see footnote 1) and any applicable local or provincial regulation. Requirements outlined herein however, shall take precedence.

5.2 *Perimeter Fence Lighting*

5.2.1 General

5.2.1.1 Security Lighting for Perimeter Fences shall:

- a) Discourage or deter escape attempts.
- b) Make detection certain should an escape be attempted within the immediate area of the perimeter fence.
- c) Avoid glare that can impact good visibility while not adversely affecting surrounding area.
- d) Ensure high system reliability.
- e) Meet levels of illumination indicated in Plates SP-4-2 and SP-4-6.
- f) Have automatic control.
- g) Consist of poles, lighting equipment and components located outside the double security fences and be made vandal or sabotage proof.
- h) Be connected to the standby power system for continuity of service.
- i) Provide minimum illumination level of 10 lx to the centre line of the perimeter road (typically between 8 m and 20 m from the edge of the outer perimeter fence).

5.2.2 Design

Perimeter Fence Lighting System shall be designed to achieve and maintain lighting quality based on the following factors and considerations:

- 5.2.2.1 Institutions are typically located in remote areas with little light from off property. Therefore, the lighting system shall autonomously enable clear viewing within the illuminated area of the fence line.
- 5.2.2.2 The height of the perimeter fences, the distance between fences and any structures such as guard towers or CCTV towers will impact the design of the security lighting system pertaining to the height of the poles and the mounting height of the fixtures.
- 5.2.2.3 A maintenance factor shall be applied in the design calculation to make allowance for luminaire dirt and any depreciation. Also consider weather conditions which will adversely affect visibility.

5.2.3 Luminaire Type

- 5.2.3.1 LED Luminaires– The current choice for lighting is Light Emitting Diode (LED) These will normally be fully operable between -40°C (or less) and + 50°C (or more) and emit a white or bluish bright light of superior quality which enhances vision and colour distinction. See Plate SP-4-6 for LED layout. LED Luminaires are specified as follows:
 - a) Mounted directly onto posts at a 9m of height.
 - b) Type Short II diffusion pattern.
 - c) 100 000 hours or higher rated lifetime.
 - d) Colour temperature between 4000K and 5700K.
 - e) 90 lumens/Watt or better
 - f) CRI ≥80
 - g) Corrosion resistant finish of all materials of the fixture.
 - h) Integral 10kV surge protection in accordance to IEEE/ANSI C62.412
 - i) Power factor of 0.9 or greater.
 - j) Total harmonic distortion of 20% or lower.
 - k) IP66 rated fixture
 - l) Meets ANSI C136.31-2001 standard for vibration resistance
 - m) Designed to operate at temperature from -40°C.

- n) cULus listed.
- o) LED modules and driver to meet **CSA-C22.2 No. 250.13-12**
- p) LM-79 and LM-80 tested.
- q) Valid IES photometric data file.
- r) 10 years warranty on all parts.

5.2.3.2 Low Pressure Sodium is being used in most existing CSC institutions for perimeter lighting. See Plate SP-4-2 and SP-4-3 for layout.

Sodium Luminaires, Lamps and Ballasts – Sodium lamps are specified as follows:

- a) Type 135 W SOX low pressure sodium, with separate ballast, available from Philips series SDP 828 or approved equal.
- b) With “unitized” cast aluminium housing free of welds, butt joints and lapped corners with baked enamel finish, anodized aluminium reflector and a clear acrylic diffuser.
- c) With HRC fuse rating as per ballast manufacturer and installed in the transformer base for protection of each luminaire.
- d) With stainless steel hardware on the outside and corrosion resistant finish of all materials inside the fixture.
- e) With an optical system protected by a neoprene gasket to keep out dust and moisture.
- f) With guard for protection against excessive vibration by using porcelain lampholder and a spring steel plastic coated lamp support.
- g) With a T-21 bulb providing 21,500 lm output (minimum) and an average rated life of 15,000 hours.
- h) With ballasts designed and manufactured to meet *CSA C22.2 No. 74-96 (R2005)*¹³, *ANSI Standard C82.1-2004*¹⁴ and CBM Standard. Ballast rated voltage shall match supply current voltage and voltage ratings of the lamps. Ballasts to have a power factor correction to a minimum of 90%.
- i) With ballasts designed to operate 135 W low pressure SOX sodium lamps at minus 40°C and to maintain lamp wattage within 8% of nominal with a supply line fluctuation of 20%.
- j) With ballast of constant wattage auto transformer type.

5.2.4 Poles are specified as follows:

5.2.4.1 Octagonal tapered of steel complete with transformer bases, eye bolts and gasketed electrical outlet boxes.

5.2.4.2 Hot dipped galvanized on interior and exterior surfaces as per *ASTM A123-09* and hot dipped galvanized anchor bolts and hardware accessories where possible.

5.2.4.3 Height and luminaire spacing to match type of lighting system as shown on Plates SP-4-3 & SP-4-6.

¹³ CAN/CSA-C22.2 No. 74-96 (R2005) – Equipment for Use with Electric Discharge Lamps

¹⁴ ANSI C82.1-2004 – American National Standard for Lamp Ballasts – Line Frequency Fluorescent Lamp Ballasts

- 5.2.4.4 Hardwood plywood template for retaining anchor bolts when grouting them in place in the concrete base.
- 5.2.4.5 With non-shrink grout.
- 5.2.4.6 Transformer base plates drilled in the manufacturer's plant to match the anchor bolt configuration set in the bases.
- 5.2.4.7 Access doors in the transformer bases are c/w gasket and use tamperproof hardware for securing doors in place.
- 5.2.4.8 Transformer base oriented so that their access doors are parallel to but facing away from the fence.
- 5.2.4.9 Yellow PVC guards installed on the guy wires on the anchor poles terminating the linear sections of the spans (applies to catenary system where used).
- 5.2.4.10 For grounding requirement specify:
 - a) 10 mm threaded copper grounding stud welded to the inside of each transformer base at the back and above the bottom of the door opening. Ground studs are supplied complete with two nuts, one lock washer and one copper clamp type lug for minimum 13 mm² stranded bare copper wire.
 - b) Ground studs welded to the transformer bases in such a manner as to present a smooth surface on the exterior of the bases.
- 5.2.4.11 Aluminium nameplate located one foot above its base to include the manufacturer's name or identification mark, year of manufacture, pole length and ordering reference number.
- 5.2.4.12 Shims for levelling consisting of one 1.5 mm and two "U" shaped 3 mm.
- 5.2.5 Catenary System
 - Only to be used for low pressure sodium light system as illustrated SP-4-3. In specifying the catenary system, consider the following requirements:
 - 5.2.5.1 The system shall be capable of withstanding a wind velocity of 160 km/h and ice loading characteristics of the area and a luminaire dead weight of not less than 9 kg and a projected area of 0.3 m²
 - 5.2.5.2 Maintain total linear balance by anchoring the terminal poles of each linear section as shown in Plates SP-4-4 & SP-4-5.
 - 5.2.5.3 The catenary (upper) and the messenger (lower) cables shall be 9 mm nominal diameter.
 - 5.2.5.4 The strainer (vertical) and suspension cables shall be a minimum 3 mm diameter stainless steel.
 - 5.2.5.5 Electrical cable assembly shall spiral around the messenger cable. Electrical cable shall be XLPE insulated stranded copper conductors in multi cord cable assembly with overall PVC jacket.
 - 5.2.5.6 Provide 3 luminaires in each span of 30 m as shown in Plates SP-4-2 and SP-4-3 resulting in a luminaire every 10 m.
 - 5.2.5.7 All hardware including turnbuckles, wire rope, clamps, etc., to be hot dipped galvanized steel.
- 5.2.6 Pole Mounted Luminaires and Lamps
 - 5.2.6.1 Distance between luminaires shall be based on Light diffusion modelling using approved lighting, their manufacturers and fixtures. Plate SP-4-6

illustrates existing installation characteristics for pole mounted luminaires.

5.2.7 Controls

Perimeter fence lighting shall be controlled by a photo cell and meet the following requirements:

5.2.7.1 A photo control unit shall automatically turn on the security fence lighting system.

5.2.7.2 The weatherproof unit capable of operating over a range of -60°C to +55°C shall be mounted on a fence lighting pole located closest to the Gatehouse.

5.2.7.3 The control shall energize the lamps on a preset (adjustable) value.

5.2.7.4 A manual control override turns the lights on and off as required.

5.2.7.5 The system shall operate on stand-by power and “be fail-secure”.

5.2.7.6 Controls shall be connected in parallel with the “ON” contacts of the “ON OFF” selector switch located as specified.

5.2.7.7 The photo control shall have a standard NEMA twist lock plug.

5.2.7.8 The photocell shall be temperature stabilized pre-aged and hermetically sealed.

5.2.7.9 The Installation Contractor shall adjust the photo control unit to switch on at not less than 40 lx. The unit shall be rated 1000 W incandescent, 120 volts, 60 HZ and CSA approved.

5.3 Other Exterior Lighting

5.3.1 Luminaire type - Lighting type shall be selected based on energy efficiency, economy and accepted practices for Recreational Areas, Parking Lots, Signage, Roads and sidewalks, Building entranceways and exits, and Institutional grounds. Luminaires must be fully operable between -40°C (or less) and + 50°C (or more).

5.3.2 Illumination Levels - The light levels requirements should be adapted for an LED technology conversion according to ***I.E.S. Handbook 10th Edition***

5.3.2.1 Recreation area illumination system shall be installed on a project specific basis so as to form an integral system as part of the exterior lighting system. Illumination levels for recreational purposes are approximately 70 lx.

Illumination levels for the following recreational activity areas are (Total Area 22,736 m², see Plate 2 for typical layout):

a) Softball Diamond - 18 x 18 m overall with 73 m outfield radius, Infield 100 lx, outfield 70 lx.

b) Hockey Rink - 60 x 26 100 lx.

c) Running Track – 50 lx

d) Games / fitness as established on a project specific basis illuminated to a maximum of 100 lx.

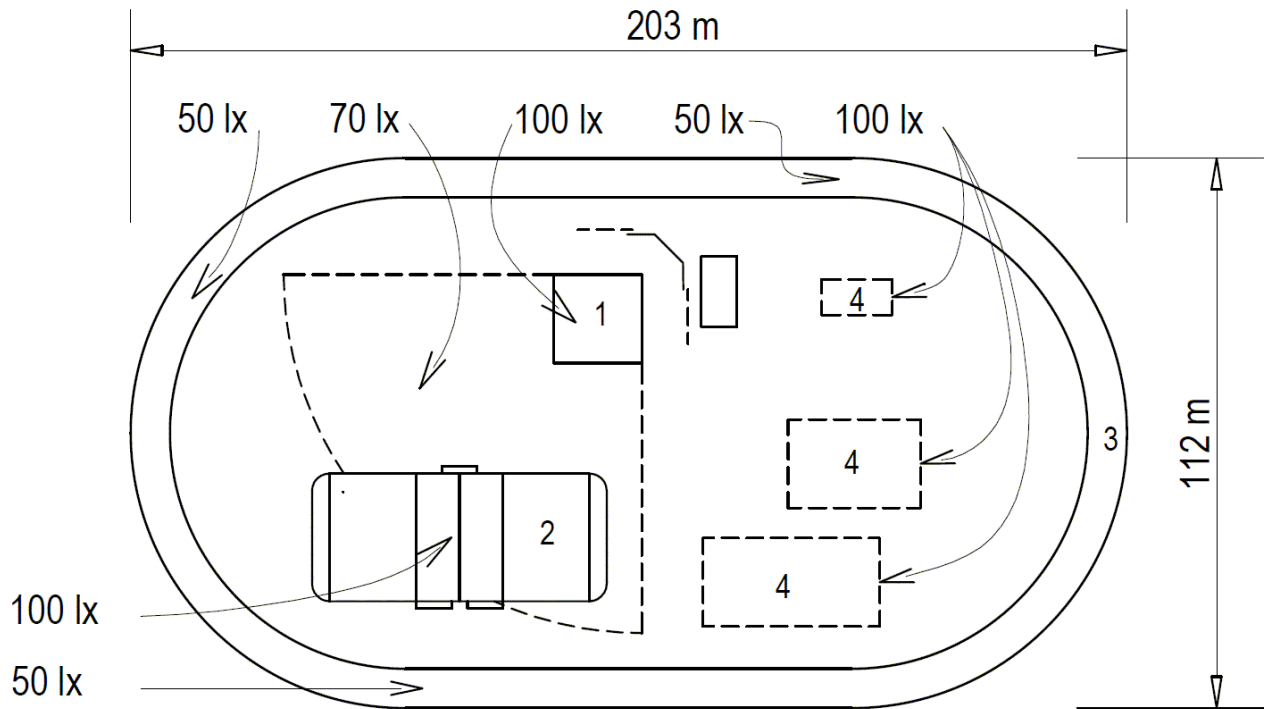
e) Dedicated mini yards connected to living areas -70 lx.

5.3.2.2 Parking Lots, Institutional Grounds. Roads and sidewalk illumination levels:

a) Average Illumination Levels – 10 lx.

- b) Illumination Uniformity – Maintain a maximum ratio of average lux to minimum lux of 3:1.
 - c) Illumination Quality – To minimize shadows especially between parked cars illuminate each point from at least two luminaire locations.
- 5.3.3 Signage, Building entranceways and exits
- 5.3.3.1 Direct lighting with similar luminaires to that for sidewalks and roads will serve to illuminate the target door or sign to a higher level.
- 5.3.4 Controls
- 5.3.4.1 The recreational lighting controls shall be manually switched on and off as required from a specified location.
- 5.3.4.2 All other exterior lighting shall be controlled by photocell or astronomical dial time clock with manual bypass from a specified location. Lighting controls shall be separated for each use.
- 5.3.5 Poles and Masts
- 5.3.5.1 Specify that all poles and masts used as light standards shall be fabricated from steel conforming to *CSA Standard G40.21-04 (R2009)*¹⁵ Type T, grade 60T, Low silicon, 60,000 psi yield strength. Do not use concrete poles and masts.
- 5.3.5.2 Avoid having steps on poles and masts.
- 5.3.5.3 Minimum height of post for pedestrian walks 3.05 m, for parking lots 6.1 m.
- 5.3.5.4 The lighting system should incorporate a method by which luminaires on high standards (poles) may be easily and economically maintained.
- 5.3.5.5 High Standards (30 m poles) are not necessary for Minimum Institution but the pole height should be less than 13 m.

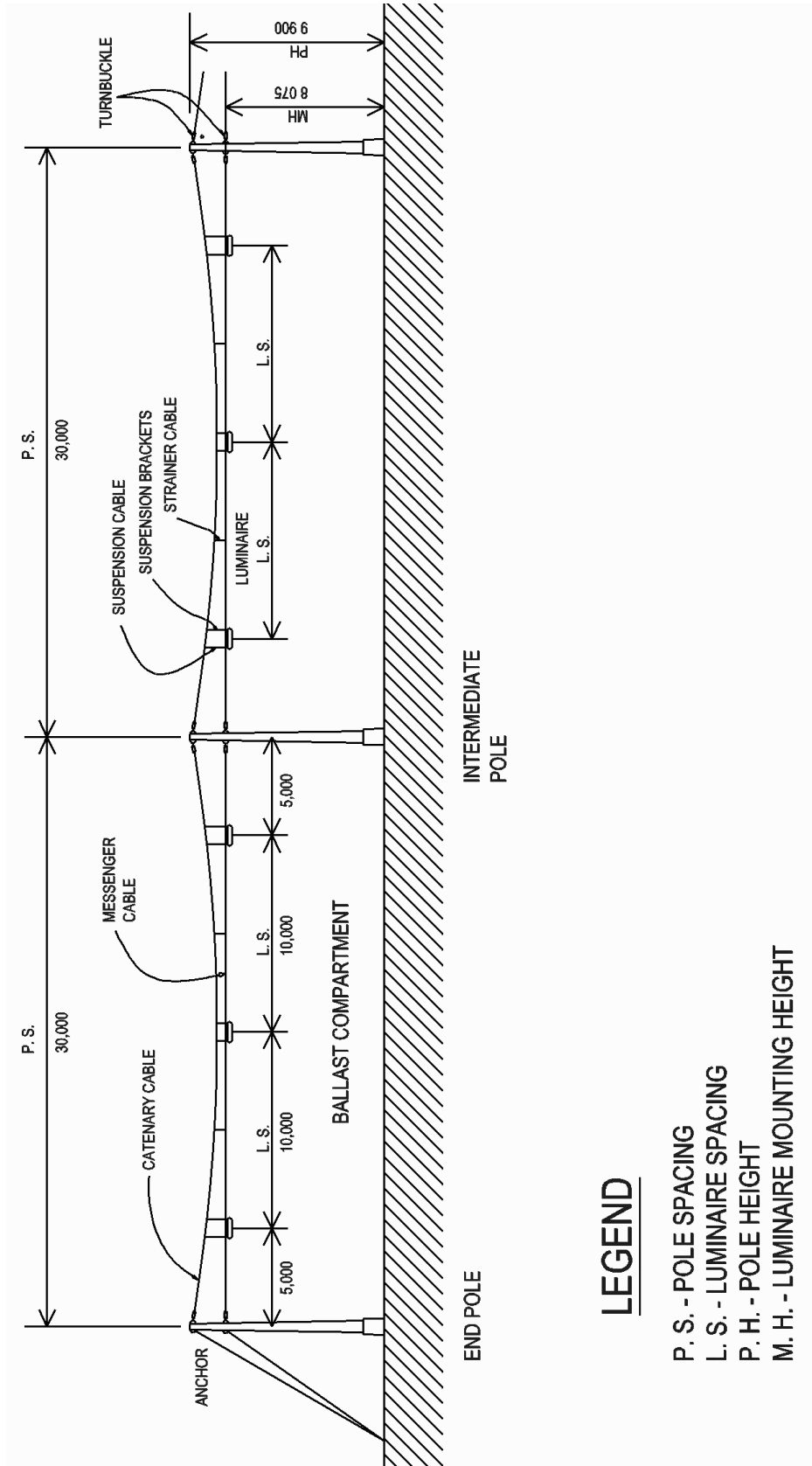
¹⁵ CSA G40.20-04/G40.21-04 (R2009) – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel



ALLOCATION FOR ILLUMINATION AND LIGHTING LEVELS

1. SOFTBALL DIAMOND 18 X 18 – 73 m OUTFIELD 4 183 m²
(100 lx INFIELD, 70 lx OUTFIELD)
 2. ICE HOCKEY RINK 60 X 25 m, 155 m² (100 lx)
 3. TRACK LENGTH NON-STANDARD (50 lx)
 4. SMALL GAMES – VARIOUS, TOTAL 1 343 m²
- APPROXIMATE FIELD SIZE 22 736 m²

SP-4-1 – ATHLETIC FIELD LIGHTING



LEGEND

- P. S. - POLE SPACING
- L. S. - LUMINAIRE SPACING
- P. H. - POLE HEIGHT
- M. H. - LUMINAIRE MOUNTING HEIGHT

SP-4-3 – CATENARY
SYSTEM – SIDE VIEW

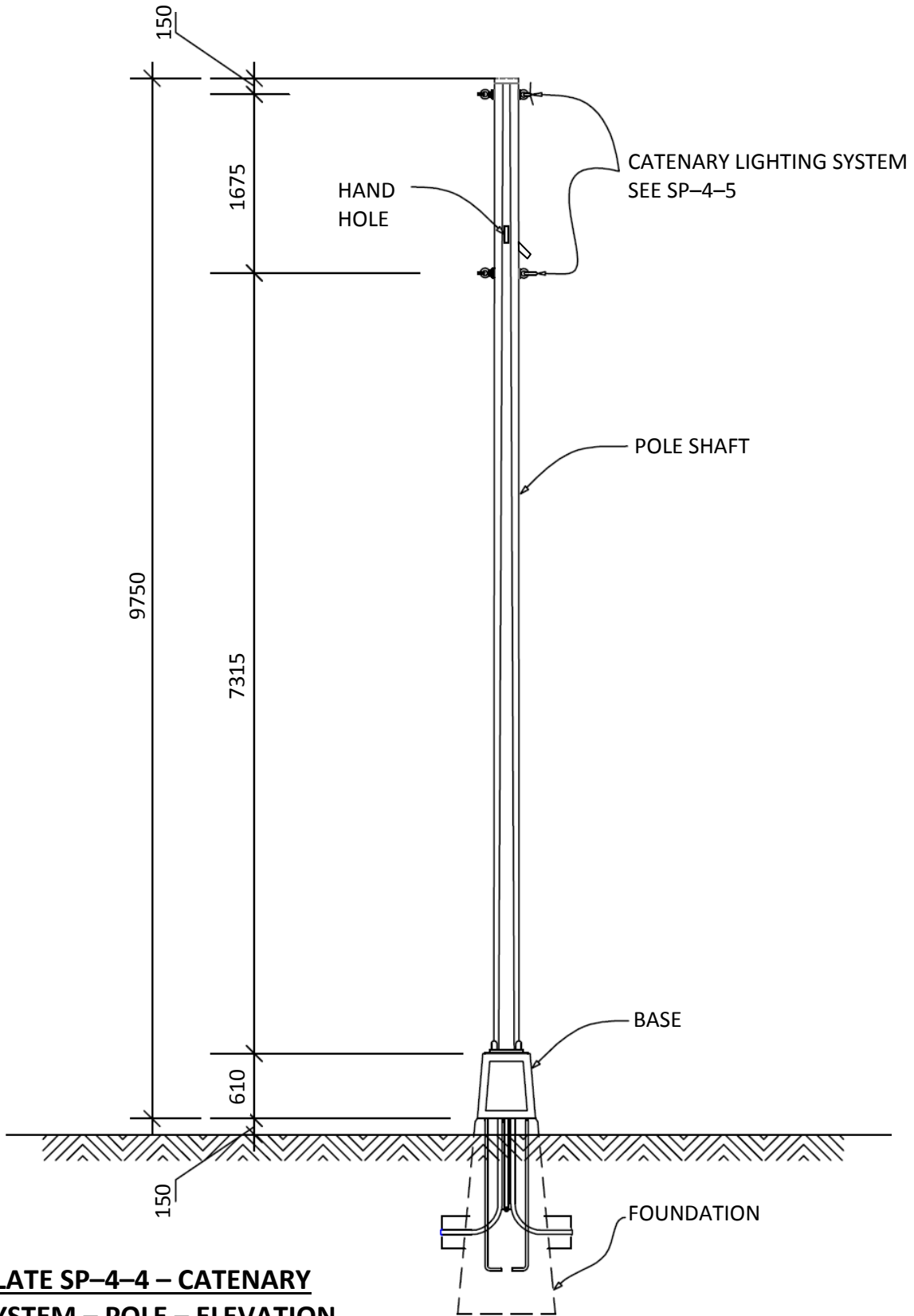
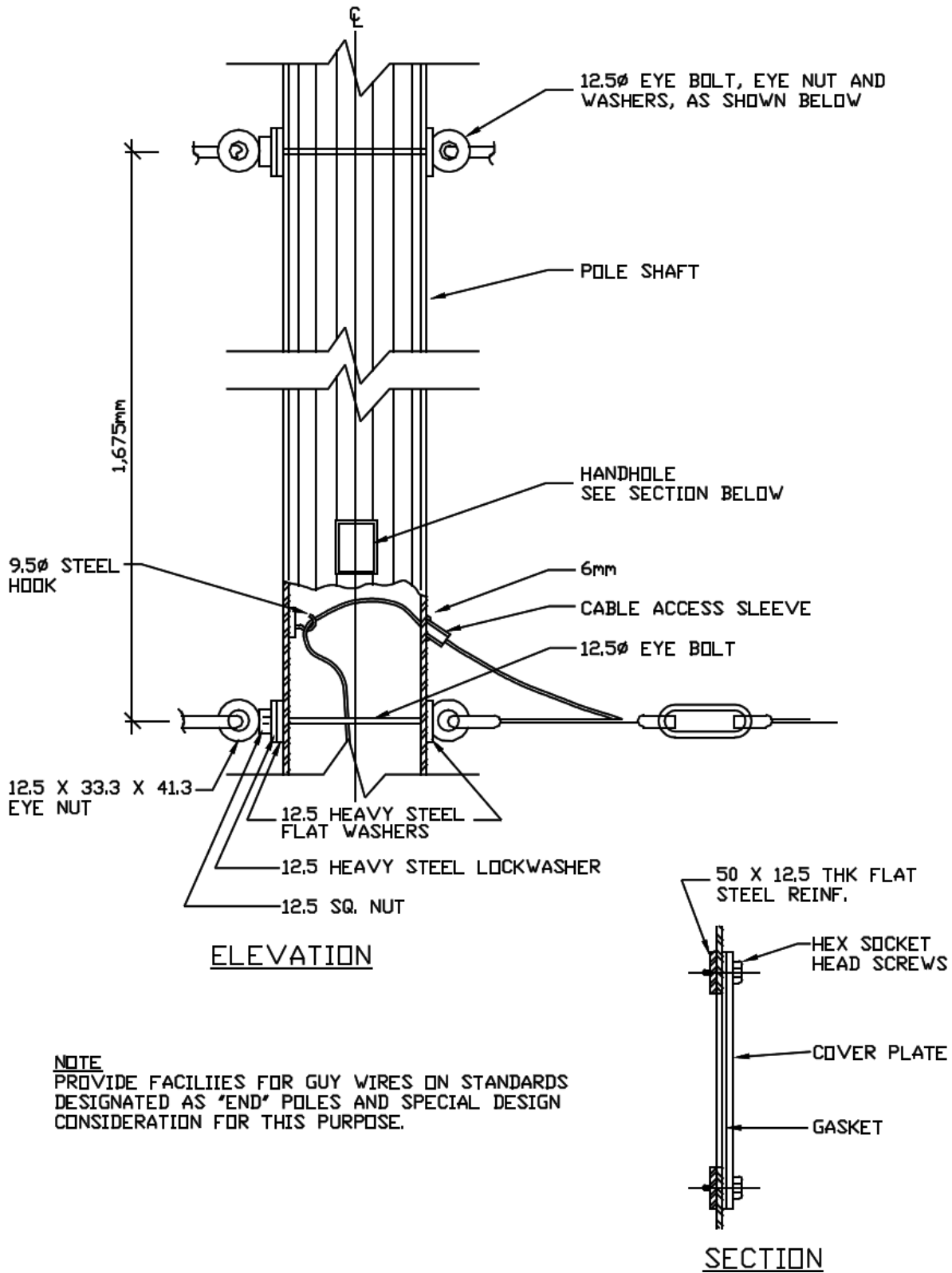
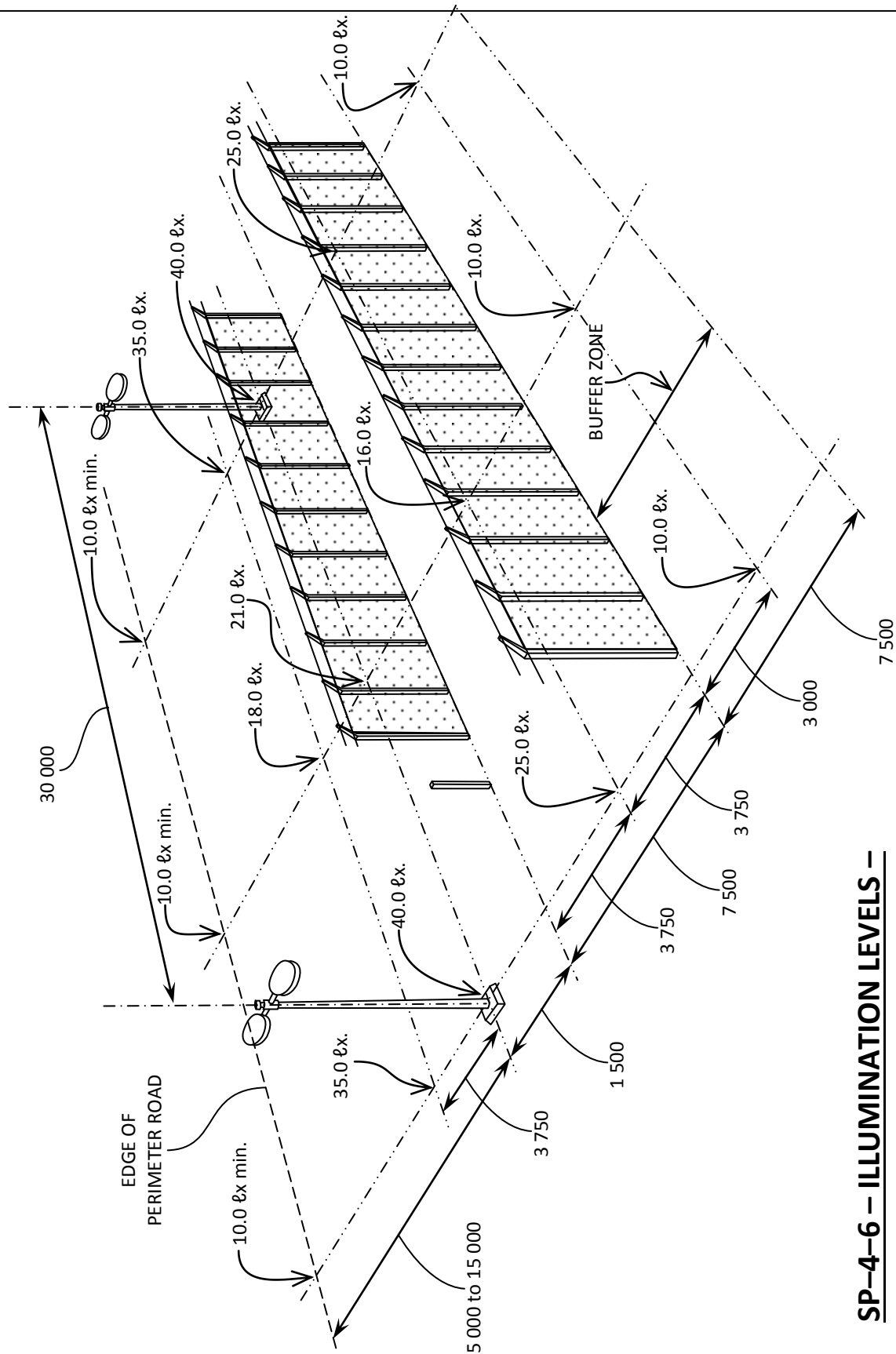


PLATE SP-4-4 – CATENARY SYSTEM – POLE – ELEVATION



SP-4-5 – CATENARY SYSTEM – POLE DETAIL



SP-4-6 – ILLUMINATION LEVELS –
POLE MOUNTED LUMINAIRES –
ISOMETRIC VIEW