Fisheries and Oceans Canada | Pêches et Océans Canada

Security Fencing Upgrades

Specifications

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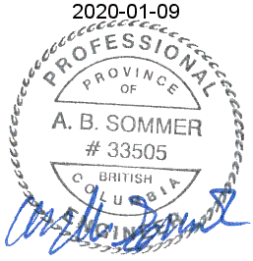

Seal #1

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Specifications

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NOTES:

Each Engineer that has applied a seal above shall indicate which sections of the specifications he or she is certifying and the engineering company they work for. Alternatively, the Engineer may indicate which engineering discipline he or she is certifying as long as the name of the engineering company they work for (the source) is shown on the applicable technical specifications.

INDEX OF DRAWINGS

ELECTRICAL		
DRAWING No.	**REV**	**DESCRIPTION**
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STRUCTURAL		
DRAWING No.	**REV**	**DESCRIPTION**
S100	4	Location Plan, Key Plan, Drawing List, and General Notes
S200	4	General Arrangement Southwest Entrance
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S300	4	Security Fence, Cantilever and Pedestrian Gate Details
S301	4	Parking Control Barrier Gate and Card Reader Base Details

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.3 DESCRIPTION OF PROJECT AND SITE LOCATION

.1 Civil Construction Services are being sought for creation of new “Security Fencing Upgrades” at the Institute of Ocean Sciences in Sidney, British Columbia. The Institute of Ocean Sciences is a Fisheries and Oceans Canada facility operated by its Real Property Branch.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises exterior lighting upgrades at the Institute of Ocean Sciences, located at 9860, West Saanich Road in Sidney, BC.

.2 Security fencing and access control works as identified in the attached drawings (Security Fencing Upgrades) including removals, offsite disposal, grading & testing, new fencing and gates, landscaping works (including reconnecting any disturbed irrigation system components), etc. as outlined on the engineered drawings. It shall be the sole responsibility of the contractor to ensure site access is not disrupted during work. The Contractor will provide all labour, materials, and equipment required to complete the security fencing project in the identified areas on the provided drawings for the project.

.3 Work of this contract is located on DFO owned land and the premises shall be considered DFO employees and various PSEC collaborators during the course of work. Any required access is to be coordinated through the DFO Project Manager Representative. The contractor shall be responsible for notifying the occupants in writing prior to the commencement of work (min. 48 hours’ notice).

.4 Work will be phased so as to not interrupt the daily operations of the site. Contractor is to provide Traffic Management/Road Closure/Phasing Plan to owner for review before work commences.

.5 Work includes but is not limited to:

- .1 Remove and dispose of existing post and wire fence gates in areas noted on attached Engineering Drawings.
- .2 Install new security fencing and gates as per attached Engineering Drawings.
- .3 Provision of new security systems including but not limited to: intercom, CCTV, and access control system including all network infrastructure to support the new systems.
- .4 Integration of new access control with facility’s existing access control system.
- .5 Provision of new luminaires, poles, and bases.
- .6 Provision of new cantilevered gates and gate controllers, integrated with the intercom and access control systems.
- .7 Provision of new lift arm gates and associated manual controls.
- .8 Provision of new fencing to prevent unauthorized site access.

.9 Provision of all Civil works required to facilitate the installation of new electrical and security systems and re-instatement excavated areas.

.10 Coordinate and pay for First Nations Cultural Observers to be present during all excavation work.

.6 Contractor shall obtain and pay for all permits required to perform the work outlined in the Contract Documents including but not limited to electrical and building permits.

1.5 SCHEDULE AND MILESTONES

.1 Work must be completed by October 31, 2020.

.2 Due to funding restrictions, work must be completed by the date listed.

.3 The following milestones (in calendar days) have been established for the implementation of this project. The Contractors detailed schedule should meet the milestones or match as closely as possible for each task.

Project Milestone	**Time-Frame**
Contract Award	Day 0
Pre-commencement Meeting	Award + 7 days
Contractor Shop Drawings/Submittals to DFO Contract Administrator	Award + 14 days
Contract Completion Date (CCD-100%)	31 October 2020

.4 Following the approval of the Contractor's schedule by the DFO Contract Administrator, the Contractor shall notify the tenants of the work schedule, and take the necessary measures to complete the work within the scheduled time-frame.

.5 Product submittals are required to ensure that the specified material and products are furnished and installed in accordance with design intent as expressed in the contract documents. Until submittals are reviewed and approved by the project authority, work involving relevant material or product may not proceed. Submittals will be reviewed by the project authority and responses provided within 3 working days.

1.6 SPECIFICATIONS AND STANDARDS

.1 The documents provided in this Contract are based on National Master Specification (NMS), Master Municipal Construction Documents Association (MMCD) Platinum Edition Volume II.

.2 The contractor shall provide each component in accordance with the descriptions in the attached specifications, Structural Drawings, Electrical Drawings, as well as comply with the overall intent of the NMS, National Building Code, the MMCD, the British Columbia Building Code.

.3 Precedence: As noted in the drawings, where a discrepancy occurs in the Specifications the most stringent specification will apply.

1.7 WORK ENVIRONMENT

.1 The Institute of Ocean Sciences is a federal facility with restricted access. All contractors' personnel must be escorted by authorized personnel or hold reliability clearance.

1.8 SITE CONDITIONS

.1 Contractor to provide and maintain flag persons, traffic signals, barricades, detour signs required to give the public proper warning. Contractor supplied disposal bins are to have a closable lid, and remain closed when being loaded.

.2 Clean-up, temporary fencing, and storage: The Contractor shall provide, install and maintain all necessary control measures to ensure the work does not impact the adjacent environment or occupants, including silt and dust control. Provide secure temporary storage facilities and fencing for materials and equipment if necessary. Clean up debris daily from the work area and ensure all hazardous impediments are removed or adequately stored or protected. The jobsite shall be left clean, neat and in a safe condition at the completion of each workday to the satisfaction of the DFO representative.

.3 Adequate storage areas for material and equipment will be provided onsite for the Contractor for the duration of the project.

.4 Contractor shall maintain site roads used by construction vehicles in a clean condition and free of mud, sand and construction debris. Roads will be swept at the end of each day, or multiple times a day as required.

1.9 GENERAL INSTRUCTIONS

.1 It is the Contractor's responsibility to visit the site prior to submission of tenders and to become thoroughly acquainted with conditions at the site, and make whatever enquiries necessary to familiarize him with climate, tide levels, and other site conditions. This includes identifying trees that will need to be removed during the construction process.

.2 The Contractor shall make his own arrangements subject to the approval of the DFO Contract Administrator, for access to the site, parking, storage, and staging areas.

.3 The Contractor shall be responsible for supply of water, electrical power, heat, sanitary, first aid and all other temporary services and facilities required for the Work.
Where connection to the Owner's services is authorized, all connection points shall be restored to their original condition, or replaced by the Contractor to the Owner's satisfaction.

.4 Contractor to provide and identify any geotechnical testing or reporting required.

.5 Utility Locates – contractor to provide utility locating prior to construction for assistance in the confirmation of potential existing utility conflicts. If any additional utility locates are required, the Contractor is to notify the Contract Administrator. Contractor to identify areas that may require additional investigation or action prior to construction.

.6 Archaeological – Full time cultural observers must be present during excavation.

.7 Contaminated Soil – Soil disposal to be coordinated with Departmental Representative. Soil sample data can be made available to the Contractor if required.

.8 Dewatering – Contractor to identify areas that may require dewatering during construction. Dewatering plan to be approved by Contract Administrator

.9 The Contractor shall erect barriers, fences, warning signs, lights, and watch for the protection of persons and property on or adjacent to the site.

.10 The Contractor shall take special care to ensure his work does not damage adjacent structures or works. The Contractor shall handle all materials appropriately to prevent their damage. The Contractor will be responsible for correcting any damage due to his mishandling at his own expense.

1.10 CONTRACT METHOD

.1 Relations and responsibilities between Contractor and subcontractors and suppliers assigned by Departmental Representative are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:

.1 Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations thereunder.

.2 Purchase and maintain general liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Departmental Representative.

.2 WorkSafeBC

.1 Within five (5) working days of execution of the Contract, provide written confirmation from the WorkSafeBC that the prime contractor and all subcontractors are registered in good standing with WorkSafeBC. No invoice will be payable until such confirmation has been received.

1.11 CHANGE MANAGEMENT PROCEDURES

.1 Any unforeseen changes in the project scope will be handled as follows:

.1 The Contractor or the Departmental Representative identifies a change in scope and provides written notice to the other party detailing the reason, impact and cost of this proposed change.

.2 An agreement is negotiated on the change, or the change is rejected.

.3 The Departmental representative issues a change order via PWGSC.

1.12 METHOD AND SOURCE OF ACCEPTANCE

.1 The Method of Inspection and Testing will be as noted in the applicable NMS and MMCD unless otherwise noted. The Certificate of Substantial Completion will be issued by the overseeing Engineering firm and the DFO Contract Administrator.

1.13 COMMUNICATIONS MANAGEMENT

.1 All onsite communications shall be directed to the DFO Contract Administrator.

1.14 CASH ALLOWANCES

.1 Not Required.

1.15 FUTURE WORK

.1 Not Required.

1.16 WORK SEQUENCE

.1 Construct Work in stages to accommodate Departmental Representative's continued use of premises during construction.

.2 Co-ordinate Progress Schedule and co-ordinate with Departmental Representative Occupancy during construction. Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

.3 Maintain fire access/control.

1.17 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, storage, and access to allow:

.1 Tenant occupancy.

.2 Work by other contractors.

.2 Co-ordinate use of premises under direction of Departmental Representative.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

.7 Contractor shall not store materials on site without DFO RPSS Site Authority approval.

.8 DFO RPSS accepts no responsibility for Contractor materials or equipment stored on site.

1.18 TENANT OCCUPANCY

.1 Tenant will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with all tenants in scheduling operations to minimize conflict and to facilitate Tenant usage.

1.19 DOCUMENTATION

.1 Maintain, at site for Project Manager and Departmental Representative 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.

.9 Other modifications to Contract,

.10 Copy of approved Construction Schedule;

.11 Health and Safety Plan and other safety related documents,

.12 Environmental protection plan and spill response plan (where required),

.13 Other documents as specified in this contract.

.2 Store record documents and samples in field office apart from documents used for construction in secure location.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

.6 Obtain and pay for three sets of white prints. As the project progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each project meeting.

.7 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

1.20 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

.2 Use of elevators existing in building for moving workers and material.

.1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.21 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 5 business 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 Provide alternative routes for pedestrian and vehicular traffic.

.4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.5 Submit schedule to and obtain approval from Departmental Representative 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.

.6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic. At the end of each working day, vehicular access for Owner's use to all areas of the site shall be restored by provision of plating over trenches or other methods approved by Departmental Representatives.

.8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

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

.11 Construct barriers in accordance with WorkSafeBC requirements.

1.22 EXCAVATION

.1 Contractor shall engage two (2) First Nations cultural observers to be present on site whenever any excavation work is performed.

.2 Prior to any excavation taking place, contractor shall perform ground penetrating radar scanning of the entire area to identify existing underground services. If underground services are found to conflict with proposed installation locations, notify Departmental Representative immediately.

1.23 TRAFFIC CONTROL

.1 Where exterior works will affect the flow of traffic, contractor shall provide traffic control personnel.

.2 On request, Contractor shall provide a traffic control plan.

1.24 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

.1 Not used.

PART 3 EXECUTION

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results.

1.3 ACCESS AND EGRESS

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

1.4 WORKING HOURS

.1 Perform work within normal work hours and in compliance with DFO Contract Administrator requirements.

.2 Work outside of normal hours is to be approved in advance by the DFO Contract Administrator.

1.5 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Project Manager and Departmental Representative 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 Provide sanitary facilities for the work force in accordance with governing regulations and ordinances. Remove temporary facilities from site when directed by the DFO Contract Administrator.

.5 Use only assigned elevators, stairwells, or paths of travel in existing in building for moving workers and material.

.1 Protect walls of passenger elevators, to approval of Project Manager and Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Protect work temporarily until permanent enclosures are completed.

.7 Workers shall refrain from use of loud and vulgar language. Non- compliance to this policy will result in the specific worker(s) involved being required to immediately leave the site and to be permanently removed from any subsequent involvement on this project by the Contractor.

.8 Use of loud radios shall be prohibited.

.9 Pets are not allowed on site.

.10 Vehicles must be parked in designated areas.

.11 The Departmental Representative will designate storage areas for tools and equipment. The Contractor shall assign and coordinate storage facilities for sub-Contractors within these designated areas.

1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants, the public and normal use of premises. Arrange with Project Manager and Departmental Representative to facilitate execution of work.

1.7 EXISTING SERVICES

.1 Notify Project Manager, Departmental Representative, and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Project Manager, and Departmental Representative a minimum of 5 working 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 personnel and vehicular traffic.

.4 Construct barriers in accordance with WorkSafeBC, safety authority, Authority Having Jurisdiction, and Project Manager.

1.8 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.

.2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.3 Keep within limits of work and avenues of ingress and egress.

.4 Carry out noise generating work outside of normal working hours or as specifically coordinated with the Project Manager and Departmental Representative.

1.9 TRENCHING AND EXCAVATION

.1 Two First Nations Cultural Observers must be present during all excavation within the IOS property. Coordinate attendance of observers with the First Nation.

.1 Costs for observers shall be paid directly to the local first nation.

.2 Costs for Cultural Observers are $30/hr for each observer.

.2 Perform work during normal working hours, Monday to Friday.

1.10 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 The Institute of Ocean Sciences (IOS) is a federal facility. Contractors' personnel must hold reliability clearance or arrange to be escorted while on site.

1.11 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted on site.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.1 ADMINISTRATIVE

.1 The Contractor will arrange project meetings, and will assume responsibility for setting meeting times.

.2 Contractor shall prepare agenda for meetings.

.3 Distribute written notice of each meeting to subcontractors four days in advance of meeting date.

.4 Provide physical space and make arrangements for meetings.

.5 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

.6 Contractor shall prepare and distribute meeting minutes for each meeting within three (3) business days.

1.2 PRECONSTRUCTION MEETING

.1 Within 10 business days after award of Contract, Contractor shall schedule a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.1 Attendance by Contractor and major Subcontractors is mandatory.

.2 Departmental Representative, Contractor, and major Subcontractors, will be in attendance.

.3 Parties shall be notified a minimum of 5 days prior to meeting.

.1 Contractor shall be responsible for notifying and coordinating attendance of Subcontractors.

.2 Contractor shall prepare preliminary Schedule of Work for review at preconstruction meeting.

.3 Agenda will include but not be limited to:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Delivery schedule of major equipment.

.6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.8 Departmental Representative provided products.

.9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.12 Monthly progress claims, administrative procedures, photographs, hold backs.

.13 Appointment of inspection and testing agencies or firms.

1.3 PROGRESS MEETINGS

.1 During course of Work schedule progress meetings every two weeks.

.2 Contractor, major Subcontractors involved in Work Departmental Representative are to be in attendance.

.3 Notify parties minimum one week prior to meetings as to who is required to attend from Departmental Representative Team.

.4 Departmental Representative shall perform the following duties:

.1 Prepare agenda for meetings.

.2 Preside at meetings.

.3 Record meeting minutes including significant proceedings and decisions.

.4 Reproduce and distribute copies of minutes within two days of meeting:

.1 To all participants at meeting.

.2 To all parties affected by decisions made at 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 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results

1.2 ADMINISTRATIVE

.1 Submit to Project Manager and Departmental Representative 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 Project Manager and Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of 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 Project Manager and Departmental Representative 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 Project Manager or Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Project Manager or Departmental Representative's review.

.10 Keep one reviewed copy of each submission on site.

1.3 SUBCONTRACTOR LIST

.1 Submit list of all subcontractors including contact information to Departmental Representative within 10 business days of contract award.

1.4 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 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada where applicable.

.3 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 co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 5 business days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Project Manager and Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Project Manager and Departmental Representative in writing of revisions other than those requested.

.7 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.

.8 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.

.9 After Project Manager and Departmental Representative's review, distribute copies.

.10 Submit electronic copy in pdf format shop drawings for each requirement requested in specification and as Project Manager or Departmental Representative may reasonably request.

.11 Submit electronic copy in pdf format of product data sheets or brochures for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.1 Indicate exact model number and all options to be supplied on data sheet.

.12 Submit electronic copy in pdf format of test reports for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copy in pdf format of certificates for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative.

.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.

.14 Submit electronic copy in pdf format of manufacturer’s instructions for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative.

.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.

.15 Submit electronic copy in pdf format of Manufacturer's Field Reports for requirements requested in specification Sections and as requested Project Manager or Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copy in pdf format of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Project Manager or Departmental Representative.

.18 Delete information not applicable to project.

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

.20 Indicate equipment numbers(s) or descriptions(s) on each submittal.

.21 If upon review by Project Manager and Departmental Representative, 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.

.22 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic of colour digital photography in jpg or tif format, standard resolution as directed by Project Manager and Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: to adequately capture the stages of existing equipment, equipment removal, equipment during construction, and final equipment replacement.

.4 Frequency of photographic documentation: as directed by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Results

1.2 REFERENCES

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

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Province of British Columbia

.1 Workers Compensation Act, RSBC latest version.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.1 Results of site specific safety hazard assessment.

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

.3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports as required by the authority having jurisdiction and provide a weekly update for the Departmental Representative.

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

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with authority having jurisdiction

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.

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

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

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

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Authority having jurisdiction.

1.8 PROJECT/SITE CONDITIONS

.1 Refer to hazardous materials report for facility appended to the specification for additional information.

1.9 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 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

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

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

.3 If the Contractor discovers conditions that pose an immediate significant threat to human health or the environment, the Contractor shall notify the DFO Contract Administrator immediately.

1.11 COMPLIANCE REQUIREMENTS

.1 Comply with Workers Compensation Act, B.C. Reg.

.2 Comply with requirements of Authority Having Jurisdiction

1.12 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 Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

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

.1 Have site-related working experience specific to activities associated with renovation and replacement of electrical distribution in existing buildings with the potential to have hazardous materials.

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

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

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

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor

1.14 POSTING OF DOCUMENTS

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

1.15 CORRECTION OF NON-COMPLIANCE

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

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

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

1.16 BLASTING

.1 Blasting or other use of explosives is not permitted

1.17 POWDER ACTUATED DEVICES

.1 Not Permitted.

1.18 WORK STOPPAGE

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

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical

1.1 INSPECTION

.1 Allow Departmental Representative 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.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Contract Documents, or law of Place of Work.

.1 Provide a minimum of 2 business days' notice to Departmental Representative and Project Manager.

.3 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.

1.2 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.

1.3 PROCEDURES

.1 Notify appropriate agency Departmental Representative 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.

1.4 REJECTED WORK

.1 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 Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative 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.

1.5 REPORTS

.1 Submit inspection and test reports in digital PDF format to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

1.6 CONCRETE TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.7 MOCK-UPS

.1 Not Required.

1.8 MILL TESTS

.1 Not Required.

1.9 EQUIPMENT AND SYSTEMS

.1 Refer to Division 26 for electrical system requirements.

Part 2 Products

1.10 NOT USED

.1 Not Used.

Part 3 Execution

1.11 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards.

.1 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.2 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance. Cost for such testing will be borne by Contractor in event of non-conformance.

1.2 WARRANTY

.1 Where the contractor supplies equipment purchased from a contractor manufacturer, the Contractor shall obtain from the Manufacturer the normal warranty period and such warranty shall be made out to Her Majesty the Queen in right of Canada.

1.3 QUALITY

.1 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.

.2 All products, materials, equipment, and articles incorporated in Work shall bear CSA, cUL, or equivalent approval and be manufactured to standard specified. Notify Departmental Representative if specified products are not available with certification for use in Canada.

.3 Where there is no alternative to supplying equipment which is not CSA certified, contractor shall obtain special prior approval from DFO RPSS Departmental Representative. CSA equivalent inspection to be performed prior to being put into service.

.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 Departmental Representative 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.

.8 Contractor shall use products of one manufacturer to match existing, including classification, unless otherwise specified.

1.4 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

Departmental Representative 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 Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

.1 Contractor shall deliver, store and maintain materials with manufacturer's seals and labels intact.

.2 Contractor shall not store materials on site without DFO RPSS Site Authority approval.

.3 DFO RPSS accepts no responsibility for Contractor materials or equipment stored on site.

.4 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.5 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.

.6 Store products subject to damage from weather in weatherproof enclosures.

.7 Store cementitious products clear of earth or concrete floors, and away from walls.

.8 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.

.9 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.10 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.

.11 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.12 Touch-up damaged factory finished surfaces Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

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

.2 Transportation cost of products supplied by Departmental Representative will be paid for by Contractor. Unload, handle and store such products.

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

.3 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.4 Improper installation or erection of products, due to failure in complying with these requirements, Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 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 Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative and Project Manager reserve the 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 Departmental Representative, whose decision is final.

1.9 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.

1.10 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation notify Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.11 REMEDIAL WORK

.1 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.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 LOCATION OF FIXTURES

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

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.13 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.

1.14 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.

1.15 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 Departmental Representative.

1.16 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, and building occupants.

.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 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.1 REFERENCES

.1 Not Required.

1.2 SURVEY REQUIREMENTS

.1 Not Required.

1.3 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Minimal documentation is available showing location of existing underground services. Buried services on the site include but are not limited to water, sewer, high voltage (25kV) distribution, low voltage (600 and 208V) distribution, and communications systems.

.3 Perform Ground Penetrating Radar scans of all areas to be excavated and/or where equipment is to be installed outdoors prior to commencing Work.

.1 Use survey paint to mark location of all services in areas to be excavated.

.2 Adjust routing of new in-ground services as required to avoid conflict with existing services. Where routing is proposed to deviate from Drawings, confirm proposed routing with Departmental Representative prior to commencing work.

1.4 LOCATION OF EQUIPMENT AND FIXTURES

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

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

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

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

1.5 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

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

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit name and address of Contractor performing Ground Penetrating Radar scans to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

1.7 SUBSURFACE CONDITIONS

.1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

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 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative or Project Manager. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.5 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.6 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.7 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.8 Debris and waste will be managed and disposed of in a proper manner as approved by the Departmental Representative. Permits for waste handling and disposal will be obtained by the contractor.

.9 Refer to Section 01 74 21 Construction/Demolition Waste Management and Disposal.

1.3 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Departmental Representative or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Remove stains, spots, dust, marks and dirt from electrical equipment, walls, and floors.

.8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.9 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 as required by the waste management service and in accordance with project documents.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.3 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals.

.2 Waste Management Goal is to divert all materials considered recyclable from landfill sites.

.3 Accomplish maximum control of solid construction waste.

.4 Preserve environment and prevent pollution and environment damage.

1.4 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation waste.

.2 Inert Fill: inert waste - exclusively asphalt and concrete.

.3 Recycled: ability of product or material to be recovered at end of its life cycle and reused.

1.5 DISPOSAL OF WASTES

.1 Debris and waste will be managed and disposed of in a proper manner as approved by the Departmental Representative. Permits for waste handling and disposal will be obtained by the contractor.

.2 Do not bury rubbish or waste materials.

.3 Burning of any materials on site is prohibited.

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

.5 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Reused or recycled waste destination.

.6 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.7 Dispose of Hazardous wastes at an approved facility only. Provide proof of proper disposal to Departmental Representative.

.1 Asbestos is known to be present throughout in all buildings at the Institute of Ocean Sciences. Dispose of all materials known to contain or which may contain asbestos at an approved facility.

1.6 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide temporary security measures approved by Departmental Representative.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 APPLICATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean up work area as work progresses.

.3 Source separate materials to be reused/recycled in specific sort areas.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Not Used.

1.3 REFERENCES

.1 Canadian Environmental Protection Act (CEPA)

.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.4 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 Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Departmental Representative's inspection.

.2 Departmental Representative's Inspection:

.1 Departmental Representative 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, adjusted, balanced, and fully operational.

.4 Certificates required by Utility companies: submitted.

.5 Operation of systems: demonstrated to Departmental Representative'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 Departmental Representative, and Contractor.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Departmental Representative 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 Departmental Representative'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.

1.5 FINAL CLEANING

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

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Project Manager, two final hard copies and one electronic 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.

1.4 O&M MANUAL FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide to scale CAD files in dwg format on CD.

1.5 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 Departmental Representative 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.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

.7 Refer to attached Commissioning Oversight Operation & Maintenance Manual Review Checklist for additional requirements for O&M manual submission.

1.6 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Project Manager and Departmental Representative 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 Store record documents and samples in field office apart from documents used for construction in secure location.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of drawings, and in copy of Project Manual, provided by Project Manager.

.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 Changes made by change orders.

.2 Details not on original Contract Drawings.

.3 References 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, as required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

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 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.5 Include manufacturer's printed operation and maintenance instructions.

.6 Include sequence of operation by controls manufacturer.

.7 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.8 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.9 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.10 Additional requirements: as specified in individual specification sections.

1.9 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 Project Manager

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

.2 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 Project Manager.

.2 Include approved listings in Maintenance Manual.

1.10 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, or temperature extremes in suitable weatherproof, heated or conditioned areas.

.4 Remove and replace damaged products at own expense and for review by Project Manager or Departmental Representative.

1.11 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.4 Submit, warranty information made available during construction phase, to Project Manager for approval prior to each monthly pay estimate.

.5 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.6 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.7 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 electrical 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 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.8 Respond in timely manner to oral or written notification of required construction warranty repair work.

.9 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate operation and maintenance of equipment and systems to Departmental Representative's personnel one week prior to date of substantial performance.

.2 Departmental Representative: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Refer to other divisions for specific demonstration and training requirements.

.4 Preparation:

.1 Verify conditions for demonstration and instructions comply with requirements.

.2 Verify designated personnel are present.

.3 Ensure equipment has been inspected and put into operation in accordance with this specification and manufacturer recommendations

.4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.5 Demonstration and Instructions:

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Coordinate with Manufacturers of pre-purchased equipment for attendance at demonstration and training.

.6 Where major equipment requires attendance of Manufacturer’s representative during testing and commissioning, arrange for demonstration and training to take place as part of the same trip as testing and commissioning work.

.1 Assist Manufacturers’ representatives with demonstration and training of major equipment as required by Manufacturer.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment two weeks prior to designated dates, Project Manager approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Departmental Representative's personnel.

.2 Provide written report that demonstration and instructions have been completed.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 10 – Testing and Commissioning

1.3 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 Cx - Commissioning.

.3 O M - Operation and Maintenance.

.4 PI - Product Information.

.5 PV - Performance Verification.

1.4 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. 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 operations and maintenance manual.

.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 Contract documents and Departmental Representatives requirements to meet all Project functional and operational requirements.

1.5 COMMISSIONING OVERVIEW

.1 Section 01 91 31 - Commissioning (Cx) Plan.

.2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.

.3 Cx to be a line item of Contractor's cost breakdown.

.4 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.5 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 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.

.6 Project Manager will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Project Manager and Departmental Representative.

.2 Equipment, components and systems have been commissioned.

.3 O M training has been completed.

1.6 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 Departmental Representative, 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 hold-back assessments.

1.7 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents, confirm by writing to Departmental Representative:

.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 Departmental Representative Project Manager.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Ensure "As-Built" system schematics are available.

.4 Inform Project Manager and Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.8 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.9 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit no later than 2 weeks after award of Contract:

.1 Name of Contractor's Cx agent(s). Commissioning agents shall be manufacturer certified technician for all equipment to be commissioned.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Project Manager and Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Project Manager and Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.10 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.

.2 Project Manager and Departmental Representative to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Project Manager and Departmental Representative.

1.11 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction 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.

1.12 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.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for review by Departmental Representative.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 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.

.4 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 Owner’s representative Project Manager and Departmental Representative 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 Project Manager. 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 Project Manager and Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Project Manager and Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Project Manager or Departmental Representative 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 Departmental Representative and Project Manager 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 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 Project Manager 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 Project Manager 14 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 Project Manager and Departmental Representative 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 Departmental Representative, or Project Manager may choose 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 Project Manager and Departmental Representative within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

.1 Building operations during normal hours are not to be disturbed, as such, it is necessary to complete Cx of new equipment outside normal operating hours using, if necessary, simulated loads.

1.24 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Project Manager’s and Equipment Manufacturer’s approval.

.2 Repetition of second verification again fails to receive approval.

.3 Project Manager or Departmental Representative deems Contractor's request for second verification was premature.

1.25 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.26 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Report problems, faults or defects affecting Cx to Project Manager and Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Project Manager and Departmental Representative.

1.27 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 reviewed and accepted by Project Manager and Departmental Representative.

1.28 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.

1.29 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Must be within equipment manufacturer's requirements.

1.30 PERFORMANCE TESTING

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

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 10 – Testing and Commissioning

1.3 SUMMARY

.1 Section Includes:

.1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

1.4 REFERENCES

.1 Underwriters' Laboratories of Canada (ULC)

.2 Canadian Electrical Code CSA C22.1

1.5 GENERAL

.1 Term "Cx" in this section means "Commissioning".

.2 Acronyms:

.1 Cx - Commissioning.
.2 MSDS - Material Safety Data Sheets.
.3 WHMIS - Workplace Hazardous Materials Information System.

.3 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.

1.6 CX PLAN

.1 Cx Plan to be completed a minimum of 4 weeks prior to scheduled commissioning.

.2 Cx Plan shall 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, and suppliers' requirements.
.6 Project construction team's and Cx team's requirements.
.7 Manufacturer’s requirements and availability.

.3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

.4 During construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.

.2 Approved design and construction changes.

.5 Revise plan(s) as required to accommodate site conditions, schedule changes, and Departmental Representative feedback.

.6 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.7 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.1 Contractor is responsible for:

.1 Organizing Cx.

.2 Ensuring implementation of final Cx Plan.

.3 Implementation of Training Plan.

.4 Testing.

.5 Performance of Cx activities.

.6 Delivery of training and Cx documentation.

.7 Assigning one person as point of contact with Departmental Representative for administrative and coordination purposes.

.8 Preparation and submission of test reports.

.1 Obtain test reports from Manufacturer's Representatives for prepurchased equipment and incorporate into overall test reports for submission to Departmental Representative.

1.8 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 Manufacturer's representative as required in other Specification Sections.

.3 Equipment manufacturer: equipment specified to be installed and started by manufacturer.

.1 To include performance verification.

.4 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.

.2 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 Reprogramming and configuration of security and network systems including but not limited to: switches, network video controller and camera viewing, card access control systems.

.3 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 1 month prior to starting date of Cx for review and approval.

1.9 EXTENT OF CX

.1 Commission Communications and Security equipment:

- .1 Network Switches
- .2 Network Video Recorders
- .3 Intercom Systems
- .4 PTZ Cameras
- .5 Card Access Systems
- .6 Lift arm gates
- .7 Cantilever gates and gate operators

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 Startup, pre-Cx activities and documentation for systems, and equipment.
- .2 Results of Performance Verification Tests and Inspections.
- .3 Description of Cx activities and documentation.
- .4 Training Plans.
- .5 Cx Reports.
- .6 Prescribed activities during warranty period.

.4 Departmental Representative to witness and review tests and reports of results.

1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Items listed in this Cx Plan include the following:

- .1 Pre-Start-Up reviews: conducted at the discretion of the Departmental Representative, prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
- .2 Notify Departmental Representative and Project manager a minimum of 14 days prior to each pre-startup inspection to allow the opportunity for Departmental Representative and Project Manager to witness inspections.

.2 Pre-Cx activities - ELECTRICAL:

- .1 Refer to Division 26

.3 Pre-Cx activities – Communications and Electronic Safety and Security:

- .1 Refer to Divisions 27 and 28

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 Electrical Equipment – Refer to Division 26.

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Departmental Representative to monitor Cx activities.

.2 Upon satisfactory completion, Contractor to prepare Cx report.

.3 Departmental Representative to review the certified testing reported results of, Cx activities.

1.14 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to Departmental Representative 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 Notification of intention to start Cx: 10 business days before start of Cx.

.3 Identification of deferred Cx.

.4 Implementation of training plans.

.5 Cx reports: immediately upon successful completion of Cx.

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Project Manager.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

1.15 TESTS TO BE PERFORMED BY OWNER/USER

.1 None is anticipated on this project.

1.16 TRAINING PLANS

.1 Refer to Division 26.

1.17 FINAL SETTINGS

.1 Upon completion of Cx to satisfaction of Departmental Representative lock panels, breaker settings, etc. in their final positions and include any updates made in Cx Reports and O&M manual.

1.18 PAYMENTS FOR CX

.1 To be included in the tender bid.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Commissioning forms to be completed for equipment, system and integrated system.

.2 Related Requirements

.1 Section 26 05 10 – Testing and Commissioning

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 Departmental Representative 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 Departmental Representative. 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 Departmental Representative'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 and obtain Departmental Representative's approval.

1.5 SAMPLES OF COMMISSIONING FORMS

.1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.

.2 Revise items on Commissioning forms to suit project requirements.

.3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

.1 When additional forms are required, but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.

.1 Additional commissioning forms to be in same format as provided by Departmental Representative

1.7 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:

.1 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.2 Confirm operation as per design criteria and intent.

.3 Identify variances between design and operation and reasons for variances.

.4 Verify operation in specified normal and emergency modes and under specified load conditions.

.5 Record analytical and substantiating data.

.6 Verify reported results.

.7 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.

.8 Submit immediately after tests are performed.

.9 Reported results in true measured SI unit values.

.10 Provide Departmental Representative with originals of completed forms.

.11 Maintain copy on site during start-up, testing and commissioning period.

.12 Forms to be both hard copy and electronic format with typed written results in Operations and Maintenance Manual.

1.8 LANGUAGE

.1 To suit the language profile of the awarded contract.

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 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.1 Payment for cast-in-place concrete will be based on volume calculated from actual measurement of dimensions of components constructed as detailed in Contract Drawing.

1.2 REFERENCES

.1 Abbreviations and Acronyms:

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.

.1 Type GU, GUb and GUL - General use cement.

.4 Reference Standards:

.1 ASTM International

.1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.

.2 CSA International

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06 (R2016), Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 At least 2 weeks prior to beginning Work, provide Departmental Representative with manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements.

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing material.

.4 Admixtures.

.5 Aggregates.

.6 Water.

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Provide Departmental Representative, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

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

Part 2 Products

2.1 PERFORMANCE CRITERIA

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

2.2 MATERIALS

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

.2 Supplementary cementing materials: to CSA A3001.

.3 Water: to CSA A23.1.

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

.5 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

2.3 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.2 Provide concrete mix to meet following hard state requirements:

.1 Class of exposure: C-2.

.2 Compressive strength at 28 days: 32 MPa minimum.

.3 Aggregate size: 20 mm maximum.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Departmental Representative written approval before placing concrete.

.1 Provide 24 hours minimum notice prior to placing of concrete.

.2 During concreting operations:

.1 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.3 Pumping of concrete is permitted only after approval of equipment and mix.

.4 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

3.2 INSTALLATION/APPLICATION

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

.2 Finishing:

.1 Finish concrete to CSA A23.1/A23.2.

3.3 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours.
.2 Slump.
.3 Air content.
.4 Compressive strength at 7 and 28 days.
.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.4 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.4 CLEANING

.1 Waste Management:

.1 Provide appropriate area on job site where concrete trucks and be safely washed.

.2 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.3 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.4 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Underwriter's Laboratories of Canada (ULC)

.1 ULC-S115 (latest edition) Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.

.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 SUBMITTALS

.1 Provide submittals in accordance with 26 05 00 Common Work Results – Electrical.

.2 Shop Drawings:

.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.3 Closeout Submittals:

.1 Contractor shall provide certificate of completion for firestopping that all firestopping has been installed in accordance with manufacturer's written instructions. Incorporate into Operations and Maintenance Manual.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: person specializing in fire stopping installations approved by manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.

.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.

.2 Fire stop system rating: to match existing.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

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 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

.6 Fire stop and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Edge of floor slabs at curtain wall and precast concrete panels.

.3 Top of fire-resistance rated masonry and gypsum board partitions.

.4 Intersection of fire-resistance rated masonry and gypsum board partitions.

.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.7 Openings and sleeves installed for future use through fire separations.

.8 Around mechanical and electrical assemblies penetrating fire separations.

.9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.4 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: not required.

3.5 FIELD QUALITY CONTROL

.1 Departmental Representative's Review: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.1 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY OF WORK

.1 The scope of work for this project includes but is not limited to:

- .1 Provision of access control system for card access at new gates to be integrated with facility's existing Kantech access control system.
  - .1 Access control equipment shall be installed, configured, and commissioned by a Kantech certified technician.
- .2 Provision of IP intercom system for access control at new gates. Intercom control shall be integrated with the facility's access control system.
- .3 Provision of new lift arm gates and cantilevered gate operators.
- .4 Installation and configuration of new Panasonic network video recorders, network video recorder hard drives, and CCTV cameras pre-purchased by DFO.
  - .1 CCTV system equipment shall be configured and commissioned by a Panasonic certified technician.
- .5 Provision of new active and passive network infrastructure including but not limited to racks, patch panels, and switches to support a new Security system network on the facility. The following systems shall operate on the new security network:
  - .1 IP Intercom System
  - .2 CCTV Cameras
  - .3 Network Video Recorders
  - .4 Camera Viewing Stations.

1.3 CODES AND REFERENCES

.1 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.

.2 Any reference to Codes, Standards, and Regulations contained within the Contract Documents shall be taken as the latest or most current in effect at time of Tender.

.3 In no instance shall the standards established by the Contract Documents be reduced by any referenced Code or Regulation.

.4 Reference Standards:

- .1 CSA Group
  - .1 CSA C22.1, Canadian Electrical Code, Part 1 (Current Edition), Safety Standard for Electrical Installations.
  - .2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.1 BICSI

.1 Telecommunications Distribution Methods Manual (TDMM) – Latest Edition.

.2 Telecommunications Industry Association (TIA)

.1 TIA-568.0-D, Commercial Building Telecommunications Cabling General Requirements.

.2 TIA-568-C.2, Commercial Building Balanced Twisted-Pair Telecommunications Cabling and Components.

.3 TIA -568.3-D, Optical Fiber Cabling Components Standard.

.4 TIA -606-C, Administration Standards for Telecommunications Infrastructure.

.5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.

.6 TIA-598-D, Optical Fiber Cable Color Coding.

.7

.8 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, Current Edition.

1.4 DEFINITIONS

.1 The word ‘Provide’ means the supply, delivery, and installation of device or equipment referenced to the level required to be complete and operational.

.2 The word ‘Supply’ means to obtain and deliver to the project site, ready for unpacking, assembly, and installation.

.3 The word ‘Install’ means the unloading, unpacking, assembling, erecting, applying, finishing, protecting, cleaning and similar operations at the project site to complete items of work supplied by others.

.4 AHJ: Authority Having Jurisdiction

1.1 RESPONSIBILITY AND COORDINATION

.1 Provide all labour, materials, equipment, tools, and incidentals necessary to provide a complete electrical installation as indicated on the Drawings and as set out in these Specifications.

.2 Without relieving the Contractor of his responsibilities, the Specifications have been divided into approximate trade sections for convenience. These Sections do not, however, limit the responsibility of any subcontractor or supplier. The Departmental Representative will not arbitrate on any dispute between the subcontractors' responsibilities. The onus of defining the extent of the subcontractors' work remains with the Contractor, who, when awarding subcontracts, will ensure that the area of responsibility of any particular subcontractor is set out in full detail.

.3 The Contractor shall advise the Departmental Representative during the tender period of any specified material or equipment which is either no longer available from manufacturers or whose delivery is likely to exceed the requirements of the anticipated Construction Schedule. Failure of the Contractor to perform the above shall cause the Contractor to supply, at his own expense, alternate material or equipment as selected by the Departmental Representative at a later date. Alternatively, the Contractor shall

procure the specified material or equipment at his own additional expense by means of air freight or other special means of transportation.

.4 The Drawings and Specifications complement each other and what is called for by one is binding as if called for by both. If there is any doubt as to the meaning or true intent due to a discrepancy between the Drawings and Specifications, obtain a ruling from the Departmental Representative prior to tender closing. Failing this, the most expensive alternative is to be allowed for.

.5 Advise the Departmental Representative of any specified equipment, material, or installation of same which appears inadequate or unsuitable or which is in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction. Provide all labour and materials which are obviously necessary or reasonably implied to be necessary to complete the work as if the work was shown on the Drawings and/or described in the Specifications.

.6 Check Drawings of all trades and coordinate the installation of all material and equipment to ensure adequate space and free access and to maintain headroom limitations for all proposed and indicated future work. Work out jointly, with all Subcontractors on the site, solutions to interference problems. Coordinate all work before fabricating or installing any material or equipment. It is incumbent on all Subcontractors on the site to ensure that all materials and equipment fit into the allocated spaces and that all equipment can be properly inspected, serviced, and replaced if and when required. Advise the Departmental Representative of space problems before fabricating or installing any material or equipment. Demonstrate to the Departmental Representative on completion of his work that all equipment and material installed by him can be properly and safely serviced and replaced. Make no deviations from the intent of the design, or any involving additional cost, without the Departmental Representative's written direction.

.7 Where electrical work and materials are noted as being provided by the Departmental Representative or under other Divisions of these Specifications, the responsibility for integrating, to the extent required, such work and materials into the complete installation, shall remain within Divisions 26, 27, and 28.

.8 Ensure that any building structure loaded during the installation is adequate to carry such load.

.9 Testing in accordance with Section 26 05 10 Testing and Commissioning. Refer to individual sections for additional testing requirements.

.10 A contractor is entitled to engage in the regulated work for which the contractor is licensed.

.1 A licensed contractor must not:

.1 Manage or do regulated work that is:

.1 Outside the scope of the license,

.2 Contrary to any term or condition of the license, or

.3 Contrary to any term or condition imposed by the regulations on the use of the license, or

.2 Permit regulated work to be undertaken by persons under the control of the licensed contractor if they are not authorized.

.2 A licensed contractor must:

.1 Maintain current knowledge of the Acts, relevant regulations, relevant directives, relevant safety orders and any other relevant material that the minister makes publicly available, and

.2 Ensure that individuals who do regulated work for the licensed contractor maintain similar current knowledge.

1.5 PERMITS, FEES, AND INSPECTIONS

.1 Before commencing work obtain and pay for all necessary approvals and permits. The Departmental Representative shall provide printed drawings required by the AHJ to obtain such permits.

.1 Contractor shall obtain an electrical permit for the work as outlined in the Security Gate Upgrade project.

.2 Arrange for inspection of the work at rough-in completion, prior to Substantial Completion, and as otherwise required by all applicable Authorities Having Jurisdiction.

.1 Notify Departmental Representative of any changes required by the Authorities Having Jurisdiction prior to proceeding with changes.

.3 Provide Departmental Representative with a certificate of unconditional approval for all electrical work from the appropriate Authorities Having Jurisdiction. Final payment to the Contractor shall not be made prior to submission of the inspection certificate.

1.6 EVALUATION OF CONTRACT CHANGES

.1 Notwithstanding other provisions of the Contract, this Contractor shall supply detailed information for the valuation of all changes to the Contract. Such information shall include, but not necessarily be limited to, the following:

.1 Labour hours per unit of material or equipment to be added, deleted, or altered.

.2 Units of material or equipment to be added or deleted.

.3 Cost to the Contractor per unit of material, equipment and labour broken down by category of labour and type of material or equipment.

.4 Extensions of the above to arrive at total costs.

.5 Other miscellaneous and identifiable charges such as delivery, restocking, overhead, profit, etc.

.6 Include in the valuation of any change to the Contract the cost, if any, of recording such change on the record drawings as previously specified.

1.7 MEASUREMENT AND PAYMENT

.1 Notwithstanding any other provisions of this Contract, supply the following general information and any additional information as may be requested by the Departmental Representative as part of each Monthly Progress Claim.

.1 Indicate the labour cost and the material cost separately for each Item of Work within Divisions 26, 27, and 28.

.2 Progress claims will be certified as per contract requirements.

.3 Format for Monthly Progress Draws shall be approved by the Departmental Representative prior to the first submission.

.4 For each Monthly Progress Draw, each change order shall be listed separately.

.5 Indicate both the Change Order number and title on the progress draw.

1.8 REVIEW OF WORK

.1 The Departmental Representative will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

.1 The Contractor shall notify the Departmental Representative a minimum of 48 hours prior to completion of rough-in to allow review prior to Work being concealed.

1.9 SCHEDULING OF WORK

.1 Work shall be scheduled as required to coordinate with other Divisions and Departmental Representative's work restrictions.

.2 Work Restrictions:

.1 Coordinate any work which may disrupt facility operations with Departmental Representative a minimum of one (1) week in advance.

.2 Access to site requires reliability level clearance, or arrangement for escort by a person holding reliability status.

.3 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

1.10 GUARANTEE

.1 Furnish a written guarantee to the Departmental Representative prior to final contract payment, which will be in effect for one year from the date of final acceptance of the complete work. Replace or repair at no cost to the Departmental Representative any defective material or workmanship except where, in the opinion of the Departmental Representative, such defects are due to the misuse or neglect by the Departmental Representative.

.2 This general guarantee shall not act as a waiver of any specified of special equipment guarantees which cover a greater length of time.

1.11 FIRE RATING OF PENETRATIONS

.1 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.

.2 Use fire stop products, approved by the Departmental Representative, at each penetration.

.3 Material of the same manufacturer is to be used throughout the entire project as part of a fully rated fire stop system.

.4 Acceptable manufacturers: Hilti, 3M or approved equal.

.5 Refer to Section 07

1.12 ACTION AND INFORMATIONAL SUBMITTALS

.1 All submissions shall be provided in electronic PDF format.

.2 Submit the following documents to the Departmental Representative a maximum of 14 days after Contract award:

.1 Project schedule in Gantt chart format.

.2 Schedule of Values for payment certification.

.3 WCB Letter of Proof of Insurance

.4 Certificate of Insurance for CGL with the Departmental Representative listed as a Certificate Holder.

.3 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.

.4 Certificates:

.1 Submit test results of installed electrical systems and instrumentation.

.2 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Manufacturer's Field Reports: submit to Departmental Representative 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.

1.13 SHOP DRAWINGS:

.1 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.

.2 Submissions include:

.1 Where specifically noted in other Sections in Divisions 26, 27, and 28, submit drawings stamped and signed by Professional Engineer registered or licensed in Province of BC, Canada.

.2 Shop Drawings shall be provided for but not limited to the following systems:

.1 Firestopping systems for all firestopping required to be installed under Divisions 26, 27, and 28.

.2 Moulded case breakers whether installed in distribution equipment supplied as part of this project or provided loose.

.3 Lighting.

.4 Cables.

.5 Wiring devices including but not limited to receptacles and switches.

.6 Wire duct.

.7 Access control equipment

.8 Intercom equipment

.9 Active and Passive Local Area Network equipment

.10 Lift arm gates

.11 Cantilever gate operators and associated accessories.

.12 Grounding

.3 Refer to other Sections within Divisions 26, 27, and 28 for detailed shop drawing submission requirements.

.4 Contractor shall review all shop drawings prior to submittal. All shop drawings shall be stamped and signed by both the Electrical Contractor and General Contractor. Unstamped drawings will be returned without comment.

.5 Each shop drawing shall clearly indicate the equipment ID and equipment type (e.g. Luminaire Type 'A', Panelboard SD-A) where applicable.

.6 Where manufactures' brochures that include multiple equipment or device models are submitted, they shall be **clearly labelled with the equipment model and options to be supplied. Submit relevant sections of manufacturer's catalogues only. Submissions of complete catalogues will be rejected.**

.7 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.

.8 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.9 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.10 Submit complete shop drawing packages for each system. Partial submissions will be returned without comment.

.11 Review of shop drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with the general design intent. The review shall not mean approval of the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.

.12 Ensure that copies of all shop drawings are available at the job site.

1.14 CLOSEOUT SUBMITTALS

.1 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.2 Operation and Maintenance Manuals:

.1 Refer to Section 26 05 11 Electrical Operations and Maintenance Data.

.2 Provide draft version of Operations and Maintenance Manual to Departmental Representative two weeks prior to Substantial Performance Review.

.3 Submit record drawings including all as-built information and changes on completion of project. Refer to Section 1.1 As-Built Documents and Samples.

.1 Each record drawing as defined above shall bear the Contractor's identification and signature, the date of record, and the notation: "We hereby certify that these Drawings represent the building as built."

.2 Provide a copy of as-built drawings to Departmental Representative for review at Substantial Completion.

1.2 WARRANTY

.1 Manufacturer warranties of all equipment shall be placed in the name of the Owner. Refer to Division 1.

1.3 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Project Manager and Departmental Representative 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.

.4 Store record documents and samples in field office apart from documents used for construction in secure location.

.5 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.6 Maintain record documents in clean, dry and legible condition.

- .1 Do not use record documents for construction purposes.

.7 Keep record documents and samples available for inspection by Departmental Representative.

.8 Obtain and pay for three sets of white prints. As the project progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each project meeting.

.9 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.

.10 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

.11 Maintain in the job site office in up-to-date condition, one (1) complete set of whiteprints of each of the Electrical Contract Drawings and one (1) set of Specifications, including Revision Drawings, marked clearly and indelibly in red, indicating as-built conditions where such conditions deviate from the original directions of the Contract Documents, and indicating final installation of feeders and branch circuits.

.12 Record Drawing markings shall include but shall not be limited to the following

- .1 All changes in circuiting
- .2 Size and routing of all conduits for all branch circuits including power, lighting and systems.
- .3 Size and routing of all installed raceways and cables.
- .4 Number and size of conductors (#12 AWG and larger) in raceways and cables.
- .5 Location of all junction boxes and pull boxes

.6 Location of all access panels

.7 Location of all conduit or duct stubs, installed equipment, devices and fixtures

.8 All changes to electrical installation resulting from Addenda,

.9 Change Orders and Site Instructions

.10 Exact location of all services left for future work

.11 Location by accurate horizontal and vertical dimensions of the routes and terminations of all raceways

.12 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.2 Recording Information on Project Record Documents.

.13 Record information on set of drawings, and in copy of Project Manual, provided by Project Manager.

.14 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.15 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.16 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Changes made by change orders.

.2 Details not on original Contract Drawings.

.3 References to related shop drawings and modifications.

.17 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.

.18 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, as required by individual specifications sections.

.19 Provide digital photos, if requested, for site records.

1.15 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.1 Except for equipment intended for installation outdoors, store equipment indoors in dry location.

.2 Store and protect equipment and materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove and dispose of all packaging waste materials.

.1 Where possible, return packaging materials to supplier for re-use.

.2 Divert all recyclable materials from landfill.

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 in English.

2.2 MATERIALS AND EQUIPMENT

.1 Equipment and material shall be new and certified by a certification body accredited by the Standards Council of Canada (SCC). Where there is no alternative to supplying equipment which is not certified, obtain special approval and pay all associated fees. Notify Departmental Representative prior to supplying material that is not SCC approved.

.2 Factory assemble control panels and component assemblies.

.3 Substitution of Products during Tender:

.1 To receive acceptance, proposed substitutes must equal or exceed the quality, finish and performance of those specified and/or shown, and must not exceed the space requirements allotted on the drawings.

.2 Provide to the Departmental Representative documentary proof of equality, and delivery dates.

.3 The contractor’s tender price shall include costs for any required revisions to other structures and products to accommodate such substitutions.

.4 Submission of a request for substitution of products during tender does not obligate the Departmental Representative to approve or accept the proposed alternate product.

.4 Substitution of Products After Contract Award

.1 After acceptance of the list of products, no substitution of any item will be permitted.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of the authority having jurisdiction, code requirements, and as specifically noted in the Contract Documents.

.2 Engraved signs using rigid phenolic engraving material, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: rigid phenolic engraving material 3 mm, lettering accurately aligned and engraved into core, mechanically attached with self tapping screws.

.2 Nameplate colours as follows:

.1 Normal Power Systems: black face, white core

.2 Emergency/Standby Power Systems: red face, white core

.3 Life Safety Systems: red face, white core

.4 Colours for other equipment as specified by the Departmental Representative.

.3 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 to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

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

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

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

.8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, 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.

.5 Refer to Division 28 for communications wiring identification requirements.

2.7 CONDUIT, CABLE, AND JUNCTION BOX IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables with the Institute of Ocean Sciences site-specific colour coding. Obtain site specific colour code requirements from Departmental Representative prior to commencing work.

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

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour. Colour coding per IOS standards below:

	Prime	Auxiliary
250V regular	Yellow	
250V UPS	Yellow	Orange

	Prime	Auxiliary
250V Emergency	Yellow	Red
600V Regular	Yellow	Green
600V UPS	Yellow/Green	Orange
600V Emergency	Yellow/Green	Red
5kV	Yellow	Blue
25kV	Yellow	Black
Ground	Green	
Telephone	Green	Black
Data	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other security	Red	Black
DDC	Orange	

2.8 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green".

.2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Pre-Bid Examination

.1 Examine the site of work and become familiar with all features and characteristics affecting this work before submitting bid.

.2 No additional compensation will be given for extra work due to existing conditions which such examination should have disclosed.

.3 Report to the Departmental Representative any unsatisfactory conditions which may adversely affect the proper completion of this work.

.2 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 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 In accordance with CSA C22.1 except where specified otherwise.

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

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install Conduit concealed within building.

.2 Weatherproof all points where conduit penetrates building.

.3 Conduit is not permitted to be installed on the exterior of any building.

3.5 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1150 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or counter splash backs: 175 mm.

.4 In mechanical rooms: 1400 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 300 mm.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

.6 Fire alarm stations: 11500 mm.

.7 Fire alarm bells: 2100 mm.

.8 Television outlets: 300 mm.

.9 Wall mounted speakers: 2300 mm AFF to top of speaker.

.10 Clocks: 2100 mm.

.11 Doorbell pushbuttons: 1150 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.8 FIELD QUALITY CONTROL

.1 Refer to Section 26 05 10 Testing & Commissioning

3.9 SUBSTANTIAL PERFORMANCE REVIEW

.1 Prior to requesting the Departmental Representative complete a Substantial Performance review, the Contractor shall submit written confirmation that:

.1 All wiring devices, coverplates, motor controls, light fixtures and other equipment are operational, plumb, clean, and correctly labelled.

.2 All electrical equipment has been cleaned and vacuumed

.3 All Test Reports have been submitted including but not limited to data test reports and fire alarm verification reports with no expections noted.

.4 Factory finished equipment has been cleaned, touched up, or refinished as necessary to present a new appearance.

.5 All firestoppingt/smoke sealing of conduits, cables, cable trays, wireways, etc. at all wall and floor penetrations has been completed.

.6 All light fixtures, fixture lenses, and reflectors have been cleaned.

.7 All loose equipment including spare parts have been turned over to the Departmental Representative.

.8 Verification letter from the Seismic Consultant.

.9 Draft copy of the Maintenance Manual.

3.10 SYSTEM STARTUP

.1 Arrange and pay for services of manufacturer's factory representative. Departmental Representative to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.2 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.

3.11 CLEANING

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Where work is performed in a phased manner, or Departmental Representative will take partial occupancy of the area of Work, perform final cleaning at the end of each Phase or prior to Departmental Representative taking occupancy of each area.

.4 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 DOCUMENTS

.1 This Section of the Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical

1.3 REGULATORY REQUIREMENTS

.1 Restraints shall meet the requirements of the latest edition of the British Columbia Building Code and amendments.

.2 The Seismic Consulting Engineer should be able to provide a proof of professional insurance and the related practice credentials if requested by the Electrical Consultant. The Seismic Consulting Engineer should be familiar with SMACNA, ECABC & NFPA guidelines as well as BCBC requirements.

.3 The Contractor's Seismic Consultant shall submit original signed BC Building Code Letters of Assurance Schedules S-B and S-C to the Prime Consultant.

.4 Importance Factor: 1.5.

.5 Use the Electrical Contractors Association of BC details in the absence of any local requirements.

.6 The above requirements shall not restrict or supplant the requirements of any local bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

1.4 SCOPE

.1 It is the responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

.2 Manufacturer's shop drawings to be submitted with seismic information on equipment structure, bracing and internal components and as required by Division 01 and other Division 26 specification sections.

.3 Provide restraint on all equipment and machinery, which is part of the building electrical services and systems, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake.

.4 The total electrical seismic restraint design and field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements. Contractor to allow for coordination, provision of seismic restraints, as well as all costs for the services of the Seismic Restraint Engineer. This Engineer, herein

referred to as the Seismic Consultant, will provide normal engineering functions as they pertain to seismic restraint of electrical installations.

.5 The Contractor shall be aware of, and comply with, all current seismic restraining requirements and make provision for those that may come into effect during construction of the project. Make proper allowance for such conditions in the tender. The contractor shall include for all costs related to seismic restraint.

.6 The Seismic Consultant shall provide detailed seismic restraint installation shop drawings to the Contractor. Copies of the shop drawings to be included in the final project manual.

.7 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs.

.8 The Seismic Consultant shall provide inspections during and after installation. The Contractor shall correct any deficiencies noted without additional cost to the contract.

.9 Include all costs associated with the Seismic installation and certification in the base tender.

1.5 SHOP DRAWINGS & SUBMITTALS

.1 Submit shop drawings of all seismic restraint systems including details of attachment to the structure, either tested in an independent testing laboratory or approved by the seismic consultant.

.2 Submit all the proposed types and locations of inserts or connection points to the building structure or support slabs. Follow the directions and recommendations of the Seismic Consultant.

PART 2 PRODUCTS

2.1 SLACK CABLE SYSTEMS

.1 Slack cable restraint systems shall be as designed and supplied by Vibra-Sonic Control or equal.

.2 Slack cable systems to allow normal maintenance of equipment and shall not create additional hazard by their location or configurations. Contractor shall rectify any such installations at no additional cost, all to the satisfaction of the engineer and inspection authority having jurisdiction.

.3 Coordinate requirements of slack cables with suppliers prior to installation.

PART 3 EXECUTION

3.1 GENERAL

.1 All seismic restraints systems shall conform to local authority having jurisdiction and all applicable code requirements.

3.2 CONDUITS

.1 Provide restraint installation information and details on conduit and equipment as indicated below:

.2 Vertical Conduit:

.1 Attachment - Secure vertical conduit at sufficiently close intervals to keep the conduit in alignment and carry the weight of the conduits and wiring. Stacks shall be supported at their bases and, if over 2 stories in height, at each floor by approved metal floor clamps.

.2 At vertical conduit risers, wherever possible, support the weight of the riser, at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m o.c.

.3 Riser joints shall be braced or stabilized between floors.

.3 Horizontal Conduits:

.1 Supports - Horizontal conduit shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

.2 EMT tubing - tubing shall be supported at approximately 1.2 m intervals for tubing.

.4 Provide transverse bracing at 12.2 m o.c. maximum unless otherwise noted. Provide bracing at all 90° bend assemblies, and pull box locations.

.5 Provide longitudinal bracing at 24.4 m o.c. maximum unless otherwise noted.

.6 Do not brace conduit runs against each other. Use separate support and restraint system.

.7 Support all conduits in accordance with the capability of the pipe to resist seismic load requirements indicated.

.8 Trapeze hangers may be used. Provide flexible conduit connections where conduits pass through building seismic or expansion joints, or where rigidly supported conduits connect to equipment with vibration or seismic isolators.

.9 A conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.

.10 Provide large enough conduit sleeves through walls or floors to allow for anticipated differential movements with firestopping where required.

.11 It is the responsibility of the contractor to ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on shop drawings. Review with seismic consultant and submit shop drawings to consultants for their reference.

3.3 FLOOR MOUNTED EQUIPMENT

.1 Bolt all equipment, e.g. network racks, transformers, switchgear, generators, motor control centres, free standing panelboards, control panels, capacitor banks, etc. to the structure. Seismic Engineer shall design anchors and bolts.

3.4 LIGHT FIXTURES

.1 Luminaires installed in suspended ceilings shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by at least two tight cables which are connected to the fixture at diagonal points.

.2 Surface and recessed style fixtures shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by taught cables.

.3 Fixtures which are hung independently of ceiling systems shall have minimum of two seismic cable in addition to the chain or cable used to support the fixture. Seismic restraint cables shall be secured into the concrete or structural deck above.

.4 Cables shall be corrosion resistant and approved for the application.

.5 Fixtures which are rod hung shall have seismic ball alignment fittings at the ceiling and fixture.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 EXISTING CONDITIONS

.1 Examine site prior to submitting Tender and be responsible for ascertaining all conditions which will affect this trade whether shown on the drawings or not and to take all the necessary measurements.

.2 Investigate and confirm the locations, the method of connections and routes of existing and new electrical facilities. Report at once any discrepancy between drawings, specifications and existing conditions.

.3 Absorb any costs incurred by failure to carry out this investigation and examination.

1.3 GENERAL REQUIREMENTS

.1 Provide and be responsible for the removal, relocation, reconnection, etc., of electrical devices, equipment, material, etc., as indicated on the drawings and/or as required by renovations to existing building and the installation of new facilities.

.2 All electrical devices and equipment which are disconnected, removed from service, etc., and which are not reused on the job and not required are to be offered to Departmental Representative. If refused, remove from site.

.3 Continuity of power and communication shall be maintained or restored promptly where services to other portions of a site are affected by renovation or demolition that is outlined on architectural, structural, mechanical or electrical plans or specifications.

1.4 SHUTDOWNS

.1 Outage plan to be provided by the contractor to the Departmental Representative for review and approval prior to interruption of any existing services. An pre-outage meeting with the Departmental Representative is required to review the proposed plan. The general outline of the plan to be submitted as follows:

.1 Electrical Power Pre-Change Over Meeting.

.1 Meeting time.

.2 Personnel required, including specialty personnel (e.g.: utility, mechanical contractor, etc.).

.3 Pre-requisite Information: Distribution coordination studies and test results. Generator load test results.

.2 List all loads to be shut down.

.1 Distribution.

.2 Sub-distribution.

.3 Panels.

.4 Circuits.

.5 Generators.

.3 Portable generator requirement to supply equipment during service changeover.

.4 Schedule.

.1 Date and time of each activity.

.2 Length of each activity.

.5 Back out plan.

.6 Monitoring plan.

.7 List of personnel to be on site.

.1 Electrical contractor foreman and required personnel.

.2 Departmental Representative and maintenance personnel

.8 Submit confirmation sheet on panelboards. Trace circuits per Section 1.3

PART 2 PRODUCTS

.1 Manufacturers of existing devices and equipment where known are indicated on the drawings or in the specifications.

.2 Material and equipment added shall match existing wherever possible unless otherwise noted.

PART 3 EXECUTION

3.1 GENERAL

.1 Visit site prior to submitting Tender and make survey of renovation areas. Check out locations and operation of all systems and be aware of all requirements involved in changes and modifications to systems. Consult maintenance staff for any information regarding type and operation of systems. Take into account and allow for all work required to existing facilities to meet requirements as indicated on the drawings and in the specifications.

.2 Check and be aware of all phasing of work requirements of the project. This would include reading of associated specifications.

.3 Provide all labour and equipment required to remove existing electrical facilities in the area to be renovated as noted.

.4 Provide all labour and materials required to revise existing electrical facilities as indicated on the drawings and/or as required by building renovations and for installation of new facilities.

.5 Existing facilities shall remain operational during construction period. When renovations are complete, all facilities shall be checked and tested and shall be left in a proper working order and to the satisfaction of Departmental Representative.

.6 Where walls, ceilings, floors, etc., containing electrical devices, material and equipment, etc., are removed and the deletion of outlets in said areas disrupt service to adjacent

devices and equipment, then conduit and wiring shall be provided to pick up adjacent devices and equipment to maintain continuity of service.

3.2 DISPOSAL OF HAZARDOUS MATERIAL

.1 Dispose of PCB Ballasts, radioactive material in smoke detectors, PCB capacitors, and PCB transformers in accordance with:

.1 Canadian Environmental Protection Act (Canada)

.2 Canadian Environmental Protection Act - Chlorobiphenyls Regulations (Canada)

.3 Provincial Environmental Protection Act

.4 Transportation of Dangerous Goods Act, (Canada)

.5 Dangerous Goods Transportation and Handling Act

.6 Other legislation and regulations which apply to the performance of the work of this section.

.2 Perform work in accordance with the recommendations in the following Environment Canada publications:

.1 Handbook on PCBs in Electrical Equipment by Environment Canada.

.2 Identification of Fluorescent Lamp Ballasts Containing PCBs, EPS 2/CG/2, April 1986, by Environment Canada.

.3 Persons employed for the removal of capacitors and other energized electrical equipment shall be qualified electricians.

.4 Where contact with liquid PCB is possible, personnel shall be instructed in handling procedures, safety precautions, use of safety equipment and applicable Provincial and Federal legislation and regulation.

.5 Handling and transportation of hazardous wastes shall be performed by a company registered as a carrier with the Provincial Environment department.

.6 Submit proof that all persons involved in handling, packing, loading, transportation, unloading, unpacking and disposal of PCB waste are trained in accordance with the Dangerous Goods Transportation and Handling Act.

.7 Dispose of all radioactive smoke detector components as radioactive waste when, smoke detectors:

.1 contain 5 microcuries (185 kilobecquerels) or more of Americium-241 or any amount of Radium.

.2 containing less than 5 microcuries (185 kilobecquerels) of Americium-241 are disposed of in quantities of ten or more.

.8 Dispose of radioactive smoke detector components by making disposal arrangement with one of the following radioactive waste disposal facilities:

.1 Original equipment manufacturer.

.2 Waste Operations Branch
Atomic Energy of Canada Ltd.
Chalk River, Ontario K0J 1J0

.3 Atomic Energy of Canada licensed waste disposal facility.

.9 Contact selected radioactive waste disposal facility to obtain their instructions for packaging, labeling and shipping of radioactive smoke detector components.

.10 Package, label and ship radioactive smoke detector components in accordance with waste disposal facility's instructions and in accordance with Provincial and Federal legislation and regulations governing the handling, transportation and disposal of radioactive materials.

3.3 LAMP DISPOSAL

.1 Contractor to recycle lamps (glass, phosphor, and metal). Provide receipt in maintenance manual for lamp recycling.

3.4 EXISTING SYSTEM SHUTDOWNS

.1 Where the work of the Contract required shutdown or will otherwise affect and existing electrical system, Contractor must follow NAG guidelines.

.2 Shutdowns for tie into existing systems may be required after normal working hour to maintain facility operation.

.3 All costs related to non-coordinated nuisance alarms or the fire alarm system caused by this contractor will be borne by this contractor (i.e. false charges by Fire Department).

3.5 EXCAVATION

.1 Refer to Structural Drawings.

3.6 ASBESTOS

.1 Asbestos has been found to be present throughout the IOS buildings. The Contractor shall assume that asbestos is present when performing any coring at the IOS facility.

.1 Coring shall be performed per WorkSafeBC requirements for handling asbestos containing materials.

.2 Contractor shall submit proposed coring procedures to Departmental Representative for review. Procedures shall prevent contamination of surrounding areas.

.3 All coring materials shall be disposed of at an approved location for disposal of Asbestos containing materials.

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY

.1 Test and check all portions of the electrical systems for satisfactory operation. All tests shall be tabulated, signed and incorporated into the Operating and Maintenance Manuals. All testing and commissioning to be carried out under this contract. Procedures and tests outlined below are electrical tests required in addition to normal visual and mechanical inspections which must be carried out prior to placing equipment in service.

.2 Prior to field testing, obtain applicable copies of factory tests for comparative results.

.3 Additional testing requirements may be outlined in specific Sections in Division 26, 27, and 28.

PART 2 PRODUCTS

.1 Not used.

PART 3 EXECUTION

.1 General

- .1 Contractor shall coordinate and pay for all testing required by the Contract Documents including any additional testing required by the Authority Having Jurisdiction.
- .2 All deficient equipment/devices shall be replaced and retested.
- .3 Testing for each System shall be performed after the System installation is complete and prior to the system being put into continuous operation.
- .4 Advise the Departmental Representative a minimum of three (3) working days in advance of each test and carry out tests in the presence of the Departmental Representative.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit detailed typewritten test reports to the Departmental Representative within five (5) working days after the completion of each test. Include all test reports in the Maintenance Manuals.
  - .1 Test reports shall clearly indicate each component that has been individually tested, test results, and whether the results are within acceptable limits.
  - .2 Each test report shall be accompanied by a cover sheet outlining the test and summarizing any items that have failed the tests.
    - .1 Cover sheet shall include names, signatures, and contact information of the individuals who conducted the tests.

.7 Protective Device Setting and Testing

.1 All work shall conform to NETA standards.

.2 Ensure circuit protective devices including but not limited to overcurrent trips, relays, and fuses are installed to required values per protection and coordination study.

.2 Contractor Testing:

.1 Infra-Red Scanning:

.1 Perform infrared scan of all distribution equipment under loaded conditions (new and existing).

.2 Load Balance:

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

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

.3 Provide upon completion of work, load balance report, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.3 Systems:

.1 Access Control

.2 Local Area Networking

.3 CCTV

.4 Gate operators

.5 Lift arm gates

.6

.4 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.5 Breakers - Molded Case Breakers 150 Amp Frame and Larger:

.1 Visually inspect.

.2 Ductor test.

.3 Megger test.

.4 Mechanical function test.

.5 Set all units with adjustable magnetic trip units.

.6 Where solid state protection is provided with large breakers, test units as follows:

.1 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.

.2 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instruction.

.3 If manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.

.4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test trip operation.

.5 Check C/T and P/T ratios and compare to coordination data.

.6 Fused or Unfused Disconnect Switches:

.1 Visually inspect and clean.

.2 Ductor test across switch blade contact surfaces.

.3 Megger test.

.4 Mechanical function test.

.7 Transformers

.1 Visual inspection of enclosure and all accessories.

.2 Torque test all bus connections and cable terminations and seal with red lacquer.

.3 Megger test.

.4 Dielectric power factor test.

.5 Core ground test.

.6 Ratio test in all tap positions.

.7 Test operation of temperature and operation of all associated alarm contacts.

.8 Test and calibrate ground fault relays and function test to trip associated breakers.

.9 Make voltage and power factor checks throughout building. If directed by the Departmental Representative, adjust transformer tap settings. Readings taken at this time to be logged, tabulated and any adjustments made to be suitably logged and incorporated in the Operating and Maintenance Manuals.

.8 Microprocessor Type Relays:

.1 Mechanical Inspection:

.1 Remove cover from relay case carefully. Trip circuit is live circuit and on some relays it is possible to cause an instantaneous trip while removing relay cover. Inspect cover gasket. Check glass for tightness and cracks.

.2 Eliminate unwanted tripping, short-circuit current transformer secondary by careful removal of relay test plug or operation of appropriate current blocks.

.3 Check connections, circuit boards and modules for tightness.

.4 Check output relay coils for signs of overheating and brittle insulation.

.2 Cleaning:

.1 Clean glass inside and out.

.2 Clean relay compartment as required. Clean relay plug in contacts if applicable, using proper tools.

.3 Remove dust and foreign materials from interior of relay using small brush or low pressure 3.2 kg blower of nitrogen.

.4 Inspect for any signs of moisture and corrosion.

.5 Clean relay output contacts with burnishing tool or non-residue contact cleaner.

.3 Electrical Testing: Function Tests for typical overcurrent relays include:

.1 Energize relay from an appropriate DC power source and check "ON" indication.

.2 Time-current function test and trip flag operation.

.3 Instantaneous pickup functional trip and flag operation.

.4 Use tests listed above for most microprocessor overcurrent type relays.

.5 Check C/T and P/T ratios and compare to coordination data.

.9 Solid State Relays:

.1 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.

.2 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instructions.

.3 If manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.

.4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test the trip operation.

.5 Check C/T and P/T ratios and compare to coordination data.

.10 Devices

.1 Test all receptacles for proper polarity, circuitry and grounding.

.3 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports to Departmental Representative for review. Include field reports in Operations and Maintenance Manuals.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Obtain manufacturer’s field services for commissioning of equipment as required in other Sections of Division 26, 27, and 28 specifications.

.4 Testing by Independent Testing Agency

.1 Contractor shall arrange and pay for system testing to be performed by an independent testing agency.

.2 All required testing shall be completed and any deficiencies corrected prior to energizing equipment.

.3 Check resistance to ground before energizing any equipment.

.4 Contractor shall provide all necessary tools, material, and labour to prepare the equipment for testing, to assist the testing agency representatives during the tests, and to re-connect equipment on completion of testing.

.1 Include in Bid price all costs associated with the coordination of testing, provision of labour required to carry out testing, and required materials other than testing instruments.

.5 The following tests shall be performed by the independent testing agency:

.1 Fire alarm systems

.5 Conduct additional testing as required in other Sections in Division 26, 27, and 28.

3.2 STANDARDS

.1 The following tests shall be conducted in accordance with latest CSA, ASTM, IEEE and IPCEA standards, recommendations for power cable and equipment testing and authority waving jurisdiction. Notwithstanding, the test levels listed in these standards, in no case shall the maximum DC test level exceed manufacturer's factory test AC level for that equipment.

.2 Equipment shall be tested to a maximum level determined by formula ET Max. = (2EN x 1.6 x 0.75) or maximum test voltage level agreeable to equipment manufacturer - whichever is highest. (Where ET = withstand test voltage' EN = nameplate voltage rating' 1.6 = AC to DC volts conversion factor' 0.75 field test factor).

.3 Where production tests are required by EEMAC or CSA for manufactured equipment, provide records of these tests.

.4 All tests shall be completed in accordance with manufacturer's published instructions. If these instructions do not conform to the test requirements as specified herein inform the Engineer prior to proceeding with the test.

3.3 TEST APPARATUS AND INSPECTION REPORT

.1 The testing company to be responsible for furnishing all apparatus and labour required for the test operations.

.2 Inspection and test results to be recorded on a suitable form which shall be furnished by the testing company. The inspection and report forms shall be submitted to the Engineer. Each form to be signed by the test technician. Space to be provided for noting approved items and their disposition.

.3 Testing company to submit full commissioning reports and information for as-built drawings and acceptance documents signed by test technician.

.4 Upon completion of the project, the testing company to assemble complete sets of inspection/test results/reports to be placed in the operating and maintenance manuals.

3.4 SYSTEM ACCEPTANCES

.1 Prior to requesting inspection, submit, for review by the Departmental Representative letters from the Manufacturers of equipment and systems indicating the their Technical Service Representative have inspected and tested the equipment and systems and are satisfied with the methods of installation, connections and operation.

.2 Acceptance letters shall be submitted for the following:

.1 Kantech Access Control System

.2 Panasonic CCTV System

.3 Intercom System

.4 Managed Network Switches

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 RELATED REQUIREMENTS

.1 Electrical Systems Testing and Commissioning Section 26 05 10.

1.3 WORK INCLUDED

.1 Provide operation and maintenance data as specified herein for incorporation in operation and maintenance manuals. Before requesting final certificates, submit copies of the operation/maintenance manuals.

.2 Contractor shall supply shop drawings and manufacturer’s instructions and specifications on all new installations for inclusion in the building inventory.

1.4 MANUALS

.1 Submit three (3) hard copy bound sets and one (1) digital set of the operations and mantinance manual on CD or USB memory stick.

.1 Submit one draft hard copy to the Departmental Representativefor review at Substantial Completion prior to final issue.

.2 O&M Manual Format

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide to scale CAD files in dwg format on CD.

.3 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.4 Contents:

.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.

.6 Training: refer to Section 26 05 12 Electrical Equipment and Systems Demonstration and Training.

.5 The divider tabs shall be laminated Mylar plastic and coloured according to Section . Plastic tabs with typewritten card insertions will not be accepted. Index manuals as follows:

.1 Tab 1.0 Division 26, 27, and 28 System complete with title page.

.2 Tab 1.1 List of Division 26, 27, and 28 Drawings

.3 Tab 1.2 Description of Systems

.4 Tab 1.3 Equipment Suppliers and Parts

.5 Tab 2.0 (.1, .2, etc.) Shop Drawings.

.6 Divider tabs shall be mylar plastic and colour coded.

.6 Each manual shall contain:

.1 Table of contents. Arrange contents sequentially by systems under section numbers. Label tabs of dividers between each to match section numbers in table of contents.

.2 Name and contact information of all project Contractors including all Electrical subcontractors.

.3 Copies of all contractor and subcontractor statements of warranty.

.4 Name and contact information of all Electrical equipment suppliers.

.5 Systems Descriptions. A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.

.6 Descriptive and technical data.

.7 Maintenance and operating instructions for all electrical equipment and controls. (These operating instructions need not be manufacturer’s data but may be typewritten instructions in simple language to guide the Owner in the proper operation and maintenance of this installation.)

.8 Lubricating and servicing intervals recommended.

.9 A copy of all wiring diagrams complete with wire coding.

.10 List of spare parts of all electrical equipment complete with names and addresses of sales, service representatives and suppliers.

.11 Copy of test data.

.12 A motor list showing each motor number, name, horsepower, nameplate, current rating, heater size and type, and current being drawn.

.13 Include type and accuracy of instruments used.

.14 Set of final reviewed Shop Drawings.

.15 Provide manufacturer's installation instructions for all systems and components.

.16 provide manufacturer's operation instructions for all systems and components

.17 Provide manufacturer's maintenance instructions for all systems and components. Include the following:

- .1 Complete parts list for all serviceable components, including description and catalogue number.
- .2 List of spare parts supplied under the Contract and list of other spare parts recommended by manufacturers.

.18 Provide copies of all inspection certification reports from authorities having jurisdiction.

.19 Provide copies of reports documenting the results of all tests, including factory tests, required by the Contract Documents to be performed.

.20 Provide copies of all manufacturer's warranties.

.21 Record Drawings.

.22 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.
- .6 Recommended spare parts

END OF SECTION

PART 1 GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms a part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 INTENT

.1 Provide demonstration and instruction sessions to familiarize Departmental Representative's operation and maintenance personnel with electrical systems and their operation and maintenance.

1.3 MANUFACTURER'S SITE SERVICES

.1 Arrange and pay for appropriately qualified manufacturer's representatives to provide or assist in providing electrical equipment and systems demonstration and instruction seminars for systems specified in this Section.

1.4 DEMONSTRATION AND INSTRUCTION SEMINARS

.1 Present Operator Training Seminar.

.2 Arrange Suitable time with Departmental Representative.

.3 Include for a minimum of 8 hours of training for systems.

PART 2 PRODUCTS

.1 Not used.

PART 3 EXECUTION

3.1 SYSTEMS AND EQUIPMENT DEMONSTRATIONS AND INSTRUCTION SEMINARS

.1 Provide demonstration and instruction seminars for the following equipment and systems identified. Include in demonstrations and instruction seminars, for each piece of equipment and system including but not limited to:

.1 Access Control System;
.2 Intercom System;
.3 Network Video Recorders, camera control, and associated software;
.4 Cantilever and lift arm gates;

END OF SECTION

PART 1 CONCRETE WORK

.1 All concrete required for and/or installed under Division 26 shall be as specified in other Divisions.

.2 Use proper placement techniques to remove entrained air. Do not place thereon or attach thereto any materials or equipment prior to a minimum curing period of seven (7) days.

.3 Vibrators shall be utilized for the placement of all concrete.

PART 2 HOUSEKEEPING PADS

.1 Provide steel reinforced concrete housekeeping pads/bases of minimum 100 mm height for all floor mounted equipment, including but not limited to switchgear, auxiliary system cabinets, etc. Size pads with reference to equipment shop drawings and so as to include for the installation of future equipment where future extensions to equipment are shown or noted.

PART 3 OPENINGS

3.1 OPENINGS AND SLOTS

.1 Provide all openings as necessary and as specified elsewhere to permit the installation of all conduits and cables and recessed equipment and devices.

.2 Grind and file smooth the interiors and edges of all sleeves and slots prior to pulling any cables.

PART 4 WALL, CEILING, AND FLOOR PENETRATIONS

.1 Any and all penetrations through walls, ceilings and floors (fire, smoke, sound as well as all other penetrations) must be sealed after the installation of all conduits, cables, bus ducts, cable trays, wireways, etc., to maintain the integrity of the separations in a manner approved by the Departmental Representative and the authorities having jurisdiction. Use sealing materials as specified herein and shown on the drawings.

.2 Rated sealing systems for penetrations of Fire Rated walls, ceilings and floors: Hilti, or approved equal, refer to the drawings. Contractors are to submit ULC, cUL, WHI, or equivalent certified Design or System Data Sheets to demonstrate compliance of a particular Floor or Wall Assembly, Through Penetrant, and Sealant with requirements and for what period of time.

.3 Provide bus ducts, cable trays, wireways, etc., with fire barriers at each floor and at each fire separation and smoke separation, and further seal against the migration of smoke.

.4 Seal all slots, core holes, etc., not being used.

.5 Provide fire-rated gypsum board of required thickness around all surfaces of recessed panelboards and cabinets within rated separations so as to maintain the separation rating as approved by the authorities having jurisdiction.

.6 Provide fire-rated gypsum board enclosures for lighting fixtures recessed in fire rated ceiling assemblies, all as required by the authorities having jurisdiction.

PART 5 WATERPROOFING/VAPOUR BARRIERS

.1 Generally penetrations through waterproofing members and vapour barriers will not be permitted. However, where any work must pierce vapour barriers and waterproofing membranes including waterproofed concrete, the method of installation, colour of caulking material and location of penetration shall be as approved by the Departmental Representative and as coordinated with Structural Engineer prior to proceeding with the work. Supply and install all necessary sleeves, caulking and flashing and make the penetrations watertight. For penetrations of vapour barrier, maintain integrity of the system. Restore penetrations through existing surfaces to match the surroundings.

.2 Provide specified caulking around all exterior recessed lighting fixtures in concrete steps, walls, etc.

.3 Provide clear silicon bead on top and down both sides of all exterior wall mounted devices (e.g. light fixtures and gongs) where devices are exposed to the weather.

PART 6 EQUIPMENT FINISHES

.1 Thoroughly degrease all metalwork and apply one overall coat of zinc chromate primer to all electrical equipment enclosures, supports, switchgear cubicles, bus ducts, gutters, panelboards, low tension and other cabinets. Unless otherwise directed, apply one overall coat of grey enamel and a second coat of gloss enamel. Paint all exposed surfaces.

.2 Grey ASA #61 unless matching existing equipment in which case colour shall match existing.

.3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint. Ensure that equipment finishes are not defaced during installation. Scratched or otherwise marred surfaces shall be refinished before the job will be accepted. Other surfaces shall be completely repaired to match original paint. Patching of damaged area will not be accepted.

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

.5 Generally, equipment finishes shall be as outlined under applicable sections of the specifications.

PART 7 VIBRATION AND NOISE CONTROL

7.1 MOUNTING

.1 Electrical equipment such as transformers and standby diesel engine generator sets shall be mounted using vibration isolators to prevent the transmission of isolators shall be selected in accordance with the weight distribution of equipment so as to produce the manufacturers' recommended uniform deflection. Such equipment shall be restrained at each isolator pad using bolts into the floor slab with neoprene washers and clearance holes to prevent short circuiting.

7.2 CONNECTIONS

.1 Connections to rotating, vibrating, or other noise-producing equipment such as motors, generators and transformers shall be by means of flexible conduit and flexible stranded conductors so as to minimize transmitted noise and vibration. Where equipment is mounted by means of resilient supports and is subject to physical displacement under such conditions as energizing a motor, the flexible conduit connections shall be formed into a loop of sufficient length to permit freedom of travel.

PART 8 ACOUSTICAL SPECIFICATIONS FOR TRANSFORMER

8.1 GENERAL

.1 Supply transformers generating a space average noise level in the respective Electrical Rooms not exceeding 70 decibels (re: 20 microPa) measured in any third octave bank between 50 Hz and 1,000 Hz based on a 300 kVA transformer.

.2 Log kVA re: 300 kVA. Use a room absorption equivalent to 1/3 of the floor area. Supply the name of a similar installation.

.3 Sound level measurements made at the project site will be made in general accordance with ANSI Standard S1.32, recognizing that the respective Electrical Rooms may not meet the full requirements of the Standard.

.4 Supply vibration isolation such that the airborne noise isolation provided by the building structure is not limited by structure-borne noise transmission. The following are minimum isolation requirements:

.1 Mount the transformer core on 25 mm (1”) deflection spring isolators, including in-series neoprene elements with an effective deflection of 2.5 mm (.10”) and use restraints meeting the National Building Code with respect to seismic requirements. (Also refer to Section 16192 Seismic Restraints).

.5 Where a transformer is located on a slab on grade, use pad isolators sized for a minimum 2.5 mm (.10”) defection, with seismic restraints.

.6 If the transformer core is mounted on separate transverse steel supporting members independent of the transformer enclosure, size the members for a 140 Hz cantilever resonant frequency under the dead load of the member (0.013 mm (.0005”) dead load cantilever deflection) and the isolator stiffness.

.7 Where smaller transformers are supplied with core bolted into steel supports within the cabinet, supply neoprene pad isolation within cabinet with minimum 2.5 mm (.10”)

deflection working against the vibration isolation provided the isolator/pad supports is not limited by the braided connectors. If such flexibility is impractical, isolate the cabinets and all other associated equipment on the neoprene pads with 2.5 mm (.10”) deflection and isolate the conduit to meet the requirement.

.8 For 10 metres (30’) in all directions from the transformer, provide neoprene hangers with 0.1" Static deflection in threaded rod supports for conduit, cable trays, etc. Avoid rigid connections to the structure.

.9 Submit shop drawings detailing proposed isolation.

PART 9 PRODUCTS

.1 Mason Z-1011 seismic restraints.

.2 Mason SLFH open spring isolators.

.3 Mason Super W pad isolator, 50 durometer.

.4 Mason HD hangers.

PART 10

.1 Locate all mechanical equipment, electrical conduit, and lighting at least 300 mm (12”) below the ceiling slab, including wall-mounted equipment. Do not locate mechanical ducts over transformer cabinets.

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 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)

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results-Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper 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 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 copper conductors.

.2 Clamp for copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Sized for conductors as indicated.

.4 Clamps or connectors for TECK cable, as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors 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 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results-Electrical.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE Non Jacketted.

.3 Aluminum Conductors: not permitted.

2.2 TECK 90 CABLE

.1 Teck cable permitted only where explicitly indicated on Drawings or where agreed to in writing by Departmental Representative.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE.

.2 Rating: , 600 V.

.4 Inner jacket: [polyvinyl chloride] material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 1500 mm centers maximum. Provide additional supports as required to prevent sagging of cables.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

.1 Not Required.

2.4 ARMOURED CABLES

.1 Not permitted.

2.5 ALUMINUM SHEATHED CABLE

.1 Not required.

2.6 CONTROL CABLES

.1 Type: LVT: soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath : thermoplastic jacket.

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT:

.1 Insulation: TW.

.2 Shielding:

.1 Tape coated with paramagnetic material over each pair or over conductors as indicated.

.2 Provide shielding where indicated on Drawings.

.3 Overall covering: PVC jackets for installation in cable tray or conduit.

2.7 NON-METALLIC SHEATHED CABLE

.1 Not Permitted.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and Section 26 05 10 – Testing and Commissioning.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.

.2 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.4 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.5 Conductor length for parallel feeders to be identical.

.6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.7 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.

.8 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.

.9 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.

.2 In underground ducts in accordance with Section 33 65 76 Direct Buried Underground Cable Ducts.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable as indicated on Drawings or as approved in writing by Departmental Representative.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Not Required.

3.6 INSTALLATION OF ARMOURED CABLES

.1 Not Required.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

.1 Not Required.

3.8 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit or cable troughs as indicated on drawings.

.2 Where present, ground control cable shield at one end only.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA International

.1 CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated on Drawings.

.3 Rod electrodes: copper clad steel, 19 mm diameter by minimum 3 m long.

.4 Plate electrodes: Not Required.

.5 Grounding conductors: bare stranded copper, soft annealed, size as indicated on Drawings or per CEC where not indicated on Drawings.

.6 Insulated grounding conductors: green, copper conductors, size as indicated.

.7 Ground bus: Not Required.

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

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Compression type connectors Burndy Hy-Press or approved equal.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.

.2 Where EMT or RGS is used, run ground (bond) wire in conduit.

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

.4 Protect exposed grounding conductors from mechanical injury.

.5 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837 (Burndy Hypress or equal).

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

.7 Soldered joints not permitted.

.8 Install bonding wire for flexible conduit, connected at [both] [one] end[s] to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.9 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.10 Install separate ground conductor to outdoor lighting standards.

.11 Connect building structural steel and metal siding to ground by welding copper to steel.

.12 Make grounding connections in radial configuration only, with connections terminating at single grounding point as indicated on Drawings. Avoid loop connections.

.13 Bond single conductor, metallic armoured cables to cabinet at supply end.

3.2 MAINTENANCE HOLES

.1 Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each maintenance hole.

.2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

3.3 ELECTRODES

.1 Install electrodes and make grounding connections as indicated on Drawings.

.2 Bond separate, multiple electrodes together.

.3 Size copper conductors for connections to electrodes as indicated on Drawings.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections minimum size 2/0AWG or as indicated on Drawings.

3.6 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:

.1 Sound, fire alarm, security systems, intercommunication systems as indicated.

3.7 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and 26 05 10 – Testing and Commissioning

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

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Not Required.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results - Electrical

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

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

.2 Cord Grips: Kellems grip Type 073-03 and 073-04 or approved equal.

.3 Wire and cable ties: nylon ‘Ty-rap’ or approved equal for wiring and control cable. Velcro cable wraps for data cables.

.4 Threaded hanger rods: galvanized steel, minimum 6mm diameter; larger sizes as shown on drawings or as required.

.5 Conduit and cable clamps for individual or pair runs:

.1 One-hole steel or galvanized malleable iron for sizes 53mm and smaller.

.2 Two-hole steel for sizes larger than 53mm.

.6 Fixture suspension chain: #3 Tenso chain.

.7 Backboards: New 21mm (3/4”) G1S paint grade fir plywood.

.1 Paint with fire-retardant paint.

.8 Conductor supports for vertical runs: O-Z Electrical Mfg. Co. Type ‘S’ or ‘R’ as required or equal, for not more than 5 wires or cables each not greater than 250 kCMIL. Kellems grip Type 022-11 or approved equal for all manufacturer-approved combinations of wires and/or cables.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with 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 1.5 m 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.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition..

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 SPLITTERS

.1 Not Required.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers for indoor use.

.4 NEMA 4X rated for outdoor locations.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated on Drawings.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square or larger outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.4 FLOOR BOXES

.1 Not Required.

2.5 CONDUIT BOXES

.1 Cast FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices unless noted otherwise on drawings.

2.6 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.7 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

SPEC NOTE DESCRIPTION: This section specifies rigid and flexible fasteners, fittings and installation.

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .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 (Current Edition).

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 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.

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

- .1 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.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

2.3 CONDUIT FASTENINGS

.1 One hole malleable iron or galvanized 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 1.5 m 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 100mm 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 Surface mount exterior conduits unless noted otherwise.

.4 Conceal interior conduits above accessible ceiling spaces except in service rooms.

.5 Use rigid aluminum threaded conduit outdoors, above ground.

.6 Use electrical metallic tubing (EMT) indoors above 2.4 m not subject to mechanical injury.

.7 Use rigid pvc conduit underground.

.8 Minimum conduit size: 21 mm.

.9 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.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] [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 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 27 mm and larger below slab and encase in 75 mm concrete envelope.

.1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.1 No.126.1, Metal Cable Tray Systems.

.2 CAN/CSA C22.1 No.126.2, Non Metallic Cable Tray Systems.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA FG 1, Fibreglass and Cable Tray Systems.

.2 NEMA VE 1, Metal Cable Tray Systems.

.3 NEMA VE 2, Cable Tray Installation Guidelines.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 CABLETROUGH

.1 Cabletroughs and fittings: to CAN/CSA C22.1 No.126.1.

.2 Wire mesh type, CAN/CSA C22.2 No.126.1.

.1 Minimum width: 300 mm

.2 Minimum Depth: 102 mm

.3 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cabletrough supplied.

.4 Solid covers for complete cabletrough system including fittings.

.5 Barriers where different voltage systems are in same cabletrough.

.6 Ground cable trays with #2 AWG bare copper conductor attached to each tray section in accordance with CEC requirements.

.7 Provide fire stop material at firewall penetrations.

2.2 SUPPORTS

.1 Provide splices, supports for a continuously grounded system as required.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install complete cabletrough system in accordance with NEMA VE 2.

.2 Support cabletrough on both sides.

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.2 CABLES IN CABLETROUGH

.1 Cabletrough for extra low voltage cabling only including but not limited to communications, access control, and security cabling.

.2 Install cables individually.

.3 Lay cables into cabletrough. Use rollers when necessary to pull cables.

HSecure cables in cabletrough at 6 m centres, with nylon ties.

.4 Identify cables every 30 m and on both sides of walls where Tray passes through walls with size 2 nameplates in accordance with Section 26 000 – Common Work Results Electrical.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 CABLE OR CONDUIT MECHANICAL PROTECTION

.1 Provide cable/conduit mechanical protection only where specifically indicated on Drawings or as approved by Departmental Representative in writing to reduce the cable depth of cover.

.2 50mm concrete.

2.2 MARKERS

.1 Not Required.

PART 3 EXECUTION

3.1 DIRECT BURIAL OF CABLES

.1 Not Permitted.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

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

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

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

3.3 MARKERS

.1 Not Required.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and 26 05 10 Testing and Commissioning.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

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

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests for power cables:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests for power cables:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing at 100% of original factory test voltage in accordance with manufacturer's recommendations.

.4 Leakage Current Testing:

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Refer to Division 28 for acceptance tests for communications, access control, and other extra low voltage wiring.

.8 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

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

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 This section includes the technical requirements for the Vehicle Access Control System (VACS) including:

.1 Supply, installation and testing of vehicle gates.

.2 Supply, installation and testing of card reader cabinets.

.3 Supply, installation and testing of vehicle detection loops.

.2 This section of the Specifications forms part of the Contract documents and is to be read, interpreted and coordinated with all other parts.

1.2 REFERENCE STANDARDS

.1 Except where specifically modified within this specification, the installation shall, as minimum, comply with the latest issues of the following standards.

.2 Canadian Standards Association (CSA International)

.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd edition) - Safety Standard for Electrical Installations.

.3 BC Ministry of Transportation and Infrastructure

.1 2012 Standard Specifications for Highway Construction, Adopted November 1, 2011.

.2 Electrical and Signing Material Standards, Volume 1, December 2003.

.4 Underwriters Laboratories of Canada (ULC)

.1 ULC-S317-96, Installation and Classification of Closed Circuit Video Equipment (CCVC) Systems for Institutional and Commercial Security Systems.

1.3 RELATED SECTIONS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

.2 Section 28 13 28 – Building Entrance Control System

1.4 SPARE COMPONENTS

.1 Not Required.

PART 2 PRODUCTS

2.1 LIFT ARM GATES

.1 Gate

.1 Standard of acceptance: Automatic Systems BL229 with 3.6 meter arm.

.2 Special requirements for each gate:

.1 Cabinet key switch.

.2 Control unit designed to accept separate dry contact input commands to raise and to lower the arm.

.3 Provide dry contact outputs to confirm gate arm up, gate arm down, cabinet intrusion, and arm unlatch.

.4 Provide a breakaway mechanism on the gate arm. Design the breakaway mechanism to minimize damage to the arm when hit and to allow for quick repositioning of the arm by use of a shear pin. Provide an electrical input to the gate controller to indicate status of the mechanism. Provide a dry contact output to confirm the status of the gate arm breakaway mechanism.

.5 Gate shall be capable of reversing mid-swing upon receipt of an open command when in the closing cycle, and a closing command when in the opening cycle.

.6 Gate shall be equipped with optional gate latch monitor

.7 Safety device overrides shall be disabled on all the lift gates.

.8 Manufacturer firmware upgrade may be required.

.9 Gate shall be capable of being locked in the 'OPEN' position.

.3 Provide detailed mechanical and electrical shop drawings for approval.

.2 Control Booth Push Buttons

.1 Provide industrial grade push buttons, pilot lights, and rotator switches within an aluminum housing for installation in Gate House.

.2 Within each gatehouse, the following shall be provided for each lane:

.1 Green pilot light

.2 Red pilot light

.3 Green momentary push button

.4 Red momentary push button

.5 Three-way rotator switch (Gate Hold Open/Hold Closed)

.3 Standard of Acceptance: Allen Bradley

2.2 MOTORIZED SLIDE GATE OPERATOR

.1 Provide motorized linear tooth drive/ chain drive slide gate operator sized to properly open and close the cantilever gate sliding gate. Gate operator shall have manual release mechanism to allow manual opening of gate.

.2 Provide linear tooth assembly mounted on cantilever bottom rail.

.3 Provide all required power and control wiring, conduit, and fittings.

.4 Provide electronic safety beam sensor, reflectors, and reflector mounting posts.

.5 Standard of acceptance, beam sensor: EMX Industries IRB-MON

.6 Configure and test gate operator and gate control.

.7 Install all components in accordance with manufacturer's instructions.

.8 Standard of acceptance, Gate Operator: HySecurity SlideDriver 15 222 SS ST or approved alternative.

.9 Coordinate with Fence and Gate contractor.

2.3 VEHICLE LOOPS

.1 Vehicle loops shall be installed in accordance with Section 26 05 00 – Common Work Results Electrical.

.2 Loops shall be supplied and installed by the gate control system contractor.

2.4 CARD READER COMPONENTS

.1 Supply card reader interface electronics in the locations noted on the Plans. Refer to Section 28 13 00 – Access Control.

2.5 INTERCOM SYSTEM COMPONENTS

.1 Supply intercom interface electronics in the locations noted on the Plans. Refer to Section 28 13 28 – Building Entrance Control System.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and datasheet.

.2 Install components securely, properly aligned and in locations shown on the Drawings.

.3 Final Grades and Installation Conditions: Examine final grades and installation conditions. Do not begin work until all unsatisfactory conditions are corrected.

3.2 LIFT GATES

.1 Lift gates shall be configured with safety reversing using the vehicle loop under the gate arm.

.2 Lift gates shall be configured to open from the operator gate house pushbuttons only. Gates shall be lockable in the open position from the gate house.

.3 Gates shall be configured to automatically close, by means of the loop detectors, after the vehicle passes through the lift gate. The close push button from the operator control booth shall also provide means to close the gate.

.4 Operator control booth push button consoles shall provide operation for all three gates. Push buttons shall be wired to allow the following:

.1 Gate open request – allows a single vehicle to pass
.2 Gate close request – closes the vehicle gate
.3 Hold Open – forces the gate to remain in the open position
.4 Hold Close – forces the gate to remain in the closed position
.5 Gate open status
.6 Gate closed status

3.3 SYSTEM TESTING AND COMMISSIONING

.1 Refer to Section 26 05 50 S – General Electrical for full testing and commissioning procedures. Testing procedures below are specific to equipment of this

Section and shall be incorporated into the overall testing and commissioning plan outlined in Section 26 05 50 S.

.2 **Phase I – Individual Component Testing:**

.1 Visual verification: Objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:

.1 Sturdiness of equipment fastening.

.2 Non-existence of installation related damages.

.3 Compliance of device locations with reviewed shop drawings.

.4 Compatibility of equipment installation with physical environment.

.5 Inclusion of all accessories.

.6 Device and cabling identification.

.7 Application and location of ULC approval decals.

.2 Technical testing and commissioning: Purpose is to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:

.1 Measurements of tension and power.

.2 Connecting joints and equipment fastening.

.3 Compliance with manufacturer's specification, product literature and installation instructions.

.4 Confirm power to all components.

.5 Confirm manual operation of components, such as open/close of vehicle gates.

.3 **Phase 2 – Integration Testing:**

.1 Test integration of motorized slide gate system with intercom and access control systems.

3.4 **CLEANING AND ADJUSTING**

.1 Remove protective coverings from components.

.2 Adjust gate arms for correct function.

.3 Clean equipment housings and system components, free from marks, packing tape, and finger prints, in accordance with manufacturer's written cleaning recommendations.

3.5 WARRANTY

.1 Refer to Section 26 05 00 – Electrical General Requirements for warranty information.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CAN/CSA C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA C22.2 No.55, Special Use Switches.

.4 CSA C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20).

.5 CAN/CSA C22.2 No.144, Ground Fault Circuit Interrupters.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 SWITCHES

.1 Rating and voltage as indicated on Drawings.

.2 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 White ‘decora’ style.

.3 Horsepower rated toggle switches for motor loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type and amperage as indicated on Drawings, U ground, to: CSA C22.2 No.42 with following features:

.1 White urea moulded housing, ‘decora’ style.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type and amperage as indicated on Drawings, U ground with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 GROUND FAULT PROTECTOR UNIT

.1 Not Required.

2.4 SPECIAL WIRING DEVICES

.1 Not Requires.

2.5 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Plastic white cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.4 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded [cast aluminum] cover plates complete with gaskets for single receptacles or switches.

2.6 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated on Drawings.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated on Drawings.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.4 Install GFI type receptacles as indicated on Drawings.

.3 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

.2 CAN/CSA C22.2 No.144, Ground Fault Circuit Interrupters.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Certificates:

.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit PDF copy of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.

.1 Production certificate of origin must be submitted to Departmental Representative for approval.

.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.

.3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.

.4 Production certificate of origin must contain:

.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

.5 Name and address of building where circuit breakers will be installed:

.1 Project title: [_____].

.2 End user's reference number: [_____].

.3 List of circuit breakers: [_____].

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Breakers shall be installed in existing panels.

.2 Moulded-case circuit breakers, ground-fault circuit-interrupters: to CSA C22.2 No. 5

.3 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.

.4 Plug-in moulded case circuit breakers: not accepted.

.5 Common-trip breakers: with single handle for multi-pole applications.

.6 Circuit breakers to have minimum symmetrical rms interrupting capacity rating to match existing panels.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Not Required.

2.3 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.4 MAGNETIC BREAKERS

.1 Not Required.

2.5 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS

.1 Not Required.

2.6 SOLID STATE TRIP BREAKERS

.1 Not Required.

2.7 OPTIONAL FEATURES

.1 Include:

.1 On-off locking device where indicated.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Contractor shall confirm manufacturer and model of existing panel boards to ensure compatibility of new breakers to be installed.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C82.1, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.

.1 ASTM F1137, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

.7 Illuminating Engineering Society of North America (IESNA)

.1 LM-79 Electrical and Photometric Measurements of Solid-State Lighting Products

.2 LM-80 Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Shop Drawings:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Not Required.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 LED LUMINAIRES:

.1 Refer to luminaire schedule on Drawings.

2.2 LAMPS

.1 Not Required.

2.3 BALLASTS

.1 Not Required.

2.4 FINISHES

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

2.5 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.6 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 TESTING AND ACCEPTANCE

.1 Test installed lighting systems in accordance with Section 26 05 00 Common Work Results Electrical and Section 26 05 10 Testing and Commissioning.

3.4 CLEANING

.1 Clean lighting control elements, lamps fixture interiors and exposed exterior surfaces prior to Substantial completion.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute

.1 ANSI J-STD-607-A, Joint Standard - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

.2 Telecommunications Industries Association (TIA)/Electronic Industries Alliance (EIA)

.1 TIA -606 Administration Standard for the Commercial Telecommunications Infrastructure.

.3 U.S. Department of Labor/Occupational Safety and Health Administration (OSHA)

.1 Nationally Recognized Testing Laboratory (NRTL).

1.3 SYSTEM DESCRIPTION

.1 Telecommunications grounding and bonding system consist of grounding busbars, bonding backbones, and other bonding conductors.

.2 Provides ground reference for telecommunications systems within building and bonding to it of telecommunications rooms.

.3 Metallic pathways, cable shields, conductors, and hardware within telecommunications spaces are bonded to telecommunications grounding and bonding system.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical

PART 2 PRODUCTS

2.1 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

.1 3/0 AWG copper conductor, green insulated FT6 marked to: ANSI J-STD-607-A.

2.2 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

.1 3/0 AWG copper conductor, green insulated FT6 marked to: ANSI J-STD-607-A.

2.3 WARNING LABELS

.1 Non-metallic warning labels in English and French to: ANSI J-STD-607-A.

.1 Identify labels with wording "If this connector is loose or must be removed, please call the building telecommunications manager".

PART 3 EXECUTION

.1 Conduit and tray sections longer than 1 meter shall be bonded unless otherwise noted

.2 Bonding conductor run in cable trays shall be fastened to tray twice per each mechanical section of tray.

3.2 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

.1 Install TGB where indicated on drawings.

.2 Install 3/0 AWG copper bonding conductor from TGB as indicated on Drawings.

3.3 BONDING CONDUCTORS GENERAL

.1 When placed in ferrous metallic conduit or EMT longer than 1 m, bond to each end of conduit or EMT using 6 AWG copper conductor.

3.4 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

.1 Install bonding conductor for telecommunications from TMGB to service equipment (power) ground.

.2 Use copper compression grounding lug, 2 hole, Burndy Hy-Press or equal for connection to TGB.

3.5 BONDING TO TGB

.1 Bond metallic raceways serving telecommunications equipment to TGB using No. 6 AWG green insulated copper conductor.

.2 Bond equipment racks and cabinets located in equipment rooms to TGB using No. 6 AWG green insulated copper conductor.

3.6 LABELLING

.1 Apply warning labels to telecommunications bonding and grounding conductors.

.2 Apply additional administrative labels to: TIA -606.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

.2 Conduits for typical single communication outlets shall be minimum 27mm unless otherwise noted

.3 Typical outlet boxes shall be minimum double gang, complete with single gang mudring unless otherwise noted

2.2 MATERIAL

.1 Conduits: type as indicated on Drawings, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Cable trays: basket type, in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.

.3 Junction boxes in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Outlet boxes, conduit boxes size, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.5 Indoor service poles: Not Required.

.6 Fish wire: polypropylene type.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install empty raceway system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

.2 Daisy chaining of outlets will not be accepted, system will be installed in a star topology unless noted otherwise.

.3 Contractor must plan and measure each run of CAT cable before ordering materials and installation and alert the Departmental Representative if any run exceeds 70 meters in length. Proceed with installation of raceways for CAT runs exceeding 70 meters only if directed in writing.

.4 All wiring shall be installed in conduit or cable tray.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

.2 Section 27 41 05 Fibre Communications

.3 Section 27 41 01 Local Area Network Equipment

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No. 214, Communications Cables (Bi-National standard with UL 444).

.2 CSA-C22.2 No. 232, Optical Fiber Cables.

.2 BICSI

.1 Telecommunications Distribution Methods Manual (TDMM) – Latest Edition.

.3 Telecommunications Industry Association (TIA)

.1 TIA-568.0-D, Commercial Building Telecommunications Cabling General Requirements.

.2 TIA-568-C.2, Commercial Building Balanced Twisted-Pair Telecommunications Cabling and Components.

.3 TIA -568.3-D, Optical Fiber Cabling Components Standard.

.4 TIA -606-C, Administration Standards for Telecommunications Infrastructure.

.5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.

.6 TIA-598-D, Optical Fiber Cable Color Coding.

1.3 DEFINITIONS

.1 Refer to TIA -598-D, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.4 SYSTEM DESCRIPTION

.1 Structured telecommunications wiring system consist of unshielded-twisted-pair and optical fiber cables, terminations, connectors, cross-connection hardware and related equipment installed inside building for occupant's telecommunications systems, including voice (telephone), data, and image.

.2 Installed in physical star configuration with separate horizontal and backbone sub-systems as indicated on Drawings

1.5 SUBMITTALS

.1 Provide submittals in accordance with Section 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 FOUR-PAIR 100 Ω BALANCED TWISTED PAIR CABLE

.1 Four-pair, 100 ohm balanced unshielded-twisted-pair (UTP) cable, flame test classification FT4to: CSA-C22.2 No. 214, Category 6 (Cat 6) to: TIA -568.0-D.

2.2 MULTI-PAIR 100 Ω BALANCED TWISTED PAIR CABLE

.1 Not Required.

2.3 WORK AREA UTP 4-PAIR MODULAR JACK

.1 Eight-position modular jack ("RJ-45"), type T568A Category 6 to: TIA -568.0-D

.1 In self-contained surface-mount box,

.2 Mounted in compatible single gang faceplate, flush entry, 2 jack positions per faceplate.

.3 Where more than two outlets are shown adjacent each other, multi-gang boxes with more than four outlets may be used.

.2 Multi-user telecommunications outlet assembly (MUTOA), number of ports as indicated on Drawings, each port equipped with field installed "RJ-45" jacks, type T568A Category 6 to: TIA/EIA-568-B.2.

2.4 TERMINATION AND CROSS-CONNECTION HARDWARE FOR UTP

.1 Patch panel: refer to specification Section 27 41 01 Local Area Network Equipment

2.5 UTP PATCH CORDS

.1 Factory-installed male plug at one end to mate with "RJ-45" jack and with factory-installed male plug at other end to mate with "RJ-45" jack. Category 6, 4 pairs. to: TIA -568.0-D.

.2 Length to suite.

2.6 UTP WORK AREA CORDS

.1 3 metres long, each end equipped with "RJ-45" Category 6]to: TIA-568.0-D.

2.7 OPTICAL-FIBER CABLE

.1 Refer to 27 41 05 Fibre Communications

2.8 CONSOLIDATION POINT FOR OPTICAL FIBER

.1 Refer to Section 27 41 05 Fibre Communications

.2 Refer to Section 27 41 01 Local Area Network Equipment

2.9 OPTICAL-FIBER PATCH PANEL

.1 Refer to Section 27 41 05 Fibre Communications

.2 Refer to Section 27 41 01 Local Area Network Equipment

2.10 OPTICAL-FIBER PATCH CORDS

.1 Refer to Section 27 41 05 Fibre Communications

.2 Refer to Section 27 41 01 Local Area Network Equipment

PART 3 EXECUTION

.1 Installation of cabling, terminations, and hardware shall be conducted in compliance with the best practices identified in the BICSI Telecommunications Distribution Methods Manual (TDMM).

.2 All cabling runs must maintain minimum separation from sources of EMI interference including line voltage, high voltage, ballast/switching power supplies, and transformers. Cables found to be in conflict with sources of EMI will be required to be re-routed at no cost to the Departmental Representative.

.3 Cables must be installed as per manufacturer's recommendations, pull strength must not exceed the maximum allowable strength.

.4 Cables found to have been superficially damaged (kinked or torn jackets, etc.) will be required to be replaced at no cost to the Departmental Representative even if the link test meets minimum standards.

.5 Cable dressing and bundeling shall be made using Velcro straps. Use of zip ties or other non-approved restraints shall not be allowed. Any installed non-standard cable bundling products shall be removed, the cables inspected for damage, and if necessary replaced.

.6 Prior to installing cables, contractor must review raceway for the run and allow to provide drop outs, supporting waterfalls, grommets, and any other reasonable miscellaneous cable restraints/support hardware as needed.

.7 Cable support products such as jhooks and other supports shall be manufactured specifically for the purpose of supporting communications cable. Site fabricated frames or other supports shall be allowed only as noted in writing.

.8 Maximum cable lengths are not to exceed 90 meters for CAT cable (including patch cords in communication room and at equipment end). Fiber lengths are not to exceed those recommended by the manufacturer. Contractor must plan installation routing and alert the Departmental Representative if any links are found to exceed or be within 3 meters of maximum distance. Planning must take place prior to starting rough-in or preparatory cutting/coring work. No extras will be allowed for revision of raceway or preparatory cutting/coring installation that was not coordinated before installation began.

3.2 INSTALLATION OF TERMINATION AND CROSS-CONNECT HARDWARE

.1 Install termination and cross-connect hardware in rack as indicated and according to manufacturers' instructions. Identify and label as indicated to: TIA-606-C.

.2 Consolidation points shall not be used unless explicitly indicated; all cabling shall be typically home run. If indicated, install consolidation points, as indicated according to manufacturer's instructions. Identify and label as indicated to: TIA -606-C.

3.3 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install horizontal cables as indicated in conduits or cable trays from telecommunication rooms to consolidation point and to individual work-area jacks. Identify and label as indicated to: TIA -606-C.

.1 J hooks: not permitted

.2 Terminate horizontal cables in telecommunications room, consolidation points, and individual work-area jacks.

.1 Identify and label as indicated to: TIA -606-C.

.3 Coil spare cables and store in ceiling space in zone.

.4 Harness slack cable in cabinets, racks, and wall-mounted termination and cross-connection hardware.

3.4 INSTALLATION OF BACKBONE CABLES

.1 Install backbone cables from each telecommunications room to main terminal/equipment rooms (MT/ER) as indicated and according to manufacturers' instructions.

.1 Identify and label as indicated to: TIA -606-C.

3.5 INSTALLATION OF EQUIPMENT CABLES

.1 Install equipment cables from equipment patch panel as indicated.

.1 Identify and label as indicated to: TIA -606-C.

3.6 IMPLEMENT CROSS-CONNECTIONS

.1 Implement cross-connections using patch cords as specified.

3.7 LABELLING STANDARDS

.1 Contractor shall label network equipment and data drops using the site-specific labelling standard. Contractor shall confirm standard with Departmental Representative prior to commencing construction.

3.8 FIELD QUALITY CONTROL

.1 Test horizontal UTP cables as specified below and correct deficiencies provide complete record of results as electronic record on USB memory stick.

.1 Perform tests 100% of cross-connected data horizontal cabling to:

.1 Category 5e using certified level IIe tester to: TIA -568-D.

.2 Category 6 using certified level III tester to: TIA -568-D .

.2 Tests for CAT 6 cables shall include: wiremap, propagation delay, delay skew, length, insertion loss, return loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, ACR, and PSACR.

.1 Provide report summary identifying links with pass, fail, conditional pass, and conditional fail.

.2 Failing or conditionally failing links must be corrected and re-tested at the Contractor’s expense.

.3 Conditional Pass links must be highlighted and will, at the discretion of Departmental Representative, be required to be corrected and re-tested at the Contractor’s expense.

.2 Test backbone UTP cables as specified below and correct deficiencies: provide record of results as electronic record on USB memory stick.

.1 Perform tests for Permanent Link on 4-pair cables:

.1 Category 5e using certified level IIe tester to: TIA -568-D.

.2 Category 6 using certified level III tester to: TIA -568-D .

.2 Perform Wire Map tests on multi-pair UTP cables to: TIA -568-D.

.3 Test Optical-fiber strands for attenuation to: TIA -568.3-D and correct deficiencies: provide record of results as electronic record on USB memory stick. Refer to Section 27 41 05 Fibre Communications for additional requirements.

.1 Test horizontal links need at only one wavelength (850 nm or 1300 nm) and in one direction.

.1 Attenuation to be less than 2.0 dB, unless consolidation point is used.

.2 If consolidation point is used, attenuation test result to be less than 2.75 dB when testing between horizontal cross-connect and telecommunications outlet/connector.

.2 Test backbone links in [one] [both] direction[s]. Backbone links:

.1 Test multi-mode fiber at both applicable wavelengths (850 nm and 1300 nm).

.2 Test single-mode fiber at both applicable wavelengths (1550 nm and 1310 m).

.3 Maximum attenuation: Cable attenuation + Connector loss + Splice loss.

.1 Multi-mode-fiber attenuation coefficients:

.1 3.5 db/km @ 850 nm; and

.2 1.5 db km @ 1300 nm

.2 Single-mode fiber attenuation coefficients at both 1310 nm and 1550 nm:

.1 1.0 db/km for inside plant cable; and

.2 0.5 db/km for outside plant cables.

.3 Maximum connector insertion loss: 0.75 db per pair and maximum splice insertion loss: 0.3 db.

.4 Perform additional Tier 2 tests using optical time domain reflectometer (OTDR) on fiber pairs to: TSB-140.

.1 Correct deficiencies.

.2 Provide record of results as described in SUBMITTALS.

.5 Provide record of results as electronic record on USB memory stickto: TIA/TSB-140.

END OF SECTION

.1 GENERAL

1.1 SECTION INCLUDES

.1 Network products.

.2 Network configuration.

.3 Network testing

1.2 RELATED REQUIREMENTS

.1 Section 01 11 00 – General Requirements.

.2 Section 01 91 13 – General Commissioning.

.3 Section 26 05 00 – Common Work Results Electrical.

.4 Section 28 13 00 – Access Control

.5 Section 28 23 00 – Video Surveillance Equipment

1.3 REFERENCES

.1 Current Canadian Electrical Code.

.2 Network Equipment Building Systems (NEBS) GR-63-CORE.

.3 National Electrical Manufacturers Association (NEMA) Type 1.

.4 International Electrotechnical Commission (IEC) IP-20.

.5 Telecommunications Industry Association (TIA)

.1 TIA-568.0-D, Commercial Building Telecommunications Cabling General Requirements.

.2 TIA-568-C.2, Commercial Building Balanced Twisted-Pair Telecommunications Cabling and Components.

.3 TIA -568.3-D, Optical Fiber Cabling Components Standard.

.4 TIA -606-C, Administration Standards for Telecommunications Infrastructure.

.5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.

.6 TIA-598-D, Optical Fiber Cable Color Coding.

1.4 SCOPE OF WORK

.4 Supply, install, configure, commission, and test Transmission Control Protocol/Internet Protocol (TCP/IP) Local Area Network (LAN) hardware to support complete operation and functionality of all integrated security system components, including hardware and software as indicated on the drawings.

.1 Components including but not limited to:

.1 Panasonic CCTV Cameras (Prepurchased by Departmental Representative)

.2 Panasonic NVR (Pre-purchased by Departmental Representative)

.3 Network equipment

.4 Kantech Card access systems

.5 Audio only and audio/visual TCP/IP intercom devices.

.2 Supply and install a sufficient quantity of the following equipment to support the equipment indicated in the drawing and other specifications.

.1 SFP Transceiver Modules

.2 Network Modules

.3 Fibre Optic Patch Cables

.4 CAT6A Patch Cables

.3 Supply and install all required communications and power cabling and conduit.

.4 Supply and install all required device mounting hardware.

.5 Supply and install cable management equipment, including trays, straps, ties, and hooks.

.6 Testing and commissioning of the new Security TCP/IP network at the facility.

.7 Coordinate installation with Shared Services Canada for tie-in points to existing Shared Services network, and for use of spare Shared Services fibres.

.2 Fully document all testing and commissioning tasks. The completed testing reports shall be submitted for review and approval prior to proceeding with the Final Inspection as outlined in Section 01 91 13 – General Commissioning and 26 05 10 Testing and Commissioning.

.3 As part of the Maintenance Manual provide Network “Shut-down and Restart Procedures” manual, IP address list, network equipment credentials list, and product manuals.

1.5 LOCAL AREA NETWORK

.1 Refer to the Block Diagrams and Equipment Rack Elevations on the Drawings for details of the proposed network.

.2 Specific IP addresses shall be provided for the Contractor by the Departmental Representative. Device installation and configuration shall be in accordance with the provided IP addresses.

1.6 COORDINATION

.1 Coordinate work to minimize downtime of any of the Facility’s systems. Coordinate all interruptions with the Facility staff through the Departmental Representative.

1.7 WORK RESTRICTIONS

.1 If any Contractor-provided laptop or computers are to be connected to any Department of Fisheries and Oceans equipment, perform antivirus and malware scans (in the presence of Departmental Representative) on Contractor-provided laptop to confirm that laptop is safe prior to connecting to facility equipment.

.2 If required, external USB storage device shall be in unopened, factory-sealed condition prior to being connected to system.

1.8 SPARE EQUIPMENT

.1 Not Required.

PART 2 PRODUCTS

2.1 CORE NETWORK SWITCHES

.1 Core network switches shall:

.1 Be layer-3
.2 Be managed
.3 Be equipped with Enhanced Multilayer Software Image (EMI) offering IPServices
.4 Be rack-mountable
.5 Support Network Teaming
.6 Offer 24 x 1000BASE-T UPOE Gigabit Ethernet ports
.7 Offer 1 Network Module providing 4 x Gigabit SFP ports
.8 Have dual 1100 W power supplies

.2 Standard of Acceptance: Cisco Catalyst WS-C3850-24U Switch with dual 1100 W power supplies.

2.2 DISTRIBUTION NETWORK SWITCHES

.1 Distribution network switches shall:

.1 Support layer 3 and layer 2
.2 Be managed
.3 Be equipped with Standard Multilayer Software Image (SMI) offering LANBase
.4 Be rack-mountable
.5 Support Network Teaming
.6 Offer 24 x 1 1000BASE-T POE+ Gigabit Ethernet ports
.7 Offer 1 Network Module providing 4 x Gigabit SFP Ports
.8 Have dual 715 W power supplies

.2 Standard of Acceptance: Cisco Catalyst WS-C3850-24P Switch with dual 715 W power supplies.

2.3 INDUSTRIAL ACCESS NETWORK SWITCHES

.1 Industrial access network switches shall:

.1 Support layer 3 and layer 2
.2 Be managed
.3 Be equipped with LANBase software image
.4 Be DIN rail-mountable
.5 Support Network Teaming
.6 Offer 8 x 10/100/1000 PoE+ Ethernet ports
.7 Offer 2 x 1 Gigabit SFP ports
.8 Have one 170 W power supply

.2 Standard of Acceptance: Cisco IE-3300-8P2S-E Switch with Cisco PWR-IE-170W-PC-AC power supply.

2.4 NETWORK MODULES

.1 Network modules shall:

.1 Provide 4 x Gigabit SFP Ports

.2 Standard of Acceptance: Cisco C3850-NM-4-1G Network Module, or approved alternate.

2.5 FIBRE SFP TRANSCEIVER MODULES

.1 SFP modules shall use LC-type connectors.

.2 Standard of Acceptance: Cisco GLC-LX-SM-RGD SFP Transceiver, or approved alternate.

2.6 CAT6 ETHERNET PATCH PANEL

.1 Standard of Acceptance: PANDUIT DP246X88TGY or PANDUIT DP486X88TGY CAT6A Patch Panel Kit. Quantity of ports as indicated on Drawings.

2.7 CABLE MANAGER

.1 Standard of Acceptance: PANDUIT PatchLink Horizontal Cable Manager.

2.8 FIBRE OPTIC PATCH CORDS

.1 Cable construction shall be indoor/riser rated, using tight buffered construction.

.2 Standard of Acceptance: Corning Fiber Optic Patch Cord.

2.9 CAT6 PATCH CORDS

.1 CAT6 Patch Cords shall be:

.1 Shielded, CMR-rated, TIA-568D/T569D, blue colour, length to suit.

.2 Standard of Acceptance: Belden CAT6 Patch Cords, Part Number CA21106XXX, where XXX denotes length in feet, or approved alternate.

PART 3 EXECUTION

1.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and datasheet.

3.2 LABELLING STANDARDS

.1 Contractor shall label network equipment and data drops using the site-specific labelling standard. Contractor shall confirm standard with Departmental Representative prior to commencing construction.

3.3 NETWORK EQUIPMENT POWER

.1 All network-related equipment shall be connected to generator-backed electrical circuits via UPS or battery backup where possible.

3.4 NAMING AND ADDRESSING

.1 IP and subnet schema and IP addresses for each device will be provided by the Departmental Representative for the Contractor prior to installation.

3.5 INSTALLATION

.1 Supply and install the network switches, mounting hardware, patch panels, patch cables, and brackets in accordance with manufacturer's written installation instructions and the Drawings.

.1 Supply and install network modules and SFP Transceivers as required in each new network switch.

.2 Install components securely, properly aligned and in locations shown on the Drawings.

3.6 SWITCH CONFIGURATION

.1 All new network switches shall be configured by a Cisco-certified technician.

.1 Contractor shall provide proof of certification to Departmental Representative prior to commencing configuration of network switches.

.2 Network topology shall consist of, but not be limited to, the following:

.1 IP Multicasting and multicast routing shall be configured and enabled on all new network switches.

.2 Kantech access control equipment shall tie-in to the existing Shared Services Canada network. Coordinate with Shared Services Canada for network configuration requirements.

.3 Quality of Service (QoS) shall be enabled on all new network switches to prioritize storage, database, and management traffic.

.3 IP addresses, subnet masks, and default gateway assignments for all IP devices shall be provided to the Contractor by the Departmental Representative.

.4 On all new network switches:

.1 Configure network switches using IP schema as directed by the Departmental Representative.

.2 Secure switch administrative access account with non-default password.

.3 Provide new switch hostname as per the Drawings.

.4 Use dedicated VLAN ID for all trunk ports.

.5 Disable all unused ports and put them in an unused VLAN.

.6 Do not use VLAN 1 for any active ports.

.7 Configure all user-facing ports as non-trunking (DTP off).

.8 Explicitly configure trunking on core and distribution switch ports.

.9 Use all tagged mode for the native VLAN on trunks and drop untagged frames.

.10 Set the default port status to "disable".

.11 Enable inter-VLAN routing and communication between new subsystem networks and existing network, as required.

.12 Configure Quality of Service (QoS) to prioritize storage, database, and management traffic.

.13 Enable multicast streaming and IGMP snooping.

3.7 INTEGRATION WITH EXISTING NETWORK

.1 Kantech access control equipment shall tie-in to the existing Shared Services Canada network. Coordinate with Shared Services Canada for network configuration requirements.

3.8 TESTING AND COMMISSIONING

.1 Refer to Section 01 91 13 – General Commissioning for full testing and commissioning procedures. Testing procedures below are specific to equipment of this Section and shall be incorporated into the overall testing and commissioning plan outlined in Section 01 91 13 – General Commissioning, and additional commissioning requirements as outlined in the following sections:

.1 Section 28 13 00 – Access Control,

.2 Section 28 23 00 – Video Surveillance Equipment,

.3 Section 28 10 00 – Integrated Electronic Security.

.1 Phase I – Individual Component Testing:

.1 Visual verification: Objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:

.1 Device and cabling identification.

.2 Phase II – Data Link Testing:

.1 Confirm link lights are indicating connectivity for all connected equipment.

.2 Test latency to all devices using pings.

.3 Export port status for each switch showing negotiated duplex, speed, and status of each switch port. Provide document to Departmental Representative for review. Make corrections in switch configurations as required and as directed by the Departmental Representative.

1.2 NETWORK CONFIGURATION REVIEW

.1 Provide Departmental Representative with running configuration of all network switches, via the following for review.

.1 On each switch:

.1 Execute “show running-config”.

.2 Copy output of command into a text file. Name the text file using the following convention:

.1 YYYYMMDD_IOS_RunningConfig_<*SwitchName*>

.2 Supply text files to Departmental Representative via secure USB or secure download link for comment. Allow for five (5) days for Departmental Representative review.

.3 Implement Departmental Representative comments.

3.9 NETWORK CONFIGURATION BACKUP

.1 After successful completion of UAT and hand-over of system to Departmental Representative, perform full backup of switch configuration for all Security System network switches. Backed-up configuration files shall reflect the as-built state of each switch's configuration and shall be completed as follows:

.1 Deploy and configure on Trivial File Transfer Protocol (TFTP) server on the Security Client Workstation.

.2 For each network switch, perform backup of switch configuration as per the following recommended procedure:

.1 Login to network switch using Telnet or terminal emulation software such as HyperTerminal.

.2 At the Switch> prompt, issue the **enable** command, and provide the required Departmental Representative-provided password when prompted.

.3 The prompt changes to Switch#, which indicates that the switch is now in privileged mode.

.4 Issue the following command:

.1 copy running-config tftp://<*IP address of TFTP server*>/YYYYMMDD_IOS_RunningConfig_<*SwitchName*>

.5 Once confirmation of configuration copy completion is received, save the file in a "Network Backup" folder on the Security Workstation using the following naming convention: "YYYYMMDD_IOS_RunningConfig_SwitchName", where "SwitchName" is the name of the switch that was backed up.

.6 Issue the following command:

.1 copy flash:/vlan.dat tftp://<*IP address of TFTP server*>/YYYYMMDD_IOS_VlanDat_<*SwitchName*>

.7 Once confirmation of configuration copy completion is received, save the file in a "Network Backup" folder on the Security Workstation using the following naming convention: storage device as "YYYYMMDD_IOS_VlanDat_SwitchName", where "SwitchName" is the name of the switch that was backed up.

.8 Log out of the network switch.

.3 Once all network switches' configurations have been backed up to the Security Workstation, copy backup files onto a USB storage device.

.2 Turn over USB storage device containing all backup files to Departmental Representative.

.3 Due to the modifications of the existing network, perform full backup of switch configuration for all existing network switches. Backed-up configuration files shall reflect the as-built state of each switch's configuration and shall be completed following the directions above.

3.10 WARRANTY

.1 Refer to Section 01 17 00 – Closeout Procedures and Section 01 78 00 – Closeout Submittals for warranty information.

.2 Manufacturer warranties of all equipment shall be placed in the name of the Owner. Refer to Division 1.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 This section includes the technical requirements for the fibre optic communication system including:

.1 Supply, installation and testing of fibre optic cable.

.2 Supply and installation of patch panels complete with splice tray.

.3 Supply and installation of connectors.

.4 Supply and installation of splice closure.

.5 Supply and installation of patch cords.

.6 Supply and installation of pre-terminated fibre pigtail assembly.

.2 This section of the Specifications forms part of the Contract documents and is to be read, interpreted and coordinated with all other parts.

1.2 REFERENCE STANDARDS

.1 Except where specifically modified within this specification, the installation shall, as minimum, comply with the latest issues of the following standards.

.2 Canadian Standards Association (CSA International).

.1 CAN/CSA-C22.2 No.232-09 (R2014), “Optical Fibre Cables”.

.2 TIA/EIA 568-C

.3 TIA/EIA 569-C

.4 TIA FOTP 8/59/60/61/78

1.3 RELATED SECTIONS

.1 Section 26 05 00 – Electrical General Requirements

.2 Section 27 41 01 - Local Area Network Equipment

1.4 COORDINATION

.1 Contractor shall coordinate with Shared Services Canada for connection of fibre to existing Shared Services network and for use of existing spare fibres in Shared Services multi-fibre cables.

PART 2 PRODUCTS

2.1 FIBRE CABLE

.1 All optical fibre cables shall be single-mode, non-armoured, underground-rated, FT4-rated, no factory splices, all dielectric construction, 8.3/125 micron (core/clad), suitable for outdoor use in conduit or indoor use (where required) non-gel filled, single loose buffer tube design and shall be CSA approved, with optical fibre strand numbers as shown on the Drawings. Maximum attenuation of the cable shall be 0.4 dB/km, measured at room temperature at 1310nm.

.1 All fibre installed in raceways and conduits shall be non-armoured unless noted otherwise.

.2 The number of optical fibre strands shall be as noted on Drawings.

.3 Standard of Acceptance: Corning ALTOS Loose Tube, Gel-Free, Single-Mode.

.2 Testing shall be done in each direction on each fibre and at 1310nm and 1550nm wavelengths. Launch cable shall be used as per the OTDR manufacturer's specifications.

.3 All optical fibre cables installed for the extension or re-routing of existing fibre cables shall match the existing cable specifications.

.4 Colour Coding and Markings

.1 Optical fibres shall be distinguishable from others in the same cable by means of colour coding as defined in EIA-598 "Color coding of fibre optic cables".

.2 The colour formulation shall be compatible with the fibre coating and be heat stable. It shall not fade, smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibres and shall not cause fibres to stick together.

.3 Cable jackets shall be marked with "Manufacturer's Name," sequential meter markings, year of manufacture and a telecommunication handset symbol, as required by CSA. The actual length of the cable shall be within -0/+1% of the length markings. The markings shall be in contrasting colour to the cable jacket. The height of the markings shall be approximately 2.5 mm.

2.2 FIBRE FAN-OUT KITS

.1 Fibre fan out kits shall comply with the following requirements:

.1 Corning SFK-P-12-250-S including tool kit and consumables or approved alternate.

.2 Provide detailed product information to Departmental Representative for approval prior to order.

2.3 FIBRE PATCH PANELS

.1 Rack-Mounted Closet Connector Housing:

.1 Standard of Acceptance: Corning Closet Connector Housing (CCH), 1 rack units, holds 2 CCH connector panels, Part Number CCH-01U.

.2 Wall-Mounted Single Panel Housing:

.1 Standard of Acceptance: Corning Single Panel Housing (SPH-01P), wall-mountable, holds 1 CCH connector panel, Part Number SPH-01P.

.3 DIN Rail Mounted Single Panel Housing:

.1 Standard of Acceptance: Corning Single Panel Housing (SPH-01P-DIN), wall-mountable, holds 1 CCH connector panel, Part Number SPH-01P-DIN.

.4 Fibre Panels:

.1 Terminate fibre cables by fusion splicing to a pre-terminated pig-tail panel.

.2 Standard of Acceptance: Corning Closet Connector Housing Panel (CCH-CP), pigtailed, LC Connectors, 12F, single-mode: CCH-CP12-A9-P03RH.

.5 CCH Splicing Cassettes:

.1 Standard of Acceptance: CCH Cassette, Splicing, empty, for 1 CCH panel, Part Number CCH-CS.

.6 Provide patch panels complete with cable strain-relief brackets.

.7 Provide detailed product information to Departmental Representative for approval prior to order.

2.4 CONNECTORS

.1 Simplex Singlemode LC or approved alternative.

.2 Provide detailed product information to Departmental Representative for approval prior to order.

2.5 PATCH CORDS

.1 Single-mode patch cords shall be constructed with fibre which meets the specification above for fibre optic cable with the following exceptions:

.1 Cable construction shall be indoor/riser rated, using tight buffered construction.

.2 Provide patch cord types as noted on the Drawings or, if not noted, to match that of the equipment being connected to the system. Length to suite installation.

2.6 PRE-TERMINATED FIBRE PIGTAIL

.1 Lucent or approved alternate.

PART 3 EXECUTION

3.1 QUALIFICATIONS AND INSTALLATION

.1 Installation of fiber optic system must be completed by a Corning Cable Systems LANscape NPI Certified Contractor.

.2 The Contractor shall supply and install all fibre optic cable, including the supply and installation of terminations and OTDR testing.

.3 All workmanship, material and/or installation practices and activity shall be equal to or better than the most recent version of the applicable standards established by the CSA and the Canadian Electrical Code.

.4 The Contractor's technician shall have a minimum of two (2) years of experience installing and testing single-mode cables of all types.

.5 Fibre optic cable shall be installed in a continuous run in conduit and shall be spliced as noted on the Drawings. The fibre optic cable shall consist of 30m loops in each vault.

.6 When installing cable in conduits, concrete vaults, and junction boxes, the Contractor shall ensure the conduit does not exceed the minimum bend radius. Each cable shall be labelled within 10 centimeters of the terminated ends with a tag and text stating the fibre optic cable identifier and destination name. Cables shall be tagged every 5 m in the concrete vaults, junction boxes and all other access points with the fibre optic cable identifier and with "CAUTION, FIBRE OPTIC CABLE" tags.

.7 Enough cable slack shall be left at termination points to allow the cable to be routed through the termination hardware to a polishing/splicing table, plus a minimum of 3 m additional slack. Cable slack shall be coiled and secured with hook and pile fastener (e.g. Velcro™) ties for breakaway protection. Cable to termination panel shall be secured to cabinet with wire ties (e.g. Ty-wraps).

.8 Excess cable inside concrete vaults and junction boxes shall be coiled and mechanically secured in place with hook and pile fastener (e.g. Velcro™) ties such that the minimum bend radius is not exceeded and the cable is suspended above the concrete vault or

junction box bottom. The hook and pile fastener straps are to provide “breakaway” protection in the event of an accidental dig up between pull boxes.

.9 All patch panels and patch cables shall be neatly organized and clearly labeled.

3.2 MAINTAINING EXISTING EQUIPMENT AND PHASING

.1 The Contractor shall ensure that existing electrical equipment is not affected by the project to the satisfaction of Departmental Representative.

3.3 FIBRE TESTING

.1 Before and after installation, each segment of each fibre shall be tested using an Optical Time Domain Reflectometer (OTDR) and power meter equipment. Testing shall be completed in each direction on each fibre and at 1310 nm and 1550 nm wavelengths. Launch cable shall be used as per the OTDR manufacturer’s specifications. The Contractor shall provide a typewritten report and digital test files detailing the results of each test, including OTDR test results in graphical format, cable length, any fibre breaks or anomalies, attenuation of the fibre’s connectors, and fibre uniformity, complete with a concise summary of the results.

.2 The Contractor shall provide on-reel testing prior to cable installation. In the “Comments” section of the OTDR software the contractor shall include: loss per km, helix factor, and length of cable. These form part of the cable specifications and usually attached to the reel. OTDR pulse width and acquisition time shall be adjusted until a clean trace is obtained. A clean trace is where the end of the fibre is significantly above the noise level. A 1.5 km launch box shall be used at the test point of the fibre. All anomalies shall be noted and included in the report. All test results shall be recorded onto a CD and submitted.

.3 The Contractor shall provide splice testing during fibre splicing. Loose tube, maximum loss of splice shall be less than 0.3 dB. OTDR wavelength shall be 1550 nm. Pulse width and acquisition time shall be adjusted so that the splice can be seen even though the splice is within specification. All anomalies shall be noted and reported to Departmental Representative.

.4 The Contractor shall provide Final Acceptance Testing. Final Acceptance Testing shall consist of light source/power meter testing, and OTDR bi-directional testing following TIA FOTP8/59/60/61/78 test standard procedure.

.5 End to end testing shall consist of testing of the new fibre installed as part of this Contract.

.6 Final testing of the fibre cables connected to existing fibre between the Administration building and the Marine Traffic Control Centre shall be performed from end-to-end of the full length of the run, including existing fibre.

.7 Light source/power meter testing shall be provided in either MS Excel or MS Word format and include: dates of tests, contractor, names of technicians, addresses of test locations, cable manufacturer, loose tube or ribbon, number of fibres, test instrument manufacturer and model numbers with last calibration date (equipment shall be calibrated within the last 12 months), length of launch reel (1500 m) or pigtails if used, and wavelengths. Light source/power meter testing shall be completed first to ensure that no fibres have been crossed. Wavelengths shall be 1310 nm and 1550 nm.

.8 OTDR bi-directional testing shall be provided. The fibre shall be tested from each end with the same OTDR parameters. OTDR wavelength shall be 1310 nm and 1550 nm. Pulse width and acquisition time shall be adjusted so that the end of the fibre is clearly seen. A 1.5 km fibre launch box shall be used at the test point of the fibre. Any anomalies

shall be noted and reported to Departmental Representative. All OTDR test results shall be either in “EXFO” trace format or a format acceptable by Departmental Representative. All test results shall be recorded onto a CD and submitted.

.9 The Contractor shall document the following in the “Comments” section of the OTDR software: number of fibres in the cable, loose tube or ribbon, length of launch reel if one is being used, test location (street address), last calibration dates. All attenuation measurements shall be carried out using approved industry standard test equipment and materials. All measuring equipment shall be in good working condition and accompanied by current calibration certificates.

.10 Any section of cable found to be defective or below specified thresholds shall be replaced and retested at the contractors cost.

.11 Prior to acceptance by the Departmental Representative, the contractor shall prepare a summary spreadsheet.

.1 Summary sheet shall include rows for each fibre tested, in both directions.

.2 Columns shall include the following:

.1 Origin

.2 Destination

.3 Wavelength

.4 Total length

.5 Quantity of splices

.6 Quantity of connectors

.7 OTDR results (actual loss)

.3 Calculation columns shall be prepared as follows:

.1 Allowable loss:

.1 Calculated by multiply the quantity of splices and connectors by the maximum allowable loss for splicing and connections, then adding the total distance multiplied by the allowable loss per kilometer.

.2 Headroom:

.1 Calculated by subtracting the actual loss from the allowable loss. A positive result indicates a fibre passing the requirements. A negative number indicates a fibre failing the minimum requirements.

3.4 TERMINATION

.1 Splices are not permitted.

.2 Terminate all fibres using fan out kits and terminate with LC connectors for LAN Equipment. Provide conversion patch cords as required to adapt to existing equipment. The finish for the connectors shall comply with TIA/EIA-568-C. Maximum loss per connector is 0.3 db.

3.5 PATCH CORDS

.1 Provide 3 m long patch cords with connectors compatible with equipment.

3.6 LABELLING

.1 Label all fibre conductors as shown on the Drawings. Label all fibres inside splice closures, patch panels, patch cords as shown on the Drawings using Grafoplast or Brady labeling system.

.2 Label all fibre cables with the segment number as shown on the fibre riser diagram. Label fibre cable using black anodized aluminum engraved nameplate with 25 mm high characters. The engraved characters shall be painted with white enamel paint. Attach the labels to the cable using black UV compatible cable ties.

.3 Label all patch cords.

.4 Label the lids of all junction boxes with a lamicoid nameplate with 50mm high lettering indicating: “DFO SECURITY FIBRE”.

3.7 PHOTO DOCUMENTATION

.1 Prior to closing splice enclosures and patch panels, photographs shall be taken of each splice tray and provided to the Departmental Representative for review.

.2 Any splice trays deemed to be unorganized shall be modified by the Contractor and secondary photographs shall be taken and provided to the Departmental Representative.

.3 Photographs of each junction box and vault shall be provided to the Departmental Representative. Photographs to clearly demonstrate cable labeling within the junction box or vault.

3.8 WARRANTY

.1 Refer to Section 26 05 00 – Common Work Results – Electrical for warranty information.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Command and Control System (C2) products.

.2 C2 installation and configuration.

.3 C2 testing.

.4 Factory Acceptance Testing.

1.2 RELATED REQUIREMENTS

.1 Section 28 13 00 – Access Control

.2 Section 28 23 00 – Video Surveillance

.3 Section 28 24 04 – Intercoms

1.3 REFERENCES

.1 Current Canadian Electrical Code.

1.4 SCOPE OF WORK

.1 The proposed C2 shall comprise the head end system for the facility's proposed video surveillance, and intercom systems and communicate with the various sub-systems on a stand-alone dedicated security network.

.2 Proposed card access shall be integrated with the facility's existing card access systems attached to the Shared Services Canada DFO network. Additional integration between the new C2 systems and access controllers with be achieved via hard-wired connections, not at the network level.

.3 Supply, install, configure, commission, and test C2, including hardware, software, and supporting electrical and communications infrastructure. In addition, C2 System Training and must be carried out.

.1 C2 Hardware includes, but is not limited to, the following:

.1 CCTV viewing Client workstations and peripherals, displays, KVM switches, KVM monitors with peripherals, adapters, network equipment, cable management, power and communications cabling and conduit, device mounting hardware and terminations.

.2 Testing and commissioning of the new C2 hardware at the facility.

.2 C2 Software includes, but is not limited to the following:

.1 C2 Panasonic software pre-purchased by the Owner, with all required licenses to support all system devices.

.1 Contractor shall notify Departmental Representative if any additional licensing not pre-purchased by the Owner is required to achieve a complete and fully functioning system that meets the intent of this design.

.2 Configuration of software required to provide a fully functioning C2 suite at the facility.

.3 Testing and commissioning of the new C2 software at the facility.

.4 The C2 Software shall be deployed using server-client architecture. Therefore, the C2 Software shall collectively refer to both the C2 Server Software and C2 Client Software packages.

.3 C2 and Network training shall be performed as outlined in Section 01 79 00 – Demonstration and Training.

.4 Perform Factory Acceptance Tests (FATs) for all required C2 components as outlined in Part 3, to ensure the proper operation and specifications-compliance of all components prior to installation.

.5 Fully document all testing and commissioning tasks. The completed test plans shall be submitted for review and approval prior to proceeding with the User Acceptance Test (UAT).

.6 Perform the UAT over a thirty (30) calendar day period. The C2 shall run for the full thirty (30) day duration of the test without incident before it is considered to be accepted by the Client.

1.5 SPARE EQUIPMENT

.1 Not Required.

PART 2 PRODUCTS

2.1 TOWER CLIENT WORKSTATIONS

.1 Provide three (3) Tower Client Workstations complete with all peripheral equipment required for a complete and functioning system, including but not limited to monitors, keyboards, mice, and KVM extenders.

.1 One workstation shall be installed at the Administration Building Commissionaire's Desk.

.2 Two workstations shall be installed at the new gate house building. Coordinate exact locations with gate house design.

.2 A Tower Client Workstation shall consist of, but not be limited to, the following:

.1 Chassis: Desktop tower

.2 Processor: Minimum of Intel Core i7 7700K, or approved alternate.

.3 Chipset: Intel C600 or above

.4 Memory: 16 GB DDR4

.5 Storage: 256 GB solid-state drive, 1 TB hard-disk drive

.6 Video Outputs: 4 active (DisplayPort or DVI)

.7 GPU: Nvidia Geforce GTX1080, or approved alternate

.8 Optical Drive: 8X DVD-ROM drive.

.9 Network: 2 x 1 GbE RJ-45 ports (1000Base-T)

.10 Operating System: Windows 10 Professional, 64-bit

.11 Warranty: 5-Year Warranty

.3 Standard of acceptance: Dell Precision 7820 Tower Workstation, or approved alternate.

2.2 24" WIDE SCREEN LCD DISPLAYS

.1 Provide two displays for each workstation.

.2 A 24" display shall:

.1 Be widescreen (16:10) flat panel LCD monitors.

.2 Have a native resolution of 1920 x 1200 pixels (2.3 MP) and support a 24-bit colour depth.

.3 Be black or grey in colour.

.4 Have matte screens or have an anti-glare surface treatment to minimize glare.

.5 Feature a DVI-D video interface and DisplayPort interface.

.3 Standard of Acceptance: Dell 24 UltraSharp Monitor U2412M, or approved alternate.

2.3 TOWER CLIENT WORKSTATION INTERNAL POWER SUPPLY UNITS

.1 Supply a common internal power supply unit model to support the tower C2 client workstation.

.2 Power supply shall be supplied with the following minimum features:

.1 Power rated to support maximum expected workstation requirements.

.2 Minimum 80 PLUS certification

2.4 WORKSTATION KEYBOARDS

.1 The Workstations Keyboards shall:

.1 Be Windows-based.

.2 Feature a standard QWERTY, US keyboard layout.

.3 Feature a USB Connection.

2.5 WORKSTATION MICE

.1 Workstation Mice shall:

.1 Be optical or laser-based.

.2 Feature two buttons and a scroll wheel.

.3 Feature a USB Connection.

2.6 C2 SOFTWARE

.1 C2 Software and licensing has been pre-purchased by the Owner. C2 Software shall be installed and configured for all NVR equipment and CCTV viewing workstations, and all required C2 Server Software and associated licenses for operation of the C2.

.1 Install and configure C2 licenses for all new CCTV cameras including both Panasonic cameras and intercom cameras, as well as for four (4) existing Wharf Panasonic cameras.

.2 Install, and configure C2 licenses for the client workstations shown in the drawings.

2.7 KVM SWITCHES

.1 Standard of Acceptance: StarTech SV1631DUSBUK, or approved alternate.

2.8 KVM MONITORS

.1 Standard of Acceptance: StarTech RACKCONS1901, or approved alternate.

2.9 SECURITY NETWORK RACKS

.1 Standard of Acceptance: APC Netshelter or approved alternate.

.2 4-Post

2.10 SECURITY NETWORK RACK PDU

.1 The Server Rack PDU shall:

.1 Have 24 Outlets.

.2 Be rated for 15A at 120/240 VAC.

.3 Have surge protection.

.2 Standard of Acceptance: Middle Atlantic Products PD-2415SC, or approved alternate.

2.11 UPS FOR WORKSTATIONS

.1 Workstation at Administration building shall be fed from UPS distribution panel in Telephone Room.

.2 Provide 2200 kVA UPS for each of two (2) workstations to be installed in the new gate house.

.1 UPS standard of acceptance shall be APC Smart UPS SMT 2200VA LCD 120V complete with network interface card.

PART 3 EXECUTION

3.1 EQUIPMENT POWER

.1 All equipment shall be connected to UPS powered electrical circuits.

3.2 NETWORK

.1 All Network Video Recorders, client workstations, and field devices are to be connected to the new Security Local Area Network (LAN) at the Facility.

3.3 FIELD DEVICES

.1 All existing IP cameras are to be assigned new IP addresses, subnet masks, and gateways as directed by the Departmental Representative, and connected to the new LAN at the Facility.

.2 Refer to Section 28 23 00 – Video Surveillance for details on IP cameras to be integrated into the C2.

3.4 CLIENT WORKSTATIONS, MONITORS, AND MICE

.1 Supply and install all Workstations, Monitors, Keyboards, and Mice as identified in the Drawings.

.2 The C2 Client Software shall be installed and configured on all workstation computers.

.3 Supply and install the appropriate cables and adapters to connect each workstation to their respective Monitors, Mice, Keyboards and KVMs as identified in the Drawings.

3.5 C2 SOFTWARE INSTALLATION AND CONFIGURATION

.1 All C2 software installation and configuration procedures shall be performed by a Panasonic Certified Technician. Certification shall be provided to the Consultant prior to commencing work.

.2 Perform all applicable Windows Updates on servers and workstations prior to installation of C2 software.

.3 Configure C2 Software as follows:

.1 All viewing stations shall be provided with full CCTV system viewing and control functionality.

.2 Each shall:

.1 Be the latest version of the software.

.2 Be named as indicated in the drawings.

.3 Have the following devices added, programed, and configured into the C2 server software:

.1 Workstations

.2 Cameras

.4 Be configured with three levels of User Group permissions as follows:

.1 Basic User Group

.1 The Basic User Group shall only have permissions to view live video.

.2 Supervisor User Group:

.1 The Supervisor User Group shall only have permissions to view live and recorded video.

.3 Administrator User Group:

.1 The Administrator User Group shall have no restrictions and shall have all permissions.

.2 The Administrator User Group shall be able to view live and recorded video and export recorded video.

.5 Be configured with Health Monitoring

.6 Be configured to trigger alarms on the workstations for the following events at minimum:

.1 Storage Hard drive Failure

.2 Field Device Failure

.3 Network Connection Loss

.3 On the servers, download applicable media controls for each camera model by accessing each camera or encoder model's webpage and downloading the active software from the camera.

.4 Configure users within the C2 software as indicated by the Owner. Allow for a minimum of 10 users.

.4 The C2 Client Software installed on each client shall:

.1 Be the latest version of the software.

.2 Be configured with the name as directed by the Consultant.

.3 Be configured to suit each workstation monitor.

.4 Be configured, connected, and authenticated with the appropriate servers.

3.6 NETWORK VIDEO RECORDER CONFIGURATION

.1 Install Owner supplied hard drives into pre-purchased Network Video Recorders.

.2 Configure hard drives in a RAID1 Array

3.7 CAMERA CONFIGURATION

.1 Cameras shall be configured within the C2 software as follows:

.1 Configured on the servers with camera naming, descriptions, and IP addresses as provided by the Consultant.

.2 All cameras shall be configured with the latest firmware, software, and license versions.

.3 Have all cameras configured for both recording and live viewing.

.4 Concurrent recording to both Network Video Recorders.

.5 Have the recording for all cameras including intercom cameras configured as follows:

.1 Continuous recording at 6 fpsat full camera resolution.

.2 Minimum 14 day retention, including deletion of files once hard drive capacity is reached.

.3 Using OnVif_S to record AIPhone IP cameras whenever camera is enabled by intercom request.

3.8 INTERCOM CONFIGURATION

.1 All intercoms and master stations shall be configured with the latest firmware, software, and license versions.

.2 Intercom stations shall be configured to call to both master stations simultaneously and can be answered by either master station.

.3 Associated video for the intercom call shall be displayed on the CCTV workstation as follows:

.1 Interview camera image from the integrated camera within the intercom.

.2 Overview camera image from the adjacent building camera (where available).

3.9 CLIENT WORKSTATION CAMERA VIEWING CONFIGURATION:

.1 Configure system for viewing of cameras as follows:

.1 Live camera playback at 18 frames per second.

.2 Prepare map within Panasonic camera software for viewing locations of all cameras and allowing navigation between cameras.

.3 Configure PTZ cameras with home views as indicated on drawings. Coordinate exact views with Departmental Representative during commissioning.

.4 Coordinate with Departmental Representative to confirm normal camera displays.

.5 Camera playback shall include both intercom cameras and Panasonic PTZ cameras.

.2 Switching:

.1 Provision to switch any camera in system to any monitor in system manually.

.2 Provision to switch system video recorders to selective monitor outputs in system.

.3 Control: provision for any camera equipped with pan, tilt, and/or motorized zoom lens:

.1 Manually control pan, tilt and lens functions.

.2 Set pan and tilt home position.

.3 Set and clear movement limits of pan and tilt mechanism.

.4 Adjust motorized zoom lens.

.4 Enter and edit CCTV programs and save them for future use.

.5 Set dwell time for viewing of any camera picture.

.6 Define sequence for viewing cameras on each monitor.

.7 Bypass cameras in system during sequencing to monitor.

.8 Provide ability to display stored 'video image' of cardholder, and switch real-time camera to card reader location for specific card usage.

.9 Overall control of CCTV provided through software control, which provides complete integration of security components.

3.10 DOOR CONFIGURATION

.1 The following status/alarm points, at a minimum, shall be configured for each Gate:

.1 Gate Open

.2 Gate forced open

.3 Gate held open

.4 AC fail

.5 Battery fail

.6 Enclosure tamper

3.11 FACTORY ACCEPTANCE TESTING

.1 Perform Factory Acceptance Tests (FATs) for all C2 components and network hardware, to ensure the proper operation and specifications-compliance of all components prior to installation at the facility.

.2 Equipment and software pre-purchased by the Owner will be supplied to the Contractor prior to the FAT.

.3 The FAT C2 configuration at Contractor’s facility shall be comprised of the following functional test system:

.1 All Network Video Recorders.

.2 All Workstations and associated displays.

.3 All network switches.

.4 One of each model of new cameras.

.5 One of each model of new intercoms and master stations.

.6 Example integration to one card access door.

.4 Ensure that all components, including servers, client workstations, and network switches are kept in a closed TCP/IP local area network during all phases of the FAT.

.1 Limit Internet access to equipment only to install required and recommended software and firmware upgrades.

.1 When required to install firmware and software updates using an Internet connection, ensure that Internet access to equipment is provided only through a secure connection utilizing hardware and software firewalls.

.2 After the firmware and software updates are complete, install and run Anti-Virus software, if possible, to ensure that the equipment has not been contaminated.

.5 Provide completed FAT check-lists and network switch configuration files to Owner and Consultant prior to the FAT Demonstration.

.1 Provide evidence (as a minimum) of testing of the operation and correct automation of the following features in the Factory Acceptance Testing checklists:

.1 Communication between all C2 servers.

.2 C2 server communication with all workstations.

.3 Populating of live and recorded camera streams in client workstation interface.

.4 Retrieval and exporting of archived video footage.

.5 Graphical map interface.

.6 Receipt of building intrusion alarms from each type of device.

.7 Card access door control.

.8 Intercom call and communication.

.9 Seamless operation following the individual simulated failure of each network switch at separate times.

.10 Alarm logging retrieval and export.

.11 Demonstrate System Health Monitoring for all relevant equipment.

.2 Provide network configuration text files for review using the process outlined in Section 28 24 02 – Local Area Network.

.6 Retest after successful corrective measures have been implemented, any FAT that fails or exhibits a suspicious result. Upon completion of the Factory Acceptance Testing, submit the completed checklists to the Consultant for review and approval of the results.

.1 Provide completed FAT check-lists to Owner and Consultant prior to the FAT Demonstration.

.7 Following successful completion of the FAT check-lists, provide the FAT Demonstration of the system, including all site specific screens and functionality, to the Owner and Consultant.

.1 FAT Demonstration to occur in the Greater Victoria area.

.2 Demonstrate, at minimum, each item outlined in the FAT checklist.

.3 Make changes recommended by the Departmental Representative and re-demonstrate system prior to proceeding with site installation.

.8 Following acceptance of the FAT Demonstration, allow a 30-day burn-in period for all equipment prior to shipment to site.

.1 Replace and retest any equipment which fails the 30-day burn-in period.

.1 In the event the failed equipment was pre-purchased by the Owner, notify Departmental Representative to determine replacement procedures.

.2 Any failure of software or hardware shall result in a restart of the 30-day burn-in period.

.9 Perform virus scans using industry-standard antivirus software on all servers and client workstations prior to shipping equipment to site. Submit scan reports as part of FAT documentation.

3.12 TESTING, COMMISSIONING, AND ACCEPTANCE

.1 The complete system shall be fully tested and commissioned to ensure the proper operation and specifications-compliance of all components.

.2 All testing and commissioning tasks shall be fully documented. The completed test plans shall be submitted for review and approval prior to proceeding with acceptance testing.

.3 Once commissioning and Final Inspection are complete, the complete system shall undergo a thirty (30) calendar day UAT.

.4 During the UAT, the entire system including all field devices will be in full, regular operation.

3.13 WARRANTY AND SUPPORT

.1 The warranty period will only commence after the successful completion of the UAT.

.2 The complete system shall be supplied with manufacturer's warranty on all equipment supplied by the Contractor.

.3 The complete system shall be supplied with a minimum one year warranty on all installation services.

.4 Warranty requirements specified in this section are supplementary to those requirements specified in the Closeout Procedures Section 01 77 00 – Item 1.4.

3.14 DOCUMENTATION AND TRAINING

.1 The system shall be supplied with a system-specific user manual that provides a clear overview of all user screens and functions, as they are configured for the Government House. C2 and Network Training shall be performed as outlined in Section 01 79 00 – Demonstration and Training.

.2 The system shall be supplied with a system-specific administration manual that provides a clear overview of all administration functions (installation, setup, configuration, etc) as they relate to the Government House.

.3 The system shall be supplied with a system-specific maintenance manual that provides a clear overview of the frequency, nature, and documentation process for maintaining the C2, including all hardware.

.4 The system shall be supplied with a system-specific as-built configuration manual that documents all settings for all components.

.5 Provide an administrator training course covering the setup and configuration of the system.

.6 Provide a maintenance training course covering the maintenance and support of all components of the system.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

.2 27 41 01 – Local Area Network Equipment

.3 27 41 05 – Fibre Communications

.4 28 24 04 - Intercoms

.5 27 01 05 – Structured Cabling for Communications Systems

1.2 REFERENCES

.1 Abbreviations:

.1 Electronic Access Control (EAC): control of people through entrances and exits of controlled area. Security utilizing hardware systems and specialized procedures to control and monitor movements within a controlled area.

.2 PIN: Personal Identification Number.

.2 Reference Standards:

.1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S301, Standard for Signal Receiving Centre Burglar Alarm System and Operations

.2 CAN/ULC-S302, Standard for Installation and Classification of Burglar Alarm Systems for Financial and Commercial Premises, Safes and Vaults.

.3 CAN/ULC-S304, Signal Receiving Centre and Premise Burglar Alarm Control Units.

.4 CAN/ULC-S306, Intrusion Detection Units.

.5 CAN/ULC-S310, Installation and Classification of Residential Burglar Alarm Systems.

.6 ULC-S318, Standard for Power Supplies for Burglar Alarm Systems.

.7 ULC-C634, Guide for the Investigation of Connectors and Switches for Use with Burglar Alarm Systems.

.3 Underwriters' Laboratories (UL)

.1 UL 294, Access Control System Units.

.2 UL 603, Power Supplies for Use with Burglar Alarm Systems.

.3 UL 681, Installation and Classification of Burglar and Holdup Alarm Systems.

.4 UL 827, Central-Station Alarm Services.

.5 UL 1076, Safety for Proprietary Burglar Alarm Units and Systems.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

1.5 WARRANTY

.1 In accordance with Island Health requirements.

.2 Manufacturer's Warranty: submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official.

PART 2 PRODUCTS

2.1 ACCESS CONTROL SYSTEM

.1 Existing system is Kantech with IOProx Card Readers.

.2 Access control system to be integrated with the following systems:

.1 Cantilevered gate operators for vehicle gates.

.2 Intercom system for vehicle and pedestrian gates.

.3 Provide external power supplies for long range readers and magnetic gate locks as indicated on drawings.

.1 Where indicated, magnetic gate lock power supply shall be integrated with fire alarm system for

2.2 CARD READERS

.1 Refer to drawings.

.2 P600 IoProx Long Range Reader for vehicular access locations.

.3 Multi-Technology readers for pedestrian gate locations.

2.3 REQUEST TO EXIT DEVICE

.1 Refer to drawings.

2.4 DOOR POSITION SWITCH

.1 Integrated with pedestrian gate magnetic locks

2.5 GATE LOCKS

.1 Magnetic Locks for pedestrian gates.

.2 Magnetic locks complete with integrated position switch.

.3 Power supply with fire alarm integration where indicated on Drawings.

2.6 POWER SUPPLIES FOR LONG RANGE CARD READERS

.1 1.5A per card reader as required by Kantech.

.2 Multiple output power supplies to accommodate four readers.

.3 7AH of integrated battery backup for each card reader.

.4 12VDC, non-switching.

.5 Standard of acceptance: Altronix, FlexPower, or approved equal.

2.7 POWER SUPPLIES MAG LOCKS

.1 24VDC, filtered power supply.

.2 Battery backup for a minimum of 4 hours operation for each lock.

.3 Fire alarm interface for lock release on activation of fire alarm where indicated on Drawings.

.4 Standard of acceptance: Rutherford Controls or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install security access systems and components in accordance with CAN/ULC-S302, CAN/ULC-S310, UL294, and UL 681.

.2 Extend wiring from nearest existing door controllers to new controllers or provide new network connections as indicated on drawings.

.3 Install components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.

.1 Install panels, intrusion detection system and components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.

.2 Install components secure to walls, ceilings or other substrates.

.3 Install required boxes in inconspicuous accessible locations.

.4 Conceal conduit and wiring.

.5 Coordinate with Shared Services Canada for integration of new door controllers into existing network.

3.2 SITE TEST AND INSPECTION

.1 Perform verification inspections and test in presence of Consultant.

.1 Provide all necessary tools, ladders and equipment.

.2 Ensure appropriate subcontractors and manufacturer's representatives are present for verification.

.2 Pretesting procedure:

.1 Verify (utilizing an approved spectrum analyzer and test equipment) that system is fully operational and meets all system performance requirements of this specification.

.2 Measure and record, control (and/or voice) carrier levels of every system channel at each of following points in the system:

.1 Door located actuating devices.

.2 Door control panel functions.

.3 Electronic supervisory control units inputs and outputs.

.4 Distribution system input and output.

.5 Telephone system interface input and output.

.3 Submit to Departmental Representative 2 copies of recorded system pretest measurements, along with pretest certification.

.3 Performance testing:

.1 Test procedure: perform test on a "go-no-go" basis.

.1 Make only operator adjustments required to show proof of performance.

.2 Test to demonstrate and verify that installed system complies with installation and technical requirements of this specification under operating conditions.

.3 Test results to be evaluated by Departmental Representative as either acceptable or unacceptable using following procedures.

.2 Documentation review:

.1 This review will determine if information provided is sufficient to meet requirements of this specification.

.2 Provide for review all System manuals, as installed drawings, pretest form[s], antenna radiation pattern[s], equipment cabinet pictorial[s], antenna pictorial, antenna mount pictorial, video and audio equipment details.

.3 Mechanical inspection:

.1 Departmental Representative and Contractor to tour areas to insure that Systems and Subsystems are installed in place for proof of performance testing.

.2 Take system inventory at this time. Verify following items before beginning proof of performance test[s]:

.1 Electrical power circuits designated for system equipment are properly labeled, wired, phased, protected and grounded.

.2 Conductor ends are protected by heat shrink wrap; audio spade lugs, barrier strips and punch blocks are used.

.3 Dust, debris, solder splatter, etc. are cleaned and removed from site.

.4 Equipment is properly labelled.

.5 Equipment identified in system's equipment list[s] are in-place and properly installed.

.6 Each lightning and System ground method are installed in accordance with manufacturer's instructions and this specification.

.4 Subsystem functional test:

.1 Conduct operational testing after review of documentation and mechanical inspection completed. Proceed as follows.

.1 Perform operational test of each Subsystem to verify that all equipment is properly connected, interfaced and is functionally operational to meet requirements of this specification.

.2 Control units:

.1 Take S/N readings from control unit's input and output in manual (and/or automatic) mode. Check output of DC/Data converter for S/N. Evaluate entire signal quality at baseband connector output of control unit and remote equipment.

.3 Audio:

.1 Take S/N readings from transmitter input and receiver output with equipment placed in manual gain mode. Check output of the audio converter, modulator or demodulator for S/N. Evaluate entire audio signal at baseband connector input and output of control unit.

.4 Distribution (or interface) system:

.1 Check each door utilizing a volt/ohm (or signal level) meter to confirm each function and to insure that system meets all performance requirements.

.2 Test each interconnection point (i.e.: door unit, junction box "cross connection", control unit, etc.) to ensure compliance with this specification.

.5 Total system test:

.1 Proceed with testing when system and subsystems are functionally tested and accepted. Total system tests to verify that requirements have been met for DC (and/or audio), sub carrier, and control signals in accordance with this specification.

.6 Safety:

.1 Demonstrate with documentation that access control system meets safety requirements specified in UL 294.

.5 Visual verification: objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:

.1 Sturdiness of equipment fastening.

.2 Non-existence of installation related damages.

.3 Compliance of device locations with reviewed shop drawings.

.4 Compatibility of equipment installation with physical environment.

.5 Inclusion of all accessories.

.6 Device and cabling identification.

.7 Application and location of ULC approval decals.

.6 Technical verification: purpose to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:

.1 Validate sensitivity of readers and applicability and application of cards.

.2 Connecting joints and equipment fastening.

.3 Compliance with manufacturer's specification, product literature and installation instructions.

.7 Operational verification: purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:

.1 Operation of each device individually and within its environment.

.2 Operation of each device in relation with programmable schedule and or/specific functions.

3.3 FIELD QUALITY CONTROL

.1 Configuration, programming, and commissioning of system shall be performed by a Kantech certified technician.

.2 Manufacturer Services:

.1 Manufacturer of products, supplied under this Section, to review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.2 Manufacturer's Field Services:

.1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product.

.2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Ensure manufacturer's representative is present before and during critical periods of installation and testing.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by access controls and equipment installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

.2 Section 28 10 00 – Integrated Electronic Security

1.2 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)

.1 ULC-S317, Installation and Classification of Closed Circuit Video Equipment (CCVC) Systems for Institutional and Commercial Security Systems.

1.3 SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

.2 Shop Drawings:

.1 Submit zone layout drawings indicating number and location of zones and areas covered.

.3 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for video surveillance equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit:

.1 Functional description of equipment.

.2 Technical data sheets of all devices.

.3 Device location plans and cable lists.

.4 Video camera surveillance chart.

.5 Video interconnection detail drawings.

.4 Samples:

.1 Not Required.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.1 Submit UL Product safety Certificates.

.2 Submit verification Certificate that service company is "UL List alarm service company".

.3 Submit verification Certificate that monitoring facility is "UL Listed central station".

.4 Submit verification Certificate that video surveillance system is "Certified alarm system".

.6 Test and Evaluation Reports:

.1 Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.7 Manufacturer's Instructions: submit manufacturer's installation instructions.

.8 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

.9 Operation and Maintenance Data: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittal. Include following:

.1 System configuration and equipment physical layout.

.2 Functional description of equipment.

.3 Manufacturer's Instructions for operation, adjustment and cleaning.

.4 Illustrations and diagrams to supplement procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

1.5 WARRANTY

.1 Equipment has been pre-purchased by the Departmental Representative. Contractor shall assume warranty for installation of equipment only.

.2 Where new equipment is provided by the Contractor, submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official.

PART 2 PRODUCTS

2.1 PRE-PURCHASED EQUIPMENT

.1 The Departmental Representative has pre-purchased the following Panasonic CCTV equipment for installation and configuration by the contractor:

.1 CCTV Cameras: WVSUD638 PTZ camera complete with Infrared light option

.2 Network Video Recorders: WJ-ND400kp

.3 I-Pro Video Management Software

.2 The Departmental Representative shall separately purchase hard drives for the Network Video Recorders, for installation by the Contractor.

2.2 CONTRACTOR SUPPLIED EQUIPMENT

.1 Contractor shall provide all accessories and wiring required to provide a complete and functioning system

PART 3 EXECUTION

3.1 CAMERA INSTALLATION AND CONFIGURATION

.1 All configuration, testing, and commissioning related to the Panasonic CCTV network shall be performed by a certified Panasonic technician.

.2 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheet.

.3 Cameras shall be configured with IP Addresses prior to installation on site. Onsite configuration changes must be done through a site workstation.

.4 Configure username and passwords for each camera as directed by the Departmental Representative.

.5 Configure maximum frame rate as directed by the Departmental Representative.

.6 Configure NTP settings as directed by the Departmental Representative.

.7 Install video surveillance equipment and components in accordance with ULC S317.

.8 Install cable, boxes, mounting hardware, brackets, video cameras and system components in accordance with manufacturer's written installation instructions.

.9 Install components securely, properly aligned and in locations shown on reviewed shop drawings.

.10 Connect cameras to cabling in accordance with installation instructions.

.11 Install ULC labels where required.

.12 Departmental Representative to provide description of desired field-of-view for each camera. Install cameras according to provided field-of-view descriptions.

.13 Focus each camera manually prior to running the camera’s auto-focus software.

.14 Cameras shall be configured for anonymous live viewing and control.

.15 Configure cameras and provide Departmental Representative with full image screen capture exports from each camera. Exports to be taken directly from camera’s software. Photographs of the camera’s image will not be accepted.

.16 Departmental Representative and Owner to review and provide direction for camera adjustments as necessary. Allow five (5) days for Departmental Representative and Owner review.

.17 Contractor to make final field-of-view adjustments for each camera as directed by the Departmental Representative.

3.2 VIDEO SURVEILLANCE LIVE VIEWING

.1 Configure cameras within the head-end control software as outlined in Section 28 10 00 – Integrated Electronic Security.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product.

.2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits to review Work at stages listed:

.1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

3.4 TESTING AND COMMISSIONING

.1 Perform verification inspections and test in the presence of Departmental Representative.

.1 Tests shall be performed by a certified Panasonic technician.

.2 Provide all necessary tools, ladders and equipment.

.3 Ensure appropriate subcontractors, manufacturer's representatives, and security specialists are present for verification.

.2 Phase I – Individual Component Testing:

.1 Visual verification: objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:

.1 Sturdiness of equipment fastening.

.2 Non-existence of installation related damages.

.3 Compliance of device locations with reviewed shop drawings.

.4 Compatibility of equipment installation with physical environment.

.5 Inclusion of all accessories.

.6 Device and cabling identification.

.7 Application and location of ULC approval decals.

.2 Technical verification: purpose to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:

.1 Measurements of tension and power.

.2 Connecting joints and equipment fastening.

.3 Measurements of signals (dB, lux, baud rate, etc).

.4 Compliance with manufacturer's specification, product literature and installation instructions.

.5 Confirmation of image quality and field-of-view verification through direct connection to camera’s CAT6 cabling prior to the network switch. Note: A PoE injector may be required to power and view the camera when connected directly to the laptop. Contractor computers may not be connected to the network.

.6 Confirmation of receipt of alarms to camera’s physical inputs where applicable.

.7 Operation and control of camera pan, tilt, and zoom.

.3 **Phase II – Data Link Testing:**

.1 Data link verification: Purpose is to ensure connectivity of all components. Data link verification includes:

.1 Perform ping tests to each camera from the NVRs to ensure network connectivity.

.2 Confirm accessibility of camera’s webpage from the associated NVR.

.1 **Phase III – Individual System Testing:**

.1 Individual system verification: Purpose is to confirm overall operation of the individual system. System verification includes:

.1 Using the Panasonic software on the workstations, verify the following for each camera:

.1 Confirmation of live video

.2 Confirmation of full time, non-motion recording.

.3 Confirmation of motion recording.

.2 Operational verification: purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:

.1 Operation of each device individually and within its environment.

.2 Operation of each device in relation with programmable schedule and or/specific functions.

.3 Operation control of camera lens, pan, tilt and zoom.

.4 Switching of camera to any monitor.

.5 Switching of system video recorder to selective monitor.

.6 Demonstrate:

.1 Sequence viewing of cameras on each monitor.

.2 Bypass capability.

.3 Display of stored image to cardholder.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by video surveillance installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

.2 Section 28 13 00 Access Control

1.2 REFERENCES

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 Common Work Results – Electrical.

1.5 STANDARD OF ACCEPTANCE

.1 AI Phone IX Series 2 or approved equal.

.1 Audio-Visual Door Station: IX-DVF with 1.2MP cameras.

.2 Audio only Door station: IX-DVF without camera.

.3 Master Station: IX-MV7-HB.

.4 System shall be OnVIf_S compatible for integration with Panasonic NVR.

.5 System shall be 802.3af POE compliant

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Entrance control system:

.1 Caller pushes button on intercom station to sound tone signal at master stations.

.1 Two master station locations:

.1 Administration Building Commissionaire's booth

.2 Gate House Commissionaire's building.

.2 Where intercom station includes a camera, the camera image shall be enabled at both master stations.

.3 Either master station to have the capability of speaking to caller at gates.

.4 Button on master station to release pedestrian or vehicle gates as applicable to allow entry.

.5 Entrance control system to be fully integrated with card access control system. Door release button on the intercom master station shall:

.1 For pedestrian gates, cause the release of the gate magnetic lock.

.2 For cantilevered vehicle gates, send a signal to the gate controller to cause the gate to open.

.6 Provide all software and licenses required to configure and operate the system.

.7 Provide all accessories to supply a complete and operating system.

2.2 ENTRANCE PANEL

.1 Control and communication panels at pedestrian and vehicle gates as indicated on Drawings.

.1 Enclosed, flush mounting.

.2 Vandal-resistant

.3 IP addressable system, POE

.4 Door Release dry contact

.5 Call button

.6 Microphone and speaker

.7 Status light

.8 Stainless steel finish.

.9 Two way communication

.10 Digital Colour video camera where indicated on Drawings

.11 System shall be OnVIf_S compatible for integration with Panasonic NVR.

.1 When activated, two separate Panasonic NVR units shall record intercom camera at 6 frames per second.

.2 AIPhone IX-DVF or approved equal.

2.3 DOOR OPENER

.1 Refer to Section 28 13 00 Access Control

2.4 MASTER STATIONS

.1 Two master stations at Commissionaire’s stations.

.1 Desk mounted handset

.2 7” Colour touchscreen monitor,

.3 Handset and hands free communications

.4 Door release button

.5 Talk button

.6 Monitor button

.2 AIPhone IX-MV7-HB or approved equal

2.5 COMMUNICATION CONDUCTORS

.1 Type CAT 6, in accordance with Section 27 10 05 Structured Cabling for Communications Systems.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install system in accordance with manufacturer's instructions.

.2 Connect to Security System network switches as indicated on Drawings.

.3 Connect system to emergency power.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and 26 05 10 Testing and Commissioning.

.2 Perform intelligibility tests.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by entrance control system installation.

3.4 ADJUSTING

.1 Manually adjust camera aiming to optimize views. Coordinate exact camera alignments with Departmental Representative during startup and Commissioning.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for fire alarm systems.

.2 Ancillary devices for integration of gate magnetic locks with fire alarm system.

.2 Related Requirements

.1 This Section shall be read in conjunction with all other Sections in all Divisions. Refer to Section 26 05 00 Common Work Results – Electrical.

1.2 REFERENCES

.1 Government of Canada

.1 TB OSH Chapter 3-03, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.

.2 TB OSH Chapter 3-04, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems.

.2 CAN/ULC-S525, Audible Signal Device for Fire Alarm Systems.

.3 CAN/ULC-S526, Visual Signal Devices for Fire Alarm Systems.

.4 CAN/ULC-S527, Control Units.

.5 CAN/ULC-S528, Manual Pull Stations for Fire Alarm Systems.

.6 CAN/ULC-S529, Smoke Detectors for Fire Alarm Systems.

.7 CAN/ULC-S530, Heat Actuated Fire Detectors for Fire Alarm Systems.

.8 CAN/ULC-S531, Standard for Smoke Alarms.

.9 CAN/ULC-S536-S537, Burglar and Fire Alarm Systems and Components.

.4 National Fire Protection Agency

.1 NFPA 72, National Fire Alarm Code.

.2 NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

.1 Shop Drawings:

.1 Submit shop drawings in accordance with Section 26 05 00 Common Work Results - Electrical

.2 Include:

.3 Submit maintenance and engineering data for incorporation into manual in accordance with ANSI/NFPA 20.

.4 Submit following:

.1 Manufacturer's Data for:

.1 Relay/Control Modules

.2 Wiring.

.3 Conduit.

.4 Outlet boxes.

.5 Fittings for conduit and outlet boxes.

.6 Mark data which describe more than one type of item to indicate which type will be provided.

.7 Submit original for each item and clear, legible, first-generation photocopies for remainder of specified copies.

.2 System wiring diagrams:

.1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.

.2 Show modules, relays, switches and lamps in control panel.

.3 Design data: Power Calculations:

.1 Submit design calculations for new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.

.2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.

.4 Schedules:

.1 Conductor wire marker schedule.

.2 Verification Test Reports:

.1 Submit verification report for verification testing with no exceptions by for complete system prior to substantial completion.

.1 Verification shall be performed by an independent testing agency engaged by the Contractor.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in fire alarm system installations approved by manufacturer.

.2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

.3 System:

.1 To TB OSH Chapter 3-04.

.2 Subject to Fire Commissioner of Canada (FC) approval.

.3 Subject to FC inspection for final acceptance.

.4 To Canadian Forces Fire Marshal approval.

.4 Extra Materials:

.1 Not Required.

.5 Maintenance Service:

.1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 26 05 00 Common Work Results – Electrical.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to CAN/ULC-S525.

.4 Visual signal devices: to CAN/ULC-S526.

.5 Control unit: to CAN/ULC-S527.

.6 Manual pull stations: to CAN/ULC-S528.

.7 Thermal detectors: to CAN/ULC-S530.

.8 Smoke detectors: to CAN/ULC-S529.

.9 Smoke alarms: to CAN/ULC-S531.

2.2 SYSTEM OPERATION

.1 Provide integration with access control mag locks as indicated on drawings.

.2 Actuation of single operation device to initiate following:

.1 Electro-magnetic door locks to de-energize where indicated on drawings.

2.3 EXISTING SYSTEM:

.1 Existing control panel is a single-stage Edwards EST-3 system.

2.4 MANUAL ALARM STATIONS

.1 Not Required.

2.5 AUTOMATIC ALARM INITIATING DEVICES

.1 Not Required.

2.6 ALARM INITIATING DEVICE SPACING AND LOCATION

2.7 AUDIBLE SIGNAL DEVICES

.1 Not Required.

2.8 END-OF-LINE DEVICES

.1 Not Required.

2.9 ELECTRO-MAGNETIC DOOR HOLDER-RELEASES

.1 Not required.

2.10 CONDUIT

.1 Electrical Metallic Tubing (EMT)

.2 Surface Metal Raceway and Fittings:

.1 Two-piece painted steel.

.2 Totally enclosed snap-cover type.

2.11 WIRING

.1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.

.2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor

.3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.

.4 Insulation 75 degrees C minimum with nylon jacket.

.5 Colour code wiring.

2.12 ANCILLARY DEVICES

.1 Remote relay unit to disconnect access control magnetic lock power supply.

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 datasheet.

3.2 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524.

.2 Locate and install ancillary devices to fire alarm control panel.

.3 Connect fire suppression systems to control panel.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.

.2 Fire alarm system:

.1 Test each new device and alarm modified circuit to ensure proper operation of devices and systems.

.2 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of system.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 TRAINING

.1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

END OF SECTION