Department of National Defence

ISSUE FOR TENDER

SPECIFICATIONS

CCTV System Replacement

Denison Armoury
1 Yukon Lane, Toronto, Ontario

THIS DOCUMENT CONTAINS SECURITY REQUIREMENTS

2024-03-29

Project No.
TT180003

Security

STANTEC
400-375, Roland-Therrien Blvd
Longueuil, QC J4H 4A6
t. (514) 281-1033

Approved by: Jonathan Hallée, P.Eng

Sections 01, 27, 28

Electrical

STANTEC
300-1331 Clyde Avenue
Ottawa, ON, K2C 3G4

Approved by: Joey Czyzewski, P.Eng

Section 26

Mechanical

STANTEC
300-1331 Clyde Avenue
Ottawa, ON, K2C 3G4

Approved by: Cary McGee, P.Eng

Sections 22, 23

TABLE OF CONTENTS

Pages

Division 01 - GENERAL REQUIREMENTS

Division 22 – PLUMBING

Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING

Drawing	TT180003-507	Partial Second Floor CCTV – New Work
Drawing	TT180003-508	Partial Third Floor CCTV – New Work
Drawing	TT180003-800	Drawing List & Camera Installation Detail
Drawing	TT180003-801	Camera Riser
Drawing	TT180003-802	Site Plan
Drawing	TT180003-803	Basement
Drawing	TT180003-804	First Floor
Drawing	TT180003-805	Second Floor
Drawing	TT180003-806	Third Floor

END OF TABLE

Part 1 General

1.1 REFERENCES

.1 National Building Code of Canada (NBC) Latest Edition including all amendments up to Tender Closing Date.

1.2 CONTRACT DOCUMENTS IDENTIFICATION

.1 Contract Documents are identified as:

Project Title:	**CCTV System Replacement**
File Number:	TT180003
Located at:	Denison Armoury 1 Yukon Lane Toronto, ON

1.3 SCOPE OF WORK

.1 Work under this Contract covers the supply of all labour, materials and equipment required to carry out Construction in accordance with the Contract Documents. Work includes but is not limited to the following:

.1 Preparation:

.1 Establish lockable construction work site, erect construction barriers in accordance with Section 01 56 00 – Temporary Barriers and Enclosures, to applicable standards and as indicated on drawings.

.2 When there are occupants in the same building as construction or the building becomes occupied prior to substantial completion, the Contractor must maintain a 1 hour fire separation as required by Section 01 56 00 – Temporary Barriers and Enclosures.

.3 Post all construction signage and safety signage as required by regulatory agency.

.2 Construction:

.1 Refer to specification Section 00 01 10 - Index for list of Drawings describing the Scope of Work.

.2 Previously, the Contract Documents were awarded to a Contractor A to complete. Contractor A completed a majority portion of the work and their contract was closed. As such, there is work remaining to be completed as part of this contract. The work remaining to be completed are denoted in the Drawings as black. The work completed in the previous contract are denoted in the Drawings as grey. The intent of this Contract is to complete the remaining work as identified in the Contract Documents and review/verify the functionality of the previous work completed in the previous contract. For the previous work completed, the Contractor shall conduct a review/verification exercise, of all equipment and accessories, as detailed in this Section under paragraph 1.3.3 and prepare a Deficiency Survey Report. The intent of the report is to provide an itemized list of deficiencies with a repair recommendations and cost of repair to allow for rectification. DCC will review the report, issue a Contemplated Change Notice and subsequent Change Order to rectify deficiencies identified in the Deficiency Survey

Report. The Contractor is to anticipate the below schedule for the Deficiency Survey Report and Change Order:

Milestones	**Time Duration (Business Days)**
Visitor Clearance Request (VCR) Approval	Day 0
Complete Existing Materials Site Verification Exercise	Within 10 Days of VCR Approval
Deficiency Survey Report Submission	Within 20 Days of VCR Clearance
DCC/DND Review	Within 10 Days of Deficiency Survey Report Submission
DCC Contemplated Change Notice Request	Within 15 Days of DCC/DND Review
Contractor's Contemplated Change Notice Submission	Within 10 Days of Contemplated Change Notice Request
Contemplated Change Notice Negotiations	Within 10 Days of Contemplated Change Notice Submission
Change Order Approval	Within 10 Days of Contemplated Change Notice Submission, but no later than 75 Days from VCR Approval.

.3 Within ten (10) Business Days of receiving Visitor Clearance Request (VCR) approval, in accordance with Section 01 35 15, the Contractor shall:

.1 Verify the condition of all existing materials previously installed under other Sections, under Part 2 - Products, or Contracts are acceptable in accordance with manufacturer's written instructions and Contract Documents. This should include:

.1 Visually inspect existing materials in presence of Owner's/DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report, Deficiency Survey Report, with the below headers. Contractor may add additional headers as required.

Deficiency #	Device				Location		Photo graph	Pass/ Fail	Power/ Voltage	Repair Description	Repair Cost ($)		Total Cost ($)
	Device	Make	Model	Serial #	Floor	Room #					Material	Labour	

.3 The Deficiency Survey Report is to be provided within ten (10) business days after completion of site verification.

.4 Allow ten (10) business days, after submission of the report, for DCC to review the Deficiency Survey Report and provide comments, if required.

.5 DCC will issue a Contemplated Change Notice, and subsequently a Change Order, to rectify and address all deficiencies identified in the

Deficiency Survey Report. The Contractor shall proceed with installation once the Change Order has been received.

.2 Equipment to test the existing materials are to be working order and supplied by the Contractor.

.4 A material inventory list, of equipment in DCC's possession, has been provided in Appendix B. The two tables identified are, "Material Inventory for TT180003 (in DCC Possession) to be used by Contractor*," and "Material Inventory for TT180003 (in DCC Possession) Contractor may choose to use*." As noted in each table's header, the Contractor will be required to use materials in one table and may choose to use materials in the second table.

.5 Removal of materials from the site must meet Section 01 35 43 - Environmental Protection.

.6 Contractor will be responsible for obtaining a licensed hauler and receiver for the transport and recycling of any hazardous materials.

.7 Contractor will submit a manifest upon completion of the work in accordance with Section 01 35 43 - Environmental Protection.

.8 Upon Completion of work, transport any hazardous material waste off-site to approved receiver. Submit manifest prior to submission of final progress claim.

1.4 CODES AND STANDARDS

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

.2 Meet or exceed requirements of:

.1 Contract Documents.
.2 Specified standards, codes and referenced documents. (Latest Editions).

1.5 WORKMANSHIP

.1 All tradesman to be licensed or certified where applicable.

.2 All work to be concealed shall be inspected by DCC Representative before concealment. Give DCC Representative 48 hours notice prior to inspection.

.3 Workmanship to be of uniformly high quality and in accordance with standard practice. All work to be completed to the satisfaction and approval of the DCC Representative.

.4 Contractor to make good any building surface, material, equipment, fitting or furnishing disturbed or damaged due to transportation of equipment or materials through the building or the Work of this Contract.

.5 Contractor to make good existing roadways, landscaping, façade and grassed areas damaged by vehicles or due to the transportation of storage of equipment or materials on site or the Work of this Contract.

1.6 SITE CONDITIONS

.1 Examine existing site for conditions that may impede prompt execution of the Work and advise the DCC Representative accordingly.

1.7 EXISTING CONDITIONS

.1 Contractor to attend the site upon award and document existing conditions and identify existing damage or deficiencies not to be addressed as part of this project. Applicable only to access to and areas of work.

.2 Contractor to provide O&M manuals and training for all equipment installed on site, including previously installed equipment, as part of the entire CCTV upgrade.

.3 In locations where ceiling suspended signage is obstructing CCTV camera view, Contractor to relocate ceiling suspended signage to suitable location not obstructing the CCTV camera and still visible to individuals.

.4 Locations for storage of materials and equipment will be determined at the pre-construction meeting.

1.8 WORK SEQUENCE

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

.2 Maintain fire access/control at all times.

1.9 CONTRACTOR'S USE OF SITE

.1 Use of site: restricted to immediate access to and area(s) of work.

.2 All workers must sign in at the commissionaire's booth daily.

.3 Contractor may park in Denison Armoury's main occupant parking lot or the overflow parking lot behind Defence Research and Development Canada (DRDC) located at 1133 Sheppard Avenue west.

.4 Coordinate use of premises under direction of DCC Representative.

.5 Obtain and pay for use of additional storage or work areas.

1.10 OWNER OCCUPANCY

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

.2 Co-ordinate with DCC Representative in scheduling operations to minimize conflict and to facilitate Owner usage.

.3 Refer to 01 70 03 Safety Requirements for further details.

1.11 PROJECT MEETINGS

.1 DCC Representative shall record meeting minutes. DCC Representative to distribute minutes to the General Contractor. General Contractor shall distribute to all Sub-trades.

.2 Site meetings shall be scheduled bi-weekly with all major trades present.

1.12 ADDITIONAL DRAWINGS

.1 The DCC Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract Documents.

1.13 SIGN-IN & SIGN-OUT LOG BOOK

.1 Contractor shall provide and maintain during the entire project, a contractor sign-in and sign-out log book.

.2 Contractor to keep log book on site and will include sign-in/sign-out of all personnel, Sub-Trades and all visitors.

.3 Contractor to turn log book over to DCC Representative upon final completion of work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 35 15 - Industrial Security

.2 Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart

.3 Section 01 70 03 - Health and Safety Requirements

.4 Section 01 56 00 - Temporary Barriers and Enclosures

1.2 PRECEDENCE

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

1.3 ACCESS AND EGRESS

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

1.4 USE OF SITE AND FACILITIES

.1 Execute Work with least possible interference or disturbance to normal use of premises. Make arrangements with DCC 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 Contractor to provide sanitary facilities for own work force in accordance with governing regulations and ordinances.

.5 Designated existing elevators or dumbwaiters may not be used by construction personnel or for transporting of construction materials.

.6 Closures: protect work temporarily until permanent enclosures are completed.

1.5 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

.2 Noisy activities such as coring to be conducted outside of typical hours of operation. Timing to be coordinated with DCC Representative.

1.6 EXISTING SERVICES

.1 Notify DCC 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 DCC Representative 5 days' notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel, pedestrian and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.7 SPECIAL REQUIREMENTS

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

.2 Ensure that Contractor 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.

1.8 SECURITY

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

.2 Security on Contracts:

.1 For all Contracts where security has been identified. Contractor must follow all requirements of Section 01 35 15 – Industrial Security. Including but not limited to:

.1 Security Requirement Checklists (SRCL) for Contract

.2 Sub SRCL for all Subcontractors

.3 Security Implementation Plan

.4 Contractor organization and employee screening and clearances, for own employees and all Subcontractor employees.

.5 Visit Clearance Requests (VCR)

.6 Positive Control

.7 Meetings

.8 Reporting

1.9 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is allowed only in areas indicated by DCC Representative.

1.10 WORK SITE REQUIREMENTS

.1 Work site restrictions and outlining of work site shall be in accordance with Section 01 70 03 – Health and Safety Requirements.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 APPOINTMENT AND PAYMENT

.1 DCC Representative will appoint for services of testing laboratory except for the following:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
- .3 Inspection and testing performed exclusively for Contractor's convenience.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under the supervision of DCC Representative.
- .6 Additional tests specified in paragraph 1.2.2.

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

1.3 CONTRACTOR’S RESPONSIBILITIES

.1 Furnish labour, equipment and facilities to:

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

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

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

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

1.2 PRECEDENCE

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

1.3 DEFINITIONS

.1 Activity: element of work performed during course of the Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management software.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.1 Weekend Work: Contractor may request to work weekends to accelerate or to regain slippage in the schedule. These requests will be reviewed with DND who retains final say on approvals.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Hours of Operation: 0800h – 1600h Monday to Friday.

.1 Extended Hours: Contractor may request to work extended hours to accelerate or to regain slippage in the schedule. These requests will be reviewed with DND who retains final say on approvals.

.2 All coring work to be completed after hours.

.7 Master Plan: A summary-level schedule that identifies major activities and key milestones.

.8 Milestone: significant event in the Project, usually completion of major deliverable or phasing of construction due to unrelated scope of work on two different areas.

1.4 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete the Work in accordance with prescribed milestones and time frame.

.3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this Contract.

1.5 SUBMITTALS

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

.2 Submit to DCC Representative within 5 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as a minimum milestone and activity types as follows:

.1 Award.
.2 Shop Drawings, Samples.
.3 Mobilization.
.4 Excavation.
.5 Backfill.
.6 Plumbing.
.7 Electrical.
.8 Controls.
.9 Heating, Ventilating, and Air Conditioning.
.10 Inspections by Authorities having jurisdiction.
.11 System Start-Ups.
.12 System Commissioning.
.13 System Training.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule as scope is added, activities are completed, slip or are ahead of schedule. Updates are to be submitted on weekly basis reflecting these activity changes and completions, as well as activities in progress to DCC Representative.

.2 Include as part of Project Schedule, narrative report identifying work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 45 00 – Quality Control

.2 Section 01 78 00 – Closeout Submittals

1.2 PRECEDENCE

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

1.3 SECTION INCLUDES

.1 Shop drawings and product data.

.2 Samples

.3 Certificates and transcripts

1.4 ADMINISTRATIVE

.1 Submit to DCC 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 DCC 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 the 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 DCC 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 DCC Representative’s review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by DCC Representative’s review.

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

1.5 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 produced by the Contractor, supplier, manufacturer, subcontractor, or fabricator to provide clear illustration of the requirements of the project. “Shop drawings” are required for all pre-fabricated items, but also are required for illustrating coordination and installation of mechanical, electrical and plumbing trades, generally referred to as “Interference Drawings”. Shop Drawing are to be first reviewed, stamped and signed by the General Contractor for compliance with project requirements.

.2 Shop Drawings are to be purposely created for the project and therefore DCC will not provide electronic drawings for use in creation of shop drawings, the only exclusion to this point will be for use in Interference Drawings, where general layout plans may be provided and will be at the DCC Representative’s Discretion.

.3 Shop Drawings are not intended to be “catch all” drawings, they are to be produced for this project, with correct dimensioning, indicating materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 The approval of shop drawings and product data by DCC Representative and Designer of Record is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that the DCC Representative and Designer of Record approves the detail design inherent, content in the shop drawings or product data or responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions or responsibility for meeting all requirements of the construction and contract documents.

.5 Without restricting the generality of the foregoing with respect to shop drawings and product data, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes, or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

.6 Allow 7 days for DCC Representative’s review of each submission.

.7 Adjustments made on shop drawings by DCC Representative are not intended to change Contract Price. If adjustments affect value of work, state such in writing to DCC Representative prior to proceeding with work.

.8 Make changes in shop drawings as DCC Representative may require, consistent with Contract Documents. When resubmitting, notify DCC Representative in writing of revisions other than those requested.

.9 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.

.10 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.

.11 After DCC Representative's review, distribute copies.

.12 Submit 1 electronic copy of shop drawings for each requirement requested in specification Sections and as DCC Representative may reasonably request.

.13 Submit 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by DCC Representative where shop drawings will not be prepared due to standardized manufacture of product.

.14 Delete information not applicable to project.

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

.16 If upon review by DCC 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 noted "revise and re-submit" or '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.

1.6 SAMPLES

.1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to DCC Representative's site office.

.3 Notify DCC Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

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

.5 Adjustments made on samples by DCC Representative are not intended to change Contract Price. If adjustments affect value of work, state such in writing to DCC Representative prior to proceeding with work.

.6 Make changes in samples which DCC Representative may require, consistent with Contract Documents.

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

1.7 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.8 PROGRESS PHOTOGRAPHS

.1 Submit progress photographs weekly, highlighting status of project, key components, site and building safety / environmental precautions/protections, materials, installations and any other pertinent details or items that should be part of the project record.

.1 Photographs are to be taken with a 4 mega pixel camera. Date stamped and saved to current electronic media.

1.9 CERTIFICATES AND TRANSCRIPTS

.1 Refer to the General Conditions.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 **Precedence** - Division 1 sections take precedence over technical specifications in other Divisions of this project manual.

1.2 REFERENCES

.1 Definitions:

.1 Contract Security Program (CSP) - A division of Public Services and Procurement Canada (PSPC), which developed the Contract Security Manual and helps industry to participate in Government of Canada and foreign government contracts. CSP provides security screening services needed for contractors before their employees can work with Protected and Classified information and assets.

.2 Company Security Officer (CSO) - The CSO is the organization's official point of contact with the CSP. The CSO is responsible for monitoring the organization's security profile, addressing security issues, and is accountable to the CSP and to the organization's designated Key Senior Official on all industrial security matters.

.3 Contractor CSO - The employee of the Contractor’s company who is the CSO.

.4 Contract Security Manual (CSM) - The CSM is a ready and simple reference which tells Company Security Officers what they must know about Canadian government security standards and procedures and how to ensure that their organization meets these security requirements.

.5 Positive Control - Measures which guarantee that persons without appropriate clearance will not be left unattended to access the Department of National Defence/Canadian Armed Forces (DND/CAF) information, assets, resources, or locations.

.6 Request for Visit (RFV) - A form to be filled out by an individual who requires access to sensitive DND property, personnel, information, assets and resources because they must be security screened at the appropriate level before commencement of their duties.

.7 Restricted - Refers to a situation where authorized persons only, are allowed access to an area or information.

.8 Security Implementation Plan - A detailed document which outlines the company’s strategy and process to meet contract security requirements.

.9 Security Requirements Check List (SRCL) - The SRCL is a Treasury Board Secretariat (TBS) form used to define the security requirements for a contract. The SRCL represents an evaluation of security threats and risks that may arise through the contracting process.

.10 Sensitive - Records that are sensitive contain information that can cause different degrees of injury to an individual, a company, or the country if the information were disclosed in an unauthorized manner.

.2 Reference Sites:

.1 Defence Construction Canada (DCC)

.1 https://www.dcc-cdc.gc.ca/industry/security-requirements

.2 PSPC Contract Security Manual

.1 https://www.tpsgc-pwgsc.gc.ca/esc-src/msc-csm/index-eng.html

1.3 GENERAL

.1 Security requirements must form part of the contract between DCC and industry when defined by a SRCL.

.2 These security requirements apply but are not limited to:

.1 construction and material objects;

.2 contractual arrangements;

.3 professional service contracts;

.4 facility maintenance contracts; and

.5 environmental and UXO contracts.

.3 A SRCL is a form that is used to define the security requirements associated with each contract. The SRCL ensures that that the appropriate security clauses are identified so they may be incorporated into the contract, thereby legally binding the parties to meet the contract's security requirements. **The SRCL must accompany all contract documents including subcontracts that contain security requirements**.

.4 If multiple levels of screening are required, a Security Classification Guide may have been provided along with the SRCL as a contractual document. This document will provide further information related to security requirements when dealing with multiple levels of clearances within the contract.

1.4 PRIVATE SECTOR ORGANIZATION SCREENING AND CLEARANCES

.1 Companies who will need access to or who will retain controlled goods, protected or classified property, information, assets or resources must be cleared as follows:

.1 Companies must be cleared to safeguard the highest level of information and asset to be retained/accessed, meaning:

.1 Designated Organization Screening (DOS) is required for contracts involving access to information at the protected level and/or secure worksites (Reliability status);

.2 Facility Security Clearance (FSC) is required for contracts involving access to information at the protected and/or classified levels and/or secure worksites (Secret status);

.3 Document Safeguarding Capability (DSC) is required to work on protected and/or classified information at their own worksite; and

.4 Companies who will electronically process protected or classified information must have IT media clearance and processing capability commensurate with the security classification level of the information to be processed and must be cleared to the level commensurate with the information or asset to be accessed.

1.5 PERSONNEL SECURITY SCREENING

.1 Individuals requiring access to information and/or site must have their personnel security screening completed prior to submitting an RFV. As a part of the screening process, it is now a requirement for individuals to undergo a law enforcement inquiry through the RCMP, for electronic finger printing. Please refer to PSPC website for more information.

.2 Prior to Contract Award, personnel security screenings may not be initiated due to CSP requirements. Therefore, contractors must allow time in their schedules to seek personnel security screenings as required by the contract.

.1 Reliability status processing is anticipated to take seven (7) business days per employee after a request has been properly submitted to CSP; and

.2 Secret clearance processing is anticipated to take seventy-five (75) business days per employee after a request has been properly submitted to CSP.

1.6 VISIT CLEARANCE REQUESTS (VCR) APPROVAL

.1 All individuals (including subcontractors) who will have access to sensitive DND or CAF property, personnel, information, assets, and resources, must be security screened at the appropriate level before the commencement of their duties in relation to the contract.

.2 Access to Operations Zones: security screening is not required for certain personnel if positive control of those individuals is maintained throughout their visit. Positive control measures must be outlined in the Security Implementation Plan. Positive control can be used for the following personnel:

.1 Logistics activities – material drop-off, waste removal, snow removal;

.2 Transit through an operations zone (no work); and

.3 Authorities having jurisdiction.

.3 The VCR process verifies that those who are permitted access onto DND property have the required clearance level as outlined within the SRCL for the contract.

1.7 POST AWARD PROCESS OVERVIEW

.1 The Contractor's CSO is provided a blank RFV form by the DCC Representative in order to obtain an approved VCR.

.2 All employees of the successful bidder who will be accessing restricted sites or sensitive information during the execution of the contract require a VCR. The Contractor's CSO must forward the completed form to the DCC Representative for processing.

.1 The CSO of each company completing an RFV form must submit a picklist from the Online Industrial Security Services (OLISS) portal instead of filling in the details of each visitor on the form. Only the employees of the company who require access to the restricted site or sensitive information for that contract shall be listed on the picklist.

.2 If the Contractor intends to use Union Hall members, the CSO will request the Union Hall to provide the CSO with a separate picklist for all members to be used on the contract. Only the individuals of the Union Hall who require access to the site for that contract shall be listed on the picklist.

.3 The CSO of the company will input “SEE ATTACHED PICKLIST” when completing Particulars of Visitors.

.3 It is the responsibility of the Prime Contractor to submit and receive an approved SRCL for each subcontract containing security requirements. This responsibility extends to all subcontracts held by subcontractors.

.1 Instructions on this process are in the CSM located at https://www.tpsgc-pwgsc.gc.ca/esc-src/msc-csm/index-eng.html

.2 Prior to Contract Award, subcontract SRCL security screenings may not be initiated due to CSP requirements. Therefore, contractors must allow time in their schedules for subcontract SRCL approvals as required by the contract.

.1 When a Private Sector Organization Screening (PSOS) is **not** required, contractors shall allow 45 business days (from the date on which a complete and correct subcontract SRCL is received by CSP) for approval of a subcontract SRCL by CSP.

.2 When a PSOS **is** required:

.1 For sub-contractors to be sponsored to the level of DOS, contractors shall allow for 50 business days (from the date on which a complete and correct PSOS is submitted to CSP) for approval of a subcontract SRCL by CSP; and

.2 For sub-contractors to be sponsored to the level of FSC (Secret), contractors shall allow 124 business days (from the date on which a complete and correct PSOS is submitted to CSP) for approval of a subcontract SRCL by CSP.

.3 All security related pre-construction activities shall proceed immediately after award.

.4 For subcontracts, the RFV shall not be submitted until after the subcontract SRCL has been approved and permission to award the contract is granted by CSP.

.1 Contractor to allow a minimum of 15 business days for VCR processing.

.5 Personnel not meeting the required security clearances will not be allowed access to restricted sites or any sensitive information pertaining to the contract, except as permitted in 1.6.2.

.6 Approved VCRs are valid for the duration of the contract **or** one year less one day, whichever is less. Extension to VCRs will need to be requested as required, again allowing a minimum of 15 business days for processing.

1.8 SUBMITTALS

.1 Submit to the DCC Representative copies of the following documents, including updates issued:

.1 Security Implementation Plan

.2 Approved subcontract SRCLs

.3 Completed Request for Visit forms for all personnel working under the contract

.4 Incident reports within (1) working day

.5 Submit other data, information and documentation upon request by the DCC Representative.

1.9 RESPONSIBILITY

.1 It is the responsibility of the Contractor to have no security breaches while undertaking the work for this contract.

1.10 MEETINGS

.1 Prior to commencement of work, the Contractor will attend a pre-commencement meeting conducted by the DCC Representative. Ensure, as minimum, attendance by Contractor's site superintendent.

.1 The DCC Representative will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.

.2 If requested by the DCC Representative, the Contractor's CSO will be required to participate in the pre-commencement meeting.

.2 Conduct site specific security meetings as required to ensure the management of security is in accordance with the contract.

.1 Record and post minutes of all meetings as allowed by the security requirements of the contract.

1.11 SECURITY IMPLEMENTATION PLAN

.1 Contractors are required to have in place a contract specific Security Implementation Plan that addresses the security requirements outlined in the contract.

.2 Provide one copy of the Security Implementation Plan to the DCC Representative prior to the commencement of work.

.3 At a minimum, the plan shall contain details addressing:

.1 CSO name and contact information;

.2 Schedule for subcontract SRCLs and RFVs;

.3 Site Access and Control Monitoring including verification that all people entering secure areas on site have approved VCRs in accordance with contractual security requirements, or any planned positive control measures;

.4 Security Education (i.e. Restrictions on photographs); and

.5 Security Incident Reporting.

.4 The DCC Representative will coordinate review of the Security Implementation Plan by the DND Project Security Authority to be completed within 10 business days of receipt following which the DCC Representative shall confirm DND's acceptance or rejection with comments.

1.12 INCIDENT REPORTING

.1 Investigate and report any security incidents immediately to the DCC Representative.

.1 Immediately provide a copy of the incident/investigation reports to the DCC Representative.

.2 Refer to Chapter 5 of the CSM https://www.tpsgc-pwgsc.gc.ca/esc-src/msc-csm/index-eng.html for more information.

.2 For the purpose of this contract, immediately notify the DCC Representative of incidents that involve a security breach from the identified clauses on the SRCL or an interruption to adjacent and/or integral infrastructure operations with potential loss implications.

.3 In the investigation and reporting of incidents, the Contractor is required to respond in a timely fashion (within 5 working days) to correct the action that was deemed to have caused the incident and advise in writing on the action taken to prevent a re-occurrence of the incident.

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 PRECEDENCE

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

1.2 FIRE INSPECTOR BRIEFING

.1 DCC Representative shall coordinate arrangements for Contractor for briefing on Fire Safety at pre-work conference by Chief Fire Inspector or his appointed designated representative before work is commenced.

1.3 REPORTING FIRES

.1 The Contractor shall inform the DCC Representative and Chief Fire Inspector or his appointed designated representative of all fire incidents at the construction site, regardless of size.

.2 Know location of nearest fire alarm box and telephone, including emergency phone number.

.3 Report immediately fire incidents to Fire Department as follows:

.1 Activate nearest fire alarm box; or

.2 Telephone.

.4 Person(s) activating fire alarm box shall make themselves available to direct Fire Department to scene of fire.

.5 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location.

1.4 INTERIOR AND EXTERIOR FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm system will not be:

.1 Obstructed; and/or

.2 Shut-off;

.1 Should any portion of the fire protection or alarm system need to be shut off or bypassed as a direct requirement of the work, the Contractor shall:

.1 Coordinate shutdown / bypass with the local fire department, Building Maintenance Technician (BMT, DND Chief Fire Inspector and DCC Representative.

.2 Inform all occupants of the building of the shutdown / bypass and of the revised fire reporting requirements.

.3 Post notification of impaired status of fire protection / alarm system and modified reporting requirements at each entrance / exit and each pull station throughout building.

.4 Keep duration of shutdown / bypass to a minimum. Shutdown/ bypass shall not extend beyond regular working hours without authorization from Chief Fire Inspector.

.5 Provide under the Contract for Firewatch for the building for the duration of the shutdown / bypass.

.6 Where the Contract includes security requirements, the Contractor must provide security cleared personnel to maintain the Firewatch.

.2 Fire hydrants, standpipes and hose systems will not be used for other than fire-fighting purposes unless authorized by Chief Fire Inspector.

1.5 FALSE ALARMS

.1 Contractor will be responsible for reimbursement of all associated costs of false alarms due to failure to comply with requirements of 1.4, or through lack of due diligence resulting in a false alarm due to Contractor activities. Costs may include but are not limited to:

.1 Fire Department Response

.2 Building Maintenance Technician Response

.3 Chief Fire Inspector Response

.4 Other associated charges to Owner.

1.6 FIRE EXTINGUISHERS

.1 Supply fire extinguishers, as scaled by Chief Fire Inspector or his appointed designated representative, necessary to protect work in progress and contractor's physical plant on site.

.2 Fire extinguishers may be required in the following areas as directed by the Chief Fire Inspector:

.1 Adjacent to hot works;

.2 In areas where combustibles are stored;

.3 Near or on any internal combustion engines;

.4 Adjacent to areas where flammable liquids or gases are stored or handled;

.5 Adjacent to temporary oil fired or gas fired equipment; and

.6 Adjacent to bitumen heating equipment.

.3 Extinguishers shall be sized as 4-A:40-B:C (20 lbs) unless otherwise directed by the Chief Fire Inspector or his appointed designated representative.

.4 Extinguishers shall be of the dry chemical type unless otherwise required by the hazard being protected.

.5 The Contractor may assume the quantity of extinguishers based on a maximum travel distance between extinguishers of 75 feet.

1.7 FIRE SAFETY PLAN

.1 Submit a Fire Safety Plan for the construction site prior to commencement of construction work. The Fire Safety Plan shall conform to the National Fire Code of Canada.

.2 The Fire Safety Plan shall be submitted to the DCC Representative for review by Chief Fire Inspector or his appointed designated representative. Any comments by local fire department shall be implemented by the Contractor.

.3 The Fire Safety Plan shall be limited to the area of construction only. Contractor is not responsible for amending fire safety plans in existing buildings.

.4 Post the Fire Safety Plan at the entrance to the construction site or near the construction site's health and safety board.

.5 The Fire Safety Plan shall conform to the National Fire Code of Canada, and shall contain, at minimum:

.1 Emergency procedures to be used in case of fire, including:

.1 Sounding the fire alarm;

.2 Notifying the fire department;

.3 Instructing occupants on procedures to be followed when the fire alarm sounds;

.4 Evacuating occupants, including special provisions for persons requiring assistance; and

.5 Confining, controlling and extinguishing fires.

.6 The appointment and organization of designated supervisory staff to carry out fire safety duties.

.7 The training of supervisory staff and other occupants in their responsibilities for fire safety.

.8 Documents including diagrams, showing the type, location and operation of building fire emergency systems.

.9 The holding of fire drills (where applicable).

.10 The control of fire hazards in the building.

.11 The inspection and maintenance of building facilities provided for the safety of occupants.

1.8 HOT WORK PERMIT

.1 Contractor will be responsible to issue a "Hot Work" permit (Found at the end of this Section) for their own work involving open flame or processes causing sparks in buildings or on DND property.

.2 When Work is carried out in dangerous or hazardous areas involving use of heat, provide Firewatch equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Firewatch is at discretion of the Chief Fire Inspector or his appointed designated representative.

.3 Provide Firewatch service for work on scale established and in conjunction with the Chief Fire Inspector as defined in the Fire Department Briefing. Firewatch shall be trained in the use of fire extinguishing equipment.

.4 Area of hot works

.1 Hot works shall be carried out in an area free of combustible and flammable content.

.2 Where 1.14.5.1 is not possible,

.1 All flammable and combustible materials within 15m of the hot works shall be protected in accordance with the National Fire Code of Canada;

.2 A Firewatch shall be provided during the hot work and for a period of not less than 60 minutes following completion of hot work unless otherwise directed by the Chief Fire Inspector or his appointed designated representative;

.3 A final inspection of the hot work area shall be conducted not less than 4 hours after the completion of hot works unless otherwise directed by the Chief Fire Inspector or his appointed designated representative.

.3 Where there is a possibility of sparks leaking onto combustible materials in areas adjacent to the areas where the hot work is carried out

.1 Openings in walls, floors or ceilings shall be covered or closed to prevent the passage of sparks to such adjacent areas, or

.2 Sentence 1.14.5.2 shall apply for those areas.

.5 Protection of flammable and combustible materials

.1 Any combustible or flammable material, dust or residue shall be

.1 Removed from the area where hot works is carried out; or

.2 Protected from ignition by non-combustible materials.

.6 Fire extinguisher

.1 A fire extinguisher shall be provided within 3 m of all hot works. Minimum size shall be 20lbs ABC unless otherwise directed by Chief Fire Inspector or his appointed designated representative.

1.9 ACCESS FOR FIRE FIGHTING

.1 Access for firefighting shall be provided in accordance with the National Fire Code of Canada.

.2 Advise the Chief Fire Inspector of work that would impede fire apparatus response. This includes violation of minimum horizontal and overhead clearance, as prescribed by the Chief Fire Inspector or his appointed designated representative, erecting of barricades and digging of trenches.

.3 Minimum horizontal clearance: clear width of not less than 5m, or as defined by the Chief Fire Inspector or his appointed designated representative.

.4 Minimum vertical clearance: overhead height of not less than 6m, or as defined by the Chief Fire Inspector or his appointed designated representative.

1.10 SMOKING PRECAUTIONS

.1 Smoking is **not permitted** in DND buildings.

.2 Smoking permitted in designated areas only.

.3 Observe smoking regulations at all times.

1.11 RUBBISH AND WASTE MATERIALS

.1 Rubbish and waste materials are to be kept to a minimum.

.2 Burning and burying of rubbish is prohibited.

.3 Removal:

.1 Remove all rubbish from work site at end of work day or shift or as directed.

.4 Storage:

.1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.

.2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove as required in 1.11.3.1.

.3 Contractor shall provide waste containers for their own use.

1.12 FLAMMABLE AND COMBUSTIBLE LIQUIDS

.1 Handling, storage and use of flammable and combustible liquids are to be governed by current liquids are to be governed by current national Fire Code of Canada.

.2 Flammable and combustible liquids such as gasoline, kerosene and naphtha will be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires permission of Chief Fire Inspector or his appointed designated representative.

.3 Transfer of flammable and combustible liquids is prohibited within buildings or jetties.

.4 Transfer of flammable and combustible liquids will not be carried out in vicinity of open flames or any type of heat-producing devices.

.5 Flammable liquids having a flash point below 38º C such as naphtha or gasoline will not be used as solvents or cleaning agents.

.6 Flammable and combustible waste liquids, for disposal, will be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and Chief Fire Inspector or his appointed designated representative is to be notified when disposal is required.

1.13 HAZARDOUS SUBSTANCES

.1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, shall be in accordance with National Fire Code of Canada.

.2 Provide ventilation where flammable liquids, such as lacquers or urethanes are used. Eliminate all sources of ignition. Inform the Chief Fire Inspector or his appointed designated representative prior to and at completion of such work.

1.14 PARTIAL OCCUPANCY

.1 Implement partial occupancy procedures as defined in the drawings and specifications. Partial occupancy is where construction occurs adjacent to work areas occupied by Departmental or Canadian Forces personnel. This includes:

.1 Phased new construction.
.2 Early or partial occupancy of new construction.
.3 New construction being added onto an existing building.
.4 Renovation or recapitalization of an existing building.
.5 Phased renovation or recapitalization of an existing building.

.2 Where partial occupancy occurs, Contractor shall implement requirements as found in the drawings and specifications. This may include construction of a rated fire separation between occupied and construction areas as required by the National Fire Code.

.3 A watch, with tours at intervals of not less than one hour, shall be provided throughout demolition sites when there are occupants in the portion of the building not being demolished.

.4 Except where a building is provided with a fire alarm system or similar equipment, a watch, with tours at intervals of not more than one hour, shall be provided when a portion of the building is occupied while construction operations are taking place.

1.15 QUESTIONS AND/OR CLARIFICATION

.1 Co-ordinate site inspections by the Chief Fire Inspector through DCC Representative.

.2 Allow the Chief Fire Inspector or his appointed designated representative unrestricted access to work site.

.3 Co-operate with the Chief Fire Inspector or his appointed designated representative during routine fire safety inspection of work site.

.4 Immediately remedy unsafe fire situations observed by the Chief Fire Inspector or his appointed designated representative.

1.16 FIRE INSPECTION

.1 Co-ordinate site inspections by Chief Fire Inspector or his appointed designated representative will be coordinated through DCC Representative.

.2 Allow Chief Fire Inspector or his appointed designated representative unrestricted access to work site.

.3 Co-operate with Chief Fire Inspector or his appointed designated representative during routine fire safety inspection of work site.

.4 Immediately remedy unsafe fire situations observed by Chief Fire Inspector or his appointed designated representative.

1.17 SITE DELINEATION

.1 When there are occupants in the same building as construction or the building becomes occupied prior to substantial completion, the Contractor must maintain a 1-hour fire separation as required by Section 01 56 00 – Temporary Barriers and Enclosures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

NOT USED
Intentionally Left Blank

COMPANY NAME

HOT WORK PERMIT

CAN THIS JOB BE DONE WITHOUT HOT WORK, OR IN THE SHOP?
IF NOT, ENSURE PRECAUTIONS ARE IN PLACE!
MAKE SURE SPRINKLERS ARE IN SERVICE AND FIRE EXTINGUISHERS ARE READILY AVAILABLE!

This Hot Work Permit is required for any operation involving open flames or producing heat and/or sparks.
This includes, but is not limited to, Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch-Applied Roofing, and Welding.

Note: The Required Precautions are not optional. They are required for fire-safe hot work. Please explain all "No" responses below.

Instructions

The Permit-Authorizing Individual must:

a) Verify precautions listed at right (or do not proceed with the work)
b) Complete and retain this page
c) Give the second page to the person doing the work.

Who, When, and Where?

Hot Work Being Done By
☐ Employee
☐ Contractor

Date	**Job/Work Order No.**

Location/Building and Floor

Nature of Job/Object

Name of Person(s) Doing Hot Work

I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for work.

Signature of Permit-Authorizing Individual

Permit Expiration

Expiration Date	**Expiration Time**	☐ **AM** ☐ **PM**

Name of Assigned Fire Watch

THIS PERMIT IS GOOD FOR 24 HOURS ONLY!

Required Precautions Checklist

☐ Available Sprinklers in Normal Automatic mode and valve open.
☐ Hot Work equipment in good repair.

Assess 11 m/ 35 ft radial "sphere" of work for potential fire hazards:

☐ Floors, work level and below, cleaned or protected.
☐ All other combustibles removed or shielded from sparks.
- Clean horizontal surfaces (e.g. building structures, equipment, ducts, cable trays, etc.) above and below where possible.
- Remove flammable liquids, dust, lint, combustible waste, oil deposits, etc., where possible.
- If removal/cleaning is impractical, protect with fire-retardant covers, or shield with fire-retardant guards and/or curtains.

☐ Transmission or conveying of sparks to adjacent areas eliminated or protected.
- Tightly cover wall/floor openings with fire-retardant material.
- Where openings cannot be sealed, suspend fire-retardant tarpaulins to help protect areas beneath.
- Isolate or shut down fans and conveyors to prevent the capturing and conveying sparks to other areas.

☐ Explosive atmosphere eliminated or potential not present.

Work on walls, ceilings or enclosed equipment:

☐ Construction materials verified as noncombustible and without combustible covering or insulation.
☐ Combustibles on other side of walls relocated or protected.
☐ Enclosed equipment cleaned and protected from all combustibles.
☐ Containers purged of flammable liquids/vapors.

Fire watch/hot work area monitoring requirements:

☐ Continuous fire watch provided during and for *at least 30 minutes* after hot work, including all breaks.
☐ Fire watch supplied with suitable extinguishers/hoses.
☐ Fire watch trained in the use of fire equipment and sounding alarm.
☐ Area to be monitored hourly for a *minimum 30 minutes* after job is completed or longer if required.

Other precautions that may be required:

☐ Fire watch provided for adjoining areas, above, or below.
☐ Confined Space or Lock-Out-Tag-Out required/used.
☐ Area smoke or heat detection disabled to eliminate false trip.

Other: _____

Comments:

_____

_____

COMPANY NAME

HOT WORK PERMIT

WARNING!

HOT WORK IN PROGRESS
WATCH FOR FIRE!

1. **Person doing hot work**: Indicate time started and post permit at hot work location. After hot work, indicate time completed and leave permit posted for Fire Watch.
2. **Fire Watch**: Prior to leaving area, do final inspection, sign, leave permit posted and notify Permit-Authorizing Individual.
3. **Monitor**: After 30 mins, do final inspection, sign, and return to designated area.

Who, When, and Where?

Hot Work Being Done By
☐ Employee
☐ Contractor

Date	**Job/Work Order No.**

Location/Building and Floor

Nature of Job/Object

Name of Person(s) Doing Hot Work

I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for work.

Signature of Permit-Authorizing Individual

Time Started	☐ **AM** ☐ **PM**	**Time Finished**	☐ **AM** ☐ **PM**
Expiration Date		**Expiration Time**	☐ **AM** ☐ **PM**

Work area and all adjacent areas to which sparks and heat might have spread were inspected during the fire watch period and were found fire safe.

Signature of Fire Watch **Time**

Work area was monitored for a minimum of 6 hours following hot work and found fire safe.

Signature of Monitor **Time**

Required Precautions Checklist

General Precautions

☐ Available Sprinklers in Normal Automatic mode and valve open.
☐ Hot Work equipment in good repair.

Assess 35 ft radial "sphere" of work for potential fire hazards:
☐ Floors, work level and below, cleaned or protected.
☐ All other combustibles removed or shielded from sparks.
- Clean horizontal surfaces (e.g. building structures, equipment, ducts, cable trays, etc.) above and below where possible.
- Remove flammable liquids, dust, lint, combustible waste, oil deposits, etc., where possible.
- If removal/cleaning is impractical, protect with fire-retardant covers, or shield with fire-retardant guards and/or curtains.

☐ Transmission or conveying of sparks to adjacent areas eliminated or protected.
- Tightly cover wall/floor openings with fire-retardant material.
- Where openings cannot be sealed, suspend fire-retardant tarpaulins to help protect areas beneath.
- Isolate or shut down fans and conveyors to prevent the capturing and conveying sparks to other areas.

☐ Explosive atmosphere eliminated or potential not present.

Work on walls, ceilings or enclosed equipment:
☐ Construction materials verified as noncombustible and without combustible covering or insulation.
☐ Combustibles on other side of walls relocated or protected.
☐ Enclosed equipment cleaned and protected from all combustibles.
☐ Containers purged of flammable liquids/vapors.

Fire watch/hot work area monitoring requirements:
☐ Continuous fire watch provided during and for *at least 30 minutes* after hot work, including all breaks.
☐ Fire watch supplied with suitable extinguishers/hoses.
☐ Fire watch trained in the use of fire equipment and sounding alarm.
☐ Area to be monitored hourly for a *minimum 30 minutes* after job is completed, or longer if required.
☐ Arc welding
- Applicable Safety Equipment Required example Arc Shield

Other precautions that may be required:
☐ Fire watch provided for adjoining areas, above, or below.
☐ Confined Space or Lock-Out-Tag-Out required/used.
☐ Area smoke or heat detection disabled to eliminate false trip.

Other: _____

Comments:

_____

_____

_____

(must be retained as record of hot work activity for 6 months minimum).
Copy of this Permit to be send to William.MacDonald2@forces.ac.ca

COMPANY NAME

WARNING!

HOT WORK IN PROGRESS
WATCH FOR FIRE!

IN CASE OF EMERGENCY:		FIRE WATCH/MONITOR RECORD		
		Checked by (initials)	**Date**	**Time**
CALL:				
AT:				

Fire Safety Precaution & Hot Process Roofing Work Permit Reverse Side

Hot Work Permit

Hot Roofing _____ **Fiesta Heaters** _____

Other _____

Location _____

Fire Watch Required: ☐ **Yes** ☐ **No**

Site Personnel Standby: ☐ **Yes** ☐ **No**

Provided by Contractor: ☐ **Yes** ☐ **No**

Fire Safety Precautions

1. All fire incidents require an emergency response and must be reported immediately to Construction Engineering Help Desk by the following means:
    a. activate the nearest fire alarm pull station and call 911, give the site location and your name
    b. phone Construction Engineering Help Desk at local (416) 633-6200 Ext 3887
    c. contact DCC Project Manager/ Coordinator
2. The person initiating an alarm by fire alarm or telephone shall remain outside the building and direct the Fire Department members to the location of the fire.
3. Before commencing the hot work, ensure adequate fire extinguishers are available, and note the location of the nearest fire alarm and telephone.

4. When required, Construction Engineering Help Desk or RP Op's Toronto Chief Fire Inspector or designated Authority will be contacted to notify the monitoring company to place the fire alarm systems in test mode. The site foreman or delegated authority will be responsible to notify the occupants of the building or facility to call 911 incase of an emergency and to investigate any alarm while the system is in test mode. Systems will be placed back online at the end of the workday unless authorized by the Chief Fire Inspector or designated Authority.

I have received a copy of the Hot Work Permit, and understand and agree to comply with all requirements. RP Op's (Toronto) Help Desk shall be notified immediately of any change affecting the operation authorized by the Hot Works Permit and comply to **CSA WII 7.2 Safety** in Welding, Cutting and Allied Processor. **NFPA 51B** Fire Prevention in use of Cutting and Welding Processes. **NFPA 241,** Safe Guarding Roofing Operations. Failure to comply with these safety precautions and pertinent codes may result in you or your company being held for any damages incurred.

CONTRACTOR CHECKLISTS

FIESTA HEATERS, ROOFING TAR HEATERS, STEAM JENNIES

All users of this equipment must exercise extreme care

☐ All operators are thoroughly trained and qualified in the proper start-up, shut-down and refuel procedures of the equipment in accordance with manufacturers instructions and applicable regulations.

☐ Fire extinguisher(s) present at the unit(s).

HOT PROCESS ROOFING WORK PERMIT

SPECIAL PRECAUTIONS THAT SHALL BE ADHERED

HOT ROOF TARRING (TAR KETTLE)

☐ Kettles equipped with thermometer on gauge

☐ Kettle to be Manned Continuously whiles in use distance a minimum of 15 ft. (5m) from buildings and supplies.

☐ Kettle must have metal cover to smother flames

☐ Fire extinguisher (20-B rating) within 7.6 m of tar kettle

☐ Fire extinguisher (2-A: 20-BC rating) on roof being repaired

☐ Kettle watch man must keep area clear and orderly

☐ Only glass fiber roofing mops

☐ Mops to be removed from roof daily after workday

☐ Mops must be stored away from combustible materials by at least 3 m from any building

☐ All roofing material shall be stored in locations at least 3 m from any building

☐ Fire Watch will be supplied by contractor doing work and be maintained for 30 minutes (.5 hour) after work completed

HOT ROOFING PERMIT PROPANE CYLINDERS & TORCHES

☐ Propane cylinders used on roof to be secured in upright position at all times

☐ Propane cylinders must be at least 4.5 m away from kettle at all times

☐ Larger, mobile tanks must be at least 7.6 m away from kettle

☐ Stored propane tanks must be at least 3 m from building

☐ Fire extinguisher (2-A: 20-BC rating) within 6.1 m of torch-applied roofing equipment

☐ All contractor's materials must be at least 3 m from building

☐ If torches used, special pre-cautions should be made around any combustible material and building

☐ Fire extinguishers shall be readily available when propane torches are in use

☐ Fire Watch will be supplied by contractor doing work and be maintained for 60 minutes (1 hour) after torches have been extinguished

Note: This permit is to be returned to RP Op's Toronto Chief Fire Inspector

Part 1 References

1.1 FEDERAL

.1 Applicable Environmental Administrative Instructions (AI) will be provided to the Contractor after award.

- .1 Directorate Contaminated Sites (DCS) Contaminated Sites Instruction (CSI.004.001)- Imported Fill.
- .2 6.102 Spill Prevention and Response
- .3 6.103 Environmental Assessment
- .4 6.104 Species at Risk
- .5 6.108 Solid Waste Diversion

.2 Canadian Council of Ministers of the Environment (CCME). *Canadian Environmental Quality Guidelines, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Total Particulate Matter*, 2002.

.3 Canadian Council of Ministers of the Environment. (CCME). *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.* PN 1326. 2003.

.4 *Canadian Environmental Protection Act 1999*. Statutes of Canada 1999 Chapter 33.

.5 *Canada Labour Code- Canadian Occupational Health and Safety Regulations* (SOR/86-304). 2019.

.6 *Canada Occupational Health and Safety Regulations* (SOR/86-304). Canada Labour Code.

.*7* *Migratory Birds Convention Act, 1994.*

.8 *Species at Risk Act*, 2003. Chapter 25-29, no.3.

.9 *Transportation of Dangerous Goods Act* and pursuant regulations.

1.2 PROVINCIAL

.1 *Ontario* Water Resources Act. Revised Statutes of Ontario 1990, Chapter O.40.

.2 Technical Standards and Safety Act, 2000 and pursuant regulations, codes, and standards. Statutes of Ontario 2000, Chapter 16.

.3 Environmental *Protection Act*. Revised Statutes of Ontario 1990, Chapter E.19.

- .1 Ontario Regulation 102/94. Waste Audits and Waste Reduction Work Plans.
- .2 Ontario Regulation 103/94. Industrial, Commercial, and Institutional Source Separation Programs.
- .3 Ontario Regulation 153/04. Record of Site Condition. Part XV.1 of the Act.

.4 Ontario Regulation 347. General—Waste Management. Revised Regulations of Ontario 1990

.5 Ontario Regulation 362. Waste Management – PCB's.

.6 Ontario Regulation 903. Wells.

.7 Ontario Regulation 406/19. On-site and Excess Soils.

.4 Occupational *Health and Safety Act*. Revised Statutes of Ontario 1990, Chapter O.1.

.1 Ontario Regulation 490/09. *Designated Substances.*

.5 Ontario Ministry of Labour 2004. *Silica on Construction Projects.*

.6 Ontario Provincial Standard Specifications. Ontario Ministry of Transportation.

.1 OPSS 518. Construction Specification for Control of Water from Dewatering Operations.

.2 OPSS 801. Construction Specification for the Protection of Trees.

.3 OPSS 805. Construction Specification for Temporary Erosion and Sediment Control Measures.

1.3 MUNICIPAL

.1 Toronto Sewer Use By-laws

.2 Toronto Noise By-laws

1.4 RELATED SECTIONS

.1 Section 01 70 03 – Safety Requirements

1.5 SUBMITTALS

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

.2 Prior to commencing construction activities submit an Environmental Protection Plan to include the following:

.3 Spill Response Plan.

.4 Erosion and Sediment Control Plan.

.5 Soil Management Plan

.6 Hazardous Materials Management Plan.

.7 Waste Management and Disposal Plan.

.8 Waste Reduction and Source Separation Work Plan.

.9 Submit other data, information and documentation upon request by the DCC Representative and as stipulated elsewhere in this section.

1.6 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

.1 Investigations into the potential presence of designated substances and hazardous materials (i.e., DSS's and other testing activities) were not completed at the Denison Armoury (i.e., the "site") due to the age of construction (2002).

.1 The following is a summary of the Lead understood to exist at the site within the project area:

.1 Lead lined walls are present within the dental unit on the first floor of Denison Armoury.

.1 For bidding purposes, lead-containing wastes are to be assumed to be non-leachate toxic, non-hazardous waste and will be transported and disposed of as regular waste.

.2 Silica is present in all concrete materials throughout the project site.

.1 Disturbance of materials containing silica shall be conducted in accordance with the most current Ministry of Labour Guidelines "*Silica on Construction Projects*" (2011).

.2 The existing lamps contain mercury vapour.

.3 Disturbance of mercury-containing lamps shall be conducted in accordance with Environment and Climate Change Canada "*Code of Practice for the Environmentally Sound Management of End-of-Life Lamps Containing Mercury*" (2017)

.3 Immediately notify the DCC Representative of potential asbestos containing material (ACM) or hazardous material discovered during the work and not apparent from the drawings, specifications, or reports pertaining to the Work. Do not disturb such material.

.4 Inform all workers and sub trades of the presence of designated substances and hazardous materials identified in the contract documents.

1.7 GENERAL

.1 Comply with all federal, provincial, and municipal regulatory requirements and guidelines for environmental protection and natural resource conservation, including the References noted above.

.2 The Work site is subject to inspection by the Environment Officer, or designate, or the DCC Representative, without prior notice.

.3 Failure to comply with environmental requirements may result in a stop work order or assessment of damages commensurate with repair of damage.

.4 All references to payment referred to in the referenced OPSS are to be disregarded and do not apply to this contract.

.5 The Contractor will be unable to request extra funding to meet environmental requirements that are within the contract.

.6 It is the Contractor's responsibility to be aware of environmental requirements and the best management practices and pollution control measures necessary to meet them.

.7 Blasting is not permitted on DND property.

.8 No fixed or temporary fuel storage tanks are permitted.

.9 Fires and burning of rubbish are not permitted on DND property.

.10 In accordance with the City of Toronto noise by-law, noise due to construction is not permitted from 7 p.m. through 7 a.m., and all day on Sundays and statutory holidays.

1.8 SPILL RESPONSE PLAN

.1 A spill or release is an accidental discharge of a pollutant (solid, liquid or gas) into the environment. After a spill or release, always ensure human health and safety is protected above all else.

.2 Establish and submit to the DCC Representative a project-specific Spill Response Plan (SRP) prior to work on-site.

.1 The SRP shall include environmental response measures necessary to prevent and to mitigate a pollutant release on National Defence property.

.2 The SRP is to include: roles and responsibilities, contact information, spill notification procedure, emergency spill response measures, project and site-specific clean up measures for spills, waste disposal, restoration activities, and reporting.

.3 Identify storage locations of materials or wastes that may require emergency spill response. Identify spill control kit inventory and location(s).

.4 SRP shall identify equipment fuelling location, methodology and control measures. Refueling operations shall be conducted within a secondary containment area. Refuel equipment no closer than 30 metres from water bodies.

.3 The SRP is to be modified and updated as necessary. On-going assessments shall be performed during the progress of work identifying and documenting new or potential spill hazards and measures not previously known and identified.

.4 Prior to starting work, provide to the DCC Representative an inventory of hazardous material to be brought to the site, including volume or mass, and Safety Data Sheets (SDS).

.5 An Incident Report shall be completed by the Contractor for all spill or release incidents.

.6 Emergency Response:

.1 With respect to liquid spills, provide enough on-site equipment to control for one hour a liquid spill of 110% of any material brought on to—or handled at—the site.

.2 The minimum typical on-site spill control kit required to include absorbent pads, absorbent granular, nitrile gloves, garbage bags and/or pails with lids, and shovels. A spill control kit shall be located wherever significant quantities of materials or wastes that may require emergency spill response are used or stored.

.3 In the event of a spill, invoke Contractor’s Spill Response Plan and make immediate notifications as per Administrative Instructions.

.4 In the event of a spill into the natural environment, do everything practicable to prevent, eliminate, and ameliorate adverse effects, and to restore the natural environment.

.5 Emergency response planning is to include measures to escalate the response in the event of an emergency that exceeds on-site equipment capabilities.

.7 Display an information placard on all such material and equipment containing liquid products that will be located overnight or longer on DND property.

.1 Information placards to include: Contractor's name and address, contact person, emergency telephone numbers, and liquid contents.

.2 Post the information placard either on the exterior of the container, or on the dashboard of the vehicle, where applicable.

1.9 EROSION AND SEDIMENT CONTROL PLAN

.1 Establish and submit to the DCC Representative an Erosion and Sediment Control (ESC) Plan prior to work on-site.

.1 ESC Plan to identify type and location of site work that requires erosion and sediment controls.

.2 ESC Plan to identify type and location of erosion and sediment controls to be provided.

.3 The ESC plan shall include any and all erosion and sediment control measures necessary to ensure that sediment-laden water is not discharged from the site. This shall include but is not limited to sediment and erosion control measures indicated on the construction drawings.

.4 Contractor to maintain and submit a Work Record to the DCC Representative showing date of construction, repairs or alternations (initialization and completion) and removal of each erosion and sediment control system.

.1 Digital photographs of all ESC measures at time of construction, of major repair or alternation and just prior to removal.

.2 Checklists of all ESC measures in place at that time, recording date, time and persons inspecting ESC measures. Required repairs to be indicated on both checklist and on Work Record for each ESC measure.

.5 Dewatering of groundwater and surface water from excavations require a dewatering system and associated holding area to prevent sediment discharge to storm sewers, ditches and/or watercourses.

.6 Dewatering systems must be capable of controlling ingress of water during work, as well as prevent surface runoff into excavation.

.7 Include monitoring and reporting requirements to ensure that control measures are in compliance with ESC Plan, Federal, Provincial, and Municipal laws and regulations.

.8 The ESC plan is to be modified and updated as necessary if existing sediment and erosion control measures are proving inadequate.

.2 Contractor to designate a qualified individual to be Environmental Protection Coordinator (EPC).

.3 Prevent the release of water containing suspended materials into any waterways, storm drains, sanitary sewers, or drainage systems. Control disposal and/or runoff of water

containing suspended materials or other harmful substances in accordance with regulatory requirements.

.4 Berm barriers are not permitted.

.5 Store any stock piles of soil or fill material at least thirty metres from the water bodies, and protect them with either a heavy duty or light duty sediment barrier.

.6 Have additional sediment control materials readily available in case they are needed promptly for erosion and sediment control.

.7 Maintain sediment controls in good condition until the terrestrial vegetation has become re-established.

.8 Remove captured sediment before dismantling sediment barriers.

1.10 HAZARDOUS MATERIALS MANAGEMENT PLAN

.1 Establish and submit to the DCC Representative a Hazardous Materials Management Plan prior to work on-site.

.2 The HMAM Plan will address the details of **how** designated substance(s) and hazardous material(s) will be managed.

.1 Identify all municipal, provincial and federal permits and notifications required to complete the Work.

.2 Detail the approach to the execution of abatement work, including the equipment, tools, materials and actions to be employed for each type of hazardous material.

.3 Layout drawing identifying existing conditions with location of proposed enclosure(s), barricades and/or warning signs to restrict access, waste and personal decontamination facilities, and proposed location of waste bin.

.4 Emergency procedures to be followed in the event of: fire, breach of the enclosure, injury or accident within the enclosure, detection of airborne asbestos fibers outside the enclosure, spilling asbestos debris en-route to the waste bin.

.3 Inform all workers and sub trades of the presence of designated substances and hazardous materials identified in the contract documents.

.4 Immediately notify the DCC Representative of potentially containing asbestos material discovered during the work and not apparent from the drawings, specifications, or reports pertaining to the Work. Do not disturb such material.

.5 Fire alarm suspension can be coordinated. Notification to DCC Representative, via submission of completed Request for Fire Alarm Shut Down form, is required a minimum of 5 days in advance of temporary fire alarm shut down

.6 Written notification to DCC Representative required a minimum of 5 days prior to request to disable or isolate the mechanical ventilation system servicing the work area.

.7 All petroleum, oil, lubricants, and other hazardous materials are to be stored within secondary containment, in an appropriate container and in compliance with applicable legislation.

1.11 WASTE MANAGEMENT AND DISPOSAL PLAN

.1 Submit a Waste Management and Disposal (WMD) Plan to the DCC Representative before construction work begins at the site.

.2 The WMD Plan is to encompass:

- .1 Regular waste,
- .2 Construction waste,
- .3 Hazardous materials used in the course of the work, and
- .4 Hazardous materials and designated substance waste.

.3 The Plan is to comply with legislation, best practices, and with the requirements of the specifications.

.4 Provide evidence in the WMD Plan that all proposed temporary storage procedures, transport methods, and disposal sites are licensed where applicable.

- .1 Include copies of licenses.

.5 The WMD Plan is to include handling, storage, transportation, disposal, and emergency response. Specific minimum requirements to be addressed are listed below.

.6 Handling:

- .1 Ensure that staff are properly trained and equipped, in accordance with regulatory requirements.
- .2 Minimize handling and exposure to hazardous materials. Use control measures such as PPE and best practice procedures to address potential risks.
- .3 All waste products will be placed in suitable containers and labeled clearly.
- .4 Waste products are to be segregated by commodity and placed in separate containers based on class.
- .5 Similar waste products are not to be mixed together without prior approval from the DCC Representative.

.7 Storage:

- .1 Identify location(s) on site where wastes and hazardous materials wastes will be stored.
- .2 Store all petroleum, oil, lubricants, and other hazardous materials within secondary containment, or in an appropriate metal clad storage building with containment.
- .3 Store incompatible materials separated to prevent reaction.
- .4 Access to hazardous waste storage areas must be controlled through appropriate physical barriers, and limited to authorized personnel.
- .5 Site is to be kept neat and orderly at all times.

.8 Transportation:

- .1 Transportation of hazardous material must be in accordance with the *Transportation of Dangerous Goods Act*, by a licensed hauler and in approved containers.

.2 Hazardous Materials Waste shall **not** be released from a work site to a carrier that is not registered as a carrier for the specific Hazardous Materials Waste, nor shall it be released for delivery to a consignee that is not registered as a receiver for the specific Hazardous Materials Waste.

.9 Disposal:

.1 Identify the proposed waste receiver facilities and the anticipated waste shipment frequency for all wastes.

.2 Contractor is required to have painted waste sampled and analyzed for toxicity characteristic leaching procedure (TCLP) metals analysis in accordance with O. Reg. 347.

.1 Sample(s) are to be taken by a Qualified Person (as defined in O. Reg. 153).

.2 Results are to be provided to DCC Representative for review prior to disposal off-site.

.3 Dispose of leachate toxic lead-based paint as hazardous materials complying with legislation on transport and disposal.

.10 Transport and Disposal of Hazardous Waste and Designated Substances:

.1 Provide DCC Representative written notification of intent to transport of hazardous materials or designated substances off site, including but not limited to hazardous and liquid industrial waste (i.e. oils, solvents, waste fuels, used spill clean-up materials) or designated substance waste (i.e. asbestos, leachate toxic lead paint, mercury vapour in fluorescent light tubes).

.2 For shipments that require a waste generator number pursuant to O. Reg. 347, the Site waste generator number is required prior to removal offsite, and will be provided by the DCC Representative.

.3 Submit the following to the DCC Representative for review 10 days prior to transport:

.1 Description and approximate quantity of waste material, including substrate if applicable.

.2 Waste carriers' business name, address, contact information, and Ministry of Environment and Climate Change (MECP) Certificate of Approval(s) listing the hazardous materials approved for transport.

.3 Contractors proposed date and time for hazardous waste material shipment.

.4 Hazardous waste receivers name, address, contact information, and MECP Certificate of Approval(s) listing the hazardous materials approved for their receiving site.

.5 Correspondence from the approved hazardous waste receiver, indicating agreement and intent to accept the specified hazardous materials waste on specified date.

.4 Coordinate with the DCC Representative so that a DND 3K qualified Traffic Tech or equivalently TDG trained DND approved personnel is present at the time of shipment to review, sign and document the Hazardous Waste Disposal Manifest before leaving DND property.

.5 Submit the following to the DCC Representative for review within 48 hours following transport from the Site:

.1 Landfill weigh scale receipt/ticket for the disposal of waste.

.2 Completed waste manifests

.11 Disposal of Mechanical Flushing Liquids:

.1 Mechanical flushing liquids and mechanical liquids include any mechanical systems (piping, units, etc.) such as HVAC, glycol and includes residual liquid in current systems, cleaning with chemical inhibitors or cleaners, and flushing of new piping.

.2 Mechanical flushing liquids are to be assumed for bidding purposes to be hazardous waste and shall be transported and disposed of at a licensed facility in accordance with O. Reg. 347, and as described in this specification for Shipment and Disposal of Hazardous Waste and Designated Substances.

.3 In the event the contractor wants to discharge to a sanitary sewer the contractor must undertake the following items:

.1 Provide DCC Representative written notification of intent to discharge mechanical flushing liquids to sanitary sewer.

.2 Submit a sample of the liquid for laboratory analysis of all parameters in the City of Toronto Sewer Bylaw Schedule A including pH to a licensed laboratory.

.3 Submit a report to DCC Representative confirming that all materials proposed to be disposed to sewers comply with all legislative requirements, including the City of Toronto Sewer Use Bylaw.

.4 Coordinate with the DCC Representative to involve the Hazardous Materials Officer to authorize results from testing and sanitary discharge. Allow a minimum of 48 hours for review and authorization.

.5 Mechanical flushing liquids and mechanical liquids that are not authorized to be discharged to sanitary sewer shall be transported and disposed of at a licensed facility in accordance with O. Reg. 347, and as described in this specification for Shipment and Disposal of Hazardous Waste and Designated Substances.

.12 Special Wastes:

.1 Smoke Detectors:

.1 Undamaged and intact commercial Canadian Standards Association (CSA) and Underwriters Laboratories (UL) approved smoke detectors containing less than 185 kilo-Becquerel's of Americium-241 may be disposed of using local waste collection systems.

.2 *Photoelectric* smoke detectors are **not** subject to this special procedure.

.3 *Ionization chamber smoke detectors* (ICSDs) contain radioactive sources, and **are** subject to this special procedure.

.4 If surplus ICSDs are not to be re-used, remove the ICSDs from walls, ceilings, etc., without breakage, and, dispose of ICSDs at an approved landfill

.2 Fluorescent Lighting Tubes:

.1 Fluorescent lighting tubes contain mercury, which must not be released to the environment. Therefore, the tubes must not be broken.

.2 At a facility equipped to capture the mercury, recycle all surplus fluorescent lighting tubes that cannot be re-used.

.3 Mercury Thermostats and Switches:

.1 Many thermostats and switches contain mercury, which must not be released to the environment.

.2 At a facility equipped to capture the mercury, recycle all surplus mercury-containing thermostats and switches that cannot be re-used.

.13 Do not bury rubbish or waste materials on DND Property.

.14 Do not dispose of waste into any waterways, storm or sanitary sewers, drainage system, or onto land.

.15 Divert unused asphalt material from landfill to be reused offsite or recycled.

.16 All solid and liquid hazardous waste material generated by work are to be taken off Site and disposed of in a lawful manner and at appropriately accredited facilities.

.17 All expenses incurred for the handling, storage, analysis, transport and disposal/recycling of all wastes will be incurred by the Contractor.

1.12 SITE CLEARING AND PLANT PROTECTION

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

.2 Trees to be protected must have secure enclosures surrounding trees located a minimum of 1.5 metres from the trunk. Comply with standards in OPSS 801 "*Construction Specification for the Protection of Trees*".

.3 Protect roots of designated trees to dripline to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Root pruning may be required when working in close proximity to a tree's drip line. Clean saw cuts are required for all root pruning.

.1 Contractor must identify to the DCC Representative prior to excavations where the limit of the root cut will be for potentially impacted trees

.2 If it is determined to require root pruning, work shall be carried out in the presence of the DCC Representative.

.3 Once the limit of the cut has been defined, the Contractor shall not under any circumstances cut the tree roots a second time without the prior approval of the DCC Representative.

.4 Do not use tree protection areas for storage, stockpiling or any other purpose. Do not dump or flush any contaminants in areas of tree feeder roots.

.5 Obtain DCC Representative's approval where it is necessary to encroach onto protected area, prior to proceeding.

.6 Do not attach rigging cables to trees.

.7 Species at Risk tree species are not to be removed. If encountered, the Contractor is to stop work and notify the contract authority immediately.

1.13 WILDLIFE PROTECTION

.1 Nesting structures in trees for birds of prey are to remain intact without harm to the tree or the nest.

.1 If these features are encountered the Contractor is to stop work and notify the DCC Representative immediately for direction on how to proceed;

.2 Depending on the nest and bird species, setbacks for disturbance zones maybe defined.

.2 The Contractor will comply with the *Migratory Birds Convention Act,* 1994.

.3 Prior to work commencing, conduct ground surveys to ensure that wildlife are not nesting/denning on or immediately adjacent to the project site.

.1 Where found, immediately notify the DCC Representative;

.2 Maintain a minimum setback distance of 3 m from wildlife burrows/dens and maintain markers indicating wildlife burrows/dens.

1.14 SOIL MANAGEMENT

.1 The Contractor shall develop and implement a Soil Management Plan (SMP) prior to removing or importing any soil, fill material, or topsoil from DND Property. The Contractor will allow a minimum of 72 hours for review of the SMP and associated documentation by the DCC Representative.

.2 The Soil Management Plan (SMP) should include but not be limited to: Soil characterization plans, disturbed soils quantity estimates, water table excavation considerations, disposal options for soil that cannot remain on-site, imported fill plans, excavated stockpile location and management plan and soil re-use plans.

.3 Analytical parameters to be tested include at a minimum, metals, volatile organic compounds (VOC's), polycyclic aromatic hydrocarbons (PAH's), hydrocarbons and the per and polyfluoroalkyl substances (PFAS) for which Health Canada has issued guidelines or screening values.

.4 Soil management shall be in accordance with Contaminated Sites Instruction (CSI.004.001) Soil Management.

.5 For bidding purposes assume existing soil meets MECP Table 3.

.6 Contractor will dispose of any excess soil or fill material offsite, at a facility that is licensed to accept MECP Table 3 Industrial/Commercial Property Use standards outlined in the document entitled "Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", MECP, dated April 2011.

.7 Federal and provincial regulations will be adhered to for the export and import of fill and soil from the work site.

.8 The Contractor is required to obtain a Qualified Person (QP) as defined by O. Reg. 153/04 to sample and characterize any excess soil or fill material to be removed from or imported to the work site. The SMP will be signed by the QP.

.9 All samples will be analyzed by laboratories accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) and the Standards Council of Canada (SCC).

.10 Contractor will provide DCC with written documentation from the Receiving Site confirming that the excess soil can be accepted at their facility based on the analytical results.

.11 The Contractor will track the number of loads and the volume of soil removed from the Work Site on a daily basis and provide this written documentation to DCC on a daily basis.

.12 The Contractor will provide DCC with copies of all manifests, weight tickets and waste hauler and disposal licenses.

.13 Soil will be disposed of off-site at authorized facilities in accordance with applicable provincial legislation.

.14 Contaminated soil exceeding the MECP Table 3 Industrial/Commercial/Community Property Use standards removed from the site shall be transported in accordance with the Transportation of Dangerous Goods Act and Regulation 347.

.15 All excavated soils that will be temporarily stored must be placed on an impermeable surface and covered with an impermeable, properly secured tarp. All stockpiles must be inspected on a regular schedule and maintained.

.16 Water contained in the stockpiled soil must be properly contained and managed to prevent contaminated water from running off into the environment.

.17 Excavated soils may be reused at the site of origin as long as the chemical analysis results meet the CCME criteria for the applicable land use.

.18 Soils that cannot be reused according to the requirements within this section must be disposed of off-site. Soils leaving the DND establishment must meet the requirements and chemical analysis as determined through provincial regulation or the requirements of the receiving facility, whichever is most stringent.

.19 Before soil is taken off-site, the environmental quality of the soil must be disclosed to the owners of the receiving site. The owners of the receiving site must be provided with all required authorizations, permits and soil results for the type of soil being accepted. Written acceptance from the owners of the receiving site shall be received.

.20 Contaminated soil will be covered with 6-mil poly during precipitation events, in order to stop water intrusion and prevent contaminant migration.

.21 Minimize stripping of topsoil and vegetation.

.22 Avoid mixing top soil and underlying soil.

.23 Prevent disturbance and compaction of top soil and underlying soil from vehicles and heavy equipment using load dispersion materials.

.1 Immediately contact the DCC Representative.

1.15 IMPORTING FILL MATERIAL

.1 Fill means: organic material, soil, rock, stone, sediment deposited on land, as per O. Reg 347.

.2 Imported fill material applies to material that can pass a US#10 sieve. Gravel or rock that does not pass this must be from a virgin source and cannot be recycled material.

.3 Imported fill material in a quantity greater than 10m3 that can pass a US#10 sieve must be sampled by a Qualified Person at the Source Site prior to coming onto DND lands.

.4 Exempt material includes topsoil, gravel/aggregate larger than 2mm, crusher dust, gravel/aggregate with less than 20% fine particulate by volume.

.1 Submit written confirmation these materials are from a virgin source.

.5 Imported fill must meet the Canadian Council of Ministers of the Environment (CCME) Agricultural Land Use Soil Quality Guidelines.

.6 Any imported fill must be of 'virgin' material obtained from a licensed quarry or pit.

.7 If applicable, submit an Environmental Sampling Plan for imported fill that includes:

.1 The name of the licensed/permitted Source Site from which the imported material will be provided;

.2 Confirmation of the number of samples to confirm presence/absences of contaminants;

.3 A description of the imported material (aggregate, fill, topsoil) and proposed quantity;

.4 Analytical results to confirm the presence/absence of contamination

.5 At a minimum imported fill must be tested for: metals, VOCs, PAHs, hydrocarbons (including BTEX) and PFAS in compliance with O. Reg 153.

.6 The DCC Representative reserves the right to request additional testing of imported material from the Source Site and at the DND deposit site to satisfy requirements.

.7 All material brought to the site that does not meet the CCME Agricultural Land Use Guidelines will be removed from the property immediately at the Contractors cost.

1.16 UNANTICIPATED SOIL CONTAMINATION

.1 Refer to General Condition GC 4.4

.2 Should unanticipated soil contamination be discovered:

.1 Stop work, and assess the situation for safety.

.2 If situation does not appear to be safe, evacuate workers from area.

.3 If safe to do so, take immediate steps to control any spread of contamination, in accordance with Contractor's spill response plan.

.4 Immediately contact the DCC Representative for direction on how to proceed.

1.17 POLLUTION PREVENTION - WATER

.1 Protection of Storm Drains:

.1 Protect storm drains within work site and within roadway that borders work site (which may be outside of work site) against entry by sediment, debris, oil, or chemicals prior to any work on-site and maintain until completion of work.

.2 Discharge of sediment-laden water to storm sewer is not permitted.

.3 Catch basins and catch basin manholes within work site and within roadway that borders work site (which may be outside of work site) to have a double layer of geotextile placed under lids to prevent sedimentation of storm sewer system. The geotextile shall be maintained until the completion of work.

.4 Ditch inlets to be protected by straw bale flow check and sediment fences immediately upstream of ditch inlet until all areas draining into the ditch inlet have been permanently stabilized.

.2 Protection of Drinking Water:

.1 In the event of a water main break, leak or disruption, Contractor is to stop work and notify the DCC Representative immediately.

.2 Water mains are to be disinfected with a 12% solution of sodium hypochlorite specific for drinking water supplies.

.3 Coordinate with DCC Representative to have the Department of National Defence's water authority; Water, Fuel and Environment (WFE) witness the connection, disinfection and flushing procedures as well as collect residual chlorine and bacteria samples.

.4 Repeat disinfection procedure of water main as required in order to achieve acceptable test results.

.3 Protection of Groundwater Monitoring Wells:

.1 Protect any and all existing groundwater monitoring wells at the site.

.2 Make good any damage through the use of a qualified licensed well technician. Work to be completed in compliance with Ontario Regulation 903.

.3 The DCC Representative will, upon request, show the Contractor the location of all known monitoring wells.

.4 Protection of Waterbodies:

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Chlorinated drinking water is considered a deleterious substance by Environment and Climate Change Canada (ECCC).

.5 Contractor is to ensure that hydrant discharge does not enter or is likely to enter fish habitat by direct or indirect discharge with measurable levels of free reactive chlorine (CCME).

.6 Discharging to land is permitted subject to the use of matting to prevent loss of soil or vegetation ensuring that items above are complied with.

.7 Comply with requirements of OPSS 182 "General Specification for Environmental Protection for Construction in Waterbodies and on Waterbody

Banks". A written strategy is required by paragraph 182.04 to be submitted to the DCC Representative before commencing work on site. Disregard references to OPSF 182-1.

1.18 POLLUTION PREVENTION - LAND

.1 Take all measures necessary to prevent dust and mud tracking on adjacent roads and streets.

.1 Use mechanical sweepers as often as necessary to keep adjacent roads and streets clean of dust and mud that is deposited from this project.

.2 Spray water to minimize the release of dust from paved areas or exposed soils.

.1 Chemical dust suppressants to be used only as approved by the DCC Representative.

.3 Maintain temporary erosion and pollution control features installed under this Contract, and those in place pre-dating the Contract.

.4 If materials are to be transported between sites, prevent any loss of material during transit.

.5 Cover or wet down dry materials or rubbish to prevent blowing dust and debris.

.1 Cover or otherwise contain loose materials that have potential to release airborne particulates during their transport, installation or removal.

.2 Stabilize soil and other material storage piles against wind erosion.

.3 Minimize vehicle traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material.

.4 Avoid excavation, or other construction activity with potential to release airborne particulates, during windy and prolonged dry periods.

.5 Restore disturbed areas as soon as possible to minimize the duration of soil exposure.

.6 Lawn care pesticides are prohibited.

.7 Secure covers on waste bins and dumpsters at the end of each working day so as to prevent unauthorized use.

.8 Secure covers on waste bins and dumpsters so as to shed rain.

1.19 POLLUTION PREVENTION - AIR

.1 Prevent material from sandblasting, saw-cutting, and other operations from contaminating air beyond application area, by providing temporary enclosures.

.2 Use new or well-maintained heavy equipment and machinery, preferably fitted with muffler/exhaust system baffles, engine covers.

.3 Comply with operating specifications for heavy equipment and machinery.

.4 Minimize the operation and idling of vehicles and avoid operating and idling vehicles and gas-powered equipment during smog advisories.

.5 Control emissions from equipment and plant to conform with federal, provincial, and municipal requirements.

.6 Products and Materials:

.1 Use products and materials that are as free as possible of noxious or toxic volatile emissions or emissions of irritating or toxic particles, so that the interior air of the completed building is as pollution-free as possible. For example, products emitting benzene, mercury, lead, or other known toxic compounds are not acceptable.

.2 Where odourless products are not available, choose products where possible so that odours are minimized. Set ventilation levels during the construction period sufficiently high to encourage the off-gassing of materials to their minimum levels prior to occupancy of the building, where possible.

.3 Choose products for installation within the air-handling and distribution systems to minimize the introduction of pollutants into the fresh air supply to the building.

.4 Remove oily rags and other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.

1.20 ARCHAEOLOGY

.1 Refer to General Condition GC 6.3

.2 Artifacts can include broken housewares, garbage, bits of uniforms, ships or boats, timber, ammunition, building materials, building foundations, cut stone, stone drains, animal bones, human bones, coins or tokens, ash pits, fire pits, encampments, Aboriginal materials, pottery, etc.

.3 During excavations, watch for the following: patterns; off-colour soils (either light or dark); any sorts of the artifacts noted above.

.4 Excavations must coincide with the archaeology the field period from April until November.

.5 Upon discovery of artifacts, stop work in that area and notify the DCC Representative.

.6 A licensed archaeologist will monitor all excavation work or disturbance of the existing ground. The DCC Representative will pay for the cost for the archaeologist.

.1 Schedule the archaeologist’s monitoring of the excavation work and coordinate through the DCC Representative.

.2 A minimum 48 hours notice is required for any excavation in which archaeological monitoring has been stipulated.

.7 Expect interruptions of excavation work by the archaeologist of up to 2 hours per day. Interruptions for longer periods will be negotiated between the General Contractor and the DCC Representative, in accordance with the General Conditions of the contract.

1.21 UNANTICIPATED UNEXPLODED ORDNANCES (UXO)

.1 Should unanticipated UXO be discovered:

.1 Stop work, and assess the situation for safety.

.2 If situation does not appear to be safe, evacuate workers from area.

.3 If safe to do so, take immediate steps to section off the area of the UXO with barriers to access.

.4 Immediately contact the DCC Representative who will notify authorities.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

REFRIGERATION AND AIR CONDITIONING SERVICE LOG

For this type of work…	*…complete these items in these Sections*			
	A	**B**	**C**	**D**
Commissioning	All	All	1.0, 1.1, 1.2, 3.0, 4.0	1 through 6, 13
Leak Test	All	All	All	1, 2, 3, 5, 6, 7, 13
Servicing of Sealed Systems Only (Refrigerant Circuit)	All	All	All	1 through 9, 13
De-Commissioning	All	All	Not applicable	1, 2, 5 through 13

SECTION A. ☐ **Commissioning** ☐ **Leak Test** ☐ **Servicing** ☐ **Decommissioning**

Building Name/No._____ Operator_____

Room No/Location_____ Owner _____

Owner Address _____

Equipment/System Description_____

Local Equipment ID No._____

SECTION B.

Work Order No._____ Service Date _____

Model Number_____ Serial Number _____

Manufacturer _____

Contracting Company/Technician Employer_____

Technician/Contractor Name (print) _____

Technician's Trade Certificate No. _____ Expiry Date_____

SECTION C.

ACTIVITY	YES	NO	COMMENTS
1.0 Leak Test Performed			Date of Last Leak Test:
1.1 Leak(s) Detected			Approximate Release Amount:
1.2 Leak(s) Repaired			Date repaired:
2.1 Halocarbon Recovered From System			Quantity:_____(kg) (g) (lbs) (oz)
2.2 Halocarbon Isolated in System			
3.0 System Charged With Halocarbon			FACTORY ☐ FIELD ☐ Amount halocarbon added:_____(kg) (g) (lbs) (oz)
4.0 Leak Test Method			Enter Method Used:

SECTION D.

1. Technician's ODP Card No. _____ Expiry Date_____
2. Type of Halocarbon_____
3. Halocarbon Charge Capacity _____ (kg) (lb) (oz). Amount of Halocarbon Charged _____ (kg) (lb) (oz)
4. Charged by: ☐ Contractor ☐ Factory ☐ DND (give DND cylinder ID No._____)
5. Cooling Capacity of System _____ (tonnes) (BTU) (kW)
6. Halocarbon charged per circuit (1)_____ (2)_____ (3) _____ (4) _____ (5) _____ (kg) (lb) (oz)
7. Type of Halocarbon Recovered _____
8. Amount of Halocarbon Recovered _____ (kg) (lb) (oz)
9. Recovered into cylinder owned by: ☐ Contractor ☐ DND (give DND cylinder barcode No.)
10. Final Destination of Equipment_____
11. Final Destination of Halocarbon _____
12. Final Destination of Refrigerant Oil_____
13. Technician Signature _____

****RELEASES**** *If there has been a release from the system, fill out the "Halocarbon/Halon Release Report" (Appendix 1 to AI 6.106) and return to the Local Garrison Environment Office within 24 hours of discovery.*

Questions regarding this form can be directed to the local Garrison Environment Office.

Copies: (1) attach to equipment (2) technician copy (3) FM Contractor (Gar Tor) or ESS HVAC Team Leader (Gar Pet) coyp (4) Local ESS Staff copy

Part 1 General

1.1 REFERENCES AND CODES

.1 Perform the Work in accordance with National Building Code of Canada (NBC) including all amendments and all governing agencies for individual trades up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, the more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: Demolition asbestos is hazardous to health. Should material resembling asbestos be encountered in course of demolition work, immediately stop work and notify DCC Representative.

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify DCC Representative.

.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify DCC Representative.

1.3 ADDITIONAL DRAWINGS

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 78 00 – Closeout Submittals

1.2 PRECEDENCE

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

1.3 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Equipment and system adjust and balance.

1.4 INSPECTION

.1 Review and inspection of the Work as per GC 2.5 of the General Conditions.

.2 Give timely notice requesting inspection if the Work is designated for special tests, inspections or approvals by DCC Representative instructions, or law of Province of Work.

.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.

.4 DCC Representative will order part of work to be examined if work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such work and pay cost of examination and correction. If such work is found in accordance with Contract Documents, DCC Representative shall pay cost of examination and replacement.

1.5 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by the Contractor for purpose of inspecting and/or testing portions of the Work. Cost of such services will be borne by the Contractor. Cost of such services will be included in the Tender Price.

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

.3 Employment of inspection/testing agencies does not relax responsibility to perform the Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by DCC Representative at no cost to DCC Representative/Owner. Pay costs for retesting and re-inspection.

1.6 ACCESS TO WORK

.1 Allow inspection/testing agencies access to the Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.7 PROCEDURES

.1 Notify appropriate agency and DCC 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.

1.8 REJECTED WORK

.1 Remove defective work, whether result of poor workmanship, use of defective products or damage and whether incorporated in the Work or not, which has been rejected by DCC 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 DCC Representative it is not expedient to correct defective work or work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between work performed and that called for by Contract Documents, amount of which will be determined by DCC Representative.

1.9 REPORTS

.1 Submit (1) electronic copy of inspection and test reports to DCC Representative.

.2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.10 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 DCC Representative and may be authorized as recoverable.

1.11 MOCK-UPS

.1 Prepare mock-ups for work specifically requested in specifications. Include for work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to DCC Representative and as specified in specific Section.

.3 Prepare mock-ups for DCC Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups 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.

.5 Approved mock-ups may remain as part of the Work.

1.12 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PRECEDENCE

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

1.2 RELATED SECTIONS

.1 Section 01 35 35 – DND Fire Safety Requirements

.2 Section 01 52 00 – Construction Facilities

.3 Section 01 56 00 – Temporary Barriers and Enclosures

1.3 POWER AND WATER SUPPLY

.1 DND can provide free of charge temporary electric power construction purposes.

.2 If the potable water is available, the DND can provide continuous supply of potable water for construction use.

.3 The DCC Representative will determine delivery points and quantitative limits. The DCC Representative's written permission is required before any connection is made. Connect to existing power supply in accordance with Canadian Electrical Code.

.4 Provide at no cost to DND, all Equipment and temporary lines to bring these services to the project site.

.5 Supply of temporary services by DND is subject to DND requirements and may be discontinued by DND at any time without notice, without acceptance of any liability for damage or delay caused by such withdrawal of temporary services.

.6 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 Lx.

.7 Use of temporary power by DND is not to be used for temporary heating or ventilation. Contractor will arrange and pay for required temporary heating and ventilation during construction.

.8 Shut downs of existing electrical building services must be kept at a maximum of 2 hrs. Notify the DCC Representative 10-working days prior to the shut down day.

.9 The Contractor shall provide all necessary labour and materials to provide temporary power to all buildings involved during any shut downs lasting longer than the specified time frame.

.10 The Contractor shall provide GFI's for all tools and extension cords.

1.4 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.5 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.6 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Consult DCC Representative to see if permanent heating system of building may be used when available. Be responsible for damage to heating system if use is permitted.

.7 On completion of Work for which permanent heating system is used, replace filters.

.8 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.9 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone, fax, data hook up, lines and equipment necessary for own use and use of DCC Representative.

1.8 FIRE PROTECTION

.1 Refer to Section 01 35 35 – DND Fire Safety Requirements.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PRECEDENCE

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

1.2 RELATED SECTIONS

.1 Section 01 51 00 – Temporary Utilities

.2 Section 01 56 00 – Temporary Barriers and Enclosures

1.3 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

1.4 REFERENCES

.1 CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.

.2 CGSB 1.59, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)

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

.2 CSA-0121-M, Douglas Fir Plywood.

.3 CAN/CSA-S269.2-M, Access Scaffolding for Construction Purposes.

.4 CAN/CSA-Z321, Signs and Symbols for the Occupational Environment.

1.5 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Indicate use of supplemental or other staging area.

.3 Provide construction facilities in order to execute work expeditiously.

.4 Remove from site all such work after use.

1.6 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs. Remove promptly when no longer required.

.3 Scaffolding system designs above certain heights will have to be stamped by a Professional Engineer registered in the Province of Ontario.

1.7 HOISTING

.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with subcontractors for their use of hoists.

.2 Hoists and cranes to be operated by qualified operator.

.3 Provide proof of insurance for crane subcontractors.

1.8 ELEVATORS

.1 Designated existing and permanent elevators may not be used by construction personnel and transporting of materials.

1.9 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.10 CONSTRUCTION PARKING

.1 DCC Representative will determine if parking is available on site.

.1 If available, parking will be permitted on site provided it does not disrupt performance of Work. Maintain and administer these spaces as directed.

.2 Provide and maintain adequate access to project site.

.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.12 SANITARY FACILITIES

.1 DCC Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

.3 Permanent facilities may be used on approval of DCC Representative.

1.13 CLEAN-UP / SITE MAINTENANCE

.1 Maintenance / restoration of existing site features within contractor compounds are the responsibility of the Contractor, including but not limited to:

.1 Snow / Ice removal on roadways and walkways
.2 Clean dirt or mud tracked onto paved or surfaced roadways.
.3 Grass cutting.
.4 Clean-up of flower beds and gardens.
.5 Restoration of grassed areas.

.2 Remove construction debris, waste materials, packaging material from work site daily.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PRECEDENCE

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

1.2 RELATED SECTIONS

.1 Section 01 51 00 – Temporary Utilities

.2 Section 01 52 00 – Construction Facilities

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.3 SECTION INCLUDES

.1 Barriers.

.2 Environmental Controls.

.3 Traffic Controls.

.4 Fire Routes.

1.4 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M, Douglas Fir Plywood.

1.5 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities and as indicated.

1.6 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.7 HOARDING

.1 Erect temporary site enclosure using minimum 1.8 m high interlocking self-supporting fence. Provide one lockable truck gate and one lockable man gate. Maintain fence in good repair. Provide ballast to fence base and dust screening on full perimeter of fencing.

.2 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

1.8 HOARDING WITHIN OCCUPIED BUILDING

.1 When there are occupants in the same building as construction or the building becomes occupied prior to substantial completion, the Contractor must maintain a 1 hour fire separation between the site and the occupied portion of the building.

1.9 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.10 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.11 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.12 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.13 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.14 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.15 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with DCC Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PRECEDENCE

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

1.2 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

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 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.

.3 Should disputes arise as to quality or fitness of products, decision rests strictly with DCC Representative based upon requirements of Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 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 DCC 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 notify DCC Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, DCC 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 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

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

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

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and gypsum board or metal flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of DCC Representative.

.9 Touch-up damaged factory finished surfaces to DCC Representative 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 Owner will be paid for by Owner. 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 Notify DCC Representative in writing, of conflicts between Specifications and manufacturer's instructions, so that DCC Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes DCC 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 DCC 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. DCC Representative reserves 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 DCC 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 inform DCC Representative if there is interference. Install as directed by DCC 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 DCC 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 of DCC Representative.

1.16 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute work in accordance with Section 01 14 00-Work Restrictions.

.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

Part 3 Execution

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 SUBMITTALS

.1 Submit to the DCC Representative copies of the following documents, including updates issued:

- .1 Site-specific Health and Safety Plan (including hazard assessment) prior to commencement of work on the work site.
- .2 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
- .3 Accident or Incident Reports, within 24 hrs of occurrence.

.2 Submit other data, information and documentation upon request by the DCC Representative as stipulated elsewhere in this section.

1.2 COMPLIANCE REQUIREMENTS

.1 Comply with the latest edition of the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act.

.2 As a minimum, comply with the Canada Labour Code Part II Part 125(1)(l) and 125(1)(w), and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.3 A copy of the Canada Labour Code Part II may be obtained by contacting:

Canadian Government Publishing
Communication Canada
Ottawa, Ontario, K1A 0S9
Telephone: (613) 941-5995 or 1-800-635-7943)
Catalogue No. L31-85-2003 (E or F)
ISBN 0-660-18897-X

A condensed version can be viewed on-line at http://laws.justice.gc.ca/en/index.html

.4 Where the Garrison Toronto Health and Safety Program may stipulate more stringent requirements than identified in the Canada Labour Code Part II and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code, the DCC Representative shall provide the Contractor with the applicable excerpts from the Health and Safety Program.

.5 Observe and enforce construction safety measures required by:

- .1 National Building Code of Canada (latest edition).
- .2 Provincial Worker's Compensation Board.
- .3 Municipal statutes and ordinances.

.6 In event of conflict between any provisions of above authorities the most stringent provision shall apply. Should a dispute arise in determining the most stringent requirement, the DCC Representative shall advise on the course of action to be followed. In the case of direct conflict between the federal and provincial/territorial regulatory Health and Safety instruments noted above in paragraphs 1.2.1 and 1.2.2, the Canada Labour Code shall be the default regulatory instrument.

.7 Provide and maintain Worker's Compensation Board coverage for all employees for the duration of the contract. Prior to commencement of the work, at the time of Interim Completion and prior to final payment, provide to the DCC Representative a letter [certificate] of Clearance from the Workers' Compensation Board indicating that the Contractor's account is in good standing.

1.3 RESPONSIBILITY

.1 In accordance with the Canada Labour Code Part II, the obligations and responsibilities for safety reside with the Department of National Defence. The DCC Representative on behalf of the Department of National Defence will monitor safety on the Work Site in accordance with the Canada Labour Code Part II and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.2 Carry out work placing emphasis on health and safety of the public, building employees, site personnel and protection of the environment.

.3 The Contractor is responsible to enforce compliance by its employees and sub-contractors accessing the Work Site with safety requirements of Contract Documents, and all applicable federal, provincial, local statues, regulations, and ordinances.

.4 The Contractor is responsible to manage safety of the work site to ensure that any persons, including but not limited to, building employees and the general public circulating adjacent to the work operations are protected against harm due to the extent that they may be affected by conduct of the work.

.5 Contractors are required under the Canada Labour Code Part II to conduct site specific occupational health and safety meetings. For the purpose of this contract, the Contractor is responsible to establish and conduct site specific occupational health and safety meetings on a monthly basis, with no less than one (1) meeting for contracts that are less than one (1) month in duration.

.6 The Contractor is responsible to record and post minutes of all site specific occupational health and safety meetings in plain view on the work site. Make copies available to the DCC Representative upon request.

.7 The Contractor is responsible to designate a competent person or persons to be present on site at all times during the work as the site health and safety representative. The designated person(s) shall be required to conduct regularly scheduled safety inspections of the work site as follows:

.1 Informal inspections on a minimum weekly basis noting deficiencies and remedial actions taken in a log book or diary. Make the log book and/or diary available for the DCC Representative's viewing as requested.

.2 Formal inspections on a minimum monthly basis, with no less than one (1) inspection for contracts that are less than one (1) month in duration and is provide a written report to the DCC Representative for each formal inspection, document deficiencies, remedial action needed and assign responsibility for rectification to the appropriate party.

.8 The Contractor is responsible to ensure Contractor employees and sub-contractors accessing the work site are in possession of and wear appropriate personnel protective equipment (PPE).

.9 Daily or weekly field level hazard assessment shall be completed by the Contractor and communicated to all employees and occupant representative with the intent to identify known and potential hazards associated with current and future work tasks. The Contractor shall establish and implement control measures for known and potential hazards that have been identified.

.10 Work outside of an enclosed room that encroaches into a hallway or similar area whereby building occupants may be present shall adequately protected. This shall include controlled access/egress as well as ensuring the work being performed does not pose hazards ie dust, debris, excessive noise, etc to building occupants.

.11 Should an unforeseen or peculiar safety related hazard or condition become evident during performance of work, the Contractor is responsible to immediately take measures to rectify the situation and prevent damage or harm and to advise the DCC Representative verbally and in writing of the hazard or condition.

1.4 SITE CONTROL AND ACCESS

.1 The Contractor shall be responsible after consultation with the DCC Representative to control all work site access points and work site activities.

.2 Delineate and isolate the work areas where possible from adjacent and surrounding occupied areas to separate the construction from the building occupants with a rigid physical and visual separation or protection. Separation shall also include measures to control hazards (dust, debris, noise, etc) being generated to minimize risk to building occupants. Infrastructure will remain operational, occupied and utilized by the Department of National Defence throughout the duration of the work of this contract.

.3 On behalf of the Department of National Defence, Defence Construction Canada will be performing a safety monitoring function as required by the Canada Labour Code in order to verify that the Contractor is fulfilling all of the required responsibilities and duties as identified above. This monitoring function will be performed throughout the duration of the contract.

.4 Erect signage at access points and at other strategic locations around the work site clearly identifying the work site area(s) as being "off-limits" to non-authorized

persons. Signage must be professionally made with well understood graphic symbols and is not to be used as advertising but for the specific use as related to site safety and key contact information.

.1 Information to be provided on the signage is as follows:

Project Name/Description:

Contractor Company Name:

Project Superintendent's Name/Phone No.:

DCC Point of Contact Name/Phone No.:

1.5 FILING OF NOTICE

.1 File Notice of Project and any other required Notices with the Provincial/Territorial Authorities prior to commencement of the work. Provide the DCC Representative with a copy of the filed Notice(s) prior to commencement of the work.

1.6 PERMITS

.1 Obtain permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction.

.2 Post all permits, licenses and compliance certificates on work site and provide copies to the DCC Representative.

1.7 PROJECT/SITE CONDITIONS

.1 Refer to Section 01 35 43 Environmental Protection for details on Designated Substances and Hazardous Materials.

.2 Contractors are required to be aware of the known hazardous substances and/or hazardous conditions and are to include in their tender price all work associated in working with, in and around the hazards.

.3 Obtain from the DCC Representative, a copy of the MSDS data sheets of the existing hazardous materials stored on site or being used by facility personnel in the course of their operations.

.4 The above lists shall not be construed as being complete and inclusive of all safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.8 MEETINGS

.1 Prior to commencement of work attend a pre-commencement meeting conducted by the DCC Representative. Ensure minimum attendance by the Contractor's site superintendent. The DCC Representative will arrange to have the Contractor's site superintendent and designated site health and safety representative briefed on the specific content of the Base Health and Safety Program where it requires more stringent requirements than stipulated in the Canada Labour Code Part II and the

Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code. The DCC Representative will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.

.2 The Contractor is responsible to conduct safety meetings as required by paragraph 1.3.5 above.

1.9 HEALTH AND SAFETY PROGRAM

.1 The Canada Labour Code Part II and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code provides the Contractor with the overall program of health and safety for operations on the project site. For the purpose of this contract, the Contractor shall perform a hazard assessment of the work site in order to acknowledge, assess and address the hazardous substances and/or hazardous conditions known and identified in paragraph 1.7, and to develop a written site-specific Health and Safety Plan as related to these known hazards. The Contractor shall be required to write the site-specific Health and Safety Plan for review by the DCC Representative. The site-specific Health and Safety Plan shall include provisions for on-going hazard assessments performed during the progress of work identifying and documenting new or potential health risks and safety hazards not previously known and identified.

.2 The format of the site-specific Health and Safety Plan shall at a minimum for the purpose of this contract contain the following three (3) parts:

.1 Part 1: Detailed description of the project and a list of individual health risks and safety hazards identified by the contractor's detailed site specific hazard assessment(s).

.1 List of critical construction activities to be communicated with the DCC Representative which could affect infrastructure operations, or pose a risk to the health and safety of the occupants, Contractor employees and to the general public.

.2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of the Plan. Describe the engineering controls, personnel protective equipment, safe work practices and any other applicable means to be implemented and followed when performing work related to each identified hazard or risk. Part 2 of the Plan must also include:

1. In the management of safety responsibility, provide the name of the competent employee(s) assigned as site safety representative(s) who is (are) to be present on site at all times during work.
2. A written statement, where applicable, that the Contractor has been made aware of known hazards and hazardous substances referred to under paragraph 1.7, and that the Contractor will inform all Contractor employees, sub-contractor employees and any persons affected or potentially affected by the work of this contract of the known hazards.
3. A written statement confirming that Contractor employees, sub-contractors and other authorized persons accessing the work site are trained and have been fully instructed in:

.1 Safe operation of tools and equipment.

.2 Proper wearing and use of personnel protective equipment (PPE) as applicable to the purpose and activities to be conducted on site.

.3 Safe work practices and procedures to be followed during the performance of their given work tasks or function on the work site.

.4 Work site conditions and minimum site safety rules provided through safety orientation sessions.

4. A copy of the Contractor's health and safety policy and disciplinary policy that will be followed to enforce compliance by Contractor employees and sub-contractors with safety requirements of contract documents, applicable regulations and the Contractor's site-specific Health and Safety Plan.

.3 Part 3: Emergency Measures and Communications Procedures as follows:

.1 Emergency Measures: On-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an accident or incident. Procedures to be specific and relevant to identified hazards. Measures to complement and be integrated with the Facility Emergency Response Plan(s) in place at site.

.2 Confirmation of the location of nearest fire alarm activation box and telephone.

.3 A map depicting the location of the nearest emergency medical facility.

.4 The location of emergency equipment and supplies including but not limited to first aid kits, emergency eye wash stations, spill kits/equipment and fire extinguishers. Including confirmation that equipment and supplies have been verified/certified for use.

.5 The names of all persons assigned responsibility by the Contractor as a first aid attendant at the project.

.6 An inventory listing the common name of all controlled products (WHMIS Products) that the Contractor knows or intends to bring to the project site. List to be updated as necessary as project proceeds.

.7 A copy of the Contractor's accident/incident investigation policy and incident and accident report form(s) to be used by the Contractor to document any incident or accident that might occur during the course of project work

.8 Communication procedures:

.1 List of names and telephone numbers of designated official(s), to be contacted should an incident or emergency situation occur, including the following:

.1 Contractor and all sub-contractors.

.2 Federal and Provincial departments and local emergency resources organizations, as applicable to the hazards identified and type of accident or incident which might occur, in accordance with applicable laws and regulations.

.2 Procedures implemented at site to communicate and share information between Contractor employees, sub-contractors, and the Contractor on work site activities, and in particular those which might endanger employees and facility occupants and infrastructure users

.3 The procedure to be followed by contract personnel to initiate emergency response by fire, police and medical personnel.

.4 Post a copy, including all updates, of the Health and Safety Plan in a common visible location at work site.

.3 Provide one copy of the site-specific Health and Safety Plan to the DCC Representative prior to commencement of work on the work site. The copy provided to the DCC Representative is for the purpose of review against both Canada Labour Code Part II and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code and the contract requirements related to the known hazardous substances and/or hazardous conditions.

.4 Provide and maintain one copy of the site-specific Health and Safety Plan at the work site, in a location that is easily accessible by all Contractor employees, sub-contractor employees and any persons affected or potentially affected by the work of this contract.

1.10 MINIMUM SITE SAFETY RULES

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons accessing the work site:

.1 Wear PPE appropriate to the function and task while on the work site.

.2 Immediately report unsafe activities, conditions, near miss accidents, injuries and damages.

.3 Maintain the work site in a tidy condition.

.4 Obey warning signs and safety tags.

1.11 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as required by Canada Labour Code Part II and the Ontario Occupational Safety and Health Act, and the Regulations made pursuant to the Act.

.2 For the purpose of this contract immediately investigate and provide a report to the DCC Representative on incidents and accidents that involve:

.1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s).

.2 Near misses or other incidents

.3 Exposure to toxic chemicals or substances.

.4 Property damage.

.5 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.

1.12 RECORDS ON SITE

.1 Maintain on site a copy of the safety documentation as specified in this section and any other safety related reports and documents issued to or received from the authorities having jurisdiction.

.2 Upon request, make copies available to the DCC Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 32 16.07 – Construction Progress Schedule - Bar Chart

1.2 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Province of work, acceptable to DCC Representative.

1.3 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on Drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to DCC Representative.

.4 Report to DCC Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

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

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

.3 Prior to any excavation, the Contractor is to obtain all Utility line locates.

1.6 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 DCC 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 DCC Representative.

1.7 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.

1.8 SUBMITTALS

.1 Submit name and address of Surveyor to DCC Representative.

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

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform to Contract Documents.

1.9 SUBSURFACE CONDITIONS

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

.2 After prompt investigation, should DCC 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

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 00 10 05 – General Instructions

.2 Section 01 33 00 – Submittal Procedures

.3 Individual product Sections: cutting and patching incidental to work of section. Advance notification to other sections required.

1.2 SUBMITTALS

.1 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of any element of Project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of any operational element.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.2 Include in request:

- .1 Identification of Project.
- .2 Location and description of affected work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

Part 2 Products

2.1 MATERIALS

.1 Required for original installation.

2.2 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of Project from damage.

.5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

Part 3 Execution

3.1 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other work.

.3 Uncover work to install work that was to be concealed.

.4 Remove and replace defective and non-conforming work.

.5 Remove samples of installed work for testing.

.6 Provide openings in non-structural elements of work for penetrations of mechanical and electrical work.

.7 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

.8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools are not allowed on masonry work without prior approval.

.10 Restore work with new products in accordance with requirements of Contract Documents.

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

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

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

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas, except where indicated otherwise.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

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

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 35 43 – Environmental Procedures

.3 Section 01 77 00 – Closeout Procedures

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.3 SECTION INCLUDES

.1 Project cleanliness.

.2 Final cleaning.

1.4 PROJECT CLEANLINESS

.1 Contractor to comply with applicable requirements of Section 01 35 43 regarding the storage, transport and disposal of construction waste materials.

.2 Contractor to provide on-site containers for collection of waste materials and debris. Containers to be provided by a licensed hauler.

.3 Contractor to submit a waste management and disposal plan in accordance with Sections 01 33 00, 01 35 43, & 01 74 21 for approval by DCC Representative. Storage, transport and disposal of construction waste and debris to be in accordance with approved plan.

.4 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other contractors.

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

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

.7 Provide on-site containers for collection of waste materials and debris.

.8 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

.10 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

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

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

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

.14 Contractor shall clean up on a daily basis building surfaces outside the construction area that get construction debris or dust.

1.5 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 Owner or other contractors.

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

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

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

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

.12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.13 Remove dirt and other disfiguration from exterior surfaces.

.14 Clean and sweep roofs, gutters, areaways, and sunken wells.

.15 Sweep and wash clean paved areas.

.16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.17 Clean roofs, downspouts, and drainage systems.

.18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.19 Remove snow and ice from access to building.

.20 Complete full professional duct cleaning as required.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PRECEDENCE

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

1.2 WASTE MANAGEMENT GOALS

.1 Accomplish maximum control of solid construction waste.

.2 Preserve environment and prevent pollution and environment damage.

1.3 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

1.4 DEFINITIONS

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

.2 Demolition Waste Audit (DWA): relates to actual waste generated from project. Refer to as “Schedule C”.

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

.4 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.7 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.8 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.9 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.10 Separate Condition: refers to waste sorted into individual types.

.11 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.12 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction,

demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to as "Schedule A".

.13 Waste Management Coordinator (WMC): Contractor Representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.14 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to as "Schedule B". WRW is based on information acquired from WA (Schedule A).

1.5 WASTE MANAGEMENT GOALS

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

.2 Provide DCC Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.

.3 Accomplish maximum control of solid construction waste.

.4 Preserve environment and prevent pollution and environmental damage.

1.6 DOCUMENTS

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

.1 Waste Audit.

.2 Waste Reduction Workplan.

.3 Material Source Separation Plan.

.4 Schedules [A] [B] [C] (defined below) completed for project.

1.7 SUBMITTALS

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

.2 Prepare and submit prior to project start-up:

.1 Submit 1 electronic copy of completed Waste Audit (WA): Schedule A.

.2 Submit 1 electronic copy of completed Waste Reduction Workplan (WRW): Schedule B.

.3 Submit 1 electronic copy of completed Demolition Waste Audit (DWA): Schedule C.

.4 Submit 1 electronic copy of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.

.1 Failure to submit could result in hold back of final payment.

.2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.

.3 For each material reused, sold or recycled from project, include amount in tonnes and size of items and the destination.

.4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.8 WASTE AUDIT (WA) – SCHEDULE A

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.9 WASTE REDUCTION WORKPLAN (WRW) – SCHEDULE B

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:

.1 Destination of materials listed.

.2 Deconstruction/disassembly techniques and sequencing.

.3 Schedule for deconstruction/disassembly.

.4 Location.

.5 Security.

.6 Protection.

.7 Clear labeling of storage areas.

.8 Details on materials handling and removal procedures.

.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site are able to review content.

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.10 DEMOLITION WASTE AUDIT (DWA) – SCHEDULE C

.1 Prepare DWA prior to project start-up. Audit (DWA): Schedule C, is included with this Section. Edit to suit Project Requirements.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.11 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by DCC Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to approved and authorized recycling facility for recycling.

1.12 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by DCC Representative.

.2 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.3 Protect structural components not removed for demolition from movement or damage.

.4 Support affected structures. If safety of building is endangered, cease operations and immediately notify DCC Representative.

.5 Protect surface drainage, mechanical and electrical from damage and blockage.

.6 Separate and store materials produced during dismantling of structures in designated areas.

.7 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Provide waybills for separated materials.

1.13 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

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

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly work progresses.

.1 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.14 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

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.

.2 Provide separate disposal bins for each material removed from demolition area, do not mix materials.

3.2 CLEANING

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

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

3.3 Waste Audit (WA)

.1 Schedule A – Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit	(3) Estimate Waste	(4) Total Quantity of Waste (Unit)	(5) Generation Point	(6) Recycled	(7) Reused
Wood & Plastics Material Description						
Off-cuts						
Warped Pallet Forms						
Plastic Packaging						
Cardboard						
Packaging						
Doors & Windows Material Description						
Painted Frames						

(1) Material Category	(2) Material Quantity Unit	(3) Estimate Waste	(4) Total Quantity of Waste (Unit)	(5) Generation Point	(6) Recycled	(7) Reused
Glass						
Wood						
Metal						
Other						

3.4 Waste Reduction Work plan (WRW)

.1 Schedule B – Waste Reduction Work plan (WRW):

(1) Material Category	(2) Person Responsible	(3) Total Quantity of Waste (Units)	(4) Reused Amounts		(5) Recycled Amount (Unit)		Materials Destination
			Projected	Actual	Projected	Actual	
Wood & Plastics Material Description							
Chutes							
Warped Pallet Forms							
Plastic Packaging							
Cardboard Packaging							
Doors & Windows Material Description							
Painted Frames							
Glass							

(1) Material Category	(2) Person Responsible	(3) Total Quantity of Waste (Units)	(4) Reused Amounts		(5) Recycled Amount (Unit)		Materials Destination
			Projected	Actual	Projected	Actual	
Wood							
Metal							
Other							

3.5 Demolition Waste Audit (DWA)

.1 Schedule C – Demolition Waste Audit (DWA):

(1) Material Category	(2) Quantity	(3) Unit	(4) Total	(5) Volume	(6) Weight	(7) Remarks and Assumptions
Wood						
Wood Stud						
Plywood						
Baseboard d-wood						
Door trim wood						
Cabinet						
Doors and Windows						
Panel Regular						

(1) Material Category	(2) Quantity	(3) Unit	(4) Total	(5) Volume	(6) Weight	(7) Remarks and Assumptions
Slab regular						
Wood laminate						
By fold closet						
Glazing						

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 78 00 – Closeout Submittals

.2 Section 01 91 13 – Commissioning

1.2 INSPECTION AND DECLARATION

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify DCC Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request DCC Representative inspection.

.2 DCC Representative Inspection: DCC Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.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 and balanced and fully operational.

.4 Certificates required by Boiler Inspection Branch, Fire Commissioner, Utility companies: submitted.

.5 Certificates required by Contract Documents as identified in specific sections of this specification, e.g., TSSA inspection reports: submitted

.6 Operation of systems: demonstrated to Owner's personnel.

.7 Commissioning of mechanical systems: completed in accordance with 01 91 13 - Commissioning and 1 hard or 3 electronic copies of final Commissioning Report included in Operation and Maintenance Manual: submitted to DCC Representative.

.8 Work is complete and ready for Final Inspection.

.2 Final Inspection: when items noted above are completed, request final inspection of Work by DCC Representative and Contractor. If Work is deemed incomplete by DCC Representative, complete outstanding items without delay and request re-inspection.

1.3 FINAL CLEANING

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

.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

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES REFERENCES

.1 As-built, samples and specification.

.2 Equipment and systems.

.3 Product data, materials, finishes and related information.

.4 Warranties.

.5 Operation and maintenance data.

1.2 SUBMISSION

.1 An organized compilation of Operating and Maintenance Data, for all equipment installed on site, including previously installed equipment, as part of the entire CCTV upgrade. It is to include detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections.

.2 Submit one (1) complete hard copy and (3) electronic PDF Format of the “Operation & Maintenance (O&M) Manuals” to the DCC Representative, one (1) week prior to application for Interim Certificate of Completion (ICC) of project.

.3 Hard copy shall be bound in accordance with paragraph 1.3.

.4 The DCC Representative will not issue the interim certificate of completion until the O&M Manuals and as-built drawings are submitted, reviewed, and accepted by the DCC Representative.

.1 The DCC Representative will retain funds as security against incomplete or non-submission of the O&M manuals and as-built drawings. No partial payment will be made against these items.

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 mm 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 1:1 scaled CAD files in DWG format on current Electronic media.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Cover Sheet:

.1 Project Title, Location and Project Number.
.2 Names, Addresses and Telephone number of General Contractor.
.3 Date of Submission.

.2 Table of Contents for Each Volume: provide title of project;

.3 All applicable warranties and guarantees.

.4 List of Sub-Contractors complete with addresses and Telephone number.

.5 Copies of approvals and certificates.

.6 Provide Data as specific in individual Sections.

.1 List of equipment including:

.1 New equipment
.2 Modified Equipment
.3 Decommissioned Equipment
.4 Service depot.
.5 Nameplate information including equipment number, make, size, capacity, model number and serial number.
.6 Parts List.
.7 Installation Details.
.8 Operating Instructions.
.9 Maintenance Instructions for Equipment.
.10 Maintenance Instructions for Finishes.
.11 Complete set of approved shop drawings.

.2 As-built drawings.

.7 **Training:** Refer to Section 01 79 00 - Demonstration and Training.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for DCC Representative one record copy of:

.1 Contract Drawings
.2 Specifications
.3 Addenda
.4 Change Orders and other modifications to the 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. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

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

.6 Near completion of the project the DCC Representative shall submit an 'AutoCAD' electronic drawing to Contractor for recording all as-built conditions on drawings.

.7 As-built Drawings.

.1 Contractor shall keep one copy on site to maintain project record drawings and record accurately any deviations from Contract Documents.

.1 Field changes of dimension and detail.
.2 Changes made by change orders.
.3 Details not on original Contract Drawings.
.4 References to related shop drawings and modifications.

.2 Record all as-built conditions in red. Mark all changes on one set of prints prior to interim completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to the DCC Representative for review and acceptance.

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line drawings, provided by DCC Representative.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

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

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.1 For Buildings: Door locations, duct sizes, piping valve, and equipment layout, cable tray alignment.

.2 For Civil/Utilities: Road widths, curve radii, alignment, curb radii, sidewalk extents, conduit/pipe sizes.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional and substitute items.

.2 Changes made by Addenda and change orders.

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

.7 Provide single-line schematic drawings for any new work completed to the building systems as follows:

.1 Electrical Schematic

.2 Water lines

.3 Sewage lines

.4 HVAC schematic

1.7 EQUIPMENT AND SYSTEMS

.1 **Each Item of Equipment and Each System:** include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 **Panel board circuit directories:** provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 **Operating Procedures:** include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

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

.6 Provide servicing and lubrication schedule, and list of lubricants required.

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

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

.13 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 00 - Commissioning.

.14 **Additional requirements:** As specified in individual specification sections.

1.8 MATERIALS AND FINISHES

.1 **Building Products, Applied Materials, and Finishes:** include product data, with catalogue number, size, composition, and colour and texture designations.

.2 **Instructions for cleaning agents and methods:** precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 **Moisture-protection and Weather-exposed Products:** include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 **Additional Requirements:** as specified in individual Specifications Sections.

1.9 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 location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to DCC Representative. Include approved listings in Maintenance Manual.

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

1.10 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections, for all equipment installed on site, including previously installed equipment, as part of the entire CCTV upgrade.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to DCC Representative. Include approved listings in Maintenance Manual.

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

1.11 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 location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to DCC Representative. Include approved listings in Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of DCC Representative.

1.13 WARRANTIES / BONDS / GUARANTEES

.1 All Warranties / Bonds / Guarantees are to be made out to:

Department of National Defence
Engineering Officer - RPOps
1 Yukon Lane
Toronto, ON M3K 1A0

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

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

.4 Obtain warranty, bond or guarantee, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

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

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

.7 Co-execute submittals when required.

.8 Retain warranty, bond or guarantee until time specified for submittal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 78 00 – Closeout Submittals

.2 Section 01 91 13 – Commissioning

1.2 PRECEDENCE

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

1.3 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of Substantial Performance.

.2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.4 QUALITY CONTROL

.1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.5 SUBMITTALS

.1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for DCC Representative’s approval.

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

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

1.6 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed, equipment and systems are fully operational.

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

1.7 PREPARATION

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

.2 Verify that designated personnel are present.

1.8 DEMONSTRATION AND INSTRUCTIONS

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

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

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

.4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

1.9 TIME ALLOCATED FOR INSTRUCTIONS

.1 Ensure amount of time required for instruction of each item of equipment or system is adequate.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section includes:

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

1.2 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by DCC 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 DCC Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project

.5 Installation/Start-up check lists shall include signature blocks for Contractor’s Cx Representative, Sub Contractor and DCC Representative complete with Date block for all installation/start-up check sheets.

.6 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

.1 Product Information (PI) forms compile 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 are 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 DCC Representative's review.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms are 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 which 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 DCC Representative's review.

1.5 SAMPLES OF COMMISSIONING FORMS (Includes PI and PV forms)

.1 DCC Representative will provide to the Contractor sample Commissioning forms in electronic format if requested by the contractor.

.2 SPEC NOTE: Provide sample Commissioning forms to enable bidders to produce realistic bids.

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

.4 Samples of Commissioning forms and a complete index of produced to date can be provided to the Contractor upon request.

1.6 CHANGES AND DEVELOPMENT OF NEW COMMISSIONING FORMS

.1 When additional commissioning forms are required, but are not available from the DCC Representative, the contractor shall develop appropriate commissioning verification forms and submit to the DCC Representative for review prior to use.

.1 Additional commissioning forms to be in the same format as provided by the DCC Representative or reviewed contractor’s sample.

1.7 COMMISSIONING FORMS

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

.2 Strategy for Use:

.1 The DCC Representative provides the Contractor with the Sample Commissioning form’s. Contractor to make forms Equipment Specific with Specification data included.

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

.3 Confirm operation as per design criteria and intent.

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

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

.6 Record analytical and substantiating data.

.7 Verify reported results.

.8 Form to bear signatures of recording technician, Contractor’s Cx Representative and reviewed and signed off by DCC Representative.

.9 Submit immediately after tests are performed.

.10 Reported results in true measured SI unit values.

.11 Provide DCC Representative with originals of completed forms.

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

.13 Forms to be both hard copy and electronic format with typed written results in accordance with Building Management 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 SUMMARY

.1 Section includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements of system functional performance testing, equipment, sub-systems, systems, and integrated systems.

.2 Related sections:

.1 Division 01 45 00 Quality Controls
.2 Division 01 35 43 Environmental Procedures
.3 Division 01 41 00 Regulatory Requirements
.4 Division 01 91 13 General Commissioning Requirements
.5 Division 01 91 13.16 Commissioning Forms
.6 Division 22 Plumbing
.7 Division 23 Heating, Ventilation and Air Conditioning
.8 Division 26 Electrical
.9 Division 27 Communication
.10 Division 28 Electronic Safety and Security

.3 Acronyms:

.1 AFD - Alternate Forms of Delivery, service provider
.2 BMM - Building Management Manual
.3 CPS - Commissioning Plan Schedule
.4 EMCS - Energy Monitoring and Control Systems
.5 ESR - Equipment Start-Up and Acceptance Report
.6 O&M - Operation and Maintenance
.7 SFPTF - System Functional Performance Test Form
.8 SVF - System Verification Form
.9 TAB - Testing, Adjusting and Balancing
.10 DCC – Defence Construction Canada
.11 RPoPS – Real Property Operations (Base Engineering and Shops)

1.2 GENERAL

.1 Commissioning is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Commissioning is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed documented and approved.

.2 Contractor shall organize all Static Testing and Documentation, Manufacture and Trade Start up Reports, Installation Check Sheets completion. Ensuring Contractor’s

Verification and integrated testing has been completed before requesting the final commissioning with DCC.

.3 DCC Representative shall be available to chair Commissioning Meetings and complete minutes, attend all static testing, start-up, and final commissioning. DCC will Coordinate the Training with DND at the request of the Contractor and the schedule.

.4 Objectives:

.1 To bring mechanical and electrical systems from a state of static completion to a state of dynamic operation.

.2 To verify conformance to contract requirements.

.3 To verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.

.4 To ensure that the completed facility meets user stated requirements and effectively train O&M staff; and

.5 To ensure appropriate documentation is compiled into the BMM.

.6 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to interact with each other as intended in accordance with Contract Documents and design criteria.

.7 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.5 Design Criteria:

.1 As per client's requirements or determined by designer.

.2 To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

.1 For commissioning it is the responsibility of the Contractor to organize and bare all cost for the commissioning of all building systems and documentation. DCC shall witness and sign all static testing and integrated testing. DCC will invite other stakeholders.

.2 Commissioning to be a line item of Contractor's cost breakdown.

.3 Commissioning activities supplement field quality and testing procedures described in relevant technical sections.

.4 Prior to Substantial Completion of commissioned systems, the contractor shall:

.1 Submit commissioning documentation to the satisfaction of DCC.

.2 Commission all equipment, components, and systems have been commissioned as per design intent.

.3 Final Air or Hydronic Balance reports have been submitted and reviewed; and accepted by DCC, Design Consultant.

.4 ASBUILT Drawings have been submitted and reviewed and accepted

.5 Submittals of final ESA Certifications, TSSA Certifications and any other systems certifications required under the systems installation in the contract

.6 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during commissioning, correct deficiencies, re-verify equipment and components within the un-functional system, including related systems as deemed required by DCC to ensure effective performance.

.2 The costs for corrective work, additional tests and inspections required to determine the acceptability and proper performance of such items to be borne at the contractor cost.

1.5 PRE-COMMISSIONING REVIEW

.1 During Construction:

.1 The contractor to coordinate provision, location, and installation of provisions for commissioning with DCC.

.2 Before Start of Commissioning:

.1 Have completed Commissioning Plan to date.

.2 Ensure installation of related components, equipment, systems, and sub-systems is complete.

.3 Fully understand commissioning requirements and procedures.

.4 Have commissioning documentation available on site for DCC review.

.5 Submit complete start-up documentation to DCC.

.6 Have commissioning schedules up to date.

.7 Ensure systems have been cleaned thoroughly.

.8 Complete TAB procedures on systems and submit TAB reports to DCC for review and approval.

.9 Ensure "As-Built" system schematics are available for review by DCC, Design Consultant or RPoPS Design Engineers.

.3 Inform DCC in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

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

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

1.7 SUBMITTALS

.1 Submittals: in accordance with Division 1.

.2 Submit no later than 4 weeks after award of Contract:

.1 Name of Contractor's Commissioning Provider can be an employee with commissioning experience.

.2 Draft Commissioning Plan.

.3 Preliminary commissioning schedule.

.3 Request in writing to DCC for changes to submittals and obtain written approval at least 8 weeks prior to start of commissioning.

.4 Submit proposed commissioning procedures to DCC where not specified and obtain written approval at least 8 weeks prior to start of commissioning.

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning Forms Section 10 91 13-16: System Verification Forms (SVF), Equipment Start-Up and Acceptance Reports (ESR) and System Functional Performance Test Forms (SFPTF) for requirements and instructions for use. The Mechanical and Electrical Contractor can submit their own company forms if available.

.2 DCC to review and approve commissioning documentation.

.3 Provide completed and approved commissioning documentation to DCC.

1.9 COMMISSIONING PLAN SCHEDULE

.1 The Contractor shall prepare and coordinate the commissioning schedule with the construction schedule, commissioning schedule prepared and submitted by the contractor.

.2 The CPS will be updated every month. Copies of this schedule and updates will be distributed to DCC.

1.10 COMMISSIONING MEETINGS

.1 Meetings shall be regularly scheduled in the Construction Meetings or possible separate commissioning meeting depending on project size, discuss, and review commissioning activities. Continue commissioning meetings on regular basis until commissioning deliverables have been addressed. DCC, Contractor, Subcontractors, will be required to attend meetings.

.2 Meetings shall take place until work has been completed.

.3 The construction schedule, commissioning plan schedule, and the commissioning plan shall be reviewed and updated as required. Upcoming tests and equipment start-ups shall be reviewed and completed test results will be evaluated.

.4 DCC will take minutes of meetings and distribute copies to all team members within one week of a meeting.

.5 Contractor's Commissioning Provider shall be present at tests performed and documented by sub-trades, suppliers, and equipment manufacturers. DCC to be notified on dates and times of the start-ups.

1.11 MANUFACTURER'S INVOLVEMENT

.1 Factory testing:

.1 Equipment manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by DCC.

.3 Arrange for DCC to witness tests on site Factory Test if required in the contract documents; and

.4 Obtain written approval of test results and documentation from DCC before delivery to site.

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

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

.4 Integrity of warranties:

.1 Use manufacturers' trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.3 Manufactures Start-up documentation to be completed and submitted to DCC.

1.12 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing, and commissioning.

.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 SVF; and

.2 Visual inspection of quality of installation.

.3 Refrigeration Equipment is required to be leek checked on arrival to site as per specification section Halocarbon Management WSO 5-16 Section 01 35 43.

.2 Equipment Start-Up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System Functional Performance Testing: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include seasonal commissioning.

.3 Correct deficiencies and obtain approval from DCC after distinct phases have been completed and before commencing next phase.

.4 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by DCC. 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 DCC.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by DCC.

.3 If evaluation report concludes that major damage has occurred, DCC shall reject equipment.

.1 Rejected equipment to be removed from site and replaced with new.

.2 Subject new equipment or systems to specified start-up procedures.

1.13 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to DCC 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; and

.5 Step-by-step description of complete start-up procedures, to permit to repeat start-up at any time.

1.14 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 Equipment that will be delivered and on site for a length of time before installation and start-up the contractor must follow the Manufactures long term storage process and identify to DCC.

.3 After completion of the dynamic commissioning, operate and maintain systems until issuance substantial completion certificate. Systems with BAS Control will be required to be Alarm free and all final adjustments have been complete. Bas Control trending to be carried out based on the specification requirements. Carry out Commissioning:

.1 Under actual operating conditions, over entire operating range, in all modes (once building construction is complete and clean).

.2 On independent systems and interacting systems.

.4 Commissioning procedures to be repeatable and reported results are to be verifiable.

.5 Follow equipment manufacturer's operating instructions.

.6 EMCS trending to be available as supporting documentation for performance verification.

1.15 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 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, ESA, TSSA, Life Safety Systems Verification Reports (DCC/ DND Fire Service) or any other certifications required in the contract documents.

.3 Provide copies to DCC the day of test and with commissioning report.

1.16 EXTENT OF VERIFICATION

.1 Provide manpower and instrumentation to verify up to 100% of reported results control point to point and sequence of operation.

.2 Balancing verification of 30 % of testing readings by DCC on site locations of testing verification will be decided at time of site verification.

.3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment and instrumentation.

1.17 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and commissioning to satisfaction of DCC.

1.18 COMPLETION OF COMMISSIONING

.1 Upon completion of commissioning leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in commissioning specifications, complete commissioning prior to issuance of substantial Completion

.3 Commissioning to be considered complete when contract commissioning deliverables have been submitted and accepted by DCC.

.4 DCC Site Commissioning Coordinator will complete a final commissioning report identifying the systems that have been commissioned what the process was and the attendees. The Final report will also identify the Seasonal Commissioning required with a return date agreed with the construction team.

1.19 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 Contractor to submit all Static Testing, Manufactures Start-up Reports, Contractor’s installation Check Sheets all Technical Authority Inspection Documents and certifications.

.2 Documentation to be in a tab form binder based on the specification sections.

.3 Letter confirming the Contractor and Subtrades will return for seasonal equipment complete with the system and the date of return.

.4 DCC to identify in writing any specification requirements for inspections over the 1-year warranty period. The document to identify the date of the return visit for the inspection and the testing procedure required. DCC Site personal will organize the required access to the building based on the agreed dates (example: contractor to return for systems operation and calibration).

1.20 TRAINING

.1 Contractor is to ensure the training dates are part of the commissioning schedule and the Contractor will be responsible to send out training invites out to DCC 2 weeks in advance.

.2 To be videotaped for all Major Mechanical, Electrical and Communication System as per design requirements

.3 Major Equipment Training to be on site when systems have been fully commissioned and operational.

.4 BAS Controls systems will be on-site with the building front end after commissioning of sequence of operation and graphic have been completed.

.5 If the contract documents require remote BAS operation from another building training will need to be completed at that site to ensure communication connection is operational.

Part 2 Commissioning Sample forms

2.1 DCC can supply electronic copies of Commissioning forms as per section 01 91 13.16 at the request of the Contractor.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all new plumbing equipment.

.3 Shop Drawings:

.1 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for all new equipment.

.1 Operation and maintenance manual approved by, and final copies deposited with, DCC Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to DCC Representative for approval. Submission of individual data will not be accepted unless directed by DCC Representative.

.2 Make changes as required and re-submit as directed by the DCC Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Contractor shall provide their own set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to the DCC Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

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

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

.1 Store materials indoors, off-ground, in a dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect against nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Inform DCC 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 DCC Representative.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork.

3.4 FIELD QUALITY CONTROL

.1 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 - ACTION AND INFORMATIONAL 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.

3.5 DEMONSTRATION

.1 DCC Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audiovisual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 DCC Representative may record these demonstrations on digital media for reference.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

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

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

3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 – Common Work Results for Plumbing

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 22 05 00 – Common Work Results for Plumbing.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Instructions: submit manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect against nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONDENSATE PUMP (CP-1)

.1 Condensate pump to automatically pump condensate once level in the condensate tank reaches a manufacturer specified level.

.2 Condensate pump to have tank capacity minimum: 5.6 Gallons.

.3 Hp: 1/30
.4 Flow: 0.01052 L/s
.5 Head: 50 kPa
.6 Electrical: 115/1/60
.7 Power: 93W
.8 Option:
.1 Overflow detection switch

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of existing materials previously installed under other Sections or Contracts are acceptable for plumbing specialities and accessories installation in accordance with manufacturer's written instructions.

.1 Visually inspect existing materials in presence of DCC Representative.
.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.
.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.
.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install in accordance with local authority having jurisdiction, and Ontario Building Code.

.2 Install in accordance with manufacturer's instructions and as specified.

3.4 START-UP

.1 Timing: start-up only after:

.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.
.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.5 TESTING AND ADJUSTING

.1 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.

.2 Flow rate at fixtures: +/- 20%.

.3 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.4 Access doors:

.1 Verify size and location relative to items to be accessed.

.5 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.6 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

3.6 CLOSEOUT ACTIVITIES

.1 Provide Commissioning Reports and Training of O&M Personnel.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 – Common Work Results for Plumbing

.2 Section 23 05 15 – Installation of HVAC Pipework

.3 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

.4 Section 23 05 53 – Identification for HVAC Piping and Equipment

.5 Section 23 07 19 – Thermal Insulation for Piping

1.2 REFERENCE STANDARDS

.1 ASTM International Inc.

.1 ASTM B32-20, Standard Specification for Solder Metal.

.2 ASTM B306-20, Standard Specification for Copper Drainage Tube (DWV).

.2 Canadian Standards Association (CSA International).

.1 CAN/CSA-B125.3-22, Plumbing Fittings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 22 05 00 – Common Work Results for Plumbing.

1.4 DELIVERY, STORAGE AND HANDLING

.1 In accordance with Section 22 05 00 – Common Work Results for Plumbing.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary and vent Type DWV to: ASTM B306.

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.3.

.2 Wrought copper: to CAN/CSA-B125.3.

.2 Solder: lead free, tin-copper 95:5, to ASTM B32.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with Section 23 05 15 – Installation of HVAC Pipework.

.2 Install in accordance with the Ontario Building Code and in accordance with codes and regulations set forth by local authority having jurisdiction.

.3 Provide thermal insulation in accordance with Section 23 07 19 – HVAC Piping Insulation.

.4 Support piping in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

3.3 IDENTIFICATION

.1 Affix applicable label (sanitary, vent, pump discharge etc.) c/w directional arrows in accordance with Section 23 05 53 – Identification for HVAC Piping and Equipment.

3.4 CLEANING

.1 In accordance with Section 22 05 00 – Common Work Results for Plumbing.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 – Common Work Results for Plumbing

.2 Section 23 05 15 – Common Installation Requirements for HVAC Pipework

.3 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

.4 Section 23 05 53 – Identification for HVAC Piping and Equipment

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM D2235-22, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.2 ASTM D2564-20, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 CSA Group (CSA)

.1 CAN/CSA-Series B1800-21, Thermoplastic Non-Pressure Pipe Compendium.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 22 05 00 – Common Work Results for Plumbing.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect against nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 For above ground DWV piping to:

.1 CAN/CSA B1800.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with Section 23 05 15 – Common Installation Requirements for HVAC Pipework.

.2 Install in accordance with most stringent requirements of Ontario Building Code and local authority having jurisdiction.

.3 Support piping in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

3.3 TESTING

.1 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

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

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

3.6 IDENTIFICATION

.1 Identify in accordance with Section 23 05 53 - Identification for HVAC Piping and Equipment.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all new equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for all new equipment for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, DCC Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Operation instruction for systems and component.

.4 Description of actions to be taken in event of equipment failure.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.5 Approvals:

.1 Submit 1 copy of draft Operation and Maintenance Manual to DCC Representative for approval. Submission of individual data will not be accepted unless directed by DCC Representative.

.2 Make changes as required and re-submit as directed by DCC Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 DCC Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to DCC Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

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

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect all new equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of existing materials previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.

.1 Visually inspect existing materials in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed DCC Representative.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

.1 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 - ACTION AND INFORMATIONAL 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.

3.5 DEMONSTRATION

.1 DCC Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 All new systems.

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 23 08 16 – Cleaning and Start-up of HVAC Piping Systems

.2 Section 23 23 00 – Refrigerant Piping

1.2 REFERENCE STANDARDS

.1 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2020 (NFC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

.1 Paint: zinc-rich.

.1 In accordance with manufacturer's recommendations for surface conditions.

.2 Fire Stopping: to match existing ratings.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.

3.4 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.5 PIPEWORK INSTALLATION

.1 Install refrigerant piping in accordance with Section 23 23 00 – Refrigerant Piping.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible.

.12 Ream pipes remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use butterfly valves at branch take-offs for isolating purposes except where specified.

.7 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.8 Install ball valves for glycol service.

3.6 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.

.2 Other floors: terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for fire stopping.

.2 Maintain the fire-resistance rating integrity of the fire separation.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.7 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.

.1 Chrome or nickel-plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.8 PREPARATION FOR FIRE STOPPING

.1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation.

.2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.

.3 Insulated pipes: ensure integrity of insulation and vapour barriers.

3.9 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 16 – Cleaning and start-up of HVAC piping systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 – Cleaning.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.10 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise DCC Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of DCC Representative.

.6 Pay costs for repairs or replacement, retesting, and making good. DCC Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by DCC Representative.

3.11 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by DCC Representative.

.2 Request written approval by DCC Representative 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

3.12 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 recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1-22, Power Piping.

.2 ASTM International

.1 ASTM A125-96(2018), Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-21, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563/A563M-21ae1, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Government of Ontario

.1 Ontario Building Code (OBC), O.Reg. 332/12, including all amendments effective as of date of tender of this project.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP58-2018, Pipe Hangers and Supports - Materials, Design and Manufacture.

.5 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2020 (NPC).

.6 Underwriter's Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

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

.3 Provide manufacturer's installation instructions.

.3 Shop Drawings:

.1 Submit shop drawings stamped by a professional engineer registered or licensed in the province of Ontario of Canada.

.2 Submit shop drawings for:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:

.1 Provide manufacturer's installation instructions.

.1 Contractor shall make available 1 copy of systems supplier's installation instructions.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58 and ANSI B31.1.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

.1 Finishes:

.1 Ensure steel hangers in contact with copper piping are epoxy coated or copper plated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut carbon steel retaining clip.

.1 Rod: 9 mm ULC listed or 13 mm FM approved.

.2 Cold piping NPS 2 1/2 or greater: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, ULC listed, FM approved, to MSS-SP58.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, ULC listed, FM approved, to MSS SP58.

.2 Cold piping NPS 2 1/2 or greater: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut ULC listed, FM approved.

.4 Upper attachment to concrete:

.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate ULC listed, FM approved, to MSS SP58.

.5 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28mm rod.

.6 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel black.

.2 Attachments for copper piping: copper plated black steel.

.3 Oversize pipe hangers and supports.

.7 Adjustable clevis: material to MSS SP58, FM approved, ULC listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP58.

.9 U-bolts: carbon steel to MSS SP58 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: black.

.2 Finishes for copper, glass, brass or aluminum pipework: epoxy coated, with formed portion plastic coated.

.10 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP58.

2.4 RISER CLAMPS

.1 Steel or cast-iron pipe: galvanized carbon steel to MSS SP58, type 42, ULC listed, FM approved.

.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with engineer-stamped shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

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 in accordance with:

- .1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

- .1 Install on piping systems at suspended fan coil units, pumps, boilers, chillers, cooling towers, and as indicated.

.3 Clamps on riser piping:

- .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
- .2 Bolt-tightening torques to industry standards.
- .3 Steel pipes: install below coupling or shear lugs welded to pipe.
- .4 Cast iron pipes: install below joint.

.4 Clevis plates:

- .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

- .1 Vertical movement of pipework is 13 mm or more,
- .2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

- .1 Transfer of load to adjacent piping or to connected equipment is not critical.
- .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Plumbing piping: to National Plumbing Code and Ontario Building Code.

.2 Fire protection: to applicable fire code.

.3 Copper piping: up to NPS 1/2: every 1.5 m.

.4 Within 300mm of each elbow.

Maximum Pipe Size: NPS	Maximum Spacing Steel Pipe	Maximum Spacing Copper Pipe
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m

Maximum Pipe Size: NPS	Maximum Spacing Steel Pipe	Maximum Spacing Copper Pipe
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

.5 Pipework greater than NPS 12: to MSS SP58.

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

.1 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 - ACTION AND INFORMATIONAL 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.

3.8 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 recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Product data to include paint colour chips, other products specified in this section.

.3 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.2 DELIVERY, STORAGE, AND HANDLING

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

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick white anodized aluminum, matte finish, with square corners, letters accurately aligned, and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size # 5.

.2 Equipment in Mechanical Rooms: use size # 9.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from DCC Representative.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend, direction of flow by arrows.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes: 50mm for piping 50mm and larger. 25mm for piping smaller than 50mm.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from DCC Representative.

.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Black	YELLOW
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Storm water	Green	STORM

2.5 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.6 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.7 LANGUAGE

.1 Identification in both English and French.

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 TIMING

.1 Provide identification only after painting has been completed.

3.3 INSTALLATION

.1 Provide ULC and CSA registration plates as required by respective agency. Plates shall be installed in visually accessible locations.

3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate, or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by DCC Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

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

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1-2022, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 ASTM International (ASTM)

.1 ASTM B209/B209M-21a Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335/C335M-23, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C449/C449M-07(2019), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.4 ASTM C547-22a, Mineral Fiber Pipe Insulation.

.3 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-18, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S702-21, Thermal Insulation, Mineral Fibre, for Buildings

.3 CAN/ULC-S702.2-15, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

.1 Qualifications:

.2 Installer: specialist in performing work of this Section and have successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) and insulation thickness:

.1 Thermal conductivity shall be tested and certified in accordance with ASTM C335.

.2 Thermal conductivity shall not exceed the following table, at the listed mean temperature ratings, in accordance with ASHRAE 90.1:

Application	TIAC Code	Fluid Operating Temperature Range (°C)	Insulation Conductivity		Nominal Pipe/Tube Size (NPS)				
			Maximum Conductivity (W/m-°C)	Mean Temperature Rating (°C)	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	8 & over
					Insulation Thickness (mm)				
All cold piping, including condensate drains	A-3	>4	0.039	24	15	15	25	25	25
		<4	0.037	10	15	25	25	25	40
Refrigerant (including liquid, hot gas, suction lines, among others)	A-6	4-13	0.039	24	25	25	25	25	25
		<4	0.037	10	25	25	40	40	40

.3 For systems that operate across multiple listed temperature ranges, use insulation compliant with the most extreme operating condition – the hottest temperature for fluids above 22°C, and the coldest temperature for fluids below 22°C. When a system operates both above and below 22°C, use the thickest and best performing insulation from all its operating conditions listed above.

.4 Submittals with conductivity values exceeding the table above must include thickness calculations as per ASHRAE 90.1 illustrating they meet the minimum required insulation performance.

.5 The contractor shall request clarification for any piping systems not explicitly listed above to determine insulation requirements. All hot and cold piping shall be insulated.

.3 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to ASTM C547 and CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.4 TIAC Code A-6: flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 Air drying or hydraulic setting on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/m^2.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 For indoor applications only.

.2 One-piece moulded type and sheet with pre-formed shapes as required.

.3 Colour: white.

.4 Minimum service temperatures: -20°C.

.5 Maximum service temperature: 65°C.

.6 Moisture vapour transmission: 0.02 perm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.2 Aluminum:

.1 For outdoor applications only.

.2 To ASTM B209.

.3 Thickness: 0.50 mm sheet.

.4 Finish: smooth.

.5 Joining: longitudinal and circumferential slip joints with 50mm laps.

.6 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.7 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Provide caulking on all seams for jackets installed outdoors.

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 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 REMOVABLE, PRE-FABRICATED INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements, flanges and unions at equipment.

.2 Design: to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: PVC.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-3.

.1 Securements: tape.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: to TIAC Code 1501-C.

.3 TIAC Code: A-6

.1 Insulation securements: tape.

.2 Seals: lap seal adhesive, lagging adhesive.

.4 Insulation thicknesses in accordance with Part 2.

.5 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

.6 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Outdoors: Aluminum jacket.

.3 Concealed, indoors: removable clamshell insulation on valves, fittings, and related accessories. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.5 Finish attachments: SS bands, at 150mm on centre. Seals: closed.

.6 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 CLEANING AND WASTE MANAGEMENT

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

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 23 08 16 – Cleaning and Start-up of HVAC Piping Systems

1.2 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS

.1 In accordance with Section 23 08 16 – Cleaning and Start-up of HVAC Piping Systems.

1.3 SANITARY AND STORM DRAINAGE SYSTEMS

.1 Ensure that traps are fully and permanently primed.

.2 Ensure that fixtures are properly anchored, connected to system.

1.4 REPORTS

.1 In accordance with Section 01 79 00 - Demonstration and Training.

1.5 DEMONSTRATION AND TRAINING

.1 In accordance with Section 01 79 00 - Demonstration and Training.

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 NOT USED

.1 Not used.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not used.

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 CLEANING

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

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 23 05 15 – Common Installation Requirements for HVAC Pipework

.2 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

.3 Section 23 05 53 – Identification for HVAC Piping and Equipment

.4 Section 23 07 19 – HVAC Piping Insulation

1.2 REFERENCE STANDARDS

.1 ASME

.1 ASME B16.22-21, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.

.2 ASME B16.26-18, Cast Copper Alloy Fittings for Flared Copper Tubes.

.3 ASME B31.5-22, Refrigeration Piping and Heat Transfer Components.

.2 ASTM International (ASTM)

.1 ASTM B280-23, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 CSA Group (CSA)

.1 CSA B51-19, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CSA B52-18, Mechanical Refrigeration Code.

.4 Environment Canada (EC)

.1 EPS1/RA/1, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Work of this section to be completed by contractor staff licensed for such work by the TSSA. Provide proof of licensing prior to commencing work of this section.

.2 Convene pre-installation meeting 1 week prior to beginning of on-site installation and work of this Section with DCC Representative and Contractor's representative.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building construction subtrades.

.4 Review manufacturer's written installation instructions and warranty requirements.

.5 Confirm refrigerant piping routing and layout on-site and in accordance with Contractor’s designed refrigerant line calculations. Calculation shall not exceed manufacturer’s recommended equivalent length.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for refrigerant piping, fittings and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates and Approval:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Contractor’s mechanical/refrigerant piping subtrade shall design the refrigerant piping system in accordance with the manufacturer’s requirements. Ensure refrigerant piping system equivalent length does not exceed the manufacturer’s recommendations and requirements.

1.5 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for refrigerant piping for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Conduct in accordance with Section 01 61 00 - Common Product Requirements.

Part 2 Products

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B280, type ACR, drawn tempered, seamless copper tube.

2.2 FITTINGS

.1 To meet CSA B51, B52, and ASME B31.5 requirements.

.2 Service: design pressure for use with high pressure R-410A refrigerant.

.3 Brazed:

.1 Fittings: wrought copper to ASME B16.22.

.2 Joints: silver solder, 15% Ag-80% Cu-5%P, copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

2.5 THERMAL INSULATION

.1 Provide thermal insulation in accordance with Section 23 07 19 – HVAC Piping Insulation.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of existing materials previously installed under other Sections or Contracts are acceptable for refrigerant piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect existing materials in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 GENERAL

.1 Install in accordance with CSA B52, EPS1/RA/1, ASME B31.5, and Section 23 05 15 – Common Installation Requirements for HVAC Pipework.

.2 Installation shall meet requirements of local Authority Having Jurisdiction (TSSA).

3.4 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

.4 Submit brazing procedure to TSSA for review and approval as required.

3.5 PIPING INSTALLATION

.1 General:

.1 Hard drawn copper tubing: do not bend. Minimize use of fittings.

.2 Soft annealed copper tubing: bend without crimping or constriction.

.3 Refrigerant system installation work shall be conducted only by an actively TSSA-licensed certified Contractor with valid Certificate of Authorization.

.1 Provide proof of licensure (scanned copy of TSSA license) to DCC Representative within three (3) days upon request.

.4 Install thermal insulation in accordance with Section 23 07 19 – HVAC Piping Insulation.

.5 Identify refrigerant piping in accordance with Section 23 05 53 – Identification for HVAC Piping and Equipment.

.6 Provide piping supports in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.2 Hot gas lines:

.1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.

.2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.

.3 Provide inverted deep trap at top of risers.

.4 Provide double risers for compressors having capacity modulation.

.1 Large riser: install traps as specified.

.2 Small riser: size for 5.1 m^3/s at minimum load. Connect upstream of traps on large riser.

3.6 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.

.3 Test procedure: build pressure up to 35 kPa with nitrogen gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

.4 Pressure test shall be witnessed by DCC Representative, and by Authority Having Jurisdiction (TSSA) if required by O.Reg.220/01. Contractor shall retain and pay for TSSA's on-site field review services for witnessing pressure test(s) as required by TSSA.

3.7 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Close service valves on factory charged equipment.

.2 DCC Representative shall be present for the vacuum procedure.

.3 Ambient temperatures to be at least 13°C for at least 12 hours before and during dehydration.

.4 Use copper lines of largest practical size to reduce evacuation time.

.5 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.

.6 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.7 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 Twice to 14 Pa absolute and hold for 4 hours.

.2 Break vacuum with refrigerant to 14 kPa.

.3 Final to 5 Pa absolute and hold for at least 12 hours.

.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.

.5 Submit test results to DCC Representative.

.8 Charging:

.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.

.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.

.3 Re-purge charging line if refrigerant container is changed during charging process.

.9 Checks:

.1 Make checks and measurements as per manufacturer's operation and maintenance instructions.

.2 Record and report measurements to DCC Representative.

.10 Manufacturer's Field Services:

.1 Have manufacturer of products, supplied under this Section, 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 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, at stages listed:

.1 Upon completion of the Work, after cleaning is carried out.

.4 Obtain reports, within 3 days of review, and submit, immediately, to DCC Representative.

.11 Authority Having Jurisdiction (TSSA) approval

.1 Engage TSSA as required by local code requirements:

.1 Contractor shall retain and pay for TSSA’s on-site field services for review of final installation, complete with documented inspection record reports with the representative’s sign-off.

.2 Contractor shall not operate the system(s) until TSSA written approval is obtained where mandated by provincial code requirements.

.3 Provide a copy of final approval letter in the O&M manual.

3.8 CLEANING AND WASTE MANAGEMENT

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for incremental heating and cooling units for incorporation into manual.

Part 2 Products

2.1 SPLIT SYSTEM HEAT PUMP - CU-1/ AC-1, AC-2, AC-3

.1 Existing unit to be connected to.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of existing materials previously installed under other Sections or Contracts are acceptable for incremental heating and cooling unit installation in accordance with manufacturer's written instructions.

- .1 Visually inspect existing materials in presence of DCC Representative.
- .2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.
- .3 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

- .1 Set controls and operate each unit.
- .2 Take readings and record:
  - .1 Current.
  - .2 Air velocity at discharge.
  - .3 Discharge air temperature.

.2 Obtain reports within 3 days of review and submit immediately to DCC Representative.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

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

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.3 Ontario Provincial Standards

.1 Ontario Electrical Safety Code (OESC) 2018, 27th Edition, and Electrical Safety Authority Bulletins.

1.2 DEFINITIONS

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for electrical equipment.

.3 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.

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

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

.4 Submit 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.5 If changes are required, notify DCC Representative of these changes before they are made.

.4 Certificates:

.1 Provide CSA certified material and equipment.

.2 Where CSA certified material and equipment is not available, submit such material and equipment to authority having jurisdiction for special approval before delivery to site.

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

.4 Permits and fees: in accordance with General Conditions of contract.

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

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to DCC Representative.

.5 Manufacturer's Field Reports: submit to DCC 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.

1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for electrical equipment:

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

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

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

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

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return to manufacturer of packaging materials, padding, pallets, crates in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction.

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates labels as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.

.2 Sizes as follows:

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by DCC Representative prior to manufacture.

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

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

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. _____".

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

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

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

2.7 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

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

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

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

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Other Communication Systems	Green	Black

.4 The Contractor is to remove the blue tape that was previously used identified the installed conduit cameras and add a Black piece of tape to ensure the standard is met stated in item .3.

CODE WITH PLASTIC TAPE OR PAINT

2.9 FINISHES

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

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for new electrical work.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

.5 All work shown in thin grey line in contract drawings is work completed under other contact. Contractor to inspect all work shown in grey thin lines prior to starting new work. Contractor to inform DCC Representative of any condition which differ from contract drawings immediately upon discovery. All work shown on contract drawings in thick dark lines to be completed following the inspection and remediation of previous scope of work.

3.2 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 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 and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

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

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

3.5 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.

3.7 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 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 as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, 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.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.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.

.3 Carry out tests in presence of DCC Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 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 - ACTION AND INFORMATIONAL 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.

3.9 SYSTEM STARTUP

.1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.

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

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

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.

.2 CAN/CSA-C22.2 No.65-18, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE).

.2 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return to manufacturer of crates, pallets, padding, and packaging materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

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 Clamp for round copper conductors.

.2 Stud clamp bolts.

.3 Bolts for copper bars.

.4 Sized for bars and conductors as indicated.

.4 Clamps or connectors for TECK cable, as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 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.

.2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

.3 Install bushing stud connectors in accordance with NEMA.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 PRODUCT DATA

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse and return to manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketted.

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:

.1 Grounding conductor: copper as indicated.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Ethylene propylene rubber EP.

.2 Cross-linked polyethylene XLPE.

.3 Rating: 1000 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 intervals not exceeding 1500 mm and within 3000 mm of every box.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable concealed, securely supported by hangers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837-2104, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA Group (CSA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

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

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse by manufacturer and return of packaging materials, pallets, padding, and crates, in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 EQUIPMENT

.1 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.

.2 Insulated grounding conductors: green, copper conductors, size as indicated.

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

.1 Grounding and bonding bushings.

.2 Bonding jumpers, straps.

.3 Pressure wire connectors.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

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

.3 Protect exposed grounding conductors from mechanical injury.

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

.5 Soldered joints not permitted.

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

.7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.8 Bond single conductor, metallic armoured cables to cabinet at supply end, and load end.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of primary 120 V system, secondary 208 V system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, duct systems, frames of motors, starters, control panels and distribution panels.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

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

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect hangers and supports from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of crates, pallets, padding, and packaging materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 SUPPORT CHANNELS

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

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with nylon shields lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 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.

.6 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.

.7 For surface mounting of two or more conduits use channels at 1 m on centre spacing.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of DCC Representative.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

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 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 CONDUIT BOXES

.1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

.2 All conduit boxes for CCTV system to be tamper proof complete with no knock-outs, internal hinges and lockable.

2.3 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 35 mm 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 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.

.7 A pull box shall be placed in conduit runs where the sum of bends exceeds 180 degrees, where the overall length of conduit run is more than 30 meters or if there is a reverse bend in the run.

.8 Pull boxes shall be constructed and sized in accordance with the Canadian Electrical Code and EIA/TIA Standards of code gauge steel and shall have a rust resistant finish. Locations and sizes shall be as indicated on the design submission.

.9 In all instances pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend. Corresponding ends of the conduit are to be aligned with each other. Conduit fittings or pull elbow fittings shall not be used in place of pull boxes or bends.

.10 Pull boxes shall be installed at a reasonable height, in an exposed location and such that access for installation of cables is not prohibited. Pull boxes shall not be placed in a fixed false ceiling space, unless immediately above a suitably marked and hinged access panel. Provide indicator decals on ceiling T-bar rail or ceiling tiles showing location of pull box or splice box. Refer to the Shared Services Design Authority for details.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 45-M1981(R2008), Rigid Metal Conduit.

.3 CSA C22.2 No. 56-04 (R2009), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83-M1985(R20017), Electrical Metallic Tubing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.3 Quality assurance submittals:

.1 Test reports: submit certified test reports.

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

.3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

.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 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with expanded ends.

.2 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal steel aluminum.

2.3 CONDUIT FASTENINGS

.1 One-hole malleable iron 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 1500mm on center.

.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 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

.4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.5 Use UV rated conduit, of proper type for rooftop applications where conduit will be exposed to UV.

.6 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.7 Mechanically bend steel conduit over 21 mm diameter.

.8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.9 Install fish cord in all conduits.

.10 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

.12 Seals such as EYS fittings shall be installed as required by Code. Do not seal fitting until circuits, wiring, etc., has been tested and verified.

.13 The inside radius of a bend in a conduit shall not be less than six times the internal diameter when the conduit is less than 50mm in diameter and ten times the internal diameter when a conduit is 50mm in diameter or larger.

.14 All zone conduits shall be identified and labelled at both ends. Tags shall identify start and finish of the conduit run. Pull boxes shall be labelled on the exposed exterior.

.15 All conduits shall originate and be physically connected to the telecom backboards in the respective room, cable tray and pull box.

.16 All conduits/sleeves that enter the telecom space shall be fitted with an approved ground bushing c/w ground lug and bonded together mechanically (one continuous piece preferred). This shall be connected to the approved building ground by means of a No. 6 AWG to the grounding bus.

.17 Unless otherwise specified, all conduit runs shall be a maximum of 30 meters (100 ft) in length with a maximum of two 90-degree bends between pull points.

.18 All conduit shall be installed in accordance with the Canadian Electrical Code, part 1 section 12, applicable building codes and in accordance with EIA/TIA 569.

.19 Cable fill capacities of conduit shall not be greater than 40%.

.20 The use of C, LB, LL, LR and T type fittings or elbow fittings are not permitted in telecom infrastructures.

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 surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

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

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 Insulated Cable Engineers Association, Inc. (ICEA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for cables and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

Part 2 Products

2.1 CABLE PROTECTION

.1 38 x 140 mm planks pressure treated with coloured, or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

.1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed DCC Representative.

3.2 DIRECT BURIAL OF CABLES

.1 After sand bed in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable.

.1 Do not pull cable into trench.

.2 Include offsets for thermal action and minor earth movements.

.1 Offset cables 150 mm minimum for each 60 m run, maintaining minimum cable separation and bending radius requirements.

.3 Make termination and splice only as indicated leaving 0.6 m minimum of surplus cable in each direction.

.1 Make splices and terminations in accordance with manufacturer's written recommendations using approved splicing kits.

.4 Underground cable splices not acceptable.

.5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.6 Cable separation:

.1 Maintain 75 mm minimum separation between cables of different circuits.

.2 Maintain 300 mm minimum horizontal separation between low and high voltage cables.

.3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.

.4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.

.5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.

.6 Install treated planks on lower cables 0.6 m minimum in each direction at crossings.

.7 After sand protective cover specified in Section 31 23 33.01- Excavating, Trenching and Backfilling, is in place, install continuous row of overlapping 38 x 140 pressure treated planks as indicated to cover length of run.

3.3 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.

3.4 MARKERS

.1 Mark cable every 150 m along duct runs and changes in direction.

.2 Mark underground splices.

.3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.4 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

.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:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

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

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

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.7 PROTECTION

.1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store circuit breakers indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect circuit breakers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of packaging materials, crates, pallets, and padding as specified in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, and ground-fault circuit-interrupters: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in moulded case circuit breakers: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Sub-Feed circuit breakers to have minimum:

.1 10kA symmetrical rms interrupting capacity rating at voltage less than 300V

.2 25kA symmetrical rms interrupting capacity rating at voltage over 300V.

2.2 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.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).

.2 CSA C22.2 No.39-13, Fuseholder Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused] and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Horsepower rated and Non-fusible disconnect switch in CSA enclosure size.

.2 Provision for padlocking in on-off switch position by 3 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Quick-make, quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of DCC Representative.

.2 Perform a functionality test of the existing materials and prepare a report indicating pass/fail status, as well as what deficiencies have been identified.

.3 Inform DCC Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 28 05 01 – Common Work Results – Electronic Safety and Security.

.2 Section 28 23 00 – Video Surveillance.

1.2 REFERENCE STANDARDS

.1 Ontario Construction Standards

.1 National Building Code (NBC 2020).

.2 Ontario Electric Code 2021.

.2 Canadian Standards Association (CSA)

.1 CSA-C22.2 no 214-17, Communications cables (Bi-national standard with UL 444).

.2 CSA-C22.2 no 232-17, Optical fibre cables.

.3 CAN/CSA-C22.2 NO. 182.4-M90 (R2015) – Plugs, Receptacles and Connectors for Communication Systems.

.3 Telecommunications Industry Association (TIA)

.1 ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.

.2 ANSI/TIA-568-2-D, Balanced Twisted-Pair Telecommunications Cabling and Components.

.3 ANSI/TIA-568.3-D, Optical Fibre Cabling Components.

.4 ANSI/TIA-569-D, Telecommunications Pathways and Spaces.

.5 ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure.

.6 TIA-598-D, Optical Fibre Cable Colour Coding.

.7 TIA-758-B, Customer-owned Outside Plant Telecommunications Infrastructure

1.3 PERFORMANCE REQUIREMENTS

.1 Contractor shall provide systems and devices designed to operate in compliance with, but not limited to, all the prescribed requirements at ambient temperatures below, unless otherwise specified.

.2 Temperature: 0° C to 30° C.

.3 Humidity: 10% to 90% (non-condensing).

1.4 SHOP DRAWINGS AND DATA SHEETS

.1 Submit shop drawings and spec sheets in accordance with Section 28 05 01 and all other general requirements sections.

.2 Submit the following technical data sheets:

.1 Data sheets of all types of cable.

.2 All data sheets for equipment to be provided in this section.

.3 Manufacturer's instructions for installing their equipment.

.3 Shop drawings to be submitted are:

.1 All typical connection diagrams of each component to be connected.

.2 Detail design book for control interconnections, network (security) and power distribution.

.3 Unused test booklet.

1.5 CONFIGURATION

.1 Configure network equipment in order to interface with the video surveillance system. Configuration of the network equipment described in this section shall be executed by the Contractor, in coordination with DCC Representative. This includes, but is not limited to, configuration of the following elements:

.1 IP addressing.

.2 Quality of Service (QoS).

.3 Management protocols (SNMP) and network security (802.1x)

1.6 WARRANTY

.1 Warranty shall be provided as described in section 28 05 01 and below.

.2 The warranty shall cover parts, labour, mobilization, time required for diagnostic and identification of failure, repair or replacement including delivery, including all related expenses.

.3 For all devices (material and software), Contractor shall provide a complete warranty of 12 months, for all items described above. When a manufacturer offers an extended warranty on a piece of equipment, the Contractor shall transfer the warranty to DCC Representative and indicate in the certificate of warranty.

.4 During the warranty period, Contractor shall offer a 24 hours/day, 365 days/year telephonic assistance in addition to identifying the source of the failure within eight (8) hours of the reception of the service call. All parts judged to be defective shall be replaced within 24 hours of the reception of the service call. All part requiring repair shall be replaced temporarily by a part with equivalent performance, until reception of the repaired part, within 14 calendar days of the reception of the service call.

.5 Warranty certificate must detail all model numbers of parts under warranty. When a part has a serial number, the serial number shall also be included in the warranty certificate. If, during the warranty period, a defective part is replaced, a new warranty certificate must be submitted for the new part and the warranty for this part shall be extended to at least a year following the replacement.

.6 Submit, for comments, the warranty certificate.

Part 2 Products

2.1 GENERAL

.1 The Contractor must refer to drawings and all technical and functional specifications, as described in the various sections, to determine the type and the exact number of equipment and accessories to provide.

.2 The scope of supply is not exhaustive in quantity or type. Unless stated otherwise, the Contractor shall design, provide, install and integrate all equipment, including specific enclosures and cabinets, connectors, accessories, finish plates, cabling as well as labour and services required for full functionality of the network.

.3 Patch cords shall be carefully placed and grouped using Velcro straps (no tie wrap), following applicable standards.

.4 All cable and patch cords being installed shall be of the same type and from the same manufacturer.

.5 Contractor shall comply with, without being limited to, the following:

.1 Provide and install the network infrastructure required to support video surveillance systems. This included, without being limited to, network switches, telecom cabinets, patch panels, fibre optic cables, cable management and uninterruptible power supplies.

.2 Provide and install all cabling required for all devices and functionalities.

.3 Coordinate and configure IP addresses as provided by DND. Provide a list of equipment requiring IP addresses for DND representative to fill out.

2.2 TELECOM CABINET

.1 Telecom cabinets are used to house the Edge Switches (ES).

.2 Telecom cabinet shall meet, or exceed, the following requirements:

.1 Rotating wall cabinet giving access to front and back of equipment housed with at least 6U of mounting space.

.2 Steel construction with key lockable door in front of the cabinet. Back rotating section of cabinet shall be also key lockable. Door shall be grid to allow for airflow.

.3 Mounting support of 19 in allowing mounting of equipment compliant with EIA-310-D standard.

.3 Contractor shall ensure a minimal clearance to allow for the rotation of the cabinet and the door of the cabinet at a 90-degree angle without obstruction, with 1 m clearance in front of the cabinet and while maintaining compliance to applicable standards.

2.3 RACKMOUNT CABINET

.1 Rackmount cabinets are used to house the core switches and the VSS servers and archivers within the main electrical room.

.2 Rackmount cabinet shall meet, or exceed, the following requirements:

.1 Floor mount cabinet with at least 42U of mounting space.

.2 Steel construction with lockable door in front and back of the cabinet. Door shall be grid to allow for airflow.

.3 Mounting support of 19 in allowing mounting of equipment compliant with EIA-310-D standard.

.4 Provide horizontal and vertical cable management raceways.

.3 Provide vertical power bar to distribute power within the rack. Vertical power strip shall meet the following:

.1 Sufficient 5-15R outlets for all provided equipment along with a reserve of at least two outlets.

.2 NEMA 5-15 P connection to plug into typical 120VAC - 15A emergency power outlet in the room.

.4 Contractor shall ensure a minimal clearance of 1 m in front and 0.6 m in back. The doors of the cabinet shall open at a 90-degree angle without obstruction and while maintaining compliance to applicable standards.

2.4 COPPER CATEGORY 6 CABLE

.1 Copper Category 6 cable shall meet the following:

.1 Category 6 cable, 4 pairs, 100 ohms, 23/24 AWG, thermoplastic insulated, solid copper conductor unshielded twisted pair (UTP), formed into four individually twisted pairs and enclosed by a thermoplastic jacket.

.2 CSA certified as CMR (for riser rated installation) per CSA Standard C22.2 No. 214094 and listed as NEC Type CMR per UL Standard 444.

2.5 COPPER CATEGORY 6 PATCH CORD

.1 Copper Category 6 patch cord shall meet the following:

.1 Meets the requirements of the Copper CAT 6 cable.

.2 Various lengths adapted to the interconnection requirements to ensure proper cable layout (between 1 m and 7 m).

.1 Calculation of total: One (1) per each network copper cable installed in support of this system.

.2 Quantity and Length: 80% of total quantity @ 2.0 m and 20% of total quantity @ 3.0 m.

.3 Colour: Coordinate with DCC Communications representative prior to ordering.

.3 Factory Manufactured and certified. Field assembled patch cords are not allowed.

.4 Cabling shall meet or exceed category 6 requirement as per ANSI/TIA/EIA-568-C.2.

.5 CSA certified as CMR (FT-4).

.6 Four (4) pairs stranded conductor copper cable.

2.6 FIBRE OPTIC CABLE

.1 Fibre optic cable shall meet, or exceed, the following characteristics:

- .1 Six (6) multimode OM4 50/125 microns fibre.
- .2 Class FT4 or OFNR on flame test.
- .3 Loose tube construction.
- .4 Composed with medium density polyethylene aqua jacket.
- .5 All-dielectric cable construction.

.2 This product is installed or in the possession of DCC. Refer to drawing PH801 for further information.

2.7 FIBRE OPTIC PATCH PANEL

.1 Optical patch enclosure shall meet, or exceed, the following requirements:

- .1 Designed for installation in a 19-inch standard cabinet.
- .2 Capacity to host a variety of optical patch panels with keystone ST, SC, LC or FC connectors.
- .3 Shall be equipped with a small form factor Duplex LC bulkhead “senior” version fitted within a keystone format opening.
- .4 Enclosure with a height of 1“U”.
- .5 Transparent and lockable hinged cover in front and rear.

.2 Provide optical patch panel with LC connectors in sufficient quantity to allow for the connection of the network switch in the room.

.3 Patch panel shall be tested after installation to verify that the system meets the loss limit from patch panel to patch panel.

.4 This product is either installed or in possession of DCC. Refer to drawing PH801 for further information.

2.8 EDGE NETWORK SWITCH (ES)

.1 Existing switches that are installed are from the UniFi brand.

.2 Edge Switches that are required to be supplied and installed shall meet, or exceed, the following requirements.

- .1 Equipped with 10 10/100 Ethernet PoE (802.3af) ports. The total PoE budget of the switch shall minimally allow the simultaneous powering of 12 PoE ports (15,4W).
- .2 Equipped with two (2) optical 1G compatible ports and a variety of SFP+ modules.
- .3 Managed switch.
- .4 Minimally supports the following protocols:
  - .1 VLAN (802.1q) for network segregation.
  - .2 Rapid Spanning Tree protocol (RSTP) to allow for a redundant star topology (IEEE 802.1d).

.3 Simple Network Management protocol (SNMP).
.4 Simple Network Time protocol (SNTP).
.5 Remote Authentication Dial-in User Service (RADIUS).

.5 Allow for the use of the following tools or mechanisms:
.1 Quality of Service (QoS IEEE 802.1p).
.2 Command Line interface (CLI).
.3 Loss of Link Management.
.4 Port Rate Limiting.
.5 Port Based Network Access Control (IEEE 802.1x).

.3 Contractor to provide, as required, SFP+ modules for fibre optic connections. SFP+ modules shall meet, or exceed, the following requirements:
.1 Compliant with standard IEEE 802.3ae 10GBASE-LR.
.2 Multi mode fibre LC connector.
.3 Compatible with the proposed access switch.

.4 Existing model is : UniFi US-48-500w.

2.9 EDGE NETWORK ENVIRONMENTALLY HARDENED SWITCH (HS)

.1 The hardened switch shall meet, or exceed, the following requirements.
.1 Equipped with 10 10/100 Ethernet PoE (802.3at) ports. The total PoE budget of the switch shall minimally allow the simultaneous powering of 6 PoE ports (30W).
.2 Equipped with minimally two (2) optical 1G compatible ports and a variety of SFP+ modules.
.3 Managed switch.
.4 Minimally supports the following protocols:
.1 VLAN (802.1q) for network segregation.
.2 Rapid Spanning Tree protocol (RSTP) to allow for a redundant star topology (IEEE 802.1d).
.3 Simple Network Management protocol (SNMP).
.4 Simple Network Time protocol (SNTP).
.5 Remote Authentication Dial-in User Service (RADIUS).
.5 Allow for the use of the following tools or mechanisms:
.1 Quality of Service (QoS IEEE 802.1p).
.2 Command Line interface (CLI).
.3 Loss of Link Management.
.4 Port Rate Limiting.
.5 Port Based Network Access Control (IEEE 802.1x).

.2 Contractor to provide, as required, SFP+ modules for fibre optic connections. SFP+ modules shall meet, or exceed, the following requirements:

.1 Compliant with standard IEEE 802.3ae 10GBASE-LR.

.2 Multi mode fibre LC connector.

.3 Compatible with the proposed access switch.

.3 Hardened switch shall be constructed to withstand harsh environmental conditions:

.1 Operating temperatures ranging from -40ºC to 75ºC without the use of fan-forced cooling.

.2 Product shall operate in an environment with relative humidity of 5% to 95% (non-condensing).

2.10 CORE SWITCH (CS)

.1 Existing switches are from the Cisco brand and new switches shall be Cisco to ensure compatibility and ease of management.

.2 The core switch shall meet, or exceed, the following requirements:

.1 Level 3 switch with dynamic routing.

.2 Adaptable port configuration SFP / SFP+ / QSFP 1/10/40 Gigabit Ethernet.

.3 Supports all network protocols, tools and mechanisms of the access switch described above.

.4 Supports Access Control List (ACL) configuration to allow/block access to network for specific IP addresses.

.5 Supports aggregation of network ports on all ports (link aggregation).

.6 QoS level 2 to level 7.

.7 With sufficient network ports to allow for the connection of all access switched, servers and archiving units.

.3 With sufficient enclosure space to allow for future expansion. Unused card space shall be universal and allow for the installation of various network cards with fibre optic or copper ports.

.4 Contractor shall provide all required SFP and SFP+ modules, fibre optic patch cord, CAT6 patch cables to allow for all connections to the core switch.

.5 Existing model is: Cisco 550X-24FT. This product is installed.

2.11 OPTICAL PATCH CORD

.1 Optical patch cord shall meet, or exceed, the following requirements:

.1 Patch cord of 2 m long (or sufficient length to allow for proper termination on the patch panel).

.2 Extremities equipped with LC connectors.

.3 The connector supported in the above section shall deploy a patch cord that is designed to automatically release from the end device without damage to the either the patch cord or the connector.

.4 Multi-mode fibre 50/125 microns with aqua jacket and compliant to ANSI/TIA-568.3-D.

.5 Patch cords shall be designed to repeatedly be pinched and still have less than 0.75 dB loss.

.6 Patch cords shall be tested to over 500 mating cycles with less than 0.75 dB losses.

.7 Patch cords shall have a minimum bend diameter of one inch.

2.12 RJ45 PATCH PANEL

.1 RJ45 patch panel shall meet, or exceed, the following requirements:

.1 Twenty-four (24) connector RJ45/BIX factory assembled for connection of CAT6 cables.

.2 Shall be made of a steel frame construction with “Black” powder coat finish.

.3 Colour coding compliant with T568A and T568B.

.4 Designed for installation in a 19-inch (482.6 mm) standard cabinet.

.5 Panel shall be 1 U high and High Density 24 port.

.6 Steel-frame construction with black powder coat finish.

.7 From ISO 9001 Certified Manufacturer.

.8 With port identification labels on front and rear.

.2 All patch panels jacks shall be equipped with factory made RJ45 patch cords meeting the technical performance requirements for CAT 6 cable. Patch cords must use the same pin and pair assignments as horizontal distribution cable. All patch cords are to be provided by the Security Contractor.

.3 Pin and pair assignments shall accommodate 8-pin modular wiring systems and conform to ISDN 568-A standard.

2.13 UNINTERRUPTIBLE POWER SUPPLY (UPS)

.1 Supply and install 1 uninterruptible power supply (UPS) for providing up to 15 minutes of backup power. The uninterruptible power supply unit must meet the following requirements:

.1 Equipped with sealed and maintenance free batteries.

.2 Rack-mountable of no less than 1U.

.3 Allows for desired autonomy when switch is fully loaded with PoE cameras.

.2 Provide a UPS within each telecom and rackmount cabinet and at security office.

2.14 WIRING AND CONDUITS

.1 Cameras shall be wired and connected to the electrical rooms. Conduits shall be installed and provided as described in Division 28. A protection against damages to the cable jacket is included in Division 28 at both ends of the conduits.

.2 Contractor is responsible for the coordination of work with other trades and parties in order to prevent unnecessary drillings and openings in walls or ceilings.

Part 3 Execution

3.1 VERIFICATION

.1 Condition verification: Before proceeding with installation of equipment, ensure that prior work by other trades is acceptable within installations and will allow for proper execution of work in full conformity with manufacturer's written instructions. The Contractor is to perform a verification that is to consist of a functionality test and to provide a report indicating pass/fail and what deficiencies are required/found.

3.2 CABLING INSTALLATION

.1 Take all necessary precautions to prevent damage to cable jacket during installation or handling.

.2 Confirm copper cabling sheath colour with DCC Representative prior to ordering.

.3 No cable shall be bent on a radius of less than eight (8) times the cable diameter.

.4 Cables shall be loosely bundled and secured using Velcro ribbons or another similar product.

.5 Cable bundles must not be stressed or over cinched.

.6 Cables terminating at the patch panel shall be dressed-in following standard craft practice.

.7 When terminating UTP, the length of cable twist (twist/cm) shall be identical to that of the remainder of the cable. This twist shall be maintained up to 13 mm from the termination point of the cable at the patch panel and the termination.

.8 When terminating UTP cable, the maximum length of sheath removed shall be 19 mm.

.9 Equipment racks within the equipment rooms (identified ion the drawings) shall be complete with all cable management systems and other equipment as required for routing and storing of cables.

.10 Pull fibre optic cable in conformity with maximal pull tension prescribed by manufacturer and standard ANSI/TIA-569-D. Take care to comply with cable minimum bend radius as prescribed by ANSI/TIA-568.3-D.

.11 Installation shall be carried out to allow for all cables to be concealed within conduits.

.12 All cables shall meet OFNR or FT4 flame test ratings.

.13 Once installation is completed, Contractor shall use a certified test module to ensure conformity of cables CAT6 and fibre optic cables as described in ANSI/TIA568.2.D and ANSI/TIA568.3.D respectively. Test results must be consigned and submitted to the DCC Representative.

.14 All cables and wires should be installed as far as possible from any power source and/or electromagnetic source such as electrical cables, ballasts, fluorescents, motors, transformers and other sources. In particular, the following installation distances must be respected.

Source Descriptions	Separation
Shielded wiring or electrical equipment with a power of less than 2 kVA	130 mm
Shielded wiring or electrical equipment with a power of between 2 and 5 kVA	310 mm
Shielded wiring or electrical equipment with a power of more than 5 kVA	620 mm
Motors, transformers, photocopiers, electrical room and other electromagnetic sources	1,000 mm

.15 Cables and conduits shall pass over other services in order to prevent nuisance in the event of a conduit or ventilation duct removal.

.16 All cables must be installed and secured in dry places, respecting the traction limits, minimum bend radius and any installation requirement specified by the manufacturer or issued in the applicable installation standards. Shielded cables should be grounded with a single point on each section, unless otherwise stated in the requirements of the manufacturer. If applicable, all cables that may be exposed to lightning must be adequately protected with appropriate device.

.17 It is the responsibility of the Contractor to make all required openings in the floor, ceiling and walls. Any walls, floors, ceilings, or other existing site structures damaged by the passage of wiring or installation of equipment should be repaired in accordance with existing finishes.

.18 When grouped, cables and wire must be fastened using VELCRO type fasteners. The use of self-locking nylon ties is prohibited.

3.3 CABLE NUMBERING AND LABELLING

.1 All labels shall be laser printed and no handwritten labels will be accepted.

.2 Labels shall be printed with a minimum 10 pt font size.

.3 Cable labels are to be self laminating, vinyl with white printing area and sized to allow label to wrap around 2.5 times minimum. Labels also to be sized to suit the labeling requirement maintaining a minimum 10 pt font size.

.4 Cable labels shall be installed on clean and dry cable and mounted within 100 mm of each end of each cable.

.5 Each cable shall be clearly marked with a permanent numerical identifier at each end of the cable.

.6 Outlets shall be clearly and permanently marked with alphanumeric identification labels indicating the cable

.7 terminating room, rack, patch panel and port.

.8 Each cable shall have permanent labels at each end of the cable identifying the cable number and pair count and where the cable terminates.

.9 Labelling of room Telecommunication outlets and patch panel shall be in accordance with TIA/EIA-606. The lamicoid labels for all patch panels shall be 25 mm x 25 mm. These labels shall have a white on black background.

.10 All termination blocks and patch panels used for horizontal cable terminations and cross connects are to be labelled consecutively starting from left to right and then from top to bottom.

3.4 INSTALLATION OF NETWORK SWITCHES

.1 Install network switches by anchoring the enclosure on all four (4) supports of the cabinets.

.2 Connect switch power to the UPS and execute base configuration. Assign an IP address for the management of each switch in a network dedicated to the security equipment management. Coordinate IP address assignment with DCC Representative.

.3 Install SFP or SFP+ modules and connect them to the optical patch panel to interconnect access switch and core switches with LC-LC patch cords.

.4 Connect, as required, all network ports to the RJ45 patch panel while making sure not to exceed the PoE budget of each switch.

.5 Use RJ45 patch cord of sufficient length (maximum 7 ft) to allow for some flexibility for future maintenance of the security network. Take care to pass cords through cable managers (vertical and horizontal) in order to provide a proper, easily manageable solution.

3.5 CONTROL AND TESTS

.1 Submit all UTP cables to the following tests and correct any deficiencies:

.1 The test shall be recorded as pass/fail as indicated by the test set in accordance with the manufacturers recommended procedures and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

.2 Each installed cable shall be tested for length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the TIA/EIA-568-A.2 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number.

.3 Cable shall be tested for permanent link.

.4 The test set to be used shall be Level 3 or above. Test sets to have been calibrated within the last 12 months and a copy of the test set "Certificate of Calibration" to be provided to the DCC Representative.

.5 Category 6 data cable shall be performance verified using an automated test set. This test set shall be capable of testing for the continuity and length parameters defined above, and provide results for the following tests:

.1 Near End Crosstalk (NEXT).

.2 Attenuation.

.3 Ambient Noise.

.4 Attenuation to Crosstalk Ratio (ACR).

.5 Far End Crosstalk (FEXT).

.6 Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard and the result shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

.2 Submit optical cable stands to attenuation tests to ANSI/TIA-568.3-D and correct any deficiencies. Validate links in both directions.

.1 Backbone multimode fibres shall be tested at both 850 nm and 1300 nm and 1310 nm and 1500 nm in both directions. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14-A for multimode fibre. The light source shall meet the launch requirements of ANSI/EIA/TIA-455-50B, Method A. This launch condition can be achieved either within the test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-B.1) with a Category 1 light source. Testing for single mode fibre cabling shall meet the requirements of ANSI/EIA/TIA-526-7.

.2 Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements. Maximum attenuation for installed cables shall be evaluated based on the following formula: manufacturer's maximum attenuation per kilometer divided by 1000 and then multiplied by the installed cable length in meters. The adjusted cable attenuation value shall be added to the manufacturers mean loss per mated pair of connectors multiplied by the number of mated pairs under test.

.3 The expected results for each cable (or group of cables of the same nominal length) shall be calculated before the start of testing and recorded in a space provided on the Contractor's test matrix. Each strand of fibre in the respective cable shall be evaluated against this target number. Any fibers that exceed this value shall be repaired or replaced at no cost to the DCC Representative.

.3 Simulate a power failure at the UPS to validate proper execution of the controlled shutdown sequence for all servers installed in the telecom cabinets.

.4 All hardware shall be tested after installation to ensure that the transmission criterion is met. For connecting hardware with modular interface components (i.e., plug and jack connectors), transmission tests shall be performed with both components in a mated state.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 28 23 00 – Video Surveillance System

.2 27 21 29 – LAN Network

1.2 DEFINITIONS

.1 (VSS) Video Surveillance System

.2 (DND) Department of National Defence

1.3 REFERENCES

.1 National Building Code (NBC 2020).

.2 Ontario Electric Code 2021.

1.4 CONTRACTOR'S RESPONSIBILITIES

.1 Existing equipment and context:

.1 Current VSS is composed of existing obsolete devices and components to be removed and recent existing equipment to remain.

.2 As referred in drawings, Contractor to install all cameras, devices, cable, conduit or other accessories required to complete the VSS system. Contractor to refer to specific notes to identify elements missing at each location. For example, some locations might have cameras provided and installed, but no cable, or empty conduit.

.3 In instances where existing equipment is to be reused, and where applicable, specification sheets for the equipment shall be provided in appendix. Except where indicated, Contractor shall not have to match the existing product model or brand, if compatibility is maintained with an alternative.

.4 As Contractor will work to configure existing equipment, Contractor shall be certified installer and provider of all identified equipment to remain.

.2 Work includes:

.1 Prior to planning and beginning of work, Contractor shall dedicate at least a full work week (40 h) for the following activities:

.1 Survey the site to confirm existing elements locations.

.2 Visual inspection of all existing devices and cables to ensure they are in proper condition.

.3 Test all installed devices and cables to identify any that would be "dead on arrival". Testing procedures shall be of a "pass/fail" nature and verify all basic functionalities of equipment tested.

.4 Identify all equipment that would need replacement. Identify all location discrepancies on drawings. Identify all failing devices in test booklet. Consign results and information in a concise, easily readable digital format.

.2 The general contractor must be sure to make the necessary coordination of work with all involved subcontractors.

.3 Providing all of the work for the IP network infrastructure dedicated to the security system.

.4 Remove and dismantle identified components and accessories and deliver them to DCC Representative. Replace Acoustical Ceiling Tiles where existing equipment is removed. The Contractor shall account for 75 ceiling tiles to be currently replaced.

.5 Design, supply, install, integrate all components and accessories such as enclosures, connectors, finishing and mounting plates, cables and wiring as well as labor and services necessary for the operation of security system.

.6 Submit for analysis the data sheets of products that differ from the product number requested or when the product number is not specified.

.7 Pull the cables as per the manufacturer's requirements and identify as per the requested requirements.

.8 Take necessary measures to ensure the protection of components from vandalism and damage until final acceptance of the work.

.9 Drill and finish off walls and ceilings after installation of components and cables.

.10 Perform tests on all components of the camera system.

.11 Perform data collection regarding the information to be entered in the database. These informations shall be provided by DCC Representative on the Contractor's forms. The Contractor shall guide the DCC Representative in the data collection.

.12 Perform system start up, update staff training and prepare the end of contract documentation containing all data sheets and installation drawings identified "as-built".

.13 The distribution of the 120VAC power supply network 120VAC.

1.5 USE OF THE PREMISES

.1 The use of the premises is restricted to areas identified for the execution of work and storage. The work must be done without interfering with the movement of people.

.2 As necessary, determine with DCC Representative access roads to the site, storage areas, where it is possible to stack the material and the location of facilities.

.3 Move stored materials that disrupt the operations of DCC Representative or other Contractor.

1.6 SCHEDULES AND COORDINATION

.1 Refer to general instructions.

1.7 DESIGN REQUIREMENTS

.1 All cables must be adapted to the conditions of use according to Ontario Electrical Safety Code, even if the type of equipment to be connected is not governed by the Code.

.2 Unless otherwise noted, the cables must meet the following requirements:

.1 The manufacturer's requirements with regards to their usage.

.2 When installed inside, should be covered with FT4 rated sheath and be installed in ducts.

.3 When installed outside under ground level, they must be covered with a sheath adapted for wet conditions.

.4 If part of the cable must be installed below ground level and the other part in a building, the cable must be both FT4 rated and adapted for wet conditions.

.5 The cable size must be increased if the voltage drop is greater than 5%.

.6 No splicing is accepted.

.7 Of sufficient length to allow a minimum of five (5) connections to the component in case of accidental breakage.

.8 With the exception of network cables for the horizontal cable subsystem, all cable cores for security equipment must be stranded (no solid conductors).

.3 Submitting to this "RFx" the contractor confirms they are aware that the proposed VMS platform and any proposed products may be rejected if such product has been listed to represent a security concern on one of the following:

.1 Canadian Security Intelligence Service (CSIS) – Security Alert.

.2 Any Canadian government agency – Security alert or Advisories.

.3 USA, Federal Communication Commission (https://www.fcc.gov/supplychain/coveredlist).

1.8 SUBMITTALS

.1 Submit the following data sheets:

.1 Data sheets for all cable types.

.2 All data sheets for equipment to be provided in this section.

.3 Manufacturer's instructions for installing their equipment.

.4 Manufacturer's manuals for the use of its equipment.

.5 Submit a list of cables that covers all the cables and wiring set up and that includes the following:

.1 Cable number.

.2 Termination.

.3 Origin.

.4 Function and specifications on equipment interconnections.

.5 Cable type.

.6 Submit a design specification including notably an overall configuration diagram of security systems.

.7 Submit maintenance manuals that will include the following for each piece of equipment:

.1 The approved datasheet for all equipment submitted.

.2 A description of the maintenance tasks required including inspection methods.

.3 The procedure for preventive periodic maintenance.

.2 Submit the following shop drawings:

.1 Wiring diagrams and details of equipment installation must indicate the location, proposed layout, cable route and arrangement, accessories, piping, conduits and all other elements which must be shown in order to achieve a coordinated system.

.2 Wiring diagrams should indicate the circuit terminals, the internal wiring of each device as well as the interconnections between different devices.

.3 Drawings must indicate clearances required for the operation, maintenance and replacement of equipment.

.4 If changes are required, notify the DCC Representative before they are made.

.3 Documents to be kept on site:

.1 DCC Representative will provide two (2) sets of drawings. On one of the sets, indicate, as they are made, all changes made during the execution of the work.

.2 At the end of the work, transfer to the second set the information recorded on the first set so as to show the systems and devices as they were installed.

.3 Keep these drawings on site and make them available for the purposes of reference and verification.

.4 Documents marked “as built” to submit to DCC Representative:

.1 Identify each drawing in the lower right corner, in letters at least 12 mm in height, as follows: “DRAWING” AS BUILT “: THIS DRAWING HAS BEEN REVISED AND INDICATES SYSTEMS AND DEVICES AS THEY HAVE INSTALLED”, “Name of Contractor” and “Date.”

.2 Submit drawings to DCC Representative for approval and then make corrections as directed.

1.9 QUALITY ASSURANCE

.1 Workforce Qualifications: security work must be performed by qualified personnel in good standing under the terms of the law of the Province of Ontario on vocational training and workforce qualifications. In addition, the staff assigned to programming or supervision of security systems work must hold manufacturer’s certification demonstrating that they have received and successfully completed training courses to install and start up the security system that is under their responsibility. Employees enrolled in a provincial apprenticeship program may perform specific tasks if they are under the direct supervision of a skilled worker.

1.10 TRANSPORTATION, STORAGE AND MAINTENANCE

.1 Refer to general instructions

1.11 WASTE MANAGEMENT

.1 Remove from site all packing materials and route them to the appropriate recycling facilities.

1.12 WORK INSPECTION

.1 Before requesting the preliminary inspection, the Contractor shall:

.1 Complete work to 100%, otherwise the DCC Representative may refuse to issue an excessively long list of deficiencies. In addition, the Contractor may be billed for unnecessary trips by DCC Representative, due to a lack of coordination or neglect.

.2 Clean all appliances included in the project and touch up the paint on the equipment, if any.

.3 Submit all documentation requested under “Submittals.”

.2 During the preliminary inspection, the Contractor shall:

.1 Demonstrate consistently that systems and equipment operate in accordance with the plans and specifications requirements.

.2 Possess the devices to measure resistance, voltage and amperage, and tools such as screwdrivers, pliers, flashlight, etc., providing access to the connections of components and reconnection if necessary.

.3 Provide DCC Representative with the means to enable him to perform verifications, such as the availability of a person with required knowledge of the project for the conducting of inspections and tests.

.1 Place stepladders and ladders where needed, move ceiling tiles, open access doors, etc.

1.13 ACCEPTANCE OF WORK

.1 Upon receipt of written notice by the Contractor that his work is complete, the DCC Representative will conduct a general inspection of the work.

.2 The DCC Representative will list all defects that he deems should be corrected. This list will be called “DEFICIENCIES LIST”.

.3 Following confirmation in writing from the Contractor that all work is completed in accordance with the contract documents and the “DEFICIENCIES LIST” issued by the DCC Representative, the DCC Representative will make a second verification if necessary. If the installation is in accordance and acceptable, a “Certificate of Substantial Completion” approving the work will be issued.

.4 If deficiencies are still present but are not deemed critical to the usability of the work, the DCC Representative will issue a second “DEFICIENCIES LIST” annexed to the “Certificate of Substantial Completion”.

1.14 FINAL ACCEPTANCE

.1 A final acceptance certificate is issued by the DCC Representative when the Supplier:

.1 Corrected the deficiencies annexed to the “Certificate of Substantial Completion” to the satisfaction of DCC Representative.

.2 Paid in full all its subcontractors.

.3 Meets all the requirements of the contract.

.4 Requested such a certificate to the DCC Representative.

.5 Completed and submitted a formal statement regarding the distribution of initial payment by the contractor.

1.15 COMMISSIONING OF THE FACILITY

.1 Instruct DCC representative and operations staff of the mode of operation and maintenance practices of the facility, its equipment and its components.

.2 Should the Contractor fail to control the execution of the work to the satisfaction of the DCC Representative or when specifically requested for a particular product, retain and pay for the services of the manufacturer to monitor the start-up of the work, to check, adjust, balance and calibrate the various elements and to instruct the operations staff.

.3 Provide these services for a sufficient duration by providing the number of visits required to put the equipment into operation and ensure that operations staff is familiar with all aspects of maintenance and operation.

1.16 OPERATING INSTRUCTIONS

.1 Provide operating instructions for each main system and for each main unit prescribed in the relevant sections of the specifications for the operating, management and maintenance personnel.

.2 Operating instructions shall include the following:

.1 Wiring diagrams, control diagrams, control sequence for each main system and for each device.

.2 Start-up, alignment, adjustment, lubrication, operation and shutdown procedures.

.3 Safety Precautions.

.4 Procedures to be followed in case of failure.

.5 Other instructions, according to the manufacturer’s recommendations for each system or device.

.3 Provide instructions printed or engraved, placed under glass frame or laminated using an approved method.

.4 Post instructions at approved locations.

.5 Exposed operating instructions should be on weather-resistant material or they must be placed in a waterproof envelope.

.6 Ensure that the operating instructions do not fade when exposed to sunlight.

1.17 WARRANTY

.1 If a part is defective, the Contractor shall arrive on site within four (4) hours of a service call being placed, identify the source of the problem and repair it immediately if the defect affects protection of building perimeter and internal partition or within a period of two (2) working days in all other cases.

.2 If the Contractor fails to remedy the defect within the requested time after notice given by the DCC Representative or repair work is not progressing at a sufficient pace, DCC Representative

can perform repairs or corrections himself or arrange for the repairs to be done by other person designated by him. The cost of this work will be borne by the Contractor.

.3 Once completed, submit a certificate of warranty describing the list of included and excluded items, starting date, duration of the warranty, nature of the services to be provided and the content of the service contract option.

.4 When a manufacturer offers an extended warranty on a piece of equipment, the Contractor shall transfer the warranty to DCC Representative and indicate in the certificate of warranty.

.5 Warranty period to begin at the deliverance of the "Certificate of Substantial Completion".

.6 Warranty shall extend to existing devices, cables and other components installed and to be installed on the video surveillance system. Defective devices and/or elements that cannot be covered by warranty shall be identified following Contractor's initial discrepancy report, see section 1.4.1 – CONTRACTOR RESPONSIBILITIES.

.7 The Contractor is to provide a warranty for devices that are already installed that the original warranty period has expired or is expiring before end of contract. The warranty period the Contractor is to provide is 12-month period after all deficiencies are completed.

1.18 SPECIAL PROVISIONS - SECURITY WORK

.1 No changes to the original plans and specifications can be performed without the DCC Representative's request in writing.

.2 In all cases, the DCC Representative shall be consulted and they alone can give permission for any changes to be made with respect to plans and specifications. All work that is not in accordance with plans and specifications must be modified by the Contractor at no additional cost.

.3 During construction, DCC Representative has the right to request changes to plans and specifications when they see fit. These changes will not affect nor invalidate the terms of this contract. If they cause an increase or decrease in the cost of the work, an adjustment will be made in the contract, following a conformity assessment.

.4 Contractor to fill out pricing list provided in appendix. Unit cost (material and labor) of all components shall be identified. Should items be added or removed from the project's scope, unit price will be used for all change pricing.

1.19 SPECIAL PROVISIONS – EQUIPMENT AND MATERIAL

.1 Quality

.1 Unless otherwise specified, equipment and materials used for the execution of work must be new, in perfect condition, manufactured, assembled and tested at the factory, according to the terms of the contract documents. They must be ready to be installed for the purposes for which they are intended. If necessary, provide evidence establishing the nature, origin and quality of products supplied.

.2 As required, equipment and materials must have the certification or approval label from a certified body recognized by the Ontario Building Code.

.3 All information on devices and materials (operation or otherwise) must be bilingual.

.4 Equipment and material found defective before the end of the work are rejected, regardless of the results of previous inspections. The Contractor shall perform the removal and replacement of defective products at his expense. He is responsible for delays and associated costs.

.5 Devices or materials must have the characteristics and dimensions suitable for the places where they are installed. Notify the DCC Representative prior to the installation of a device or material that does not meet these conditions.

.2 Availability

.1 Parts and products should not be for the exclusive use of the Contractor who gets the contract. The devices and security software must be commercially available in Ontario for a minimum of twelve (12) months from at least three (3) accredited installers and at a price comparable to the competition.

.2 Immediately after being awarded the contract, the contractor shall deliver equipment and materials according to requirements and anticipate any delays. Order the required quantities at the right time, given the schedule of work and storage capacity on site. If it is possible to anticipate some delays in delivery, notify the DCC Representative so that measures can be taken to substitute replacement equipment or material or make the necessary corrections and this sufficiently in advance to restrict delaying the work.

.1 Should the DCC Representative not be notified of anticipated delivery delays at the start of work, and should it also seem likely that the execution of the work be delayed, DCC Representative reserves the right to substitute expected equipment or material with other comparable equipment or material that can be delivered more quickly, provided that the contract price will not be increased.

.3 Transport

.1 Transportation costs of equipment or materials required for the execution of the work are the responsibility of the Contractor.

.2 The Contractor is responsible for the inspection, storage of equipment and materials arriving on site.

.3 Move and store under lock and key equipment and materials avoiding damage, alterations or soiling, and following the manufacturer's instructions where applicable.

.4 Store equipment and materials in their original packaging, taking care to leave intact the manufacturers’ label and seal.

.5 Replace at no additional charge damaged equipment or materials to the satisfaction of the DCC Representative.

.6 Unless otherwise indicated, install or set up equipment or materials by following the manufacturer's instructions.

Part 2 Products

2.1 MATERIAL AND EQUIPMENT

.1 When required by the Ontario Electrical Code, equipment must be CSA certified. In cases where equipment cannot be certified or in the case of an assembly to be connected to an electrical installation and assembly requires certification, submit materials and equipment or assembly to the competent authority before delivery on site or prior to commissioning the assembly.

.2 Use manufacturer recommended cabling, including sizes and fabrication. Except where otherwise indicated by manufacturer, cabling shall be multi-conductor (no individual wires). Cabling larger than 22 AWG shall be stranded and all cabling smaller than 22 AWG shall be solid. When a specific size is required for a conductor by the manufacturer, the size is to be adjusted upwards depending on the cable length and a maximum voltage drop of 3%.

.3 All components must be of appropriate quality for intensive use.

.4 All components must operate below the recommended manufacturer's limits.

2.2 WIRING TERMINATIONS

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

.2 Joint connectors (wire to wire) must be compression type with gel against corrosion and moisture.

.3 Use grommet type compression endings when connecting to bolts (e.g., grounding of a piece of equipment). Fork type terminations are to be avoided.

.4 When connecting to a terminal block, strip the wire to a suitable length. The unsheathed portion should not exceed the depth of the terminal block. For stranded wire less than 22 AWG caliber, the conductor must be unsheathed to a length double to what is normally required and folded on itself, and twisted before being inserted into the terminal.

.5 Cover with shrink tubing all junctions (wire to wire) when the joint is subjected to external weather conditions or performed outside of a heated building.

2.3 COMPONENT IDENTIFICATION

.1 The identification of the boxes or cabinets of security components must be done by the use of label plates conforming to the following requirements:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, melamine with black matte finish face and white core, letters accurately aligned and engraved into core, mechanically attached with self-tapping screws, aligned letters, etched in the plate.

.2 Sizes as follows:

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

.3 Wording on nameplates to be approved by the Engineer prior to manufacture.

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

.5 Equipment cabinet must have a label in Size 3 when the cabinet width is less than 600 mm, and a Size 4 in other cases. Number according to the DCC Representative directives.

2.4 WIRING IDENTIFICATION

.1 Both ends of the cables should be marked permanently and indelibly with a self-laminating vinyl plastic tape or equivalent. Identification must be carried out according to the following structure:

.1 When it is a component associated with a door, identification must be AAAA-BBBB (AAAA represents the number of the door and BBBB is the component code).

.2 In the case of a component that is not associated with a door, the identification must be BBBB-CCCC (CCCC represents the number DES-XXX and BBBB represents the component code).

.3 Information identifying the components is found on the plans. Do not improvise the numbering if the above requirements are not available. If this is the case, the Representative will provide the missing information.

.2 Identification method must be uniform for the entire installation.

.3 Use communication cables and conductors with uniform color coding throughout the network.

.4 Unless agreed by the DCC Representative, the color code of the sheaths of cables and conductors shall be uniform throughout the installation for the same type of component.

2.5 EQUIPMENT CABINET AND METAL HOUSINGS FINISH

.1 Units installed outdoors must be NEMA 4X or equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 Unless otherwise indicated, perform all of the installations in accordance with CSA C22.1.

3.2 LABELS, INDICATOR PLATES AND SIGNAGE PLATES

.1 Ensure CSA labels, indicator plates and signage plates are visible and legible when materials are installed.

3.3 INSTALLATION OF CABLES

.1 Comply with the manufacturer's requirements.

.2 Installation of wiring must be done so that all of the cables must be installed in conduits. Unless there are exceptions approved by the DCC Representative, all wiring must be inserted in conduits. The security contractor is responsible for completing certain conduits runs over a distance not exceeding 3 m. For the ends of runs where installing a rigid conduit is not adequate, the security contractor will supply and install flexible ducts.

.3 The security contractor must ensure that power cables for electrical locks are hidden and are not accessible from the unsecured side. Coordinate with the electrical contractor responsible for installing conduits so that pull-boxes are not accessible from the unsecured side.

.4 When grouped, cables and wire must be fastened using VELCRO type fasteners. The use of self-locking nylon ties is prohibited.

.5 All cables and wires (horizontal and vertical) must be free of any cuts and/or seal/splice. The cables from the end of the line components must be continuous to the main panel or control module.

.6 All cables and wires should be installed as far as possible from any power source and/or electromagnetic source such as electrical cables, ballasts, fluorescents, motors, transformers and other sources. In particular, the following installation distances must be respected.

SOURCE DESCRIPTIONS	SEPARATION
Shielded wiring or electrical equipment with a power of less than 2 kVA	130 mm
Shielded wiring or electrical equipment with a power of between 2 and 5 kVA	310 mm
Shielded wiring or electrical equipment with a power of more than 5 kVA	620 mm
Motors, transformers, photocopiers, electrical room and other electromagnetic sources	1,000 mm

.7 All cables and security wiring must be installed and secured in dry places, respecting the traction limits, minimum bend radius and any installation requirement specified by the manufacturer or issued in the applicable installation standards. Shielded cables should be grounded with a single point on each section, unless otherwise stated in the requirements of the manufacturer. If applicable, all cables that may be exposed to lightning must be adequately protected with appropriate device.

.8 To be impervious to electromagnetic fields, all major metal parts (racks, cabinets and desks) must be grounded to the grounding network of the building. The grounding must be made in accordance with the manufacturer's recommendations.

.9 Cables and wires should never be in contact with hot surfaces, electrical power cables, machinery or ducts attributed to other services (steam piping, hot water, lighting accessories, motors, transformers, etc.).

.10 It is the responsibility of the Contractor to make all required openings in the floor, ceiling and walls. Any walls, floors, ceilings, or other existing site structures damaged by the passage of wiring or installation of equipment should be repaired in accordance with existing finishes.

.11 When the use of a lubricant is necessary to facilitate cable pulling, the Contractor shall use a product that is safe for human contact and the environment. In addition, it must be compatible with all types of sheaths and CSA approved. Product data sheets must be submitted and contractor must obtain authorization before use.

.12 Patch cord shall be used with all equipment.

3.4 INSTALLATION OF CONDUITS

.1 See Division 26 for conduit requirements.

.2 Contractor shall design, supply and install a new conduit network in accordance to Electrical code specifications for all new components to be supplied.

.3 All telecommunications cables shall be installed in home run conduits originating from the camera to the applicable telecom room. The use of J hooks, brackets, cable ties and other attachment is **not permitted**.

.4 All metallic parts of the cable distribution supporting system shall be bonded together mechanically, including at all transition points (i.e., cable tray and distribution conduit not mechanically connected) using a 6 AWG green jacket stranded copper ground wire. The metallic components of the distribution system shall be bonded together at the telecom backboards and then bonded to their respective telecom ground bus bar. The maximum cable length from the mechanical termination in the telecom space to the camera shall not exceed 90 m in length. Where the horizontal distance exceeds 90 m in overall length, provide ethernet extenders. It is the Security Contractor’s responsibility to ensure that the conduit path will be within 90 m.

.5 It is the Security Contractor’s responsibility to ensure that the sizing of pipes indicated on the plans and specifications are of a size suitable for the security needs based on cables and equipment offered. If the Security Contractor concludes that sizing is insufficient, they shall inform the DCC Representative and confirm any design problem.

.6 Submit plans for review showing wiring distribution in all conduits.

.7 To minimize the impact of lightning, cables for any outdoor cameras installed on the building must be installed in conduits dedicated to this purpose. Cables for indoor applications shall not be run in conduits serving equipment installed outdoors.

3.5 LOCATION OF EQUIPMENT AND MATERIALS

.1 Unless otherwise indicated, measure the component installation height from the finished floor to the horizontal centreline of the component.

.2 Where the mounting height is not listed, check with the DCC Representative prior to beginning installation.

.3 The camera shall be installed according to the drawing's specification.

.4 The exact location of equipment or materials is defined only schematically on drawings, final positioning must be detailed on site in conjunction with the DCC Representative. The position on drawings can be changed without additional charge or credit on condition that the displacement does not exceed 3 m.

.5 Install devices, materials and conduits to limit congestion and keep as much floor space clear as possible, in accordance with the manufacturer's recommendations for safety, access and maintenance.

.6 Inform DCC Representative of any problem that could cause any device or material to be installed contrary to the guidelines.

.7 If hatches must be installed to allow for regular maintenance or access to equipment or materials, make a request to the DCC Representative. The supply and installation of access hatches are the responsibility of the DCC Representative.

.8 The cameras final view shall meet the DCC Representative expectation and the adjustment can be changed for each camera at no additional charge.

3.6 PROTECTION OF WORK IN PROGRESS

.1 Ensure integrity of all finished works or work in progress by utilizing adequate protection. Damaged or altered finished works due to lack of compliance with afore mentioned protection measures must be replaced or repaired free of charge, as specified by the DCC Representative.

.2 Unless otherwise specified, you must obtain written authorization of the DCC Representative before cutting, drilling or installing a sleeve through framework.

3.7 COORDINATION OF PROTECTIVE DEVICES

.1 Ensure protective devices such as circuit breakers, relays and fuses are installed, and that they are the correct size and set to the required value.

.2 Provide measuring instruments, indicators, equipment and personnel required for carrying out tests during performance of work and during the completion of work.

3.8 DISMANTLING OF EXISTING EQUIPMENT

.1 Where specifications indicate that existing devices shall be dismantled, remove all accessories and hardware along with the component to be removed.

.2 All removed components must be returned to DCC Representative along with a transmission slip.

.3 Contractor must dispose of all discarded wiring.

.4 The Contractor is responsible for all damages caused by the dismantling work and must repair as necessary when damages are incurred, including patching and painting walls or ceiling, asphalt damage, brick or block wall repair, etc.

3.9 COORDINATION OF PLANS AND SPECIFICATIONS

.1 Plans and specifications indicate a schematic and approximate location of devices and components.

.2 Verify dimensions and the exact position of the equipment on site and not according to scale on drawings.

3.10 SYSTEM START-UP

.1 Provide services as needed at the end of the work for start up, coordination, integration and adjustment of security systems for optimal operation.

.2 The contractor shall install and program the new system infrastructure to ensure no downtime in the transition between the existing and new system. Existing system shall remain operational to the point that all existing cameras are removed. Existing cameras are to be only removed when locations are being replaced with new cameras or when the new system is fully operational.

.3 If unable to demonstrate technical expertise as expected by the DCC Representative, retain the services of the manufacturer or of a qualified professional to confirm whether the work was carried out according to manufacturer's requirements. The manufacturer or specialist will make recommendations regarding installation, programming and use of components and conduct periodic visits to check if the implementation was performed according to the recommendations.

.4 All costs incurred by retaining the services of the manufacturer or a qualified professional shall be borne by the Contractor if the DCC Representative determines that the Contractor does not have full expertise of the work.

3.11 CLEANING

.1 The Contractor shall keep the site clean and public areas free of debris and waste. Remove trash and debris out of the workplace and dispose of them accordingly. Clean at the end of work.

.2 Clean and touch up factory painted surfaces that were scratched or damaged during transport and installation; use a paint and color identical to the original painting.

.3 Clean hooks, brackets, fasteners and other exposed non-galvanized fasteners and apply a primer to protect against rust.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 28 05 01 – Common Work Results – Electronic Safety and Security

.2 27 21 29 – LAN Network

1.2 DEFINITIONS

.1 (CSS) Camera Surveillance System

.2 (DND) Department of National Defence

1.3 REFERENCES

.1 National Building Code (NBC 2020).

.2 Ontario Electric Code 2021.

1.4 SECTION CONTENT

.1 This section describes the characteristics, features and particularities of CSS equipment. It contains the description of the different types of cameras including power supplies, mounts, communications and archiving servers and workstations to deliver a complete video surveillance system interfaced.

.2 Conduits required for CSS are described in section 26.

.3 Network requirements for the CSS equipment is described in section 27.

1.5 SCOPE OF WORK

.1 Unless stated otherwise, the Contractor shall provide and install all equipment and accessories necessary for the implementation of the solution.

.2 The Contractor shall define the complete list of equipment and software to provide based on the requirements requested in order to obtain a complete and functional solution.

.3 This list should be developed taking into consideration the equipment and software specified in other sections.

.4 The Contractor must refer to drawings and all technical and functional specifications, as described in the various sections, to determine the type and the exact number of equipment and accessories to provide.

1.6 DESCRIPTION

.1 Supply and install a complete video surveillance system including the necessary managing and operating licenses. The system includes, but is not limited to, PoE interior and exterior fixed and mobile cameras including Ethernet switches and the required network set-up, management and supervisor workstations, digital recorders, required licenses, and necessary racks and equipment cabinets.

.2 CSS control software should be of open architecture, available since at least 12 months prior to purchase by a minimum of three (3) Contractors.

1.7 FUNCTIONS

.1 Without limitation, the main functions to perform are:

.1 Configure the system so that each operator is forced to enter a password to access the CSS and allow for the implementation of a hierarchy of access levels.

.2 Configure the system to display video images selected by the customer for the following profiles permanently: day, evening, night, current events and public holiday.

.3 Configure the system to allow the arming of cameras selected by the customer for the following profiles: day, evening, night, current events and public holiday. This is to allow the reception of analytic video detection events on a dedicated alarm monitor. In addition to the basic configuration profiles, the system should allow the operator to individually select the arming and disarming of specific cameras and this for all cameras.

.4 Mobile cameras must operate on a pre-programmed monitoring circuit while allowing the operator to regain control of the mobile camera at all times. The camera should return to its original programmed position within one (1) minute.

.5 The CSS must be programmed to record at different frame rates and at a higher resolution for motion detection event detected by the camera while maintaining a recording on a default schedule where there are no events. Event recording quality settings shall be in operation from 60 seconds before the start of an event and up to 2 minutes after the event in accordance with the settings selected with the DCC Representative.

.6 Allow simultaneous real-time viewing and playback of recorded data.

1.8 PERFORMANCE REQUIREMENTS

.1 Camera surveillance system shall be fully digital open protocol.

.2 The system shall allow and include a redundancy for video data recording management server, communications and related tasks.

.3 System cameras must support POE, POE+ and High POE technology.

.4 Workstations must be able to simultaneously support a minimum of three (3) monitors at a resolution greater than 1080p.

.5 The choice of equipment and software should allow to route video streams simultaneously to multiple operators without limiting the number of operators (IP multicast connection type). IP Network switches dedicated to security systems must support multicast functionality.

.6 Environment: systems and video components must be designed to operate in compliance with all the prescribed requirements at ambient temperatures below.

.1 Indoor facilities

.1 Temperature: 0° C to 30° C.

.2 Humidity: 10% to 80% (non-condensing).

.2 Exterior

.1 Temperature: -40 ° C to 60 ° C.

.2 Humidity: 10% to 90% (non-condensing).

1.9 SHOP DRAWINGS AND DATA SHEETS

.1 Submit shop drawings in accordance with Section 28 05 01 – Common Work Results – Electronic Safety and Security.

.2 Submit the following technical data:

.1 Data sheets of all types of cable.

.2 All data sheets for equipment to be provided in this section.

.3 Manufacturer's instructions for installing their equipment.

.3 Shop drawings to be submitted are:

.1 All typical connection diagrams of each component to be connected.

.2 Detail design book of control interconnections, network (security) and power distribution.

.3 Unused test booklet.

1.10 WARRANTY

.1 Submit for comments the warranty certificate as per Section 28 05 01 - Common Work Results – Electronic Safety and Security.

1.11 PROJECT COMPLETION WORK DOCUMENTS

.1 Submit project completion documents required under Section 28 05 01 - Common Work Results – Electronic Safety and Security.

.2 Project completion documents to submit are:

.1 All documentation to date specified in paragraph SHOP DRAWINGS AND DATA SHEETS.

.2 “As-Built” line diagrams of the systems.

.3 Printed reports of system’s entire configuration.

.4 Management, operation and maintenance manuals.

.5 Test log book with results.

.6 Warranty certificate.

.7 Software, licenses and installer access codes.

Part 2 Products

2.1 MEGAPIXEL INTERIOR FIXED CAMERA (IFC)

.1 Megapixel interior fixed camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 Resolution of 2MP or higher. Various lower resolutions must be field selectable.

.3 Available Format: H.265 at a minimum of 30 frames/second.

.4 Allows for multiple simultaneous H.265 flux at 30 fps.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.15 lux and 0.03 lux night.

.6 Remote focus and zoom.

.7 Wide Dynamic Range.

.8 Motion detection capability configurable at the camera.

.9 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.10 Vandal-resistant dome housing of clear polycarbonate recessed or surface depending on the environment.

.11 RJ45 connection and TCP / IP 10/100 Base-T.

.12 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.13 PoE IEEE 802.3af compliant.

.14 Lens designed for Megapixel camera with variable aperture for a horizontal field of view from 34 degrees to 92 degrees or different depending on the desired field of view.

.15 Connection cable between the camera and the MDVO module.

.2 Existing model is: Bosch 5000i.

2.2 MEGAPIXEL INTERIOR 360° FISH-EYE CAMERA (IFC360)

.1 Megapixel interior 360° Fish-Eye camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 12 Megapixel minimum.

.3 Dual video stream encoding MJPEG and H.264, 25 fps, the rates should be variable and controllable.

.4 Allows 2992 x 2992 at 25 frames / second.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.19 lux and 0.04 lux night.

.6 360° overview, with four (4) individually cropped out and dewarped view area. Camera should provide at least four (4) feeds of various field selectable viewing regions of the full view.

.7 Wide Dynamic Range.

.8 Motion detection capability configurable at the camera.

.9 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.10 Vandal-resistant dome housing of clear polycarbonate recessed or surface depending on the environment.

.11 RJ45 connection and TCP / IP 10/100 Base-T.

.12 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.13 PoE IEEE 802.3af/at compliant.

.14 Connection cable between the camera and the MDVO module.

.15 Operating temperature 0°C – 50°C.

.2 Existing model is: Bosch Flexidome panoramic 5100i.

2.3 MEGAPIXEL INTERIOR 180° MULTI-SENSOR CAMERA (IMSC180)

.1 Megapixel interior 180° Multi-sensor camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 12 Megapixel minimum.

.3 Dual video stream encoding MJPEG and H.264, 25 fps, the rates should be variable and controllable.

.4 Allows 3x 2560 x 1920 at 25 frames / second.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.3 lux and 0.06 lux night.

.6 Wide Dynamic Range.

.7 Motion detection capability configurable at the camera.

.8 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.9 Vandal-resistant dome housing of clear polycarbonate recessed or surface depending on the environment.

.10 RJ45 connection and TCP / IP 10/100 Base-T.

.11 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.12 PoE IEEE 802.3 at compliant.

.13 Connection cable between the camera and the MDVO module.

.14 Operating temperature 0°C – 50°C.

.2 Existing model is: Bosch multi 7000i – NDM-7703-A.

2.4 MEGAPIXEL INTERIOR 360° MULTI-SENSOR CAMERA (IMSC360)

.1 Megapixel interior 360° Multi-sensor camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 4x 2 Megapixel minimum.

.3 Dual video stream encoding MJPEG and H.264, 25 fps, the rates should be variable and controllable.

.4 Allows 4x 1280 x 720 at 25 frames / second minimum.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.3 lux and 0.06 lux night.

.6 Wide Dynamic Range.

.7 Motion detection capability configurable at the camera.

.8 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.9 Vandal-resistant dome housing of clear polycarbonate recessed or surface depending on the environment.

.10 RJ45 connection and TCP / IP 10/100 Base-T.

.11 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.12 PoE IEEE 802.3 at compliant.

.13 Connection cable between the camera and the MDVO module.

.14 Provide adequate mounting brackets manufactured by the manufacturer for wall, pole or roof mounting.

.15 Operating temperature 0°C – 50°C.

.2 Existing model is: Bosch multi 7000i – NDM-7702-A.

2.5 MEGAPIXEL EXTERIOR FIXED CAMERA (EFC)

.1 Megapixel exterior fixed camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 Resolution of 5 MP or higher. Various lower resolutions must be field selectable.

.3 Available Format: H.265 at a minimum of 30 frames/second.

.4 Allows for multiple simultaneous H.265 flux at 30 fps.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.15 lux and 0.03 lux night.

.6 Remote focus and zoom.

.7 Motion detection capability configurable at the camera.

.8 Wide Dynamic Range.

.9 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.10 Vandal-resistant dome housing of clear polycarbonate recessed or surface depending on the environment.

.11 RJ45 connection and TCP / IP 10/100 Base-T.

.12 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.13 PoE IEEE 802.3af compliant.

.14 Lens designed for Megapixel camera with variable aperture for a horizontal field of view from 34 degrees to 92 degrees or different depending on the desired field of view.

.15 Connection cable between the camera and the MDVO module.

.16 Operating temperature -40°C to 55°C.

.2 The exterior camera (camera 017) required on the exterior pedestal has been installed and is a Bosch 5000i.

2.6 MEGAPIXEL EXTERIOR MOBILE CAMERA (EMC)

.1 Colour camera compatible with CSS software.

.2 Dual video streams encoding MJPEG and H.264, 30 fps, the rates should be variable and controllable.

.3 Minimum resolution of 2 MP or higher. Various other resolutions must be field selectable.

.4 Telephoto view of at least 30x optical zoom, allowing a telephoto reach of 4.4 to 132 mm.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.2 lux and 0.04 lux night.

.6 Automatic iris with manual override.

.7 Motion detection capability configurable at the camera.

.8 Wide Dynamic Range.

.9 Intelligent capabilities including enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.10 Electronic Image Stabilization.

.11 Automatic defogging.

.12 Vandal-resistant dome housing with clear polycarbonate for outdoor installation.

.13 Housing provided with a heating element and a fan, or equivalent performance. Metal housing (aluminum) according to IP66, NEMA 4X and IK10 with unsmoked polycarbonate dome (PC) and sun visor (PC / ASA).

.14 Continuous horizontal movement of 180 degrees to -180 degrees at a speed of 360 degrees in less than .5 seconds.

.15 Vertical Movement +90 degrees to -90 degrees to 180 degrees at a speed less than .5 seconds.

.16 RJ45 connection and TCP / IP 10/100 Base-T.

.17 Minimum network Protocol: IGMP multicast and 802.1x. Password protection, IP address filtering and HTTPS encryption.

.18 Fit with surge protector. Refer to Lightning Surge Protector section.

.19 High PoE on based consumption of the camera when using the full functionality (including heating) or 24VAC.

.1 In the case of 24VAC power, the Contractor is responsible for the provision and the installation of a dedicated 24VAC power supply for cameras.

.2 In the case of PoE power, Contractor shall provide compatible PoE injector providing High-PoE (802.bt) power to the camera with 120 VAC input.

.20 Connection cable between the camera and the MDVO module.

.21 Provide adequate mounting brackets manufactured by the manufacturer for wall, pole or roof mounting.

2.7 MEGAPIXEL EXTERIOR 360° MULTI-SENSOR CAMERA (EMSC360)

.1 Megapixel exterior 360° Multi-sensor camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 4x 2 Megapixel minimum.

.3 Dual video stream encoding MJPEG and H.264, 25 fps, the rates should be variable and controllable.

.4 Allows 4x 1280 x 720 at 25 frames / second minimum.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.3 lux and 0.06 lux night.

.6 Wide Dynamic Range.

.7 Motion detection capability configurable at the camera.

.8 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.9 Vandal-resistant dome housing of clear polycarbonate recessed or surface depending on the environment.

.10 RJ45 connection and TCP / IP 10/100 Base-T.

.11 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.12 PoE IEEE 802.3 at compliant.

.13 Connection cable between the camera and the MDVO module.

.14 Provide adequate mounting brackets manufactured by the manufacturer for wall, pole or roof mounting.

.15 High PoE on based consumption of the camera when using the full functionality (including heating) or 24Vac;

.1 In the case of 24VAC power, the Contractor is responsible for the provision and the installation of a dedicated 24VAC power supply for cameras.

.2 In the case of PoE power, Contractor shall provide compatible PoE injector providing High-PoE (802.bt) power to the camera with 120VAC input.

.16 Connection cable between the camera and the MDVO module.

.17 Provide adequate mounting brackets manufactured by the manufacturer for wall, pole or roof mounting.

.18 Operating temperature -40°C – 50°C.

2.8 MEGAPIXEL EXTERIOR 360° MULTI-SENSOR CAMERA WITH ADDITIONAL MOBILE CAMERA (EMSCM)

.1 Megapixel exterior 360° Multi-sensor camera with additional mobile camera must meet or exceed the following:

.1 Megapixel exterior 360° Multi-sensor camera with additional mobile camera is a combination of EMSC360 and EMC.

.2 High PoE on based consumption of the camera when using the full functionality (including heating) or 24VAC;

.1 In the case of 24VAC power, the Contractor is responsible for the provision and the installation of a dedicated 24VAC power supply for cameras.

.2 In the case of POE power, Contractor shall provide compatible POE injector providing high-POE (802.bt) power to the camera with 120VAC input.

2.9 LICENSE PLATE RECOGNITION CAMERA (LPR)

.1 License plate Recognition camera must meet or exceed the following:

.1 Day / night camera, color, monochrome, compatible with the CSS software.

.2 Resolution of 5 MP or higher. Various lower resolutions must be field selectable.

.3 Available Format: H.265 at a minimum of 30 frames/second.

.4 Allows for multiple simultaneous H.265 flux at 30 fps.

.5 High sensitivity with day and night operation modes with automatic self-disengaging IR filter. Minimum illumination in day mode 0.15 lux and 0.03 lux night.

.6 Remote focus and zoom.

.7 Motion detection capability configurable at the camera.

.8 Licence plate recognition software running within the camera.

.9 Wide Dynamic Range.

.10 Intelligent capabilities shall include enhanced video motion detection, audio detection and detection of camera tampering attempts like blocking or spray-painting.

.11 Vandal-resistant housing with necessary support bracket.

.12 RJ45 connection and TCP / IP 10/100 Base-T.

.13 Advanced security and networking features, such as HTTPS encryption with preserved performance, IPv6, 802.1x, and QoS (Quality of Service).

.14 PoE IEEE 802.3af compliant.

.15 Lens designed for Megapixel camera with variable aperture for a horizontal field of view from 34 degrees to 92 degrees or different depending on the desired field of view.

.16 Connection cable between the camera and the MDVO module.

.17 Operating temperature -40°C to 55°C.

2.10 VIDEO SURVEILLANCE SOFTWARE

.1 The existing video surveillance management system (VMS) installed on the server is AXXON ONE.

.2 Contractor is to remove the current AXXON One VMS software from the server and provide a new VMS which must meet the following minimum requirements:

.1 Programmable interface by the user.

.2 IP-based Open Architecture and ONVIF compatible.

.3 Auto population of data when adding hardware in one or other of the systems.

.4 Manage bandwidth using the multicast protocol (Multicast - IGMP).

.5 Display video signals in multiple formats to view live and recorded video.

.6 Take over IP compression formats H.264, H.265 and MJPEG or higher.

.7 Simultaneously manage resolution and different compression formats for the purpose of recording and viewing.

.8 Allow to set a different number of live images and recordings when the camera does not support multiple-flow functionality.

.9 Manage recording video signals on NAS, SAN and DAS type devices while being compatible with RAID storage.

.10 Set archiving schedules using flexible archive settings as needed.

.11 Automatically purge recorded images after a set period for some cameras while preventing purges for other cameras.

.12 Redirect video signals to other storage drive in case of a disk failure or a recording device failure (archive failsafe).

.13 Secure against the export of images by embedding permission passwords and watermarks to protect the integrity and confidentiality of videos.

.14 Use a Microsoft SQL Server database.

.15 Must use a simple and easy to understand and handle user interface.

.16 Display images in full-screen mode (edge to edge).

.17 Display images with menu commands for some monitors.

.18 Have the choice to view any camera on any monitor.

.19 Automatically run viewing sequences on different monitors or parts of monitors according to the priority of events.

.20 Automatically position the moving cameras according to the nature of events.

.21 Integrate motion detection according to a schedule.

.22 Surveillance monitor configuration shall allow arming of individual tiles or whole monitor grid for alarm reception.

.23 Include the supply and installation of cameras and workstations licenses, and requested features including technical support and updates until the end of the warranty period.

.24 If the CSS involves the use of license, include at least the following licenses:

.1 Activation License from the main database and site directory.

.2 Activation Licenses for each camera (provide licenses for all the ports on the hardware).

.3 For Windows and SQL Server Licenses, workstations and others.

.4 A minimum of four (4) client licenses for complete workstation.

.5 A minimum of two (2) Web client licenses.

.6 Gateway License.

.7 Archiving License.

.8 Redundancy License for complete failover functionality.

.9 Other relevant license to operate the system.

2.11 LIGHTNING SURGE PROTECTOR

.1 The lightning arrester must meet or exceed the following:

.1 Protection of data link:

.1 Designed for outdoor installation.

.2 Data link protection on CAT6 (protection of 4 pairs).

.3 Compatible with 10/100/1000 BaseT Ethernet application with RJ45 termination and 802.3af, 802.3at, 802.3bt PoE standards.

.4 Lighting protection 10kA/20kV.

.5 ESD Protection 15 kV (air)/8 kV(contact)

.6 For wall or cabinet mounting.

.2 For pole mounted cameras, provide protection module within pole cabinet. Module shall be grounded on the pole’s grounding rod.

.3 For wall and/or roof mounted cameras, provide protection module at the entrance to the building. Module shall be grounded on the junction box. Provide junction box which allows for fitting of the module and connections within the box. Box shall be installed with tamperproof screws.

.4 Module shall be installed between the camera and the PoE injector.

2.12 DECODER

.1 Decoder shall be used to connect the camera identified on the riser diagram directly to a new monitor.

.2 Decoder shall meet the following requirements:

.1 Can decode MJPEG and H.264

.2 RJ45 input for the camera. HDMI output for the monitor.

.3 Resolution of at least 1080p at 30 fps on the monitor.

.4 Provides PoE power to the camera. If it does not provide power, provide additional injector for the camera.

.5 Includes power supply.

.3 Provide an HDMI cable for the connection of the monitor.

.4 Provide an additional flat panel monitor (609 mm diagonal) display with HDMI port, 5 ms response time or less, 1920x1080 resolution, dynamic contrast ratio of 20,000,000: 1, viewing angle 170º horizontal, vertical 160º, anti-glare, integrated power supply, integrated speakers, the life cycle of 30,000 hrs. (Min), compatible with VESA support. Power cables, video, USB and audio required.

.5 Existing model is: AXIS T8705. DCC is in possession of this equipment. Refer to drawing PH801 for quantities of items in possession and required to be supplied by the contractor.

2.13 ENCODER

.1 Encoder shall be used to connect explosion proof cameras to the camera system network infrastructure.

.2 Encoder shall meet the following requirements:

.1 PoE powered.

.2 Multiple video stream encoding MJPEG and H.264, up to 30 fps.

.3 RJ45 connector to network infrastructure.

.4 BNC connector to camera.

.3 Provide an explosion proof coax cable between the encoder and the camera.

.4 Existing model is: AXIS P7304 & M7011. DCC is in possession of this equipment. Refer to drawing PH801 for quantities of items in possession and required to be supplied by the contractor.

2.14 ETHERNET EXTENDER

.1 Ethernet Extender shall be used for cameras where cable pathway exceeds 90 meters and where shown.

.2 Ethernet extender shall meet the following requirements:

.1 Two modules per cable. One at the switch and at the junction box of the end device.

.2 Equipped with two RJ45 connectors.

.3 Equipped with status LED indicating link communication and power status.

.4 Using a CAT6 cable between module, extends 100Base-TX data range to at least 200 meters.

.5 Powered by 802.3af compatible network switch port and CAT6 cable.

.6 Compatible with power supply allowing for extension of 802.3af and 802.3at over the same distance.

Provided with accessory for rack mounting of the device at the switch.

.7 Provide additional concealed junction box at the device for the installation of the Ethernet Extender.

2.15 MEDIA CONVERTER

.1 When indicated, provide media converter to convert fiber connection from the switch to copper cable at the device.

.2 Media converter shall meet the following requirements:

.1 Converts optical fiber to Ethernet cabling.

.2 Built for exterior installation with operating conditions of -40 ° C to 60 ° C.

.3 Compatible with OM4 Multimode fiber.

.4 Equipped with fiber SFP input port allowing for LC connectors of provided fiber optic cable.

.5 Equipped with RJ45 output port and CAT6 patch cord to interconnect media converter and PoE injector.

.6 Equipped with power and link status LED.

.7 Support for 10/100 Mbps.

.8 Power input: 24VDC.

.3 Existing model is: TrendNet TI-UF11SFP. DCC is in possession of this equipment. Refer to drawing PH801 for quantities of items in possession and required to be supplied by the contractor.

2.16 EXTERIOR CABINET

.1 Cabinet shall be installed on the lighting poles and meet the following requirements:

.1 Meets NEMA 4.

.2 12 AWG stainless steel construction with NRP hinges and high security lock with a set of 2 keys (on existing keyway).

.3 Mounting plate for equipment.

.4 Ventilation inside cabinet.

.5 Cable managers for all data and power connections.

.6 Punch holes for data, device and power conduits.

.7 Connected to the lighting pole grounding rod.

.8 Provided with 24VDC power supply and two 7Ah batteries. Equipped with termination strip to receive 120VAC power cables (10 AWG).

2.17 VIDEO SERVER (SERVV)

.1 Server for communication management.

.1 The server must be PC compatible (or approved equivalent), and meet the following characteristics (if the manufacturers' CSS requirements and / or specifications of video surveillance software in connection with the parameters of the project are higher, the requirements described below must be enhanced)

.1 RAID 1 configuration with a 1 GB primary controller.

.2 16X DVD player.

.3 Rack mount.

.4 Operating Software Windows Professional Server 2016, 64 bits, including licenses for working and maintenance stations.

.5 Standard MS-SQL database.

.6 Two (2) network adapters.

.7 3-year warranty from the manufacturer, onsite, 24 x 7, 4-hour response time.

.8 Manufactured by one of the following manufacturers: Dell, HP, or Lenovo.

.2 Accessories

.1 Toggle screen, keyboard and “trackpad” for installation in an equipment bay.

.2 KVM Switch.

2.18 IMAGE RECORDING SERVER

.1 The video server including video archiving and storage units must be able to handle all video signals from cameras including automatic cutover in case of failure of an archiving or storage device or communications failure.

.2 The Contractor shall provide and demonstrate that the architecture of the solution he proposes is able to meet the following parameters:

.1 Recording by IFC, IFC360, IMSC180, IMSC360 at full resolution at H.264 at 8 frames per second in event recording mode.

.2 Recording by fixed cameras **for identification** at full resolution at MJPEG at 3 frames per second in continuous recording mode.

.3 Recording by EMSCM cameras at full resolution at H.264 at 10 frames per second in continuous recording mode.

.4 Recording by EFC, cameras at full resolution at H.264 at 8 frames per second in event recording mode.

.5 Recording by LPR cameras at full resolution at MJPEG at 12 frames per second in continuous recording mode.

.6 Keep images for a minimum of 180 days at all times; gradual deletion of the memory buffer when full.

.3 MJPEG Recording Codec for recording of alarm, event and motion detection.

.4 H264 recording codec for continual recording.

.5 The Contractor shall base its proposal using a type of NAS or SAN storage architecture or another architecture ensuring a level of equal or greater fidelity.

.6 The archive server must meet the following specifications (if the manufacturer's requirements of CSS and / or specifications of video surveillance software in connection with the parameters of the project are higher, the requirements described must be enhanced):

.1 Housing for mounting in an equipment bay with rail and cable support.

.2 Processors that can process a minimum of 500 Mbit / s with actual usage not more than 400 Mbit / s in normal situation (without failure of an archival device).

.3 RAID 6 configuration with 1 GB primary controller.

.4 16X DVD player.

.5 Operating Software Windows Professional 64-bit.

.6 Database MS-SQL Standard.

.7 Two (2) network adapters.

.8 3-year warranty from the manufacturer, onsite, 24 x 7, 4-hour response time.

.9 Manufactured by one of the following manufacturers: Dell, HP, Lenovo or equivalent.

.7 Storage units must be of sufficiently sized to support the recording requirements and retention of data for this project.

.8 Additional archiving server shall be installed as indicated on the drawings for the two stand-alone systems. These archivers shall be from the same manufacturer as the main archiver or the software provider and meet the following requirements:

.1 Small factor or tower format.

.2 Processors that can process a minimum of 32 Mbps.

.3 At least 2 TB of SATA storage for camera images.

.4 Equipped with HDMI port for connection to the monitor.

.5 Equipped with USB ports for keyboard and mouse. The archiver shall be usable as a workstation.

.6 RAID 6 configuration with 1 GB primary controller.

.7 Equipped with 16X DVD player with DVD writing capability for image export.

.8 Provided with stand-alone video surveillance software and licence. The software must be from the same manufacturer as the software of the site-wide system.

.9 Operating Software Windows Professional 64-bit.

.10 Software and OS should be installed on a separate SSD hard disk drive.

.11 Database MS-SQL Standard.

.9 For each stand-alone system, provide an additional flat panel monitor (609 mm diagonal) display with HDMI port, 5 ms response time or less, 1920x1080 resolution, dynamic contrast ratio of 20,000,000: 1, viewing angle 170º horizontal, vertical 160º, anti-glare, integrated power supply, integrated speakers, the life cycle of 30,000 hrs. (Min), compatible with VESA support. Power cables, video, USB and audio required.

.10 For each stand-alone system, provide an amplifier module for two (2) audio outputs from the cameras. The amplifier shall meet the following requirements:

.1 Allow for the selection of the audio feed to output

.2 Comes with integrated speaker or output for box paging system speaker.

.3 Desk mounted.

.4 35W rated output.

.5 At least 60 dB signal to noise ratio.

.6 Volume control on the amplifier.

2.19 VIDEO WORKSTATION

.1 Video workstation must meet the following specifications. If the manufacturer's requirements of specifications of video surveillance software in relation to the parameters of the project are higher than the requirements described, Contractor shall enhance the following requirements:

.1 Tower Enclosure.

.2 Processor: Intel i7-4770 GHz with 16 MB Cache.

.3 Memory 16 GB RAM or better.

.4 Main hard drive (s) for the operating system. Two (2) 500 GB 7.2K RPM SATA 3Gbps 3.5 in Hot-plug installed in RAID 0.

.5 Secondary hard drive (s) for CSS archiving software. Two (2) 500 GB 7.2K RPM SATA 3Gbps 3.5 in Hot-plug installed in RAID 0.

.6 DVD-RW drive.

.7 Network card: 2 x 1000 Base-T.

.8 64-bit operating system, Windows 7 or newer.

.9 USB 3.0.

.10 Video Card 1GB DDR5 multiple-output (2) can be displayed on two monitors simultaneously with a resolution of 2x 1080P.

.11 Optical mouse and keyboard (with cord).

.2 Accessories for security office workstation:

.1 Provide four (4) additional flat panel monitors (609 mm diagonal) display with display ports or HDMI port, 5 ms response time or less, 1920x1080 resolution, dynamic contrast ratio of 20,000,000: 1, viewing angle 170º horizontal, vertical 160º, anti-glare, integrated power supply, integrated speakers, the life cycle of 30,000 hrs. (Min), compatible with VESA support. Power cables, video, USB and audio required.

.2 Mobile dual monitor support that allows for support of VESA mount monitors up to 24 inches.

.1 Movement of 360 degrees pan and 75 degrees tilt.

.2 Allows monitors to be lifted at least 12 inches.

.3 Can be mounted on desks.

.3 PTZ keyboard for the selection and control of PTZ cameras.

2.20 ETHERNET SWITCH AND EQUIPMENT HOUSING

.1 All indoor cameras (all categories) and all cameras installed outside the buildings shall be connected by the Contractor to the Ethernet network dedicated to security. This network is to be provided and installed according to section 27 21 29.

2.21 PEDESTAL POLE

.1 The Contractor must provide and install a pedestal for the installation of the camera equipment, shown on the Site Plan drawing. The pedestal shall meet the following requirements:

.1 Base plate of approximately 200 mm x 200 mm with anchor bolts.

.2 Approximately 1 200 mm high, 100 mm x100 mm heavy-duty square tube (post).

.3 Approximately 250 mm deep, 400 mm x 400 mm steel housing rated NEMA 4x.

.4 Adjust box size to proposed camera and provide enclosure for weather protection.

.5 Pedestal pole must be black powder coat finish.

2.22 WIRING AND CONDUITS

.1 Conduits are provided in 28 05 01 – Common Work Results-Electronic Safety and Security.

.2 Camera network cables should be CAT-6 type and have MDVO plugs at both ends. Terminating a network cable by manually installing a compression connector is not allowed.

.3 The Contractor shall provide and install all patch cords required for the CSS.

.4 The Contractor shall provide and install any other cables required to connect all components of the CSS as well as connectors and Velcro fasteners.

.5 Cable specifications are defined in Section 28 05 01 and section 27 21 29.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with the requirements listed in manufacturer's written data, including product technical bulletins, instructions appearing in the product catalog, instructions appearing on the product packaging and on data sheets.

3.2 CAMERA INSTALLATION

.1 Install components in accordance with the manufacturer's written installation instructions, according to location, mounting heights and surveillance zones appearing on the revised plans and shop drawings.

.2 Secure the components to walls, ceilings and other supports as specified.

.3 Camera anchors shall be stainless steel. The anchoring tensile force must be greater than 1 kN tensile and shear force when installed at a 40 mm depth in a concrete of 13.8 MPa. Each camera must have a minimum of three (3) anchors.

.4 Any exposed heads for anchors, screws or bolts must be anti-vandal.

.5 Install all required boxes in accessible, concealed locations.

.6 The contractor is to supply and install new Acoustical ceiling tile materials where existing cameras were installed and not replaced. The current ACT is 24"'x48" medium-textured non-directional pattern white tiles.

.7 Conceal all conduit and wiring.

.8 The exact position of each camera must be demonstrated by a field of view test that must be performed in the presence of the DCC Representative. No cameras should be installed before this test has been completed and approval obtained.

.9 The device must be secured with anchors and anti-vandal screws.

.10 Camera power (PoE or low voltage), heater, defroster and ventilation testing should be performed.

.11 Comments to be submitted for location, orientation, media type and anchors and wait for authorization before starting work.

.12 MDVO module at the end of the camera should be hidden in the camera body where space permits, or in pull-box and/or assembly otherwise.

3.3 MEDIA CONVERTER

.1 Install and connect the media converter in the pole exterior cabinet.

.2 Media converter shall be connected directly to exterior cabinet power.

3.4 DECODER

.1 Decoder shall be installed behind the monitor.

3.5 ENCODER

.1 Install the encoder in a junction box close to the camera.

3.6 ETHERNET EXTENDER

.1 Install transmitter module in rack mount accessory in the same rack as the network switch.

.2 Install receiver module in the junction box inside the building close to the camera.

.3 Configure the network port of the switch to power the device through PoE.

.4 Contractor to coordinate conduit path with Electrical Contractor. Any cabling run that exceeds 90 meters because of non-optimal conduit path shall require an Ethernet Extender.

3.7 EXTERIOR CABINET

.1 Cabinet shall be installed and affixed to the lighting pole.

.2 All cabling within cabinet shall be installed in cable managers.

.3 Cabinet shall be equipped with keys and locks matching the existing site's keyway.

3.8 LIGHTNING SURGE PROTECTOR

.1 All outdoor cameras must have safeguards installed protecting against surges in accordance with manufacturer's written instructions.

.2 Outdoor cameras attached to the building shall be equipped with lightning protection module located Grounding cable must be connected to the junction box using a cable with green sheath 6 AWG with two-hole compression lugs. Grounding cable must be installed in nonferrous metal conduit with compression unions to ensure continuity.

.3 Outdoor cameras attached to poles shall be equipped with lightning protection modules located in cabinet on pole and individually connected to the lightning grounding rod closest to the pole. Grounding block cabinet must be connected to the grounding bar using a cable with green sheath 6 AWG with one-hole compression lugs. Grounding cable must be installed in nonferrous metal conduit with compression unions to ensure continuity.

3.9 (SERVV) VIDEO SERVER

.1 Install the server, the software and the latest available updates.

.2 Configure Network in “Domain” mode.

.3 Configure RAID functionalities.

.4 Configure redundancy functionalities.

.5 Produce an image of the final configuration on DVD.

.6 Make the connection and programming needed for time synchronization so that all safety systems are synchronized to the same time.

.7 The Contractor shall program all components of the video system including alarm points and customization options.

.8 Coordinate with DCC Representative, full backups of the system, as well as updating the images of the final configuration at the end of the project.

3.10 IMAGE RECORDING SERVER

.1 Install the server, the software and the latest available updates.

.2 Configure Network in “Domain” mode.

.3 Configure RAID functionalities.

.4 Configure hot redundancy recording servers.

.5 Produce an image of the final configuration on DVD.

.6 Make all necessary connections and programming for time synchronization so that all security systems are synchronized to the same time.

.7 The Contractor shall program all components of the video system including alarm points and customization options.

.8 The failure of a recording server should automatically generate a transfer of images to other recording servers. The information submitted must be shared evenly between the other recording servers.

3.11 (PTV) VIDEO WORKSTATION

.1 Install the workstation and software.

.2 Collect from the DCC Representative all the features and customizations needed and program them.

.3 Customize the display sequence images as directed by the client.

.4 Customize workstations as needed according to the environment and depending on physical location.

.5 Set all components of the security system, including graphic cards of alarm points, schedules and all operating sequences that may be required, such as, but not limited to:

- .1 Setup and calibration of system.
- .2 Customizing privileges and access rights for workstation functionality as directed by the DCC Representative.
- .3 Automated recording of a video clip showing the scene before the triggering event (adjustable video up to 5 minutes before the triggering event).
- .4 Automated sequential shuffling of images to conduct surveillance of an entire sector.
- .5 Automated sequential shuffling of images to check all cameras from one sector to ensure the quality of images.
- .6 Blocking and unblocking a camera.
- .7 The positioning of mobile cameras based on points of interest.
- .8 Auto-return to the initial position of mobile cameras.
- .9 Motion detection and detection zones.
- .10 The recovery of images and off-line viewing.
- .11 Graphics pages to locate and select the individual cameras.

.6 Produce an image of the final configuration on DVD.

3.12 ETHERNET SWITCH

.1 Ethernet Switch is described in section 27 21 29 - LAN Network.

3.13 WIRING AND CONDUITS

.1 Complete necessary conduit network in accordance with the requirements of Division 28 section 28 05 01, while respecting the minimum radius curvature required by the cable manufacturer.

.2 Install wiring according to manufacturer's instructions.

.3 Leave both ends long enough to make the initial connection and three (3) other connections.

.4 Affix identifying wiring at both ends so that the latter is visible once the connection is made.

3.14 RACKS AND TELECOM CABINETS

.1 Racks and telecom cabinets are described in section 27 21 29 - LAN Network.

3.15 CONTROL

.1 Visual inspection: control to assess the quality of the installation and assembly, as well as the overall look of the material, to ensure that the system complies with the contract documents and include the following:

- .1 Strength of hardware fasteners.
- .2 No damage to the facility.
- .3 Device location compliant with revised shop drawings.
- .4 Equipment installed to be compatible with the physical environment.
- .5 Provide all accessories.
- .6 Identification of devices and tracing of cables.
- .7 CSA Registration or other organization certified for installation in Ontario when the required by code.

.2 Engineering Controls: Controls to verify that all systems and devices are properly installed, free of defects and damage, and to include the following:

- .1 Voltage and power measurement.
- .2 Joints/connections and mounting hardware.
- .3 Measurement signals and parameters.
- .4 Compliant with specification, documentation and manufacturer's installation instructions.

.3 Operational control: control to ensure that the performance of devices and systems comply with or exceed the established functional requirements, and to include the following:

- .1 Operation of each device individually and in its environment.
- .2 Operation of each device in association with specific functions.
- .3 Demonstration of the features described in Part 1 of this section and this for each location with a CSS monitoring station.

3.16 ON-SITE TESTING

.1 Subject the elements of the system to testing and complete the log book before requesting inspection.

.2 In addition to the items compiled into the log book, take voltage measurements and power of each component connected to the CSS and compile it in the log book (measurements taken at the device according to the most demanding conditions).

.3 Provide labor and tools to demonstrate to the DCC Representative that the system is functional.

.4 Demonstrate to DCC Representative with supporting evidence that the system is functional (comparing results with log book). If the DCC Representative considers that the Contractor has not conducted his own tests by comparing the result of the test in the

log book with the test in the presence of the DCC Representative, he will stop testing and the Contractor shall repeat his own testing and the loss of time by the DCC Representative will be borne by the Contractor.

.5 Correct all deficiencies that were identified and demonstrate again to the Engineer that the system is ready to be delivered.

.6 Once testing is complete, return the log book listing the tested elements DCC Representative.

3.17 CLEANING AND ADJUSTING

.1 Remove camera and components protective coatings.

.2 Set adjustments to meet the DND operation objectives.

.3 Clean, according to the written recommendations of the manufacturer(s), cabinets, cameras, camera lenses and other system components, to remove packaging products, fingerprints and other marks.

3.18 TRAINING

.1 At least 10 days prior to system take-off (but not more than 15 days), inform users and managers of the security office to the use of the CSS system so they can make informed decisions about how to set personalized parameters.

.2 The training given at the start of work must meet the following requirements:

- .1 To be performed on operational equipment in the security office or in a training room (application in a real context).
- .2 A total of 12 hours (3 sessions of 4 hours).
- .3 All software documentation should be in English.

.3 Prepare a training program for the operation and maintenance of the CSS system.

.4 The training program shall be submitted for comments and corrected if required.

.5 Provide separate sessions for managers and operators.

.6 Training for operators must meet the following requirements:

- .1 To be carried out on the delivered and operational equipment (application in a real context).
- .2 A period of 1.5 hours per working group not exceeding a reasonable number of participants taking into account local operating conditions.
- .3 Provide twelve (12) 1.5-hour training sessions to cover all employees.
- .4 Demonstrate the operation of all controls by performing a real simulation.

.7 Training for managers must meet the following requirements:

- .1 To be carried out on the delivered and operational equipment (application in a real context).
- .2 A period of 4 hours per working group of not more than four (4) managers.
- .3 Provide three (3) 4-hour sessions to cover all managers
- .4 Demonstrate the operation of all controls by performing a real simulation.

.5 Show how to generate event reports and creating an operator profile.

END OF SECTION