Public Works and Government Services Canada

Requisition No. EZ899-162042/A

DRAWINGS & SPECIFICATIONS
for
Addition of Freezer at
Matsqui Institution
33344 King Road, Abbotsford, B.C.

Project No.: R.077707.001
Date 1.12.15

APPROVED BY:

Regional Manager, AES — Date 2015-12-17

Construction Safety Coordinator — Date 2015-12-03

TENDER:

Project Manager — Date 2016-1-17

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END OF SECTION

1 SUMMARY OF WORK

.1 Work covered by Contract Documents:

.1 Work under this Contract shall include all labour, materials and equipment necessary for the installation of new freezer at Matsqui Institution, Abbotsford, B.C., outside the south west corner of the Regional Supply Depot, construction of new canopy, renewal of existing refrigeration equipment, installation of new outside lighting and new sprinkler system for the existing cooler and freezer, all associated connections for mechanical, plumbing, drainage, electrical and food equipment services, relocation of existing services, pavement at building and remedial work as more fully described in the drawings as listed in Sheet A-000 (COVER SHEET AND DRAWING LIST) and these specifications.

.2 Contractor's Use of Premises:

.1 Contractor has controlled use of site within the construction area for Work, storage, and access as directed by the Departmental Representative.

.2 Use of areas inside Matsqui Institution, for access to the construction site is controlled, by the Departmental Representative.

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

.4 The new building will be constructed inside the security fence. The institution will be fully operational during work of this Contract. Provide temporary construction fence around site until new security fencing is installed.

2 WORK RESTRICTIONS

.1 Notify, Departmental Representative of intended interruption of disconnected services and provide schedule for review. Schedule major disruption of services in existing during approved times.

.2 Where Work involves breaking into or connecting to existing service lines, give departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum. Coordinate interruptions affecting existing building if affected by the disruption.

.3 Construct barriers in accordance with Temporary Barriers and Enclosures clause.

.4 Security Requirements: refer to Section 01 14 10 - Security requirements.

.5 Hours of work:

.1 Perform work during normal working hours of the Institution (0730 to 1600), Monday through Friday except holidays. Work may be performed after normal working hours of the Institution, Monday through Friday, on weekends and holidays, with a minimum forty-eight (48) hours advance notice and approval of the Departmental Representative. Provide schedule for prior approval of Departmental Representative.

.2 Allow for delays due to security protocol when work interferes with Institution security operations.

.6 Access into Institution is required:

.1 Vehicular access through the Principal Entrance sally port will be restricted during the

inmate "count" at breakfast, lunch and dinner hours. Confirm "count" times with Departmental Representative. Delays may occur when entering and exiting the Institution with vehicles during "count" times and due to security situations and heavy traffic.

.2 A construction escort will be provided by the Departmental Representative, at no cost to the Contract when access is required inside institution. Notify Departmental Representative minimum 24 hours in advance of when Construction Escort is required.

3 CONSTRUCTION WORK SCHEDULE

.1 Commence work immediately upon official notification of acceptance of offer and complete the work within eleven (11) weeks from the date of such notification.

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

.3 Submittals:

.1 Submit to Departmental Representative within ten (10) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of construction progress.

.2 Identify each trade or operation.

.3 Show dates for delivery of items requiring long lead time.

.4 Departmental Representative will review schedule and return one copy.

.5 Re-submit two (2) copies of finalized schedule to Departmental Representative within five (5) working days after return of reviewed preliminary copy.

.4 Project Scheduling Reporting:

.1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.

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

.5 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.

.3 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

4 SUBMITTAL PROCEDURES

.1 Administrative:

.1 Submit to Departmental Representative submittals listed for review. Submit with

reasonable promptness and in orderly sequence so as to not cause delay in Work.

.2 Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.3 Do not proceed with work affected by submittal, until review is complete.

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

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

.6 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

.7 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.8 Verify field measurements and affected adjacent Work are coordinated.

.9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative review of submittals.

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

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

.2 Shop Drawings:

.1 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.

.3 Product Data:

.1 Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that the product concerned is clearly identified. Submit in sets, not as individual submissions.

.4 Samples:

.1 Submit samples in sizes and quantities specified.

.2 Where colour is criterion, submit full range of colours.

.3 Submit all samples as soon as possible after the contract is awarded, to facilitate production of complete colour scheme by the Departmental Representative.

.5 Mock-ups:

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

.2 Construct in location as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative' review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.6 Submission Requirements:
- .1 Schedule submissions at least ten days before dates reviewed submissions will be needed.
- .2 Submit number of copies of product data, shop drawings which Contractor requires for distribution plus four (4) copies which will be retained by Departmental Representative.
- .3 Accompany submissions with transmittal letter in duplicate.
- .4 Submit either bond copies or one (1) electronic pdf file of each shop drawing and product data as directed by Departmental Representative.

.7 Coordination of Submissions:
- .1 Review shop drawings, product data and samples prior to submission.
- .2 Coordinate with field construction criteria.
- .3 Verify catalogue numbers and similar data.
- .4 Coordinate each submittal with requirements of the work of all trades and contract documents.
- .5 Responsibility for errors and omissions in submittals is not relieved by Departmental Representative's review of submittals.
- .6 Responsibility for deviations in submittals from requirements of Contract documents is not relieved by Departmental Representative's review of submittals, unless Departmental Representative gives written acceptance of specified deviations.
- .7 Notify Departmental Representative, in writing at time of submission, of deviations in submittals from requirements of Contract documents.
- .8 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and re-submit as directed by Departmental Representative.
- .9 After Departmental Representative's review, distribute copies.
- .10 Shop Drawings Review:
  - .1 Review of shop drawings by Public Works and Government Services Canada (PWGSC) is for the sole purpose of ascertaining conformance with the general concept.
  - .2 The Departmental Representative's review does not mean that PWGSC approves the detail design inherent in the shop drawings, responsibility remains with the contractor submitting same, and such review will not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents.
  - .3 Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for co-ordination of the work of all sub trades.

5 HEALTH AND SAFETY

.1 Specified in Section 01 35 33 - Health and Safety Requirements.

6 ENVIRONMENTAL PROCEDURES

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

.2 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.

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

.4 Provide temporary drainage and pumping as necessary to keep excavations and site free from water during excavation and grading activities.

.5 Control disposal of run-off of water containing suspended materials or other harmful substances in accordance with local authority requirements. Construct settlement ponds and silt fences as required by the Provincial Environmental authority.

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

.7 Under no circumstances dispose of rubbish or waste materials on property or CSC waste bins.

7 REGULATORY REQUIREMENTS

.1 References and Codes:
- .1 Perform Work in accordance with National Building Code of Canada (NBCC2010) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

8 QUALITY CONTROL

.1 Inspection:
- .1 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .2 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.
- .3 Departmental Representative may order any 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, Departmental Representative shall pay cost of examination and replacement.

.2 Independent Inspection Agencies:
- .1 Provide independent Inspection/Testing Agencies for purpose of inspecting and/or testing portions of Work as specified in relevant sections. Cost of such services will be borne by the Contractor.

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

.3 Employment of inspection/testing agencies does not relax responsibility to perform 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 Departmental Representative at no extra cost to Contract. Pay costs for retesting and re-inspection.

.3 Procedures:

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay 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.

.4 Rejected Work:

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

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

.5 Reports:

.1 Submit (4) four copies or one scanned pdf copy of inspection and test reports to Departmental Representative.

.6 Tests and Mix Designs:

.1 Furnish test results and mix designs as may be requested.

.7 Mock-ups;

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

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

.3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.8 Mill Tests:

.1 Submit mill test certificates as requested and as required of specification Sections.

.9 Equipment and Systems:
- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to specific Section for definitive requirements.

9 TEMPORARY UTILITIES

.1 Installation and Removal:
- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

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

.3 Water Supply:
- .1 Existing water supply system may be used for construction purposes provided that damaged components are replaced when damaged. Provide own hoses from source.

.4 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 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 The air system will be in use during work of this contract inside existing building. Protect ducting system by filters inspected daily and replaced as necessary. During dust generating construction work block off all outlets and seal air tight.
  - .1 Before Substantial Completion comply with the following conditions:
    - .1 Remove all temporary duct covers.
    - .2 Replace used air filters with new filters.
- .6 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.

.7 Activate air system under direction of Departmental Representative to provide temporary heat. Protect ducting system by filters inspected daily and replaced as necessary.
- .1 Before Substantial Completion comply with the following conditions:
  - .1 Bring plant and systems to as new conditions. (Vacuum clean duct system.)
  - .2 Replace used air filters with new 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.

.5 Temporary Power and Light:
- .1 Arrange, pay for and maintain temporary electric power supply in accordance with local power authority governing regulations and ordinances.
- .2 Electrical power and lighting installed under this contract may be used for construction purposes at no extra cost, provided that guarantees are not affected thereby and electrical components used for temporary power are replaced when damaged.
- .3 Replace lighting bulbs/tubes used for more than three months or provide replacement bulbs/tubes and hand over to Departmental Representative.

.6 Temporary Communication Facilities:
- .1 Provide and pay for temporary telephone and fax hook up, line(s) necessary for own use. Conform to Section 01 14 10 Security Requirements.

.7 Fire Protection:
- .1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

10 CONSTRUCTION FACILITIES

.1 Installation and Removal:
- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

.2 Scaffolding:
- .1 Design, construct and maintain scaffolding in rigid, secure and safe manner, in accordance with WCBBC regulations and Section 01 35 33.
- .2 Erect scaffolding independent of walls. Remove promptly when no longer required.

.3 Hoisting/lifts:
- .1 Provide, operate and maintain hoists/lifts required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Hoists/lifts: operated by qualified operator.

.4 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 a weight or force that will endanger the Work.

.5 Construction Parking:
- .1 Make good damage to local roads used for access to project site.
- .2 Parking space is available outside double fence and temporary parking of delivery vehicles within construction site as directed by the Departmental Representative.

.6 Contractor's Site Office:
- .1 Provide office as required to accommodate Contractor's operations.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

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

.8 Sanitary Facilities:
- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.9 Construction Signs:
- .1 Format, location and quantity of site signs and notices to be approved by Departmental Representative.
- .2 Signs and notices for safety or instruction to be in English language, or commonly understood graphic symbols.
- .3 Maintain signboards, signs and notices for duration of project. Remove and dispose of signs off site when directed by Departmental Representative.
- .4 Remove signs from site at completion of project or as directed by Departmental Representative.

11 TEMPORARY BARRIERS AND ENCLOSURES

.1 Enclosure of Structure:
- .1 Provide temporary weather tight secure protection for exterior openings until permanently enclosed. Design enclosures to withstand wind pressure. Secure construction areas inside institution with fenced area to secure materials and temporary buildings.
- .2 Provide temporary dust screens in existing building where dust generating work occurs.

.2 Guardrails and Excavations:
- .1 Provide secure, rigid guard rails and barricades around deep excavations, open edges of floors and roofs in accordance with WCB requirements.

.3 Access to Site:
- .1 Maintain existing access roads and designated parking area in broom clean condition.

.4 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 Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

12 COMMON PRODUCT REQUIREMENTS

.1 Reference Standards:
- .1 If there is a question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .2 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .3 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

.2 Quality:
- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 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 any dispute arise as to quality or fitness of products, decision rests strictly with Departmental 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

.3 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 on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent

spontaneous combustion.

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

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

.4 Transportation:

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

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

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

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

.6 Quality of Work:

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

.7 Co-ordination:

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

.8 Concealment:

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

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

.9 Remedial Work:

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate 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.

.10 Location of Fixtures:
- .1 Inform Departmental Representative of conflicting installation. Install as directed.
- .2 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

.11 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.

.12 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.

.13 Protection of Work in Progress:
- .1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

.14 Existing Utilities:
- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by Departmental Representative and governing authorities, with minimum of disturbance to pedestrian and vehicular traffic. Maintain vehicular access on roadways at all times.
- .2 Before commencing work, establish location and extent of service lines in areas of work and notify Departmental Representative of findings.
- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .5 Record locations of maintained and re-routed services lines.

13 EXAMINATION AND PREPARATION

.1 Existing Services:
- .1 Before commencing work, establish location and extent of service lines in area of

Work and notify Departmental 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 Departmental Representative.

.2 Location of Equipment and Fixtures:

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

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

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

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

14 EXECUTION REQUIREMENTS

.1 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.

.2 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 ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

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

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

.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

15 CLEANING

.1 Project Cleanliness:

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

.2 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 from site.
- .5 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.
- .6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .7 Clean lighting reflectors, lenses, and other lighting surfaces.
- .8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .9 Wax, seal, vacuum clean, shampoo or prepare floor finishes, as recommended by manufacturer.
- .10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Sweep and wash clean paved areas used during work of this contract.
- .14 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .15 Clean roofs, downspouts, and drainage systems.
- .16 Remove snow and ice from access to building.

16 CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL

.1 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and/or recyclable materials and waste. Separate non-salvageable materials from salvaged items. Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes. Transport and deliver non-salvageable items to licensed disposal facility.

.2 Provide containers to deposit reusable and/or recyclable materials. Locate containers in locations, to facilitate deposit of materials without hindering daily operations. Provide containers to deposit reusable and/or recyclable materials.

.3 Collect, handle, store on-site and transport off-site, salvaged materials in separate condition. Transport to approved and authorized recycling facility and/or users of material for recycling.

.4 Locate waste and salvage bins on site as directed by Departmental Representative.

17 CLOSEOUT PROCEDURES

.1 Inspection and Declaration:
- .1 Contractor's Inspection: Conduct an inspection of Work with all subcontractors, identify deficiencies and defects, and repair as required to conform to Contract Documents.
- .2 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .3 Request Departmental Representative's Inspection.

.2 Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:
- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
- .4 Certificates required by Authority Having Jurisdiction, Utility companies have been submitted.
- .5 Operation of systems have been demonstrated to Department's personnel.
- .6 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

18 CLOSEOUT SUBMITTALS

.1 Record Drawings:
- .1 As work progresses, maintain accurate records to show all deviations from the Contract Drawings. Note on as-built drawings as changes occur. At completion supply:
  - .1 Four (4) set of CD's in AutoCad file format (version: 2007) with all as-built

information on the diskettes.

.2 Four (4) sets of printed as-built drawings.

.3 Submit one copy of check plots to Departmental Representative prior to final printing of as-built drawings.

.4 Departmental Representative will supply copies of the original AutoCad files.

.5 Retain original logo and title block on the as-built drawings. Contractor may place on the upper right-hand title block area a small company logo, the text "AS-BUILT" and the date.

.2 Costs for transferring as-built information from marked up working set of drawings to electronic format using ACAD and plotting service is included in the Contract.

.2 Maintenance manual:

.1 On completion of project submit to Departmental Representative four (4) CD R/ disk copies and four paper (in loose leaf type binder) of Operations and Maintenance Manual, made up as follows:

.1 Provide maintenance manual on CDs using pdf, or other approved format for descriptive writing, page size images and page size drawings. Organize manuals into industry standard maintenance manual tabs with links in index to each descriptive section describing the component or maintenance procedure etc.

.2 Organize files into CSI Masterformat numbering system or other approved descriptive titles.

.3 Label disk "Operation and Maintenance Data", project name, date, names of Contractor, subcontractors, consultants and sub consultants.

.4 Include scanned guarantees, diagrams and drawings.

.5 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labeled tabs (navigational buttons).

.6 Drawings, diagrams and manufacturer's literature must be legible.

.7 Refer to Mechanical and Electrical Divisions for specific details for Mechanical and Electrical data.

.3 Maintenance Materials, Special Tools and Spare Parts:

.1 Specific requirements for maintenance materials, tools and spare parts are specified in individual sections.

.2 Deliver maintenance materials, special tools and spare parts to Departmental Representative and store in designated area as directed by Departmental Representative.

.3 Prepare lists of maintenance materials, special tools and spare parts for inclusion in Manual specified in Clause 18.2.

.4 Maintenance materials:

.1 Deliver wrapped, identify on carton or package, colour, room number, system or area as applicable where item is used.

.5 Special tools:

.1 Assemble as specified;

.2 Include identifications and instructions on intended use of tools.

.6 Spare parts:

.1 Assemble parts as specified;

.2 Include part number, identification of equipment or system for which parts are applicable;

.3 Installation instructions;

.4 Name and address of nearest supplier.

.4 Warranties and Bonds:

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

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

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

.4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Interim Completion is determined.

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

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

19 DEMONSTRATION AND TRAINING

.1 Demonstration and Training:

.1 Demonstrate operation and maintenance of equipment and systems to maintenance personnel following interim Completion and prior to date of final certificate of completion

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

END OF SECTION

1 PURPOSE

.1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

2 DEFINITIONS

.1 "Contraband" means:
- .1 an intoxicant, including alcoholic beverages, drugs and narcotics
- .2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,
- .3 an explosive or a bomb or a component thereof,
- .4 currency over any applicable prescribed limit, $25.00, and
- .5 any item not described in paragraphs (a) to (d) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.

.2 "Unauthorized smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.

.3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.

.4 "CSC" means Correctional Service Canada.

.5 "Director" means Director, Warden or Superintendent of the Institution as applicable.

.6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.

.7 "Departmental Representative" means the Public Works and Government Services Canada representative defined in General Conditions.

.8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.

.9 "Construction limits" means the area, as indicated in the contract documents, that the contractor will be allowed to work". This area may or may not be isolated from the security area of the institution. Limits to be confirmed at construction start-up meeting.

3 PRELIMINARY PROCEEDINGS

.1 At construction start-up meeting:
- .1 Discuss the nature and extent of all activities involved in the Project.
- .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

.2 The Contractors's responsibilities:
- .1 Ensure that all construction employees are aware of the security requirements.
- .2 Ensure that a copy of the security requirements is always prominently on display at the job site.
- .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

4 CONSTRUCTION EMPLOYEES

.1 Submit to the Departmental Representative a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee.

.2 Allow 10 working days for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at this institution except as approved otherwise.

.3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that these Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked up upon arrival at the Institution and be displayed prominently on the construction employees clothing at all times while employees are in the institution.

.4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.

.5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:

.1 appear to be under the influence of alcohol, drugs or narcotics.
.2 behave in an unusual or disorderly manner.
.3 are in possession of contraband.

5 VEHICLES

.1 All unattended vehicles on CSC property must have windows closed; fuel caps locked, doors and trunks locked and keys removed. The keys must be securely in the possession of the owner or an employee of the company that owns the vehicle.

.2 The director may limit at any time the number and type of vehicles allowed within the Institution.

.3 Drivers of delivery vehicles for material required by the project will require security clearances and must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or PWGSC Construction Escorts while in the Institution.

.4 If the Director permits trailers to be left inside the secure perimeter of the Institution, the trailer doors must be locked at all times. All windows must be securely locked bars when left unoccupied. Cover all windows with expanded metal mesh. When not in use lock all storage trailers located inside and outside the perimeter.

6 PARKING

.1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

7 SHIPMENTS

.1 To avoid confusion with the institution's own shipments, address all shipments of project material, equipment and tools in the Contractor's name and have a representative on site to receive any deliveries or shipments. CSC or PWGSC staff will **NOT** accept receipt of deliveries or shipments of any material equipment or tools.

8 TELEPHONES

.1 The installation of telephones, facsimile machines and computers with Internet connections is not permitted within the Institution perimeter unless prior approved by the Director.

.2 The Director will ensure that approved telephones, facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved

password protection that will stop an Internet connection to unauthorized personnel.

.3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, Blackberries, telephone used as 2-way radios are not permitted within the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.

.4 The Director may approve but limit the use of 2-way radios.

9 WORK HOURS

.1 Conform to Division 1.

.2 Work is not permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waved by the Director.

10 OVERTIME WORK

.1 Conform to Division 1.

.2 Provide 48 hours advance notice to Director for all work to be performed after normal working hours of the Institution. Notify Director immediately if emergency work is required, such as to complete a concrete pour or make the construction site safe and secure.

11 TOOLS AND EQUIPMENT

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

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

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

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

.5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor. Secure and lock scaffolding when not erected and when erected Secure in a manner agreed upon with the Institution designate.

.6 Report all missing or lost tools or equipment immediately to the Departmental Representative/Director.

.7 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:

.1 At the beginning and conclusion of every work day or shift upon entering and exiting the Institution.

.2 At any time when contractor is on Institution property.

.8 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day. Maintain

up to date inventory of all used blades/cartridges.

.9 If propane or natural gas is used for heating the construction, the institution will require that the contractor supervise the construction site during non-working hours.

12 KEYS

.1 Security Hardware Keys.
- .1 Arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
- .2 The SMO will provide a receipt to the Contractor for security hardware keys.
- .3 Provide a copy of the receipt to the Departmental Representative.

.2 Other Keys
- .1 Use standard construction cylinders for locks for his use during the construction period.
- .2 Issue instructions to employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
- .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
  - .1 Prepare an operational keying schedule
  - .2 Accept the operational keys and cylinders directly from the lock manufacturer.
  - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
- .4 Upon putting operational security keys into use, the PWGSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the PWGSC construction escort.

13 SECURITY HARDWARE

.1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

14 PRESCRIPTION DRUGS

.1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

15 SMOKING RESTRICTIONS

.1 Smoking is not permitted inside correctional facilities or outdoors within the perimeter of a correctional facility and persons must not possess unauthorized smoking items within the perimeter of a correctional facility.

.2 Persons in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist will be directed to leave the Institution.

.3 Smoking is permitted outside the perimeter of a correctional facility in an area designated by the Director.

16 CONTRABAND

.1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.

.2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.

.3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.

.4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

17 SEARCHES

.1 All vehicles and persons entering institutional property may be subject to search.

.2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband, he may order that person to be searched.

.3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY

.1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

19 MOVEMENT OF VEHICLES

.1 Escorted commercial vehicles may not be allowed to enter or leave the institution through the vehicle access gate during the regular "inmate count" occurring at breakfast, lunch and dinner hour as established by the Institution. Confirm "count" times with Director or Departmental Representative to reduce down times for deliveries to Institution and movement of contractors vehicles through Institution vehicle access gate.

.2 Construction vehicles will not be allowed to leave the Institution until an inmate count is completed.

.3 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.

.4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or PWGSC construction escorts working under the authority of the Director.

.5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.

.6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution. Arrange with Director for parking of contractor's vehicles at minimum security Institutions.

.7 Private vehicles of construction employees will not be allowed within the security wall or fence of medium or maximum security institutions without the permission of the Director.

.8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.

.9 With the approval of the Director, certain equipment may be permitted to remain on the construction

site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.

20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

.1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.

.2 However, notwithstanding paragraph above, the Director may:
- .1 Prohibit or restrict access to any part of the institution.
- .2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when accompanied by a member of the CSC security staff.

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

21 SURVEILLANCE AND INSPECTION

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

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

22 STOPPAGE OF WORK

.1 The director may request at any time that the contractor, his employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.

.2 The contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

23 CONTACT WITH INMATES

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

.2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

END OF SECTION

1 REFERENCES

.1 Government of Canada:
- .1 Canada Labour Code - Part II.
- .2 Canada Occupational Health and Safety Regulations.

.2 American National Standards Institute (ANSI):
- .1 ANSI A10.3-2006, – Safety Requirements for Powder-Actuated Fastening Systems ANSI for Construction and Demolition Operations

.3 Canadian Standards Association (CSA):
- .1 CSA Z797-2009 Code of Practice for Access Scaffold.

.4 National Fire Code of Canada:
- .1 FCC No. 301, Standard for Construction Operations (as amended).
- .2 FCC No.302, Standard for Welding and Cutting (as amended).
- .3 Part 5 - Hazardous Processes and Operations & Division B (as required).

.5 National Building Code of Canada (NBCC 2005):
- .1 Part 8, Safety Measures at Construction and Demolition Sites

.6 Province of British Columbia Building Code (2006):
- .1 Part 8, Safety Measures at Construction and Demolition Sites.

.7 Province of British Columbia:
- .1 Workers Compensation Act Part 3 - Occupational Health & Safety.
- .2 Occupational Health & Safety Regulations.

2 RELATED SECTIONS

.1 Section 01 01 50 - General Instructions for; Submittals procedures, Section Temporary utilities, Construction facilities and Temporary barriers and enclosures.

3 WORKERS' COMPENSATION BOARD COVERAGE

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

4 COMPLIANCE WITH REGULATIONS

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

5 SUBMITTALS

.1 Make submittals in accordance with Section 01 01 50 General Instructions for Submittals.

.2 Submit the following:
- .1 Health and Safety Plan.
- .2 Copies of reports or directions issued by federal and provincial health and safety inspectors.
- .3 Copies of incident and accident reports.
- .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .5 Emergency Procedures.

.3 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative for review.

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

.5 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
- .1 Be construed to imply approval by the Departmental Representative.
- .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
- .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

6 RESPONSIBILITY

.1 Assume responsibility as the Prime Contractor for work under this contract and appoint a qualified coordinator for the purpose of ensuring the coordination of health and safety activities for the location in accordance with sections 118 and 119 of Part 3 of the Workers Compensation Act.

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

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

7 HEALTH AND SAFETY COORDINATOR

.1 The Health and Safety Coordinator must:
- .1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
- .2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health

and Safety Plan.

.3 Be on site during execution of work.

8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site after working hours in accordance with Section 01 14 10 - Security Requirements.

9 PROJECT/SITE CONDITIONS

.1 Work at site will involve:

.1 Working in areas where inmates may be present who are under supervision by CSC staff. Conform to Security Requirements Section 01 41 10 Contact with Inmates clause and other security requirements pertaining to a CSC institution.

10 REGULATORY REQUIREMENTS

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

.2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

11 FILING OF NOTICE

.1 Submit a Notice of Project, form 52E49, to WorkSafeBC in accordance with OH&S Regulation 20.2, at least 24 hours before start of work.

.2 Submit copy to Departmental Representative.

12 HEALTH AND SAFETY PLAN

.1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.

.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:

.1 Primary requirements:

.1 Contractor's safety policy.

.2 Identification of applicable compliance obligations.

.3 Definition of responsibilities for project safety/organization chart for project.

.4 General safety rules for project.

.5 Job-specific safe work, procedures.

.6 Inspection policy and procedures.
.7 Incident reporting and investigation policy and procedures.
.8 Occupational Health and Safety Committee/Representative procedures.
.9 Occupational Health and Safety meetings.
.10 Occupational Health and Safety communications and recordkeeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.

.3 List hazardous materials to be brought on site as required by work.

.4 Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.

.5 Identify personal protective equipment (PPE) to be used by workers.

.6 Identify personnel and alternates responsible for site safety and health.

.7 Identify personnel training requirements and training plan, including site orientation for new workers.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and Government Services Canada (PWGSC). PWGSC's review shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

13 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
.1 Designated personnel from own company.
.2 Regulatory agencies applicable to work and as per legislated regulations.
.3 Local emergency resources.
.4 Departmental Representative.

.2 Include the following provisions in the emergency procedures:
.1 Notify workers of the nature and location of the emergency.
.2 Evacuate all workers safely.
.3 Check and confirm the safe evacuation of all workers.
.4 Notify the fire department or other emergency responders.
.5 Notify adjacent workplaces which may be affected if the risk extends beyond the workplace.
.6 Notify Departmental Representative.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:
.1 Work at high angles.
.2 Work in confined spaces or where there is a risk of entrapment.
.3 Work with hazardous substances.
.4 Underground work.

14 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:
- .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents in accordance with clause 5.2.4.

15 ELECTRICAL SAFETY REQUIREMENTS

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
- .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
- .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

16 ELECTRICAL LOCKOUT

.1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.

.3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

17 OVERLOADING

.1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

18 FALSEWORK

.1 Design and construct false work in accordance with CSA S269.1.

19 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 Code of Practice for Access Scaffold and BC Occupational Health and Safety Regulations.

20 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with provincial regulations.

21 POWDER-ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

22 FIRE SAFETY AND HOT WORK

.1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

23 FIRE SAFETY REQUIREMENTS

.1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

24 FIRE PROTECTION AND ALARM SYSTEM

.1 Do not obstruct, shut-off or leave inactive at the end of a working day or shift, the fire protection and alarm systems.

.2 Do not use fire hydrants for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from the fire department and the Departmental Representative, resulting from false alarms.

25 UNFORESEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

26 POSTED DOCUMENTS

.1 Post legible versions of the following documents on site:
- .1 Health and Safety Plan.
- .2 Sequence of work.
- .3 Emergency procedures.
- .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
- .5 Notice of Project.

.6 Floor plan(s).
.7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
.8 Workplace Hazardous Materials Information System (WHMIS) documents.
.9 Material Safety Data Sheets (MSDS).
.10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

27 MEETINGS

.1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

28 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

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

.3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The Contractor will be responsible for any costs arising from such a "stop work order".

END OF SECTION

1 RELATED SECTIONS

.1 Section 01 01 50 - General Instructions.

.2 Division 11 - Equipment

.3 Division 21 - Fire Suppression

.4 Division 22 - Plumbing.

.5 Division 23 - Heating Ventilating and Air Conditioning

.6 Division 26 - Electrical.

2 DEFINITIONS

.1 Acronyms:
- .1 Cx - Commissioning.
- .2 EMCS - Energy Monitoring and Control Systems.
- .3 O&M - Operation and Maintenance.
- .4 PI - Product Information.
- .5 PV - Performance Verification.
- .6 TAB - Testing, Adjusting and Balancing.

3 QUALITY ASSURANCE

.1 Testing organization: current member in good standing of AABC certified to perform specified services.

.2 Comply with applicable procedures and standards of the certification sponsoring association.

.3 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

4 REFERENCES

.1 Associated Air Balance Council (AABC): National Standards for Field Measurement and Instrumentation, Total Systems Balance, Air Distribution-Hydronics Systems.

5 SUBMITTALS

.1 Submit test reports in accordance with Section 01 01 50 - General Instructions; Submittal Clause.

.2 Prior to start of Work, submit name of organization proposed to perform services. Designate who has managerial responsibilities for coordination of entire testing, adjusting and balancing.

.3 Prior to start of Work, designate who has managerial responsibilities for coordination of entire testing and adjusting of electronic equipment.

.4 Submit documentation to confirm organization compliance with quality assurance provision.

.5 Submit 3 preliminary specimen copies of each of report forms proposed for use.

.6 Ten (10) days prior to Substantial Performance, submit 3 copies of final reports on applicable forms.

.7 Submit reports of testing, adjusting and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

6 PROCEDURES - GENERAL

.1 Comply with procedural standards of certifying association under whose standard services will be performed.

.2 Notify Departmental Representative 3 days prior to beginning of operations.

.3 Accurately record data for each step.

.4 Report to Departmental Representative any deficiencies or defects noted during performance of services.

7 CONTRACTOR'S RESPONSIBILITY

.1 Prepare each system for testing and balancing.

.2 Cooperate with testing organization and provide access to equipment and systems.

.3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

.4 Notify testing organization 7 days prior to time project will be ready for testing, adjusting, and balancing.

8 PREPARTATION

.1 Provide instruments required for testing and adjusting operations.

.2 Make instruments available to Departmental Representative to facilitate spot checks during testing.

.3 Test electronic system for proper operation and programming.

9 FINAL REPORTS

.1 Reports to be completed by organization having managerial responsibility.

.2 Ensure each form bears signature of recorder and his supervisor.

10 COMPLETION OF COMMSSIONING

.1 Upon completion of Cx leave systems in specified operating and program mode.

.2 Complete Cx prior to issuance of Substantial Completion.

.3 Cx deliverables have been submitted and accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

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

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 01 50 - General Instructions].

.2 Before proceeding with demolition of slab on grade and excavation adjacent to existing building and where required by authority having jurisdiction submit for review by Departmental Representative shoring and underpinning drawings prepared by qualified professional engineer registered or licensed in the Province of British Columbia, showing proposed method.

.3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Sections 01 01 50 - General Instructions and indicate:

.1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.

.2 Schedule of selective demolition.

.3 Number and location of dumpsters.

.4 Anticipated frequency of tippage.

.5 Name and address of haulers and waste receiving organizations.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 - General Instructions.

1.4 SITE CONDITIONS

.1 Review "Designated Substance Report" and take precautions to protect environment.

.2 Should material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.

.1 Do not proceed until written instructions have been received from Departmental Representative.

.3 Notify Departmental Representative before disrupting building access or services.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 PREPARATION

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

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

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

.4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

.1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.

.2 Immediately notify the Engineer should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PROTECTION

.1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.5 Do Work in accordance with Section 01 35 33 - Health and Safety Requirements.

3.3 SALVAGE

.1 Refer to demolition drawings and specifications for items to be salvaged for reuse.

.2 Remove items to be reused, store as directed by Departmental Representative, and re-install under appropriate section of specification.

3.4 SITE REMOVALS

.1 Remove items as indicated.

.2 Removal of Pavements, Curbs and Slabs:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

3.5 DEMOLITION

.1 Remove parts of existing building site to permit new construction. Sort materials into appropriate piles for reuse and recycling.

.2 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

3.6 DISPOSAL

.1 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

END OF SECTION

1.0 GENERAL

1.1 RELATED WORK

.1	Concrete Reinforcing	Section 03 20 00
.2	Cast-in-Place Concrete	Section 03 30 00

1.2 REFERENCES

.1 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.

.2 CAN/CSA-O86-09, Engineering Design in Wood (Limit States Design).

.3 CSA O121-08, Douglas Fir Plywood.

.4 CSA O151-04, Canadian Softwood Plywood.

.5 CSA S269.1-1975, Falsework for Construction Purposes.

.6 CAN/CSA-S269.3-M92, Concrete Formwork.

1.3 SHOP DRAWINGS

.1 Prepare shop drawings for formwork and falsework in accordance with Section 01 33 00 – Shop drawings, product data and samples.

.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and comply with CAN/CSA-S269.3 for formwork drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

.5 The contractor is responsible for the design of all formwork and shoring and for complying with all Work Safe BC regulations pertaining to formwork construction, design and inspection. Formwork and shoring shall be designed by a qualified professional engineer registered or licensed in British Columbia.

2.0 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use plywood and wood formwork materials to CSA-O121and CAN/CSA-O86,

.2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.

.2 Pan forms: removable as indicated.

.3 Form ties:
- .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.4 Form liner:
- .1 Plywood: Douglas Fir to CSA O121 or Canadian Softwood Plywood to CSA O151 square edge.

.5 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps.

.6 Falsework materials: to CSA S269.1.

.7 Sealant: to Section 07 90 00 –Sealant.

3.0 EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork / falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Do not place shores and mud sills on frozen ground.

.6 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.8 Align form joints and make watertight. Keep form joints to minimum.

.9 Use 25mm chamfer strips on external corners and/or 25mm fillets at interior corners of concrete members, joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated. Refer to architectural drawings for reveals, recesses, chamfers, finishes and other architectural requirements not indicated on the structural drawings.

.11 Refer to architectural, mechanical and electrical drawings for locations and sizes of curbs and equipment pads.

.12 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.13 Build in anchors, sleeves, and other inserts required to accommodate Work specific in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Formwork removal and reshoring: Do not remove forms and shoring before the concrete has attained sufficient strength to ensure the safety of the structure and not before the following minimum and long term performance periods of time after placing concrete:

24 hours	side forms for pilasters, foundation walls, curbs & footings

.2 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

1.0 GENERAL

1.1 RELATED WORK

1.	Concrete Forming and Accessories	Section 03 10 00
.2	Cast-in-Place Concrete	Section 03 30 00

1.2 REFERENCES

.1 ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R-94, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.3 ASTM A775/A775M-04, Specification for Epoxy-Coated Reinforcing Steel Bars.

.4 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.

.5 CAN3-A23.3-04, Design of Concrete Structures for Buildings.

.6 CSA G30.3-M1983(R1991), Cold Drawn Steel wire for Concrete Reinforcement.

.7 CSA G30.5-M1983(R1991), Welded Steel Wire Fabric for Concrete Reinforcement.

.8 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.

.9 CSA G30.14-M1983(R1991), Deformed Steel Wire for Concrete Reinforcement.

.10 CSA G30.15-M1983(R1991), Welded Deformed Steel wire Fabric for Concrete Reinforcement.

.11 CAN/CSA-G40.21-04, Structural Quality Steels.

.12 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

.13 CSA W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 SOURCE QUALITY CONTROL

.1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 1 week prior to commencing reinforcing work.

.2 Inform Departmental Representative of proposed source of material to be supplied.

1.4 SHOP DRAWINGS

.1 Produce shop drawings including placing of reinforcement.

.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacing, locations of reinforcement and mechanical splices if approved by Departmental

Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated.

1.5 SUBSTITUTES

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

2.0 PRODUCTS

2.1 MATERIALS

.1 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.2 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA G30.18.

.3 Cold-drawn annealed steel wire ties: to CSA G30.3.

.4 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.

.5 Epoxy coating of non-prestressed reinforcement: to ASTM A775/A775M.

.6 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

.7 Mechanical splices: subject to approval of Departmental Representative.

.8 Plain round bars: to CAN/CSA-G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures unless indicated otherwise. For epoxy coated bars, fabricate in accordance with ASTM D3963.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists. For epoxy coated bars, method of bundling and transportation should be in accordance with ASTM A775/A775M and ASTM D3963.

3.0 EXECUTION

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CAN/CSA-A23.1.

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

.3 Prior to placing concrete obtain Departmental Representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

1.0 GENERAL

1.1 RELATED SECTIONS

.1	Concrete Forming and Accessories	Section 03 10 00
.2	Concrete Reinforcing	Section 03 20 00

1.2 REFERENCES

.1 ASTM C109-05, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).

.2 ASTM C309-03, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C332-99, Specification for Lightweight Aggregates for Insulating Concrete.

.4 ASTM C827-01a, Test Method for Early Volume Change of Cementitious Mixtures.

.5 ASTM C939-02, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.

.6 ASTM D412-98a(2002), Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.

.7 ASTM D624-00e1, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.8 ASTM D1751-99, Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.9 ASTM D1752-04, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

.10 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

.11 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.12 CAN/CSA-A5-98, Portland Cement.

.13 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.

.14 CAN/CSA-A23.2-09, Methods of Test for Concrete.

.15 CAN/CSA-A23.5-98, Supplementary Cementing Materials.

.16 ASTM C 260 – 01, Specifications for Air-Entraining Admixtures for Concrete.

.17 ASTM C 494M – 05a, Specifications for Chemical Admixtures for Concrete.

1.3 CERTIFICATES

.1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.

.2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

1.4 QUALITY ASSURANCE

.1 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:

- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Curing.
- .5 Finishes.
- .6 Formwork removal.
- .7 Joints.

2.0 PRODUCTS

2.1 MATERIALS

.1 Portland cement: to CAN/CSA-A5.

.2 Supplementary cementing materials: to CAN/CSA-A23.5.

.3 Water: to CAN/CSA-A23.1.

.4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.

.5 Low density aggregate for insulating concrete: to CAN/CSA-A23.1 and ASTM C332 group II.

.6 Air entraining admixture: to ASTM C260.

.7 Chemical admixtures: to ASTM C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.

- .1 Compressive strength: 50 MPa at 28 days.
- .2 Consistency:
  - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 s.
  - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portion) 125 to 145%.
  - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125%.
  - .4 Dry pack to manufacturer's requirements.

.9 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.10 Curing compound: to CAN/CSA-A23.1 and to ASTM C309, Type 1-chlorinated rubber.

.11 Ribbed waterstops: extruded PVC Arctic Grade of sizes indicated with welded corner and intersecting pieces:

.1 Tensile strength: to ASTM D412, method A, Die "C", minimum 11.4 MPa.
.2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.
.3 Tear resistance: to ASTM D624, method A, Die "B", minimum 48 kN/m.

.12 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751.
.2 Sponge rubber: to ASTM D1752, Type I, flexible grade.

.13 Weep hole tubes: plastic.

.14 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.

.15 Polyethylene film: 0.375mm (15 Mil) thickness to CAN/CGSB-51.34.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following properties:

.1 Cement: Type GU Portland cement
.2 Minimum compressive strength at 28 days, class of exposure and nominal size of coarse aggregate:

Member	minimum 28-days strength (Mpa)	maximum aggregate size (mm)	exposure class	air content Category
Footings & walls	25	25	F-2	2
Pedestals & curbs	25	25	F-2	2
Slab on grade - Exterior	32	20	C-2	1

.3 Slump at time and point of discharge: To CSA-A23.1 Clause 4.3.2.3. When superplasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of superplasticizers shall be included in the cost of the concrete. Smaller aggregate size may be used where necessary to increase slump.
.4 Air content: To CSA-A23.1 Table 2 & 4 to suit appropriate exposure class.
.5 Chemical admixtures: following admixtures in accordance with to ASTM C494M. Admixtures shall contain no salts or acids.

.6 Concrete mix designs shall be submitted to a material consultant for approval and to Departmental representative for review prior to any concrete work.

3.0 EXECUTION

3.1 PREPARATION

.1 Obtain Departmental Representative's approval before placing concrete. Provide 48 h notice prior to placing of concrete.

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

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.

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

.6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.7 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1 and CAN/CSA-A23.2. Adhere strictly to CSA-A23.1 for proper preparation and protection for cold weather and hot weather concrete work.

.2 Sleeves and inserts.

.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.

.2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Departmental Representative.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
.2 With approval of Departmental Representative, grout anchor bolts in holes drilled after concrete has set. Drilled holes to be to manufacturer's recommendations.
.3 Protect anchor bolt holes from water accumulations, snow and ice build-up.
.4 Set bolts and fill holes with epoxy grout.
.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forms and Accessories. If wood forms are used, remove them after concrete has set.
.2 Install weep hole tubes and drains as indicated.

.5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.6 Finishing:

.1 Finish concrete in accordance with CAN/CSA-A23.1.
.2 Use procedures acceptable to Departmental Representative or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
.3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: Provide written declaration that compounds used are compatible.

.7 Waterstops:

.1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
.2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Departmental Representative.

.8 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
.2 Locate and form isolation, construction and expansion joints as indicated. Install joint filler.
.3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.9 Dampproof membrane:
.1 Install dampproof membrane under concrete slabs-on-grade inside building.
.2 Lap dampproof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

.10 Locations of construction joints shall be submitted to the departmental representative for review in advance and prior to commencement of construction.

.11 Supply and set anchor bolts, sleeves, pipe hangers, expansion joints and other inserts and openings as indicated in the structural drawings and specifications or in documents by other consultants.

.12 All dowels, anchor bolts, embedded plates and other inserts shall be placed before the concrete is poured.

.13 Slab on grade joints shall be 35mm deep sawcuts spaced maximum 2000mm apart, layout of joins shall be approved by the Departmental representative, seal with flexible joint sealer to prevent ingress of water.

3.3 SITE TOLERANCE

.1 All horizontal surfaces shall meet the Class A Slab and Floor Finish classification (+/- 8mm) in accordance with Table 19 of CAN/CSA-A23.1 straight edge method.

.2 Tolerance closer than those specified in CSA-A23.1 may be required at certain locations for structural, architectural and construction requirements as directed by Departmental Representative.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a CSA certified Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA-A23.1. Submit all concrete testing results to the Departmental Representative.

.2 Costs of tests shall be borne by the Contractor.

.3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.

.5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 General Instructions — Section 01 01 50

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM A 36/A 36M-12, Specification for Structural Steel.
- .2 ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.
- .3 ASTM A325-10e1, Specification for Structural Bolts, Steel, Heat Treated,120/105 ksi Minimum Tensile Strength.
- .4 ASTM A 325M-13, Specification for High-Strength Bolts for Structural Steel Joints.

.2 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

- .1 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .2 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.

.3 Canadian Standards Association (CSA International)

- .1 CAN/CSA-G40.20-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
- .2 CAN/CSA-G40.21-04 (R2009), Structural Quality Steels.
- .3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 CAN/CSA-S16-09, Design of steel structures, Includes Update No. 1 (2010), Updated No. 2 (2010), Update No. 3 (2013)
- .5 CSA W47.1-03 (R2009), Certification of Companies for Fusion Welding of Steel Structures.
- .6 CSA W48-06(R2011), Electrodes.
- .7 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .8 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).

1.3 DESIGN REQUIREMENTS

.1 All structural steel connections shall be designed by the contractor for forces, moments and shears resulting from the specified load and self weight of the supporting elements and all forces as shown on the drawings, unless noted otherwise. All main connection bolts shall be minimum M20. Use minimum two bolts per connection. All welds shall have 6mm leg minimum.

.2 If connection for shear only (standard connection) is required:

- .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction".

.3 If shears are not indicated, select or design connections to support reaction from 120% maximum uniformly distributed load that can be safely supported by beam in bending (60% each end), provided no point loads act on beam.

.4 Provide splices as indicated on drawings. Unless noted otherwise, all continuous elements called up on the drawings shall be provided with full strength splice either by full strength groove weld or by full strength splice plates on each end of the connection elements.

1.4 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 01 50 – General Instructions. Shop drawings for anchor bolt layout and embedded plate layout shall also be submitted for review.

.2 On erection drawings, indicate all details and information necessary for assembly and erection purposes such as, description of methods, sequence of erection, type of equipment used in erection and temporary bracings.

.3 No fabrication or work shall be commenced until the review and approval of the shop drawings. The contractor shall assume full responsibility for any fabrication and work done prior to review and approval of the shop drawings.

.4 Contractor shall co-ordinate and verify all dimension and locations prior to production of the drawing.

.5 All fabricator designed assemblies, components and connections, and drawings to be stamped and signed by qualified professional engineer licensed in the British Columbia, Canada.

.6 The Professional Engineer responsible for the shop drawings shall inspect the installation of the work for conformance with the design and the shop drawings, and shall upon completion of the work submit to the Consultant a completed Schedule S-B: Assurance of Professional Design and Commitment for Field Review by Supporting Registered Professional, and Schedule S-C: Assurance of Professional Field Review and Compliance by Supporting Registered Professional.

1.5 QUALITY ASSURANCE

.1 Submit 2 copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work at least 2 weeks prior to fabrication of structural steel. Mill test reports shall be certified by metallurgists qualified to practice in British Columbia, Canada.

.2 Fabricator of structural steel shall, in addition, provide an affidavit stating that materials and products used in fabrication conform to applicable material and products standards called for by design drawings and specifications.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions.

Part 2 Products

MATERIALS

.1 Structural steel: to CAN/CSA-G40.21 Grade as indicated on drawings.

.2 Anchor bolts: ASTM A307 unless noted otherwise on drawings.

.3 Bolts, nuts and washers: to ASTM A 325.

.4 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.

.5 Shop paint primer: to CISC/CPMA 1.

.6 Hot dip galvanizing as specified on drawings: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m2.

2.2 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Welding shall be performed by certified welders. Fabrication shops shall be approved by the Canadian welding bureau to CSA-W47.1 (Division 1 or 2). Certification shall be supplied to the Departmental Representative upon request.

.3 Unless noted otherwise, install all rolled steel sections with mill camber upwards.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

.5 All areas of galvanized parts shall be grounded off prior to welding. Part 2 coats minimum of zinc rich primer read mix to CAN/CGSB-1.181 after welding.

2.3 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC SP7 brush off blast.

.3 Apply one coat of CISC/CMPD2-75 primer in shop to steel surfaces to achieve minimum dry film thickness of 3 to 4 mils, except:

- .1 Surfaces to be encased in concrete.
- .2 Surfaces to receive field installed stud shear connections.
- .3 Surfaces and edges to be field welded.
- .4 Faying surfaces of friction-type connections.
- .5 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

Part 3 Execution

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

3.3 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark for fit and match.

3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.

.2 Field cutting or altering structural members: to approval of Departmental Representative.

.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

.5 Grout for posts/beams base plate supported by pile caps shall be strenson's M-Bed standard, Masterbuilder's Masterflow 713 or approved equal and shall have minimum strength of 50MPa at 28 days mix to fluid consistency. Also see Section 03 30 00 – Cast-in-place Concrete.

.6 Install and torque all bolts and drilled anchors in accordance with manufacturer's specifications and procedures.

.7 Any misfit or misalignment must be reported to the Departmental Representative. The contractor shall provide proposed remedial measures to the Departmental Representative for review and approval. Any remedial work on connections must be reviewed and/or redesigned by the connection engineer. Costs of remedial work are at the expense of the contractor.

.8 Do not notch or cut openings in any of the framing members and connection without prior approval from the Departmental Representative.

.9 Provide temporary bracing to structure for stability and safety as required until the completion of the steel structure.

3.5 FIELD QUALITY CONTROL

.1 The Departmental Representative will not be responsible for inspection of the Contractor's work as described in Clause 7.12 of the CISC Code of Standard Practice for Structural Steel. The Contractor is responsible for the accuracy and completeness of his own work and shall verify that the structural steel has been fabricated, erected and finished in accordance with the contract specifications.

.2 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.

.3 Testing requirements are as follows:

.1 100% of Bolts to be visually Inspected and perform 10% Torque Testing of all bolted connections.

.2 Non Destructive Testing of Welds: 100% of all welds to be visually inspected.

.4 Welding inspector shall be certified to CSA W178.2 Level 2 or Level 3.

.5 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.

.6 Submit test reports to Departmental Representative within 1 week of completion of inspection.

.7 Costs of tests shall be borne by the Contractor.

3.6 FIELD PAINTING

.1 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC-SP-6 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 07 61 00 – Sheet Metal Roofing.

.2 Section 11 41 10 – Walk-In Freezer.

1.2 REFERENCE STANDARDS

.1 ASTM International:
- .1 ASTM A123 / A123M - 09 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A 307-10, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.
- .3 ASTM A 653/A653M-10, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .4 ASTM A1011 / A1011M - 10 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

.2 CSA International:
- .1 CAN/CSA-G40.21-04(2009), Structural Quality Steels.
- .2 CAN/CSA-S16-01 Consolidation (R2007) includes; Limit States Design of Steel Structures; S16S1-05, Supplement #1 to CAN/CSA-S16-01, Limit States Design of Steel Structures.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.40-M97, Primer, Structural Steel, Oil Alkyd Type.
- .2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.

1.3 SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 01 50 - General Instructions, Submittals clause.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 01 50 - General Instructions, Submittals clause. Indicate VOC's:
  - .1 For finishes, coatings, primers and paints.

.2 Shop Drawings
- .1 Submit shop drawings in accordance with Section 01 01 50 - General Instructions, Submittals clause.
- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

.1 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:
- .1 Deliver, store, handle and protect materials in accordance with Section 01 01 50 - General Instructions, Common Product Requirements clause.

.2 Storage and Protection:
- .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
- .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management And Disposal clause.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA-G40.21, Grade 300W.

.2 Welding materials: to CSA W59.

.3 Bolts and anchorbolts: to ASTM A307; corrosion resistant types to ASTM A325M, Type 3. Provide all required anchoring devices including anchor clips, bar and strap anchors, expansion bolts and shields, and other devices designed to support and secure work.

.4 Wire cloth square mesh: Commercial hot dipped galvanized steel wire cloth, 4 mesh per 25 mm, 2.337 mm wire diameter, 4.013 mm width of opening, 39.9% open area, 104.78 kg/ 100sf. Trimmed on four sides. Acceptable Product: McNichols or acceptable substitution.

.5 Galvanizing: hot dipped galvanizing with minimum zinc coating of 600 g/m^2 to ASTM A123. All ferrous metal fabrication for exterior locations to be galvanized after fabrication.

.6 Galvanize touch-up primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.2 FABRICATION

.1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Fabricate items from steel unless indicated otherwise; use galvanized steel for exterior items, unless indicated otherwise.

.3 Use self-tapping shake-proof countersunk flat headed screws on items requiring assembly by screws or as indicated. Use welded connections for exterior work, unless approved otherwise by Departmental Representative.

.4 Where possible, fit and shop assemble work, match mark, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush with sharp edges and corners rounded to 3 mm radius. Where continuous welds may cause distortion of fabrication use stitch welds and plastic filler, grind and sand smooth.

.6 Seal exterior steel fabrications to provide corrosion protection in accordance with CAN/CSA-S16.

2.3 MISCELLANEOUS STEEL BRACKETS AND ANGLES

.1 Supply for installation by respective trades. Drill for countersunk screws and anchor bolts.

.2 Prime hot dip galvanized exterior steel.

3 Execution

3.1 ERECTION

.1 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections. Hold in place until concrete embedment are cured.

.2 Provide suitable means of anchorage as indicated or as acceptable to the Engineer, such as dowels, anchor clips, bar anchors, expansion bolts and shields, toggles.

.3 Make field connections with high tensile bolts, to CAN/CSA-S16 or weld.

.4 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection using primer.

.5 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 MISCELLANEOUS STEEL BRACKETS AND ANGLES

.1 Supply to respective trades and install miscellaneous metal items in accordance with reviewed shop drawings and details.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 07 67 16 – Vapour Barrier.

1.2 REFERENCES

.1 Underwriters Laboratories of Canada (ULC).
- .1 CAN/ULC-S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .2 CAN/ULC-S704-11, Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .3 CAN/ULC-S770-09, Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
- .4 CAN3-A451.1-M86 (R2001) Polystyrene Insulation Adhesives.

1.3 SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 01 50 - General Instructions for Submittal Procedures clause.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 01 50 - General Instructions for Submittal Procedures clause. Indicate VOC's insulation products and adhesives.

.2 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 - General Instructions for Construction/Demolition Waste Management and Disposal clause.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

2 Products

2.1 MATERIALS

.1 Insulation below freezer:

.1 Extruded polystyrene foam insulation to CAN/ULC-S701, Type 4, rigid, closed cell type, with integral high density skin.

.1 Thermal Resistance: Long term aged RSI value of 0.87/25 mm, to ASTM C518.

.2 Board Size: 610 x 1220 mm, 100 mm thick.

.3 Compressive Strength: to ASTM D1621, minimum 415 kPa.

.4 Water Absorption: to ASTM D2842, 0.7% by volume maximum.

.5 Edges: Tongue and groove sides, square edge ends.

.6 Water Vapour Permeance: to ASTM E96, 50 ng/Pas m^2.

.2 Clips and Fasteners: corrosion-resistant type, sized to suit application; as supplied by insulation manufacturer.

2.1 ACCESSORIES

.1 Tape for sealing joints as recommended by manufacturer.

2.2 ADHESIVE

.1 Type A (for polystyrene): to CAN3-A451.1 and suitable for bead application.

2.3 COMPATIBILITY

.1 Ensure insulation is compatible with other materials in contact with insulation. Confirm compatibility with Damp-proofing at elevator pit.

.2 Where incompatibility exists provide means to separate materials as recommended by manufacturer of insulation.

3 Execution

3.1 WORKMANSHIP

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation closely around horizontal Z-girt framing, vertical intermediate framing at exterior door and window openings, plumbing pipes and ducts, and around other protruding elements.

.4 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.5 Do not enclose insulation until it has been inspected and approved by Engineer.

3.2 FREEZER INSULATION

.1 Apply Type 4 polystyrene insulation boards over vapour retarder using approved adhesive and

fastener clips as recommended by insulation manufacturer.

.2 Fit insulation tight to perimeter of foundation.

.3 Butt insulation panels tightly.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 03 30 00 - Cast-in-Place Concrete

.2 Section 07 21 13 - Board Insulation.

.3 Section 11 41 10 – Walk-In Freezer.

1.2 REFERENCES

.1 ASTM International:

- .1 ASTM D1709 - 09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- .2 ASTM E96/E96M-13 Standard Test Methods for Water Vapor Transmission of Materials.
- .3 ASTM E154 / E154M - 08a (2013) e1 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls.
- .4 ASTM E1643 - 11 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .5 ASTM E1745 - 11 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- .6 ASTM F1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.3 ENVIRONMENTAL REQUIREMENTS

.1 Do not proceed with work when temperatures fall below recommended application requirements.

.2 Do not apply during rain or snow unless surfaces are protected to manufacturer's requirements.

1.4 SUBMITTALS

.1 Comply with Section 01 01 50 - General Instructions, Submittal Procedures.

.2 Submit manufacturer's product data and application instructions.

1.5 QUALITY ASSURANCE

.1 Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapor retarder.

.2 Provide vapor retarder materials from a single manufacturer regularly engaged in manufacturing the product.

.3 Provide products which comply with all provincial and local regulations controlling use of volatile organic compounds (VOCs).

1.6 PRECONSTRUCTION MEETING

.1 Convene meeting one week prior to installation of freezer vapour retarder. Attendees to be as follows: - Departmental Representative, General Contractor and Vapor Retarder Installer to discuss the application in detail.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

.2 Store materials in a clean, dry area in accordance with manufacturer's instructions.

.3 Protect materials during handling and application to prevent damage or contamination.

.4 Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness at intervals of no more than 220 cm.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Product not intended for uses subject to abuse or permanent exposure to the elements.

2 Products

2.1 MATERIALS

.1 Plastic Vapor Retarder: manufactured from virgin polyolefin resins, and tested to requirements of ASTM E1745 to meet the following minimum performance requirements:

- .1 Maximum Water Vapor Permeance (ASTM E154 Sections 7, 8, 11, 12, 13, by ASTM E96, Method B or ASTM F1249):
  - .1 As received: 0.0063 perms.
  - .2 After Wetting and Drying: 0.0052 perms.
  - .3 Resistance to Plastic Flow and Temperature: 0.0057 perms.
  - .4 Effect Low Temperature and Flexibility: 0.0052 perms.
  - .5 Resistance to Deterioration from Organisms and Substances in Contacting Soil: 0.0052 perms.
- .2 Puncture Resistance (ASTM D1709) : >3,200 grams.
- .3 Tensile Strength ASTM E154, Section 9: 72 Lb. Force/Inch.

2.2 ACCESSORIES

.1 Seam Tape:

- .1 High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 100 mm.

.2 Pipe Collars

- .1 Construct pipe collars from vapor retarder material and pressure sensitive tape per manufacturer's instructions.

3 Execution

3.1 SURFACE PREPARATION

.1 Prepare surfaces in accordance with manufacturer's instructions.

.2 Level, tamp, or roll earth or granular material beneath the slab base.

3.2 EXAMINATION

.1 Examine surfaces to receive vapour retarder. Notify Departmental Representative if surfaces are not acceptable. Do not begin application until unacceptable conditions have been corrected.

3.3 UNDER SLAB APPLICATION

.1 Install the vapor retarder membrane in accordance with manufacturer's instructions and ASTM E 1643.

.2 Unroll vapor retarder with the longest dimension parallel with the direction of the pour.

.3 Lap vapor retarder over footings and seal to foundation walls.

.4 Overlap joints 152 m) and seal with manufacturer's tape.

.5 Seal all penetrations (including pipes) with manufacturer's pipe boot.

.6 Ensure no penetration of the vapor retarder occurs throughout installation except for reinforcing steel and permanent utilities.

.7 Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 152 mm and taping all four sides with tape.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for sheet metal roofing.

1.2 RELATED SECTIONS

.1 Section 09 91 23 – Painting.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.

1.4 SUBMITTALS

.1 Submit product data.

.2 Submit shop drawings.

.3 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: to ASTM A653/A653M, commercial quality, with Z275 coating, prefinished as specified in 2.2, 0.61 mm minimum base metal thickness.

.2 Acceptable product, Vicwest 7/8" Corrugated, similar product by Mercury Metals or acceptable substitution.

2.2 PREFINISHED STEEL SHEET

.1 Prefinished steel with factory applied silicone modified polyester.

.1 Colour selected by Departmental Representative from manufacturer's standard range.

2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.

.3 Fasteners: Colour matched, self-drilling, exposed type.

.4 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.5 Touch-up paint: as recommended by sheet metal roofing manufacturer.

2.4 Z-GIRTS

.1 Roll formed hot-dipped galvanized Z275 coated, minimum base thickness 1.52 mm for Z-girts or as required for applied loading, face width 32 mm, depths as indicated.

.2 Fasteners: Sheet metal screws to have minimum coating thickness of 0.008 mm of zinc or cadmium. Other coatings providing equal or better corrosion protection may be used. Acceptable fasteners, Leland Industries DT-2000 or acceptable substitution.

.3 Welding electrodes of the 480 Mpa minimum tensile strength series (eg. E480XXX, E480S-X).

.4 Zinc rich paint for touching up welds and damaged metallic coatings to conform to CGSB 1-GP-181M.

2.5 FABRICATION

.1 Form individual pieces in maximum lengths. Make allowances for expansion at joints.

.2 Hem exposed edges on underside 12 mm, mitre and seal.

.3 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.4 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

Part 3 Execution

3.1 INSTALLATION

.1 Flash roof penetrations with material matching roof panels, and make watertight.

.2 Form seams in direction of water-flow and make watertight.

3.2 SHEET METAL ROOFING

.1 Follow manufacturer's directions.

.2 Lay sheets with long dimension parallel to roof slope.

.3 At eaves and gable ends, terminate roofing by hooking over previously installed edge strip.

.4 Lap panel seam ribs away from prevailing wind direction.

.5 Apply sealant tape on topside of male ribs prior to installing next overlapping panel.

.6 Flash roof penetrations with material matching roof panels, and make watertight.

.7 Form seams in direction of water-flow and make watertight.

.8 Where end laps are necessary due to the length of the roof, follow manufacturer's recommended details. Seal endlaps with continuous sealant tape and caulking compound.

.9 Maximum alignment variation: 5 mm in 12 metres.

.10 Install hip and valley flashing to manufacturer's details using approved fasteners and sealant.

.11 Overlap panels minimum 150 mm.

.12 Notch and fold down flashing into space between ribs at flashing perpendicular to ribs.

.13 At completion of work each day and at completion sweep panels, flashing and gutters clean. Do not allow fasteners, cuttings, fillings or scraps to accumulate on finished surfaces.

.14 Do not expose any cut edges. Paint and protect all cut edges of metal from corrosion.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 01 01 50 - Submittal Procedures, Waste Management and Disposal.

.2 Section 03 30 00 – Cast-in-Place concrete.

.3 Section 05 12 23 – Structural Steel Framing.

1.2 DESCRIPTION OF WORK

.1 Refer to finish schedules and notes on drawings for finishing of new work and existing surfaces.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM):
  .1 ASTM D 3960-05, Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

.2 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada.

1.4 QUALITY ASSURANCE

.1 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.2 Conform to latest MPI requirements for interior painting work including preparation and priming.

.3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.4 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.5 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

.6 Standard of Acceptance:
  .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
  .2 Bulkheads/Ceilings: No defects visible from at 45° to surface when viewed using final lighting source.
  .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface

area.

1.5 SAMPLES

.1 Submit sample colours of each paint type specified in accordance with Section 01 01 50.

.2 Submit duplicate mm sample panels of each paint, stain, clear coating, special finish, type colour texture specified.

.3 Submit full range of available colours where colour availability is restricted.

.4 Use 10 mm D-Fir plywood for finishes over natural wood surfaces. Use 12.5 mm gypsum board for finishes over smooth surfaces.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 01 50.

.2 Labels shall clearly indicate:
- .1 Manufacturer's name and address.
- .2 Type of paint or coating.
- .3 Compliance with applicable standard.
- .4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in a well ventilated area with temperature range 7° C to 30° C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Consultant.

.10 Remove paint materials from storage only in quantities required for same day use.

.11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.12 Fire Safety Requirements:
- .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly"E2, E3 rating based on VOC (EPA Method 24) content levels.

1.8 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:
- .1 Ventilate enclosed spaces in accordance with Section 01 01 50.
- .2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 ° C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
- .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
- .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities is provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:
  - .1 Ambient air and substrate temperatures are below 10 ° C.
  - .2 Substrate temperature is over 32 ° C unless paint is specifically formulated for application at high temperatures.
  - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
- .2 Perform no painting work when the maximum moisture content of the substrate exceeds:
  - .1 15% for wood.
  - .2 12% for gypsum board.
- .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter.
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:
- .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
- .3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Additional Interior Application Requirements:
- .1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
- .2 Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.9 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization form Departmental Representative for any changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the occupied floors in building.

1.10 WASTE MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Non-water based opaque and transparent finishes and related materials (thinners, solvents, etc.,) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:

- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
- .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

.8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

2 Products

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Only qualified products with E2, E3 "Environmentally Friendly" rating are acceptable for use on this project.

.4 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

.1 Departmental Representative will provide Colour Schedule after Contract award.

.2 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.3 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

loss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 max.

G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 min.
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
	High-Gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as specified.

2.5 EXTERIOR PAINTING SYSTEMS

.1 Cast-in-Place Concrete Floor Sealer:
.1 EXT 3.2H Sealer, Clear W.B.

.2 Structural Steel Columns, Steel Frame and Metal Fabrications:
.1 EXT 5.1D - Alkyd G4 gloss level finish (over alkyd primer).

3 Execution

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.3 PROTECTION

.1 Protect interior and exterior building surfaces not to be painted from paint spatters, markings and other damage. If damaged, clean and restore such surfaces as directed by Departmental Representative.

.2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.

.3 Protect items that are permanently attached such as Fire Labels on doors and frames.

.4 Protect factory finished products and equipment.

.5 Remove electrical cover plates, light fixtures, surface hardware on doors, accessories and other surface mounted equipment, fittings and fastenings prior to undertaking any painting operations by General Contractor. Securely store and re-install items after painting is completed by General Contractor.

.6 As painting operations progress, place "WET PAINT" signs in all areas to approval of Departmental Representative.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

- .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.
- .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
- .4 Allow surfaces to drain completely and allow to dry thoroughly.
- .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
- .6 Use trigger operated spray nozzles for water hoses.
- .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

- .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
- .2 Apply wood filler to nail holes and cracks.
- .3 Tint filler to match stains for stained woodwork.

.4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, or vacuum cleaning.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

.7 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
- .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant Departmental Representative.
- .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:
- .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
- .4 Brush out immediately all runs and sags.
- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Departmental Representative.

.5 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish closets and alcoves as specified for adjoining rooms.

.10 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.4 Do not paint over nameplates.

.5 Keep sprinkler heads free of paint.

.6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

3.7 FIELD QUALITY CONTROL

.1 Field inspection of painting operations to be carried out by independent inspection firm as designated by Departmental Representative.

.2 Advise Departmental Representative when each applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Co-operate with inspection firm and provide access to all areas of the work.

3.8 RESTORATION

.1 Clean and re-install all items that were removed before undertaking painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 American Iron and Steel Institute (AISI)

.2 American National Standards Institute (ANSI)

.1 ANSI Z83.11/CGA 1.8, Gas Food Service Equipment.

.3 American Society for Testing and Materials (ASTM International)

.1 ASTM A167-99, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A240/A240M-02, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels, and for General Applications.

.4 Canadian Standards Association (CSA International)

.1 CSA B149.1, Natural Gas and Propane Installation Code.

.2 CSA B149.2, Propane Storage and Handling Code.

.3 CSA C22.2No.109, Commercial Cooking Appliances.

.4 CAN/CSA-C22.2 No.120, Refrigeration Equipment.

.5 CAN/CSA-C22.2 No.150, Microwave Ovens.

.6 CAN/CSA-C22.2No.168, Commercial Dishwashing Machines.

.7 CAN/CSA C22.2No.195, Motor Operated Food Processing Appliances (Household and Commercial).

.8 CAN/CSA-C388, Energy Consumption Test Methods for Household Microwave Ovens.

.5 National Sanitation Foundation (NSF)

.6 National Fire Protection Association (NFPA)

.1 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, Current Edition

.7 Underwriter's Laboratories of Canada (ULC)

.8 Certified Ratings – Exhaust Hoods: catalogued or published ratings obtained from tests carried out by manufacturer or independent testing agency designated by manufacturer and signifying adherence to codes and standards

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Data to include:

.1 Description of equipment giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.4 CLOSEOUT SUBMITTALS

.1 Submit operating and maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal any and all packaging/crating material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers

.5 Divert unused metal/wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.6 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 GENERAL

.1 Stainless steel: to AISI, grade 18-8, of types and finishes specified herein.

.2 Equipment to be National Sanitation Foundation (NSF) listed

2.2 SCHEDULE

.1 Racking Item #3

.1 For racking of pallets with food product in Walk-in Freezer. Keep products off the floor to prevent contamination from dirt

.2 Smooth rust and corrosion proof fully welded multi-formed posts/end frame/bracing and floor bearing plates consistent with capacity of the unit

.3 19,051kg capacity

.4 Size: length to suit interior of walk-in; depth 1120mm; height 1500mm (1370mm clear from floor); single level

.5 Safety bars as needed for unit

.2 Warranty: Minimum two (2) year warranty on parts and labour

.3 Acceptable materials: Arpac Mastorak or Approved Equivalent

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment in accordance with manufacturer's instructions

.1 Utilize certified designer for design of system

.2 Adjust equipment to level position for proper operation

END OF SECTION

Part 1 `General

1.1 SECTION INCLUDES

.1 Materials, fabrication and installation for custom fabricated food service equipment.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

.1 -

1.3 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.4 REFERENCES

.1 American Iron and Steel Institute (AISI)

.2 American Society for Testing and Materials (ASTM International)

.1 ASTM A167-99, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A269-01, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A240/A240M-02, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.4 ASTM B456-95, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.5 ASTM A480/A480M-02, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.

.4 Canadian Standards Association (CSA International)

.5 National Sanitation Foundation (NSF)

.6 SMACNA Guidelines for Seismic Restraints of Kitchen Equipment in applicable jurisdiction

1.5 SUBMITTALS

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

1.6 SHOP DRAWINGS

.2 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.3 Indicate construction details of equipment including materials, components, metal thicknesses, reinforcements, welds and weld types, interior and exterior corner and joint details, anchorages, locations of exposed fasteners, assembly methods, finishes, mechanical and electrical characteristics.

.4 Indicate roughing-in service requirements for mechanically and electrically operated equipment.

1.7 CLOSEOUT SUBMITTALS

.1 Submit operating and maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal any and all packaging/crating material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Divert unused metal/wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.6 Unused sealant material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.

.7 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.8 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

.1 Stainless steel sheet: to ASTM A240/A240M, Type 304 with No.4 finish unless otherwise indicated.

- .1 Metal thickness unless otherwise specified or indicated:
- .2 2.0 mm: Exposed frames, uprights angles, reinforcements.
- .3 2.0 mm: Table tops, counter tops, drainboards, pot sinks and all sinks over 508 mm x 508 mm, backsplash.
- .4 1.6 mm: Shelves, utility sinks 508 mm x 508 mm or smaller, angle slides.
- .5 1.3 mm: Exposed bodies of cabinets, casing of exposed electrical outlets, ventilation ducts.
- .6 1.0 mm: Interior partitions of cabinets, lining of insulated cabinets, skirting, interior and exterior surfaces of doors and drawers.

.2 Stainless steel tubing: to ASTM A269, Type 304, commercial grade, seamless and welded with AISI No.4 finish.

.3 Hardware and fastenings: stainless steel.

.4 Nickel/chromium coating: to ASTM B456, Service Condition Number SC3 finish to match adjacent.

.5 Filler/trim strip: stainless steel, same material finish as surrounding components.

.6 Sealant: to CAN/CGSB-19.13, non-toxic aluminum coloured sealing compound, adhesive/sealant, meeting National Sanitation Foundation (NSF) requirements for direct contact with food and stay flexible during long term exposure to temperatures ranging from minus 73°C to plus 232°C.

2.2 COMPONENTS

.1 -

2.3 FABRICATION

.1 All exposed surfaces must be stainless steel unless otherwise indicated.

.2 Fabricate equipment from stainless steel, to sizes and configurations indicated.

.3 Fabricate work square, true, straight, to suit installation conditions and as indicated. Design to maximum sanitary conditions in accordance with NSF requirements.

.4 Fit and shop-assemble equipment ready for erection where possible.

.5 Debur, smooth and round off raw edges prior to forming.

.6 All straight lengths: to be one continuous piece if 3.0 m or less in length. If over 3.0 m, sections to be fully welded unless otherwise indicated.

.7 Welding: sound, non-porous, and free from imperfections.

.1 Weld metal to be colour matched to, and be as corrosion-resistant as parent metal.

.2 Spot welds, if any, to be minimum 3.0 mm diameter and have full penetration.

.3 Grind exposed welds smooth and polish to match parent metal.

.4 Grind other welds smooth.

.5 Welding and finishing is not to impair corrosion resistance of finished article.

.6 Welds, except spot welds, shall be continuous unless otherwise indicated.

.8 Legs and bracing: demountable, of stainless steel tubing, with 12 mm thick stainless steel mounting plates, welded construction with stainless steel sanitary, adjustable, flanged feet with tamper-proof mounting bolts. Mounting screws: welded to 2.5 mm thick stainless steel leg channels.

.1 Legs: 41 mm od tubing 1.6 mm thick stainless steel.

.2 Bracing: 30 mm od tubing 1.2 mm thick stainless steel as required for equipment use.

.9 Solid undershelf: 2 mm thick stainless steel, edges boxed, backs up 50 mm and hemmed at back, shelf supports welded to legs and bracing unless otherwise noted to be removable, 255 mm clear of floor at mid-way adjustment of feet. With adjustable shelves, use sanitary type supports.

.10 Slatted undershelf: constructed in removable equal-length sections not over 610 mm in length, consisting of 50 mm wide x 2 mm thick creased stainless steel slats, spaced equally not over 19 mm apart and fillet welded at right angles to 19 x 19 x 3 mm stainless

steel angles. Ends of slats rounded and curved down to fit over front and rear bracing without projecting beyond bracing, welded to bracing. Where used near wall, turn up backs 50 mm and hem, add back support.

2.4 SINK UNITS

.1 –

2.5 UTILITY AND WORKTABLES

.1 –.

2.6 DRAWERS

.1 –.

2.7 CABINETS AND COUNTERS

.1 –.

2.8 DISH TABLING

.1 –.

Part 3 Execution

3.1 INSTALLATION

.1 Coordinate connection of mechanical and electrical services.

- .1 Provide dimensioned rough-in drawings to the applicable trade
- .2 Coordinate with others for steel block locations as required for rough-in locations

.2 Install food service equipment plumb with cabinets and counters level to 1.5 mm in 3050 mm

.3 Prefit and assemble all work in the shop, to confirm alignment and fit.

.4 Level base cabinets and counters by adjusting levelling legs.

.5 Scribe and fit stainless steel filler strips to irregularities of adjacent surfaces, maximum gap opening 0.5 mm.

.6 Joints and intersecting members are to be accurately fitted, and made in true planes with adequate concealed fastening. Overall work is to be fabricated and erected square, straight, true and accurately fitted. Provide adequate anchorage and reinforcing as required for use

.7 Secure equipment to floor and wall as indicated.

.8 Securely fasten wall cabinets as indicated.

.9 Fastening: where stationary or fixed and matching items butt against one another, join with concealed non-removable/tamper-proof stainless steel fasteners.

.10 Seal joints in accordance with approved industry standard as directed by the Departmental Representative.

.1 Where joints cannot be sealed with single pass, use stainless steel filler strip in conjunction with sealant.

.2 Where items are against or through walls or partitions seal resultant joint.

.11 Field weld all joints over 3 m long.

.12 Provide service access areas on custom equipment requiring electrical or mechanical work

.13 Provide all inserts, anchors, sleeves, bolts and similar items required to be attached or built into the building components to provide proper anchorage of equipment to Correctional use standards. Provide all necessary templates, instructions, direction and coordination of such items. Provide necessary tamper-proof removal tool as used for screws or bolts

3.2 SHOP QUALITY CONTROL

.1 Departmental Representative will conduct shop inspections of equipment fabrication prior to delivery to site.

3.3 ADJUSTING

.1 After installation, fit and adjust operating hardware.

3.4 DEMONSTRATION

.1 Manufacturer to demonstrate equipment capabilities, operation, safety and minor user maintenance to approval of Departmental Representative.

3.5 SCHEDULE

.1 Refer to applicable Plan, Elevation and Detail drawings for additional information

.2 Item numbers correspond to the itemized equipment noted on the drawings.

.3 Compressor Stand Item: #4

.1 Quantity: One (1) required

.2 Size: width to suit site conditions (approximately 2845mm) x depth and height to accommodate new refrigeration system unit(s) (depth approximately 1200mm; (clear height under approximately 915mm);

.1 Verify size with site

.3 Description: Epoxy painted heavy duty steel tubular/channel construction with steel channel supports; verify support structure with site conditions; weather resistant (wet and high temperature dry); non-moving.

.1 Lot required stainless steel chase(s) to cover exposed refrigeration lines from building exterior to walk-in wall of use; ensure no gaps/openings which could allow water or dust penetration

.4 Miscellaneous Stainless Steel work

.1 Evaporator drain line cover

.1 Quantity: Lot required

.2 Size: to suit site conditions and line runs; coverage for full length of line run from evaporator to exit point at walk-in wall; width to cover drain line with heat trace/insulation wrap

.1 Verify quantity and size with site

.3 Description: Stainless steel chase/channel fixed to walk-in wall; 1220mm maximum length sections

.2 Evaporator drain line guard

.1 Quantity: Lot required

.2 Size: to suit site conditions

.1 Verify quantity and size with site

.3 Description: non-rusting steel channel to protect evaporator drain line from impact damage outside of walk-in box

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation, administrative and procedural requirements for prefabricated walk-in freezers and coolers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.3 Section 01 45 00 - Quality Control.

.4 Section 01 78 00 - Closeout Submittals.

1.3 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)

- .1 ANSI/ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .2 ANSI/ASME B16.29, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV.

.2 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)

- .1 ANSI/NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.

.3 American Society for Testing and Materials International, (ASTM)

- .1 ASTM A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .3 ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
  - .1 Finish for sheet: No. 4 Finish-General purpose polished finish, one or both sides.
- .4 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM B88M, Standard Specification for Seamless Copper Water Tube [Metric].
- .6 ASTM B280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .7 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .8 ASTM E162, Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

.4 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-19.13, Sealing Compound, One-Component, Elastomeric, Chemical Curing.

.5 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.137, Electric Luminaires for Use in Hazardous Locations.

.6 National Sanitation Foundation (NSF)

.7 Underwriters' Laboratories of Canada

.1 CAN/ULC-S704, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.2 CAN/ULC-S705.1, Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate:

.1 Construction details of equipment by drawings and manufacturers' literature.

.2 Roughing-in requirements for mechanical and electrical services.

.3 Installation details.

.3 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal any and all packaging/crating material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Unused caulking material must be disposed of at an official hazardous material collections site as approved by Departmental Representative.

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

.1 Stainless steel sheet: to ASTM A167 A240/A240M, type 304 with No. 4 finish.

.2 Galvanized steel sheet: commercial grade to ASTM A653/A653M, with zinc coating (galvanized) to ASTM A653/A653M.

.3 Mild steel sheet: cold rolled to Society of Automotive Engineers (SAE) 1010 to 1020 suitably prepared for specified finish.

.4 Aluminum sheet: utility sheet with "stucco" pattern finish on exterior panels and smooth finish on interior panels.

.5 Galvalume: steel sheet with aluminum zinc alloy coating with baked on polyester finish.

.6 Sealant: to colour to match panel. Minimize use of sealant as possible for sealed unit.

.7 Rubber gaskets to be used between panels

.8 Isolating coating: to manufacturer's recommendations.

.9 Panels

.1 Panels to be as required for outdoor installation

.2 Insulation for panels and screeds: to Class 3, poured type foamed-in-place polyurethane (urethane), 100 mm thick. Panels to consist of interior and exterior zinc coated precision die formed galvanized steel panels pans, foamed in place urethane insulation between interior and exterior pans, and thoroughly checked for gauge and accuracy. Panels to be of same size wherever possible and to be interchangeable with panels of like size. Metal pans to be treated on the inside with a preparation coating of bonding agent to ensure a stable adhesion with the chemical bonding capabilities of the insulation.

.3 Wall and ceiling panels are to be 100 mm thick and contain 100% foamed in place insulation and will not have any internal wood or metal structural members. To ensure tight fitting joints, all panel edges are to have foamed in place urethane tongues and grooves and a flexible vinyl gasket foamed in place on the interior and exterior of all edges

.4 Wall and ceiling panels are to be finished with a baked white polyester enamel finish on all interior and exterior exposed surfaces. Galvanized surfaces are permitted on exterior roof and unexposed walls

.5 All interior vertical corners shall be coved with a 13 mm radius, where specified under individual item

.6 Panel Fastening - Panel joints to be tongue and groove type to ensure proper alignment and to eliminate any vapour or frost transmission. All panel joints to be drawn tight with factory installed cam-action speed lock assemblies Locking device to be accessible from the inside to facilitate installation in confined areas and to be provided with press-fit caps to cover wrench holes. Joints between panels to be sealed at interior and exterior edges with a PVC gasket or an odor-less nontoxic, synthetic polymerized sealant corrections grade, to maintain continuity and to be uniform and smooth

2.2 FABRICATION

.1 Overall dimensions: as indicated.

.2 Panels to be as required for outdoor installation

.3 Panel sections: precision die formed metal pans accurately spaced and insulated. Panel edges and corners to have tongue and grooves, formed-in-place, to assure airtight, vapour proof joints using gaskets or sealants.

.4 Door panels: insulated and finished as per exterior and interior panels with 1372 x 1980 mm clear door opening, reinforced to prevent door panels from twisting, racking or warping. Ensure that doors will close and seal opening. Equip each door panel with:

.1 One, in fitting flush mounted type, door (swing as indicated) to fit door opening, insulated and finished same as panels, having 1220 high x 1.6 mm thick stainless steel push/kick-plates on both exterior and interior and having soft thermoplastic gasket with magnetic steel core at top and both sides, adjustable

rubber wiper gasket at bottom. Gaskets to be oil, fat, water and sunlight resistant and be replaceable.

.2 Hinges, spring loaded, self-closing type, with stainless steel pin and nylon cam-type bearing, of brushed chrome.

.3 One latch, to match hinges, for opening door by breaking force of trigger-action door closer and magnetic gasket. Latch to have cylinder type lock, be capable of being locked with padlock, have inside safety release handle capable of opening door from within regardless of whether door is padlocked or not. Illuminated panic switches

.4 One foot treadle to match hinges and latch, for opening door without use of hands

.5 One trigger-action positive door closer, located on interior, to assist in positive closing of door.

.6 Sills with built-in thermostatically controlled heater cables inside perimeter of door and beneath sill plate and jambs of door opening. Heaters to have fused protection within panels

.1 Sills to be removable for replacement of heater cable

.2 Integral Ramp where required to be to be prefabricated 1.6 mm stainless steel ramps with 2.0 mm galvanized reinforcing and urethane foamed in place insulation.

.1 Wearing surface to have 100 mm wide rectangular non-skid strips, width of the ramp – non-removable. Sill to be built into ramp/pre-fabricated floors

.7 Threshold plates: 2.0 mm stainless steel and removable.

.8 One 50 mm diameter flush-face dial-type thermometer to provide temperature readings from -51°C to 27°C and mounted on hinge side of panel approximately 1525 mm from floor. Cover sensing bulb with protective stainless steel moulding.

.9 One incandescent vapour-tight luminaire, with guard, mounted not less than 1980 mm from floor on interior of panel, operated from toggle switch with pilot light, mounted 1372 mm from floor on exterior of panel, adjacent to latch. All factory pre-wired and terminating in vapour-tight junction box that light is mounted on.

.10 Each door to have a kickplate of 1.98 mm stainless steel 915 mm high and full width of door. Mount on the interior and exterior face of each door

.11 355 x 355mm 3-pane heated Viewport with heated glass and frame heater

.12 -

.5 Ceiling panels: reinforced internally or externally as required, to support evaporator. Where external reinforcement is needed and through fasteners are used, fasteners to be of low heat conducting material such as teflon. Insert fasteners in teflon sleeves to prevent compressing of insulation.

.6 Screeds: same construction materials and finish as wall panels or channel shaped PVC to accommodate wall panels in fully secured position. Length and configuration to match wall and corner panels. Reinforce screeds internally at 584 mm centres to accommodate fastening to building and/or wearing floor. Reinforcing and floor fastenings to form an integral part of panel locking devices system.

.7 Interior floor panels: reinforced for pallet truck use.

.8 Panel thickness[es] and finish[es] for exterior and interior panels [exposed to normal view] except floor panels: [0.5 mm minimum stainless steel] [0.8 mm core galvanized steel, factory painted, colour [white]] [1.0 mm plain or stucco patterned aluminum].

.9 Locking devices: panel sections to have cam- action locking devices, spaced at maximum 950 mm vertically, 600 mm horizontally. Male and female lock pockets.

.10 Lighting: to CSA 22.2 No.137 Class III Hazardous Locations

.1 Each entrance door section is to be provided with an vapour proof lamp on the interior. An operating toggle switch and pilot light to be mounted on the exterior. An inlet box to be provided for 115V, 60 cycle, single phase AC service. All lights, switching and heater cables pre-wired at factory to single junction box

.2 Individual room lighting to be supplied as indicated. Specifications to provide a light level of 25FC 915 mm above finished floor. Normal temperature coolers 35°F (+2°C) low temperature fluorescent. Storage freezers -10°F (-23°C) low temperature fluorescent, remote ballast. Low temperature freezers -20°F (-30°C) mercury vapour type (HID) or LED

.3 All light fixtures, interconnecting conduit and wiring, roof and wall penetrations and wiring to junction boxes is to be provided by the equipment supplier for final connection by the Electrical Contractor

.11 Digital Thermometer and Alarm – at each door, for each refrigerated storage room (Walk-in)

.1 Digital thermometer and alarm to be furnished for each cold storage room. The capillary to be extended away from the door and protected for its full length with stainless steel moulding securely fastened to the room wall

.2 Digital thermometers to be supplied with an integrated alarm system providing both visual and audio alarm signal

.3 When the door does not open into an ambient area, the digital thermometer and alarm are to be factory installed, as specified above, in a remote wall panel with an ambient face that will not interfere with other equipment and functions and is identified with a nameplate of the room being monitored. The sensor capillary to be extruded as required and, when necessary, run in electrical conduit. Provide escutcheon plates on each side of each partition penetrated

.4 Power source failure alarm with adjustable set point for temperature.

.5 Jack for remote alarm telephone dialer and enunciator panel.

.6 Digital thermometer with minus 15°C to plus 30°C range.

.7 Built-in battery and charger

.8 All weather housing cover, non-removable, for exterior units

.12 Removable closure panels: extend from lower edge of erected prefabricated ceiling panels to finished building ceiling. Extend cover strips or angles from building floor to ceiling closure panels between exposed ends of walk-in boxes and building wall. Closure panels, cover strips or angles to match exposed exterior wall panels.

.13 Rub rails : 70 x 200 x 1.6 mm stainless steel on exposed exterior panels, mounted 300 mm from center of rail to finished building floor. Where rub rail is at external corner, mitre joint and weld. Box open ends. Top and vertical ends where rail makes contact with wall panels are to be sealed. Two rub rails are required on interior of garbage refrigerator mounted 600 and 300 mm from respective centers to refrigerator floor. Rub rails are not required at doors, door panels or within 200 mm of internal angles of walls.

.14 Two-way pressure relief port: in freezer wall panel away from direct air stream flowing from coil. Embed anti-sweat heater cables in frame of port so intake and exhaust ports will not freeze. Terminate wiring in junction box on interior panel over top of port.

.15 Walk-in alarm system – self-contained with visual and audible alarm - Modularm 75LC with Communicator or equivalent. Include following:

.1 Custom Remote Annunciator Panel with components as required for alarm units for each walk-in; located as noted; with integral dry contacts for connection/monitoring in remote location.

.1 Stainless Steel panel sized to accommodate components; refer to site for space allocation;

.2 Provide fully wired panel with additional dry contact for tie in to out of work area (remote) monitoring

.3 Individual audio and visual alarm indicator for each monitored point to easily identify issue location

.4 Rechargeable battery backup with recharging circuitry for power failure operation

.2 Temperature alarm system – interconnection with all refrigeration system components for Walk-ins;

.1 Power source failure alarm with adjustable set point for temperature.

.2 Jack for remote alarm telephone dialer and enunciator panel.

.3 Digital thermometer with minus 15°C to plus 30°C range.

.4 Built-in battery and charger

.5 All weather housing cover, non-removable, for exterior units

.6 Interconnected to panel in Staff Office

.3 Door Ajar notification/monitor at each walk-in door

.1 Door contact (magnetic) at each walk-in door (sliding and swing)

.2 Interconnected to panel in Staff Office

.4 Panic Button notification at each walk-in door

.1 At each door at each walk-in provide an Illuminated Panic Button

.2 Interconnected to panel in Staff Office

2.3 REFRIGERATION EQUIPMENT (FOR REMOTE INSTALLATION)

.1 All remote refrigeration systems to be furnished and installed by one contractor, unless otherwise specified. Refrigeration work to be in strict accordance with the Provincial regulations regarding refrigeration plants and the current Mechanical Refrigeration Code

.2 Refrigeration equipment: with refrigerant HFC/HCFC, fully automatic in operation, and to conform to following minimum requirements work includes furnishing all labour, materials, tools, equipment and services necessary to provide a complete equipment refrigeration package. The contract documents are intended to include everything required for completion of all work. It includes, but is not limited to the following:

.1 All mechanical refrigeration items for remote refrigeration systems, except for items included with standard manufactured or fabricated equipment; all weather

.2 All compressor units, condensers, refrigerant, refrigerant piping, control valves and accessories and line insulation. Compressor units are to be air cooled, unless otherwise specified. Units up to 1.5 hp are to be hermetic (sealed). Units 1.5 hp and over are to be semi hermetic. Refrigerants in compliance with CFC regulations and the Montreal Protocol. Refrigerants R404A or their programmed

replacements at installation date are to be used. Design unit for 16 h to 18 h operation at specified evaporating temperature, in 32.2°C ambient temperature.

.3 All cold storage room and remote equipment evaporators with thermostatic expansion valves, evaporator drain lines or condensate evaporators where specified

.4 Motor Starters

.5 Thermostats

.6 Defrosting equipment for remote refrigeration systems

.7 Steel angle racks for motor compressor or condensing units. All compressors to be adequately mounted to eliminate vibration noises. Rack to be suitably braced to ensure stability. Rack to be painted with grey enamel. Rack sized to accommodate all compressors as specified

.8 Pre determined or positioned cold storage room evaporator hangers and line penetration locations

.9 Building wall and/or floor sleeves. Cut and patch building work as required for installation:

.10 Evaporator: forced-convection, unit-cooler type, suspended from ceiling panels, with forced-air discharged parallel to ceiling. Assemble air circulating motor, multifin and tube type coil [and grille] within protective housing also, contain expansion valve, with strainer, heat exchanger and inlet and outlet connections within same housing complete with safety screen. Air circulation motors: lifetime sealed. Entire unit-cooler assembly readily accessible for cleaning. Provide drip pan and drain connection. Equip unit coolers with mounting brackets for installation and controls for safe and satisfactory operation. When Walk-In is used for freezer applications, provide an automatic system for defrosting unit cooler, including heaters and time control. Provide disconnect switch within 600 mm of evaporator motor.

.11 Stainless steel cover as shown to cover exposed refrigeration lines

.12 Stainless steel cover as exterior unit sized to cover exposed drain lines from evaporator to drain

.3 Refrigerant tubing:

.1 Conform to ASTM B88M and ASTM B280 requirements.

.2 Relief valve discharge pipe on outdoor installations shall be copper tube type "L" with brazed joints, with welded .

.3 Fittings:

.1 Conform to ANSI/ASME B16.26 and ANSI/ASME B16.29.

.2 Long radius type for elbows and return bends.

.4 Warranty extended 5 year on parts and labour

2.4 HEATER CABLES

.1 Provide necessary heater cables and insulating wrap as required for evaporator drain lines.

.1 Fully coil wrap evaporator drain line from evaporator to 25mm outside walk-in for interior located walk-ins

.2 Fully coil wrap evaporator drain line from evaporator to end of piping (outlet) for exterior located walk-ins

2.5 SOURCE QUALITY CONTROL

.1 Ensure equipment is manufactured and installed by company having personnel skilled in manufacturing and installing of prefab walk-in freezers and coolers and having continuous proven experience within last five years.

.2 Departmental Representative will conduct shop inspection of equipment fabrication prior to delivery to site.

2.6 SCHEDULE

.1 Walk-in Freezer Assembly Item #1

.1 Walk-in Freezer

.1 Size: approximately 6000 x 4800 x 3835mm (3660mm AFF)

.2 One (1) swing door: approximately 1372 x 1981mm

.3 Lighting as required for use light levels; LED

.4 Without integral floor; walls to match screen/insulation in depression supplied/installed by others

.1 Do NOT install walls unless there is tight/flush contact (no gaps; no overflow of concrete) between wall base/screed and depression screed/insulation – inform Departmental Representative of any discrepancy

.5 Remote temperature display/alarm panel; located in adjacent building as shown

.2 Refrigeration System #2 & 3

.1 One (2) evaporator, 208v 1 phase

.2 One (1) condensing/compressor unit – air cooled, remote outdoor unit, 208v 3 phase; extreme temperatures location

.3 One (2) evaporator efficiency unit (KE2 Evaporator Efficiency), 208v 1 phase (one unit acceptable if unit can control two evaporators)

.4 Heater cable, 120v 1 phase and insulation wrap; as required to fully wrap full length of drain line

.2 Replacement Refrigeration System - Freezer Item #6

.1 Refrigeration System #6A & 6B

.1 One (1) evaporator, 208v 1 phase

.2 One (1) condensing/compressor unit – air cooled, remote outdoor unit, 208v 3 phase; extreme temperatures location

.3 One (1) evaporator efficiency unit (KE2 Evaporator Efficiency), 208v 1 phase

.4 One (1) heater cable, 120v 1 phase and insulation wrap; to fully wrap full length of drain line

.3 Replacement Refrigeration System - Cooler Item #7

.1 Refrigeration System #7A & 7B

.1 One (1) evaporator, 120v 1 phase

.2 One (1) condensing/compressor unit – air cooled, remote outdoor unit, 208v 3 phase; extreme temperatures location

.3 One (1) evaporator efficiency unit (KE2 Evaporator Efficiency), 120v 1 phase

Part 3 Execution

3.1 INSTALLATION

.1 Provide appropriate protection apparatus.

.2 Erect work true-to-line, plumb, square and level with joints aligned. Fit joints and intersecting members accurately and in true planes adequately fastened.

.3 Clear drain holes in floor, in freezer area, and ensure that underslab vapour barrier is punctured to allow drainage to drains and vent pipes.

.4 Insulate to prevent electrolysis between metal and concrete by applying coating of asphaltic paint to metal surface, applied in accordance with manufacturer's instructions. Insulation to be dry before assembling floor panels in place.

.5 Unless otherwise indicated, install units within 25 mm of building walls, with minimum 25 mm clearance between top of unit and room ceiling. Fasten screeds to building and/or wearing floor in accordance with manufacturer's instructions.

.6 Caulk around perimeter of floor panels/screeds after installation on building floor.

.7 Fill space between perimeter of floor panels and edge of floor depression with concrete or non-shrink grout and trowel flush with building floor.

.8 Cut or drill holes in panels, as required, to accommodate electrical and mechanical services, runs or connections. Insert teflon sleeves into holes and seal. After installation of services, fill remaining space with insulation.

.9 Cap wrench access holes with an in-fitting, flush, stainless steel removable plug.

.10 Install removable closure panels, cover strips, and angles.

.11 Supervise installation of thresholds, heaters and urethane insulation for floors.

3.2 CLEANING AND ADJUSTING

.1 Upon completion of Work:

- .1 Clean equipment and apparatus in accordance with Section 01 45 00 - Quality Control.
- .2 Remove protective coverings and test and adjust operating equipment.
- .3 Re-finish damaged coatings and finishes.

3.3 EXISTING EQUIPMENT

.1 Timing

- .1 Coordinate work with site to ensure storage of food product; allow for staggered pump-down and removal of equipment
- .2 Coordinate with applicable trades for disconnection of existing services

.2 Shut-down systems; pump-down, remove and dispose of used refrigerant in approved industry method

.3 Remove and dispose of all existing components which are not being reused, including but not limited to: evaporators and compressor/condensing units, refrigerant piping, evaporator piping, electrical wiring

.4 Remove and dispose existing compressor stand

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 01 50 General Instructions

.2 Section 01 14 10 Security Requirements

.3 Section 01 35 33 Health & Safety Requirements

.4 Section 01 91 00 Commissioning

1.2 References

.1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)

.1 ANSI/NFPA 13-2007, Installation of Sprinkler Systems.

.2 ANSI/NFPA 25-2007, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

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

.1 Material Safety Data Sheets (MSDS).

.3 Underwriter's Laboratories of Canada (ULC).

.4 Fire Commissioner of Canada FC 403, "Sprinkler System".

1.3 Samples

.1 Submit samples of following:

.1 Each type of sprinkler head.

1.4 Design Requirements

.1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area.

.2 Include with each system materials, accessories, and equipment inside building to provide each system complete and ready for use.

.3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.

.4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

.5 Devices and equipment for fire protection service: ULC approved for use in sprinkler systems.

.6 Design systems for earthquake protection for buildings in seismic zone applicable.

.7 Location of Sprinkler Heads:

.1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.

.2 Uniformly space sprinklers on branch.

.8 Water Distribution:

.1 Make distribution uniform throughout the area in which sprinkler heads will open.

.9 Water Supply:

.1 Base hydraulic calculations on static and residual pressures indicated on drawings.

.10 The "Authority Having Jurisdiction" will be designated by the Department Representative.

.11 Sprinkler drawings and specifications are to give the bidder concept of the work involved. The design intent shall not be changed. Significant design features such as the location of exposed pipes and the method of zoning the sprinkler system may not be changed without prior discussion and approval by the Department Representative. Field changes may be required to accommodate lighting and hidden obstructions. Possible additional sprinkler heads may be required if blind spaces and ceiling drips have not been noted and/or dry type heads may have to be implemented if the area is not frost free.

1.5 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.2 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of B.C.

.3 Indicate:

.1 Materials.

.2 Finishes.

.3 Method of anchorage

.4 Number of anchors.

.5 Supports.

.6 Reinforcement.

.7 Assembly details.

.8 Accessories.

.3 Quality assurance submittals:

.1 Test reports:

.1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

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

.3 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 01 50 – General Instructions in accordance with ANSI/NFPA 20.

.2 Manufacturer's Catalog Data, including specific model, type, and size for:

.1 Pipe and fittings.

.2 Sprinkler heads.

.3 Pipe hangers and supports.

.4 Mechanical couplings.

.3 Drawings:

.1 Sprinkler heads and piping system layout.

.1 Prepare detail working drawings of system layout in accordance with NFPA 13 using full size contract drawings.
.2 Show data essential for proper installation of each system.
.3 Show details, plan view, elevations, and sections of systems supply and piping.
.4 Show piping schematic of systems supply, devices, valves, pipe, and fittings.

.4 Design Data:

.1 Calculations of sprinkler system design.

.2 Indicate type and design density of each system.

.5 Field Test Reports:

.1 Preliminary tests on piping system.

.6 Records:

.1 As-Built drawings of each system.

.1 After completion, but before final acceptance, submit complete set of as-built drawings (prints) of each system for record purposes.
.2 Submit drawings in digital file versions with title block similar to full size contract drawings.

.7 Operation and Maintenance Manuals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

.2 Provide detailed hydraulic calculations including summary sheet, and Contractors Material and Test Certificate for aboveground piping and other documentation for incorporation into manual specified in Section 01 01 50 – General Instructions in accordance with ANSI/NFPA 13.

1.6 Quality Assurance

.1 Qualifications:

.1 Installer: company or person specializing in wet sprinkler systems with documented experience approved by manufacturer.

.2 All work shall be carried out by Sprinkler Pipe Fitters who carry a "Certificate of Qualification" for this trade as issued by the Ministry of Labour.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.3 Inspections and Tests:

.1 All inspections, examinations and tests required by the "Authorities and Agencies" specified shall be arranged and paid for by the fire protection contractor, as necessary to obtain complete and final acceptance of the fire protection system.

.2 Provide Contractor's Material and Test Certificates and all required test papers as may be requested by all parties having jurisdiction and duly witnessed by Engineer, showing proof of:

- Hydrostatic test of overhead piping @ 1400 kPa (200 PSI).
- Verification of all alarm and trouble devices installed under this contract.

.3 If welding is required the Contractor shall submit a copy of the welder's certification to the Engineer for record purposes prior to starting work.

1.7 Maintenance

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 01 50 – General Instructions.

.2 Provide spare sprinklers and tools as required by ANSI/NFPA 13.

1.8 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Protection:

.1 Store materials indoors in dry location.

.2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 Pipe, Fittings & Valves

.1 Pipe:

.1 Piping shall meet or exceed one of the following standards:

.1 Black and Hot-Dipped Galvanized Welded and Seamless Steel Pipe – ASTM A795

.2 Welded and Seamless Steel Pipe – ANSI/ASTM A53

.3 Wrought Steel Pipe – ANSI B36.19M

.4 Elec.-Resistance Welded Steel Pipe – ASTM A135

.2 All thickness for pressures up to 2070 kPa (300 psi) shall be as follows:

.1 Joined by shop welding or roll grooving:

.1 Up to and incl. 125mm (5") – Schedule 10

.2 150mm (6") – 3.40mm (0.134)

.3 200mm, 250mm (8", 10") – 4.78mm (0.188")

.2 Joined by threaded fittings or cut grooves:

.1 up to 200mm (8") – Schedule 40

.2 200mm (8") and larger – Schedule 30

.2 Fittings and joints to ANSI/NFPA 13:

.1 Ferrous: screwed, welded, flanged or roll grooved.

.2 Copper tube: screwed, soldered, brazed.

.3 System piping 50mm (2") and smaller shall be Schedule 40 and joined with threaded fittings in accordance with NFPA 13. Larger sizes shall be Schedule 10 and joined by welding or groove joining methods in accordance with NFPA 13.

.4 All grooved products shall be of one manufacturer. All grooved end fittings shall be of "full flow" design and manufactured from ductile iron conforming to ASTM A-536. Grooved coupling shall be designed with angle bolt pads to provide a rigid joint except where flexibility is required. "Flush cap" or "flush seal" gaskets shall be used with couplings in dry pipe systems.

.5 Cast iron floor and ceiling plates with set screws shall be provided whenever pipe passes through walls, floors and partitions. In finished areas, plates shall be chrome plated.

.3 Valves:

.1 ULC listed for fire protection service.

.2 Up to NPS 2: bronze, screwed ends, O. S. & Y. gate.

.3 NPS 2 1/2 and over: cast iron, flanged or roll grooved ends, indicating butterfly valve; OS & Y gate.

.4 Swing check valves.

.5 Ball drip.

.6 All water supply and zone isolation valves shall be monitored with tamper switches. Electric wiring for control and alarm components will be provided Under Division 26.

.7 Valves controlling water supply and alarm shut-off shall be of O. S. & Y. type with rising stem or approved gear operated butterfly valves with supervisory switch. Where a grooved piping system is installed, grooved end isolation/control valves may be used. Valves shall be supervised by a factory installed double throw/double pole switch.

.8 All O. S. & Y. gate vales shall be monitored with tamper switches. Electric wiring for control and alarm components shall be provided under Division 26.

.4 Pipe hangers:

.1 ULC listed for fire protection services.

.2 Hanger standards shall conform to Section 3-10 of NFPA 13. Use "C" clamps complete with lock nuts and restraining straps. Hangers shall be supplied and installed in accordance with NFPA 13. C-type clamps used to attach hangers to the building structure shall be equipped with lock nuts and retaining straps.

.3 Sway bracing shall be installed as per Section 3-5.3.5 of NFPA 13.

2.2 Sprinkler Heads

.1 General: to ANSI/NFPA 13 and ULC listed for fire services.

.2 All sprinklers in suspended ceiling areas shall be chrome finish recessed type with chrome flush type escutcheon plates. All sprinklers in open ceiling areas shall be of brass finish upright or pendent types. All sidewall sprinklers shall be chrome finish horizontal type.

.3 Sprinkler shall be protected from mechanical injury by standard guards where necessary. The proximity of sprinklers to heating units shall be taken into consideration in determining the temperature rating.

.4 Adjacent to each sprinkler valve station, provide one (1) 12-sprinkler capacity Underwriters approved cabinet complete with various type and temperatures of sprinklers in ratio to the numbers installed of each type along with a standard sprinkler wrench.

2.3 Supervisory Switches

.1 Not Used.

2.4 Pressure Gauges

.1 Provide pressure gauges at the following locations:
- dry pipe valve
- compressor
- top of all standpipe risers

.2 Pressure gauges shall be ULC listed stem mount or wall mount type with Bourdon phosphor bronze tube, brass socket, 6 mm [1/4"] lower connection, aluminum case in black enamel finish, chrome removable slip ring, stainless steel rotary type movement, minimum 90mm [3 1/2"] dial of 1% of full scale range and pressure range to suit application, with lever handle cock and brass 6 mm [1/4"] NPT snubber to suit service.

2.5 Flow Switches

.1 Not Used.

2.6 Pipe Sleeves

.1 Provide pipe sleeves where piping passes through walls, floors, and roofs.

.2 Secure sleeves in position and location during construction.

.3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs.

.4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.

.1 Firmly pack space with mineral wool insulation.

.2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.

.3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.

.5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide hot-dip galvanized steel, ductile-iron, cast-iron sleeves.

.2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.

.6 Sleeves in Other than Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide 0.61 mm thick galvanized steel sheet.

2.7 Escutcheon Plates

.1 Provide split hinged type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.

.2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.

.3 Provide paint finish on metal plates in unfinished spaces.

2.8 Spare Parts Cabinet

.1 For storage of maintenance materials, spare sprinkler heads and special tools.

.2 Construct to sprinkler head manufacturer's standard.

2.9 Inspector's Test Connection

.1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 3m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.

.2 Provide test connection piping to location where discharged without property damage.

.3 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.10 Signs

.1 Attach properly lettered and approved metal signs to each valve and alarm device to ANSI/NFPA 13.

.2 Permanently fix hydraulic design data nameplates to riser of each system.

PART 3 EXECUTION

3.1 Manufacturer's Instruction

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

3.2 Above Ground Piping Systems

.1 Provide fittings for changes in direction of piping and for connections.

.1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

.2 Perform welding in shop; field welding will not be permitted.

.3 Conceal piping in areas with suspended ceiling.

3.3 Pipe Installation

.1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.

.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

.4 Inspect piping before placing into position.

.5 Install spare parts cabinet as indicated.

.6 Valve identification:

.1 Identify drain valve and auxiliary valves.

3.4 Disinfection

.1 Disinfect new piping.

.2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.

.3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.

.4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

3.5 Field Painting

.1 Clean, pre-treat, prime, and paint new systems including piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.

.2 Apply coatings to clean, dry surfaces, using clean brushes.

.3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.

.4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 ml.

.5 Shield sprinkler heads with protective covering while painting is in progress.

.6 Upon completion of painting, remove protective covering from sprinkler heads.

.7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.

.8 Provide primed surfaces with following:

.1 Piping in Finished Areas:

.1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.

.2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.

.3 Provide piping with 50 mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6 m intervals throughout piping systems.

.2 Piping in Unfinished Areas:

.1 Finish painting not required in spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a pre-finished material.

.2 Provide piping with 50 mm wide red enamel bands self-adhering red plastic bands spaced at maximum of 6 m intervals.

3.6 Field Quality Control

.1 Site Test, Inspection:

.1 Perform test to determine compliance with specified requirements in presence of Engineer.

.2 Test, inspect, and approve piping before covering or concealing.

.3 Preliminary Tests:

.1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.

.2 Flush piping with potable water in accordance with NFPA 13.

.3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

.4 Test alarms and other devices.

.5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.

.4 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.

.2 Submit written request for formal inspection at least 15 days prior to inspection date.

.3 Repeat required tests as directed.

.4 Correct defects and make additional tests until systems comply with contract requirements.

.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.

.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

.7 Altered and relocated sprinkler system to be inspected and tested in conformance with NFPA 25.

3.7 Field Review

.1 Provide the services of the Professional Engineer who designed the fire protection systems for "Field Review" of the installation including completion of the Letters of Assurance of Professional Review and Compliance in accordance with the Building Code. Typewritten inspection reports shall be submitted to the project consultant during the construction period.

.2 Assurance commitment letters shall be provided at the commencement of the project for Building Permit applications, and at its completion.

.3 All work shall be carried out by Sprinkler Pipe Fitters who carry a "Certificate of Qualification" for this trade as issued by the B.C. Province Ministry of Labour.

3.8 Placing In Service

.1 When the entire fire protection system has been completed to the satisfaction of the Owners and/or their agents and when operating and maintenance instructions have been provided, the Fire Protection Contractor shall, in the presence of the Engineer, demonstrate the complete operation and maintenance required to the Owner's personnel. A complete operational test conducted on the entire installation for the purpose of verification of compliance with all applicable standards and codes shall be carried out.

.2 Three copies of a complete operating manual shall be provided, which must include the following:

- Detailed instructions for the normal maintenance of all installed equipment including operational procedures, frequency of operational checks, service instructions and trouble-shooting instructions.
- Valve schedule for all valves including location, service type and normal position for all systems.
- Schematic showing the location of each inspectors test valves, low point drains and flow switches where applicable.
- Warranties and certificates.
- Manufacturer's operating and maintenance manuals.
- Description of the operation of each system and the function of each piece of equipment.

- Lubrication schedule for all lubricated equipment including recommended lubricants.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 01 50 General Instructions

.2 Section 01 14 10 Security Requirements

.3 Section 01 35 33 Health & Safety Requirements

.4 Section 01 91 00 Commissioning

1.2 References

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM B 32-03, Specification for Solder Metal.

.2 ASTM B 306-02, Specification for Copper Drainage Tube (DWV).

.3 ASTM C 564-03a, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).

.1 CAN/CSA-B70-02, Cast Iron Soil Pipe, Fittings and Means of Joining.

.2 CAN/CSA-B125-01, Plumbing Fittings.

1.3 Submittals

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Provide maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

1.4 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.5 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.6 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 Copper Tube and Fittings

.1 Above ground sanitary storm and vent, Copper Type DWV to: ASTM B 306.

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.

.2 Wrought copper: to CAN/CSA-B125.

.2 Solder: tin-lead, 50:50, type 50A or lead free, tin-copper alloy 95:5, type TA to ASTM B 32.

2.2 Cast Iron Piping and Fittings

.1 Buried sanitary, storm and vent, cast iron (minimum NPS 2) to: CAN/CSA-B70.

.1 Joints.

.1 Mechanical joints.

.1 Neoprene or butyl rubber compression gaskets: to ASTM C 564 or CAN/CSA-B70.

.2 Stainless steel clamps.

.2 Above ground sanitary storm and vent: Cast iron to CAN/CSA-B70.

.1 Joints.

.1 Mechanical joints.

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

2.3 ABS Piping

.1 Drainage piping under the building, provided that such piping does not pass through any fire separations, may be as follows, at the contractor's option:

.1 Underground sanitary drainage piping under building, 150mm in diameter and smaller shall be certified to the current version of CSA B181.1, ABS Drain, Waste and Vent Pipe and Fittings. Piping shall be solid wall in construction. Cell core piping is not acceptable.

PART 3 EXECUTION

3.1 Installation

.1 In accordance with Section 23 05 05 - Installation of Pipework.

.2 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

.3 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 150 mm of clean washed sand.

.4 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

3.2 Testing

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 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 that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 The supply and installation of Plumbing Specialties and Accessories.

.2 Products Installed but not Supplied Under this Section:

.1 Install rough-in for equipment supplied by others, complete with waste.

.2 Equipment installed by others.

.1 Connect with unions.

.3 Equipment not installed.

.1 Capped for future connection by others.

1.2 Related Section

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results for Mechanical
.4	Section 23 05 05	Installation of Pipework
.5	Section 23 05 29	Hangers & Supports for Piping & Equipment

1.3 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A126-04(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.

.3 ASTM B193-02(2008), Standard Test Method for Resistivity of Electrical Conductor Materials.

.2 American Water Works Association (AWWA)

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-B64 Series-01 (2007), Backflow Preventers and Vacuum Breakers.

.2 CAN/CSA-C22.2 No. 130-03 (R2013), Requirements for Electrical Resistance Heating Cables and Heating Device Sets.

.3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Plumbing and Drainage Institute (PDI)

.1 PDI-WH201-2010, Water Hammer Arresters Standard.

.5 National Sanitation Foundation (NSF) / American National Standards Institute (ANSI).

.1 NSF/ANSI 61, Drinking Water System Components.

1.4 Submittals

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Indicate, for all plumbing specialties and accessories:

.1 Dimensions, construction details, roughing-in dimensions.

1.5 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 01 50 – General Instructions.

.2 Include:

.1 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.6 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.7 Delivery Storage and Disposal

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 01 50 – General Instructions.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.3 Fold up metal banding, flatten and place in designated area for recycling.

1.8 Quality Assurance

.1 All potable water system components shall conform to NSF/ANSI Standard 61.

PART 2 PRODUCTS

2.1 Cleanouts

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Access covers:

.1 Wall access: face or wall type, polished nickel bronze or stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.2 Floor access: round cast iron body and frame with adjustable secured nickel bronze top cast box with anchor lugs and:

.1 Plugs: bolted bronze with neoprene gasket.
.2 Cover for unfinished concrete floors: cast iron round gasket, vandal-proof screws.

.3 Cover for terrazzo finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws

.4 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.5 Cover for carpeted floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.2 Back Flow Preventer

.1 Not Used.

2.3 Piping Freeze Protection Systems

.1 Complete CSA approved system of heaters and components, listed specifically for maintaining freeze protection for insulated piping at ambient to -40°C.

.2 The self-regulating heater shall consist of two (2) 16 AWG tinned-copper bus wires embedded in parallel in self-regulating polymer core specially designed for this application that varies its heat output all along its length, allowing the heater to maintain the water in the selected temperature range. The resistance shall be less than the heating cable bus wire resistance as determined in a type test per ASTM B193. The heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket.

.3 The heater shall operate on a single phase line voltage as noted.

.4 Provide power connection, end seal, splice, tee components and required accessories for field installation.

.5 In order to conserve energy and to prevent overheating, the heating cable shall have a self-regulating factor of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heating cable output going from 40°F pipe temperature operation to 150°F pipe temperature operation.

.6 The heating cable for metal-pipe freeze protection shall be sided according to the table below. The require heating cable output rating is in watts per foot at 50°F. Heating cable selection based on 1 inch fiberglass insulation on metal piping.

Minimum Ambient Temperature		
Pipe Size (inches)	**0°F (-18°C)**	**-20°F (-29°C)**
3 or less	5 Watts	5 Watts

.7 The heating cable shall be XL-Trace cable.

.8 Power connection, end seal, splice and tee kit components shall be applied in the field.

.9 Heating cable circuit shall be protected by a ground-fault device for equipment protection. This requirement is in accordance with Section 427-22 of the NEC-1996.

.10 Provide a complete CSA approved system of heaters and components listed specifically for maintaining freeze protection for insulated piping at ambient to -40°C.

.11 All heating-cable components shall be UL Listed, CSA Certified or FM Approved for use as part of the system to provide pipe freeze protection. Component enclosures shall berated NEMA 4X to prevent water ingress and corrosion. Installation shall not require the installing contractor to cut into the heat-cable core to expose the bus wires. Connection systems that require the installing contractor to strip the bus wires or that us crimps or terminal blocks shall not be acceptable. All components that make an electrical connection shall be re-enterable for servicing. No component shall use silicone to seal the electrical connections. An exception will be made in areas where a conduit transition is required.

.12 System Control:

a. Thermostatic Control-Line Sensing: The system shall be controlled by a line sensing thermostat set at 40°F directly through contactor.

b. Provide Controller.

.13 Execution:

a. System must be installed per manufacturer's recommendations.

b. Apply the heating cable linearly on the pipe after piping has been successfully pressure-tested. Secure the heating cable to piping with cable ties or fiberglass tape.

c. Apply "Electric Traced" labels to the outside of the thermal insulation.

.14. Project Requirements:

Freeze Protection

- Ensure that the heating cable is installed away from any sharp or cut edges.

- Heating cable is to be supplied from a 120V equipment protection ground fault circuit (15A 1-Pole, supplied by Electrician).
- System controller to be installed at locations shown on drawings.
- Co-ordinate all testing with the manufacturer.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with National Plumbing Code and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.2 Cleanouts

.1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.3 Back Flow Preventers

.1 Not Used.

3.4 Piping Freeze Protection Systems

.1 Install self-regulating heater and components condensate drain piping and underground sanitary lines as indicated in the plans and specifications after the piping has been pressure tested, but before the thermal insulation is applied. Secure the heater to piping with fibreglass tape.

.2 Apply "electric traced" signs to the outside of the thermal insulation.

.3 After installation and before and after installing the thermal insulation, test heater using a 1000 VDC megger. Minimum insulation resistance should be between 20 and 1000 megaohms regardless of length.

.4 Power connection to heater shall be provided by Division 26. Arrange with electrical contractor to perform and certify the megger test.

.5 All heating cable connections (power, splice, tee and end termination) are made above ground. No buried or in-conduit splices or tees are allowed.

.6 The heating cable has a fluoropolymer outer jacket (-CT).

.7 The power connection and end seal are made in CSA Certified junction box above grade.

.8 The heating cable is protected from the pipe to the power connection box in CSA Certified water-sealed conduit (minimum ¾ inch diameter) suitable for the location.

.9 A 30-mA ground-fault protection device (GFPD) is used.

.10 Closed-cell, waterproof thermal insulation with fire-retardant, waterproof covering is used. The most common type is foam-glass and polyurethane insulation.

.11 For the sanitary pipe freeze protection application, use 5XL1-CT with EC-TS ambient sensing thermostat.

3.5 Performance Verification:

.1 General:

.1 In accordance with Section 23 08 01 – Performance Verification Mechanical Piping Systems.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Read Division 1 General Requirements in conjunction with these specifications. Division 1 and this section shall form a part of and shall apply to all Mechanical Sections. The most stringent requirements of this and other Mechanical Sections must be adhered to.

.2 The Mechanical work shall consist of the supply and installation of complete and operable mechanical systems and shall include all necessary labour, plant, materials, and incidentals for the work involved as listed in the following division sections:

.1 Division 21 Fire Suppression

.2 Division 22 Plumbing

.3 Division 23 Heating, Ventilating & Air Conditioning

1.2 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Shop drawings to show:

.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.

.4 In addition to transmittal letter referred to in Section 01 01 50 – General Instructions: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

.2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.

.3 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.

.4 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.

.5 Performance data to include:

.1 Equipment performance verification test results.

.2 Special performance data as specified.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

.2 Make changes as required and re-submit as directed by Departmental Representative.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Departmental 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 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.

.9 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 Departmental Representative for approval and make corrections as directed.

.4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.3 Regulations

.1 Comply with most stringent requirements of NBC, Provincial and Municipal regulations and by-laws, specified standards, codes and this specification. Practices contained in these standards or standards suggested or recommended by reference organizations, are to be taken as minimum requirements.

.2 Furnish certificates confirming work installed conforms to requirements of authorities having jurisdiction.

.3 Drawings and specifications should not conflict with these Regulations but where there are apparent discrepancies, notify the Departmental Representative in writing and obtain clarifications before proceeding with the work.

1.4 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Definitions

.1 Definitions used in this Division will have the following meaning:

.1 "Concealed": pipes, ducts, etc., in trenches, chases, furred spaces, pipe shafts, or hung ceilings.

.2 “Exposed": regarding insulation and painting of piping, ducts, etc., will mean that they are not "concealed", as defined herein.

.3 "Piping": includes, in addition to pipe, all fittings, valves, hangers, other accessories which comprise a system.

.4 "Provide": to supply and install, complete and ready for use.

1.6 Drawings

.1 Drawings:

.1 Are not intended to show structural details or architectural features.

.2 Are not to be scaled.

.3 Except where dimensioned, indicate general mechanical layouts only.

.2 Provide field (shop) drawings to indicate relative position of various services when required by Departmental Representative and obtain approval before commencing work.

1.7 Maintenance

.1 Furnish spare parts in accordance with Section 01 01 50 – General Instructions as indicated in the detailed product specification clauses.

.2 Provide access doors for concealed expansion joints, traps, strainers, cleanouts, balance dampers, fire dampers, other parts requiring accessibility for operating and maintenance.

.3 In suspended panel ceilings, use panel in place of access door; provide in such panel a button or other means of identification and easy removal when necessary.

1.8 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Co-ordination

.1 Co-ordinate work with work of other sections to avoid conflict.

.2 Locate distribution systems, equipment, and materials to provide minimum interferences and maximum usable space.

.3 Where interference occurs, Departmental Representative shall approve relocation of equipment and materials, regardless of installation sequence.

3.2 Cleaning

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 Cutting and Patching

.1 Make arrangements with General Contractor for all cutting and patching in this work.

.2 Minimize cutting and patching. Set sleeves and mark openings in concrete or masonry.

3.4 Waterproofing

.1 Where any work pierces waterproofing including waterproofing concrete, the method of installation shall be as approved by the Engineer before the work is done. Supply and install all necessary sleeves, caulking, roof curbs, and flashing required and make the openings watertight.

3.5 Protection of Work

.1 Protect equipment and material during construction from the weather, moisture, dust, painting, plastering and physical damage. Clean and return to "as new" condition.

.2 Mask or grease and cover machined surfaces. Firmly secure covers over equipment openings and open ends of piping, conduit and ductwork as work progresses. Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

.3 Any equipment that has operating parts, bearings or machined surfaces that show signs of rusting, pitting or physical damage will be rejected.

.4 Refinish damaged or marred factory finishes to the satisfaction of the Departmental Representative, using equal quality materials.

3.6 Field Quality Control

.1 Site Tests: conduct following tests in accordance with Section 01 01 50 – General Instructions and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Where specified, obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

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

3.7 Demonstration

.1 Departmental 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, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual and as-built drawings as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 23 05 00 Common Work Results – Mechanical

.2 Section 23 08 02 Cleaning and Start-up of Mechanical Piping Systems

1.2 References

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-1999, Ready-Mixed Organic Zinc-Rich Coating.

1.3 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2 PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 EXECUTION

3.1 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.

3.2 Clearances

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, or components.

3.3 Pipework Installation

.1 Protect openings against entry of foreign material.

.2 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.5 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.6 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400mm above floor in Mechanical Rooms.

.7 Install dielectric coupling between dissimilar metals.

3.4 Sleeves

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and un-insulated 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 25mm above finished floor.

.6 Sealing:

.1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.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.

3.5 Escutcheons

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe.

3.6 Cleaning of Piping Systems

.1 Before start-up, clean interior of piping systems in accordance with requirements of Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.7 Pressure Testing of Equipment and Pipework

.1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

.6 Conceal work only after approval and certification of tests by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 Related Section

.1	Section 01 01 50	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results – Mechanical
.4	Section 23 05 48	Vibration & Seismic Control for Ductwork, Piping and Equipment

1.2 References

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

.1 Seismic Restraint Manual, Guidelines for Mechanical Systems, 1998.

.2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME):

.1 ANSI/ASME B31.1-01, Power Piping, (SI Edition).

.3 American Society for Testing and Materials (ASTM):

.1 ASTM A 125-1996, Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307-00, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.3 ASTM A 563-00, Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):

.1 MSS SP58-1993, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP69-1996, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89-1998, Pipe Hangers and Supports - Fabrication and Installation Practices.

.5 National Plumbing Code.

1.3 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 all 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 to be in accordance with MSS SP58.

.2 Performance Requirements:

.1 Design supports and hangers to withstand seismic events as specified Section 23 05 48 – Vibration & Seismic Control for Ductwork, Piping and Equipment.

1.4 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Submit shop drawings and product data for following items:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.3 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

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

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 01 50 – General Instructions.

1.5 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 01 50 – General Instructions.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

PART 2 PRODUCTS

2.1 General

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 Pipe Hangers

.1 Finishes:

.1 Pipe hangers and supports: galvanized after manufacture.

.2 Use electro-plating galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 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 [6] mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate to MSS SP69.

.3 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.

.4 Pipe attachments: material to MSS SP58.

.1 Attachments for steel piping: carbon steel galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.5 Hanger rod attachment: material to MSS SP58.

.1 Use expansion anchor on existing concrete structure.

.6 Adjustable clevis: material to MSS SP 69, 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.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems per Section 23 05 48 – Vibration and Seismic Controls for HVAC Ductwork, Piping and Equipment.

.3 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations. Supporting piping from underside of light weight roof deck (without concrete) is not permitted.

3.2 Hanger Spacing

.1 Plumbing piping: in accordance with the most stringent requirements of the table below as well as the following:

.1 National. Plumbing Code.

.2 Authority Having Jurisdiction.

.2 Pipe hanger rods shall be sized in accordance to SMACNA Seismic Restraint Manual based on Seismic Hazard Level (SHL). For SHL, see Section 23 05 48 – Vibration and Seismic Controls for HVAC Ductwork, Piping and Equipment.

MAXIMUM HANGER SPACING						
PIPE DIA. NPS	STEEL SCH.40	COPPER L,K Hard Drawn	CAST.I STD.	GLASS	ABS/PVC	PEX
1/2	1.8 m [6'-0"]	1.8 m [6'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
3/4 & 1	2.4 m [8'-0"]	2.4 m [8'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
1-1/4	2.4 m [8'-0"]	3.0 m [10'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
1-1/2 & 2	2.4 m [8'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]		1.2 m [4'-0"]	0.8 m [2'-6"]
2-1/2, 3, 4 & 5	2.4 m [8'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]	2.4 m [8'-0"]	1.2 m [4'-0"]	0.8 m [2'-6"]
6 & 8	3.0 m [10'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]	2.4 m [8'-0"]	1.2 m [4'-0"]	0.8 m [2'-6"]

3.3 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.

3.4 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 13mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 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.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 01 50 General Instructions

.2 Section 01 35 33 Health and Safety Requirements

.3 Section 23 05 00 Common Work Results - Mechanical

.4 Section 23 05 05 Installation of Pipe Work.

.5 Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment

1.2 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1-2004; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM B 209M-2001, Specification for Aluminum and Aluminum Alloy Sheet and Plate [Metric].

.2 ASTM C 335-1995, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C 411-1997, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C 449/C449M-2000, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C 534-2005, Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

.6 ASTM C 795-1992(1998), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.7 ASTM C 921-1989(1996), Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-M88, Surface Burning characteristics of Building Materials and Assemblies.

1.3 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 defined herein.

.2 TIAC Codes:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 Submittals

.1 Submittals: in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 01 50 – General Instructions.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 01 50 – General Instructions.

.4 Quality assurance submittals: submit following in accordance with Section 01 01 50 – General Instructions.

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

.2 Instructions: submit manufacturer's installation instructions.

1.5 Quality Assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 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 01 50 – General Instructions.

.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.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

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 as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: Rigid molded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/CGSB-51.9.

.2 Maximum "k" factor: to CAN/CGSB-51.9.

.4 TIAC Code A-3: Rigid molded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/CGSB-51.9.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/CGSB-51.9.

.5 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.4 Foam-Glass and polyurethane insulation.

.6 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: flexible closed-cell elastomer to ASTM C534.

.2 Jacket: to CGSB 51-GP-52Ma. Required for outdoor application.

.3 Maximum "k" factor: 0.27.

.4 Vapour transmission: 0.08 perm-inch.

.5 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.

.7 To be formaldehyde free, low VOC; resists mold and mildew.

.8 Evidence shall be provided to the Engineer on the site of ULC listings of all products being used. Duct insulation adhesives and coatings shall be non-toxic as defined by WCB Regulations.

2.3 Insulation Securement

.1 Tape: Self-adhesive, aluminum, reinforced, 50mm wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5mm diameter stainless steel.

.5 Bands: Stainless steel, 19mm wide, 0.5mm thick.

2.4 Cement

.1 Thermal insulating and finishing cement:

.1 To CAN/CGSB-51.12.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C 449.

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.

2.8 Jackets

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CGSB 51-GP-53M with pre-formed shapes as required.

.2 Colours: White.

.3 Minimum service temperatures: 20°C [68°F].

.4 Maximum service temperature: 65°C [150°F].

.5 Moisture vapour transmission: 0.02 perm.

.6 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 Canvas:

.1 220 and 120 gm/m cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.2 Lagging adhesive: Compatible with insulation.

.3 Aluminum foil laminate:

.1 Multi-layer aluminum foil laminate; highly puncture and resistant, non-permeable vapour barrier for complete moisture protection. Inhibits mold growth. UL listed.

.2 Total thickness: 0.20 mm.

.3 Substrate thickness: 0.15 mm sheet.

.4 Finish: Aluminum, stucco embossed.

.5 Adhesive: cold weather acrylic adhesive.

PART 3 EXECUTION

3.1 Pre-Installation Requirement

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 Installation

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's 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 Hangers, supports to be 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.

3.3 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 movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: PVC.

3.4 Installation of Elastomeric Insulation

.1 Insulation to remain dry at all times. Overlaps to manufacturer's instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.5 Piping Insulation Schedules

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Seals: lap seal adhesive, lagging adhesive.

.2 Installation: TIAC Code: 1501-CA; per manufacturer's recommendation.

.5 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation to be as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000mm long.

.2 Do not insulate exposed run-outs to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC Code	Run out	To NPS1	1 ¼-2	2 ½-4	5-6	8 & over
RWL		C-2	25	25	25	25	25	25
Cooling Coil Condensate Drain		C-2	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: Canvas and/or PVC jacket.

.2 Exposed in mechanical rooms: Canvas and/or PVC jacket.

.3 Concealed, indoors: ASJ, no further finish.

.4 Exposed outdoors: Aluminum foil laminate.

.5 Underground: Waterproof cover (foam-glass and polyurethane insulation).

3.6 Cleaning

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

.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 Sections

.1 Section 22 42 01 Plumbing Specialties and Accessories

.2 Section 23 05 93 Testing, Adjusting and Balancing

.3 This Section applies to all related work under Divisions 22 and 23.

1.2 Wet and Dry Pipe Sprinkler System, Standpipe and Hose Systems

.1 Cleaning, testing, start-up, performance verification of equipment, systems, components, and devices is specified elsewhere in Division 21.

.2 Verification of controls, detection devices, alarm devices is specified Division 28.

.3 Demonstrate that fire hose will reach to most remote location regardless of partitions, and obstructions.

.4 Verify operation of interlocks between HVAC systems and fire alarm systems.

1.3 Sanitary and Storm Drainage Systems

.1 Buried systems: Perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.

.2 Ensure that traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system.

.4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.

.5 Cleanouts: Refer to Section 22 42 01 - Plumbing Specialties and Accessories.

1.4 Reports

.1 In accordance with Section 01 91 00 – Commissioning and Section 23 08 00 – Commissioning of Mechanical Systems

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used.

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This Section describes the Common Work Results applicable to electrical disciplines.

1.2 GENERAL

.1 The general conditions and general requirements together with all amendments and supplements contained in the General Specifications shall form an integral part of the electrical specification and will be made part of this contract.

.2 Reference to "Electrical Divisions" shall mean all Divisions 26, 27, 28, 33, 34 and 48 in the Master Format or the Canadian Master Specifications.

.3 The word "Provide" shall mean "Supply and Install" the products and services specified. "As Indicated" means that the item(s) specified are shown on the drawings.

.4 Confirm with the architectural plans and specifications the extent and nature of the work and how it will affect the electrical work. Include in the tender sum for any complications or additional work described therein.

.5 Review mechanical plans and specifications for the extent of electrical work required to make mechanical systems complete and include this work in the tender sum.

.6 Review structural plans for limitations of penetrations or inclusions of electrical equipment. In the tender sum, allow for avoiding critical areas with electrical equipment.

.7 Review existing record plans and site conditions for limitations of penetrations or inclusions of electrical equipment. In tender sum, allow for avoiding critical areas with electrical equipment.

.8 Comply with the requirements of the General Contract, and coordinate the installation with all other trades on site.

.9 Confirm on-site the exact location of equipment, outlets, and fixtures and the location of outlets for equipment supplied by other trades.

1.3 WORK INCLUDED

.1 This work shall include the supply and installation of all the necessary materials and apparatus for complete operating systems as indicated on the plans or mentioned in this specification, with the exception of materials or apparatus specifically mentioned to be omitted or to be supplied by owner.

.2 Items obviously necessary or reasonably implied to complete the work, shall be included as if shown on drawings and noted in the specifications.

.3 All materials, tools, appliances, scaffolding, apparatus and labour necessary for the execution, erection and completion of the systems described herein shall be furnished. This includes providing lighting and power for own work.

.4 This contract shall include, but is not confined to, the following scope of work:
- .1 All electrically related civil works, trenching, backfilling, resurfacing
- .2 Underground ducts including concrete encasement, pullboxes etc.
- .3 Power distribution equipment
- .4 Power connections and outlets
- .5 Surface wireways and floor boxes
- .6 Mechanical equipment connections
- .7 Lighting system
- .8 Lighting controls system

.5 Complete all electrical connections to equipment and accessories pertaining to this contract and leave all in operating condition to the electrical Departmental Representative's satisfaction.

.6 Remove all existing electrical equipment and material made redundant by this contract or in conflict with work to be carried out. Reroute, reinstall or replace existing electrical material that becomes necessary due to work carried out by this contract so a complete working electrical system will be retained in all areas affected by this installation.

1.4 WORK EXCLUDED

.1 The contract scope of work shall not include the following:

.2 Low voltage mechanical systems control wiring where indicated in electrical and mechanical specifications to be done by controls contractor shall be excluded from the electrical contractor work as noted.

1.5 DRAWINGS AND SPECIFICATIONS

.1 The drawings and specifications compliment each other and what is called for by one is binding as if called for by both. If there is any doubt as to meaning or true intent due to a discrepancy between the electrical drawings and specifications, and all other contract documents. **The most expensive alternative is to be allowed for.**

.2 The plans show the approximate location of outlets and apparatus but the right is reserved to make such changes in location as may be necessary to meet the emergencies of construction in any way. No extra will be allowed for such changes to any piece of electrical equipment unless the distance exceeds 3 metres, or if the relocation is required after initial installation is complete.

.3 It is imperative that the contractor visit the site and completely familiarize himself as to the work to be undertaken.

1.6 CODES AND STANDARDS

.1 All electrical work shall be carried out in accordance with the latest edition of the CEC C22.1 (Canadian Electrical Code) as amended and adopted by the Province of British Columbia and to the satisfaction of the Electrical Inspection Authority having jurisdiction, except where specified or specifically stated otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 latest edition, except where specified or specifically stated otherwise.

.3 All work shall be carried out in accordance with the National Building Code current edition (including all local amendments) to the satisfaction of local building inspector authority having jurisdiction.

.4 Any electrical material and/or equipment supplied by any contractor or sub-contractor for installation on this project must bear evidence of CSA approval or special CSA certification acceptable to the Chief Electrical Inspector for the Province of British Columbia.

1.7 CARE, OPERATION AND START-UP

.1 Instruct Departmental Representative and Operating Personnel in the 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 all aspects of its care and operation.

1.8 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235 latest edition.

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

1.9 PERMITS, FEES AND INSPECTION

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

.2 Pay all associated fees.

.3 Fees will cover all routine inspections by the District Electrical Inspector. Any fees for follow-up inspections found to be necessary by the District Electrical Inspectors as a result of incorrect work shall be borne by this contractor without any cost to the owner.

.4 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Department [authorities having jurisdiction] on completion of work to Departmental Representative.

.6 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work. Obtain electrical permit and pay associated fees.

.7 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost to the Contractor.

.8 Furnish to Departmental Representative on completion of work Certificates of Acceptance from Electrical Inspection Department.

1.10 LOCATION OF OUTLETS

.1 Locate outlets in accordance with these specifications and as indicated on the Architectural and Electrical drawings.

.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 3000mm, and information is given before installation.

1.11 MOUNTING HEIGHTS

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

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

.3 Install electrical equipment at following heights unless indicated otherwise on the Architectural and Electrical drawings.

.1 Local switches: 1200 mm.

.2 Wall receptacles:

.1 General: 400 mm.

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

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

.4 In mechanical rooms: 1200 mm.

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

1.12 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads (lighting and mechanical) 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.

1.13 CONDUIT AND CABLE INSTALLATION

.1 Install flashing and gooseneck assembly for all roof penetrations for running cables to serve roof mounted equipment.

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

1.14 EXTRA WORK

.1 Any extra work ordered to be done shall be governed by this specification unless specific instructions or clauses are contained in the Change Order. In such cases, these instructions or clauses shall supersede those of the specification for this particular application only.

1.15 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or supervised apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks. The activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Master Electrical Contractor License as issued by the Province that the work is being conducted.

.3 Conduct and pay for following tests:

- .1 Power distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

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

.5 Insulation resistance testing:

- .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.
- .2 Megger 350V - 600 V circuits, feeders and equipment with a 1000V instrument.
- .3 Check resistance to ground before energizing.

.6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.7 Submit test results for Departmental Representative's review.

1.16 CO-ORDINATION OF TRADES

.1 Consult with Construction Manager and all subtrades involved to confirm the location of the various outlets and equipment, and cooperate fully to ensure that no conflict arises during the installation.

.2 Special care shall be taken that equipment, outlets, junction boxes or pullboxes will not be obstructed by other structure, equipment, pipes or ducts installed under this general contract by other trades.

.3 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost to the Owner, without the Departmental Representative's written approval.

.4 The drawings indicate the general location and route to be followed by the electrical services. Where details are not shown on the drawings or only shown diagrammatically, the services shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All services in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All electrical services shall be coordinated in elevation to ensure that they are concealed in the ceiling or structural space provided unless detailed otherwise on drawings.

.5 Work out jointly all interference problems on the site and coordinate all work before fabricating, or installing any material or equipment. Where necessary, produce interference/coordination drawings showing exact locations of electrical systems or equipment within service areas, shafts and the ceiling space. Distribute copies of the final interference/coordination drawings to the Architect and the Departmental Representative and all affected parties.

.6 Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Departmental Representative of space problems before installing any material or equipment. Demonstrate to the Departmental Representative on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

1.17 SUBSTITUTIONS

.1 Unless otherwise noted on the plans or specifications, substitutions may be approved by the Departmental Representative if requested by the contractor or by equipment suppliers, for items specified by the manufacturer's catalogue number.

.2 Requests for approval of such substitutions shall be submitted at least five (5) working days prior to the tender closing date.

.3 Complete description and data sheets of proposed substitution shall accompany the application and supplier must be prepared to submit samples for approval on short notice.

.4 Proposed substitutions must be at least of equal quality to that of the specified item. The manufacturer's specification of the specified item shall apply for comparison if no other clause of this specification applies. The decision of the Departmental Representative to accept or reject shall be final.

.5 Off-the-shelf items such as standard boxes, EMT, which are specified by description only or indicated on the drawings, without any manufacturer, model, type or catalogue number, do not require approval prior to the tender closing date.

.6 Submit list of alternates used, within one week after acceptance of tender.

1.18 PROTECTION OF EQUIPMENT

.1 See section 1.23.7 for lighting.

.2 This contractor shall provide and ensure maximum protection of electrical equipment on the site. Electrical equipment, including existing electrical equipment, shall be kept clean and dry at all times and caution shall be taken to ensure no mechanical damage is done to the equipment. Equipment shall not be delivered to the site until it can be stored safely or placed in final position and the space is clean.

1.19 DAMAGES

.1 If the finish of electrical equipment is damaged either when received or during installation, have such equipment completely refinished and restored to its original condition at no cost to the owner.

.2 Irreparably damaged equipment shall be replaced at no cost to the owner.

1.20 SHOP DRAWINGS

.1 Submit shop drawings, product data and samples in accordance with the contract specifications.

.2 Shop drawings and product data shall indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other sections.

.5 Prior to manufacture of any item made specifically for this job, submit detailed drawings of the item through the Construction Manager.

.6 Shop drawings must be received by the Departmental Representative at a date early enough to permit reasonable study prior to approval and manufacture, or to permit alterations where necessary. Late submissions of shop drawings will be sufficient reason for a stoppage of construction pending approval, or removal and replacement of any unsatisfactory item at the contractor's expense.

.7 Shop drawings/product data content:

- .1 Shop drawings submitted title sheet.
- .2 Data shall be specific and technical.
- .3 Identify each piece of equipment.
- .4 Information shall include all schedule data.
- .5 Advertising literature will be rejected.
- .6 The project and equipment designations shall be identified on each document.
- .7 The shop drawings/product data shall include:
  - .1 Dimensioned construction drawings with plans and sections showing size, arrangement and necessary clearances, with all equipment weights and mounting point loads.

.2 Mounting arrangements.

.3 Control explanation and internal wiring diagrams for packaged equipment.

.4 A written description of control sequences relating to the schematic diagrams.

1.21 CUTTING AND PATCHING

.1 This contractor is responsible for all cutting or blocking out required to install electrical equipment.

.2 If this contractor makes excessive cuts or does not coordinate work so that finished work requires cutting or patching, then this contractor shall pay for all patching to original condition.

.3 Any dispute resulting from this shall be referred to the Departmental Representative for decision.

.4 Prior to any major cutting of walls or floor, review the proposed location, size and method with the Departmental Representative. This includes notification when cutting or coring into any fire rated construction.

1.22 FIRESTOPPING

.1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Section 1300.

.2 Submit material safety data sheets provided with product delivered to job-site.

.3 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary training to install manufacture's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

.4 The work is to be installed by a contractor with at least one of the following qualifications:

.1 FM 4991 Approved Contractor

.2 UL Approved Contractor

.3 Hilti Accredited Fire Stop Specialty Contractor

.5 Installer shall have minimum 3 years of experience with fire stop installation.

.6 Seal all openings for conduit or sleeve penetrations in fire rated and smoke rated separations using approved materials.

.7 All block outs and access slots to be sealed using approved fire stopping assembly. Provide full details for all fire stopping applications as they relate to each application.

.8 Provide shop drawings for all fire stopping products, including assembly details as it relates to each application. Products shall be ULC approved as an assembly.

.9 Allow for the destructive testing of 10% of fire stopping applications. Should installations not conform to manufacturer's details, an additional 25% of installation will be destructively tested and should there be more failures, the contractor will be responsible to remove all fire stopping products and reinstall products correctly, at no additional cost to the owner.

1.23 PROTECTION OF EXPOSED LIVE EQUIPMENT

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.24 SPRINKLER PROTECTION

.1 Provide drip covers or CSA Type 2 enclosure for all new surface mounted panelboards and cabinets in sprinklered rooms.

.2 Provide drip covers for all communications backboards in sprinklered rooms.

.3 Provide sprinkler covers for all communications racks in sprinklered rooms.

1.25 INSPECTIONS AND TESTS

.1 Notify the Departmental Representative and authorities having jurisdiction at least five (5) working days in advance when the installations will be ready for inspection or testing.

.2 Test reports, signed by all attending authorities, shall be submitted to the Departmental Representative through the General Contractor after successful completion of an inspection or test.

.3 Conduct all tests in a thorough and complete manner to the satisfaction of the Departmental Representative and pay for any fees incurred to complete tests.

.4 Furnish the Departmental Representative with a copy of Certificate of Inspection from B.C. Electrical Safety Branch indicating that all work has been satisfactorily completed and issued prior to final connection.

1.26 CLEAN UP

.1 Vacuum clean all new raceways and any electrical equipment. Ensure that no debris or spare parts are left in any electrical equipment.

.2 Any scrap material shall be removed from the site and disposed of by the Contractor.

.3 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

1.27 SURPLUS MATERIALS

.1 All material removed from existing site and not being reused in this contract shall be the property of the owner and delivered as directed by the owner's representative. Material as it becomes surplus shall be reviewed by the owner or

owner's representative and that part considered of value to the owner shall be classed as surplus material, all other becomes scrap material, and shall be disposed of by the contractor.

1.28 SPARE PARTS

.1 This contract calls for spare parts or material. These are to be provided new in unopened cartons to the owner at the time of substantial completion of the contract.

.2 Obtain a signed receipt from the owner's representative for all these parts or materials and include a copy in the front of the maintenance manual. Without this receipt these items will be treated as a deficiency and the cost withheld at twice the estimated value by the Departmental Representative.

1.29 SUBSTANTIAL PERFORMANCE

.1 Provide request to Architect/Departmental Representative in writing that a Substantial Performance Inspection shall be carried out.

.2 Do not issue this written request until the following have been completed and/or submitted to Departmental Representative:

.1 As-installed drawings (CAD files or Revit model) have been provided.

.2 All deficiencies noted during job inspections have been completed.

.3 Warranty Certificates have been provided.

.4 All systems have been tested and are ready for operation.

.5 All Inspection Certificates have been furnished including Final Electrical Inspection Certificate.

.6 The Owner's personnel have been instructed in the operation and maintenance of all systems.

.7 All equipment identification has been completed.

.8 The cleaning up is finished in all respects.

.9 All spare parts and replacement parts specified have been provided and receipt of same acknowledged.

.10 Copies of Seismic Departmental Representative's Schedules B1, B2 and CB have been submitted.

.11 Fire Alarm System is verified and operational. Copy of Verification Report submitted to Departmental Representative.

1.30 AS-BUILT DRAWINGS

.1 Obtain two (2) sets of white prints for the sole purpose of recording changes in installation as they occur. One (1) set is to be used in the field for day-to-day recording, and one (1) set for submittal after completion.

.2 These plans shall be kept up-to-date as changes occur and shall be available to be inspected by the Departmental Representative.

.3 Arrange and pay for the incorporation of any "as-built" changes to reproducible plans and AutoCAD (Revit) disks. These changes shall be of similar quality of

presentation as the original plans. NOTE: All plans whether requiring as-built changes or not, shall be included in this set.

.4 Should the contractor require the Electrical Departmental Representative to prepare the as-built CAD drawings, the cost would be $350 per plan, unless excessive changes have been required. Costs associated with such excessive changes should be included with the change orders.

.5 Update costs for the Revit model will be determined based on the extent of the work required. Contractor to confirm this cost with the Departmental Representative.

.6 These amended drawings shall be given to the Departmental Representative at time of final inspections.

.7 "As-built" drawings shall include the location and circuit numbers of junction boxes in ceiling spaces, and all conduit placed in or under poured concrete. Note normal depth of conduits below top of concrete slab.

1.31 OPERATING AND MAINTENANCE MANUALS

.1 Submit **four sets** of operating and maintenance manuals for equipment or as requested by the general section of the contract. Include descriptive and technical data, all shop drawings, operating procedures, routine and preventative maintenance, wiring diagrams, spare parts lists, warranties, service companies, suppliers for replacement parts, test results, fire alarm certificate of verification, electrical inspection authority certificate and contract guarantee.

.2 Submit documentation in **green colored** heavy duty three ring binders, with lettering on spine identifying: "OPERATING AND MAINTENANCE MANUAL", project title and system names.

.3 Submit one copy for approval by Departmental Representative prior to assembly of final sets.

1.32 DEMONSTRATION OF SYSTEMS

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

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

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

1.33 WARRANTY

.1 Within a period of one year from the date of final acceptance of work, replace or repair at own expense any defect in workmanship or material. Reused material shall be operating satisfactorily at the time of final acceptance but subsequent failures are not the responsibility of this contractor.

.2 Warranties for equipment having more than one year guarantee shall be made out to owner, and copies shall be provided in the maintenance manuals.

.3 Maintenance from manufacturer and contractor of all equipment shall be included for first year, including all lamps except incandescent.

1.34 PAINTING

.1 Arrange and pay for the painting of the devices noted in these specifications, in particular:

.1 exposed conduits and conduit fittings where required.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Refer to Section 01 35 18 of the General Requirements.

2.2 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

2.3 MATERIALS AND EQUIPMENT

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

.2 Factory assemble control panels and component assemblies.

2.4 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on the electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule.

.2 Control wiring and conduit is specified in [Division 16] [Divisions 26, 27, 28, 33, 34 and 48] except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Specifications and shown on mechanical drawings.

2.5 WARNING SIGNS

.1 As specified and to meet the requirements of the BC Electrical Inspection Authority and the Departmental Representative.

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

2.6 FINISHES

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

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

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

2.7 EQUIPMENT IDENTIFICATION

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

.2 Nameplates:

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

.2 Nameplate colors shall be as follows:

.1 Normal power: Black face with white letters;

.2 Life safety emergency power: Red face with white letters;

.3 Standby power: Blue face with white letters.

.3 Nameplate sizes shall be as follows

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 Labels:

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

.4 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.5 Allow for average of twenty-five (25) letters per nameplate and label.

.6 Identification to be English.

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

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

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

.10 Label all receptacles with branch circuit label indicating panel name and branch circuit number. Use brother P-Touch device or similar. Labels are to be white with black lettering.

2.8 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1 [latest edition].

.4 Use colour coded wires in communication cables, matched throughout system.

2.9 CONDUIT AND CABLE IDENTIFICATION

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

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

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

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

Part 3 Execution

3.1 PROJECT CLOSEOUT REQUIREMENTS

.1 The following items are required for the Contractor to provide to the Electrical Departmental Representative prior to releasing a Schedule C-B.

.1 Final record drawings (as-built)

.2 Maintenance manual

.3 Warranty letter

.4 System briefing to Owner

.5 Electrical final from AHJ

.6 Fire stopping letter

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies the materials and installation for wire and box connectors, rated to 1000V.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA-C22.2No.18 latest edition, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2No.65 latest edition, Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

- .1 EEMAC 1Y-2, latest edition, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

- .1 Connector body and stud clamp for stranded copper conductors.
- .2 Clamp for stranded copper conductors.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors.
- .5 Sized for conductors as indicated.

Part 3 Execution

3.1 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 CSA C22.2 No.65.
- .2 Install fixture type connectors and tighten. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies copper conductors rated 0-1000 Volts and the most common electrical insulation and covering materials.

1.2 REFERENCES

.1 CSA C22.2 No .0.3 latest edition, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131 latest edition, Type TECK 90 Cable.

1.3 GENERAL REQUIREMENTS

.1 Typically use insulated 98% conductivity copper conductor wiring enclosed in EMT (steel) conduit for the general wiring systems unless otherwise indicated.

.2 Teck cable may only be used where specifically indicated on the drawings or in the specifications. Where permitted, Teck wiring up to 750 system volts to be PVC jacketed armoured cable, multi-copper conductor type Teck90 1000 volt having a PVC jacket with FT-4 flame spread rating.

.3 Flexible AC90 armoured cabling (BX) shall not be used for the general wiring system other than final drops to recessed light fixtures in concealed locations.

.4 Cabling indicated to be 2-Hour Fire-Rated shall be compliant to CAN/ULC-S139 and CSA 38-95 (Draka Lifeline, Raychem RHW, or Shawflex). Cabling shall be low smoke halogen free. Conduit to be sized and installed as per manufacturers' requirements for these specialized cables and assemblies regardless of the size indicated on drawings.

.5 Provide all control wiring except HVAC controls as specified in Mechanical Divisions.

.6 Non-metallic sheathed wiring is not to be used on this project.

Part 2 Products

2.1 WIRE AND CABLE GENERAL

.1 Conductors: stranded for 10 AWG and larger. Minimum size #12 AWG.

.2 Insulation to be 600 volt RW90XLPE (X link) for the general building wiring in conduit.

.3 Use RWU90XLPE for underground installations.

.4 Site services sub-circuits, including site lighting, to be minimum #10 AWG for power and #12 for controls. Increase wiring size for lengthy and/or loaded circuits so that system will not exceed the maximum voltage drop as recommended by the Canadian Electrical Code CSA 22.1.

.5 TBS90 #14 AWG stranded shall be used in all switchgear assemblies.

.6 Conductors to be colour-coded. Conductors No.10 gauge and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size No.8 gauge and larger may be colour-coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible. Where colour-coding tape is utilized, it shall be applied for a minimum of 50 mm at terminations, junctions and pullboxes and conduit fittings. Conductors not to be painted.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131 [latest edition].

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking galvanized steel or aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.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 1000 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.3 CONTROL CABLES

.1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.

.2 Low energy 300 V control cable: solid annealed copper conductors sized as indicated, with TWH over each conductor and overall covering of PVC jacket.

.3 600 V type: stranded copper conductors, sizes as indicated with R90 (x-link) ethylene-propylene rubber insulation type over each conductor and overall covering of PVC jacket.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

.2 In underground ducts in accordance with Section 26 05 34.

.3 In trenches in accordance with Section 26 05 34.

.4 All wires are to be pulled in together in a common raceway, using liberal amounts of Compound 77 lubricant.

.5 All power circuits connected to isolated ground type receptacles are to have individual separate neutral c/w insulated bonding conductor.

.6 No combining of circuits onto common neutral will be permitted. Use 2 pole or 3 pole breakers for combined circuits, no connector clips will be allowed.

.7 Ensure that all single phase loadings are reasonably closely balanced over the main feeders.

3.2 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Install cable in trenches in accordance with Section 26 05 34.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Install cable in trenches in accordance with Section 26 05 34.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.4 INSTALLATION OF CONTROL CABLES

.1 Control cable and conduit will be supplied and installed by Mechanical Contractor. Controls wiring must be installed in conformance with Electrical Specifications. Install control cables in conduit.

.2 Ground control cable shield.

3.5 INSTALLATION OF NON-METALLIC SHEATHED CABLE

.1 Install cables.

.2 Install straps and box connectors to cables as required.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies rigid and flexible fasteners, fittings and installation.

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 for special devices.

.3 Gang boxes where wiring devices are grouped. Do not use sectional boxes.

.4 Blank cover plates for boxes without wiring devices.

.5 347V outlet boxes for 347V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi-gang device boxes for flush installation, minimum size 76 x 51 x 38 mm or as indicated. For 347 V switches, use 347 V type device boxes.

.2 Larger 102 mm square x 54mm deep outlet boxes to be used for single gang when more than one conduit enters one side, for telecommunication outlets (for slack storage), or for flush mounting devices in finished plaster and/or tile walls. Provide raised device covers as required.

.3 For larger boxes (those requiring more wiring space, MUTOAs, etc.) use pre-ganged 102 mm high x 51 mm deep solid type as required. Allow extra gang for telecommunication outlets.

.4 Boxes for surface mounted switches, receptacles, or telecommunications outlets to be 102 mm square, or 102 mm high utility, boxes, with rounded corners and raised surface covers. Minimum 38 mm (54 for telecom.) deep

.5 Lighting fixture outlets: 102 mm square outlet boxes or octagonal outlet boxes.

.6 Provide extension and plaster rings as required.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang type shallow or deep boxes for devices flush mounted in exposed block walls, minimum 95 mm high x 63 mm deep.

2.4 SURFACE CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

2.5 FITTINGS – GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of foreign materials.

.3 Conduit outlet bodies for conduit up to 35 mm. Use pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Typical outlet box mounting heights are indicated in Section 26 05 00 or refer to wiring device and communication specification sections and to architectural layouts for particular mounting heights of outlet boxes where indicated.

.2 Support boxes independently of connecting conduits.

.3 Ceiling outlet boxes to be provided for each surface mounted fixture.

.4 Fill open boxes with paper, sponges, foam or similar approved material to prevent entry of construction material. Remove upon completion of work.

.5 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not to be used.

.6 No sectional or handy boxes to be installed.

.7 Provide vapour barrier wrap or boots behind outlets mounted in exterior walls. Maintain integrity of the vapour barrier and insulation to prevent condensation through boxes.

.8 Coordinate location and mounting heights of outlets above counters, benches, splash-backs and with respect to heating units and plumbing fixtures. Coordinate with architectural details.

.9 Outlets installed back to back in party stud walls to be off-set by one stud space.

.10 Separate outlets located immediately alongside one another to be mounted at exactly the same height above finished floor. Similarly, outlets mounted on a wall in the same general location at varying heights to be on the same vertical centre-line unless otherwise noted.

.11 Where outlet boxes penetrate an assembly with a fire-resistance rating (fire separation), ensure that the boxes are externally tightly fitted with an approved non-combustible material to prevent passage of smoke or flame in the event of a fire. Such boxes may not exceed 0.016 mm2 per NBCC 3.1.9.2.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies rigid and flexible conduits, fasteners, fittings and installation.

1.2 REFERENCES

.1 Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware: to CSA C22.2 No. 18.

.2 Rigid metal conduit (RMC): to CSA C22.2 No. 45.

.3 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.4 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.

.5 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.6 PVC (DB2) conduit: to CSA #C22.1 211-1.

.7 Flexible metal conduit (FMC): to CSA C22.2 No. 56.

.8 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

1.3 BASIC WIRING METHODS

.1 Underground or in concrete exterior to building:

.1 All wiring shall be in Schedule 40 RPVC conduit.

.2 Concrete walls and slabs interior to building:

.1 All wiring shall be in Schedule 40 RPVC conduit.

.3 Surface raceways - interior:

.1 All surface raceways shall be EMT, except if located without protection in areas susceptible to damage, which shall be rigid steel conduit.

.4 Surface raceways - exterior:

.1 All surface raceways shall be UV compensated Schedule 40 RPVC conduit, protected from damage and excessive heating to the Consultant's satisfaction.

1.4 LOCATION

.1 Electrical drawings are diagrammatic and do not show all conduits, wire, cable, etc. Electrical contractor to provide conduit, wire cable, etc. for a complete operating job to meet in all respects the intent of the drawings and specifications.

.2 Outlet positions shown on architectural drawings (plans and elevations) to take precedence over locations and mounting heights indicated on electrical plans or in specifications.

.3 Locate electrical devices on walls with regard given for convenience of operation and conservation of wall space. Switches, receptacles, etc. generally to be

vertically lined up where items are in the same general location. Adjacent common devices to be installed in common outlet box.

.4 Review the exact location criteria of each electrical outlet and device with the Architect and Consultant prior to rough-in. Relocate any item installed without architectural confirmation as required by the architect or Consultant at no cost to the owner as long as the relocation is within 3m of the location originally shown on the electrical drawings.

.5 Do not install outlets back-to-back in party walls; allow a minimum of one stud space horizontal clearance between boxes. Install behind all outlets in party walls a Lowry Acoustic backing pad.

.6 Locate light switches on latch side of doors.

.7 All outlets located on exterior walls to be complete with moulded plastic vapour barriers to maintain integrity of wall vapour barrier system.

.8 All raceways and wiring shall be installed concealed in building fabric as much as possible.

.9 All outlet boxes, junction boxes, and cabinets to hold electrical devices shall be mounted so the equipment can be flush mounted unless indicated otherwise.

Part 2 Products

2.1 CONDUIT GENERAL

.1 All conduit fittings shall be malleable steel, set screw type. No cast fittings.

.2 All connectors shall have insulated throat type bushing, connectors etc.

.3 Bonding conductor to be provided in all conduit runs.

2.2 EMT RACEWAY

.1 Electrical Metallic Tubing (EMT) shall be galvanized steel of sufficient quality and thickness to allow smooth field formed bends.

.2 EMT couplings, connectors and fittings shall be steel. Cast type units shall not be used on this installation.

2.3 FLEXIBLE ELECTRIC NON-METALLIC (ENT) TUBING

.1 Flexible electrical non-metallic tubing (ENT) **shall not** be used on this project.

2.4 OUTLET BOXES AND JUNCTION BOXES

.1 Except as noted for rigid PVC raceways, all outlet boxes and junction boxes shall be one piece formed or welded.

.2 Outlet boxes to be galvanized steel.

.3 Junction boxes to be galvanized steel or aluminum.

2.5 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1500mm oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.6 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT in all exterior applications. Set-screws are not acceptable.

2.7 EXPANSION FITTING FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.8 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Use rigid galvanized steel threaded conduit except where specified otherwise.

.3 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury.

.4 Use rigid pvc conduit underground, in corrosive areas, and surface mounted in wet areas not subject to damage.

.5 Minimum conduit size for lighting and power circuits: 19mm.

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

.7 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.8 Install fish cord in empty conduits.

.9 Dry conduits out before installing wire.

.10 Conduits shall be installed mechanically continuous from outlet to outlet and without pockets. All the necessary standard bushings, elbows and bends shall be provided. All conduit bends shall have a radius of not less than six (6) times the internal diameter of the conduit and in no case shall the equivalent of more than four quarter bends from outlet to outlet be made. For all conduit sizes to be used for low voltage raceway, the conduits shall have a minimum bending radius of 230mm.

.11 Conduit bends shall be made with no more than 10% flattening of the conduit. Bends shall be smooth throughout deformations.

.12 On surface wall runs, all conduit shall be installed in true vertical or horizontal direction and on ceilings in true 90 degree angles or parallel to the walls. Crossings of conduits shall also be made at 90 degree angles. Parallel running conduit shall be kept on equal spacing on the entire length of run including bends.

.13 All conduits shall be fastened to structure with steel straps (no cast type straps allowed).

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 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.

3.4 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.5 FIRESTOPPING

.1 Apply ULC approved fire stopping assembly to all conduit penetrations passing through fire rated walls and floors.

.2 Provide shop drawings showing details for each type of application on the project. Shop drawings shall include catalogue data and installation details.

.3 For all communication sleeves accessible via ceilings or in stacked closets/rooms passing through floors, provide 2 hour rated STI EZ-PATH assembly. Where

quantity is not indicated on plans, provide minimum two sleeves between each floor and each communication closet/room.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies photoelectric lighting control equipment for exterior use only.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures

Part 2 Products

2.1 PHOTOELECTRIC LIGHTING CONTROL

.1 Wall mounting.
.2 Capable of switching 1000W of lighting at 120 V.
.3 Voltage variation: plus or minus 10%.
.4 Temperature range: minus 40°C to plus 40°C.
.5 Switching on lights at 70 lux.
.6 Switching off lights at 105 lux.
.7 Rated for a minimum of 5000 operations.
.8 Options:
  .1 Lightning arrester.
  .2 Fail-safe circuit completed when relay de-energized.
  .3 Twist-lock type receptacle.
  .4 Terminal strip.
  .5 Sensitivity adjustment.
.9 Switching time delay of 0 to 30 s.
.10 Wall mounting bracket.
.11 Colour coded leads: size 10 AWG, 500mm long.

Part 3 Execution

3.1 INSTALLATION

.1 Install photoelectric controls in accordance with manufacturer's instructions.
.2 Install on the building exterior as indicated on plans.
.3 Install manual override switch on a wall inside the existing building adjacent to the exit/entrance door to the new walk-in freezer.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This Section specifies standard and custom panelboards and their installation.

1.2 SCOPE OF WORK

.1 Provide and install panelboards as indicated on the drawings, panel schedules and these specifications.

.2 Types of panelboards in this section include the following:

.1 Lighting and power panelboards

1.3 PRODUCT INFORMATION

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

.3 Shop drawings to include matching tub and trim details for factory installed low voltage relay cabinets where specified.

1.4 PLANT ASSEMBLY

.1 Install circuit breakers in panelboards before shipment from plant.

.2 In addition to CSA requirements, manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.3 All panelboards to be of a common manufacturer.

1.5 FINISH

.1 Apply finishes in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Panel finish to be standard ASA Grey baked enamel. Confirm with Consultant prior to shop finishing panels.

Part 2 Products

2.1 PANELBOARDS, DOORS AND TRIMS

.1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer.

.2 Bus and breakers unless otherwise indicated on the drawings and in the specifications, shall be rated for:

.1 Minimum 10 kA at 208Y/120V.

.2 Minimum 22 kA at 600Y/347V.

.3 Tin plated aluminum bus with full size neutral.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number.

.5 Mains capacity, number of circuits and number and size of branch circuit breakers as indicated.

.6 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank fillers for all spaces.

.7 Concealed hinges and concealed trim mounting screws, hinged locking door with flush catch.

.8 Panelboards to have flush doors.

.9 Provide two keys for each panelboard and key similar voltage and system panelboards alike.

.10 Panel tubs to be typically 600mm wide.

.11 Provide "sprinkler-proof" design in areas where sprinkler fire protection is installed. In any event, all surface mounted enclosures to be complete with sprinkler drip cover.

.12 Provide door within door trims where indicated to facilitate ease of service maintenance Each tub trim cover to be hinged and self supporting and to swing out to expose breaker cable terminations and wireways. Hinged trim shall be secured with cover screws on opening side by concealed machine screws. Hinged breaker cover shall be recessed into the hinged overall tub cover. Breaker cover shall have latch type closures. Submit details on shop drawings prior to manufacturing.

2.2 BREAKERS

.1 For Power Distribution Panelboards: Bolt on type molded case, adjustable and interchangeable trip, single, two and three pole, 120/208V and with trip free position separate from "On" or "Off" positions.

.2 Two and three pole breakers to have common simultaneous trip and able to be located in any circuit position within the panelboard.

.3 Main breaker (where required) to be separately mounted at top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Provide circuit breakers with indicated trip ratings as shown in the panelboard schedules.

.5 Provide minimum 10% spare breakers.

.6 Provide breaker type Ground Fault Interrupter(s) (GFI) as indicated.

2.3 PANELBOARD IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Nameplate for each panelboard size 5 (2 line) engraved as indicated and include panel designation and voltage/phase.

.3 Complete updated circuit directory with typewritten cards located in slide-in plastic pocket fixed to the back of the related door. Directory card to indicate the panel designation, mains size, voltage/phase and the location and load controlled of each circuit. Include a "letter sized" paper copy of each directory in the project maintenance manual.

.4 Provide a plasticized typewritten information card fixed to the back of the each panel door. Information card to indicate the panel designation and location, feeder type and size and locations of any controlling contactors and feeder pullboxes. Include a "letter sized" paper copy of each information card in the project maintenance manual.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.

.2 Mount panelboards to height given in Section 26 05 00 or as indicated.

.3 Connect loads to circuits as indicated.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This Section specifies switches, receptacles, wiring devices, cover plates and their installation.

1.2 PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 330 00 – Submittal Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CSA-C22.2 No.42.1, Cover Plates for Flush Mounted Wiring Devices.
- .3 CSA-C22.2 No.55, Special Use Switches.
- .4 CSA-C22.2 No.111, General Use Snap Switches.

Part 2 Products

2.1 SWITCHES

.1 Heavy duty commercial grade.

.2 20 A, 120 V or 347 V, single pole, double pole, three-way, four-way switches as indicated.

.3 Manually-operated general purpose ac switches as indicated and with following features:

- .1 Terminal holes approved for No.10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine molding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 White toggle (red toggle for emergency power circuits).

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rating capacity of motor loads.

.5 Switches of one manufacturer throughout project.

.6 Standards of acceptance: Specification grade.

2.2 RECEPTACLES – GENERAL

.1 Heavy duty commercial grade.

.2 Duplex receptacles, CSA type L5-15 R, 125 V, 15 A, U ground, with following features:

.1 White nylon molded housing.

.2 Suitable for No.10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and non riveted grounding contacts.

.3 Receptacles of one manufacturer throughout project.

.4 Standards of acceptance: Specification grade.

2.3 RECEPTACLES – PARTICULAR APPLICATION

.1 Ground Fault Interrupter type to be 15 Amp, 125 volt duplex receptacles to be 2 pole, 3 wire hospital grade, white face, parallel blade, U ground, impact resistant nylon face, complete with breaker and reset button. Equal to Specification grade.

.2 All other single outlet and special purpose receptacles to be equal to Specification grade. Confirm ampacity, voltage and pin configuration prior to installation.

2.4 COVER PLATES

.1 Stainless steel: Type 302 or 304, No. 4 finish, 1mm thick, accurately die cut, protective cover for shipping. Outlets in labs or as indicated in the drawings or specifications.

.2 Nylon plates: Heavy duty, unbreakable and flush. All nylon plates to match wiring device colour.

.3 Steel: sheet steel hot dip galvanized with rolled edges for surface mounted utility boxes.

.4 Wall plates to be flush mounting with "positive bow" feature to ensure that all edges of plate are flush with wall or surface box when installed.

.5 All plates to be beveled type with smooth rolled outer edge and smooth face. Exposed sharp edges are not acceptable.

.6 Cast metal: die cast profile, ribbed for strength, flash removed, primed with grey enamel finish and complete with four mounting screws to box for special purpose wiring devices.

.7 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for wiring devices as indicated. Double doors for standard duplex receptacles. Cover plates to fasten to box by four screws.

.8 Gaskets: resilient rubber or close cell foam urethane.

.9 Cover plates for all wiring devices to be from one manufacturer throughout project.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Mount wiring devices to height specified in Section 26 05 00 or as indicated.

.2 All plates to be installed parallel or perpendicular to building lines.

3.2 INSTALLATION PARTICULAR

.1 Switches:

- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.

.2 Receptacles:

- .1 Install all receptacles in the vertical plane unless otherwise noted.
- .2 Generally install the L5-15/20R U ground pin down unless otherwise noted. Neutral up when receptacle in mounted horizontal.
- .3 Install receptacles vertically in gang type outlet box when more than one receptacle is required in one location.
- .4 Where split receptacles has one portion switched, mount vertically and switch the upper portion.
- .5 Ground fault interrupter duplex receptacles to be used, where shown on the drawings.

.3 Cover plates:

- .1 Protect cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies the materials and installation for luminaires for the entire project including exterior lighting fixtures.

.2 Refer to the Luminaire Schedule on the electrical drawings.

1.2 REFERENCES

.1 CAN/CSA C22.1-09, Canadian Electrical Code, Part I.

.2 CAN/CSA C22.2 No.9.0, General Requirements for Luminaires.

1.3 ADDITION OF ACCEPTABLE MANUFACTURERS

.1 See Section 26 05 00 subsection 1.23.7.

1.4 PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit complete photometric and heat dissipation data prepared by independent testing laboratory for proposed luminaires.

1.5 INTENT

.1 Provide lighting fixtures and accessories for all outlets as listed in the Luminaire Schedule and as shown on drawings.

.2 Lighting fixtures shall be structurally well designed and constructed, using new parts and materials of the highest commercial grade available.

.3 Ground all lighting equipment to grounding system.

.4 Verify all ceiling types and finishes before ordering fixtures and provide fixtures suitable for mounting in or on ceilings being installed in each area, as specified. Where fixture types specified are not suitable for ceiling being installed, obtain written instructions from the Consultant before ordering fixtures.

.5 Fixtures of the same or similar type shall be supplied by the same manufacturer.

Part 2 Products

2.1 BALLASTS

.1 All ballasts shall be supplied with a rated voltage matching the supply voltage indicated on the drawings. Ballast output current and voltage shall match the current and voltage ratings of the lamp or lamps they are designed to operate. All ballasts to be built to CSA Standard C22.2 No.74.

.2 Ballasts shall comply with FCC and NEMA limits covering EMI and RFI and shall not interfere with operation of other normal electrical equipment.

.3 Minimum requirements for electronic ballasts:

.1 Sound rating of 'A'.

.2 High frequency operation (25 KHz or higher).

.3 Total harmonic distortion to be less than 10%.

.4 Current crest factor to be less than 1.7.

.5 Rated lamp life shall be maintained.

.6 High power factor of 90% or higher.

.7 High efficiency programmed start ballasts for linear fluorescent lamps.

.8 120 Volt input, or otherwise indicated on the drawings.

.9 Ballast to operate no more than two linear fluorescent lamps.

.10 Ballasts used in exterior luminaires to have minimum starting temperature of -18°C.

.4 Minimum requirements for electromagnetic ballasts:

.1 Current crest factor to be less than 1.7.

.2 Epoxy encased "super quiet" ballast assemblies for all interior fixtures ballast.

.3 Ballasts used in exterior luminaires to have minimum starting temperature of -30°C.

2.2 LUMINAIRES

.1 Accessories and components shall comply with relevant CSA Standards.

.2 All fixture diffusers, lens panels, lens frames, etc., shall be securely and adequately supported and shall be removable without the use of tools for cleaning.

.3 Fixtures shall incorporate adequate gasketting, stops and barriers to form light traps and prevent light leaks.

.4 Fixtures shall be designed for adequate dissipation of ballast and lamp heat to avoid short ballast life, nuisance thermal tripping and decreased lamp output.

.5 Construction of all fixtures shall be such as to provide a rigid well aligned fixture. Formed or ribbed backplates, end plates, reinforcing channel, heavy gauge sockets, straps, etc., shall be used where required to accomplish this.

.6 The construction and performance of all LED fixtures shall be subject to the acceptance of the Consultant. Full photometric data from independent testing laboratory shall be provided when requested by the Electrical Consultant.

Part 3 Execution

3.1 INSTALLATION AND SUPPORTS

.1 Provide complete and proper support for all fixtures, fixture hangers, etc., including headers in ceiling space, where required, for proper support of outlet boxes and fixture hanger assemblies.

.2 Support fixtures as shown on the drawings, level, plumb and true with the structure and other equipment in a horizontal or vertical position as intended. Wall or side bracket mounted fixture housings shall be rigidly installed and adjusted to give a neat flush fit to the surface on which it is mounted.

.3 All hangers, supports, fastenings or accessory fittings shall be protected against corrosion. Care shall be taken during the installation to assure that insulation and corrosion protection is not damaged.

.4 Self aligning seismically rated ball joint hangers shall be used for rod suspended fixtures. Ceiling canopies or hood assemblies intended to cover the suspension attachments shall be installed to fit tightly to the ceiling without restricting the alignment of the hanger. Support fixtures by hangers and mounting arrangements which will not cause the fixture frame, housing, sides or lens frame to be distorted; or prevent complete alignment of several fixtures in a row.

.5 The suspension length of all ceiling mounted suspended types of lighting fixtures as listed in the Luminaire Schedule shall be the overall length from the ceiling to the lowest point of the fixture body, reflector or glassware in its hanging position.

.6 Metal inserts, expansion bolts or toggle bolts in concrete slabs for stems which do not carry wiring must be accurately located in relation to the outlet boxes, to allow perfect alignment and spacing of suspension stems.

.7 Install fixture lenses as late as possible to protect from dirt and dust. Remove and clean or replace lenses to the satisfaction of the Consultant.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m^3.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.3 The designation OPSS refers to Ontario Provincial Standard Specifications.

.4 The designation CCDG refers to "Cahier des charges et devis généraux" from "Ministère des Transports du Québec".

1.2 SCOPE OF WORK

.1 Engineering cut, fill trenching and grading work for :

.1 Sub-grading below slab on grade and paved areas.

.2 Excavating, trenching and backfill for utility services and buried installations.

1.3 SOIL REPORT

.1 Examine soil report in Appendix I.

1.4 REGULATIONS

.1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

.2 Do not begin backfilling or filling operations until material has been approved for use by the Departmental Representative.

.3 No later than 48 hours before backfilling or filling with approved material, notify the Departmental Representative so that compaction tests can be carried out by designated testing agency.

1.5 TESTS AND INSPECTIONS

.1 The Contractor shall retain, at his own cost, the services of an independent and certified testing agency to undertake soil and granular material tests at the following minimum frequencies:

.1 Sieve Analysis prior to commencing and 1 every 200 tonnes on:

.1 All materials referred to in item 2.1 of the Section.

.2 Base and sub-base materials referred to in 2.1 of Section 32 12 16 Asphaltic Paving.

.2 Modified Proctor Analysis on all materials for which density tests are specified below, prior to commencing and 1 for every 200 tonnes.

.3 Density Tests on placed and compacted soils and granular materials, for which the results are to be expressed as a percentage of Modified Proctor Density, as follows:

.1 Stripped and compacted subgrade: Density tests at 1 per 500m2 or part thereof.

.2 Compacted fill below paved areas: Density tests at 1 per 500 m2 or part thereof.

.3 Base and Sub-base granular: Density tests at 1 per 500 m2 or part thereof.

.4 Compacted trench backfill (up to 1.5 m depth): Density tests at 1 per 30 lin. m or part thereof, juts below pavement subgrade.

.5 Compacted trench backfill (exceeding 1.5 m depth): Density tests at 2 per 30 lin. m or part thereof, one at half height and one just below pavement grade.

.4 The Contractor shall cooperate with the Departmental Representative in the selection of test samples. Copies of the test results shall be forwarded to Departmental Representative.

.5 The Contractor is responsible for ensuring all materials meet specifications. Where initial tests fail and subsequent testing is deemed necessary by the Departmental Representative, the cost of the subsequent testing will be the responsibility of the Contractor.

.6 In addition to sample testing, the Contractor will undertake proof rolling of subgrade, subbase and base granular surfaces as required and in the presence of the Departmental Representative and/or the Geotechnical Consultant, for which a minimum of 48 hours notice shall be provided by the Contractor.

1.6 BURIED SERVICES

.1 Before commencing work verify the location of all buried services on and adjacent to the site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations and elsewhere as shown on drawings or where in conflict with the permanent works. Cap cut-offs.

1.7 PROTECTION

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction.

.5 Protect buried services that are required to remain undisturbed.

.6 Repair at Contractor's own cost damage to existing structures or services resulting from the Contractor's failure to locate and protect.

.7 Avoid mixing excavated materials.

Part 2 Products

2.1 MATERIALS

.1 Imported granular material to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM test procedure C-88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

.2 Imported crushed granular material when tested according to ASTM C-136 and ASTM C-117, or latest revised issue, to have a generally uniform gradation, conform to following sieve grading and have one or more fractured faces. Determination of the Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

.3 Native material to be any workable soil free of organic or foreign matter; any material obtained within limits of Contract may be deemed native material for purposes of payment if it is approved by the Departmental Representative. Native material is not acceptable if it is impracticable to control its water content or compact to specified density.

.4 Granular Pipe Bedding and Surround Material: Crushed or graded gravels: to conform to following gradation:

Percent Passing

Sieve Designation	Type 1*
25.0mm	100
19.0mm	90 - 100
12.5mm	65 - 85
09.5mm	50 - 75
4.75mm	25 - 50
2.36mm	10 - 35
1.18mm	6 - 26
0.600mm	3 - 17
0.075mm	0 - 5

.5 Below Paved areas trench backfill and general fill should consist of imported 75 mm minus sand or gravel with less than five percent fines)particles passing the 75 µm diameter sieve), be substantially free of clay lumps, free of organic matter and other extraneous material and meet the graduation requirements below:

Sieve Designation	Pit run gravel Percent Passing
75.0mm	100
50.0mm	70 - 100
25.0mm	50 - 100
4.75mm	22 - 100
2.36mm	10 - 85
0.075mm	2 - 8

.6 Approved native material used as trench backfill below unpaved areas is to be free of organic and foreign matter. Native material is not acceptable if it is impracticable to control its water content or compact to the specified density.

Part 3 Execution

3.1 SITE PREPARATION

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

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

3.2 EXCAVATION

.1 Excavate as required to carry out work, in all materials met. Do not disturb soil or rock below bearing surfaces. Notify Departmental Representative when excavations are complete. If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.

.2 Temporary excavations for service trenches and building areas deeper than 1.2m requiring worker entry should be sloped/shored in accordance with Workers' Compensation Board regulations, or as directed on site by a qualified professional engineer. Flatter cut slope inclinations may be required if heavy

groundwater seepage is encountered or if the temporary excavations will be open during periods of high precipitation.

.3 Dewatering may be required, especially if the excavation is carried out during wet weather. The contractor should protect open excavations against flooding and damage from surface runoff. Select dewatering methods based on site conditions and construction techniques, disposing of water in accordance with Environmental procedures via flocculation tanks, settling basins or other treatment facilities to remove suspended solids or other contaminants before discharging to storm sewers. Avoid discharge to permanent existing or proposed soakaways without written approval of the Departmental Representative.

.4 Excavate trenches to provide uniform continuous bearing and support for 100 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 300 mm above pipe not to exceed diameter of pipe plus 600 mm.

.5 Excavate for slabs and paving to subgrade levels. In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

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

.7 Keep excavated and stockpiled materials a safe distance away from edge of trench. Restrict vehicle operations directly adjacent to open trenches.

.8 Avoid mixing different excavated subsoils.

3.3 BACKFILLING

.1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Departmental Representative.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with selected gravel and sand compacted as specified for fill.

.5 Placing:

.1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.

.2 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.

.6 Compaction: compact each layer of material to following densities for material to ASTM D698:

.1 To underside of base courses: 95%.

.2 Base courses: 100%.

.3 Elsewhere: 90%.

.7 In trenches:

.1 Up to 300 mm above pipe or conduit: sand placed by hand.

.2 Over 300 mm above pipe or conduit: native material approved by Departmental Representative.

.8 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.4 GRADING

.1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative. Grade to be gradual between finished spot elevations shown on drawings.

.2 Proof roll exposed sub-grade. Excavate soft spots encountered and backfill with permitted materials in maximum 150mm lifts with compaction to specified density.

.3 Before placing fill in areas requiring fill, scarify surface to depth of 150mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.4 In areas requiring fill, raise elevations in permitted materials in maximum 150mm lifts with compaction to specified density.

.5 Employ the preceding operations to achieve rough grading to design elevations allowing for depth of pavement structure, or other surface treatment as indicated. Grade slopes to be consistent and smooth between finished spot elevations shown on drawings. Tolerance on sub-grade elevations is within 30mm of design elevations but not uniformly high or low.

.6 Slope rough grade away from building at 2% minimum (unless indicated otherwise).

3.5 RESTORATION – GENERAL

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

.2 Reinstate pavement areas in layers, materials, densities and to lines and elevations which existed before excavation, in all cases providing smooth

transition to adjacent paved areas.

.3 Clean all affected surfaces.

3.6 SHORTAGE AND SURPLUS

.1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.

.2 Dispose of surplus material off site.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-In-Place Concrete.

1.2 GENERAL

.1 Unless modified herein, all materials, execution and workmanship to conform to the requirements of Sections 32 11 16.1, 32 11 23 and 32 12 16 of the Master Municipal Specification, published by the Master Municipal Construction Documents Association Platinum Edition, Volume II.

1.3 LOCATION AND LAYOUT

.1 Establish and maintain all pertinent lines and levels required for the accurate completion of the work to grades and dimensions indicated on the drawings.

1.4 PROTECTION

.1 Protect the work of other trades from damage due to the work of this Section.

2 Products

2.1 MATERIALS

.1 Base Course: Crushed Rock; 19 mm minus crushed gravel graded to the following limits:

Screen size	% Passing
19.00 mm	100
9.50 mm	60 – 95
4.75 mm	40 – 70
2.36 mm	30 – 60
1.18 mm	20 – 45
0.50 mm	8 – 2
0.07 mm	2 – 9

.2 Sub-Base Course: 75 mm maximum clean sand and gravel.

.3 Minimum thickness of gravel bases compacted to minimum 95% percent of their ASTM D1557 Modified Proctor maximum dry densities within 2% of their optimum moisture contents:

.1 Asphalt areas: match existing sub-base, base and asphalt layers.

.4 Mix: Asphalt concrete to driveways and parking to be mix of crushed rock or gravel free from clay, silt and organic matter to the screen sizes of the Master Municipal Specification.

.1 Asphalt cement content between 5.7 and 6.7 % by mass of total mix.

Minimum Marshall Stability	3336N @ 60°C
Flow Index	8
Air Voids	2 to 5
Voids in Mineral Aggregate	15
Voids filled	80

.5 Tack coat emulsion to be type RS-1 applied at a maximum rate of 2.25 L per square metre.

3 Execution

3.1 PREPARATION

.1 When excavation is necessary up to adjoining asphalt, cut a clean straight line by diamond saw cutting or by compressor or by use of a cutting wheel attachment on a back-hoe bucket.

.2 Do not use a back-hoe bucket or excavator for cutting asphalt.

.3 Sweep clean pavement surface when paving over existing asphalt surface. Power wash existing asphalt and allow to dry prior to placing topping.

.4 When leveling course is not required, patch and correct depressions and other irregularities prior to paving operations.

.5 Fill soft spots or depressions in subgrade with compacted gravel, maximum size 19 mm, prior to laying gravel base.

.6 Power wash areas scheduled to receive asphalt topping. Dry thoroughly prior to application of tack coat emulsion and asphalt topping.

3.2 EQUIPMENT

.1 Pavers: Mechanical (grade controlled) self-powered capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

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

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

.1 Boxes with tight bottoms.

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

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

.4 Trucks that cannot be weighed in a single operation on scales supplied will not be accepted.

.4 Hand Tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having a mass not less than 12 kg and a bearing area not exceeding 310 cm2 for compacting material along curbs, gutters and other structures inaccessible to roller.

.3 Straight edges, 3 m in length, to test finished surfaces.

3.3 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with light oil, limewater, soap or detergent solution at least once a day or as required. Elevate truck bed and thoroughly drain. Do not allow excess solution to accumulate.

.3 Deliver material to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.

.4 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at a temperature within range of 135°C to 163°C but not less than 135°C.

3.4 WORKMANSHIP

.1 Construct base course over prepared sub-grade with crushed rock specified. Spread material evenly and compact to minimum 100% of Standard Proctor Maximum Dry Density according to ASTM D698. Base course to be at least 150 mm compacted depth at vehicular areas. Sub-base course to be at least 300 mm compacted thickness.

.2 Proof roll sub-base with heavy vibratory roller to detect soft or loose spots. Over excavate any soft or loose spots and replace with sand and gravel sub-base coarse material compacted as specified.

.3 Construct asphalt concrete specified, placed with a power driven paving machine over dry, compacted base. Hand laying may be used in areas too small for paving machine. Thoroughly and uniformly compact asphalt concrete. Grades and slopes to conform to those indicated on the drawings. Provide minimum slope of 1%.

.4 Asphaltic concrete to be one layer of minimum compacted depth of 75 mm.

.5 Placing Mix:

.1 Lay with a power-driven paving machine when size of the area permits the use of such equipment.

.2 Compact course with steel wheeled rollers that develop a pressure on the rear wheel of not less than 90 kg per 25 mm over a minimum roller width of 500 mm.

.3 Compact asphalt paving to minimum 98% of a blow marshal mix design.

.6 Do not lay asphalt concrete when granular base is wet or temperature is below 7 °C.

.7 Paint edges of concrete slabs and curbs with quick setting asphalt emulsion before placing asphalt concrete.

.8 Level the asphaltic course prior to compacting.

.9 Finished surface area to be free from roller marks, pockets, humps and granular rough areas.

.10 Finished surface to conform to the grade as indicated or to existing grades in the case of resurfacing and drain freely and completely.

.11 Finished surface when tested with a 3 m straight edge is not to have any ordinates exceeding 6 mm when measured from the face of the straight edge to the surface.

.12 Protect finished asphalt paving from traffic until line painting is completed.

.13 Install precast concrete wheel stop curb on new concrete slab to act as wheel stops where indicated. Drill concrete slab for dowel anchors. Recess anchors flush to top of precast concrete curb.

3.5 CLEAN UP

.1 Remove any excess or waste material created by the work of this Section.

END OF SECTION

Geotechnical Report

Geotechnical Exploration Report (Revision 1)

Prepared By: Braun Geotechnical Ltd.
Date: December 10, 2015
File: 15-6516

Foundations, Excavation & Shoring Specialists

December 10, 2015 (Rev.1)

Our File: 15-6516

Via email: gdowling@dgbk.com

DGBK Architecture
950 – 1500 West Georgia Street
Vancouver, BC V6G 2Z6

Attention: Greg Dowling

Re: Geotechnical Exploration Report
Addition of Freezer at Matsqui Institution
33344 King Road, Abbotsford, BC

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Professional Engineers and Geoscientists of BC MEMBER

1.0 INTRODUCTION

As requested, Braun Geotechnical Ltd. carried out a geotechnical exploration for the above referenced site on August 25 & 27, 2015. The geotechnical work has been performed in general accordance with the terms and conditions of Braun's Proposal dated July 21, 2015 (our ref. P15-4642).

The geotechnical scope of work included a review of site geology, historical airphoto review, onsite exploration and the provision of geotechnical comments and recommendations for site preparation ad foundation design. The scope of services was limited to the evaluation of geotechnical characteristics of the site and no consideration has been given to any environmental contamination issues.

Should changes be made to the proposed layout or general nature of the project, Braun Geotechnical should be notified to review and modify the recommendations to reflect those changes, as appropriate.

Prior to construction Braun Geotechnical should be provided the opportunity to review architectural, mechanical, structural, and civil drawings for geotechnical considerations.

2.0 SITE DESCRIPTION AND BACKGROUND INFORMATION

The subject site is located at 33344 King Road within Matsqui Institution in Abbotsford, BC. The proposed freezer addition is to be located at the regional supply depot service buildings to the east of the Fraser Valley Institution.

Geotechnical exploration data from previous site deep drilling efforts at the Matsqui Institution was provided for review, and included:

- Golder Associates Ltd. Geotechnical Report (Draft), dated January 20, 2012
- Stantec Consulting Ltd. Geotechnical Report, dated December 1, 2011
- Klohn Crippen Berger Soil Logs, dated November 02 and 29, 2010

Factual subsurface information presented on the soil logs attached to the reports was reviewed and soil logs from the selected reports are attached for reference.

The exploration by others generally encountered subsurface conditions consistent with in-house and published geological information.

We note that differing findings with respect to the Site Class (BCBC 2012) were reached by Golder (Site Class D) and Stantec (Site Class C). The Golder exploration program was carried out to a limited depth ranging approximately 4.5 to 5.5m using preliminary in-situ testing methods (Dynamic Cone Penetration Testing) and presented as a draft report. The Stantec and Klohn exploration was carried out to depths ranging approximately 12 to 14m using Becker Hammer method and included closed-end Becker Penetration Testing (BPT) with bounce chamber pressures measured for use in SPT correlation. As such, the Stantec and Klohn site exploration data are considered a more detailed site evaluation.

3.0 GEOTECHNICAL EXPLORATION

Two test pits (TP15-01 and -02) and two hand pits (HP15-01 and -02) were excavated within accessible portions of the subject sites on August 25 & 27, 2015, using hand shovel and a tracked excavator under subcontract to Braun Geotechnical. TP15-01 and -02 were excavated to depths of 1.7 and 2.3m respectively and HP15-01 and -02 were excavated to depths of 1.7 and 0.9 respectively. The soil conditions were logged in the field by a representative from Braun Geotechnical and representative soil samples were returned for further classification. Approximate test pit locations are shown on the attached plan (Dwg. 15-6516-01 and -02). As shown on the location plans, TP15-02 was excavated at the regional supply depot adjacent to the existing freezer.

Soil conditions were logged in the field by a representative from Braun Geotechnical and representative soil samples were returned for routine geotechnical laboratory moisture content testing and further visual classification purposes.

4.0 SOIL AND GROUNDWATER CONDITIONS

Based on a review of available published and in-house geological information indicated that the Matsqui Institution study site area is underlain by Eolian deposits comprising windblown sand, silt and silt loam 1 to 8m thick, and/ or Sumas Drift comprising recessional and/ or advance glaciofluvial gravel and sand up to 40m thick.

The results of the geotechnical exploration were considered to be consistent with the published information. Please refer to the enclosed test pit and hand pit logs for detailed subsurface conditions encountered at the test location. A general subsoil profile based on the test pit and hand pit information is provided below.

TOPSOIL/ FILL

Brown, damp, firm SILT with some sand, trace organics and trace rootlets were encountered within TP15-02 to a depth of 0.3m and is underlain by brown, damp, compact, silty SAND to a depth of 1.1m.

SAND

Grey, damp, compact SAND with some gravel, trace silt and occasional cobbles was encountered below to depth of excavation at 2.3m.

GROUNDWATER:

Semi-static groundwater levels or seepage flows were not encountered at time of drilling at each test location. In general, groundwater levels are expected to fluctuate seasonally and with drainage conditions.

The subsurface conditions described above were encountered at the test pit locations only. Subsurface conditions at other locations could vary.

5.0 DISCUSSION AND RECOMMENDATION

5.1 General

It is considered that the proposed freezer can be supported on the underlying natural soils and/ or on structural fills placed thereon.

The following sections provide our geotechnical recommendations for site preparation and foundation design.

5.2 Site Preparation

5.2.1 Stripping

General site stripping below the proposed building should include removal of any existing surficial vegetation and organic rich material to expose existing sand. Final trimming should be carried out using an excavator equipped with a smooth bucket. Based on observed conditions, the depth of stripping for removal of unsuitable materials below the proposed freezer is expected to be nominal in the order of 0.3m or less.

Granular sand subgrade areas should be compacted using a heavy drum roller to at least 95% Modified Proctor Density (MPD), and re-compaction of the exposed subgrade should be reviewed by Braun Geotechnical. Soft spots that cannot be re-compacted should be sub-excavated and replaced with suitable structural fill. Drainage measures should be implemented to reduce potential for water ponding on exposed subgrades.

5.2.2 Structural Fill

Structural fills placed below proposed building footings and parking areas should consist of clean, free draining well graded sand / sand and gravel or equivalent with less than 5% fines (percent passing the #200 sieve). Structural fill should be placed and compacted in maximum 1 ft (300 mm) loose lifts with each lift compacted to at least 95% Modified Proctor Density (MPD). Structural fills placed under foundations should typically extend beyond the edges of the foundations a distance equal to the thickness of confined structural fill.

Re-use of excavated site soils as structural fill would be subject to review and acceptance of the material and site conditions by Braun Geotechnical. However, it is anticipated that selected site sand / sand & gravel would be suitable for re-use as structural fill.

Density testing during site fill placement should be carried out on a regular basis to confirm adequacy of compaction, and the results forwarded to Braun Geotechnical for review. Braun Geotechnical should also be contacted to review fill quality, and placement and compaction procedures.

5.3 Foundation Design

Conventional shallow strip and spread foundation support is considered feasible on natural soils or structural fills placed thereon. The following soil resistance (bearing) values may be adopted for foundation design:

Foundation Subgrade	Limit States Design		Working Stress Design
	Factored Ultimate Bearing Resistance (ULS)	Serviceability Limit State (SLS)	Allowable Bearing Pressure DL + LL
Compacted Natural or Structural Fills placed thereon	225 kPa (~4,500 psf)	150 kPa (~3,100 psf)	150 kPa (~3,100 psf)

The above design bearing pressures for soil subgrade assume the following:

- Strip and pad footings have minimum widths of 18" (460mm) and 24" (600mm), respectively.
- Site preparation is completed as indicated above and load-bearing surfaces are reviewed and approved by the Geotechnical Engineer.
- Foundation bearing surfaces are no higher than 1H:1V (Horizontal to Vertical) from the base or toe of adjacent walls, sumps, or buried structures such as utility lines, etc.
- Footings are placed below a 2H:1V line projected up from lower footings.
- Perimeter footings are founded at least 18" (460mm) below final finished adjacent grade for frost protection. Interior footings should be founded at least 12" (300mm) below finished adjacent grade for confinement.

5.4 Seismic Considerations

The current 2012 BC Building Code classifies a site as Site Class C where the subgrade soils in the upper 30m consist of "very dense soil and soft rock" with average SPT N values more than 50, and average undrained shear strength (Su) greater than 100kPa. Based on findings of the Geotechnical Exploration and available Becker Hammer results by Stantec and DCPT results by Klohn, Site Class C is considered appropriate for the study site.

The subgrade soil conditions are not considered susceptible to seismically induced liquefaction.

5.5 Slab on Grade

Slab on grade areas should be underlain by a drainage layer comprising a minimum 100mm (4") thick layer of well-compacted clean sand & gravel (less than 5% passing No. 200 sieve). Polyethylene sheeting should typically be provided beneath the floor slab to reduce potential for slab dampness within office areas and/or as required by others.

Compaction testing should be carried out on any new underslab fills to confirm that fills placed below the building has been compacted to at least 95% MPD.

Prior to placement of any grade restoration fills, the subgrade should be reviewed by the geotechnical consultant. Existing granular slab subgrade areas should be re-compacted under review by Braun Geotechnical. Any 'Soft' spots identified during the review should be excavated and replaced with structural fill.

5.6 Perimeter Drains

If the finished floor grade is at least 200mm higher than the adjacent exterior grade, it is considered that perimeter drains are not required. If this cannot be achieved, a perimeter footing drain system should be installed. The perimeter drain should consist of a 150mm diameter perforated PVC pipe placed at least 300mm below the top of floor slab at or above the bottom of foundation. The drain should be surrounded by a minimum 100mm thickness of 20mm clear crushed gravel. A 75mm thickness of birdseye gravel or filter fabric should be placed around the clear crushed gravel to act as a filter.

6.0 GEOTECHNICAL FIELD REVIEW

Geotechnical field reviews are required by the Geotechnical Engineer of Record and to satisfy the requirements of the Letters of Professional Assurance required for the Building Permits. Field reviews are essential to ensure that the recommendations of the geotechnical report are understood and followed.

Geotechnical field reviews will be needed to address the following:

- Review stripping unsuitable materials below the building footprint and pavement areas;
- Review and density testing of structural fill placed below building areas;
- Confirm suitability of exposed footing subgrade;
- Review and density testing of existing sand and structural fill;

7.0 CLOSURE

This report is prepared for the exclusive use of DGBK Architecture and their designated representatives and may not be used by other parties without the written permission of Braun Geotechnical. The City Abbotsford and Public Works and Government Services Canada (PWGSC) may also rely on the findings of the Geotechnical Report.

If the development plans change, or if during construction soil conditions are noted to be different from those described in this report, Braun Geotechnical should be notified immediately in order that the geotechnical recommendations can be confirmed or modified, if required. Further, this report assumes that field reviews will be completed by Braun Geotechnical during construction.

The site contractor should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions.

This report should not be included in the specifications without suitable qualifications approved by the geotechnical engineer. The report should be considered preliminary and subject to review and revision as required for final project design and construction.

The use of this report is subject to the conditions on the Report Interpretation and Limitations, sheet which is included with the report. The reader's attention is drawn specifically to those conditions, as it is considered essential that they be followed for proper use and interpretation of this report.

We hope the above meets with your requirements. Should any questions arise, please do not hesitate to contact the undersigned.

Yours truly,

Braun Geotechnical Ltd.

Euraj N Vivekanandan, EIT.
Geotechnical Engineer

Braun Geotechnical Ltd.

James Wetherill, P.Eng.
Geotechnical Engineer

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J.F. WETHERILL
19963
Dec 21/15

Encl: Report Interpretation and Limitations
Test Pit and Hand Pit Location Plan
Test Pit and Hand Pit Logs
Test Hole Information (by others)

REPORT INTERPRETATION AND LIMITATIONS

1. STANDARD OF CARE

Braun Geotechnical Ltd. (Braun) has prepared this report in a manner consistent with generally accepted engineering consulting practices in this area, subject to the time and physical constraints applicable. No other warranty, expressed or implied, is made.

2. COMPLETENESS OF THIS REPORT

This Report represents a summary of paper, electronic and other documents, records, data and files and is not intended to stand alone without reference to the instructions given to Braun by the Client, communications between Braun and the Client, and/or to any other reports, writings, proposals or documents prepared by Braun for the Client relating to the specific site described herein.

This report is intended to be used and quoted in its entirety. Any references to this report must include the whole of the report and any appendices or supporting material. Braun cannot be responsible for use by any party of portions of this report without reference to the entire report.

3. BASIS OF THIS REPORT

This report has been prepared for the specific site, development, design objective, and purpose described to Braun by the Client or the Client's Representatives or Consultants. The applicability and reliability of any of the factual data, findings, recommendations or opinions expressed in this document pertain to a specific project at described in this report and are not applicable to any other project or site, and are valid only to the extent that there has been no material alteration to or variation from any of the descriptions provided to Braun. Braun cannot be responsible for use of this report, or portions thereof, unless we were specifically requested by the Client to review and revise the Report in light of any alterations or variations to the project description provided by the Client.

If the project does not commence within 18 months of the report date, the report may become invalid and further review may be required.

The recommendations of this report should only be used for design. The extent of exploration including number of test pits or test holes necessary to thoroughly investigate the site for conditions that may affect construction costs will generally be greater than that required for design purposes. Contractors should rely upon their own explorations and interpretation of the factual data provided for costing purposes, equipment requirements, construction techniques, or to establish project schedule.

The information provided in this report is based on limited exploration, for a specific project scope. Braun cannot accept responsibility for independent conclusions, interpretations, interpolations or decisions by the Client or others based on information contained in this Report. This restriction of liability includes decisions made to purchase or sell land.

4. USE OF THIS REPORT

The contents of this report, including plans, data, drawings and all other documents including electronic and hard copies remain the copyright property of Braun Geotechnical Ltd. However, we will consider any reasonable request by the Client to approve the use of this report by other parties as "Approved Users." With regard to the duplication and distribution of this Report or its contents, we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of this Report by those parties. The Client and "Approved Users" may not give, lend, sell or otherwise make this Report or any portion thereof available to any other party without express written permission from Braun. Any use which a third party makes of this Report – in its entirety or portions thereof – is the sole responsibility of such third parties. BRAUN GEOTECHNICAL LTD. ACCEPTS NO RESPONSIBILITY FOR DAMAGES SUFFERED BY ANY PARTY RESULTING FROM THE UNAUTHORIZED USE OF THIS REPORT.

Electronic media is susceptible to unauthorized modification or unintended alteration, and the Client should not rely on electronic versions of reports or other documents. All documents should be obtained directly from Braun.

5. INTERPRETATION OF THIS REPORT

Classification and identification of soils and rock and other geological units, including groundwater conditions have been based on exploration(s) performed in accordance with the standards set out in Paragraph 1. These tasks are judgemental in nature; despite comprehensive sampling and testing programs properly performed by experienced personnel with the appropriate equipment, some conditions may elude detection. As such, all explorations involve an inherent risk that some conditions will not be detected.

Further, all documents or records summarizing such exploration will be based on assumptions of what exists between the actual points sampled at the time of the site exploration. Actual conditions may vary

significantly between the points investigated and all persons making use of such documents or records should be aware of and accept this risk.
The Client and "Approved Users" accept that subsurface conditions may change with time and this report only represents the soil conditions encountered at the time of exploration and/or review. Soil and ground water conditions may change due to construction activity on the site or on adjacent sites, and also from other causes, including climactic conditions.
The exploration and review provided in this report were for geotechnical purposes only. Environmental aspects of soil and groundwater have not been included in the exploration or review, or addressed in any other way.
The exploration and Report is based on information provided by the Client or the Client's Consultants, and conditions observed at the time of our site reconnaissance or exploration. Braun has relied in good faith upon all information provided. Accordingly, Braun cannot accept responsibility for inaccuracies, misstatements, omissions, or deficiencies in this Report resulting from misstatements, omissions, misrepresentations or fraudulent acts of persons or sources providing this information.

6. DESIGN AND CONSTRUCTION REVIEW

This report assumes that Braun will be retained to work and coordinate design and construction with other Design Professionals and the Contractor. Further, it is assumed that Braun will be retained to provide field reviews during construction to confirm adherence to building code guidelines and generally accepted engineering practices, and the recommendations provided in this report. Field services recommended for the project represent the minimum necessary to confirm that the work is being carried out in general conformance with Braun's recommendations and generally accepted engineering standards. It is the Client's or the Client's Contractor's responsibility to provide timely notice to Braun to carry out site reviews. The Client acknowledges that unsatisfactory or unsafe conditions may be missed by intermittent site reviews by Braun. Accordingly, it is the Client's or Client's Contractor's responsibility to inform Braun of any such conditions.
Work that is covered prior to review by Braun may have to be re-exposed at considerable cost to the Client. Review of all Geotechnical aspects of the project are required for submittal of unconditional Letters of Assurance to regulatory authorities. The site reviews are not carried out for the benefit of the Contractor(s) and therefore do not in any way effect the Contractor(s) obligations to perform under the terms of his/her Contract.

7. SAMPLE DISPOSAL

Braun will dispose of all samples 3 months after issuance of this report, or after a longer period of time at the Client's expense if requested by the Client. All contaminated samples remain the property of the Client and it will be the Client's responsibility to dispose of them properly.

8. SUBCONSULTANTS AND CONTRACTORS

Engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which Braun Geotechnical Ltd. does not provide. These services are arranged as a convenience to our Clients, for the Client's benefit. Accordingly, the Client agrees to hold the Company harmless and to indemnify and defend Braun Geotechnical Ltd. from and against all claims arising through such Subconsultants or Contractors as though the Client had retained those services directly. This includes responsibility for payment of services rendered and the pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. These conditions apply to specialized subconsultants and the use of drilling, excavation and laboratory testing services, and any other Subconsultant or Contractor.

9. SITE SAFETY

Braun Geotechnical Ltd. assumes responsibility for site safety solely for the activities of our employees on the jobsite. The Client or any Contractors on the site will be responsible for their own personnel. The Client or his representatives, Contractors or others retain control of the site. It is the Client's or the Client's Contractors responsibility to inform Braun of conditions pertaining to the safety and security of the site – hazardous or otherwise – of which the Client or Contractor is aware.
Exploration or construction activities could uncover previously unknown hazardous conditions, materials, or substances that may result in the necessity to undertake emergency procedures to protect workers, the public or the environment. Additional work may be required that is outside of any previously established budget(s). The Client agrees to reimburse Braun for fees and expenses resulting from such discoveries. The Client acknowledges that some discoveries require that certain regulatory bodies be informed. The Client agrees that notification to such bodies by Braun Geotechnical Ltd. will not be a cause for either action or dispute.

BRAUN TECHNICAL LTD.

Client: DGBK Architecture				Title: LOCATION PLAN		
Project: Proposed Freezer Addition, Matsqui Institution, Abbotsford						
Project no.: 15-6516	Drawn: EV	Design: HD	Checked: JW	Date: September 15, 2015	Scale: 1:1000	Draw

Test Pit Log: TP15-02

File: 15-6516
Project: Proposed Freezer Addition
Client: DGBK Architecture
Location: Matsqui Instituition, Abbotsford

BRAUN GEOTECHNICAL LTD.

Depth (ft)	Depth (m)	Thickness (mm)	Sample	Soil Description	Sample #	Water Cont.	Remarks
0	0			brown, damp, firm SILT, some sand, trace organics, trace rootlets (TOPSOIL)			
1				brown, damp, compact, silty SAND			
2			○		S1		
3	1						
4				grey, damp, compact SAND, trace to some gravel, trace silt, occasional cobbles/ boulders			
5			○		S2		
6							
7	2		○		S3		
8				End of Test Pit @ 2.3m			
9							
10	3						

Equipment: Tracked Compact Excavator
Sampling Method: Lump Sample

Datum: Ground Surface
Water Depth: Not Encountered

Logged By: EV
Exploration Date: August 25, 2015
Dwg No.: 15-6516-TP02
Page: 1 of 1

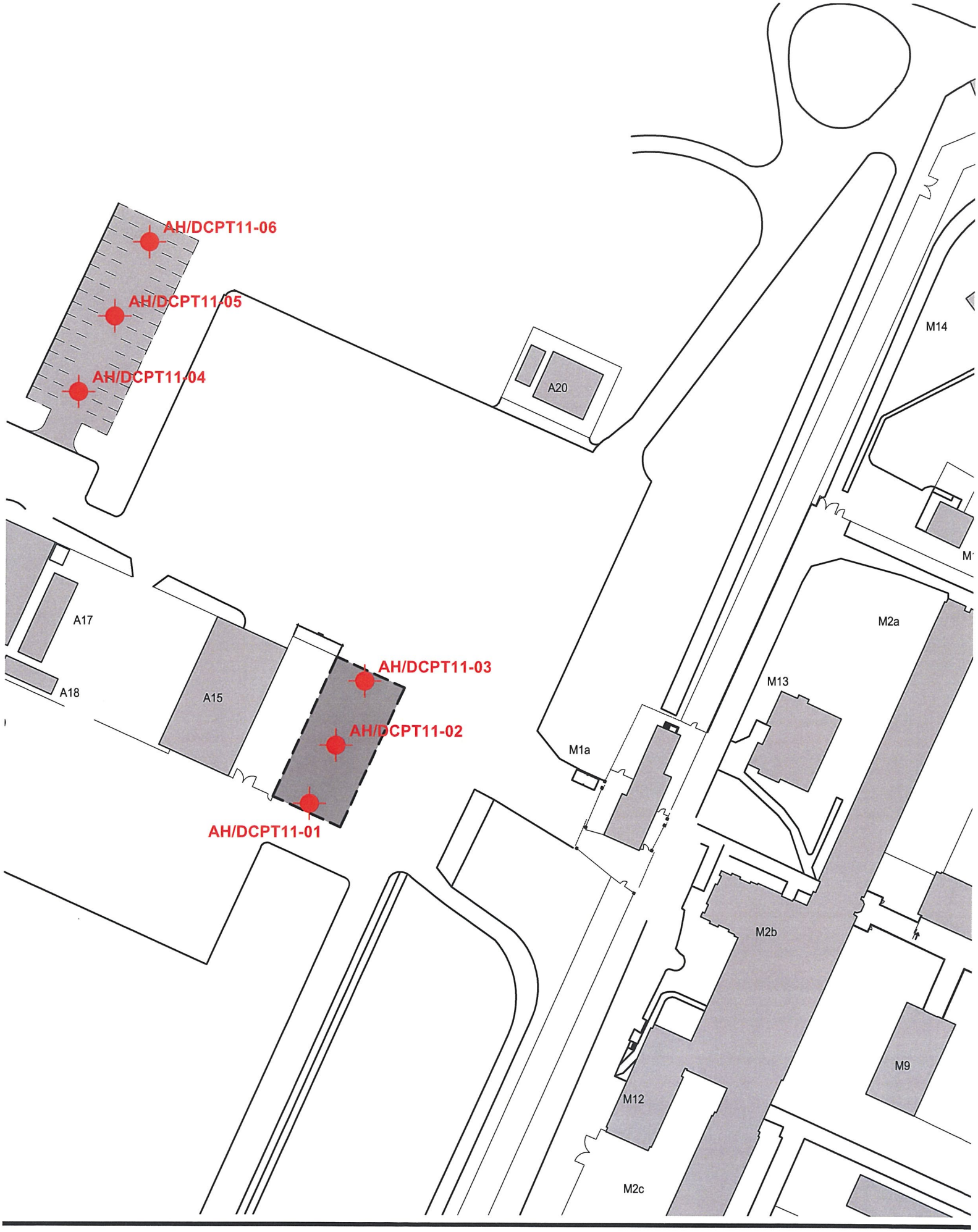
APPENDIX A

GOLDER ASSOCIATES LTD.

SOIL LOGS

NOVEMBER 28, 2011

BRAUN GEOTECHNICAL LTD.


AH/DCPT11-06
AH/DCPT11-05
AH/DCPT11-04
AH/DCPT11-03
AH/DCPT11-02
AH/DCPT11-01
A20
A17
A18
A15
M1a
M13
M2a
M14
M2b
M9
M12
M2c

PROJECT No.: 11-1447-0264/2030

RECORD OF AUGERHOLE: AH/DCPT11-01

SHEET 1 OF 1

LOCATION: See Figure 2.
N: ~5430578 E: ~550821
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: November 28, 2011
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
0	Track Mounted Auger Drill; Solid Stem Auger	Ground Surface					
		Firm, moist, brown CLAYEY SILT, trace sand and gravel. [FILL]		0.00	1	AS	
1							
2		Compact to dense, moist, grey SAND, trace to some gravel, trace silt with possible cobbles.		1.52	2	AS	
3							
4					3	AS	
5		End of Augerhole.		4.88			
6							
7							
8							
9							
10							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20, 40, 60, 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; NP - Non-Plastic; 10, 20, 30, 40

End of Dynamic Cone Penetration Test.

ADDITIONAL LAB. TESTING: M

PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION: No Groundwater Seepage Encountered in Open Hole.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AN
CHECKED: DEN

DRAFT

PROJECT No.: 11-1447-0264/2030

RECORD OF AUGERHOLE: AH/DCPT11-02

SHEET 1 OF 1

LOCATION: See Figure 2.
N: ~5430583 E: ~550807
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DATUM: Local

DRILLING DATE: November 28, 2011
DRILLING CONTRACTOR: Downrite Drilling Ltd.

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface									
0	Track Mounted Auger Drill / Solid Stem Auger	Soft to firm, moist, brown CLAYEY SILT, trace sand and gravel.		0.00	1	AS					
1		Loose to compact, moist, grey SAND, trace silt and gravel.		0.76	2	AS				M	No Groundwater Seepage Encountered in Open Hole.
2		Compact to dense, moist, grey SAND, some gravel to gravelly, trace silt.		1.60	3	AS				M	
3					4	AS					
4		End of Augerhole.		3.96					End of Dynamic Cone Penetration Test.		
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AN
CHECKED: DEN

DRAFT

File:N\ACTIVE\YEAR.2011\1447\11-1447-0264 (PWGSC - GEOTECH SERVICES - VARIOUS)\GINT DATABASE\11-1447-0264 (2030).GPJ Output Form:BC_BOREHOLE (AUTO) Template:BC REGION TEMPLATE BETA 1.6DT Library:BC REGION LIBRARY.GLB CRMSmith 01/20/12

PROJECT No.: 11-1447-0264/2030

RECORD OF AUGERHOLE: AH/DCPT11-03

SHEET 1 OF 1

LOCATION: See Figure 2.
N: ~5430586 E: ~550794
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: November 28, 2011
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
0	Track Mounted Auger Drill / Solid Stem Auger	Ground Surface					
		Loose to compact, moist, brown SILT, some sand and gravel. [possible FILL]		0.00	1	AS	
1		Compact, moist, grey SAND and GRAVEL. trace silt.		0.91	2	AS	
2		Compact to dense, moist, grey SAND, trace to some gravel, trace silt.		1.52	3	AS	
3		End of Augerhole.		3.05			
4							
5							
6							
7							
8							
9							
10							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20, 40, 60, 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● / rem V. ⊕ U - ○: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; NP - Non-Plastic: 10, 20, 30, 40

145

End of Dynamic Cone Penetration Test.

ADDITIONAL LAB. TESTING: M

PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION

Soil Cuttings.

No Groundwater Seepage Encountered in Open Hole.

Screen
Filter Sand

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AN
CHECKED: DEN

DRAFT

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PROJECT No.: 11-1447-0264/2030

RECORD OF AUGERHOLE: AH/DCPT11-04

SHEET 1 OF 1

LOCATION: See Figure 2.
N: ~5430530 E: ~550753
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: November 28, 2011
DRILLING CONTRACTOR: Downite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
0	Track Mounted Auger Drill; Solid Stem Auger	Ground Surface					
		Firm, moist, brown CLAYEY SILT, trace fine sand, gravel and organics (wood/roots). [FILL]		0.00	1	AS	
1		Compact, moist, grey, gravelly SAND to SAND and GRAVEL, trace silt. [possible FILL]		0.76	2	AS	
2		Compact, moist, grey SAND and GRAVEL, trace silt.		1.52	3	AS	
3		No recovery. Possible Cobbles.		3.05			
4		End of Augerhole.		3.96			
5							
6							
7							
8							
9							
10							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80)

SHEAR STRENGTH Cu, kPa (20, 40, 60, 80) — nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3})

WATER CONTENT PERCENT (10, 20, 30, 40) — Wp, W, Wl

NP - Non-Plastic

End of Dynamic Cone Penetration Test.

ADDITIONAL LAB. TESTING

PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION

No Groundwater Seepage Encountered in Open Hole.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AN
CHECKED: DEN

DRAFT

PROJECT No.: 11-1447-0264/2030

RECORD OF AUGERHOLE: AH/DCPT11-05

SHEET 1 OF 1

LOCATION: See Figure 2.
N: ~5430539 E: ~550733
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: November 28, 2011
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Track Mounted Auger Drill / Solid Stem Auger	Ground Surface		0.00							
1		Loose, moist, brown SILT and SAND, trace gravel and organics (roots). [FILL]			1	AS					No Groundwater Seepage Encountered in Open Hole.
2		Loose, moist, brown, sandy SILT, trace to some gravel with fragments of brick. [FILL]		1.52	2	AS					
3					3	AS					
4		Compact to dense, moist, grey SAND and GRAVEL, trace silt.		3.66	4	AS					
5		End of Augerhole.		4.57				End of Dynamic Cone Penetration Test.			
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AN
CHECKED: DEN

DRAFT

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PROJECT No.: 11-1447-0264/2030

RECORD OF AUGERHOLE: AH/DCPT11-06

SHEET 1 OF 1

LOCATION: See Figure 2.
N: ~5430537 E: ~550720
Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING DATE: November 28, 2011
DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM: Local

INCLINATION: -90°

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
0	Track Mounted Auger Drill / Solid Stem Auger	Ground Surface		0.00							
1		Loose, moist, brown, sandy SILT, trace gravel and organics (roots).			1	AS					
2					2	AS					
3		Loose, wet, brown, sandy SILT, some gravel with possible cobbles at about 3.96 m.		3.05	3	AS					Water level observed in open hole during drilling
4		End of Augerhole.		3.96				End of Dynamic Cone Penetration Test.			
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AN
CHECKED: DEN

DRAFT

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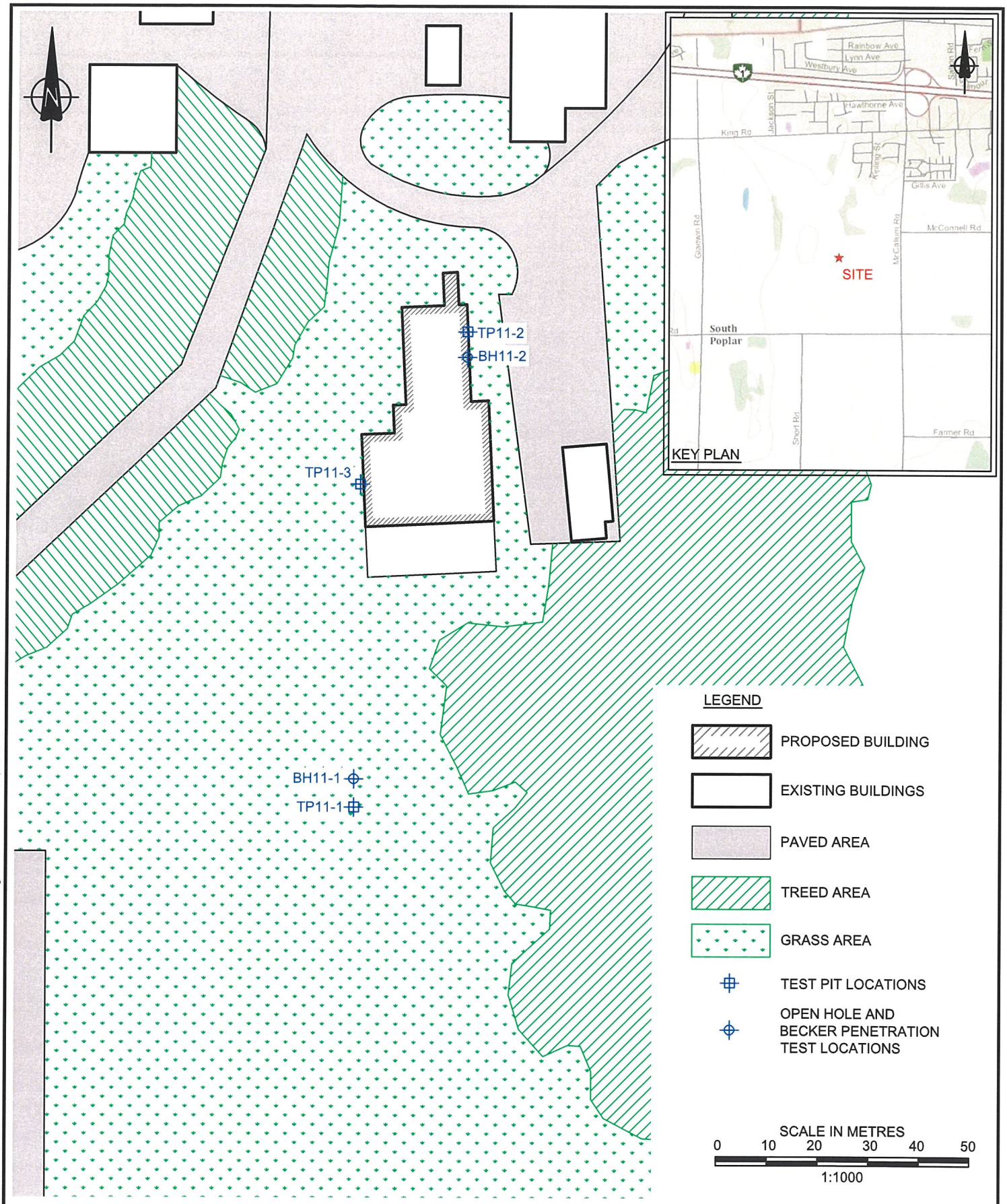
APPENDIX B

STANTEC CONSULTING LTD.

SOIL LOGS

NOVEMBER 7-9, 2011

BRAUN GEOTECHNICAL LTD.



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

TEST HOLE LOCATION PLAN

GEOTECHNICAL SITE ASSESSMENT
MATSQUI 20 MAN BUILDING
33344 KING ROAD, ABBOTSFORD

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Job No.:	123310756
Scale:	1:1000
Date:	17-Nov-11
Dwn. By:	SS
App'd By:	JP

Dwg. No.: 1

Stantec

R:\2011\Stantec\123310756_man_matsqui\cad\123310756 D01 R0_TestHoleLocationPlan.dwg PRINTED: Nov 23, 2011

BOREHOLE RECORD

BH11-1

CLIENT Public Works and Government Services Canada — PROJECT No. 123310756

PROJECT 20 Men Living Inmate Building — DATUM

LOCATION 33344 King Road, Abbotsford — ELEVATION

DRILLING DATE Nov. 7, 2011 — DRILLING CO. Foundex Explorations Ltd. — DRILLING METHOD Becker Hammer

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES TYPE	SAMPLES NUMBER	MOISTURE CONTENT (%)
0	TP		GRASS over brown/reddish brown sandy SILT, trace organics, clay and gravel (Tosoil), firm				
	ML		Reddish brown sandy SILT, trace clay, firm to stiff				
1	SP		Brown/grey fine to medium SAND, trace gravel, loose		GS	1	
			-some gravel below				
			-coarse sand below				
2	GP		Grey fine to medium SAND and GRAVEL, trace silt, compact to dense				
3					GS	2	
4			-some gravel below				
5					GS	3	
6			-some moist below				
▽7			-wet				

□ Insitu Shear Vane (kPa) ■ Bounce Chamber Reading (kPa)
△ Pocket Penetrometer (kPa)

50kPa 100kPa 150kPa 200kPa

W_P W W_L Moisture Content & Atterberg Limits

● BPT Field Blows, blows/0.3m

10 20 30 40 50 60 70 80 90

DEPTH (ft)

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

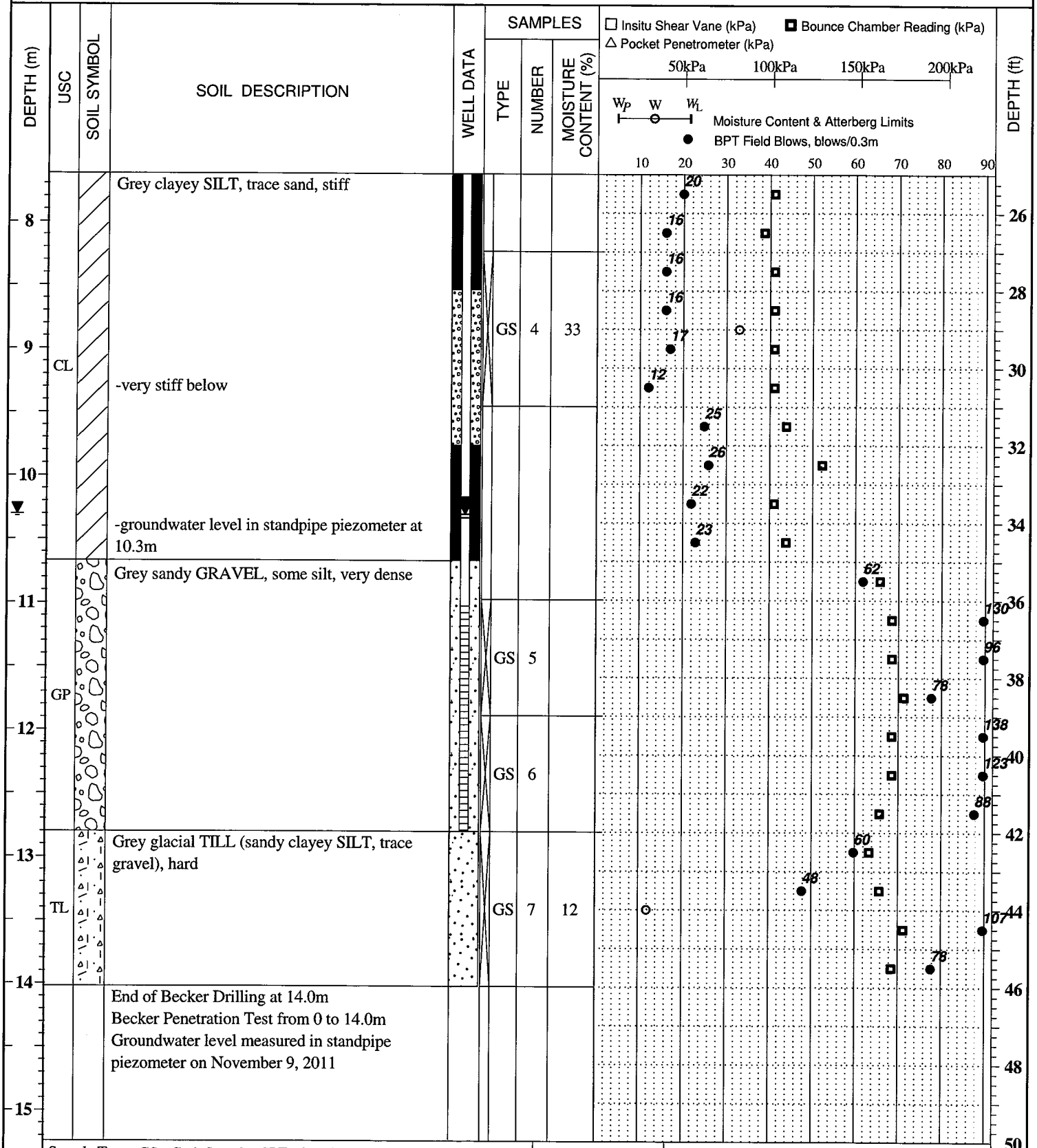
Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov. 16, 2011

Stantec

BOREHOLE RECORD

BH11-1 cont'd

CLIENT Public Works and Government Services Canada
PROJECT No. 123310756
PROJECT 20 Men Living Inmate Building
DATUM
LOCATION 33344 King Road, Abbotsford
ELEVATION
DRILLING DATE Nov. 7, 2011 DRILLING CO. Foundex Explorations Ltd. DRILLING METHOD Becker Hammer



Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov. 16, 2011

Stantec

BOREHOLE RECORD

BH11-2

CLIENT Public Works and Government Services Canada — PROJECT No. 123310756

PROJECT 20 Men Living Inmate Building — DATUM — NORTHING 5430178

LOCATION 33344 King Road, Abbotsford — ELEVATION — EASTING 551166

DRILLING DATE Nov. 8, 2011 — DRILLING CO. Foundex Explorations Ltd. — DRILLING METHOD Becker Hammer

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLES TYPE	SAMPLES NUMBER	MOISTURE CONTENT (%)
0	TP	GRASS over brown/reddish brown sandy SILT, some organics, trace clay (Topsoil), firm			
	ML	Reddish brown sandy SILT, trace clay, firm to stiff			
1		Grey SAND, some gravel, trace silt, loose	GS	1	
		-gravelly, compact below			
2					
3	SP	-dense below	GS	2	
4		-gravelly, trace cobbles below	GS	3	
5		-some sandy silt layers from 5.1 to 5.8m	GS	4	
6		Grey SAND and GRAVEL, some silt, very dense	GS	5	
7	GP				

□ Insitu Shear Vane (kPa) ■ Bounce Chamber Reading (kPa)
△ Pocket Penetrometer (kPa)
50kPa 100kPa 150kPa 200kPa
W_P W W_L Moisture Content & Atterberg Limits
● BPT Field Blows, blows/0.3m
10 20 30 40 50 60 70 80 90

BPT Field Blows: 2, 8, 9, 14, 10, 17, 19, 20, 29, 34, 39, 40, 46, 91, 92, 52, 56, 76, 128, 149, 132, 135, 146

DEPTH (ft): 0 2 4 6 8 10 12 14 16 18 20 22 24

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: ■ Bentonite ▨ Sloughed ▨ Drill Cuttings ⁘ Sand

Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov. 16, 2011

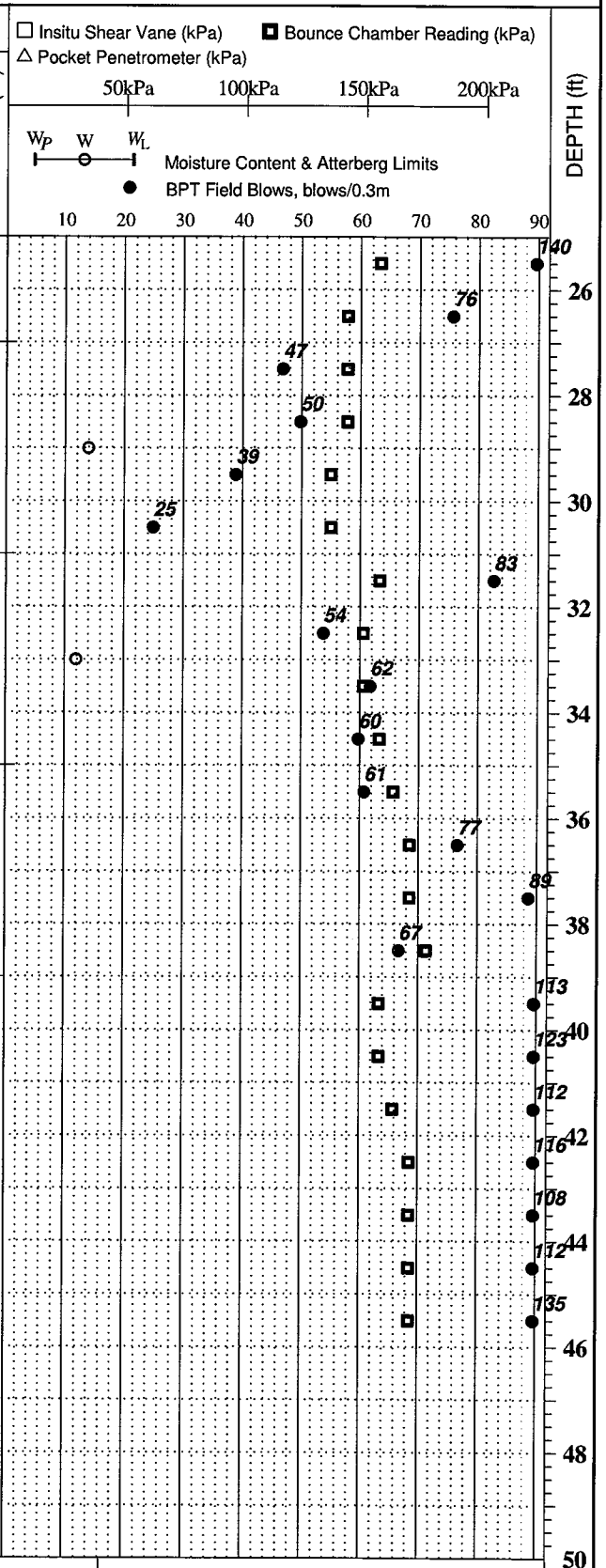
Stantec

BOREHOLE RECORD

BH11-2 cont'd

CLIENT Public Works and Government Services Canada
PROJECT No. 123310756
PROJECT 20 Men Living Inmate Building
DATUM
NORTHING 5430178
LOCATION 33344 King Road, Abbotsford
ELEVATION
EASTING 551166
DRILLING DATE Nov. 8, 2011
DRILLING CO. Foundex Explorations Ltd.
DRILLING METHOD Becker Hammer

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLES TYPE	SAMPLES NUMBER	MOISTURE CONTENT (%)
8			Grey SAND and GRAVEL, some silt, very dense	GS	6	
9	CL		Grey sandy clayey SILT, some gravel, very stiff to hard	GS	7	14
10	TL		Grey glacial TILL (sandy clayey SILT, some gravel), hard	GS	8	12
11				GS	9	
12			End of Becker Drilling at 11.9m Hole sealed with Bentonite from 1.2 to 1.8m, 3.0 to 4.3m and 10.4 to 11.6m. Becker Penetration Test from 0.7 to 14.0m			
13						
14						
15						



DEPTH (ft): 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov. 16, 2011

Stantec

TEST PIT RECORD

TP11-1

CLIENT Public Works and Government Services Canada — PROJECT No. 123310756

PROJECT 20 Men Living Inmate Building — DATUM

LOCATION 33344 King Road, Abbotsford, BC — ELEVATION

EXCAVATION DATE Nov. 9, 2011 — CONTRACTOR Backhoes Unlimited — EXCAVATION METHOD Test Pit

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLES TYPE	SAMPLES NUMBER	MOISTURE CONTENT (%)
0	TP	GRASS over brown/reddish brown sandy SILT, trace organics, clay and gravel (Topsoil), firm	GS	1	30
	ML	Reddish brown sandy SILT, trace clay, firm to stiff	GS	2	31
1	SP	Brown/grey fine to medium SAND, trace gravel, loose	GS	3	
		-some gravel below	GS	4	
		- coarse sand below	GS	5	
			GS	6	
2	GP	Grey fine to medium SAND and GRAVEL, trace silt, compact to dense	GS	7	
			GS	8	
			GS	9	
3		End of Test Pit at 2.6m No seepage encountered in test pit			
4					
5					
6					
7					

□ Insitu Shear Vane (kPa) ■ Remoulded Shear Vane (kPa)
△ Pocket Penetrometer (kPa) ✖ Disturbed Torvane (kPa)

50kPa 100kPa 150kPa 200kPa

W_P W W_L Moisture Content & Atterberg Limits

● Standard Penetration Test, blows/0.3m

10 20 30 40 50 60 70 80 90

DEPTH (ft): 0 2 4 6 8 10 12 14 16 18 20 22 24

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov 15, 2011

Stantec

TEST PIT RECORD

TP11-2

CLIENT Public Works and Government Services Canada — PROJECT No. 123310756

PROJECT 20 Men Living Inmate Building — DATUM

LOCATION 33344 King Road, Abbotsford, BC — ELEVATION

EXCAVATION DATE Nov. 9, 2011 — CONTRACTOR Backhoes Unlimited — EXCAVATION METHOD Test Pit

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	MOISTURE CONTENT (%)
0	TP		GRASS over brown/reddish brown sandy SILT, some organics, trace clay (Topsoil), firm	GS	1	46
	ML		Reddish brown sandy SILT, trace clay, firm to stiff	GS	2	37
1	SP		Grey SAND, some gravel, trace silt, loose	GS	3	
			-gravelly, compact below	GS	4	
				GS	5	
2				GS	6	
				GS	7	
				GS	8	
3			End of Test Pit at 2.4m No seepage encountered in test pit			
4						
5						
6						
7						

□ Insitu Shear Vane (kPa) ■ Remoulded Shear Vane (kPa)
△ Pocket Penetrometer (kPa) ✖ Disturbed Torvane (kPa)

50kPa 100kPa 150kPa 200kPa

W_P W W_L Moisture Content & Atterberg Limits

● Standard Penetration Test, blows/0.3m

10 20 30 40 50 60 70 80 90

DEPTH (ft): 0 2 4 6 8 10 12 14 16 18 20 22 24

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov 15, 2011

Stantec

TEST PIT RECORD

TP11-3

CLIENT Public Works and Government Services Canada — PROJECT No. 123310756

PROJECT 20 Men Living Inmate Building — DATUM

LOCATION 33344 King Road, Abbotsford, BC — ELEVATION

EXCAVATION DATE Nov. 9, 2011 — CONTRACTOR Backhoes Unlimited — EXCAVATION METHOD Test Pit

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	MOISTURE CONTENT (%)
0	TP	GRASS over brown/reddish brown sandy SILT, trace organics (Topsoil), firm	GS	1	39
	ML	Reddish brown sandy SILT, trace clay, stiff to very stiff	GS	2	30
1	SM	Grey/light brown silty SAND, trace gravel, compact to dense	GS	3	
	GP	Grey/light brown medium SAND and GRAVEL, trace silt, compact	GS	4	
2		-some gravel to gravelly below	GS	5	
			GS	6	
			GS	7	
3		End of Test Pit at 2.4m No seepage encountered in test pit			
4					
5					
6					
7					

□ Insitu Shear Vane (kPa) ■ Remoulded Shear Vane (kPa)
△ Pocket Penetrometer (kPa) ✖ Disturbed Torvane (kPa)

50kPa 100kPa 150kPa 200kPa

W_P W W_L Moisture Content & Atterberg Limits

● Standard Penetration Test, blows/0.3m

10 20 30 40 50 60 70 80 90

DEPTH (ft): 0 2 4 6 8 10 12 14 16 18 20 22 24

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
ST - Shelby Tube PT - Piston Tube VT - Shear Vane Test

Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: CG/RI
Reviewed by: BH/HK
Date: Nov 15, 2011

Stantec

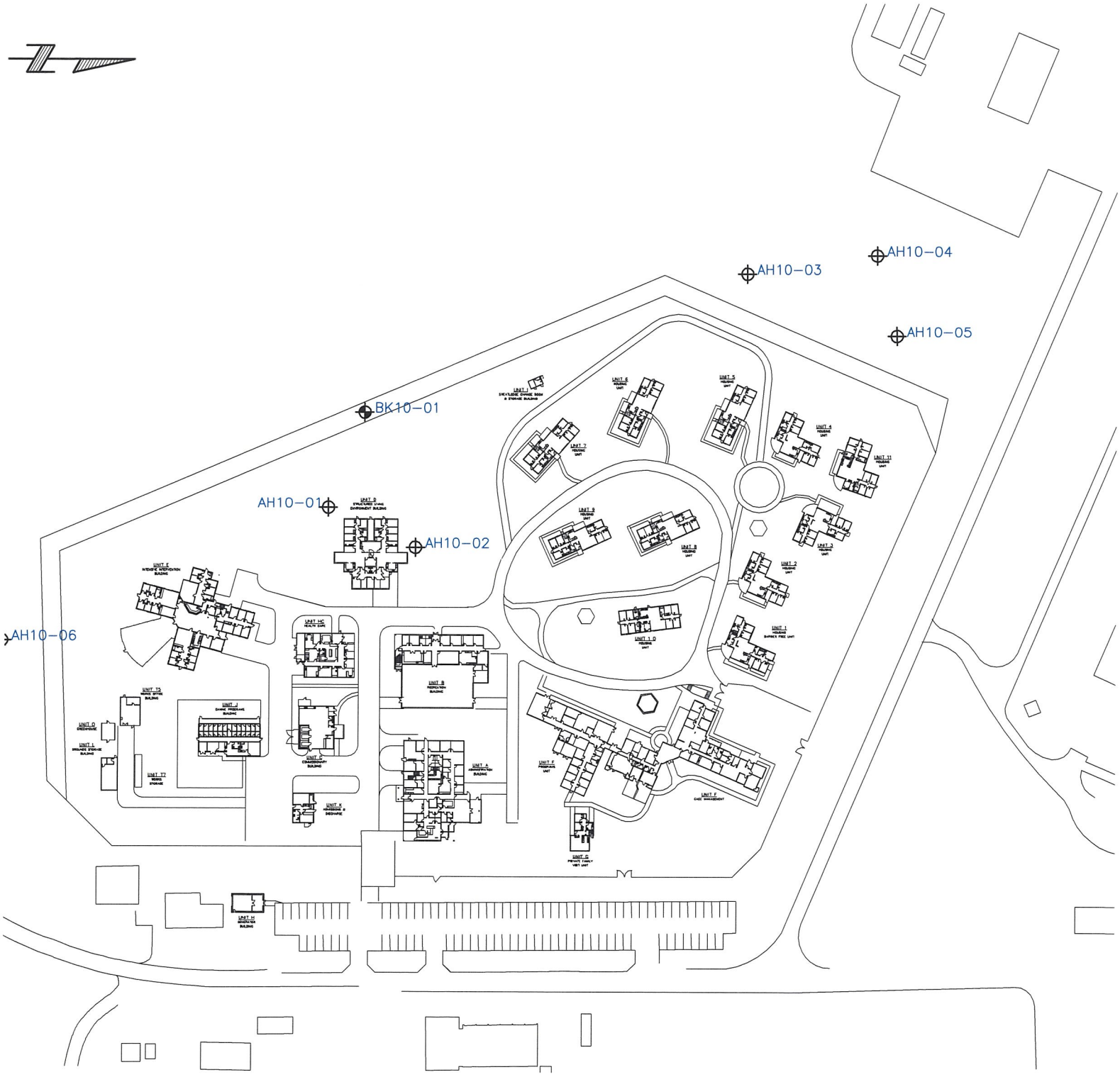
APPENDIX C

KLOHN CRIPPEN BERGER

SOIL LOGS

NOVEMBER 2-29, 2010

BRAUN GEOTECHNICAL LTD.



NOT FOR CONSTRUCTION

TO BE READ WITH KLOHN CRIPPEN REPORT DATED _____

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA,STATEMENTS,CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT

Public Works and Government Services Canada

Klohn Crip

Klohn Crippen Berger

SYMBOLS AND TERMS

FOR SOIL DESCRIPTION AND TEST HOLE LOGS

BASIC SYMBOLS

SYMBOL VARIATIONS - EXAMPLES[1]

CLASSIFICATION BY PARTICLE SIZE				
		Size Range		
			U.S. Standard Sieve Size	
Name		(mm) [3]	Retained	Passing
Boulders		> 200	8 inch	-
Cobbles		75 - 200	3 inch	8 inch
Gravel:	coarse	19 - 75	0.75 inch	3 inch
	fine	5 - 19	No. 4	0.75 inch
Sand:	coarse	2 - 5	No. 10	No. 4
	medium	0.4 - 2	No. 40	No. 10
	fine	0.075 - 0.4	No. 200	No. 40
Fines (Silt or Clay) [4]		< 0.075	-	No. 200

PROPORTION OF MINOR COMPONENTS BY WEIGHT[2]	
and	35 - 50%
y/ey	20 - 35%
some	10 - 20%
trace	0 - 10%

PARTICLE SHAPE	
Flat	width/thickness > 3
Elongated	length/width > 3

DENSITY OF GRANULAR SOILS		
Description	SPT N [5]	SPT $(N_1)_{60}$ [6]
Very Loose	0 - 4	0 - 3
Loose	4 - 10	3 - 8
Compact	10 - 30	8 - 25
Dense	30 - 50	25 - 42
Very Dense	> 50	> 42

CONSISTENCY OF COHESIVE SOILS			
Description	S_u [7]		SPT N [9]
	(kPa) [3]	(ksf) [8]	
Very Soft	< 12	< 0.25	< 2
Soft	12 - 25	0.25 - 0.5	2 - 4
Firm	25 - 50	0.5 - 1	4 - 8
Stiff	50 - 100	1 - 2	8 - 15
Very Stiff	100 - 200	2 - 4	15 - 30
Hard	> 200	> 4	> 30

(1) Only selected examples of the possible variations or combinations of the basic symbols are illustrated.
(2) Example: SAND, silty, trace of gravel = sand with 20% to 35% silt and up to 10% gravel, by weight.
(3) Approximate metric conversion.
(4) Fines are classified as silt or clay on the basis of Atterberg limits (refer to Plasticity Chart).
(5) Standard Penetration Test (SPT) blow count (uncorrected), after Terzaghi and Peck, 1948.
(6) Standard Penetration Test blow count, based on above N value corrected to 60% hammer efficiency and 96 kPa (1.0 ton/ft²) effective overburden pressure, after Skempton, 1986.
(7) Undrained shear strength can be estimated by vane (gives S_u), pocket penetrometer (gives unconfined compressive strength, i.e., 2 S_u), or unconfined compression test (gives 2 S_u).
(8) ksf = 1000 pounds per square foot = 0.5 tsf (ton/ft²) = approximately 0.5 kg/cm².
(9) Very approximate correlation with Standard Penetration Test blow counts, after Terzaghi and Peck, 1948.

Klohn Crippen Berger

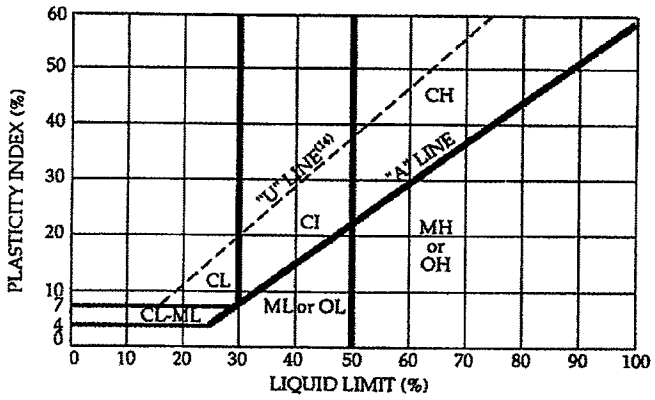
SYMBOLS AND TERMS

FOR SOIL DESCRIPTION AND TEST HOLE LOGS

PLASTICITY OF COHESIVE SOILS[10]		
Description	Silt	Clay
High	W_L[11] > 50	W_L > 50
Medium	–	30 < W_L < 50
Low	W_L < 50	W_L < 30
Non-Plastic	NP[12]	–

SENSITIVITY OF COHESIVE SOILS	
Description	Undisturbed Strength[13] / Remoulded Strength
High	> 8
Medium	4 to 8
Low	< 4

PLASTICITY CHART FOR SOILS PASSING NO. 40 SIEVE[10]



CLASSIFICATION OF GROUND ICE[15]			
GROUP		SUBGROUP	
Symbol	Description	Symbol	Description
N	Ice not visible by unaided eye	Nf	Poorly bonded or friable
		Nbn	Well bonded, no excess ice
		Nbe	Well bonded, excess ice
V	Visible ice less than 25 mm thick	Vx	Individual ice crystals or inclusions
		Vc	Ice coatings on soil particles
		Vr	Random or irregularly oriented ice
		Vs	Stratified or distinctly oriented ice
ICE	Visible ice greater than 25 mm thick	ICE + (soil type)	Ice with soil inclusions
		ICE	Ice without soil inclusions

(10) This plasticity classification conforms to the Unified Soil Classification System (USCS) and the ASTM D-2487 plasticity chart, except for the addition of an intermediate category for clay, where the liquid limit is between 30% and 50% (CI). Under ASTM and USCS, all clays with a liquid limit less than 50% are classified as low plasticity (CL).
(11) W_L = Liquid Limit (%).
(12) NP = Non Plastic (silts only).
(13) Dimensionless ratio.
(14) "U" Line marks typical upper limit. "A" Line divides clays from silts and organic soils.
(15) For soil descriptions, estimate percentage of ground ice based on volume, after National Research Council of Canada, 1963.

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SYMBOLS AND TERMS
FOR SOIL TEST HOLE LOGS

TEST TYPES[1]

DH	Drill Hole - *typical drilling methods include tricone, percussion, wash boring, machine auger with SPT or thin-walled tube samples and coring.*
BK	Becker hammer drill hole - *both open and closed test at the same location.*
BKS	Becker hammer drill hole - *open casing, sampled.*
BPT	Becker penetration test - *closed casing.*
TP	Test pit - *machine or hand dug.*
CPT	Electric cone penetration test with pore pressure measurements.
DCT	Dynamic cone penetration test.
VST	Vane shear test.
AH	Auger hole - *machine or hand auger, no SPT or thin-walled tube samples taken.*

IN SITU TESTS OR DOWNHOLE INSTRUMENTATION[2]

BM	Benchmark
DMT	Dilatometer test
IN	Inclinometer
PMT	Pressuremeter test
PT	Permeability test
PZ	Piezometer
SW	Shear wave velocity test

LABORATORY AND/OR FIELD TESTS[3]

S_u Undrained shear strength, measured by:[4]

- ◆ Field Vane (peak)
- ◇ Field Vane (remoulded)
- ■ Lab Vane (peak)
- □ Lab Vane (remoulded)
- ▲ Unconfined Compression
- △ Pocket penetrometer

- ● Standard Penetration Test (SPT) blow count, uncorrected (N)
- ○ W% In situ moisture content
- ✕ W_P% Plastic limit
- ✕ W_L% Liquid limit
- Becker penetration test blow counts, closed casing
- Becker penetration test blow counts, open casing
- ▼ or ▽ Water level, measured on date and from piezometer indicated on log

OTHER LABORATORY TESTS[5]

CD	Consolidated, drained triaxial test
CUP	Consolidated, undrained triaxial test with pore pressure measurements
CUCY	Consolidated, undrained triaxial test with cyclic loading
UU	Unconsolidated, undrained triaxial test
UC	Unconfined (uniaxial) compression test
DS	Direct shear test
DSS	Direct simple shear test
GSD	Grain size distribution *(by sieve or hydrometer)*
MDR	Moisture-density relationship *(i.e. standard or modified Proctor test)*
ORG	Organic content
OED	Oedometer consolidation test
RD	Relative density *(also known as density index)*
GS	Specific gravity
K	Permeability
UW	Unit Weight

(1) Test type abbreviation is typically followed by a two-part number indicating year and chronological sequence of test. Example: CPT93-1 indicates the first electric cone penetration test at a particular site in 1993.
(2) In situ test or downhole instrumentation abbreviations are typically shown in brackets following the appropriate test type designation. Example: DH93-1(PZ) indicates a piezometer was installed in drill hole 93-1.
(3) These symbols are for laboratory and/or field test results shown on the test hole log.
(4) Vane gives S_u. Pocket penetrometer and unconfined compression tests give 2 S_u, so results are divided by 2 for plotting on log.
(5) Where other laboratory test results are available but not shown on the test hole log, the applicable abbreviation appears under the heading *"Other Tests"* on the log.

TEST HOLE LOG

STARTED: Nov 2, 2010 **FINISHED:** Nov 2, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★% FINES △ P.PEN/2 (psi) | DCPT (blows/0.3m)
W_P% W% W_L% (20 40 60 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0					0.2 SILT (ML) trace sand, soft, brown, moist, rootlets.	
		Grab	S1		SAND (SP) medium to coarse, some gravel, trace silt; compact, sub-angular to sub-rounded light brown to grey, moist, largest observed size 50 mm. 0.9	
1					SAND and GRAVEL (SP-GP) trace to some silt, dense, sub-angular to sub-rounded, grey, wet, largest observed size 50 mm; poor recovery from 1.2 m (~50 to 30%).	
2					2.6	
3		Grab	S2		CLAY (CL) trace sand with increasing gravel with depth, very stiff to hard, grey, moist, blocky, moderate cementation, no dilatancy, poor recovery from 2.6 m to 3.0 m (~50 to 30%). (TILL)	
		Grab	S3		4.6	
4					End of Hole at 4.6 m	
5					1) Drill hole was conducted using a truck-mounted auger drill operated by Downrite Drilling of Chilliwack, BC.	
6					2) Solid Stem Auger hole terminated at 4.6m depth. DCPT terminated at 2.7m depth.	
7						
8						
9						
10						

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 1 **OF** 1 **HOLE NO.:** AH10-01

KCBL_DCT-SI 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10

TEST HOLE LOG

STARTED: Nov 2, 2010 **FINISHED:** Nov 2, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★% FINES △ P.PEN/2 (psi) | DCPT (blows/0.3m)
W_P% W% W_L% (20 40 60 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0					0.1 CLAY (CL) trace sand, soft, brown, moist, rootlets.	
		Grab	S1		CLAY (CL) trace gravel, very stiff to hard, light brown to grey, moist, blocky, moderate cementation, no dilatancy.	
1		Grab	S2			
2					2.1 CLAY (CL) trace sand and gravel, very stiff to hard, grey, moist to dry, blocky, moderate cementation, no dilatancy. (TILL)	
3		Grab	S3			
4		Grab	S4		@3.9m: Hard Drilling	
5		Grab	S5			
6					6.1 End of Hole at 6.1 m	
7					1) Drill hole was conducted using a truck-mounted auger drill operated by Downrite Drilling of Chilliwack, BC. 2) Solid Stem Auger hole terminated at 6.1m depth. DCPT terminated at 3.9m depth.	
8						
9						
10						

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 1 **OF** 1 **HOLE NO.:** AH10-02

KCBL_DCT-SI 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10

TEST HOLE LOG

STARTED: Nov 2, 2010 **FINISHED:** Nov 2, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST

Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★% FINES △ P.PEN/2 (psi) | DCPT (blows/0.3m)
W_P% W% W_L%
20 40 60 80

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
					0.2 SILT (ML) trace sand, soft, brown, moist, rootlets.	
1		Grab	S1		SILT (ML) trace gravel, firm, light brown to grey, moist, blocky, moderate cementation, no dilatancy, largest observed size 50 mm. 1.1	
		Grab	S2		ORGANIC SILT (OL) trace sand, plasticity, soft, dark brown, moist, organics are amorphous to fine fibrous. 1.5	
2		Grab	S3		SAND (SP) fine, trace silt, poorly graded, loose, sub-rounded to sub-angular, brown, moist, trace rootlets. 2.3	
		Grab	S4		CLAY (CL) trace gravel and sand, firm, dark to light brown, moist, blocky, moderate cementation, no dilatancy. 3.0	
3					CLAY (CL) trace gravel and sand, very stiff to hard, light brown to grey, moist, blocky, moderate cementation, no dilatancy. (TILL)	
4		Grab	S5			
5		Grab	S6		@5.2m to 5.8 m: Poor recovery (~50%) @5.5m: Hard Drilling 5.8	
6					End of Hole at 5.8 m	
7					1) Drill hole was conducted using a truck-mounted auger drill operated by Downrite Drilling of Chilliwack, BC. 2) Solid Stem Auger hole terminated at 5.8 m depth. DCPT terminated at 3.8m depth.	
8						
9						
10						

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 1 **OF** 1 **HOLE NO.:** AH10-03

KCBL_DCT-SI 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10

TEST HOLE LOG

STARTED: Nov 2, 2010 **FINISHED:** Nov 2, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★% FINES △ P.PEN/2 (psi) — DCPT (blows/0.3m)
W_P% W% W_L% (20 40 60 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
					SILT (ML) trace sand, soft, brown, moist, rootlets.	
					0.3	
		Grab	S1		SILT (ML) some sand, trace gravel, firm, brown, moist, trace rootlets.	
					0.9	
1		Grab	S2		SAND (SP) medium to coarse, trace to some gravel, trace silt, compact, brown to grey, moist.	
2		Grab	S3		@2.1m: Poor Recovery (~30-50%), wet	
3		Grab	S4			
		Grab	S5		4.0	
4		Grab	S6		CLAY (CL) sandy to trace sand, trace fine gravel, trace clay, very stiff to hard, brown to grey, moist, blocky, largest observed size 50 mm. (TILL)	
5		Grab	S7			
6		Grab	S8		6.6	
7					End of Hole at 6.6 m 1) Drill hole was conducted using a truck-mounted auger drill operated by Downrite Drilling of Chilliwack, BC. 2) Solid Stem Auger hole terminated at 6.6m depth. DCPT terminated at 6.0m depth.	
8						
9						
10						

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 1 **OF** 1 **HOLE NO.:** AH10-04

KCBL_DCT-SI 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10

TEST HOLE LOG

STARTED: Nov 3, 2010 **FINISHED:** Nov 3, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★% FINES △ P.PEN/2 (psi) — DCPT (blows/0.3m)
W_P% W% W_L% (20 40 60 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT	DETAILS
					0.2 SILT (ML) trace sand, soft, brown, moist, rootlets.		
		Grab	S1		ORGANIC SILT (OS) trace sand and gravel, firm, brown, moist.		
					0.9		
1		Grab	S2		SAND (SP) fine to medium, some gravel, trace silt, loose, grey, moist to wet, largest observed size 70 m.		
2		Grab	S3		@2.6m to 3.0 m: Poor Recovery (50%)		
3							
4		Grab	S4		@4.0m to 4.6m: Poor Recovery (30-50%), wet		
					4.6	▼	
		Grab	S5		SILT (ML) trace sand and gravel, soft, light brown to grey, wet.		
5					5.0 SAND (SP) medium to coarse, some gravel, trace silt, compact, grey, wet.		
		Grab	S6		@5.5m to 6.1m: Poor Recovery (~30%)		
6							
		Grab	S7		@6.6m to 7.2m: Poor Recovery (~30%)		
7					7.2 SILT (ML) sandy, trace gravel, very stiff to hard, light brown to grey, wet.		
		Grab	S8		7.6 CLAY (CL) sandy, trace gravel with depth, very stiff to hard, grey, moist to dry. (TILL)		
8							
		Grab	S9		@8.8m to 12.1m: Hard Drilling		
9					@9.1m to 10.7m': Poor Recovery (~10-30%)		
10					Continued Next Page		

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 1 **OF** 2 **HOLE NO.:** AH10-05

TEST HOLE LOG

STARTED: Nov 3, 2010 **FINISHED:** Nov 3, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★% FINES △ P.PEN/2 (psi) | DCPT (blows/0.3m)
W_P% W% W_L% (20 40 60 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
11		Grab	S10			
		Grab	S11		@11.6m to 12.2m: Poor Recovery (~50-60%)	
12					12.2	
					End of Hole at 12.2 m	
13					1) Drill hole was conducted using a truck-mounted auger drill operated by Downrite Drilling of Chilliwack, BC. 2) Solid Stem Auger hole terminated at 9.1m depth. DCPT terminated at 10.6m depth. 3) 1.5" diameter PVC standpipe installed to 7.1m depth and completed with flush mount surface monument. 4) Water level measured November 29, 2010 at 4.48m depth.	
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Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 2 **OF** 2 **HOLE NO.:** AH10-05

KCBL_DCT-SI 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10

TEST HOLE LOG

STARTED: Nov 3, 2010 **FINISHED:** Nov 3, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DYNAMIC CONE PENETRATION TEST
Rod O.D.: | Shoe O.D.:
Hammer Weight: 140 lb | Height Drop: 30 inches
● SPT N ★ % FINES △ P.PEN/2 (psi) | DCPT (blows/0.3m)
W_P% W% W_L% (20 40 60 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0					0.1 TOPSOIL	
		Grab	S1		SAND (SP) gravely, very loose to loose, maximum size observed 50 mm, rounded to sub-rounded, brown to grey, moist.	
1						
2		Grab	S2		@2.6m to 3.0m: Poor Recovery (~30%)	
3						
4		Grab	S3		@4.3m to 4.6m: Poor Recovery (~30%)	
					4.9	
5					CLAY (ML) some gravel to gravely at depth, gravel is rounded to sub-rounded, stiff to hard, brown to grey at depth, moist to wet, maximum size observed 50 mm. (TILL)	
		Grab	S4		@5.0m to 9.1m: Hard Drilling	
6						
7		Grab	S5		@7.0m to 7.6m: Poor recovery (~10-20%)	
					@7.6m to 9.1m: Poor Recovery (~10-30%)	
8						
		Grab	S6			
9					9.1	
					End of Hole at 9.1 m	
10					1) Drill hole was conducted using a truck-mounted auger drill operated by Downrite Drilling of Chilliwack. Continued Next Page	

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 1 **OF** 2 **HOLE NO.:** AH10-06

TEST HOLE LOG

STARTED: Nov 3, 2010 **FINISHED:** Nov 3, 2010
DRILL METHOD: Solid Stem Auger
GROUND ELEV. (m):
COORDINATES (m):

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
11					BC. 2) Solid Stem Auger hole terminated at 12.2m depth. DCPT terminated at 4.6m depth. 3) 1.5" diameter PVC standpipe installed to 7.1m depth and completed with flush mount surface monument. 4) Water level measured November 29, 2010 at 6.08m depth.	
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DYNAMIC CONE PENETRATION TEST

Rod O.D.:	Shoe O.D.:
Hammer Weight: 140 lb	Height Drop: 30 inches

● SPT N ★% FINES
△ P.PEN/2 (psi)
DCPT (blows/0.3m)

W_P% × – – – – o – – – – × W_L%
20 40 60 80

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: VL **CHECKED BY:**
SHEET 2 **OF** 2 **HOLE NO.:** AH10-06

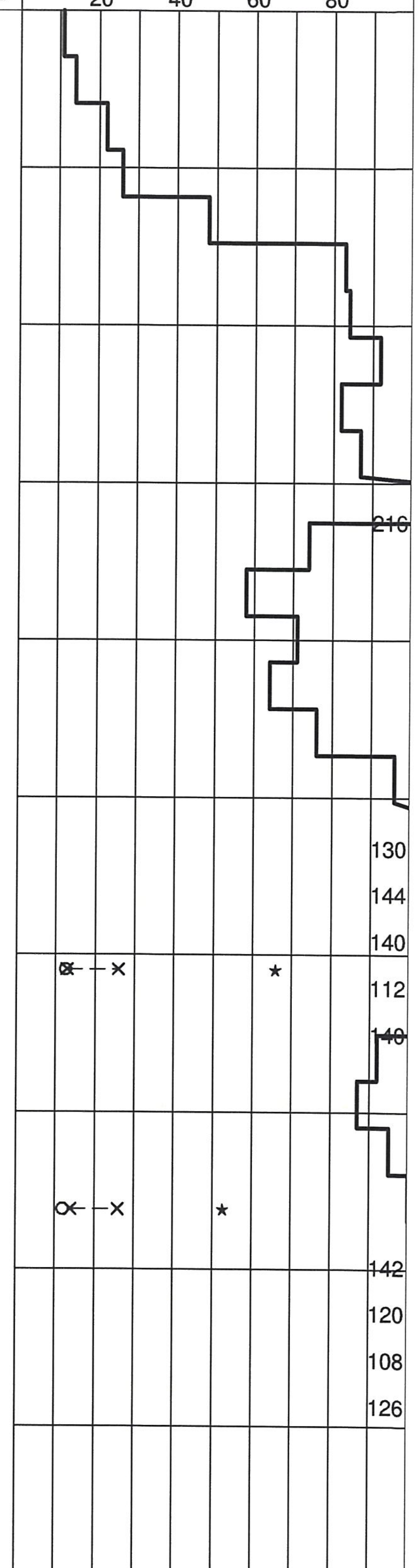
KCBL_DCT-SI 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10

BECKER TEST HOLE LOG

STARTED: Nov 29, 2010 **FINISHED:** Nov 29, 2010
DRILL RIG MODEL: Becker Hammer
GROUND ELEV. (m):
COORDINATES (m):

Casing O.D.: — CLOSE ENDED (blows/0.3m)
Hammer Energy: 11 kJ max. rated — OPEN ENDED (blows/0.3m)
★ % FINES — BOUNCE PRESS (kPa)
$W_P\%$ — W% — $W_L\%$ (20, 40, 60, 80)

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
0.0		Grab	G1	SAND (SP) brown, some gravel. (ROAD FILL)	
0.9				SAND (SP) some gravel, occasional cobbles, trace silt, greyish brown colour, dry.	
1.8		Grab Grab	G2 G3	SAND and GRAVEL (SP-GP) some cobbles, light brown, dry. Becomes more difficult to drill through. Broken rock fragments in drill cuttings. Drill kicks sideways at 2.5 m and needs to be repositioned.	
3.4				SILT ML) some fine sand to sandy, trace to some fine gravel, light brown, very stiff. (TILL)	
4.0		Grab	G4	SILT (ML) trace sand, trace gravel, light grey, very stiff to hard. (TILL)	
4.6		Grab	G5	CLAY (CL) trace sand, medium plasticity, light grey, dry to moist, very stiff to hard. (TILL)	
7.6		Grab	G6	CLAY (CL) some sand, some gravel, moist, grey, very stiff to hard. (TILL)	
8.2		Grab	G7	CLAY (CL) grey, dry, very stiff to hard. (TILL)	



Continued Next Page

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: AP **CHECKED BY:**

BECKER TEST HOLE LOG

STARTED: Nov 29, 2010 **FINISHED:** Nov 29, 2010
DRILL RIG MODEL: Becker Hammer
GROUND ELEV. (m):
COORDINATES (m):

DEPTH (m)	SPT BLOWS PER 0.15m	SAMPLE TYPE	SAMPLE No.	SYMBOL	DESCRIPTION OF MATERIALS	INSTRUMENT DETAILS
					10.4	
		Grab	G8		CLAY (CL) sandy, trace gravel, grey, moist, very stiff to hard. (TILL)	
11					11.0 CLAY (CL) trace to some sand, trace fine gravel, dry, very stiff to hard. (TILL)	
					11.9	
12					End of Becker Drill Hole at 11.9 m	
					1) Drill hole was conducted using a truck-mounted Becker Hammer drill operated by Foundex Explorations of Surrey, BC. 2) Closed Becker hole terminated at 9.1m depth. Open Becker hole terminated at 11.9m depth.	
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BECKER PENETRATION TEST

Casing O.D.: CLOSE ENDED (blows/0.3m)
Hammer Energy: 11 kJ max. rated: OPEN ENDED (blows/0.3m)
★ % FINES: BOUNCE PRESS (kPa)

W_P% W% W_L%
20 40 60 80

Klohn Crippen Berger

PROJECT NO.: P09625 A06
PROJECT: Fraser Valley Institute Inmate Housing
LOCATION: Abbotsford, BC
LOGGED BY: AP **CHECKED BY:**
SHEET 2 **OF** 2 **HOLE NO.:** BK10-01

KCBL_BECKER-SI (FINES) 2010-11-02_03 INVESTIGATION - R2 METRIC.GPJ KC_DATA.GDT 12/10/10