Public Works and Government Services Canada

Requisition No. _ EZ899-170372 __

DRAWINGS & SPECIFICATIONS
for
William Head Institution
Electrical High Voltage Upgrade (PHASE 2 OF 2)
ISSUED FOR TENDER

Project No.: R.069376.001

APPROVED BY:

Regional Manager, AES — Date: 2016-05-16

Construction Safety Coordinator — Date: 2016-05-02

TENDER:

Project Manager — Date: 2016-05-03

Real Property Services Branch, Professional and Technical Services, Pacific Region
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END OF INDEX

Total Pages 300

CONSULTANTS – SEAL & SIGNATURE

Discipline	**Seal / Signature / Date**
Electrical (Prime)	 APR 28 2016

END OF SECTION

PART 1 General

1.1 SUMMARY OF WORK

.1 Work covered by Contract Documents:

.1 Work of this Contract comprises general construction requiring demolition, renovation and construction to provide electrical upgrades at William Head Institution (Metchosin, BC). This Work is the second of two phases to replace the high voltage site distribution and improve fault current and arc flash levels throughout the site.

.2 Work to be performed under this Contract includes, but not limited to, the following items covered further in the Contract documents:

.1 Provide a detailed work plan including a project schedule and phasing. This detailed work plan shall be submitted to the Departmental Representative for review to verify that there will be no interruption of service.

.2 Do not start work until all essential equipment is delivered to the site and the work can proceed without delays.

.3 Provide as-built drawings and closeout submittals.

.4 Provide trenching, backfilling, asphalt and concrete repair work where required by scope of work. Trenches are not to be left open after hours.

.5 Replace the main dry-type outdoor unit substation with a new liquid-filled outdoor unit substation.

.6 Provide automatic transfer capabilities for stand-by power supply for site. Transfer from normal supply to diesel generator to be performed, initially through an open-transition, however, transfer switch to be complete with system components to provide closed-transition.

.7 Replace high voltage cables, primary loadbreak switches, transformers, and secondary distribution centres where indicated.

.8 Decommission existing electrical equipment that is not required for the renovated layout. Equipment to be removed is to be disposed of/recycled in accordance with environmental standards and regulations.

.9 Provide temporary power generation (including fuel) for services that are interrupted to minimize downtime of service during tie-in and switch-over from existing to new systems.

.10 Replace existing secondary panelboards and feeders where indicated for panelboards that are currently at capacity.

.11 Tie in existing panels and circuits to new secondary distribution centre.

.12 Provide selectively coordinated devices coordinated with upstream protective devices.

.13 Provide protective devices that limit arc-flash incident energy level below 8cal/cm^2.

.14 Commissioning agent to commission new system in accordance with NETA standards.

.15 Provide the final arc flash and coordination studies of the entire institution and to hand over the data files for these completed studies.

.3 Contractor's Use of Premises:

.1 Contractor has limited use of site for work of this contract until Substantial Completion:

.1 Contractor use of premises for storage and access, as approved by the Departmental representative.

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

.2 Vehicular access through the Sally Port will be restricted during the inmate "count" at breakfast, lunch and dinner hours. Confirm times with Departmental Representative. Delays may occur when entering and exiting the Institution with vehicles due to security situations and heavy traffic.

1.2 WORK RESTRICTIONS

.1 Notify Departmental Representative of intended interruption of power, communication and water services and provide schedule of interruption times.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of services throughout course of work. Keep duration of interruptions to a minimum. Coordinate interruptions with local authority having jurisdiction and local residences and businesses affected by the disruption.

.3 Provide for access by pedestrian and vehicular traffic on and around site where work is in progress.

.4 Construct barriers in accordance with Section Temporary Barriers and Enclosures.

.5 Security Requirements: refer to Section 01 14 10 - Security Requirements.

.6 Hours of work:

.1 Perform work during normal working hours of the Institution 0730 to 1600, Monday through Friday except holidays.

.2 When it is necessary, arrange in advance with Departmental Representative to work outside of normal working hours.

1.3 CONSTRUCTION WORK SCHEDULE

.1 Commence work immediately upon official notification of acceptance of offer and complete the work within 36 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 Submittal:

.1 Submit to Departmental Representative within 10 working days of Award of Contract, a 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.

.5 Project Scheduling Reporting:

.1 Update Project Schedule on bi-weekly 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.

.6 Project Meetings:

.1 Discuss Project Schedule at bi-weekly 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. Only PWGSC paper work is acceptable.

1.4 SITE ACCESS AND CONTRACTOR LAYDOWN AREA

.1 The work of this contract is within the secure perimeter of the existing institution. All access will be through the existing Principle Entrance of the Institution.

.1 Reference Section 01 14 10 Security Requirements.

.2 PWGSC has designated a Contractor Laydown area for this project. The contractor will be required to use this area only for construction operations. Note obtain and follow all rules and regulations.

.1 Reference Section 01 14 10 Security Requirements.

.3 Material and equipment deliveries must be through the Principle Entrance of the Institution.

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

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

.6 Refer to Section 01 14 10 for special security requirements.

1.5 RESPONSIBILITIES

.1 Departmental Representative Responsibilities:

.1 No additional responsibilities except as described in the specifications.

.2 Contractor Responsibilities:

.1 Designate submittals and delivery date for each product in progress schedule.

.2 Review shop drawings, product data, samples, and other submittals. Submit to departmental representative notification of any observed discrepancies or problems anticipated due to non-conformance with contract documents.

.3 Receive and unload products at site.

.4 Inspect deliveries jointly with departmental representative; record shortages, and damaged or defective items.

.5 Handle products at site, including uncrating and storage.

.6 Protect products from damage, and from exposure to elements.

.7 Assemble, install, connect, adjust, and finish products.

.8 Provide installation inspections required by public authorities.

.9 Repair or replace items damaged by contractor or subcontractor on site under his control.

.10 Take meeting minutes at project meetings.

1.6 SUBMITTAL PROCEDURES

.1 Administrative:

.1 Submit to Departmental Representative submittal listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. 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.

.2 Work affected by submittal shall not proceed until review is complete.

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

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

.5 Review submittal 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 co-ordinated with requirements of Work and Contract Documents. Submittal not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

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

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

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

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

.10 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 Progress Photographs:

.1 Provide construction photographs in accordance with procedures and submission requirements specified in this clause.

.2 Progress Photographs:

.1 Provide digital photographs with images of minimum 3.1 mega pixel resolution and stored in Jpeg format with minimal compression.

.2 Number of viewpoints: four (4), locations of viewpoints directed by Departmental Representative.

.3 Frequency: monthly, submitted on disk with monthly progress

statement, sent via e-mail or as directed by Departmental Representative.

.4 Identify photos by location, date and sequential numbering system.

.3 Final Photographs:

.1 Provide digital photographs with images of minimum 3.1 mega pixel resolution and stored in Jpeg format with minimal compression. Where photos are e-mailed compression can be increased.

.2 Number of viewpoints:

.1 Each side of building for a total of 4.

.2 Interior of rooms and finishes for a total of 8.

.3 Locations of viewpoints determined by Departmental Representative.

.3 Submit final photographs in digital format on CD, before final acceptance of building.

.4 Label disks and identify with name and project number of project. Indicate exposure dates and viewpoints of each photo and photo number.

.7 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 bond copies (hard copy) as directed by Departmental Representative.

.8 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 submittal is not relieved by Departmental Representative's review of submittal.

.6 Responsibility for deviations in submittal from requirements of Contract documents is not relieved by Departmental Representative's review of submittal, unless Departmental Representative gives written acceptance of specified deviations.

.7 Notify Departmental Representative, in writing, at time of submission, of deviations in submittal 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 subtrades.

1.7 HEALTH AND SAFETY

.1 Specified in Section 01 35 33.

1.8 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 adjoining property.

1.9 REGULATORY REQUIREMENTS

.1 References and Codes:

.1 Perform Work in accordance with National Building Code of Canada (NBCC2010) and where applicable British Columbia Building Code (BCBC2012) including all amendments up to bid 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.

1.10 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 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.

.3 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.

.4 Reports:

.1 Submit (4) four copies of inspection and test reports to Departmental Representative.

.5 Tests and Mix Designs:

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

.6 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.

.7 Mill Tests:

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

.8 Equipment and Systems:

.1 Submit adjustment and balancing reports for electrical equipment systems.

.2 Refer to specific Section for definitive requirements.

1.11 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 Arrange, pay for and maintain temporary water supply in accordance with local authority, governing regulations and ordinances.

.2 Permanent water supply system installed under this contract may be used for construction requirements provided that guarantees are not affected thereby. Replace damaged components.

.4 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 and clean reflectors and lenses used for more than three months.

.5 Temporary Communication Facilities:

.1 Provide and pay for temporary telephone and fax hook up, line(s) necessary for own use.

.6 Fire Protection:

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

1.12 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 WorkSafe BC regulations and Section 01 35 33.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required.

.3 Hoisting:

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

.2 Hoists to be 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 existing roads used for access to project site.

.2 Build and maintain temporary access where required and provide snow removal during period of Work.

.3 Park vehicles outside perimeter fence in designated parking areas.

.6 Contractor's Site Office and enclosure:

.1 Provide office of size to accommodate site meetings and Contractor's operations.

.2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.3 Provide temporary fenced area to enclose site and operations.

.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.

.2 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures. Permanent facilities may be used on approval of Departmental Representative.

1.13 TEMPORARY BARRIERS AND ENCLOSURES

.1 Hoarding:

.1 Erect temporary site enclosure using new 1.8 m high temporary construction fencing. Provide lockable truck gate. Maintain fence in good repair.

.2 Enclosure of Structure:

.1 Provide temporary weathertight enclosures and protection for exterior openings until permanently enclosed. Design enclosures to withstand wind pressure. Provide lockable entry as required for moving personnel equipment and materials.

.2 Provide temporary enclosures to secure building from entry of unauthorized personnel during construction period.

.3 Guardrails and Excavations:

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

.2 Provide as required by governing authorities.

.4 Access to Site:

.1 Maintain immediate local access roads in clean condition used during work of this contract.

.5 Protection for Off-Site and CSC Property:

.1 Protect surrounding CSC property from damage during performance of Work.

.2 Be responsible for damage incurred.

.6 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.

1.14 COMMON PRODUCT REQUIREMENTS

.1 Reference Standards:

.1 If there is 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 born 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 neither to damage nor to put at risk any portion of Work.

.10 Location of Fixtures:

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

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

.3 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 governing authorities, with minimum of disturbance to pedestrian and vehicular traffic.

.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, capped and re-routed services lines.

.15 Contractors Options for Selection of Products:

.1 Products specified by **"Prescriptive" specifications**: select any product meeting or exceeding specifications.

.2 Products specified under "**Acceptable Products**" (used for complex Mechanical or Electrical Systems): select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.

.3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.

.4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Product. Alternative products may be considered provided full technical data is received in writing by Departmental Representative in accordance with "Instructions to Bidders".

.5 When products are specified by a referenced standard or by Performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.

.16 Substitution after award of Contract:

.1 No substitutions are permitted without prior written approval of the Departmental Representative.

.2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by the Departmental Representative if:

.1 Products selected by tenderer from those specified are not available;

.2 Delivery date of products selected from those specified would unduly delay completion of Contract, or

.3 Alternative product to that specified, which is brought to the attention of and considered by Departmental Representative as equivalent to the product specified, and will result in a credit to the Contract amount.

.4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.

.5 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative, and the Contract price will be reduced accordingly.

1.15 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.

1.16 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 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 purpose made saw or core drill. Pneumatic or impact tools not allowed on brittle materials 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 firestopping 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.

1.17 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 Clear snow and ice from access to building.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use clearly marked separate bins for recycling. Refer to-Construction/Demolition Waste Management And Disposal.

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

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

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

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

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

.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 and 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.

.5 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.6 Clean lighting reflectors, lenses, and other lighting surfaces.

.7 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.8 Wax, seal, vacuum clean, shampoo or prepare floor finishes, as recommended by manufacturer.

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

.10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.11 Remove dirt and other disfiguration from exterior surfaces.

.12 Sweep and wash clean paved areas.

.14 Clean roofs, downspouts, and drainage systems.

.15 Remove snow and ice from access to building.

1.18 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.

.1 Separate non-salvageable materials from salvaged items.

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

.3 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.

1.19 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 Substantial 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 Jurisdictions for seismic restraints.

.5 Operation of systems have been demonstrated to Departments 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.

1.20 CLOSEOUT SUBMITTAL

.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 Submit one copy of as-built marked up set to Departmental Representative.

.2 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.

.3 Provide additional details on as-built drawings if requested to do so by Consultant or Departmental Representative.

.2 Maintenance manual:

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

.1 Provide maintenance manual on USB Flash Drives 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 drive "Operation and Maintenance Data", project name, date, names of Contractor, subcontractors, consultants and subconsultants.

.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 Electrical Divisions for specific details and 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.

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:

(a) an intoxicant, including alcoholic beverages, drugs and narcotics

(b) 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,

(c) an explosive or a bomb or a component thereof,

(d) currency over any applicable prescribed limit, $25.00, and

(e) 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 or Warden of the Institution as applicable or their representative.

.6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies. Workers 18 years or younger are not permitted within Institution.

.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 zone" 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.

.1 Construction zone for this contract includes the project location at William Head Institution.

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 contractor's responsibilities:

.1 Ensure that all construction employees are aware of the CSC security requirements.

.2 Ensure that a copy of the CSC 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 Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the construction employees clothing at all time while employees are at 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.

.4 are 18 years old or younger.

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. All storage trailers inside and outside the perimeter must be locked when not in use.

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 for the contractor.

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, PDAs, 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 Work hours within the Institution are: 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 waived 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 will 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

.2 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 Construction vehicles are not to leave the Institution until an inmate count is completed. Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:

.1 AM: 0745 hrs. to 1100 hrs.

.2 PM: 1300hrs. to 1530 hrs.

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

.3 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.

.4 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.

.5 Vehicles will 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.

.6 Private vehicles of construction employees will not be allowed within the security wall or fence of medium or maximum security Institutions without the authorization of the Director.

.7 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 or PWGSC Construction Escort Officer.

.3 During the lunch and coffee/health breaks, all construction employees will remain within the construction site. Construction employees are not permitted to eat in the Institution cafeteria 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 will note the name of the staff member giving the instruction, the time of the request and obey the order as quickly as possible.

.2 The contractor shall advise the Departmental Representative of this interruption of the work within 24 hours.

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 Digital cameras (or any other type) are not allowed on CSC property.

.3 Notwithstanding the above paragraph, if the director approves of the use of cameras, it is strictly 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.

24 COMPLETION OF CONSTRUCTION PROJECT

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

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Expend Cash Allowances as directed by Departmental Representative.

.2 Cash Allowances will be adjusted to actual cost as defined hereunder and contract price will be amended accordingly by written order.

.3 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.

.4 Progress payments for work and material authorized under cash allowances will be made in accordance with contract terms of payment.

1.2 MATERIAL AND INSTALLATION ALLOWANCES

.1 The following cash allowances are included in the Lump Sum Tender Price.

.1 $ 65,000: for BC Hydro connection charges.

.2 Cash allowances to include and provide payment for:

.1 Net cost of material and service.
.2 Applicable duties and taxes.
.3 Delivery to site.
.4 Handling at site, including unloading, uncrating, storage and hoisting.
.5 Protection from damage by elements or otherwise.
.6 Labour installation and finishing.
.7 Other expenses required to complete installation.

Part 2 Products (not applicable)

Part 3 Execution (not applicable)

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Government of Canada.

.1 Canada Labour Code - Part II

.2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):

.1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2009 Code of Practice for Access Scaffold

.2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes

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

.4 Fire Protection Engineering Services, HRSDC:

.1 FCC No. 301, Standard for Construction Operations.

.2 FCC No. 302, Standard for Welding and Cutting.

.5 National Building Code of Canada (NBCC 2005):

.1 Part 8, Safety Measures at Construction and Demolition Sites

.6 American National Standards Institute (ANSI):

.1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.7 Province of British Columbia:

.1 Workers Compensation Act Part 3-Occupational Health and Safety.

.2 Occupational Health and Safety Regulation

1.2 RELATED SECTIONS

.1 Refer to the following current NMS sections as required:

.1 Section 01 01 50 General Instructions

1.3 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.

1.4 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.

1.5 SUBMITTALS

.1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 01 50.

.2 Work effected by submittal shall not proceed until review is complete.

.3 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.

.4 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 10 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.5 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.

.6 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.

1.6 RESPONSIBILITY

.1 Perform role of Prime Contractor and be responsible for the health and safety program (per WorksafeBC) of the construction site while these other contractors/trades are working on site.

.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.

1.7 HEALTH AND SAFETY COORDINATOR

.1 The Health and Safety Coordinator (Registered Occupational Hygienist, Certified Industrial Specified Hygienist) 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.

1.8 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 at night time or provide security guard as deemed necessary to protect site against entry.

1.9 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.

1.10 WORK PERMITS

.1 Obtain specialty permit related to project before start of work.

1.11 FILING OF NOTICE

.1 The General Contractor is to complete and submit a Notice of Project as required by Provincial authorities.

.2 Provide copies of all notices to the Departmental Representative.

1.12 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 record keeping 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) 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.

1.13 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 and the first-aid attendant, 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 or residences 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.

.5 Work on, over, under and adjacent to water.

.6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

.5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.14 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 as per Section 01 01 50.

.2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.

1.15 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.

1.16 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.

1.17 OVERLOADING

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

1.18 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1.

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.

1.20 CONFINED SPACES

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

1.21 POWER-ACTUATED DEVICES

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

1.22 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.

1.23 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.

1.24 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, standpipes and hose systems for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.25 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.

1.26 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 plans or site plans. Must be posted in a non-inmate access are and locked up when not being used.

.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.

1.27 MEETINGS

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

1.28 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 General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)/International Electrical Testing Association (NETA)

.1 ANSI/NETA ATS-2009, Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

.2 ANSI/NETA MTS-2007, Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems

1.2 QUALITY ASSURANCE

.1 Provide third party commissioning agent(s) for electrical systems. Include commissioning costs in tender price.

.2 Commissioning Agent(s) for testing shall be certified in accordance with ANSI/NETA ETT-2000 with on-site crew leaders holding a current certification level of Level III or higher in electrical testing. Comply with applicable procedures and standards of the certification sponsoring association.

.3 The Commissioning Agent(s) to be responsible for scheduling inspections and including reports in their final submission prior to turnover.

1.3 SUBMITTALS

.1 Submit the names of a minimum three (3) commissioning agents proposed to perform commissioning and testing services, complete with references and CV of each member of the agency who will be doing the work for this project. Submit documentation to confirm agencies compliance with quality assurance provision.

.2 Prior to commencing commissioning services, submit 3 preliminary specimen copies of each of report forms proposed for use.

.3 Upon completion of commissioning services, prepare and submit preliminary report. Prepare final report with corrections and completed work requested, at time of turnover. Submit 3 copies and one electronic PDF file of final reports on approved forms.

.4 The project will not be turned over without a final report showing no deficiencies or outstanding work. Once the building is occupied there will be no opportunities to return to the Institution to complete work unless escorted.

1.4 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 immediately to Departmental Representative any deficiencies or defects noted during performance of services.

1.5 FINAL REPORTS

.1 Commissioning agent to prepare final reports. Submit Operation and Maintenance manuals, testing results and reports to Commissioning Agent for final submission to Departmental Representative.

.2 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.

.3 Identify each instrument used, and latest date of calibration of each.

1.6 COMMISSIONING AGENT'S RESPONSIBILITIES

.1 Unless otherwise outlined in the requirements of Division 26, conduct testing and commissioning of the Electrical Equipment supplied and installed under the General Contract in accordance ANSI/NETA standards.

.2 Unless otherwise outlined in the requirements of Division 26, conduct electrical system testing in accordance with ANSI/NETA standards.

.3 Conduct an inspection and sign off on every detail in each assembly and system based on the requirements stipulated in the specification. Provide to the Departmental Representative, a full schedule of items to be inspected.

1.7 PREPARATION

.1 Provide instruments required for testing, adjusting, and load balancing operations.

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

.3 Retain possession of instruments and remove at completion of services.

.4 Verify systems installation is complete and in continuous operation.

1.8 EXECUTION

.1 Conduct room to room inspection.

.2 Test equipment, and balance electrical systems.

.3 For schedule of Electrical systems requiring testing, start up and verification refer to Division 26, where it applies to the electrical systems.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of interim completion.

.2 Departmental Representative will provide list of CSC personnel to Contractor and coordinate dates and times.

1.2 QUALITY CONTROL

.1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Departmental Representative's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

.1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

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

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

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - Commissioning and equipment and systems are fully operational.

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

1.5 PREPARATION

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

.2 Verify that designated personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

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

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

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

.4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT (NOT USED)

.1 Removal of existing asphalt pavement will be measured in square metres of surface actually removed regardless of depth removed.

.2 Payment under this item will include operations involved in removing, hauling and stockpiling designated pavement and cleaning of remaining pavement surface.

Part 2 Execution

2.1 PREPARATION

.1 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.

.2 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

2.2 REMOVAL

.1 Remove existing asphalt pavement as required and as established by Departmental Representative in field.

.2 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Suppress dust generated by removal process.

2.3 FINISH TOLERANCES

.1 Finished surfaces in areas where asphalt pavement has been removed to be within +/-10 mm of grade specified but not uniformly high or low.

2.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 01 50 – General Instructions.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 01 50 – General Instructions.

.3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

.4 Waste Management: separate waste materials for recycling in accordance with Section 01 01 50 – General Instructions.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Removed asphalt pavement which is to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Alteration project procedures.

.2 Removal and or salvage of designated construction.

.3 Disposal of materials.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.

.2 National Building Code Part 8

1.3 SUBMITTALS

.1 Submit detailed schedule for any and all work affecting the existing building. Consult with CSC regarding work required. Submit schedule minimum 10 calendar days prior to scheduled work.

.2 Submit with the project schedule a coordinated complete series of drawings diagrams, details and supporting data clearly showing sequence of demolition and removal work, reconstruction, occupant moves required, material storage, temporary barriers for all phases of the demolition construction work.

.3 The contractor will not be permitted to proceed until agreement with CSC and the Departmental Representative are obtained on the schedule and drawings.

.4 Submit the qualifications and names of the persons experienced and qualified for the deconstruction work as described below.

.5 Comply with requirement of 01 01 50 – General Instructions.

1.4 SCHEDULING

.1 Reference requirements in section 01 01 50 – General Instructions

.2 Perform noisy, malodorous, dusty, work:

.1 As directed by CSC and the Departmental Representative.

1.5 SITE CONDITIONS

.1 Review the Project Specific Hazardous Building Materials Assessment for William Head Institution with the Departmental Representative.

.1 Remove hazardous materials in a manner consistent with the Occupational Health & Safety Regulation, General Hazard Requirements of the Work Safe BC, and other applicable regulations. Changes to the Work will be dealt in accordance with the provisions of the Contract Documents.

.2 Handle and dispose of all hazardous and banned materials in accordance with the Special Waste Regulation, and Regional and Municipal regulations. These hazardous and banned materials include but are not limited to asbestos, drywall (banned from disposal), underground storage tanks, Polychlorinated Biphenyls (PCBs), abandoned chemicals (gasoline, pesticides, herbicides, flammable and combustible substances), freon from cooling equipment, lead-based paints, smoke detectors, and mercury containing switches.

.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 minimum 5 working days before disrupting building access or services.

.4 The Contractor shall accept the site as it exists and will be responsible for all deconstruction work as required.

1.6 ALTERATION PROJECT PROCEDURES

.1 Scope: Reference Electrical Drawings and Specifications.

.1 The approximate operating hours of the Institution is 7:30 to 16:00, and closed on weekends.

.2 The Institution may accommodate various deviations for the noted operating hours. Contractor may coordinate with Departmental Representative.

.3 The project is required to be completed in phases to minimize disruption to building services. The contractor is to consider this and develop a scheme for developing the management and construction of the project.

.4 Remove and reconstruct existing construction as required to install the requirements of the documents.

.5 Existing Conditions:

.1 Visit site at own expense prior to submission of bids and take whatever time is required to ascertain existing site conditions and surrounding features related to the proposed deconstruction.

.2 Confirm conditions are suitable for execution of the work. No additional sums of money will be allowed for after acceptance of bid for any items resulting from lack of understanding and familiarity with the site conditions, and failing to report immediately to the Departmental Representative any discrepancies observed on site that are in conflict with the intent of drawings and specifications.

.3 Accept the site as it exists and be responsible for all deconstruction work as required.

.4 The contractor must include all costs for the work in the existing building.

.2 Materials: As specified in Product sections; match existing Products and work for patching and extending work.

.3 Employ skilled and experienced installer to perform alteration work.

.4 Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

.5 Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original condition.

.6 Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with a neat transition to adjacent finishes.

.7 Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

.8 When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Departmental Representative for review.

.9 Where a change of plane of 6 mm or more occurs, submit recommendation for providing a smooth transition; to Departmental Representative for review. Request instructions from the Departmental Representative.

.10 Patch or replace portions of existing surfaces which are damaged, lifted, discoloured, or showing other imperfections.

.11 Finish surfaces as specified in individual Product sections.

1.7 PROTECTION

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

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

.1 Refer to Section 01 01 50 General Instructions

.2 Noisy work will only be permitted at times agreed to and accepted by the Departmental Representative.

.3 Protect building mechanical and electrical systems, services and equipment.

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

.5 Do not overload any portion of the structure with material or equipment

.6 Where existing load bearing partitions are to be removed, do not commence work until new support structure is installed, inspected and approved by the Departmental Representative.

.7 Cease operations and notify the Departmental Representative if safety of any adjacent work or structure appears to be endangered. Take all precautions to support the structure. Do not resume operations until reviewed with the Departmental Representative.

.8 Ensure safe passage of building occupants around area of demolition. Remove debris and clean areas of access immediately.

1.8 PROJECT CONDITIONS

.1 Conduct demolition to minimize interference with adjacent and occupied building areas.

1.9 QUALITY ASSURANCE

.1 Salvage or Demolition Firm: Company (ies) must be experienced and specializing in performing the work of this section with documented experience in similar types of deconstruction work.

.2 Qualifications of Workers: Provide a supervisor who shall be present at all times during the deconstruction work and who shall be thoroughly familiar with the work required and who shall direct all work. Provide one (1) person on site who is responsible for maintaining the safety barriers and protection of the workers and the public.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 PREPARATION

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

.2 Provide, erect, and maintain temporary barriers security partitions at locations indicated agreed to with CSC and the Departmental Representative.

.1 Erect and maintain temporary partitions to prevent spread of dust, odours, and noise to permit continued occupancy. Refer to phasing notes on drawings. The extent of the partitions required may exceed the information shown on the phasing drawing or demolition drawings.

.3 Erect and maintain weatherproof closures for exterior openings.

.4 Protect existing materials which are not to be demolished.

.5 Prevent movement of structure; provide bracing and shoring.

3.2 PROTECTION

.1 Maintain public safety and traffic control precautions at all times during the demolition work, using properly trained qualified persons to control all Contractor's activities, vehicles, equipment, traffic and all public pedestrian and vehicles traffic that are coming to and from the site or passing along the vicinity of the site access locations.

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

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

.4 Protect building systems, services and equipment.

.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.

3.5 DEMOLITION

.1 The electrical services MUST NOT be terminated within the building at any time. Notify the building Departmental Representative of any requirements for partial termination of services in accordance with Division 1 requirements. Keep down time at a minimum.

.2 Remove parts of existing building to permit new construction. Sort materials into appropriate piles for reuse, recycling, or disposal.

.1 Demolish in an orderly and careful manner. Protect existing supporting structural members.

.2 Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

.3 Remove temporary Work.

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

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

.1 Canadian Environmental Protection Act,1999 (CEPA 1999).

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

.1 Material Safety Data Sheets (MSDS).

.3 National Fire Code of Canada.

.4 Transportation of Dangerous Goods Act (TDGA), c. 34.

.5 Transportation of Dangerous Goods Regulations (TDGR), T-19.01-SOR/2003-400.

.6 Storage of PCB Material Regulations, SOR/92-507.

.7 PCB Waste Export Regulations, 1996, SOR/97-109.

.8 Ozone-Depleting Substances Regulations, SOR/99-07.

.9 Environmental Code of Practice on Halons, July 1996.

.10 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, March 1996.

1.3 DEFINITIONS

.1 Toxic: substance is considered toxic if it is listed on Toxic Substances List found in Schedule 1 of CEPA.

.2 List of Toxic Substances: found in Schedule 1 of CEPA, lists substances that have been assessed as toxic. Federal Government can make regulations with respect to a substance specified on List of Toxic Substances. Column II of this list identifies type of regulation applicable to each substance.

.3 PCBs: includes chlorobiphenyls referred to in Column I of item 1 of the List of Toxic Substances in Schedule I of Canadian Environmental Protection Act.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.2 Submit photocopy of shipping documents and waste manifests to Departmental Representative when shipping toxic wastes off site.

.3 Maintain 1 copy of product data in readily accessible file on site.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Store and handle toxic wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.2 Store and handle flammable and combustible wastes in accordance with current National Fire Code of Canada requirements.

.3 Co-ordinate storage of toxic wastes with Departmental Representative and follow internal requirements for labelling and storage of wastes.

.4 Observe smoking regulations, smoking is prohibited in area where toxic wastes are stored, used, or handled.

.5 Report spills or accidents involving toxic wastes immediately to Departmental Representative and to appropriate regulatory authorities. Take reasonable measures to contain the release while ensuring health and safety is protected.

.6 Transport toxic wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.7 Use authorized/licensed carrier to transport toxic waste.

.8 Co-ordinate transportation and disposal of toxic wastes with Departmental Representative.

.9 Notify appropriate regulatory authorities and obtain required permits and approvals prior to exporting toxic waste.

.10 Ensure toxic waste is shipped to authorized/licensed treatment or disposal facility and that liability insurance requirements are met.

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 RELATED REQUIREMENTS

.1 Section 02 82 00.01 - Asbestos Abatement - Minimum Precautions

.2 Section 02 82 00.02 - Asbestos Abatement - Intermediate Precautions

.3 Section 02 82 00.03 – Asbestos Abatement – Maximum Precautions

1.2 REFERENCES

.1 Reports:

.1 "Hazardous Materials Survey High Voltage Upgrade –William Head Institution, Correctional Services Canada, Victoria, British Columbia", prepared by Stantec Consulting Ltd., dated March, 2016 (Assessment Report).

.2 Definitions:

.1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.

.3 Reference Standards:

.1 Canadian Environmental Protection Act,1999 (CEPA 1999)

.1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).

.2 Department of Justice Canada (Jus)

.1 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).

.2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).

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

.1 Material Safety Data Sheets (MSDS).

.4 National Research Council Canada Institute for Research in Construction (NRC-IRC)

.1 National Fire Code of Canada-[2005].

.5 WorkSafe BC

.1 British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97, including amendments to date of work)

.2 "Safe Work Practices for Handling Asbestos" (2012 Edition)

.3 "Lead-Containing Paints and Coatings; Preventing Exposure in the Construction Industry", 2011

.6 The current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)

.7 The Federal Transportation of Dangerous Goods Regulation

.8 The Federal PCB Regulations (SOR/2008-273).

.9 The British Columbia Waste Management Act - Ozone Depleting Substances and Other Halocarbons Regulation (BC Reg. 387/99).

.10 The Federal Halocarbons Regulation, July 2003

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS in accordance with Sections 01 35 33 - Health and Safety Requirements and 01 35 29.06 - Environmental Procedures to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.

.3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

.4 Construction Waste Management:

.1 Submit project Demolition Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating percentage of construction wastes were recycled or salvaged

.5 Low-Emitting Materials: submit listing of adhesives and sealants used in building, comply with VOC and chemical component limits or restrictions requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.

.2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.

.7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

.3 Store hazardous materials and wastes in containers compatible with that material or waste.

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.

.6 Store hazardous materials and wastes in secure storage area with controlled access.

.7 Maintain clear egress from storage area.

.8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.

.9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.

.10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 When hazardous waste is generated on site:

.1 Co-ordinate transportation and disposal with Departmental Representative.

.2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.

.3 Use licensed carrier authorized by provincial authorities to accept subject material.

.4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.

.5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.

.6 Only trained personnel handle, offer for transport, or transport dangerous goods.

.7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.

.8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.

.9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

.12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

.5 Develop Demolition Waste Management Plan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

.1 Description:

.1 Bring on site only quantities hazardous material required to perform Work.

.2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

Part 3 Execution

3.1 HAZARDOUS MATERIALS ABATEMENT

.1 Scope of Abatement Activities (other than Asbestos – specified elsewhere) for the high voltage upgrade at William Head Institution.

.1 Abatement shall be conducted to remove and dispose of hazardous building materials as identified in the Stantec Report in accordance with applicable regulations, guidelines, standards and/or best practices for such work.

.2 The listing below is a summary of the identified hazardous building materials (other than asbestos) and associated removal and disposal regulations, guidelines and/or standards.

.1 Lead

Demolition to be conducted in accordance with the requirements of the current version of the WorkSafe BC publication "Lead-Containing Paint and Coatings: Preventing Exposure in the Construction Industry", keeping airborne exposure to lead dust to less than the 8-hour Occupational Exposure Limit (OEL) for lead of 0.05 milligram per cubic metre (mg/m^3).

Waste transportation to be conducted in accordance the Federal Transportation of Dangerous Goods Regulation.

Waste disposal to be conducted in accordance with the current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88). If the Contractor chooses to dispose of identified lead-containing materials or materials with identified lead-containing paints via landfill in BC, the Contractor will be responsible for applicable leachate testing of waste materials to determine landfill options.

Lead-containing materials to be considered during demolition are summarized below:

1. Inmate Training
    1. Per the Stantec Report: Grey paint on concrete floors
    2. Per the Stantec Report: Red/brown paint on doors in the basement
    3. Per the Stantec Report: Cream paint on block walls in rooms 102 – 104.
    4. Per the Stantec Report: Brown paint on doors and trim on the main floor
    5. Per the Stantec Report: Tan/brown paint on block walls in the main floor hallway
2. Standby Power Plant
    1. Per the Stantec Report: Grey paint on concrete floors
    2. Per the Stantec Report: Red paint on vent, windows, and door trim
3. Vocational Training
    1. Per the Stantec Report: White paint on block walls in room 132
    2. Per the Stantec Report: Grey paint on concrete floors
    3. Per the Stantec Report: Red paint on steel beams in room 115
    4. Per the Stantec Report: Blue paint on walls and ceiling in room 130
    5. Per the Stantec Report: Black paint on trim
    6. Per the Stantec Report: Dark blue paint on doors
4. Lead is also expected to be present in lead-acid batteries used in emergency lighting, older electrical wiring materials and sheathing, solder used on domestic water lines, solder used in bell fittings for cast iron pipes, solder used in electrical equipment and vent and pipe flashings.

.2 Polychlorinated Biphenyls (PCBs)

For the fluorescent light fixtures within both Port of Entry Buildings:

1. Remove all fluorescent lamp fixtures. Assess all ballasts in comparison to the Environment Canada document entitled "Identification of Lamp Ballasts Containing PCBs, Report EPS 2/CC/2", dated August 1991 (or equivalent reference).

2. Sort PCB-containing lamp ballasts from non-PCB-containing lamp ballasts.

Waste transportation to be conducted in accordance the Federal Transportation of Dangerous Goods Regulation.

Dispose of ballasts in accordance with the current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88) and The Federal PCB Regulations (SOR/2008-273).

.3 Mercury

Remove all thermostats with mercury-containing switches, fluorescent light tubes and high intensity discharge lights (mercury vapour) and/or other mercury-containing items.

Waste transportation to be conducted in accordance with the Federal Transportation of Dangerous Goods Regulation.

Dispose of waste in accordance with the current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88).

.4 Ozone-Depleting Substances (ODSs)

ODSs within equipment to be drained and recaptured by licensed technicians in accordance with the Federal Halocarbons Regulations, complete with appropriate support documentation to be provided to the Departmental Representative.

Waste transportation to be conducted in accordance the Federal Transportation of Dangerous Goods Regulation.

Waste disposal to be conducted in accordance with the British Columbia Waste Management Act - Ozone Depleting Substances and Other Halocarbons Regulation (BC Reg. 387/99).

.5 Silica

Silica may be present in concrete, cement, floor tiles, drywall, and acoustic ceiling tiles, which are present in various locations throughout.

When silica-containing materials are to be removed during demolition activities, ensure dust control measures are employed such that airborne silica dust concentrations do not exceed the exposure limit as stipulated by BC Reg. 296/97 (0.025 mg/m^3). This would include, but not be limited to, the following:

1. Providing workers with respiratory protection
2. Wetting the surface of the materials to prevent dust emissions
3. Providing workers with facilities to properly wash prior to exiting the work area
4. Providing dust control to mitigate the potential for demolition dust to escape from the work area into public and/or adjacent areas

.5 Equipment with Radioactive Components

If smoke detectors with radioactive components are present, these items should be removed for disposal in accordance with applicable regulations as stated in the Stantec Report.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable federal and provincial regulations.
- .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
  - .1 Hazardous wastes recycled in manner constituting disposal.
  - .2 Hazardous waste burned for energy recovery.
  - .3 Lead-acid battery recycling.
  - .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Refer to following reports attached in the Appendices for information pertaining to the asbestos-containing materials (ACMs) that have been identified in William Head Institution and that may be impacted by the Work.

.1 "Hazardous Materials Survey High Voltage Upgrade– William Head Institution, Correctional Services Canada, Victoria, British Columbia", prepared by Stantec Consulting Ltd., dated March, 2016 (Assessment Report).

.2 Unless otherwise determined through risk assessment conducted by a qualified person, comply with requirements of this Section when disturbance to the following materials is required to complete the Work:

.1 Asbestos-containing vinyl floor tiles.

.1 This material will require removal and disposal

.2 Asbestos-containing mastics.

.1 This material will require removal and disposal

.3 Asbestos-containing caulkings.

.1 This material will require removal and disposal.

.4 Asbestos-containing ceiling tiles.

.1 This material will require removal and disposal

1.2 SECTION INCLUDES

.1 Requirements and procedures for applicable procedures and personal protective equipment to be utilized during set-up of asbestos abatement work areas and for abatement of ACMs of the type described within.

1.3 RELATED REQUIREMENTS

.1 Section 02 82 00.02 – Asbestos Abatement Intermediate Precautions

1.4 REFERENCES

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

.3 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.4 Underwriters' Laboratories of Canada (ULC)

.5 WorkSafe BC

.1 British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97, including amendments to date of work)

.2 "Safe Work Practices for Handling Asbestos" (2012 Edition)

.6 The current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)

1.5 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight (or vermiculite insulation materials with any asbestos) and are identified under Existing Conditions including fallen materials and settled dust.

.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.5 Authorized Visitors: Departmental Representative and representatives of regulatory agencies.

.6 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.7 Friable material: means material that:

.1 When dry, can be crumbled, pulverized or powdered by hand pressure, or

.2 is crumbled, pulverized or powdered.

.8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.

.10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial and/or local requirements for Notice of Project Form.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.6 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.7 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Perform construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.2 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to

be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

.2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are to be supplied by the Contractor.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

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

.4 Separate and place in designated containers steel metal plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal banding, flatten and place in designated area for recycling.

.8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 mil bags or leak proof drums. Label containers with appropriate warning labels.

.9 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.9 EXISTING CONDITIONS

.1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into this specification in the appendices.

.2 Notify Departmental Representative of additional suspected ACMs discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative.

1.10 SCHEDULING

.1 Hours of Work: perform work during normal working hours.

1.11 OWNER'S INSTRUCTIONS

.1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, following minimum requirements:

.1 Fitting of equipment.
.2 Inspection and maintenance of equipment.
.3 Disinfecting of equipment.
.4 Limitations of equipment.

.3 Instruction and training must be provided by a competent, qualified person.

Part 2 Products

2.1 MATERIALS

.1 Drop Sheets:

.1 Polyethylene: 0.15 mm thick.
.2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.

.4 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.

.5 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

Part 3 Execution

3.1 PROCEDURES

.1 Do construction occupational health and safety in accordance Section 01 35 33 - Health and Safety Requirements.

.2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

.1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.

.2 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.

.3 Do not use compressed air to clean up or remove dust from any surface.

.3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.

.4 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.

.1 Use garden reservoir type low - velocity fine - mist sprayer.

.2 Perform Work to reduce dust creation to lowest levels practicable.

.3 Work will be subject to visual inspection and air monitoring.

.4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.5 Frequently and at regular intervals during Work and immediately on completion of work:

.1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste container, and

.2 Drop sheets to be wetted and placed in a waste container as soon as practicable.

.6 Cleanup:

.1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.

.2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.

.4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

3.2 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, Departmental Representative to take air samples inside and outside of Asbestos Work Area enclosure[s] in accordance with British Columbia's Occupational Health and Safety Regulation and the current version of the WorkSafeBC Manual entitled "Safe Work Practices for Handling Asbestos".

.1 Departmental Representative will be responsible for monitoring inside enclosure in accordance with applicable Provincial Occupational Health and Safety Regulations.

.2 If air monitoring shows that areas outside Asbestos Work Area enclosure[s] are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area, at no additional cost to the Contract

.3 Ensure that respiratory safety factors are not exceeded.

.4 During the course of Work, Departmental Representative to measure fibre content of air outside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).

.1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Refer to following reports attached in the appendices for information pertaining to the asbestos-containing materials (ACMs) that have been identified in William Head Institution and that may be impacted by the Work.

.1 "Hazardous Materials Survey High Voltage Upgrade– William Head Institution, Correctional Services Canada, Victoria, British Columbia", prepared by Stantec Consulting Ltd., dated March, 2016 (Assessment Report).

.2 Unless otherwise determined through risk assessment conducted by a qualified person, comply with requirements of this Section when performing following Work:

.1 Asbestos-containing parging cement.

.1 This material will require removal and disposal

.2 Asbestos-containing pipe fitting insulation.

.1 This material will require removal and disposal

1.2 SECTION INCLUDES

.1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.

1.3 RELATED REQUIREMENTS

.1 Section 02 82 00.01 – Asbestos Abatement Minimum Precautions

1.4 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.205-[94], Sealer for Application of Asbestos Fibre Releasing Materials.

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 Underwriters' Laboratories of Canada (ULC)

.6 WorkSafe BC

.1 British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97, including amendments to date of work)

.2 "Safe Work Practices for Handling Asbestos" (2012 Edition)

.7 The current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)

1.5 DEFINITIONS

.1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.

.2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight (or vermiculite insulation materials with any asbestos) and are identified under Existing Conditions including fallen materials and settled dust.

.3 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.

.4 Authorized Visitors: Departmental Representative, and representatives of regulatory agencies.

.5 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.6 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.7 Glove Bag: prefabricated glove bag as follows:

.1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.

.2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.

.3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.

.4 Straps for sealing ends around pipe.

.8 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.

.9 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.10 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

.11 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial and/or local requirements for Notice of Project Form.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.

.6 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration. Minimum of one supervisor for every ten workers.

.8 Submit Worker's Compensation Board status and transcription of insurance.

.9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:

- .1 Encapsulants;
- .2 Amended water;
- .3 Slow drying sealer.

.10 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.

.2 Health and Safety:

- .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.
- .2 Safety Requirements: worker and visitor protection.
  - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Full-facepiece powered, air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.7 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

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

.4 Separate for reuse and recycling and place in designated containers steel, metal, and/or plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal banding, flatten and place in designated area for recycling.

.8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 mil bags or leak proof drums. Label containers with appropriate warning labels.

.9 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.9 EXISTING CONDITIONS

.1 Reports and information pertaining to ACMS to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification in the appendices

.2 Notify Departmental Representative of additional suspected ACM discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.10 SCHEDULING

.1 Hours of Work: perform work during normal working hours.

1.11 OWNER'S INSTRUCTIONS

.1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, in use of glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, at minimum:

.1 Fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by competent, qualified person.

Part 2 Products

2.1 MATERIALS

.1 Drop and Enclosure Sheets:

.1 Polyethylene: 0.15 mm thick.

.2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.

.3 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.

.4 Glove bag:

.1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.

.2 The glove bag to be equipped with:

.1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.

.2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.

.3 A tool pouch with a drain.

.4 A seamless bottom and a means of sealing off the lower portion of the bag.

.5 A high strength double throw zipper and removable straps, if the bag is to be moved during the removal operation.

.5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.

.1 Sealer: flame spread and smoke developed rating less than 50.

.7 Encapsulant: penetrating type conforming to CAN/CGSB-1.205.

Part 3 Execution

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used: 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.

.3 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.

.1 Use HEPA vacuum or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.

.2 Do not use compressed air to clean up or remove dust from any surface.

.4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.

.5 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.

.1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.

.2 Perform Work in a manner to reduce dust creation to lowest levels practicable.

.6 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.7 Cleanup:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, Departmental Representative to take air samples inside and outside of Asbestos Work Area enclosure[s] in accordance with British Columbia's Occupational Health and Safety Regulation and the current version of the WorkSafeBC Manual entitled "Safe Work Practices for Handling Asbestos".

.1 Departmental Representative will be responsible for monitoring inside enclosure in accordance with applicable Provincial Occupational Health and Safety Regulations.

.2 If air monitoring shows that areas outside Asbestos Work Area enclosure[s] are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area, at no additional cost to the Contract

.3 Ensure that respiratory safety factors are not exceeded.

.4 During the course of Work, Departmental Representative to measure fibre content of air outside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).

.1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.

.5 Final air monitoring to be conducted as follows: After Asbestos Work Area has passed visual inspection and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period has passed, Departmental Representative will perform air monitoring within Asbestos Work Area.

.1 Final air monitoring results must show fibre levels of less than 0.01 f/cc.

.2 If air monitoring results show fibre levels in excess of 0.01 f/cc, re-clean work area and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat as necessary until fibre levels are less than 0.01 f/cc, at no cost to Contract.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Refer to following reports attached in the Appendices for information pertaining to the asbestos-containing materials (ACMs) that have been identified in William Head Institution and that may be impacted by the Work.

.1 "Hazardous Materials Survey High Voltage Upgrade– William Head Institution, Correctional Services Canada, Victoria, British Columbia", prepared by Stantec Consulting Ltd., dated March, 2016 (Assessment Report).

.2 Unless otherwise determined through risk assessment conducted by a qualified person, comply with requirements of this Section when performing following Work:

.1 Asbestos-containing boiler stack insulation.

.1 This material will require removal and disposal

.2 Asbestos-containing boiler insulation.

.1 This material will require removal and disposal

.3 Asbestos-containing vermiculite insulation.

.1 Removal and disposal of asbestos-containing vermiculite insulation (and associated asbestos-contaminated insulation and debris) where hand removal procedures are used as the primary method for removal.

1.2 SECTION INCLUDES

.1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.

1.3 RELATED REQUIREMENTS

.1 Section 02 82 00.02 – Asbestos Abatement Intermediate Precautions

1.4 REFERENCES

.1 Government of Canada.

.1 Canada Labour Code - Part II

.2 Canada Occupational Health and Safety Regulations.

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 Underwriters' Laboratories of Canada (ULC)

.6 WorkSafe BC

.1 British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97, including amendments to date of work)

.2 "Safe Work Practices for Handling Asbestos" (2012 Edition)

.7 The current version of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)

1.5 DEFINITIONS

.1 Airlock: system for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.

.2 Amended Water: water with a non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.

.3 Asbestos Containing Materials (ACMs): materials that contain any asbestos and are identified under Existing Conditions, including fallen materials and settled dust.

.4 Asbestos Work Areas: area where work takes place which will, or may disturb ACMs.

.5 Authorized Visitors: Departmental Representative, Consultant, and representatives of regulatory agencies.

.6 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.7 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:

.1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.

.2 Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing.

.3 Overlap each polyethylene sheet at openings not less than 1.5 m on each side.

.8 DOP Test: testing method used to determine integrity of Negative Pressure unit using dioctyl phthalate (DOP) HEPA-filter leak test.

.9 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.10 Glove Bag: prefabricated glove bag as follows:

.1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.

.2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.

.3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.

.4 Straps for sealing ends around pipe.

.11 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.12 Negative pressure: system that extracts air directly from work area, filters such extracted air through High Efficiency Particulate Air filtering system, and discharges this air directly outside work area to exterior of building.

.1 System to maintain minimum pressure differential of 5 Pa relative to adjacent areas outside of work areas, be equipped with alarm to warn of system breakdown, and be equipped with instrument to continuously monitor and automatically record pressure differences.

.13 Non-Friable Materials: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.14 Occupied Areas: any area of building or work site that is outside Asbestos Work Area.

.15 Polyethylene sheeting sealed with tape: polyethylene sheeting of type and thickness specified sealed with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through sheeting into clean area.

.16 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Before beginning work:

.1 Obtain from appropriate agency and submit to Departmental Representative necessary permits for transportation and disposal of asbestos waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to receive and properly dispose of asbestos waste.

.2 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person on hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing. Submit proof of attendance in form of certificate.

.3 Ensure supervisory personnel have attended asbestos abatement course, of not less than two days duration. Submit proof of attendance in form of certificate. Minimum of one Supervisor for every ten workers.

.4 Submit layout of proposed enclosures and decontamination facilities to Departmental Representative for review.

.5 Delete the following paragraph if sealing does not apply.

.6 Submit documentation including test results for sealer proposed for use.

.7 Submit Provincial and/or local requirements for Notice of Project form.

.8 Submit proof of Contractor's Asbestos Liability Insurance.

.9 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

.10 Submit Worker's Compensation Board status and transcription of insurance.

.11 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including but not limited to following:

.1 Encapsulants.

.2 Amended water.

.3 Slow drying sealer.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:

.1 Powered air purifying respirator (PAPR) with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators,

and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn. Requirements for each worker:

.1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters that have been tested as satisfactory, clean coveralls and head covers before entering Equipment and Access Rooms or Asbestos Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.

.2 Remove gross contamination from clothing before leaving work area then proceed to Equipment and Access Room and remove clothing except respirators. Place contaminated work suits in receptacles for disposal with other asbestos - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. Still wearing the respirator proceed naked to showers. Using soap and water wash body and hair thoroughly. Clean outside of respirator with soap and water while showering; remove respirator; remove filters and wet them and dispose of filters in container provided for purpose; and wash and rinse inside of respirator. When not in use in work area, store work footwear in Equipment and Access Room. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment and Access Room.

.3 After showering and drying off, proceed to clean change room and dress in street clothes at end of each day's work, or in clean coveralls before eating, smoking, or drinking. If re-entering work area, follow procedures outlined in paragraphs above.

.4 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers must not use this system as means to leave or enter work area.

.2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.3 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.

.4 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.

.5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.6 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.8 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 Collect and separate for disposal packaging material in appropriate on-site bins for recycling.

.4 Separate for reuse and recycling and place in designated containers steel, metal, and plastic waste.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Provincial, Regional and Municipal regulations.

.7 Fold up metal banding, flatten and place in designated area for recycling.

.8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6mil bags or leak proof drums. Label containers with appropriate warning labels.

.9 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.9 EXISTING CONDITIONS

.1 Reports and information pertaining to ACMS to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification in **Appendix A**.

.2 Notify Departmental Representative of suspected asbestos-containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.10 SCHEDULING

.1 Submit to Departmental Representative copy of notifications prior to start of Work.

.2 Hours of Work: perform work during hours as stipulated in this Contract.

1.11 OWNER'S INSTRUCTIONS

.1 Before beginning Work, provide to Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, at minimum:

.1 Proper fitting of equipment.
.2 Inspection and maintenance of equipment.
.3 Disinfecting of equipment.
.4 Limitations of equipment.

.3 Instruction and training must be provided by competent, qualified person.

.4 Supervisory personnel to complete required training.

Part 2 Products

2.1 MATERIALS

.1 Polyethylene: minimum 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.

.2 FR polyethylene: minimum 0.15 mm thick, woven fibre reinforced fabric bonded both sides with polyethylene.

.3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

.4 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or other material approved by Departmental Representative, mixed with water in concentration to provide adequate penetration and wetting of asbestos containing material.

.5 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene bag.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site. Label containers in accordance with Asbestos Regulations 29 CFR 1910.1001. Label in both official languages.

.6 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.7 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.

.8 Sealer: flame spread and smoke developed rating less than 50.

.9 Encapsulants: Type 1 penetrating type Class A water based conforming to CAN/CGSB-1.205 and approved by the Fire Commissioner of Canada having following characteristics:

.10 Sprayed fireproofing: ULC labelled and listed asbestos-free to provide degree of fire or thermal protection required.

Part 3 Execution

3.1 PREPARATION

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.2 Work Areas:

.1 Shut off and isolate air handling and ventilation systems to prevent fibre dispersal to other building areas during work phase. Conduct smoke tests to ensure that duct work is airtight. Seal and caulk joints and seams of active return air ducts within Asbestos Work Area.

.2 Clean proposed work areas using, where practicable, HEPA vacuum cleaning equipment. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum equipment.

.3 The spread of dust from the work area to be prevented by:

.1 Using enclosures of polyethylene or other suitable material that is impervious to asbestos (including, if the enclosure material is opaque, one or more transparent window areas to allow observation of the entire work area from outside the enclosure), if the work area is not enclosed by walls.

.2 Using curtains of polyethylene sheeting or other suitable material that is impervious to asbestos, fitted on each side of each entrance or exit from the work area.

.4 Put negative pressure system in operation and operate continuously from time first polyethylene is installed to seal openings until final completion of work including final cleanup. Provide continuous monitoring of pressure difference using

automatic recording instrument. The system to maintain a negative air pressure, relative to the area outside the enclosed area. The system to be inspected and maintained by a competent person prior each use to ensure that there is no air leakage, and if the filter is found to be damaged or defective, it to be replaced before the ventilation system is used.

.5 Seal off openings such as corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.

.6 Cover floor and wall surfaces with polyethylene sheeting sealed with tape. Cover floors first so that polyethylene extends at least 300 mm up walls then cover walls to overlap floor sheeting.

.7 Build airlocks at entrances to and exits from work areas so that work areas are always closed off by one curtained doorway when workers enter or exit.

.8 At each access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used: "CAUTION ASBESTOS HAZARD AREA (25 mm) NO UNAUTHORIZED ENTRY (19 mm) WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)".

.9 After work area isolation, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags 0.15 mm minimum thick and treat as contaminated asbestos waste. Remove ceiling - mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal, as directed by Departmental Representative. Use localized water spraying during fixture removal to reduce fibre dispersal.

.10 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Fire Commissioner of Canada and Provincial Fire Marshall Authority having jurisdiction.

.11 Where application of water is required for wetting asbestos containing materials, shut off electrical power, provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.

.12 After preparation of work areas and Decontamination Enclosure Systems, for the removal of all other asbestos containing materials, remove within work area and dispose of as contaminated waste in specified containers. Spray asbestos debris and immediate work area with amended water to reduce dust, as work progresses.

.3 Worker Decontamination Enclosure System:

.1 Worker Decontamination Enclosure System includes Equipment and Access Room, Shower Room, and Clean Room, as follows:

.1 Equipment and Access Room: build Equipment and Access Room between Shower Room and work area[s], with two curtained doorways, one to Shower Room and one to work area[s]. Install waste receptor and storage facilities for workers' shoes and protective clothing to be reworn in work area[s]. Build Equipment and Access Room large enough to accommodate specified facilities, other equipment needed, and at least one worker allowing him /her sufficient space to undress comfortably.

.2 Shower Room: build Shower Room between Clean Room and Equipment and Access Room, with two curtained doorways, one to Clean Room and one to Equipment and Access Room. Provide one shower for every five workers. Provide constant supply of hot and cold or warm water. Provide piping and connect to water sources and drains. Pump waste water through 5 micrometre filter system before directing into drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.

.3 Clean Room: build Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.

.4 Container and Equipment Decontamination Enclosure System:

.1 Container and Equipment Decontamination Enclosure System consists of Staging Area within work area, Washroom, Holding Room, and Unloading Room. Purpose of system is to provide means to decontaminate waste containers, scaffolding, waste and material containers, vacuum and spray equipment, and other tools and equipment for which Worker Decontamination Enclosure System is not suitable.

.1 Staging Area: designate Staging Area in work area for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal to Washroom. Equip Staging Area with curtained doorway to Washroom.

.2 Washroom: build Washroom between Staging Area and Holding Room with two curtained doorways, one to Staging Area and one to Holding Room. Provide high - pressure low - volume sprays for washing of waste containers and equipment. Pump waste water through 5 micrometre filter system before directing into drains. Provide piping and connect to water sources and drains.

.3 Holding Room: build Holding Room between Washroom and Unloading Room, with two curtained doorways, one to Washroom and one to Unloading Room. Build Holding Room sized to accommodate at least two waste containers and largest item of equipment used.

.4 Unloading Room: build Unloading Room between Holding Room and outside, with two curtained doorways, one to Holding Room and one to outside.

.5 Construction of Decontamination Enclosures:

.1 Build suitable framing for enclosures or use existing rooms where convenient, and line with polyethylene sheeting sealed with tape. [.

.2 Build curtained doorways between enclosures so that when people move through or when waste containers and equipment are moved through doorway, one of two closures comprising doorway always remains closed.

.6 Maintenance of Enclosures:

.1 Maintain enclosures in tidy condition.

.2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

.3 Visually inspect enclosures at beginning of each working period.

.4 Use smoke methods to test effectiveness of barriers when directed by Consultant.

.7 Do not begin Asbestos Abatement work until:

.1 Arrangements have been made for disposal of waste.

.2 For wet stripping techniques, arrangements have been made for containing, filtering, and disposal of waste water.

.3 Work area[s] and decontamination enclosures are effectively segregated.

.4 Tools, equipment, and materials waste containers are on hand.

.5 Arrangements have been made for building security.

.6 Warning signs are displayed where access to contaminated areas is possible.

.7 Notifications have been completed and other preparatory steps have been taken.

3.2 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos containing materials.

3.3 ASBESTOS REMOVAL

.1 Before removing asbestos:

.1 Prepare site.

.2 Where possible, spray asbestos material with water containing specified wetting agent, using airless spray equipment capable of providing "mist" application to prevent release of fibres. Saturate asbestos material sufficiently to wet it to substrate without causing excess dripping. Spray asbestos material repeatedly during work process to maintain saturation and to minimize asbestos fibre dispersion.

.2 Remove saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed pack material in sealable plastic bags 0.15 mm minimum thick and place in labelled containers for transport.

.3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure that containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of stripping work, wire brushed and wet sponged surfaces from which asbestos has been removed to remove visible material. During this work keep surfaces wet.

.5 Where Departmental Representative decides complete removal of asbestos containing material is impossible due to obstructions such as structural members or major service elements, and provides written direction, encapsulate material as follows:

.1 Apply penetrating type sealer to penetrate existing sprayed asbestos surfaces uniformly to substrate.

.6 After wire brushing and wet sponging to remove visible asbestos, and after encapsulating asbestos containing material impossible to remove, wet clean entire work area including Equipment and Access Room, and equipment used in process. After 24 hour period to allow for dust settling, wet clean these areas and objects again. During this settling period no entry, activity, or ventilation will be permitted. After second 24 hour period under same conditions, clean these areas and objects again using HEPA vacuum followed by wet cleaning. After inspection by Consultant apply continuous coat of slow drying sealer to surfaces of work area. Allow at least 16 hours with no entry, activity, ventilation, or disturbance other than operation of negative pressure units during this period.

.7 Work is subject to visual inspection and air monitoring by the Consultant. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.8 Cleanup:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped, and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.4 FINAL CLEANUP

.1 Following cleaning specified above, and when air sampling shows that airborne asbestos levels on both sides of seals do not exceed 0.01 fibres/cc as determined by membrane filter method at 400-500X magnification phase contrast illumination, as described in NIOSH Analytical Method 7400, "Asbestos and Other Fibres" or equivalent, proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible asbestos containing particles observed during cleanup, immediately, using HEPA vacuum equipment.

.3 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.

.4 Include in clean-up Work areas, Equipment and Access Room, Washroom, Shower Room, and other contaminated enclosures.

.5 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.

.6 Conduct final check to ensure that no dust or debris remains on surfaces as result of dismantling operations and carry out air monitoring again to ensure that asbestos levels in building do not exceed 0.01 fibres/cc. Repeat cleaning using HEPA vacuum equipment, or wet cleaning methods where feasible, in conjunction with sampling until levels meet this criteria.

.7 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled containers containing asbestos waste and dispose of to authorized disposal area in accordance with requirements of disposal authority. Ensure that each shipment of containers transported to dump is accompanied by Contractor's representative to ensure that dumping is done in accordance with governing regulations.

3.5 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, Consultant will take air samples on daily basis outside of work area enclosure in accordance with Provincial Occupational Health and Safety Regulations and industry standard practices, whichever is more stringent.

.1 Consultant will be responsible for monitoring inside enclosure.

.2 Use results of air monitoring inside work area to establish type of respirators to be used. Workers may be required to wear sample pumps for up to full-shift periods.

.1 If fibre levels are above safety factor of respirators in use, stop abatement, apply means of dust suppression, and use higher safety factor in respiratory protection for persons inside enclosure.

.2 If air monitoring shows that areas outside work area enclosures are contaminated, enclose, maintain and clean these areas, in same manner as that applicable to work areas.

.3 During course of Work, Consultant will measure fibre content of air outside work areas by means air samples analyzed by Phase Contrast Microscopy (PCM).

.1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.

.4 Final air monitoring to be conducted as follows: After Asbestos Work Area has passed visual inspection and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period has passed, Consultant will perform air monitoring within Asbestos Work Area.

.1 Final air monitoring results must show fibre levels of less than 0.01 f/cc.

.2 If air monitoring results show fibre levels in excess of 0.01 f/cc, re-clean work area and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat as necessary until fibre levels are less than 0.01 f/cc, at no additional cost to Owner.

3.6 INSPECTION

.1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviations from these requirements that have not been approved in writing by Departmental Representative may result in Work stoppage, at no cost to Owner.

.2 Consultant will inspect Work for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.3 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur Departmental Representative may order Work shutdown.

.1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 All labour, Material, services, and equipment necessary and incidental for the cast-in-place concrete as specified herein and indicated on the Drawings. All material and work specified in this Section shall be the responsibility of one contractor who will be held solely responsible for providing and co-ordinating all parts and installation.

1.2 DOCUMENTS

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

1.3 REFERENCE

.1 Do work in accordance with CAN/CSA-A23.1-09 and CAN/CSA A23.2-09, except where specified otherwise.

1.4 CERTIFICATES

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

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

1.5 QUALITY CONTROL

.1 Submit proposed quality control procedures for Departmental Representative's review.

1.6 SAMPLES AND PROTOTYPES

.1 Material samples: submit the following samples of materials for approval to the Departmental Representative. Approved samples shall be used as the acceptable standard for all materials used on the project.

- .1 Forming materials,
- .2 Gaskets, sealing materials, and form jointing system (as applicable).
- .3 Form release agent.

Part 2 Products

2.1 MATERIALS

.1 Portland cement: Type GU and to CAN/CSA-A3000-08. No mixing of brands permitted.

.2 Water: to CAN/CSA-A23.1-09.

.3 Aggregates: to CAN/CSA-A23.1-09. Coarse aggregates to be normal density.

.4 Air entraining admixture: to CAN3-A266.1.

.5 Chemical admixtures: to CAN3-A266.2 and CAN/CSA S413-07. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.6 Super-plasticizer: to CAN3-A266.5 "Guidelines for the use of Super-plasticizing Admixtures in Concrete".

.7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticising agents of pouring consistency, capable of developing a compressive strength of 50 MPa at 28 days.

.8 Bonding agent: formulated for bonding new concrete to cured concrete.

2.2 CONCRETE MIXES

.1 Design concrete mixes in accordance with CAN/CSA-A23.1 alternate 1, to give the properties shown in tabular form on structural drawings.

Part 3 Execution

3.1 GENERAL

.1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.

3.2 WORKMANSHIP

.1 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours' notice, minimum, prior to placing concrete.

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

.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. Provide minimum of 7 day moist curing for all slabs.

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

.6 Do not place concrete over snow or ice.

.7 Follow cold weather concrete procedures in CAN/CSA A23.1 and as noted on the drawings.

.8 Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or plains of weakness. If a section cannot be placed continuously, construction joints shall be located as permitted by the Departmental Representative. All pour and construction joints shall be formed with a straight-edge fixed to formwork. Placing shall be carried out at such a rate that concrete which is being integrated with fresh concrete is still plastic.

.9 Compact concrete with high-frequency vibrators applied directly to concrete by experienced personnel. Do not over-vibrate.

.10 In locations where new concrete is dowelled to existing work, drill holes in existing

concrete. Attach steel dowels of deformed steel reinforcing bars with Hilti RE 500 epoxy adhesive to the depths shown on the drawings or specified by the manufacturer.

.11 Take every precaution to protect finished surfaces from stains and abrasions. Surfaces and edges likely to be damaged during the construction period shall be especially protected.

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

3.3 INSERTS

.1 NO sleeves, ducts, pipes or other openings shall pass through joists, beams, slab bands, column capitals or columns, except where expressly detailed on structural drawings or approved by the Departmental Representative.

.2 Anchor bolts: Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

3.4 TOLERANCES

.1 Concrete tolerances to be in accordance with CAN/CSA-A23.1.

3.5 PATCHING

.1 General:

.1 Areas to be repaired shall be determined by the Departmental Representative and shall not exceed 0.2 m^2 for each 100 m^2 of surface area, and shall be widely dispersed. Repairs shall match the surrounding area. Patching of slabs and concrete paving will not be accepted. Removal and replacement of work shall be at no additional cost.

.2 Before commencing any repair work, the Contractor shall confirm repair procedures with the Departmental Representative and establish the formula required by trial mix. The Contractor shall demonstrate his repair techniques on a prototype sample panel.

.2 Repair of cracks in concrete slabs and slabs-on-grade shall be the sole responsibility of the Contractor at no expense to the Departmental Representative to satisfy the installation and performance requirements of the floor finishes. This may include grinding off curled edges at slab cracks.

3.6 FINISHING

.1 Formed surface: The finishes to be provided for the various formed surfaces shall be:

.1 Unexposed Finish:

.1 This finish shall apply to formed surfaces which are not exposed to view and where roughness is not objectionable.

.2 The surface, in general, shall not require any treatment after form removal, other than repair of defective concrete, snap-tie holes, and the removal of ridges and surface irregularities.

.2 Unformed surface: The finish to be provided for the various unformed surfaces shall be:

.1 Final finishing shall be accomplished by mechanical floating, mechanical

troweling, creation of the specified surface finish, and tooling or edges and joints, in that order. Exposed edges and corners shall be as detailed. Surfaces at tooled edges shall be trowelled and sand-blasted to remove tool edge marks. Hand floating and trowelling shall only be permitted in small areas of restricted access. All final finishing procedures shall conform to the requirements of CAN/CSA-A23.1, Clause 7.

.2 Final finishing shall commence after bleed water has disappeared from the surface and when the concrete has stiffened sufficiently to prevent the working of excess water to the surface. No additional dry cement or water shall be used to facilitate finishing.

3.7 HOUSEKEEPING AND EQUIPMENT PADS

.1 Provide concrete pads and curbs under equipment where indicated on drawings and as specified in Division 26 and to approved shop drawings. Prepare base concrete with a rough scratch finish and use an approved bonding agent to bond concrete pad to base course. Dowel pads and curbs to base slab in accordance with details on the drawings.

3.8 QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory pre-approved by the Departmental Representative in accordance with CAN/CSA-A23.1. Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.

.2 Contractor will pay for costs of tests.

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

.4 If results of tests show concrete to be less than specified in quality or strength, the Departmental Representative shall have the right to have the mix designs altered for the remainder of the work at no cost. Further testing and remedial measures required by CAN/CSA-A23.1 shall be done, the costs of this work paid for by the Contractor.

.5 Inspection or testing will not augment or replace Contractor quality control nor relieve him of his contractual responsibilities.

.6 Contractor to coordinate testing agency with concrete placement providing testing agency with sufficient time to provide personnel and equipment.

.7 Where field tests show that concrete is not within tolerance for slump and air, the truck shall be returned to the batch plant as soon as the results are obtained. The contractor shall not place concrete that has been shown not to meet the specifications.

.8 For additional information see Section 01 01 50 General Instructions.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Fire stopping and smoke seals within electrical assemblies (i.e. inside ducts) are specified in Division 26 respectively.

1.2 REFERENCES

.1 Underwriter's Laboratories of Canada (ULC)

.1 ULC-S115-1995, Fire Tests of Firestop Systems.

1.3 SAMPLES

.1 Submit samples in accordance with Section 01 01 50 – General Instructions.

.2 Submit duplicate 300 x 300 mm samples showing actual firestop material proposed for project.

1.4 SHOP DRAWINGS

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

.2 Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

.3 Show location of all seals covered under this section including numbered index of seals and applicable underwriter's listing design.

1.5 PRODUCT DATA

.1 Submit product data in accordance with Section 01 01 50 – General Instructions.

.2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

1.6 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing Products of this section with a minimum of three (3) years experience. Provide a manufacturer's direct technical representative to be on site during initial installation of fire stop systems to train personnel in proper selection and installation procedures. The technical representative shall carry out regular site inspections during the firestopping work to ensure that the installation is carried out in accordance with manufacturer's printed installation instructions and that deficiencies are corrected. Provide qualification documentation to the Departmental Representative when requested.

.2 Applicator: Approved, certified, licensed or otherwise qualified by the manufacturer of firestopping materials with a minimum of three (3) years proven experience.

.3 Product: Manufactured under a underwriter's follow-up program and bearing listing ULC or cUL label.

.4 Pre-Installation Conference: Convene a meeting between related sections following award of contract to discuss firestopping requirements. Ensure that other sections are aware of the maximum and minimum clearance requirements to the penetration stipulated by the underwriter's design listing.

.5 Equivalencies: For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgement derived from similar ULC or cUL system designs or other tests shall be submitted to local authorities having jurisdiction for their review and approval prior to installation.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials 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.

Part 2 Products

2.1 GENERAL

.1 General: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire resistance rated systems.

2.2 MATERIALS

.1 Firestopping Systems: Tested in accordance with ULC S-115 or CAN4-S115M, listed and certified by a third party testing agency, asbestos free, ULC or cUL labelled, and bearing the following rating:

.1 Firestop System Rating: In accordance with the National Building Code.

.2 Firestop system shall act as an effective smoke seal and have a flame spread rating less than 25.

.2 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.

.3 Service penetration firestop components: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.13 and ULC Guide No.40 U19.15 under the Label Service of ULC.

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

.5 The fire protection rating of installed firestopping assembly in a non rated floor or wall assembly shall not be less than twenty (20) minutes when tested in accordance with CAN4-S115M.

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

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

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

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

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

.11 Sealants for vertical joints: non-sagging.

Part 3 Execution

3.1 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

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

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

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

3.2 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

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

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

.4 Tool or trowel exposed surfaces to a neat finish.

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

3.3 INSPECTION

.1 Notify Departmental Representative when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.4 SCHEDULE

.1 Firestop and smoke seal at:

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

.2 Edge of floor slabs at exterior walls.

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

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

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

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

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

3.5 CLEAN UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 84 00 – Fire Stopping

.2 Section 26 05 15 – Commissioning of Electrical Systems

1.2 REFERENCES

.1 Definitions:

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

.2 Reference Standards:

.1 CSA Group

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear

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

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 01 50 – General Instructions.

.2 Submit for review single line electrical diagrams and locate under plexiglass in.

.1 Electrical distribution system in main electrical room.

.2 Electrical distribution systems in outdoor unit substations.

.3 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

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

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

.5 Submit electrical drawings to the local electrical inspection authorities.

.6 If changes are required, notify the Departmental Representative of these changes before they are made.

.4 Certificates:

.1 Provide CSA certified equipment and materials.

.2 Where CSA certified equipment and material is not available, submit such equipment and materials to special inspection authorities for special approval before delivery to site.

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

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3.10.1 LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to the Departmental Representative.

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

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 01 50 – General Instructions.

.2 Operation and Maintenance Data: submit operation and maintenance data and incorporate into manual specified in Section 01 01 50 – General Instructions.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

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

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

.1 Deliver and handle in accordance with Section 01 01 50 – General Instructions. Store materials in accordance with section 01 01 50 or manufacturer's recommendations in clean dry, well-ventilated area; whichever requirement is more stringent.

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

.3 Replace defective or damaged materials with new.

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

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 01 50 – General Instructions.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory-assemble control panels and component assemblies.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of inspection authorities.

.2 Decal signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify all electrical equipment (including each feeder breakers at MDC, panelboards, disconnect switches, etc.) with nameplates and labels as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black or matt white finish face, black or white core, lettering accurately aligned and engraved into core and mechanically attached with self-tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

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

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

.6 Identify equipment with Size 3 labels engraved as noted. Equipment designations to reference equipment schedule references.

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

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

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

.10 Provide neatly typed circuit directories in panelboards to indicate area or equipment controlled by each branch circuit.

.11 Receptacles: lamacoids mounted to device plate to indicate panel and circuit number and voltage.

.12 Cables: cable labels for all devices. Identify circuit numbers, location, and origin at both ends of cables.

.13 Pull boxes, junction boxes, conduits: provide purpose-manufactured, durable, and clearly legible markings to identify the function and voltage of the system.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible cable labels, numbered, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Provide slip-on plaster ID for wiring inside panelboards, control cabinets or tub and starter panels, etc.

.2 Colour code conduits, boxes and metallic sheathed cables.

.3 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.4 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

System	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	

2.8 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green" finish to Munsell 7GY3.29/1.5 green (STD).

.2 Paint indoor switchgear and distribution enclosures light gray to EEMCA 2Y-1.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

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

3.2 COORDINATION WITH OTHER DIVISIONS

.1 The Trade Contractor shall:

.1 Examine the drawings and specifications of all divisions and become fully familiar with their work.

.2 Lay out the work and equipment with due regard to architectural, structural, civil, mechanical, and process features.

.3 Coordinate with all Divisions installing equipment and services, and ensure that there are no conflicts.

.4 Install anchors, bolts, pipe sleeves, hanger inserts, etc. in ample time to prevent delays.

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipes, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

.4 Provide sleeves of galvanized steel pipe with machine cut ends of ample size to accommodate conduits passing through walls, partitions, ceilings, floors, etc.

.1 For wall, partitions and ceilings, the end shall be flush with the finish on both sides but for floors they shall extend 50 mm above finished floor level.

.2 The space between the sleeves and the conduit shall be filled with ULC listed fire stopping and caulked around the top and bottom with approved permanently resilient, non-flammable and weatherproof silicone base compound and ensure that the seal is compatible with the floor and ceiling finishes. Refer to Section 07 84 00 – Fire Stopping for details.

.5 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosions.

.1 In particular, contact between dissimilar metals, such as copper and aluminum is not permitted.

3.5 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.

3.6 SEALING OF WALL AND FLOOR OPENINGS

.1 All conduit and cable entries through outside walls of building, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade shall be sealed to prevent passage of moisture, water, dust, gasses, flame, or to maintain pressurization.

.2 Openings shall be sealed when all wiring entries have been completed.

.3 Sealing material shall be fire resistant and shall not contain any compounds which will chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations shall be sealed. Cable penetrations through retaining wall shall be watertight.

.4 Fire stopping shall be applied by factory trained specialist, provide evidence of certification.

3.7 PROTECTION OF OPENINGS

.1 Protect equipment and system openings from dirt, dust, and other foreign materials with materials appropriate to system.

3.8 CO-ORDINATION OF PROTECTIVE DEVICES, STATION GROUNDING & STEP TOUCH POTENTIAL

.1 Submit coordination study for the power distribution system. The report shall be signed and sealed by a Professional Engineer registered with the Province of British Columbia, Canada.

.2 Prior to testing and commissioning, check and calibrate circuit protective devices such as overcurrent trips, relays, and fuses are installed to require values and settings. Submit commissioning report signed and sealed by a Professional Engineer registered in the Province of British Columbia, Canada.

.3 Provide Arc Flash Hazard Study for the complete distribution systems including the equipment product data of 15KV and 120/208V distribution panels in accordance with CEC Section 2-306. The study shall be carried out by an approved agency located in Vancouver Island, British Columbia, submit the complete report signed and sealed by a P.Eng registered in the Province of British Columbia. Provide an Arc Flash warning sticker, made with UV resistant ink, indicating arc flash (incident energy) and shock protection information for every piece of equipment modified as part of the new power distribution system.

.4 Provide station grounding and step & touch potential study and commissioning report for primary equipment installation such as primary switch and padmount transformer.

3.9 SEISMIC RESTRAINT

.1 Seismic restraint in accordance with third-party Seismic Engineer's recommendations.

3.10 FIELD QUALITY CONTROL

.1 Load Balance:

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

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

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS: phase and neutral currents on panelboards, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 01 50 – General Instructions.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Insulation resistance testing:

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

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.4 **Non-destructive** testing for feeders in 15kV class

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.4 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

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

3.11 COMMISSIONING

.1 Provide complete commissioning of all equipment and systems specified in Division 26 and other related Sections as part of this project.

.2 Comply with the requirements of the following Sections:

.1 Section 01 91 31 – Commissioning Requirements

.2 Section 26 05 15 – Commissioning of Electrical Systems

3.12 DEMONSTRATION AND TRAINING

.1 Provide demonstration and training for all equipment and systems specified in Division 26

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.13 TESTING

.1 Requirements for testing of equipment, materials and systems are listed in individual specification Sections.

3.14 PERMIT AND INSPECTION

.1 Submit to the local Electrical Inspection Department necessary number of drawings for examination and approval prior to commencement of work.

.2 Obtain an electrical work permit and pay all associated fees. Submit documentation to the Departmental Representative for record.

.3 Notify the Departmental Representative of changes required by the Electrical Inspection department prior to making changes.

.4 Furnish Certificates of Acceptance from Electrical Inspection Department jurisdiction on completion of work to Departmental Representative.

3.15 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No. 131-07, Type TECK 90 Cable.

.2 CSA-C68.3-97(R2006), Shielded and Concentric Neutral Power Cables.

.3 CSA-C233.1-87(R2004), Gapless Metal Oxide Surge Arresters for Alternating Current Systems.

.2 National Electrical Manufacturers' Association (NEMA)/Insulated Cable Engineers Association (ICEA)

.1 NEMA WC3-1992/ICEA S-19-81, Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

.2 NEMA WC7-1992/ICEA S-66-524, Cross-Linked Polyethylene Wire and Cable for Transmission and Distribution.

.3 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE C62.36-2000, Standard Test Methods for Surge Protectors Used in Low Voltage Data, Communications and Signalling Circuits.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 01 50 – General Instructions.

.2 Provide product data in accordance with Section 01 01 50 – General Instructions.

.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

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

Part 2 Products

2.1 CONCENTRIC NEUTRAL POWER CABLES (5001 - 15000 V)

.1 Concentric neutral power cable: to NEMA WC7-1992/ICEAS-66-524, AEIC CS5, ICEA S-66-524 and CSA-C68.3.

.2 Single copper conductor, size as indicated.

.3 Semi-conducting strand shield.

.4 Class 2 compact round stranding per ASTM B4596:

.1 All strand interstices to be filled during stranding operation and each wire and successive layers of wires to be sealed with approved sealing compound.

.2 Acceptable products: Canada Wire "STRAND BLOCK"; Pirelli "STRANDSEAL."

.5 Insulation: tree-retardant cross-linked thermo-setting polyethylene (TR-XLPE) rated 90°C and 15 kV for 100 % voltage level.

.6 Semi-conducting insulation shielding layer.

.7 Copper neutral wires applied helically over insulation shield equivalent to 100 % full capacity.

.8 Separator tape over neutral wires.

.9 Insulation shield of semi-conducting thermo-setting XLPE applies as a co-extrusion with the insulation and the conductor shield.

.1 Semi-conducting insulation shield to be marked with words "SEMI-CONDUCTING – REMOVE WHEN SPLICING OR TERMINATING."

.10 Jacket, encapsulating linear low density polythethylene.

.11 Acceptable manufacturers: Canada Wire, Pirelli, Nexan.

2.2 DEAD BREAK BUSHING WELL INSERT

.1 Dead break bushing inserts 15 kV, 95 kV BIL, as indicated, consisting of:

.1 Arc snuffer.

.2 Female contact, tin-plated copper.

.3 Housing, moulded EDPM compound.

.4 Connector replaceable contact, copper.

.5 Lock ring.

.6 Grounding eye.

.7 Acceptable manufacturers: Elastimold, RTE Corp., ITT Blackburn, Hubbell, Cooper.

2.3 DEAB BREAK ELBOW CONNECTORS

.1 Dead break elbow connectors 200 A, 15 kV, 95 kV BIL, as indicated, consisting of:

.1 Arc follower.

.2 Male contact, tin-plated copper.

.3 Elbow connector housing, moulded EDPM compound.

.4 Conductor contact, copper crimp type.

.5 Voltage test point with hot stick removable cap.

.6 Grounding eye moulded in elbow housing.

.7 Moulded stress relief in elbow housing.

.8 Moulded outer jacket conductive shield.

.9 Acceptable manufacturers: Elastimold, RTE Corp., ITT Blackburn, Hubbell.

2.4 CABLE TERMINATORS

.1 Single piece outdoor cable slip-on terminator 15 kV, 95 kV BIL for 7.2k/12.5kV and for 15 kV primary system, consisting of:

.1 External insulation – high strength, wet process porcelain, deep draw corrugated skirts, gasket sealed to body of terminator.

.2 Body – cast aluminum complete with plastic threaded vent plug.

.3 Stress relief control device.

.4 Internal insulating material (Novoid 254) factory filled to provide a void-free environment for cable end.

.5 Cable centering plug.

.6 Sealing system – gasketed hood on top of terminator, sealing bolts, silicone rubber diaphragm at cable entrance. Bolted aluminum sealing plate on bottom.

.7 Copper compression connector to terminate connector.

.8 Aerial lug – eyebolt style.

.9 Cross arm mounting bracket complete with ground connection stud.

2.5 DEAD BREAK JUNCTION

.1 Four-point dead-break junctions 200 A 15 kV, 5 kV BIL consisting of:

.1 Junction housing of EDPM compounds.

.2 Internal solid copper bus bar.

.3 Contact assembly identical to load-break bushing insert.

.4 Insulated protective cap matching the interface.

.5 Moulded outer conductive shield jacket of conducting EDPM.

.6 Back plate.

.7 Mounting bracket.

.8 Grounding lug.

.9 Parking stands.

.10 Two (2) stand-off bushings.

.11 Four (4) dead-end receptacles.

.2 Acceptable manufacturers: Elastimold, RTE Corp., ITT Blackburn, Hubbell

Part 3 Execution

3.1 INSTALLATION

.1 Install concentric neutral power cables in ductbank and conduit in accordance with manufacturer's instructions.

.2 Install power cable in ducts and manholes as indicated and in accordance with manufacturer's instructions.

.3 Provide supports and accessories for installation of high voltage power cable.

.4 Install stress cones, terminations and splices in accordance with manufacturer's instructions

.5 Install grounding in accordance with local inspection authority having jurisdiction.

.6 Provide cable identification tags and identify each phase conductor of power cable.

.7 Terminate cables with elbow connectors or cable terminators as indicated and where necessary to complete the primary distribution system. Install all cable terminations to the manufacturers' specifications and instructions.

.8 Install cable dead break junctions to each phase of a three-phase system in primary switch enclosure as indicated.

.9 Install matching dead end receptacle cap to all spare junction bushings.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Use of qualified tradespersons for installation, splicing, termination and testing of high voltage power cables.

.3 Engage an independent testing agent to test high voltage power cable:

.1 Existing high voltage power cables to be non-destructively tested using the very low frequency test method

.2 New high voltage power cables to be tested using hi-pot test.

.4 Submit test result and inspection certificate.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies the requirements for commissioning of the electrical systems and equipment installations.

.2 Coordinate related commissioning with other divisions.

.3 Coordinate the Work in this section with Section 01 91 13 - Commissioning Requirements.

.4 Perform on site verification, tests and commissioning in accordance with:

.1 The Contract Documents.

.2 Manufacturer's published instructions.

.3 Applicable CSA, ULC, IEEE, IPCEA, EEMAC, ANSI, NETA, and ASTM standards.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.0.4., Bonding of Electrical Equipment

.2 CSA-C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations, amendment as adopted by the Province of British Columbia and the respective electrical safety bulletins issued by British Columbia Safety Services.

.2 American National Standards Institute (ANSI)/International Electrical Testing Association (NETA)

.1 ANSI/NETA ATS-2009, Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

.2 ANSI/NETA MTS-2007, Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Submit all information and data in both printed paper format and PDF electronic format. The PDF electronic format will be used for insertion into the Building Interactive Electronic Operating and Maintenance and Commissioning Manuals. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures.

.3 Develop and submit Verification/Static Forms and Prefunctional Checklists and Functional/Dynamic Forms and Functional Test Procedures for all electrical equipment and systems in both printed paper format and PDF electronic format. The PDF electronic format will be used for insertion into the Building Interactive Electronic Operating and Maintenance and Commissioning Manuals.

.4 Closeout Submittals:

.1 Submit completed and signed forms, checklists and test results after completion of commissioning for incorporation into manuals specified in Section 01 01 50 – General Instructions and Section 01 91 13 – Commissioning Requirements.

1.4 GENERAL

.1 Be responsible for the performance and commissioning of all equipment supplied under the Sections of the Divisions.

.2 Commissioning is the process of advancing the installation from the stage of static completion to full working order in accordance with the contract documents and design intent. It is the activation of the completed installation.

.3 In consultation with the General Contractor, ensure that sufficient time is allowed and fully identified on the construction schedule for the proper commissioning of all electrical systems.

.4 Commissioning of the electrical systems shall be in accordance with the Code of Practice and industry standards for Commissioning Electrical Systems in Industrial Facilities and as described in this section.

.5 The commissioning process shall be applied to all shop move equipment and systems provided under this Division.

1.5 ELECTRICAL COMMISSIONING AGENCY

.1 Retain services of independent Electrical Commissioning Agency with demonstrated minimum 10 years of experience in commissioning of electrical systems and equipment such as those required on this project.

.2 This agency will be responsible for participation in commissioning process and providing required commissioning services specified in the contract documents.

.3 Electrical Commissioning Agency shall prepare Verification/Static Forms and Prefunctional Checklists and Functional/Dynamic Forms and Functional Test Procedures.

.4 Provide or coordinate demonstration and instruction to Owner's staff to enable them to become familiar with the equipment and systems.

1.6 RESPONSIBILITIES

.1 The commissioning responsibilities applicable to each of the subcontractors, suppliers, commissioning agency and other affected parties of the Divisions are as follows (all references apply to commissioned equipment and systems only):

Construction and Acceptance Phases

.1 Include and itemize the cost of commissioning in the contract price.

.2 In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.

.3 Attend a commissioning scoping meeting and other meetings necessary to facilitate the Cx process.

.4 Contractors shall provide the Commissioning Agent (CA) with normal cut sheets and shop drawing submittals of commissioned equipment in both digital and paper media.

.5 Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.

a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA.

b. The CA may request further documentation necessary for the commissioning process.

c. This data request may be made prior to normal submittals.

.6 Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and comment.

.7 Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

.8 Prepare and provide to the CA commissioning forms including Verification/Static Forms, Prefunctional Checklists, Functional/Dynamic Forms, and Functional Performance Test Procedures as specified. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

.9 Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the verification/static forms and prefunctional checklists for all commissioned equipment and systems. Submit to CA for review and comment prior to startup. Refer to Section 01 91 13– Commissioning Requirements for further details on start-up plan preparation.

.10 During the startup and initial checkout process, execute Verification/Static Forms and the prefunctional checklists for all commissioned equipment and systems for the work covered under the above listed Divisions.

.11 Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.

.12 Address current punch list items before functional testing.

.13 Provide skilled technicians to execute Functional/Dynamic Forms and the functional performance tests and starting of equipment. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

.14 Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment and systems in respective sections

and Section 01 91 13 – Commissioning Requirements. Assist the CA in interpreting the monitoring data, as necessary.

.15 Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, Departmental Representative and Design Consultant and retest the equipment.

.16 Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

.17 During construction, maintain as-built red-line drawings for all drawings. Update after completion of commissioning (excluding deferred testing).

.18 Provide training of the Owner's operating staff using expert qualified personnel, as specified.

.19 Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

.1 Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.

.2 Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.7 COMMISSIONING AND DEMONSTRATION

.1 Provide the services of an approved independent specialist firm to coordinate the commissioning process specified under this division and those items of other Divisions which interact with work of this Division as outlined herein.

.2 Coordinate work with commissioning specified in Division 1.

.3 The cooperation of all trades is essential for an efficient and planned process. A team comprising the following is recommended:

.1 Electrical Commissioning Coordinator.

.2 General Contractor.

.3 Electrical Contractor's Supervisor.

.4 Other Division's Trades and Suppliers.

.4 Prepare a commissioning statement for each of the four (4) phases that the process is perceived to be worked through. In sequence, the phases are expected to be:

.1 PHASE 1 - System readiness.

.2 PHASE 2 - System start-up, testing, balancing, etc.

.3 PHASE 3 - Verification of system performance.

.4 PHASE 4 - Demonstration & instruction.

.5 Each phase is applicable to each major and/or separate system making up the work in each Division.

.6 Regular meetings shall be held during the commissioning process. Minutes of the meetings shall be issued to all contractors involved, the Departmental Representative and the Owners representative.

.7 Plan the work to be specific in respect of personnel, schedule, review and laboratory tests.

.1 Personnel: Assign direct overall charge of commissioning to a person (the commissioning coordinator) fully qualified through practical experience and a comprehensive knowledge of the interactive nature of building and process systems and their controls to understand the complete system and be available to carry the project through to total completion. This person shall be responsible for: Commissioning, Demonstration to the Departmental Representative and Owner and Certifications of Substantial Completion.

.2 Schedule: Submit a Cx schedule to synchronize with the construction schedule, as part of the construction schedules, for the commissioning phase of the work. This schedule shall show:

.1 Equipment start-up schedule.

.2 Submission dates for the various documents required prior to substantial completion.

.3 Timing of the various phases of the commissioning, testing, balancing and demonstration process.

.3 Review: Within two (2) months of commencing with the project work, the person having direct overall charge of commissioning shall review design intent and intended commissioning procedures with the Departmental Representative. Within three (3) months of commencing with the project, submit a detailed plan that addresses the entire approach to the commissioning process. The plan should be prepared specifically for the project at hand. The plan should include the following components:

.1 Name and qualifications of the commissioning coordinator.

.2 Itemized check lists for the readiness, start-up and operational verification of all equipment and systems.

.3 Outline of proposed method of notification and correction of interim operational deficiencies.

.4 Outline of proposed demonstration and operator training program.

.4 Troubleshooting: Where problems become apparent during the commissioning process, work at the identification and resolution of these problems. The basic functions in trouble shooting are:

.1 What - Identification and definition of the problem.

.2 Why - Determination and evaluation of the causes.

.3 When - Determine the time available to resolve the problem.

.4 Involve the Departmental Representative in the review of the problem and proposed resolution.

.5 Co-ordinate remedial action with the appropriate parties.

.6 Evaluate the effectiveness of the remedial action.

.5 Laboratory Tests: If the field tests indicate that equipment supplied to the project does not meet specifications, laboratory certification of the potentially deficient equipment may be requested by the Departmental Representative. In the event that equipment does not meet specifications, contractor shall be responsible for the costs of:

.1 The above laboratory tests, and

.2 All subsequent testing and correction required.

.8 The work included in each of the four phases shall be generally as follows:

.1 **PHASE 1** System Readiness

.1 Before starting any of the separate systems, provide written verification stating that the specific system is ready for start-up and the following conditions have been met:

.1 All safety controls installed and fully operational (dry run test).

.2 Qualified personnel available to operate the plant.

.3 Permanent electrical connections made to all equipment in accordance with CSA C22.1.

.2 System readiness shall include, but not necessarily be limited to the following:

.1 Checking system physical completion, including insulation resistant tests, continuity test, phase rotations, all controls and instrumentation.

.2 Copies of all test and certificates (site testing reports, manufacturer's production test records, and provincial electrical inspector final inspection certificate) have been submitted to the Departmental Representative.

.3 All controls and safety interlocks installed and fully operational (dry run test).

.4 All cleaning is complete.

.5 Pre-start checks are complete.

.6 All equipment and tools necessary to perform testing, adjusting and balancing as required.

.7 Vibration isolation and seismic restraints completed.

.8 All cabling and wiring are completed and labelled.

.9 Control functional checks, including completing all interconnection wiring, alarms, and interlocks are performed.

.10 Start-up verification checks by manufacturer's representatives completed.

.11 All deficiencies to be recorded, reviewed by the commissioning team and, subsequently corrected before proceeding to the next phase, PHASE 2.

.2 **PHASE 2** System startup, testing, balancing

.1 System Commissioning shall include but not necessarily be limited to:

.1 Activation of all systems and installation.

.2 Testing and adjustment of all systems.

.3 All deficiencies are to be recorded, reviewed by the commissioning team and, subsequently, corrected. The process at the point of the deficiency, shall be repeated before proceeding to PHASE 3.

.2 Phase 2 is concluded when the installation is in full working order and acceptable for use. The work will include the following:

.1 Testing of equipment operation.

.2 Insulation resistance testing for all power and control wiring.

.3 Step and touch potential.

.4 Station grounding testing.

.5 Ground resistance test to CSA C22.2 No.0.4.

.6 Load balance testing.

.7 Thermographic testing of all connections/terminations.

.8 Power factor testing.

.9 Voltage testing and adjustment.

.10 Fine Tuning/calibration:

.1 Load balancing at panelboard.

.2 Correct power factor.

.3 Re-calibrate circuit breakers tripping.

.4 Adjust transformer tapping for nominal service voltage.

.11 Testing:

.1 A detailed check by a person having direct overall charge of commissioning. This check to include all items and functions to be later demonstrated to the Departmental Representative and Owner's representatives.

.3 **PHASE 3** Verification of Commissioning:

.1 Verification of system performance by the Departmental Representative will not commence until PHASE 2 has been totally completed. Submit test procedure completion test certificates at the time of requesting the commencement of the verification procedure. The verification process will include the demonstration of the following:

.1 Power Distribution Systems and outlets

.1 Primary switchgears and pad mounted transformer

.2 Panelboards

.3 Feeders, conductors and branch circuit wiring

.4 Feeder Breakers

.5 Grounding & Bonding

.6 Feeder Cables

.2 At the completion of Phase 3, the Contractor shall submit the following to the Departmental Representative:

.1 A letter certifying that all work specified under this contract is complete, clean and operational in accordance with the specification and drawings.

.2 A commissioning report which should include completed copies of all Phase 2 documentation outlined in the commissioning plan plus copies of start-up reports from specialty contractors and vendors and any other relevant information for inclusion in the operating & maintenance manuals.

.3 Record drawings as specified, update to include changes resulting from commissioning.

.4 Identification of equipment and systems complete.

.4 PHASE 4 Demonstration and Acceptance

.1 Demonstration and acceptance shall not commence until the commissioning process PHASE 3 has been successfully completed.

.2 The Demonstration process is a planned process requiring a preplan approval before commencement and a signed statement of satisfaction from the Departmental Representative upon completion.

.3 For Demonstration and instruction to Operating staff requirements, refer to this section of the specification and also to Section 01 91 41 - Demonstration and Training.

.4 Fire Safety Systems operation in the fire mode shall be demonstrated to the Departmental Representative. Obtain a written statement/certificate of approval.

.5 Post Substantial Performance Visits

.1 Provide follow-up visits to the site at one month, two months and six month after substantial performance for a minimum period of two days, to ensure that the systems are operating correctly and that they are being operated and maintained properly.

.2 Submit a report to the Departmental Representative and Owner which documents any problems that have arisen and correction action required.

1.8 VERIFICATION/STATIC FORMS AND PREFUNCTIONAL CHECKLISTS

.1 Produce Verification/Static Forms and Prefunctional Checklists.

The forms and checklists shall contain items for Electrical contractors to perform. On each form and checklist, provide a column that should be filled out by the Contractor assigning responsibility for that line item to a trade. Those executing the forms and checklists are only responsible to perform items that apply to the specific application at hand. These forms and checklists do not take the place of the manufacturer's recommended checkout and start-up procedures or report. Some forms and checklists procedures may be redundant of some checkout procedures that will be documented on typical factory field checkout sheets. Double documenting is required in those cases.

Refer to Section 01 91 13 – Commissioning Requirements for requirements regarding verification/static forms and prefunctional checklists, startup and initial checkout. Develop Verification/Static Forms and Prefunctional Checklists for each item, equipment and system.

Contractors assigned responsibility for sections of the form and checklist shall be responsible to see that form and checklist items by their subcontractors are completed and checked off. "Contr." column or abbreviations in brackets to the right of an item refer to the contractor responsible to verify completion of this item. All = all contractors, CA = commissioning agent, CC = controls contractor (s) (EMCS and Plant Control System (PCS)), DC = Design Consultant, EC = electrical contractor, GC = general contractor, MC = mechanical contractor, SC = sheet metal contractor.

1.9 FUNCTIONAL/DYNAMIC FORMS AND FUNCTIONAL TESTING PROCEDURES

.1 Produce the Functional/Dynamic forms and Functional Testing procedures. Use the functional/dynamic and functional testing requirements in applicable sections and the testing protocols specified in Section 01 91 13 – Commissioning Requirements for developing site-specific functional/dynamic forms and functional test procedures and forms for this project.

Develop Functional/Dynamic Forms and Functional Testing procedure and carry of functional testing as required.

1.10 VERIFICATION/STATIC FORMS & PREFUNCTIONAL CHECKLISTS AND FUNCTIONAL/DYNAMIC FORMS & FUNCTIONAL TESTING PROCEDURES: REQUIREMENTS

.1 Verification/Static forms and Prefunctional Checklists and Functional/Dynamic forms and Functional Testing Procedures are required for the following:

.1 Power Systems

a. Primary Switchgear
b. Power transformer
c. Secondary power distribution centers
d. Secondary power distribution panelboards
e. Panelboards
f. Primary grounding and secondary grounding including station grounding test, step and touch potential for primary equipment installation.
g. Bonding
h. Metering and instrument
i. Control systems

.2 Seismic restraint

.3 Electrical identification system for equipment and systems

.2 Install and test all controls prior to commissioning.

.3 Ensure that the commissioning provides for the full and comprehensive operation of the equipment under all anticipated normal and adverse operating conditions.

.4 An Acceptance Meeting must be held at the end of the twenty-eight (28) day test to confirm the status of the System.

.5 Suggested Numbering Key for Commissioning Procedures:

The checklists, functional tests, documentation and training use the following identification numbering:

At the beginning of the identification number is a text abbreviation for the following:

Document or Event Abbreviations

DOC = Documentation

PC	=	Prefunctional Checklist
SP	=	Startup Plan
SR	=	Startup Report
FPT	=	Functional Performance Test
R	=	Review
TR	=	Training Record

Part 2 Products

2.1 TEST EQUIPMENT

.1 Subcontractors, suppliers, commissioning coordinator and other affected parties of the Divisions shall provide all test equipment necessary to fulfill the testing requirements as specified.

Part 3 Execution

3.1 SUBMITTALS

.1 Provide submittal documentation relative to commissioning as required in Part 1, Section 01 91 13 – Commissioning Requirements.

3.2 STARTUP

.1 The subcontractors, suppliers, commissioning agencies and other affected parties of the Divisions shall follow the start-up and initial checkout procedures listed in 1.8 Prefunctional Checklists, 1.5 Responsibilities and in Section 01 91 13 – Commissioning Requirements. Responsibilities include start-up and complete systems and sub-systems that are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the CA or the Departmental Representative.

.2 Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and Departmental Representative. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all verification/static forms and prefunctional checklists as soon as possible.

3.3 VERIFICATION/STATIC FORMS AND PREFUNCTIONAL CHECKLISTS

.1 Refer to 1.5 and 1.7 for specific details on the required verification/static forms and prefunctional checklists.

3.4 FUNCTIONAL/DYNAMIC FORMS AND FUNCTIONAL PERFORMANCE TESTS

.1 Refer to 1.6 and 1.7 for specific details on the required functional/dynamic forms and functional performance tests.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

.1 Refer to Section 01 91 13 – Commissioning Requirements for specific details on non-conformance issues relating to verification/static forms and prefunctional checklists and functional/dynamic forms and functional performance tests.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

.1 The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

.2 Compile and prepare documentation for all equipment and systems covered in the Divisions and deliver this documentation to the Contractor for inclusion in the O&M Manuals, according to this section and individual technical sections, prior to the training of owner personnel.

.3 The CA shall receive a copy of the O&M manuals for review.

.4 Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls contractor(s) shall compile and organize at minimum the following data on the control system in labelled 3-ring binders with indexed tabs.

.1 Three copies of the controls training manuals in a separate manual from the O&M Manuals.

.2 Operation and Maintenance Manuals containing:

a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.

b. Full as-built set of control drawings (refer to Submittal section above for details).

c. Full as-built sequence of operations for each piece of equipment.

d. Full print out of all schedules and set points after testing and acceptance of the system.

e. Full as-built print out of software program.

f. Electronic copy on USB Flash Drive of the entire program for this facility.

g. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

h. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.

i. Control equipment component submittals, parts lists, etc.

j. Warranty requirements.

k. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

.3 The manual shall be organized and subdivided with permanently labelled tabs for each of the following data in the given order:

a. System description

b. Sequences of operation

c. Control drawings and schematic diagram

d. Program setups (software program printouts)

.4 Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

.5 Special Documentation Requirements. The CA will compile and submit the following with other documentation that may be specified elsewhere in the *Specifications*.

.1 Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.

.2 The CA shall mark on the drawings where all critical measurements were taken and cross reference the location in the report.

.6 Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the Design Consultant and the CA. Refer to Section 01 91 13 - Commissioning Requirements for details.

3.7 TRAINING OF OWNER PERSONNEL

.1 The Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 01 91 13 – Commissioning Requirements for additional details.

.2 The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment and systems. Refer to Section 01 91 13 - Commissioning Requirements for additional details.

.3 Electrical

.1 Provide the CA with a training plan two weeks before the planned training according to the outline described in Section 01 91 13 – Commissioning Requirements.

.2 Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment and system.

.3 Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, power failure, etc.

.4 During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

.5 The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or supplier's/manufacturer's technical supports representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.

.6 The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

.7 The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

.8 Training shall include:

a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

c. Discussion of relevant health and safety issues and concerns.

d. Discussion of warranties and guarantees.

e. Common troubleshooting problems and solutions.

f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

g. Discussion of any peculiarities of equipment installation or operation.

h. Coordinate the format and training agenda with Mechanical (Division 25)

i. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

.9 Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

.10 Training shall occur after functional testing is complete, unless approved otherwise by the Departmental Representative.

.11 Duration of Training. The contractor shall provide training on each piece of equipment and system according to the following training hour.

SYSTEM	**HOURS**	
Power Systems • Primary Power • Secondary Power • Grounding and Bonding • Control systems	30	

SYSTEM	HOURS	
Equipment vibration and seismic installation	2	

3.8 GENERAL

.1 Test all wiring devices for correct operation.

.2 Check if all equipment is CSA approved before hook up.

.3 Test all receptacles and outlets for proper polarity and circuitry.

.4 Check all equipment for proper installation and coordination settings.

.5 Check for circuit labelling.

.6 Examine fire stopping assembly is installed as per it ULC listing. Allow for 1% destructive testing (or a minimum of one, whichever greater) of installed fire stopping. All assemblies tested shall be repaired.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 14 – Power Cable and Terminations (1001V and Over)

1.2 REFERENCES

.1 CSA Group

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).

.3 CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

1.3 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect connectors and terminations.

.3 Replace defective or damaged materials with new.

1.4 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 all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

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

Part 3 Execution

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No.41.

.3 Connectors for feeders and terminations over 1000V per section 26 05 14.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

.2 Section 26 05 22 - Connectors and Terminations

.3 Section 26 05 28 - Grounding – Secondary

1.2 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837-02, Qualifying Permanent Connections Used in Substation Grounding.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 01 50 – General Instructions.

Part 2 Products

2.1 MATERIALS

.1 Rod electrodes: copper, 19 mm diameter by 3m long.

.2 Conductors: bare, stranded, tinned soft annealed copper wire, size No. 4/0 AWG and 2/0 AWG for ground bus, electrode interconnections, metal structures, gradient control mats, transformers, switchgear, motors, ground connections.

.3 Conductors: bare, stranded, tinned soft annealed copper wire, size No. 4 AWG unless otherwise indicated on drawings for grounding cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers.

.4 Conductors: pvc insulated coloured green, stranded tinned soft annealed copper wire No. 10 AWG for grounding meter and relay cases.

.5 Conductors: No. 3/0 AWG extra flexible (425 strands) copper conductor for connection of switch mechanism operating rod to gradient control mat, fence gates, vault doors.

.6 Bolted removable test links.

.7 Gradient control mat as indicated on drawings.

.8 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:

.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Thermit welded type conductor connectors.
.4 Bonding jumpers, straps.
.5 Pressure wire connectors.
.6 Permanent compression connectors.

.9 Wire connectors and terminations: to Section 26 05 22 - Connectors and Terminations.

Part 3 Execution

3.1 INSTALLATION

.1 Install continuous grounding system including, electrodes, conductors, connectors and accessories as indicated and to requirements of local authority having jurisdiction.

.2 Ground fences to grounding system independent of station ground.

.3 Install connectors and cadweld in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors during and after construction.

.5 Make buried connections, and connections to electrodes, structural steel work, using copper welding by thermit process.

.6 Use mechanical connectors for grounding connections to equipment provided with lugs.

.7 Use No. 4/0 AWG bare copper cable for main ground bus of substation and No. 2/0 AWG bare copper cable for taps on risers from main ground bus to equipment.

.8 Use tinned copper conductors for aluminum structures.

.9 Do not use bare copper conductors near un-jacketed lead sheath cables.

3.2 ELECTRODE INSTALLATION

.1 Install ground rod electrodes. Make grounding connections to station equipment.

.2 Install ground rod electrodes at transformer and switchgear locations.

.3 Install gradient control mats. Connect mats to station ground electrode and switch mechanism operating rods.

.4 Make special provision for installing electrodes that will give acceptable resistance to ground value, where rock or sand terrain prevails.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections as indicated to typical station equipment including: metallic water main, line sky wire, neutral, gradient control mats. Non-current carrying parts of: transformers, generators, motors, circuit breakers, reclosers, current transformers, frames of gang-operated switches and fuse cutout bases. Cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers. Meter and relay cases. Any exposed building metal, within or forming part of station enclosure. Sub-station fences, pothead bodies. Outdoor lighting.

.2 Ground hinged doors to main frame of electrical equipment enclosure with flexible jumper.

.3 Connect metallic piping (water, oil, air, etc.) inside station to main ground bus at several locations, including each service location within station.[Make connections to metallic water pipes outside station to assist in reduction of station ground resistance value].

3.4 NEUTRAL GROUNDING

.1 Connect transformer neutral and distribution neutral together using 1000 V insulated conductor to one side of ground test link, the other side of the test link being connected directly to main station ground. Ensure distribution neutral and neutrals of potential transformers and service banks are bonded directly to transformer neutral and not to main station ground.

.2 Interconnect electrodes and neutrals at each grounding installation.

.3 Connect neutral of station service transformer to main neutral bus with tap of same size as secondary neutral.

.4 Ground transformer tank with continuous conductor from tank ground lug through connector on ground bus to primary neutral. Connect neutral bushing at transformer to primary neutral in same manner.

3.5 CABLE SHEATH GROUNDING

.1 Bond single conductor, metallic sheathed cables together at one end only. Break sheath continuity by inserting insulating sleeves in cables.

.2 Use No. 6 AWG flexible copper wire soldered, not clamped, to cable sheath.

.3 Connect bonded cables to ground with No. 2/0 AWG copper conductor.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform earth loop test and resistance tests using method appropriate to site conditions and to approval of the Consultant and local authority having jurisdiction.

.3 Perform test before energizing electrical system.

.4 Provide step-and-touch potential calculations using measured station ground resistance measurements. Make adjustments to grounding system and retest to ensure results meet the requirements of the Canadian Electrical Code. Submit test result and inspection certificate before energizing electrical system.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies the requirements for supply and installation of the secondary grounding system.

.2 Provide bonding conductor and bonding to all non-current carrying metallic parts or conductive parts in accordance with CEC.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23^{d} Edition), Safety Standard for Electrical Installations, amendment as adopted by the Province of British Columbia and the respective electrical safety bulletins issued by British Columbia Safety Services

.2 CSA C22.2 No.0.4-04, Bonding of Electrical Equipment.

.3 CSA C22.2 No.41-07, Grounding and Bonding Equipment.

Part 2 Products

2.1 EQUIPMENT

.1 Grounding connections include the following:

.1 Cable to steel.

.2 Cable to lug.

.3 Cable to busbar.

.4 Horizontal splice

.5 Parallel splice.

.6 Ground electrode: copper clad steel 19 mm dia. by 3 m long (minimum).

.7 Ground plate: Cooper, size as shown in drawing

.2 Grounding conductors:

.1 Bare stranded copper, tinned, soft or hard annealed, size as indicated.

.2 Green XLPE insulated stranded copper as indicated.

.3 Insulated bonding conductors: green, type XLPE, stranded, tinned soft annealed copper wire, sized in accordance with CEC Table 16, unless otherwise indicated.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings
.2 Protective type clamps
.3 Bolted type conductor connectors
.4 Exothermic welded type connections
.5 Permanent compression type conductor connectors
.6 Bonding jumpers, straps
.7 Pressure wire connectors

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install grounding conductor from each distribution transformer grounding terminal back to unit substation power transformer ground bus.

.2 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where Conduit is used, run ground wire in conduit.

.3 Install connectors in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors from mechanical injury, install insulated green grounding conductor in conduit.

.5 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermite process or permanent compression connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.6 Use mechanical connectors for grounding connections to equipment provided with lugs.

.7 Soldered joints not permitted.

.8 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Provide bonding conductor for each underground conduit or duct in accordance with CEC.

.13 Provide separate bonding conductor in all conduit systems. Conduits shall not be utilized as a bonding method.

3.2 IN GROUND PULL BOX

.1 Install conveniently located grounding stud, electrode, size 4/0 stranded copper conductor in each manhole.

.2 Install ground rod in each in ground pull box and provide bonding for pull box cover plate.

3.3 ELECTRODES

.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.

.2 Make ground connections to continuously conductive gas piping at gas meter.

.3 Install water meter shunt.

.4 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.5 Install rod, plate electrodes and make grounding connections.

.6 Bond separate, multiple electrodes together.

.7 Use size 4/0 AWG copper conductors for connections to electrodes.

.8 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary 600V system, and 120//208 V system as shown on drawings.

3.5 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: service equipment, transformers, switchgear, frames of motors, motor control centres, starters, control panels, building steel work, distribution panels, outdoor lighting etc.

3.6 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections as shown in drawings. Install grounding and bonding

conductors for new equipment as indicated, including connectors and accessories. Where EMT is used, run bonding wire in conduit.

.3 Bond all cable trays, racks and cable support structures.

.4 Provide bonding conductor for each underground conduit in accordance with CEC.

3.7 FIELD QUALITY CONTROL

.1 Perform ground continuity and resistance tests using method appropriate to site conditions before energizing electrical system. Ground reading shall meet CEC requirements. Submit grounding test results to the Departmental Representative.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 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 all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management plan.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers.

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase, and function or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.
- .2 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .3 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .4 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .5 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
- .6 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
- .7 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 01 50 General Instructions.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

- .1 Submit cable manufacturing data.

.3 Quality assurance submittals:

- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic waste in designated containers.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel, threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with expanded ends.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One-hole malleable iron straps to secure surface conduits 50 mm and smaller.

.1 Two-hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 27 mm and larger conduits.

.3 Connectors and coupling: Steel set screw connectors and couplings for all EMT.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use rigid galvanized steel threaded conduit in area subject to mechanical injury such as exterior wall outside electrical room.

.4 Use electrical metallic tubing (EMT), in the electrical room where not subject to mechanical injury.

.5 Use rigid schedule 40 pvc conduit, concrete encased, for underground exterior installations.

.6 Minimum conduit size for lighting and power circuits: 21 mm.

.7 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.8 Mechanically bend steel conduit over 21 mm diameter.

.9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.10 Install fish cord in empty conduits.

.11 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.12 Dry conduits out before installing wire.

.13 All rigid steel threaded conduit connected to boxes, panelboard and cabinet shall be terminated with a threaded hub type connector.

.14 Color code all concealed and exposed conduit as per section 26 05 00 requirements.

.15 Ground Wires:

.1 Provide ground wire for each branch circuit wiring sized to CSA-C22.1 Table 16A.

.2 Provide ground wire for service feeder sized to CSA-C22.1 Table 51.

.3 Minimum ground wire size shall be #12 AWG for power wiring, #14 AWG for class 2 wiring.

.16 Fittings for threaded rigid steel: Threaded hub type connectors to be installed on conduit on conduits at all connections to junction or pull boxes and at panelboards. Acceptable products precision cast, machined surface equal to T&B Bullet, HZ.HTZ Hubs or Myers Hub ST4.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

.3 Conduit to be rigid schedule 40 PVC.

.4 Provide warning tape to meet Canadian Electrical Code requirements.

.5 For areas outside of building foot prints, conduits to be encased in minimum 100mm concrete.

3.5 CLEANING

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Short circuit and protective device coordination study.

.2 Arc Flash Hazard Analysis Study: to NFPA 70E and CSA Z462.

1.2 RELATED SECTIONS

.1 Section 26 05 15 - Commissioning of Electrical Systems

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA Z462-12 – Workplace Electrical Safety

.2 Institute of Electrical and Electronics Engineers, Inc. (IEEE):

.1 IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

.2 IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis

.3 IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations

.3 The National Fire Protection Association (NFPA)

.1 NFPA 70E-2012 – Standard for Electrical Safety in the Workplace

1.4 SUBMITTALS

.1 The short-circuit and protective device coordination studies of the entire institution shall be submitted to the Departmental Representative prior to receiving final approval of the equipment shop drawings listed in Clause 1.2 Related Sections.

.2 The results of the short-circuit protective device coordination and arc flash hazard analysis studies shall be summarized in a final report and shall be included in the operation and maintenance manual.

.3 Upon substantial completion of the project, provide the electronic project files of the entire institution for use with ETAP version 12.6.0. Files to be included on CD and on USB memory stick, as well as upon request.

.4 Provide three (3) bound copies, one CD, and one USB memory stick in PDF format.

.5 The report shall include, but not be limited to, the following as a minimum:

.1 One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, stand-by generator kVA ratings, and switchgear/switchboard/panelboard designations.

.2 Descriptions, purpose, basis and scope of the study.

.3 Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.

.4 Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.

.5 Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.

.6 Incident energy and flash protection boundary calculations.

.7 Recommendations for PPE based on incident energies.

.8 Comments and recommendations for system improvements, where needed.

.9 Executive Summary including source of information and assumptions.

1.5 QUALIFICATIONS

.1 The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Professional Electrical Engineer registered in the Province of British Columbia and skilled in performing and interpreting the power system studies.

.2 This study report shall bear the stamp of a professional engineer registered in the Province of British Columbia.

Part 2 Products

2.1 STUDIES

.1 The coordination study shall cover the entire institution and begin with the utility company's feeder protective device and include all of the electrical protective devices down to power distribution panelboards.

.2 Calculation results to include all fault point/busses for panelboards and loads as follows:

.1 120/208V and 347/600 V panelboards and loads for 3 phase symmetrical short circuit current.

2.2 DATA COLLECTION

.1 The Engineer performing the short-circuit protective device coordination and arc flash hazard analysis studies shall furnish Departmental Representative with a listing of required data immediately after award of the contract.

.2 Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Departmental Representative.

.3 Include fault contribution of existing motors in the study, with motors equal to or larger than 50 hp as separate equipments and less than 50 hp as grouped together. The Contractor shall obtain required existing equipment data, to satisfy the study requirements.

2.3 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

.1 Use actual conductor impedances and lengths if known. If unknown, use typical conductor impedances based on IEEE Standards 141, latest edition and length measured on the Contract drawings.

.2 Transformer design impedances and standard X/R ratios on the manufacturer's technical sheet shall be used when test values are not available.

.3 Provide the following:

.1 Calculation methods and assumptions.

.2 Selected base per unit quantities.

.3 One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted.

.4 Source impedance data, including electric utility system and motor fault contribution characteristics.

.5 Typical calculations.

.6 Tabulations of calculated quantities.

.7 Results, conclusions, and recommendations.

.4 Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:

.1 Electric utility's supply termination point.

.2 Incoming switchgear.

.3 Unit substation primary and secondary terminals.

.4 Low voltage switchgear.

.5 Stand-by generator, transfer switches

.6 Branch circuit panelboards.

.7 Other significant locations throughout the system.

.5 Calculate separate short-circuit momentary and interrupting duties for stand-by generator operation for areas as defined for the three-phase bolted fault short-circuit study.

.6 For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

.7 Protective Device Evaluation:

.1 Evaluate equipment and protective devices and compare to short circuit ratings.

.2 Adequacy of switchgear and panelboard bus bracing to withstand short-circuit stresses.

.3 Adequacy of transformer windings to withstand short-circuit stresses.

.4 Cable and busway sizes for ability to withstand short-circuit heating.

.5 Notify Departmental Representative in writing, of existing circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

.1 Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.

.2 Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.

.3 Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

.4 Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

.5 Plot the following characteristics on the TCC curve sheets, where applicable:

- .1 Rated current and 3 phase symmetrical short circuit current values for busses of protective devices included.
- .2 Electric utility's protective device.
- .3 Medium voltage equipment relays.
- .4 Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
- .5 Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
- .6 Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.
- .7 Conductor damage curves.
- .8 Ground fault protective devices, as applicable.
- .9 Pertinent motor starting characteristics and motor damage points.
- .10 Pertinent generator short-circuit decrement curve and generator damage point.
- .11 Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center.

.6 Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.5 ARC FLASH HAZARD ANALYSIS

.1 The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.

.2 When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.

.3 The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, panelboards, busway and splitters) where work could be performed on energized parts.

.4 The Arc-Flash Hazard Analysis shall include all 25kV, 15 kV, 600V, 120/208V installations and equipment.

.5 Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering incident energy of 1.2 cal/cm^2.

.6 The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

.7 Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

.8 Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584 section B.1.2.

2.6 REPORT SECTIONS

.1 Input Data:

- .1 Utility three-phase and line-to-ground available contribution with associated X/R ratios.
- .2 Short-circuit reactance of rotating machines with associated X/R ratios.
- .3 Cable type, construction, size, # per phase, length, impedance and conduit type.
- .4 Bus duct type, size, length, and impedance.
- .5 Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio.
- .6 Reactor inductance and continuous ampere rating.
- .7 Aerial line type, construction, conductor spacing, size, # per phase, and length.

.2 Short-Circuit Data:

- .1 Source fault impedance and generator contributions.
- .2 X to R ratios.
- .3 Asymmetry factors.
- .4 Motor contributions.
- .5 Short circuit kVA.
- .6 Symmetrical and asymmetrical fault currents.

.3 Recommended Protective Device Settings:

- .1 Phase and Ground Relays.
- .2 Current transformer ratio.
- .3 Current setting.
- .4 Time setting.
- .5 Instantaneous setting.
- .6 Specialty non-overcurrent device settings.

.7 Recommendations on improved relaying systems, if applicable.

.4 Circuit Breakers:

.1 Adjustable pickups and time delays (long time, short time, ground).
.2 Adjustable time-current characteristic.
.3 Adjustable instantaneous pickup.
.4 Recommendations on improved trip systems, if applicable.

.5 Incident energy and flash protection boundary calculations.

.1 Arcing fault magnitude.
.2 Device clearing time.
.3 Duration of arc.
.4 Arc flash boundary.
.5 Working distance.
.6 Incident energy.
.7 Hazard Risk Category.
.8 Recommendations for arc flash energy reduction.

Part 3 Execution

3.1 FIELD ADJUSTMENT

.1 Adjust relay and protective device settings according to the recommended settings table provided by the coordination study to achieve an arc flash incident energy level no greater than 8 cal/cm^2.

.2 Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

.3 Notify Departmental Representative in writing of any required major equipment modifications including the recommended mitigation measure with supporting calculations.

3.2 ARC FLASH WARNING LABELS

.1 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

.2 Orange header with the wording, "WARNING, ARC FLASH HAZARD", and with the following information:

.1 Location designation.
.2 Nominal voltage.
.3 Flash protection boundary.
.4 Hazard risk category.
.5 Incident energy.
.6 Working distance.

.7 Engineering report number, revision number and issue date.

.3 Labels shall be machine printed, with no field markings.

.4 Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

.1 For each 25kV, 15kV, 600V, and applicable 120/208V panelboards, one arc flash label shall be provided

.2 For each low voltage switchboard, one arc flash label shall be provided

.3 For medium voltage switches and circuit breakers, one arc flash label shall be provided for each cubicle.

END OF SECTION

Part 1 General

1.1 SCOPE

.1 The work specified in this section shall be conducted by the contractor and his supplier or manufacturer or an approved engineering service division of a major electrical distribution equipment manufacturer which maintains division-wide recognized specialized testing capabilities for the purpose of performing tests as herein specified.

1.2 RELATED SECTIONS

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

.2 Section 26 11 13.01 – Outdoor Unit Substation to 25kV

1.3 APPLICABLE CODES, STANDARDS AND REFERENCES

.1 All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

- .1 National Electrical Manufacturer's Association – NEMA
- .2 American National Standards Institute – ANSI
- .3 Institute of Electrical and Electronic Engineers – IEEE
- .4 Canadian Standards Association - CSA
- .5 National Fire Protection Association – NFPA
- .6 American Society for Testing and Materials – ASTM
- .7 Insulated Power Cable Engineers Association – IPCEA
- .8 Local codes and ordinances
- .9 Applicable Independent Testing Associations Specifications

.2 All inspections and tests shall utilize the following references:

- .1 Project design specifications
- .2 Project design drawings
- .3 Manufacturer's instruction manuals applicable to each particular apparatus.

1.4 QUALIFICATIONS OF TESTING COMPANY

.1 The testing plan and procedures shall be reviewed and approved by one of the field engineering division's registered professional electrical engineers. The registered professional engineer shall be a full time employee of the engineering service testing group with at least 10 years of field experience testing electrical apparatus.

.2 All test records shall be recorded onto standardized test forms.

.3 The engineering service testing group shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.

.4 The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain.

.5 Instruments shall be calibrated in accordance with the following frequency schedule:

.1 Field instruments – six to twelve months

.2 Laboratory instruments – twelve months

.6 Dated calibration labels shall be visible on all test equipment.

.7 Records must be kept up to date, which show date and results of all instruments calibrated or tested.

1.5 SUBMITTALS

.1 The complete test report shall be signed and sealed by a professional engineer licensed in the province of British Columbia, shall include the following.

.1 Summary of project

.2 Description of equipment tested

.3 Description of test

.4 Test results

.5 Conclusions and recommendations

.6 Appendix, including appropriate test forms

.7 List of test equipment used and calibration date

.2 Submit complete test report to the Department Representative no later than 5 days after completion of the project, unless directed otherwise. Submittal in accordance with Section 26 05 00.

1.6 SAFETY AND PRECAUTIONS

.1 Safety practices shall include, but are not limited to, the following requirements:

.1 Canadian Standard Association – CSA Z462-12.

.2 Applicable provincial local safety operating procedures.

.2 All tests shall be performed with apparatus de-energized except where otherwise specified.

.3 The engineering service testing group's lead test engineer for the project shall be a designated safety representative and shall be present on the project and supervise testing operations and safety requirements.

.4 Power circuits shall have conductors shorted to ground by a hotline grounded device approved for the purpose in accordance with the appropriate test procedures.

.5 In all cases, work shall not proceed until the safety representative has determined that it is safe to do so.

.6 The engineering service testing group shall have available sufficient protective barriers and warning signs, where necessary, to conduct specified tests safely.

.7 The owner's safety procedures shall be reviewed and understood by the engineering service testing group personnel.

Part 2 Products

2.1 EQUIPMENT EVALUATION PREPARATION

.1 Work shall be coordinated to expedite project scheduling.

.2 Supply a complete set of as-built electrical plans, specifications and any pertinent change orders to the engineering service testing group prior to commencement of testing.

.3 The contractor shall notify the Department Representative prior to commencement of any testing.

.4 The contractor and his engineering service testing group shall be responsible for implementing all final settings and adjustments on protective devices and electrical equipment in accordance with the coordination study performed by the engineer of record of the testing group's licensed professional engineer.

.5 Any system, material or workmanship which is found defective on the basis of electrical tests shall be reported directly to the Department Representative.

.6 The contractor and his engineering service testing group shall maintain a written record of all tests and upon completion of the project, assemble and certify a final test report.

.7 Three copies of the final report shall be submitted, sealed and signed by the professional engineer leading the testing and startup. An electronic copy shall be submitted on CD in PDF format.

Part 3 Execution

3.1 FIELD TESTING

.1 The contractor's field engineering service testing group shall provide all material, equipment, labor and technical supervision to perform electrical equipment tests and inspections. The contractor and his field engineering service organization shall administer all acceptance and start-up testing, and power system studies, as referenced in other specification sections.

.2 The intent of these tests is to assure that all electrical equipment is operational within industry standards and manufacturer's tolerances and that equipment is installed and functioning in the system in the manner intended by the Department Representative.

.3 Upon completion of the tests and inspections noted in these specifications, a label shall be attached to all serviced devices. These labels will indicate date serviced and the engineering service testing group responsible.

.4 The tests and inspections shall determine suitability for initial continued reliable operation.

3.2 ACCEPTANCE TESTING FOR MAIN SERVICE EQUIPMENT

.1 Examine the equipment, including breakers, and accessories for:

.1 Doors, panels, and sections for alignment, dents, scratches, fit, and missing hardware

.2 Shipped loose and shipped short components.

.3 Shipping damage

.4 Loose or obviously damaged components.

.5 Proper identification.

.6 Physical damage from installation.

.7 If the unit was placed in temporary storage, verify and record that proper procedures were observed. Remove temporary heater wiring and shipping braces.

.2 Inspect

.1 Shipping Splits to insure that all bus connections were properly connected and all control wiring splits have been properly terminated.

.2 Inspect all grounding connections for cleanliness and alignment.

.3 Main Bonding Jumper for proper size and termination

.4 Insulators for evidence of physical damage or contaminated surfaces.

.5 Surge Arrester and/or Surge Suppression size, type, installation and connection.

.6 Control power & instrument transformers, if applicable.

.7 Wiring for damaged insulation, broken leads, tightness of connections, proper crimping, and overall general condition.

.3 Verify structure, grounding, cables and bus assembly:

.1 Anchorage (per local codes, wind and seismic considerations).

.2 Required area clearances, correct alignment and cleanliness.

.3 Verify the grounding electrode conductor is properly sized and terminated.

.4 The proper grounding of instruments, panels and connections.

.5 Conductor identification (as applicable).

.6 Cable termination tightness.

.7 That all cables have been properly installed, routed and supported and are clear of energized parts.

.8 That conduits and conduit bushings are correctly installed.

.9 Tightness of accessible bolted electrical connections, especially shipping splits, by calibrated torque-wrench method in accordance with manufacturers published data.

.4 Verify Control & Instrumentation:

.1 That all VT and CT ratios properly correspond to drawings and that polarity is correct.

.2 That shorting screws and bars are removed from CT's and terminal blocks as required.

.3 That primary and secondary fuse ratings or circuit breakers match drawings.

.4 Meter scaling and type match drawings.

.5 Set Meter, Relay, & Breaker Trip Settings:

.1 Set meter, relay, & breaker trip setting per coordination study.

.6 Ductor Testing

.1 Inspect shipping splits for connection assuring adequate surface contact.

.2 Ground bonding & shipping splits shall be tested with ductor tester (Digital low ohm resistance meter) to insure connection is a low resistance connection. Test from one fixed bus to adjacent fixed bus through the shipping split connector to measure both connection points.

.3 Microhm values shall not vary more than 50% from other phase readings and meet the manufactures published data based on bus size, ampacities and material.

.7 Ground Fault Testing

.1 Inspect switchboard main bonding jumper for proper size and termination on source side of neutral disconnect link.

.2 Inspect Grounding electrode conductor to assure proper size and secure termination to ground bus.

.3 Inspect switchboard neutral bus downstream of the neutral disconnect link to verify the absence of ground connections.

.4 Set Ground fault setting per coordination.

.5 Verify Ground Fault System Performance for correct response of the circuit-interrupting device by primary ground sensor current injection. Record ground fault pickup current. Verify breaker trips and indicator works.

.6 Verify Ground fault does not pick-up at 90% of pickup setting.

.7 Record settings, results, and any other notations on the Low Voltage Breaker data form.

3.3 GROUND GRID TESTING

.1 Perform ground grid resistance and step-and-touch potential rise tests of completed installation demonstrating compliance with Canadian Electrical Code requirements.

.1 If ground grid, as installed, does not comply, provide recommendations for remedial action.

3.4 RESTORATION OF EQUIPMENT AND REPORTS

.1 Before energizing:

.1 Remove and account for all test equipment, jumper wires, and tools used during testing.

.2 Remove and account for safety grounds and tools.

.3 Replace all barriers and covers, close all doors, and secure all latches.

.4 Remove safety locks and tags.

.5 Insure all adjustable meters, relays and trip devices are properly set in accordance with the coordination study.

.6 Apply testing label to equipment

.2 Note corrective actions taken, deficiencies, recommendations and any general comments.

.3 Finish recording data on test forms, completely filling in the blanks.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials, components, cabinets, instruments and installation for metering and switchboard Instruments.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C39.1-1981, Requirements, Electrical Analog Indicating Instruments.

.2 Canadian Standards Association, (CSA International)

.1 CAN3-C17-M84(R2004), Alternating-Current Electricity Metering.

.2 CAN3-C13-M83(R2003), Instrument Transformers.

1.4 PRODUCT DATA

.1 Indicate meter, instrument, outline dimensions, panel drilling dimensions and include cutout template.

1.5 QUALITY CONTROL

.1 General:

.1 Contractor to be responsible for quality control of the products and installation in this section.

.2 Submit all information and material required for the Quality Management System, in accordance with Section 26 05 00 – Work Results for Electrical.

.3 Quality Control Program Submittals:

.1 Quality Control Check Sheet

.4 Quality Control Check Sheet:

.1 Prepare and maintain Quality Control Check Sheets.

.2 Check sheet to be kept on site and be made available for review by the Engineer at any time.

.3 Check sheets to be filled in and submitted for review, prior to substantial completion.

.4 Check sheets for each metering and switchboard instruments to include the following information:

.1 Metering and switchboard instruments specifications and installation details

.2 Itemize a check list for the following:

.1 Type of meter and instruments
.2 Proper connections
.3 Characteristics of each meter and instrument
.4 Check for correct and proper calibration

.3 For each tabulated item, state the following:
.1 Does the item comply with the specification? Yes/No/Not Applicable.

.5 Identify any areas of non compliance and the proposed action to make it complaint.

Part 2 Products

2.1 METER

.1 Secondary 208V digital power meter with display for kW demand, kWhr energy, and percent power factor provides power consumption data for information. Digital power meter shall be IP based and have communication port supporting the RS485 standard. 10 Base T Ethernet port is also required.

.2 The contractor shall supply and install an appropriate converter to interface new digital meter with the existing Institution DDC system to make a complete and fully operation monitoring system.

2.2 SHOP INSTALLATION

.1 All wiring and inter-wiring shall be factory installed. Provide slip on plaster label for wiring identification to match schematic wiring diagram supplied.

.2 Install meters and instrument transformers in separate compartment of switchboard.

.3 Install instruments on switchboard.

.4 Ensure adequate spacing between current transformers installed on each phase.

.5 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

Part 3 Execution

3.1 METERING INSTALLATION

.1 Install meters and instruments in location free from vibration and shock.

.2 Make connections in accordance with diagrams.

.3 If applicable, ensure power factor corrective equipment connected on load side of meter.

.4 Connect meter and instrument transformer cabinets to ground.

.5 Installation of communication cable from communication port for interfacing the power meter with Institution DDC system and the Institution system is by others.

.6 Locate meter integrated within the front panel of the switchboard enclosure.

3.2 FIELD QUALITY CONTROL

.1 Conduct tests in accordance with Section 26 05 00 - Common Work Results – Electrical, and in accordance with manufacturer's recommendations.

.2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.

.3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.

.4 Perform tests to obtain correct calibration.

.5 Do not dismantle meters and instruments.

.6 Provide a written report for commissioning of the metering operation.

.7 Provide onsite training for owner's maintenance staff.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for outdoor substation with primary switchgear, transformer and secondary switchgear.

1.2 RELATED SECTIONS

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

.2 Section 26 05 73 – Coordination Study & Arc Flash Analysis

.3 Section 26 08 00 – Electrical Equipment Acceptance Testing and Startup.

.4 Section 26 09 02.b – Metering and Switchboard Instruments

.5 Section 26 24 13 – Switchboards

1.3 REFERENCES

.1 American National Standards Institute / Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C37.121-1989(R2000), Unit Substations - Requirements.

.2 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.58-M1989(R2000), High-Voltage Isolating Switches.

.2 CSA G40.20/G40.21-98(June 2000), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMACG1-1, 1958, Indoor and Outdoor Switch and Bus Insulators.

.4 Underwriters' Laboratories (UL)

.1 UL 1062-97, Unit Substations.

1.4 SYSTEM DESCRIPTION

.1 Outdoor unit substation with:

.1 Primary switchgear

.2 Transformer.

.3 Secondary switchgear.

1.5 SHOP DRAWINGS

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.2 Indicate:

.1 Single line diagram.

.2 Equipment layout.

.3 Equipment dimensions including door openings, draw-out equipment positions and workspace requirements.

.4 Dimensioned foundation template.

.5 Dimensioned cable entrance and exit locations.

.6 Dimensioned cable termination heights.

.7 Details of entry plate.

.3 Submit preliminary coordination study with shop drawings.

.1 Study to show coordinated curves for the protective devices from the utility fuse cutouts or recloser, to the secondary breakers.

.2 Study to show protective devices and transformer damage curves are properly coordinated.

.3 Recommend fuse sizes breaker settings and main secondary breaker setting.

.4 Shop drawings will not be accepted or reviewed without this co-ordination study.

1.6 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for unit substation for incorporation into manual specified in Section 26 05 00.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit maintenance materials in accordance with Section 01 01 50 – General Instructions.

.2 Include:

.1 Fuses:

.1 6 fuse refills for each type up to and including 600 A.

.2 6 of each type of indicator light bulbs installed.

1.8 QUALITY ASSURANCE

.1 Submit six (6) copies of production test results to Consultant. Do not ship equipment until test results have been accepted by Consultant.

Part 2 Products

2.1 DESIGN TO INCLUDE THE FOLLOWING:

.1 Designed to **arc flash incident energy less than 8 cal/cm^2** utilizing SEL 787 relay and transformer differential relays, provide letter and calculation and TCC characteristics of recloser to confirm compliance with the design criteria (signed and sealed by a Professional Engineer registered in the Province of British Columbia).

.2 Primary VT (primary voltage as required to 120V) to provide a reliable 120V power source for the motor operator for the interrupter, space heaters and receptacle.

.3 Lightning and surge arrestors.

.4 External shunt trip ability.

.5 Gauge auxiliary contacts.

.6 Environmentally friendly, liquid-filled transformer.

.7 Low voltage terminal lugs to suit conductor size (note reducers may be required)

.8 Transformer overload/over temperature shunt trip.

.9 Single phase protection

.10 Secondary ground fault detection and annunciation

.11 Marine grade aluminum front end enclosure

2.2 ENCLOSURE

.1 Enclosure: metal enclosed free standing, pad mounted, dead front, outdoor non walk in CSA Enclosure 3R cubicle unit. Constructed from flat marine grade aluminum sheets 4 mm thick.

.2 Same construction for primary and secondary switchgear.

.3 Ventilating louvers: vermin, insect, rain proof with easily replaceable fibreglass filters.

.4 Use stainless steel or hot dipped galvanized bolts and hardwares.

.5 Access from front only.

.6 100 mm stainless steel channel sills for base mounting in single length common to multi-cubicle switch board.

.7 Full height outer door reinforced with stiffeners, gasketed, hinges on left side, provision for multiple padlocking. Three point latching, hold-open stops, to open at least 135 degrees.

.8 Inner doors to open at least 90 degrees, with viewing windows of transparent shatterproof material for inspection of disconnecting / isolating switch position.

.9 Hinge doors of multi-cubicle switchboard on same side.

.10 Gaskets on removable covers.

.11 Removable cover bolts not accessible from outside of cubicle.

.12 Interior hinged and bolted mesh stainless steel screens to prevent inadvertent contact with exposed live parts.

.13 Metal pocket on inside surface of door to accommodate drawing and diagram prints.

.14 Following devices factory or shop wired to identified terminals for wiring to:

.1 Space heaters: 120 V, 250 W, 60 Hz, single phase, in each cubicle complete with thermostat and disconnect switch.

.2 Receptacle: 120 V, single phase, 60 Hz, U-ground, duplex.

2.3 PRIMARY BUS BARS AND CONNECTIONS

.1 Three phase bare bus bars, continuous current rating 600 A extending full width of cubicle multi-cubicle switchboard suitably supported on insulators.

.2 Main connections between bus bars, major switching components and fuses of continuous current rating to match major switching components.

.3 Copper for bus bars and main connections.

.4 Brace bus-bar system to withstand stresses resulting from short circuit currents specified.

.5 Tin surfaced joints, secured with stainless steel or hot dipped galvanized bolts and washers, tightened with torque wrench in accordance with manufacturer's recommended load.

.6 Identify phases of bus bars by suitable marking and/or coloured paint.

.7 Busbar connectors when switchgear shipped in more than one section.

2.4 GROUNDING

.1 Copper ground bus not smaller than 50 x 6 mm extending full width of multi-cubicle switchboard section and situated at bottom. Lugs at each end for size 4/0 AWG grounding cable.

.2 Bond non-current carrying metal parts, including switchgear framework, enclosure and bases to ground bus.

2.5 TRANSFORMER PROTECTION RELAY

.1 Relay for protection of unit substation transformer shall have following features:

.1 Percentage differential protection for two windings, with adjustable slopes, intersection points, and minimum pickup values.

.2 CT phase angle compensation

.3 Harmonic elements to prevent unrestrained differential element operation during inrush or over-excitation.

.4 Unrestrained differential protection for rapid tripping for severe internal faults

.5 RTD inputs, compatible with temperature sensors provided in transformer

.2 Relay to be SEL-787, or approved equal.

2.6 LIGHTNING ARRESTERS

.1 Provide three distribution class lightning arresters for surge protection. Arresters are to be mounted in the high voltage compartment and rated for the primary voltage available.

.2 System highest voltage (line to line) 25,000 volts

.3 MCOV: 15.3 kV

.4 Polymer housing

2.7 INTERLOCKS

.1 Kirk key interlocks, Type F for load interrupter switch and Type D for switchgear cubicle door to prevent:

.1 Opening cubicle door for access to fuses while load interrupter is in closed position.

.2 Closing load interrupter while cubicle door is open.

.2 Kirk key interlocks Type F for main circuit breaker and Type F for group operated isolating switch to prevent:

.1 Opening isolating switch while main circuit breaker is closed.

.2 Closing circuit breaker while isolating switch is open.

2.8 PRIMARY PROTECTION

.1 The transformer shall come complete with an integral, oil immersed switch with built in over current protection in the form of a VFI breaker (vacuum fault interrupter) to provide phase and ground fault protection, rated for the application. The following minimum ratings shall apply:

.1 600 amps full load

.2 40 kA close and latch

.3 20 kA withstand

.4 95kV BIL at 12.5kV; 125 kV BIL at 25 kV.

.5 Three (3) boric acid fuses coordinated to the upstream device;

.6 Three (3) spare fuses, contained in the main fuse cabinet for the VFI switch.

.7 The VFI switch shall be complete with grounding position, live line indicators, mimic diagram, viewing port and built in lights, and;

.8 The VFI switches shall be motor operated by an open/close switch with built in delay of operation, allowing the operator to get out of the Arc flash zone. The switch when activated for open or close, will delay the operation for 15 seconds, so the operator can stand back and watch the switch operate from a safe distance.

2.9 LIQUID FILLED TRANSFORMER

.1 Rating: as shown on drawings

.2 Short circuit: 500MVA at primary voltage

.3 Basic Impulse Level (BIL) shall be 125 kV for 25kV; 95kV BIL for 12.5kV; and, 30kV at 208V and 600V.

.4 Frequency: 60Hz

.5 Winding: Copper

.6 Temperature rise: 60 degree Celsius

.7 Protection: phase and ground overcurrent protection relay.

.8 Switch: 12.5kV or 25kV motor operated Vacuum Fault Interrupters (VFI) under liquid with SCADA and visible disconnect switch, 20kA. Include a sealed viewing window integral to the transformer tank wall and large, easily viewed contacts for verifying circuit isolation. Visible break contacts shall be mechanically interlocked with the VFI and shall provide closed, open position. Switch and breaker to be provided with live line indicators (fault indicator and live point indicator)

.9 Impedance not exceeding 5.75% unless noted otherwise.

.10 Sound rating: 65dB max.

.11 The transformer shall be furnished with full capacity high-voltage taps. The tap changer switch shall be located in the secondary cabinet. The tap changer shall be clearly labelled to reflect the transformer must be de-energized before operating the tap changer as required in Section 5.1.1 of ANSI C57.12.10. Taps shall be provided on the higher voltage of dual voltage primary units. The tap changer switch shall be an externally operated, snap action switch with a lever handle. Padlocking provisions are available for lever handles. The unit shall have one of the following tap configurations:

.1 5@ - 2½% taps above and below rated voltage (off/load)

.12 The transformer, filled with Envirotemp FR3, shall have a 75°C average winding temperature rise rating. The above winding temperature rise shall not exceed 75°C when loaded at base kVA rating.

.13 The transformer shall be cooled by the natural circulation of air over the tank surface and any corrugate or radiators if required, allowing only the base kVA rating shall be provided with Class ONAN.

.14 High Voltage Bushings and Terminals: to BC Hydro standards for primary service connections.

.15 Low Voltage Bushings and Terminals: The transformer shall be provided with three (3) cover mounted, electrical grade, wet process porcelain, bushings rated for full three-phase duty with twelve-hole spade connector.

.16 Tank and Terminal Compartment: The core and coil shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. The coil shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper. The winding shall be of copper construction.

.17 The dielectric coolant in the transformer shall be non-toxic, non-bioaccumulating and be readily and completely biodegradable per EPA OPPTS 835.3100. The base fluid shall be 100% derived from edible seed oils and food grade performance enhancing additives. The fluid shall not require genetically altered seeds for its base oil. The fluid shall be certified to comply with the US EPA Environmental Technology Verification (ETV) requirements, and tested for compatibility with transformer components. The fluid shall be UL Classified Dielectric Medium (UL-EOUV) and UL Classified Transformer Fluid (UL-EOVK), Envirotemp FR3™ fluid.

.18 The tank must be welded using precision cut, cold-rolled steel plate and equipped with extra-heavy duty, welded-in-place lifting lugs and jacking pads. The tank base must be designed to allow skidding or rolling in any direction.

.19 The transformer shall be of sealed tank construction of sufficient strength to withstand a pressure of 7 psig without permanent distortion, and 15 psig without rupturing.

.20 The tank shall include a pressure relief valve as a means to relieve pressure in excess of pressure resulting from normal operation. The venting and sealing characteristics shall be as follows:

.1 Cracking Pressure: 10 psig +/-2 psig
.2 Resealing Pressure: 6-psig minimum
.3 Zero leakage from reseal pressure to -8 psig
.4 Flow at 15 psig: 35 SCFM minimum

.21 The tank shall be cleaned with an alkaline cleaning agent to remove grease and oil. An iron phosphate coating shall then be chemically bonded to the metal to assure coating adhesion and retard corrosion. The tank shall be primed with an electrodeposited powder epoxy to provide a barrier against moisture, salt, and corrosives. The tank shall then be coated with an electrostatically-applied, oven-cured polyester powder coat to enhance abrasion and impact resistance. The top-coat shall be a liquid polyurethane coating to seal and add ultraviolet protection. The tank coating shall meet all requirements in ANSI C57.12.28 – latest revision.

.22 The tank shall be complete with an anodized aluminum or a stainless steel laser engraved nameplate. This nameplate shall meet ANSI C57.12.00 for Nameplate B.

.23 Standards of compliance:

.1 CSA C22.2 No.31
.2 NEMA 3R
.3 ANSI C37/60 for breaker and switch
.4 ANSI for transformer C57.12.00, C57.12.26, C57.12.28, C57.12/12.9
.5 CUSA C2.1 with C802.2 Efficiency
.6 CU listed bearing CUL label
.7 Canadian Electrical Code
.8 Safety Authority Directive No: D-E3 0903121
.9 CSA SPE-1000

.24 The following standard accessories and features shall be provided (supplier to indicate items below in the shop drawing:

.1 600A deadbreak HV bushing rated for primary voltage
.2 Sealed viewing window
.3 Lightning arrestors
.4 Copper ground bus
.5 Drain valve with sampler
.6 Ground pad 0.5-13 tap
.7 Ground strap and pad
.8 High security cabinet with pentahead door bolts
.9 LV bushing support
.10 Four (4) lifting lugs
.11 Liquid temperature gauge with alarm contacts
.12 1.2kV LV bushing with 12 hole spade supported
.13 Magnetic liquid level gauge with alarm contacts
.14 Nameplates
.15 Pressure vacuum gauge
.16 Bolt down anchor provisions for seismic restraint.
.17 Tank base with jacking and rolling facilities
.18 Tap changer
.19 Vacuum witch with alarm contacts
.20 X0 bushing
.21 Lockable side cabinet for gauges and VFI
.22 RTD transmitter
.23 VFI control box
.24 Access hole with shipping cover
.25 De-energized tap changer
.26 1.0" upper fill plug with filter press connection.
.27 Automatic pressure relief valve
.28 Welded cover and bolted manhole
.29 Liquid level gauge
.30 Full length ground buss, 2 inches copper, c/w grounding ball.
.31 3 spare fuses
.32 Switch mimic diagram
.33 Anti-condensation insulation
.34 Primary live front connection
.35 Switch load side ground position
.36 Live line indicators (3 phase)
.37 Stainless steel hardware

.25 Standard factory tests:

.1 Insulation power factor
.2 Winding resistance
.3 Applied potential

.4 Loss test
.5 Switchgear dielectric test
.6 ANSI lightning impulse
.7 Tank distortion & rupture
.8 Ratio, polarity, phase relation
.9 Routine impulse test
.10 Induced potential
.11 Leak test
.12 Sound level
.13 Short circuit
.14 Temperature rise

2.10 SECONDARY DISTRIBUTION CENTRE

.1 Refer to Section 26 24 13, unless otherwise noted below.

.2 Secondary distribution centre: outdoor non-walk in type. Voltage, current, and phase rating as indicated on drawings. Minimum short circuit current withstand capability 35 kA.

.3 Enclosure:

.1 Match primary switchgear enclosure construction.
.2 Distribution cubicle to contain:
.1 Molded case circuit breakers with digitrip feature, sized as indicated.
.2 Tinned copper bus from main cubicle to distribution cubicles, including vertical bussing
.3 50% blanked off spaces for future devices.

.4 Busbars and connections:

.1 Three phase insulated bus bars, continuous current rating as shown on drawings, self-cooled, extending from main cubicle to distribution cubicles including vertical bus

.5 Neutral:

.1 Solidly grounded neutral.

2.11 SECONDARY CIRCUIT BREAKERS

.1 For 208V or 600V distribution: circuit breakers shall have a minimum symmetrical interrupting capacity of 35,000 amperes. To ensure a selectively coordinated system, all circuit breakers shall have 30-cycle short-time withstand ratings equal to their symmetrical interrupting ratings, regardless of whether equipped with instantaneous trip protection or not.

.2 All circuit breakers suitable for protection devices specified below.

.1 Molded case circuit breakers, with electronic tripping units, LSIG
.2 Breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-centre switching mechanism that is mechanically trip-free.

.3 Padlocking mechanism for all breakers

.4 Automatic tripping of the breaker shall be clearly indicated by the handle position.

.5 Contacts shall be no welding silver alloy and arc extinction shall be accomplished by means of arc chutes.

.6 A push-to-trip button to provide a local manual means to exercise the trip mechanism.

.7 Minimum symmetrical interrupting rating as shown on the drawings.

.8 Where indicated provide CSA listed circuit breakers for applications at 100% of their continuous ampere rating in their intended enclosure.

2.12 SECONDARY CIRCUIT BREAKER TRIP UNITS

.1 Microprocessor based, with three (3) current sensors, a trip unit and a flux-transfer shunt trip.

.2 True rms sensing.

.3 Continuous trip ratings established by interchangeable rating plugs, interlocked so they are not interchangeable between frames, and interlocked such that a breaker cannot be closed and latched with the rating plug removed.

.4 System coordination shall be provided by the following microprocessor-based programmable time/current curve shaping adjustments:

.1 Programmable long-time pickup settings in 1% increments, with +/- 5% band tolerance

.2 Programmable long-time delay with selectable I^2t or I^4t curve shaping

.3 Programmable short-time settings (dependent on long-time setting) in 1% increments, with +/- 5% band tolerance

.4 Programmable short-time delay with selectable flat or I^2t curve shaping

.5 Programmable instantaneous pickup settings in 1% increments

.6 Programmable ground fault pickup settings trip or alarm in 1% increments

.7 Programmable ground fault delay with selectable flat or I^2t curve shaping

.5 Powered/unpowered selectable thermal memory to provide protection against cumulative overheating.

.6 Selectable discriminator circuit prevent the breaker being closed and latched on to a faulted circuit.

.7 Internal ground fault.

.8 Battery backed-up LEDs to indicate mode of trip following an automatic trip operation, retained after trip complemented by trip event information stored in non-volatile memory after a trip event. A trip reset button shall be provided to turn off the LED indication and reset the memory after an automatic trip. A test pushbutton shall energize an LED to indicate battery status.

.9 A red LED shall be provided on the face of the trip unit and pre-set to flash on and off when an adjustable high-load level is exceeded. A time-delay shall be provided to avoid nuisance alarms. The microprocessor-based trip units shall be capable of monitoring the following data:

.1 Instantaneous value of phase, neutral and ground current
.2 Minimum and maximum current values
.3 Average demand current
.4 System diagnostic information such as alarms and cause of trip
.5 Approximate level of fault current that initiated an automatic trip operation

.10 A hand-held programming unit to set/change the network communication breaker address for each device, set the system baud rate, distribution frequency, display breaker information, and display monitored values. The programmer shall be self-powered by an internal battery. Provide as a minimum one (1) hand-held programming unit per assembly.

.11 The trip unit shall be capable of two-way communication via a network twisted pair for remote monitoring and control. All monitored values shall be transmittable over the network.

.12 Zone interlocking capability for the short-time delay and ground fault delay trip functions for improved system coordination.

.13 Built-in metering system to monitor following parameters:

.1 Peak demand (kW)
.2 Present demand (kW)
.3 Total energy (kWh)
.4 Power factor
.5 Percentage harmonic content
.6 Total Harmonic Distortion (THD)

2.13 GROUND FAULT

.1 Ground fault to be provided as follows:

.1 2 indicating light
.2 Local audible alarm
.3 Remote visual and audible alarm to terminal office.

2.14 DIGITAL INFORMATION METER

.1 Digital information meter to section 26 09 02.b Metering and Switchboard Instruments.

2.15 SHOP FABRICATION

.1 Shop assembles and test components of unit substation.

.2 After completion of factory assembly and high potential test, prepare for shipment to site in sections, complete with hardware for re-assembly and re-connecting.

.3 Prior to shipment obtain CSA approval for the complete unit substation.

2.16 FINISHES

.1 Apply finishes in accordance with Section 26 05 00 - Common Work Results of Electrical

.2 Supply 2 spray cans touch up paint.

2.17 MIMIC DIAGRAM

.1 Single line mimic diagrams on the front of the cubicle for the complete assembly.

.2 Integrates the position indicators to give a clear visual display of the circuit breaker's status: open, closed, isolated, in service.

.3 Positive indication of the status of the grounding switch.

.4 Mimic diagrams shall be visible in the event of a power failure.

2.18 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical

.2 Nameplates:

.1 Primary switchgear: white plate, black letters, size 7:

.1 Engraved: "Primary Cubicle".

.2 Engraved: "Main Breaker"

.2 Transformers: white plate, black letters, size 7:

.1 Engraved: "Transformer" "___ kVA, ___ V to ___ V, ___ phase, 60 Hz".

.2 Winding temperature device engraved: "Winding Temperature".

.3 Oil thermometer engraved: "Oil Temperature".

.3 Secondary distribution: white plate, black letters, size 7:

.1 Engraved: "Low Voltage Cubicle".

.2 Engraved: "Main Breaker"

.3 Engraved: "Feeder No. 1 to ___, Feeder No. 2 to ___, Feeder No. 3 to ___", as indicated

2.19 WARNING SIGNS

.1 Provide warning signs in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.20 COORDINATION STUDY AND COMMISSIONING

.1 Refer to Section 26 05 73, in addition include the following:

.1 Submission for approval to BC Hydro to include coordination study from utility source to largest downstream device, including phase and ground overcurrent plots.

.2 BC Hydro statement of primary voltage stamped and sealed by a professional engineer registered with APEGBC

.3 Equipment commissioning in accordance with CEC Rules – All testing performed to NETA 2003 and applicable IEEE/ANSI Standards

.1 Unit substation Tests:

.1 Transformer turn ratio

.2 Insulation test – HV- ground, LV-Ground, HV-LV

.3 Resistance Test (Switch and Transformer)

.4 Equipment inspection

.5 Ground resistance test

.2 Secondary Equipment

.1 Secondary cable insulation test

.2 Secondary breaker set up and calibration

.3 Secondary breaker test as applicable

.3 Station grounding, ground grid step/touch potential calculation per IEEE Standard 80, as required by CEC Table 52, site testing and sealed by a professional engineer registered in BC.

2.21 SOURCE QUALITY CONTROL

.1 Submit quality assurance as follows:

.1 Provide manufacturer's type test certificates indicating switchgear cubicles and components tested as integrated assembly.

.2 Submit to Engineer test procedures, at least 10 days prior to testing.

.3 Submit 6 copies of production test results to Engineer before equipment is shipped from factory.

.2 Submit to Consultant standard factory test certificates of each transformer and type test of each transformer with high voltage accessories in accordance with CSA-C227.4.

Part 3 Execution

3.1 INSTALLATION

.1 Provide a structural engineer (registered in APEGBC) to design a reinforced concrete pad with seismic restraint anchoring. Size the concrete pad to suit equipment shop drawings for physical footprints and cable entries. Submit detailed shop drawings (signed and sealed by a Professional Engineer registered in the Province of British Columbia) for review.

.2 Set and secure cubicles and transformers in place, rigid, plumb and square, on channel bases.

.3 Interconnect cubicles and transformer with bus bar connections supplied by manufacturer.

.4 Check factory made connections for mechanical security and electrical continuity.

.5 Make field connections in accordance with manufacturer's recommendations.

.6 Install six (6) ground rods and grounding conductor 4/0 AWG bare copper encompassing the substation.

.7 After finishing Work, remove foreign material, including dust, before energizing substation.

.8 Set transformer taps for secondary voltage at no load.

.9 Check fuses, relays, trip unit settings against co-ordination study to ensure proper working and protection of components and that co-ordinated sequence of action is established.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Check insulation of switchgear assembly with 1000V megger. If values not satisfactory, clean, and dry and heat switchgear and repeat tests until readings acceptable to the Engineer.

.3 Operate load interrupter and circuit breaker closing and tripping mechanisms, to verify correct functioning.

.4 Check phase rotation of each feeder.

.5 Place primary switchgear in service and check ammeter, voltmeter, wattmeter, power factor meter readings to ensure proper functioning of instruments and satisfactory phase balance and power factor of loads.

.6 Check fuses for correct type and rating.

.7 Check for grounding and neutral continuity between station ground and system neutral.

.8 Have factory representative commission final installation and certify proper operation and installation in accordance with Section 26 05 15 - Commissioning of Electrical Systems.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Test for 24 consecutive hours, to include:

- .1 Primary and secondary voltage at no load.
- .2 Primary and secondary voltages at normal load once per hour.
- .3 Primary and secondary current in each phase once per hour.
- .4 kW and kVA once per hour.
- .5 Transformer and ambient temperature once per hour.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results for Electrical

.2 Section 26 40 00.01 - Primary Lightning Arrestors

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers, Inc. (IEEE)

.1 ANSI/IEEE 386-95(R2001), Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-C227.4-06, Three-Phase Pad-Mounted Distribution Transformers with Separable Insulated High-Voltage Connectors.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, and limitations.

.3 Submit shop drawings and indicate:

.1 Anchoring method and dimensioned foundation template.

.2 Dimensioned cable entry locations.

.4 Identified internal and external component layout on assembly drawing.

.5 Insulating liquid capacity.

.6 Submit primary fuse and secondary breaker time-current characteristics.

.7 Quality Assurance Submittals: submit following in accordance with Section 01 01 50 – General Instructions.

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

.2 Instructions: submit manufacturer's installation instructions.

.8 Closeout Submittals:

.1 Provide operation and maintenance data for pad mounted distribution transformers for incorporation into manual specified in Section 01 01 50 – General Instructions.

.2 Include insulating liquid maintenance data.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 02 50 13 – Management of Toxic Waste.

1.5 MAINTENANCE

.1 Provide maintenance materials in accordance with Section 01 01 50 – General Instructions.

Part 2 Products

2.1 EQUIPMENT

.1 Constructed for outdoor installation CSA 3R, three phase dead front pad mounted distribution transformers: to CSA C227.4. Separable insulated connectors for power distribution systems above 600 V: to ANSI/IEEE 386.

.2 Liquid filled distribution transformer complete with primary and secondary cable compartments and accessories to form complete factory assembled, self contained, steel fabricated unit low profile unit for mounting on concrete pad. The dielectric liquid shall be seed breed environmental friendly type.

.3 High voltage bushing wells for connection to distribution system through separable insulated connectors for dead front operation solderless connectors.

.4 Separable insulated connectors.

.5 Spade type low voltage terminals.

.6 Connectors for primary and secondary cables.

.7 Designed and constructed for loop feed operation.

.8 Two fuse system as defined in CAN/CSA 227.04-06 to be provided and complete with 3 spare BAYONET fuses.

.9 Mechanical interlock systems to prevent access to primary compartment unless primary supply is isolated at source. Separate padlocking for primary compartment door.

.10 Three 8.4kV MCOV and 10kV duty cycle lightning arrestors to be Elbow style in accordance with Section 26 40 00.01 – Primary Lightning Arrestors The lightning

arresters to be connected to the spare bushings provided with the loop feed type transformer

.11 Load break inserts for elbow connectors.

.12 Stays to hold compartment doors in 110 degrees open position.

.13 Barrier shall be provided between secondary voltage and primary voltage compartment.

2.2 TRANSFORMER CHARACTERISTICS

.1 Primary voltage: 7.2/12.5 kV, 60 Hz, delta connected, three phase, neutral and grounded.

.2 Secondary voltage: voltage as indicated on drawing, wye connected, three phase, four wire, neutral grounded.

.3 Capacity: kVA rating as indicated on drawing.

.4 Copper winding.

.5 Type: ONAN.

.6 Temperature Rise: 65 degree C.

.7 Basic impulse level: 95 kV.

.8 Impedance: 4%.

.9 No load losses: standard.

.10 Full load losses: standard.

.11 Average sound level: 55dB.

2.3 VOLTAGE TAPS

.1 Four-2.5% taps, 2-FCAN, 2-FCBN.

2.4 TAP CHANGER

.1 Externally operated off-load tap changer, with provision for padlocking on 3 phase units.

2.5 ACCESSORIES

.1 Liquid temperature thermometer with two sets of contacts.

.2 Liquid level gauge with two sets of contacts.

.3 Pressure relief device.

.4 Internal current limiting primary fuse

.5 Secondary circuit breaker as per drawings.

.6 25 mm drain valve.

.7 25 mm filler plug.

.8 Voltage selector switch.

2.6 GROUNDING

.1 Copper grounding bus.

.2 Connectors for grounding conductor size 4/0 or as indicated.

2.7 FINISH

.1 Two coats of enamel over one coat of rust resistant primer. Finish exterior of unit in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.8 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Nameplate information label to match existing Institution standard.

2.9 WARNING SIGNS

.1 Provide warning signs in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.10 SOURCE QUALITY CONTROL

.1 Submit to Consultant standard factory test certificates of each transformer and type test of each transformer with high voltage accessories in accordance with CSA-C227.4.

2.11 ACCEPTABLE MANUFACTURERS

.1 Carte International, Pioneer, Cam Tran, Cooper Power.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

.2 Transformer to be filled with insulating oil by manufacturer prior to shipment.

3.2 INSPECTION

.1 Check factory made connections of transformer unit for mechanical security and electrical continuity.

.2 Check transformer insulating liquid for correct quantity and specification according to manufacturer's instructions.

.3 Check for leakage of insulating liquid.

3.3 INSTALLATION

.1 Provide a structural engineer (registered in APEGBC) to design a pre-cast reinforced concrete pad or cast-in-place reinforced concrete pad, with seismic restraint anchoring. Size the concrete pad to suit transformer shop drawings for physical footprint and cable entries. Submit detailed shop drawings (signed and sealed by a Professional Engineer registered in the Province of British Columbia) for review.

.2 Set and secure transformer unit in place, rigid, plumb and square. Bolt down transformer in accordance with manufacturer's shop drawings.

.3 Make connections.

.4 Connect transformer unit ground bus to system ground.

.5 When field filling of transformer is necessary, the filling shall be done by transformer manufacturer's representative.

.6 Set taps to produce the rated secondary voltage at no load.

.7 Wire one set of contacts on liquid temperature thermometer, liquid level gauge, to sound alarm when unsafe condition reached, wire second set of contacts to trip transformer circuit interrupter.

.8 Ensure care is taken to prevent contamination of liquid and components when field filling transformer.

.9 Use only metal hose when field-filling transformer with oil: do not use rubber hose.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Contractor to include and allow for equipment manufacturer or separate independent testing company to perform on site testing of units and equipments.

.3 Carry out following insulation tests using megger with 20,000 megohm scale and resulting insulation resistance corrected to base of 20 degrees C.

.1 High voltage to ground with secondary grounded for duration of test.

.2 Low voltage to ground with primary grounded for duration of test.

.3 High to low voltage.

.4 Inspect primary and secondary connections for tightness and for signs of overheating.

.5 Inspect and clean bushings and insulators.

.6 Check oil level and temperature indicators.

.7 Set transformer taps to rated voltage as specified.

.8 Inspect for oil leaks and excessive rusting.

.9 Inspect oil level.

.10 Check fuses for correctness of type and size.

.11 Check circuit breakers for size and settings.

.12 Check for grounding and neutral continuity between primary and secondary circuits of transformer.

.13 Record phase and neutral voltages and currents under normal load.

.14 Record tap setting and adjust as directed. Record phase voltage and current with new tap setting.

.15 Record circuit breaker settings.

.16 Failed transformer is to be replaced at no cost and shall be expedite for delivery as soon as possible. Implement temporary solution at no cost.

.17 Obtain inspection certificate of compliance covering field quality control mentioned above from inspection authority and include it with as-built drawings and maintenance manuals.

3.5 CLEANING

.1 Proceed in accordance with Section 01 01 50 – General Instructions.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 09 02.b – Metering and Switchboard Instruments

.2 Section 26 28 21 – Moulded Case Circuit Breakers

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.2 No.31-04, Switchgear Assemblies

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC G8-3.3, Metal-Enclosed Interrupter Switchgear Assemblies

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for switchboards and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit maintenance materials in accordance with Section 01 01 50 – General Instructions.

.2 Provide spare parts as recommended by manufacturer for maintenance period of 2 years minimum.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect switchboards from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Rating: 120/208V, 3 phase, 4 wire, amperage as indicated, 65kA short circuit current (rms symmetrical) or as indicated; 347/600V, 3 phase, 4 wire, amperage as indicated, 25kA short circuit current (rms symmetrical) or as indicated.

.2 Cubicles: free-standing, dead front, size as indicated.

.3 Distribution section.

.4 Hinged access panels with captive knurled thumb screws.

.5 Bus bars and main connections: 99.3% tinned copper.

.6 Identify phases with colour coding.

.7 Complete with drip shields.

2.2 ENCLOSURE

.1 Main incoming section to contain:

.1 Top or side/rear entry pull boxes, sized as required, to permit feeder drip loop

.2 Distribution sections to contain:

.1 Moulded case circuit breakers sized as indicated

.2 Tinned copper bus, from main section to distribution sections including vertical bussing.

.3 Blanked off spaces for future units.

.4 Metal enclosed, free standing, floor mounted, dead front, indoor, CSA enclosure 1 cubicle unit with sprinkler shield.

.5 Ventilating louvres: vermin, inspect proof with easily replaceable fibreglass filters.

.6 Access from front.

.7 Steel channel sills for base mounting in single length common to multi-cubicle switchboard.

.8 Provision for future extension as indicated on drawing.

2.3 BUS BARS

.1 Three phase and full capacity neutral, bare busbars, continuous current rating as indicated on drawing. A self-cooled, extending full width of multi-cubicle switchboard, suitably supported on insulators.

.2 Main connections between bus and major switching components to have continuous current rating to match major switching components.

.3 Busbars and main connections: 99.30% conductivity.

.4 Provision for extension of bus without need for further drilling or preparation in field.

.5 Tin plated joints, secured with non-corrosive bolts and Belleville washers.

.6 Identify phases of busbars by suitable marking.

.7 Busbar connectors, when switchboard shipped in more than one Section.

2.4 GROUNDING

.1 Copper ground bus not smaller than 50 x 6 mm extending full width of multi-cubicle switchboard and situated at bottom.

.2 Lugs at each end for size 4/0 AWG grounding cable.

2.5 MOULDED CASE CIRCUIT BREAKERS

.1 Refer to Section 26 28 21 – Molded Case Circuit Breakers

2.6 INSTRUMENTS

.1 Instruments and digital information meter in accordance with Section 26 09 02b – Metering and Switchboard Instruments

2.7 FINISHES

.1 Apply finishes in accordance with Section 26 05 00 – Common Work Results for Electrical

.1 Cubicle exteriors: grey

2.8 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Locate switchgear assembly as indicated and bolt to floor.

.2 Connect main secondary power supply to main breaker, or as indicated on drawing.

.3 Connect load side of breakers in distribution cubicles to distribution feeders.

.4 Check factory made connections for mechanical security and electrical continuity.

.5 Run one grounding conductor 4/0 AWG bare copper in 25 mm conduit from ground bus to ground.

.6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Include all associated costs to have manufacturer's representative visit the site for 8 hours to aid in commissioning equipment. Forward all commissioning documentation to the Consultant for review.

.3 Coordinate field control performance and testing with designated commission agent.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for moulded-case circuit breakers, circuit breakers, ground-fault circuit-interrupters, and accessory high-fault protectors.

.2 Addition of new breakers in the existing panelboard shall be of the same type as the existing installation.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.2 NO. 5-13 - Moulded-case circuit breakers, moulded-case switches and circuit-breaker enclosures.

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 01 50 – General Instructions.

.2 Include time-current characteristic curves for breakers with ampacity of 225A and over or with interrupting capacity of 20,000 A symmetrical (rms) and over at system voltage.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

1.5 QUALITY CONTROL

.1 General:

.1 Contractor to be responsible for quality control of the products and installation in this section.

.2 Quality Control Program Submittals:

.1 Quality Control Check Sheet

.3 Quality Control Check Sheet:

.1 Prepare and maintain Quality Control Check Sheets.

.2 Check sheet to be kept on site and be made available for review by the Departmental Representative at any time.

.3 Check sheets to be filled in and submitted for review, prior to substantial completion.

.4 Check sheets for each moulded case circuit breaker to include the following information:

.1 Moulded case circuit breaker specifications and installation details

.2 Itemize a check list for the following:

□

.1 Rating of each breaker including voltage, amp, interrupting capacity

.2 Proper connections.

.3 Label and identification

.4 Check for correct and proper calibration in accordance with coordination study.

.5 Information reflected into the as built drawings.

.3 For each tabulated item, state the following:

.1 Does the item comply with the specification? Yes/No/Not Applicable.

.4 Identify any areas of non compliance and the proposed action to make it complaint.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, circuit breakers, ground-fault circuit-interrupters, and accessory high-fault protectors: to CSA-C22.2 No.5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Circuit breakers to have minimum 14,000 A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 SOLID STATE TRIP BREAKERS

.1 Moulded case circuit breaker LSIG to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current

trip under overload condition, and long time, short time, instantaneous tripping for phase and ground fault short circuit protection.

2.4 NEW CIRCUIT BREAKER IN EXISTING PANELBOARD

.1 To be compatible and to match the existing installation.

2.5 OPTIONAL FEATURES

.1 Include:

.1 Shunt trip.
.2 Auxiliary switch.
.3 On-off locking device.
.4 Handle mechanism.

Part 3 Execution

3.1 INSTALLATION

.1 Circuit breakers installed in the existing panelboard shall be of the same type for compatibility.

.2 Install circuit breakers as indicated.

.3 Calibrate and set breakers in accordance with coordination study report.

END OF SECTION

□

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 26 05 73 – Coordination Study & Arc Flash Analysis

.3 Section 26 08 00 – Electrical Equipment Acceptance Testing and Startup

1.2 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C37.20.2 – Standard for Metal-Clad Switchgear

.2 ANSI/IEEE C37.04 – Standard Rating Structure for AC High-Voltage Circuit Breakers

.3 ANSI/IEEE C37.06 – Standard for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis – Preferred Ratings an Related Required Capabilities for Voltages Above 1000V

.4 ANSI/IEEE C37.11 – Standard Requirements for electrical control for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis or a total current basis

.5 ANSI/IEEE C37.09 – Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

.6 ANSI/IEEE C57.13 – Standard Requirements for Instrument Transformers

.2 CSA International

.1 CSA C22.2 No.5-09, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).

.2 CSA C22.2 No.178.1-2007, Automatic Transfer Switches.

.3 CAN/CSA C60044-1-07, Instrument Transformers.

.4 IEEE C37.100.1 – Standard of Common Requirements for High Voltage Power Switchgear Rated Above 1000 V

.3 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 2-1996(R2009), Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

.2 NEMA SG4 – Alternating Current High Voltage Circuit Breakers

.3 NEMA SG5 – Power Switchgear Assemblies

.4 Underwriters' Laboratories (UL)

.1 UL 1008A – Standard for Medium Voltage Transfer Switches, 1st Edition, for transfer switches rated greater than 750 volts up to 46 kV

.2 UL 1062-97, Unit Substations

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 01 50 – General Instructions.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for transfer switches and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.2 Indicate:

.1 Make, model, and type.

.2 Description of equipment operation including:

.1 Automatic starting and transfer to standby unit and back to normal power.

.2 Test control.

.3 Manual control.

.4 Automatic shutdown.

.3 Single line diagram showing controls and relays.

.4 Equipment layout.

.5 Equipment dimensions including door openings, draw-out equipment positions and workspace requirements.

.6 Dimensioned foundation template.

.7 Dimensioned cable entrance and exit locations.

.8 Dimensioned cable termination heights.

.9 Details of entry plate.

.3 Submit preliminary coordination study with shop drawings.

.1 Study to show coordinated curves for the protective devices from the utility fuse cutouts or recloser, to the secondary breakers.

.2 Study to show protective devices and transformer damage curves are properly coordinated.

.3 Recommend fuse sizes breaker settings and main secondary breaker setting.

.4 Shop drawings will not be accepted or reviewed without this co-ordination study.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 01 50 – General Instructions.

.2 Operation and Maintenance Data: submit operation and maintenance data for transfer switches for incorporation into manual.

.3 Detailed instructions to permit effective operation, maintenance and repair.

.4 Technical data:

.1 Schematic diagram of components, controls and relays.

.2 Illustrated parts lists with parts catalogue numbers.

.3 Certified copy of factory test results.

.5 Commissioning agent's commissioning report

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Automatic load transfer equipment to:

.1 Monitor voltage on phases of normal power supply.

.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below preset adjustable limits for adjustable period of time.

.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.

.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.

.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

.2 Furnish and install closed transition transfer switches (CTTS) with number of poles, amperage, voltage, withstand and close-on ratings as shown on the plans to the satisfaction of BC Hydro. Each CTTS shall consist of high voltage (15 kV) metal-clad switchgear with vacuum circuit breakers and a microprocessor based controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

.3 The CTTS shall transfer the load without interruption (closed transition) by momentarily connecting both sources of power only when both sources are present and acceptable. The maximum interconnection time is 100 milliseconds. The CTTS shall operate as a conventional break-before-make (open transition) switch when the power source serving the load fails.

.4 The switchgear shall be NEMA3R rated and designed for installation on a level concrete pad at grade.

.5 The integrated switchgear assembly shall withstand the effects of closing, carrying and interrupting currents up to the assigned maximum short circuit rating.

.6 The switchgear shall be one of two types noted below:

.1 Freestanding metal-clad switchgear type

.2 Oil-immersed distribution type

2.2 MATERIALS

.1 Instrument transformers: to CAN/CSA C60044-1.

.2 Contactors: to NEMA ICS2.

2.3 TRANSFER EQUIPMENT OF THE FREESTANDING METAL-CLAD SWITCHGEAR TYPE

.1 Construction

.1 Stationary Structure

.1 The switchgear shall comprise a minimum of two sections including one breaker compartment and one auxiliary compartment with potential assemblies for Normal and Standby sources assembled to form a rigid self-supporting completely enclosed structures providing steel barriers between sections.

.2 The first section is divided by metal barriers into the following compartments: Circuit breaker, main bus and cable. The section may have up to two circuit breaker compartments for a 1200 ampere rating

.3 The second section is divided by metal barriers into the following compartments: Two sets of potential transformer assembly, load bus and cable.

.2 Circuit Breaker Compartment

.1 Each circuit breaker compartment shall be designed to house a horizontal drawout metal-clad vacuum circuit breaker. The stationary primary disconnecting contacts are to be silver-plated copper and mounted within glass polyester support bushings. The movable contacts and springs shall be mounted on the circuit breaker element for ease of inspection/maintenance.

.2 Entrance to the stationary primary disconnecting contacts shall be automatically covered by metal shutters when the circuit breaker is withdrawn from the connected position to the test or disconnected position or removed from the circuit breaker compartment. Extend a ground bus into the circuit breaker compartment to automatically ground the breaker frame with high-current spring type grounding contacts located on the breaker chassis when in the test and connected positions. Guide rails for positioning the circuit breaker and all other necessary hardware are to be an integral part of the circuit breaker compartment. Blocking devices shall interlock breaker frame sizes to prevent installation of a lower ampere rating or interrupting capacity element into a compartment designed for one of a higher rating. It shall be possible with indoor switchgear to install a circuit breaker into a bottom compartment without use of a transport truck or lift device.

.3 Ground Bus

.1 A ¼ inch x 2 inch copper ground bus shall extend through the entire length of the transfer switch.

.4 Main Bus Compartment

.1 The main bus is to be rated 1200 amps and be fully insulated for its entire length with an epoxy coating by the fluidized bed process. The conductors are to be silver-plated copper and be of a bolted, not welded, design. Access to this compartment is gained from the front or rear of the structure by removing a steel barrier. Provide standard provisions for future extension, as applicable.

.5 Doors and Panels

.1 Relays, control switches, etc., shall be mounted on a formed front-hinged panel for each circuit breaker compartment. Front doors shall include features to facilitate quick and complete removal or reinstallation of entire front door assembly. Door hinges shall have removable pins. Where allowable, all control circuits (except, for example, current transformers and grounding) shall be wired via plugs/receptacles prior to termination.

.6 Circuit Breakers

.1 The circuit breakers shall be rated 12.5kV nominal volts, 15000 maximum volts, 60 Hz, with a continuous current rating of 600 amps and a maximum symmetrical interrupting rating of 25kA/500MVA - 15 kV system. Furnish vacuum circuit breakers with one vacuum interrupter per phase. Breakers of same type and rating shall be completely interchangeable. The circuit breaker shall be operated by means of a stored energy mechanism which is normally charged by a universal motor but can also be charged by the manual handle supplied on each breaker for manual emergency closing or testing. The closing speed of the moving contacts is to be independent of both the control voltage and the operator. Provide a full front shield on the breaker. Secondary control circuits shall be connected automatically with a self-aligning, self-engaging plug and receptacle arrangement when the circuit breaker is racked into the connected position. Provision shall be made for secondary control plug to be manually connected in test position. A minimum of 4 auxiliary contacts, shall be provided for external use. 6 additional cell-mounted auxiliary contacts MOC type for external use shall be provided. The racking mechanism to move the breaker between positions shall be operable with the front door closed and position indication shall be visible with door closed.

.2 An interlocking system shall be provided to prevent racking a closed circuit breaker to or from any position. An additional interlock shall automatically discharge the stored-energy operating mechanism springs upon removal of the breaker out of the compartment.

.3 The circuit breaker control voltage shall be: 250 volts DC, 120 volts ac -one capacitor trip unit provided for each circuit breaker with ac control power.

2.4 TRANSFER EQUIPMENT OF THE OIL-IMMERSED DISTRIBUTION TYPE

.1 Construction

.1 The underground distribution switchgear shall consist of a 2-sided, sealed tank, and with separate front and rear cable compartments. Overall height, width, depth and layout shall conform to the manufacturer's standard construction practices for the configuration, ratings, and voltage class specified. Standard construction shall be of mild steel with stainless steel hardware.

.2 Provide tamperproof bolted tank cover design c/w rubber gaskets.

.3 The main cable compartments shall house source bushings, source switches and transfer control. The tap compartment shall house tap bushings. Recessed lifting provisions for suitable balanced lift shall be provided on the tank ends.

.4 Side-hinged doors shall have a door stay to manually latch the door in the open position at approximately 120° from the closed position. Provide pentahead bolts, with provisions for padlocking on each set of doors.

.5 Units shall be shipped complete with the specified liquid insulation, and relay installed.

.1 The unit shall be equipped with a 1-inch oil-fill plug and a 1-inch drain plug with 3/8" sampler

.6 Provide a single automatic pressure relief valve that is hotstick-operable and sight gauges to monitor the dielectric level located on each unit side equipped with an operating handle.

.7 A non-corrosive operating diagram (one-line schematic of the unit) shall be affixed to the inside of the right hand, first opening door, on both sides of the unit, if two (2) sided. A single nameplate shall be provided that is mounted on the source side tank front plate in the upper right hand corner. The nameplate shall contain the following information:

.1 Catalog Number/Model Number

.2 Serial Number

.3 Nominal voltage class, kV

.4 Rated maximum voltage, kV

.5 BIL, kV

.6 Manufacturing Date: MM/YYYY

.7 Rated continuous current, A

.8 Rated load interrupting rating, A

.9 Momentary current rating, kA asym.

.10 Close & latch rating, kA asym.

.11 Total weight, lbs.

.12 Liquid dielectric volume (gallons)

.8 Bushings shall be deadfront type for use with separable connectors conforming to IEEE Std 386™-2006 standard and ANSI Standard C119.2. The source ways shall have a continuous current rating of 600 ampere with bushings.

.2 Vacuum Fault Interrupters

.1 The switchgear shall incorporate two vacuum fault interrupters (VFI) for tap overcurrent protection. The device shall interrupt all fault currents up to the rated maximum. The VFI shall be manually resettable, with no consumable parts (i.e. fuses). The maximum interrupting time from issuance of a trip signal from the electronic control shall be 2 cycles.

.2 To provide maximum safety to the operator, the VFI shall incorporate a trip-free mechanism to prevent the possibility of holding the interrupter closed under a faulted condition.

.3 The VFI shall act as a three-phase gang operated fault interrupter. The handle shall be designed for operation with a lineman's hotstick and have a push to close / pull to open / pull to reset operation requiring no more than 75 lbs. of force at the handle and 60 degrees of movement for complete operation. When the vacuum fault interrupter is tripped the operating handle shall drop to an

intermediate position between its closed and open positions, to indicate that it is tripped. The operating handle assembly shall include provisions to padlock the handle in the Open position.

2.5 CONTROLS

.1 The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.

.2 The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator's manuals.

.3 All customer connections shall be wired to a common terminal block to simplify field-wiring connections.

.4 Transfer parameters – any combination shall be selectable. The source shall be determined to be unhealthy if any of the enabled parameters are met. Each parameter shall have a programmable time delay.

.1 Two levels of undervoltage: 27-1 & 27-2

.2 One level of positive sequence undervoltage: 27P

.3 Two levels of underfrequency: 81U1 & 81U2

.4 Two levels of overfrequency: 81O1 & 81O2

.5 Restoration parameters– any combination shall be selectable. The source shall be determined to be healthy if all enabled parameters are met. Each parameter shall have a programmable time delay.

.1 One level of minimum phase-ground voltage: 59

.2 One level of minimum positive sequence voltage: 59P

.3 One level of minimum source frequency: 81U

.4 One level of maximum source frequency: 81O

.6 User selectable and programmable Sync Check Settings

.7 Sync check shall be active if parallel restoration is selected. The sync check algorithm will compare positive sequence voltage magnitude, angle, frequency, and slip to determine synchronism.

.1 Provide synchronism-check relay (25) and directional power relay (32) for sync check process

.2 The following settings shall be available to provide user programmable tolerances.

.1 Maximum delta voltage angle

.2 Maximum delta voltage magnitude

.3 Minimum time for phasors to meet Maximum delta voltage angle and Maximum delta voltage angle

.4 Delta frequency limit

.5 Mechanism closing delay

.6 Sync. close attempt window which shall be the maximum time in which the iST will attempt a synchronous close. Failure to sync within this time will assert a fail to sync signal.

.7 An option to allow non-parallel restoration shall be provided if a Failure to Sync occurs during a parallel restoration. The time window to attempt a synchronous close shall be adjustable from 10 to 300 seconds.

.8 The generator source switch will close after the generator meets all of the enabled Source Restoration parameter settings. One or more of the following elements shall be programmable:

.1 Minimum Phase-ground voltage

.2 Minimum positive sequence voltage

.3 Minimum frequency

.4 Maximum frequency

.9 Restoration from the generator back to the preferred source shall be made after the preferred source meets all of the enabled Source Restoration parameters. The user shall have the option for restoration to be parallel with sync check or non-parallel.

.1 Non- Parallel restoration sequence: After the preferred source is "healthy", the generator switch opens, then the preferred source switch closes after a customer programmable time delay.

.2 Parallel restoration sequence: The preferred source switch will close when it is in sync with the generator, then the generator source switch will open.

.10 The generator power down contact will close after the user defined generator standby timer expires

.11 Selector switch – 4-position "Test", "Auto", "Manual", "Engine start".

.1 Test position - normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.

.2 Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.

.3 Manual position - transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start.

.4 Engine start position - engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.12 Control transformers: dry type with 120 V secondary to isolate control circuits from:

.1 Normal power supply.

.2 Stand-by power supply.

.13 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A minimum:

.1 Voltage sensing: 3 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.

.2 Time delay: normal power to standby, adjustable solid state, 5 to 180 s.

.3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 3 to 20 s delay.

.4 Time delay on retransfer from standby to normal power, adjustable 0 to 60 s.

.5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 20 s intervals to 10 minutes.

.6 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5 s intervals to 180 s.

.7 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.

.8 Neutral position delay: allow time for motors to delay between live sources, adjustable, 0 to 5 s.

.9 Protective relay functions as required by BC Hydro for closed-transition transfer as noted on the Drawings.

.14 Solid state electronic in-phase monitor.

.15 Overcurrent protection and metering shall be provided for the loads

.16 The relay shall be provided with tap overcurrent protection which is user programmable and shall include:

.1 Individual Settings for phase and ground overcurrent and fault protection

.2 Provide user selectable TCC curves to satisfy the requirements of BC Hydro's closed transition transfer protocol

.17

2.6 ACCESSORIES

.1 Ensure pilot lights indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.

.2 Plant exerciser: 168 hours timer to start standby unit once each week for selected interval but does not transfer load from normal supply. Timer adjustable 0-168 hours in 15 minute intervals.

.3 Auxiliary relay to provide minimum 3 N.O. and 3 N.C. contacts for remote alarms.

.4 Instruments:

.1 Digital true RMS, indicating type 2 % accuracy, flush panel mounting:

.1 Voltmeter: ac, scale 0 to 25kV.

.2 Ammeter: ac, scale 0 to 600A.

.3 Frequency meter: scale 55 to 65 Hz.

.5 Voltmeter selector switch: rotary, maintained contacts, panel mounting type, round notched handle, four position, labelled "OFF-Phase A-Phase B-Phase C".

.6 Potential transformers - type for outdoor use:

.1 Ratio: 14,400 to 120.

.2 Rating: 15kV, 60Hz, BIL 95kV.

.7 Ammeter selector switch: rotary, maintained contacts, panel mounting type, designed to prevent opening of current circuits, round notched handle, four position labelled "OFF - Phase A - Phase B - Phase C".

.8 Current transformers - type for outdoor use:

.1 Rating: 15kV, 60Hz, BIL 95kV.

.2 Positive action automatic short- circuiting device in secondary terminals.

.9 Manual bypass and isolator: to both supplies.

.10 Submit one racking handle per high voltage CTTS line-up as applicable. Charging handle to be furnished on each breaker mechanism.

.11 Provide one circuit breaker lifting device.

2.7 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Control panel:

.1 For selector switch and manual switch: size 4 nameplates.

.2 For meters, indicating lights, minor controls: use size 2 nameplates.

2.8 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Departmental Representative.

.2 Notify Departmental Representative 5 days minimum in advance of date of factory test.

.3 Tests:

.1 Operate equipment both mechanically and electrically to ensure proper performance.

.2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.

.3 Check voltage sensing and time delay relay settings.

.4 Check:

.1 Automatic starting and transfer of load on failure of normal power.

.2 Retransfer of load when normal power supply resumed.

.3 Automatic shutdown.

.4 In-phase monitor operation.

Part 3 Execution

3.1 INSTALLATION

.1 Locate, install and connect transfer equipment.

.2 Check relays and solid state monitors and adjust as required to ensure correct operation.

.3 Install and connect auxiliary 120Vac power supply and remote alarms.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

.4 Set selector switch in "Manual" position and check to ensure proper performance.

.5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.6 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

.7 Repeat, at 1 hour intervals, 2 times, complete test with selector switch in each position, for each test.

.8 Allow for minimum of 2 training sessions to be carried out on consecutive days to accommodate separate groups. Manufacturer's technical field representatives shall perform this function.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 01 50 – General Instructions.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 01 50 – General Instructions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for primary lighting arresters.

1.2 RELATED SECTIONS

.1 Section 26 12 19 – Pad Mounted, Liquid Filled, Medium Voltage Transformers

1.3 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE C62.36-2000, Standard Test Methods for Surge Protectors Used in Low Voltage Data Communications and Signaling Circuits, Standard Test Methods.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-C233.1-87(R1999), Gapless Metal Oxide Surge Arresters for Alternating Current Systems.

1.4 PRODUCT DATA

.1 Submit product data in accordance with Section 01 01 50 – General Instructions.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material, in appropriate on-site bins, for recycling.

Part 2 Products

2.1 MATERIALS

.1 Arrester component parts: to CAN/CSA-C233.1 and ANSI/IEEE-C62.36.

.2 Three 10.2kV MCOV lightning arrestors to be Elbow style: for installation at Transformer to Section 26 12 19 – Pad Mounted, Liquid Filled, Medium Voltage Transformer. The lightning arresters to be connected to the spare bushings provided with the loop feed type transformer

.3 Arrester characteristics:

.1 Distribution class arrester.

.2 System highest voltage line to line: 12.47 kV, 4 wire grounded neutral.

.3 MCOB (maximum continuous operating voltage): 12.47 kV.

.4 Outdoor type.

.5 Housing: polymer.

Part 3 Execution

3.1 INSTALLATION

.1 Mount arresters as close to transformer as possible.

.2 Connect line terminals to phase conductors.

.3 From arrester ground terminal run No.#4/0 AWG copper ground wire down to ground rod.

.4 From arrester ground terminal run shortest possible #4/0 AWG conductor to secondary neutral of transformer.

.5 Mount arresters adjacent to primary pad mounted transformers and connect line terminals to phase conductors. Connect ground terminals to ground electrode.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 31 23 33.01 – Excavation, Trenching and Backfilling

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 ACTION AND INFORMATION SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittals.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples

.1 Allow continual sampling by Departmental Representative during production.

.2 Provide Departmental Representative with access to source and processed material for sampling.

.3 Supply new or clean sample bags or containers as appropriate for aggregate materials.

.4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

.5 Submit test results for granular gradation in accordance with Section 01 01 50 – General Instructions.

.6 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Departmental Representative.

.7 Wash aggregates, if required, to meet specifications. Use only equipment approved by Departmental Representative.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 01 50 – General Instructions and with manufacturer's written instructions.

.2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

.3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 Products

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or of recycled materials which on this project is not permitted.

.2 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances. Recycled materials are not permitted.

.3 Flat and elongated particles of coarse aggregate: to ASTM D4791.

.1 Greatest dimension to exceed 5 times least dimension.

.4 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.5 Coarse aggregates satisfying requirements of Section 31 23 33.01- Excavation Trenching and Backfilling to be one of or blend of following:

.1 Crushed rock.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

2.2 SOURCE QUALITY CONTROL

.1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.

.2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with topsoil stripping only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Topsoil stripping:

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
- .2 Begin topsoil stripping of areas after area has been cleared of brush, weeds, grasses and removed from site.
- .3 Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
- .5 Dispose of topsoil off site as directed by Departmental Representative.

.2 Stockpiling:

- .1 Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Maximum 1.5 m for coarse aggregate and base course materials.
  - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
  - .3 Maximum 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 01 50 – General Instructions.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 01 50 – General Instructions.

.3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

.5 Waste Management: separate waste materials for recycling in accordance with Section 01 01 50 – General Instructions.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

.7 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 General requirements for excavating and backfilling procedures for installation of underground duct, ductbanks and manholes.

1.2 RELATED SECTIONS

.1 Section 31 05 16 – Aggregate Materials

.2 Section 33 65 73 – Concrete Encased Ductbanks and Manholes

1.3 REFERENCES

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

.1 ASTM C117- 04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136- 06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422- 63 (2007), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m ;).

.5 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-08, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 Worksafe B.C. Health and Safety Act

.5 Canadian Council of the Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines

.6 BC Ministry of Environment (BC MoE), pursuant to the *Environmental Management Act* (EMA, SBC 2003 Chapter 53, current to June 22, 2011).

.1 The Contaminated Site Regulation (CSR, BC Reg. 375/96, O.C. 1480/96 and M271/2004, including amendments up to BC Reg. 97/2011, May 31, 2011).

.2 Hazardous Waste Regulation (HWR, BC Reg.63/88, O.C. 268/88, including amendments up to BC Reg. 63/2009, April 1, 2009), which includes standards for total concentrations of select substances as well as leachate quality standards.

.3 Standards Triggering Contaminated Soil Relocation Agreements (CSRA, Schedule 7).

.7 Transportation of Dangerous Goods Regulations.

1.4 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock: any sound or solid mass material in excess of 0.5 cubic metres, of such hardness and texture that it cannot be effectively loosened or broken down by mechanical ripping equipment with a minimum drawbar pull of 360 kN and/or by means of heavy duty excavation equipment. Frozen material is not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

.1 Weak, chemically contaminated, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index higher than 10 when tested to ASTM D4318, and classified as CL, CH, CL-ML, ML, and SM with material fine than 0.02 mm exceeding 15%.

.2 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

.9 Classification of soils:

.1 Native Soils (Clayey silt and clay) classified as "Not Exceeding CSR Schedule 7, Column 2 Standards": Soil with concentrations of substances less than Contaminated Sites Regulation (CSR) Schedule 7, Column 2 standards or any other standard in the CSR.

.2 Soil classified as "Waste": Soil containing concentrations of substances greater than CSR Schedule 7, Column 2 standards or any other standard in the CSR, but not classified as "Hazardous Waste" under the Hazardous Waste Regulation (HWR). Soil must be disposed of at a permitted waste facility.

.3 Soil classified as "Hazardous Waste": Soil contains substance concentrations that would cause it to be classified as Hazardous Waste under the HWR. Soil must be disposed of at a permitted hazardous waste facility.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Submit design and supporting data at least 2 weeks prior to beginning Work.

.3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.

.4 Keep design and supporting data on site.

.5 Engage services of qualified professional engineer who is registered or licensed in Province of British Columbia, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.6 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling and for disposal.

.2 Divert excess aggregate materials from landfill to local quarry, recycling facility for reuse.

1.7 EXISTING CONDITIONS

.1 Examine topographic survey and existing conditions information included with Contract Documents.

.2 Buried services:

.1 Before commencing work verify and establish location of buried services on and adjacent to 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 structure: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to beginning excavation Work, notify the Departmental Representative and authorities having jurisdiction and establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.

.6 Confirm locations of buried utilities by careful test excavations, ground penetrating radar scans, soil hydrovac methods or other approved method.

.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.8 Where utility lines or structures exist in area of excavation, obtain direction of the Departmental Representative before removing and/or re-routing.

.9 Record location of maintained, re-routed and abandoned underground lines.

.3 Existing buildings and surface features:

.1 Conduct, with the Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by the Departmental Representative.

.3 Where required for excavation, cut roots or branches as directed by the Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Type 1 (bedding and pipe cushion), Type 2 (Granular Sub-base), Type 3 (select subgrade material) and Type 4 (Granular Base) fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.

.3 Table:

Sieve Designation	% Passing			
	Type 1	Type 2	Type 3	Type 4
75 mm	-	100	100	-
50 mm	-	-	70-100	-
37.5 mm	-	60-100	-	-
25 mm	100	-	50-100	-
19 mm	90-100	35-80	-	100
12.5 mm	65-85	-	-	75-100

Sieve Designation	% Passing			
	Type 1	Type 2	Type 3	Type 4
9.5 mm	50-75	26-60	-	60-90
4.75 mm	25-50	20-40	22-100	40-70
2.36 mm	10-35	15-30	10-85	27-55
1.18 mm	6-26	10-20	-	16-42
0.600 mm	3-17	5-15	-	8-30
0.300 mm	-	-	-	5-20
0.075 mm	0-5	0-5	2-8	2-8

.2 Type 2 Fill (Granular Sub-base): Properties as follows:

.1 Los Angeles degradation: to ASTM C 131. Max % Loss by mass: 40.

.2 Particles smaller than 0.02 mm: to ASTM D 422, Maximum 3%.

.3 Soaked CBR: to ASTM D 1883, Min 40 when compacted to 95% of ASTM D 698.

.3 Type 3 Fill (Select Subgrade Material): well-graded granular material, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials meeting the requirements in the above table.

.1 Recovered rock from the work by blasting, trenching or other approved method may be used if crushed and graded to meet requirements of Type 3.

.4 Type 4 Fill (Granular Base): Properties as follows:

.1 Los Angeles degradation: to ASTM C 131. Max. % loss by weight: 45.

.5 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least one freshly fractured face. Material to be divided into ranges using methods of ASTM C 136.

.6 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.5MPa at 28 days.

.2 Maximum cement content of 25 kg/m; with 40% by volume fly ash replacement

.3 Minimum strength of 0.07 MPa at 24 h.

.4 Concrete aggregates: to CSA A23.1/A23.2.

.5 Cement: Type 10 Portland Cement.

.6 Slump: 160 to 200mm.

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 PREPARATION/PROTECTION

.1 Protect existing features in accordance with the applicable local regulations.

.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 the 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, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.3 SOILS CLASSIFIED AS "WASTE"

.1 All Soils at site are classified as "Waste" unless excavation reveals hazardous waste (HW) soils. Obtain directions from the Departmental Representative for testing and disposal of hazardous waste (HW) soils.

.2 Include the following in the Environmental Protection Plan:

.1 How excavation, handling, and disposal of the soils will be carried. Include location of disposal facility.

.3 Set up environmental and engineering controls as specified and required as per applicable regulations.

.4 Remove top soil, existing fill material if any and excavate the areas.

.5 Handle, load and transport "waste" soils as per the applicable federal, provincial and municipal regulations.

.6 Dispose as follows.

.1 "Waste": Dispose of at a permitted waste facility.

.7 Backfill excavated areas as specified and indicated.

3.4 STRIPPING OF TOPSOIL

.1 Strip topsoil where required.

.2 Strip topsoil to existing fill materials and native soil.

.1 Do not mix topsoil with existing fill or native soil.

.3 Stockpile on site within the Limit of Construction of each stage of work.

.1 Stockpile height not to exceed 2 m and should be protected from erosion.

.4 Dispose of unused topsoil off site.

3.5 STOCKPILING

.1 Stockpile fill materials on site within the Limit of Construction.

.1 Stockpile granular materials in manner to prevent segregation. Maximum stockpile height is 2.5 metres.

.2 Protect fill materials from contamination.

.3 Protect fill materials from wet weather conditions, precipitation, and excessive moisture.

.4 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Engage services of qualified professional engineer who is registered or licensed in the Province of British Columbia, Canada to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.2 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance Health and Safety Act for the Province of British Columbia, Canada.

.3 Construct temporary Works to depths, heights and locations as required under the directions of qualified professional engineer responsible for such temporary Works.

.4 During backfill operation:

.1 Unless otherwise indicated or directed by the Departmental Representative, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.3 Protect open excavations against flooding and damage due to surface run-off.

.4 Dispose of water to approved collection areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.8 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 The existing utilities information (type, location, size, elevations) provided on the existing condition drawings included in the contract documents has not been verified. In order to address this issue the following procedure will be followed:

.1 Excavate and expose all utilities within the excavation limits as indicated. Determine the extent of excavation based on site safety requirements, construction methods and schedule.

.2 Prior to carrying out further work in the excavation, jointly with the Departmental Representative inspect the excavation and identify known and unknown exposed utilities. Based upon the results of the inspection, the Departmental Representative will issue appropriate instructions. Comply with instructions and proceed with the work.

.3 For all connections of new utilities to existing utilities, expose the connection points to existing utilities for verification by the Departmental Representative. Based on the results of the verification, the Departmental Representative will issue appropriate instructions. Comply with the instructions.

.3 Excavation must not cause bearing capacity failure and settlement of adjacent foundations.

.4 For trench excavation, unless otherwise authorized by the Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.

.6 Restrict vehicle operations directly adjacent to open excavation and trenches.

.7 Dispose of excavated material off site as per the requirements of applicable regulations as follows:

.1 Soil classified as "Waste": Soil containing concentrations of substances greater than CSR Schedule 7, Column 2 standards or any other standard in the CSR, but not classified as "Hazardous Waste" under the Hazardous Waste Regulation (HWR). Soil must be disposed of at a permitted waste facility.

.8 Do not obstruct flow of surface drainage or natural watercourses.

.9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.10 Notify the Departmental Representative when bottom of excavation is reached.

.11 Obtain the Departmental Representative's approval of completed excavation.

.12 Remove unsuitable material from bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.

.13 Correct unauthorized over-excavation as follows at no additional cost to the contract:

.1 Fill under bearing surfaces excluding building foundations and footings placed on bedrock with Type 1 fill compacted to not less than 100% Standard Proctor maximum dry density.

.2 Fill under other areas with Type 3 fill compacted to not less than 95% of Standard Proctor maximum dry density.

.14 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of the Departmental Representative.

3.9 FILL TYPES AND COMPACTION

.1 For fill types and compactions for utility trenches, utility structures (manholes/pull boxes) road structures and building and retaining wall foundations, see contract drawings.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.11 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 The Departmental Representative has inspected and approved installations.

.2 The Departmental Representative has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.4 Removal of concrete formwork.

.5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 300 mm loose thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 48 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500 mm.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Departmental Representative.

.6 Place unshrinkable fill in areas as indicated.

.7 Consolidate and level unshrinkable fill with internal vibrators.

.8 Install drainage filter system in backfill as indicated.

3.12 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by the Departmental Representative.

.2 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation as indicated.

.3 Clean and reinstate areas affected by Work as directed by the Departmental Representative.

.4 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDE

.1 A complete ductbank and manhole infrastructure for 15kV primary power. Include excavation, trenching and backfilling to Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Coordinate the installation of ductbank with all existing civil and electrical site utilities and site works.

1.2 RELATED SECTIONS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling

1.3 REFERENCES

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

.1 ASTM A82/A82M-05a, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.3 ASTM C139-05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.

.4 ASTM C 478/C478M-06, Standard Specification for Precast Reinforced Concrete Manhole Sections.

.5 ASTM D1056-00, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

.2 CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.4 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:

.1 Submit shop drawings for precast manholes or pull boxes.

.3 Quality assurance submittals:

.1 Test reports: submit certified test reports for specified materials 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.

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

Part 2 Products

2.1 PVC DUCTS

.1 PVC ducts, type DB-2, encased in reinforced concrete.

2.2 PVC DUCT FITTINGS

.1 Rigid PVC opaque solvent welded, translucent pushfit type couplings, bell end fittings, plugs, caps, adaptors as required to complete installation.

.2 Expansion joints.

.3 Rigid PVC 5 degree angle couplings.

2.3 DRAINAGE

.1 Storm sewer connection: cast iron service saddle consisting of oil resistant gasket, stainless steel clamp and oil resistant O ring.

.2 Sump pit: 300 x 300 x 125 mm.

2.4 CABLE PULLING EQUIPMENT

.1 Pulling iron: galvanized steel rods, size and shape as indicated.

.2 Pull rope: 6 mm stranded nylon, tensile strength 5 kN, continuous throughout each duct run with 3 m spare rope at each end.

2.5 MARKERS

.1 Concrete type cable markers: 600 x 600 x 100 mm, with words: "Cable", "Joint", "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION GENERAL

.1 Install underground duct banks including formwork, excavation, trenching and backfilling to Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

.3 Open trench completely in area of work before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.

.4 Prior to laying ducts, construct "mud slab" not less than 75 mm thick.

.5 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.

.6 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.

.7 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75 mm horizontally and vertically.

.1 Stagger joints in adjacent layers at least 150 mm and make joints watertight.

.2 Encase duct bank with 75mm thick concrete cover.

.3 Use galvanized steel conduit for sections extending above finished grade level.

.8 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with duct offset.

.9 Use bell ends at duct terminations in pull boxes, manholes or buildings.

.10 Use conduit to duct adapters when connecting to conduits.

.11 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.

.12 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.

.13 Allow concrete to attain 50% of its specified strength before backfilling.

.14 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete.

.1 Tie ducts to spacers with twine or other non-metallic material.

APPENDIX A

PROJECT-SPECIFIC HAZARDOUS BUILDING MATERIALS ASSESSMENT
MARCH 31, 2016

PREPARED BY
STANTEC CONSULTING LTD.

(77 PAGES)

Project-Specific Hazardous Building Materials Assessment

William Head Institution High Voltage Upgrade

Stantec

Prepared for:
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March 31, 2016

Table of Contents

LIST OF APPENDICES

Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) on behalf of Correctional Service Canada (CSC) to conduct a project-specific hazardous building materials assessment within three buildings at William Head Institution, which is located at 6000 William Head Road, Victoria, BC. A list of the buildings assessed is included in Appendix A.

The purpose of the assessment was to check for potential hazardous building materials that may require special attention in accordance with the requirements of the Canada Labour Code, Part II (Canada Labour Code) and the current version of British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97), during a planned high voltage upgrade project.

Assessments were completed only pertaining to specific areas and/or materials in some buildings, while areas and/or materials throughout other buildings were assessed. The scope completed within each particular building was dictated to Stantec by PWGSC/CSC, and was based on the extent of impacts that each building was expected to incur during the planned fire alarm replacement project.

The hazardous building materials considered included asbestos-containing materials (ACMs), lead-containing materials including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould or moisture affected building materials, and silica.

Based on Stantec's visual assessment and on the laboratory analyses performed on samples collected as well as our review of information from previous assessment reports, hazardous building materials that may be impacted during the planned fire alarm replacement project were identified within many of the buildings assessed.

A summary of our findings and recommendations is presented below. It should be noted that this summary is subject to the same restrictions and limitations as presented in Section 3.0 (Assessment Limitations) and Section 6.0 (Closure) of this report. The information provided is to be read in conjunction with the remainder of this report.

NOTE: Where particular hazardous building materials are not listed in the following table, they were not identified in that particular building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Inmate Training (only specific areas/materials assessed)	**Asbestos** • 12"x12" dark blue vinyl floor tile with white streaks within room 008 and 009 is asbestos-containing. • 12"x12" Light blue vinyl floor tile with white streaks within room 008 is asbestos-containing. • Grey duct mastic throughout is asbestos-containing. • Parging cement applied to mechanical pipes throughout is asbestos-containing. • Breeching insulation, pipe flange gaskets, and breeching access plate gaskets within mechanical room 002 were identified as ACMS in previous reports but were not observed to be present during this assessment. If these materials are encountered they should be presumed to be asbestos-containing, additional sampling may clarify. **Lead** • Grey coloured paint on the concrete floors is lead-containing. • Red/brown coloured paint on doors in in the basement is lead-containing. • Cream coloured paint on block walls throughout is lead-containing. • Brown coloured paint on doors and trim is potentially lead-containing, additional sampling may clarify. • Tan/brown coloured paint on block walls in the main floor hallway is potentially lead-containing, additional sampling may clarify. • Lead is expected to be present in lead-acid batteries used in emergency lighting; older electrical wiring materials and sheathing; solder used on domestic water lines, in bell fittings for cast iron pipes and/or in electrical equipment; and as vent and pipe flashings. **PCBs** • PCBs may be present in the fluorescent light ballasts of the approximately 60 light fixtures observed. As the ballasts were energized, they could not be inspected at the time of the assessment for health and safety reasons. **Mercury** • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 60 fluorescent light fixtures. **Silica** • Silica is presumed to be present in vinyl floor tiles, drywall, cement, and concrete materials within the assessed areas.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Standby Power Plant (accessible areas of building assessed)	**Lead** • Grey coloured paint on the concrete floor within room 100 is lead-containing. • Red coloured paint on the vent, windows, and door trim within room 100 and on the exterior is lead-containing. • Lead is expected to be present in lead-acid batteries used in emergency lighting; older electrical wiring materials and sheathing; solder used on domestic water lines, in bell fittings for cast iron pipes and/or in electrical equipment; and as vent and pipe flashings. **PCBs** • PCBs may be present in the fluorescent light ballasts of the approximately seven light fixtures observed. As the ballasts were energized, they could not be inspected at the time of the assessment for health and safety reasons. **Mercury** • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in seven fluorescent light fixtures. **Silica** • Silica is presumed to be present in cement and concrete materials within the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Vocational Training Shops (only specific areas/materials assessed)	**Asbestos** • 2'x4' suspended ceiling tiles (worm and pinhole fissure pattern) located within the hallway (130) are asbestos-containing. • Black vinyl floor tile with white streaks within the hallway (130) is asbestos-containing. • Black window caulking within the welding shop (110) is asbestos-containing. • Boiler and boiler stack insulation within room 120 is asbestos-containing. • Pipe fitting insulation on elbows, valves and two water supply and return headers in the Mechanical Room (120) is asbestos-containing. • Vermiculite insulation within perimeter block wall cavities is asbestos-containing. **Lead** • White coloured paint on block walls is lead-containing. • Grey coloured paint on the concrete floor is lead-containing. • Red coloured primer on open web steel joists and pipes is lead-containing. • Blue coloured paint on walls and ceiling is lead-containing. • Black coloured paint on trim is potentially lead-containing, additional sampling may clarify. • Dark blue coloured paint on doors is lead-containing. • Lead is expected to be present in lead-acid batteries used in emergency lighting; older electrical wiring materials and sheathing; solder used on domestic water lines, in bell fittings for cast iron pipes and/or in electrical equipment; and as vent and pipe flashings. **PCBs** • PCBs may be present in the fluorescent light ballasts of the approximately 40 light fixtures observed. As the ballasts were energized, they could not be inspected at the time of the assessment for health and safety reasons. **Mercury** • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 40 fluorescent light fixtures. **Silica** • Silica is presumed to be present in ceiling tiles, vinyl floor tile, cement, and concrete materials within the assessed areas.

Building-by-building summaries of the identified hazardous building materials are provided in Appendix B through Appendix D. General findings pertaining to hazardous building materials are provided in Section 4.0 and the building-by-building appendices of this report. General recommendations are provided in Section 5.0 of this report and building-specific recommendations regarding identified hazardous building materials in "non-compliant" condition (materials requiring action) are provided in the building-by-building appendices.

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) on behalf of Correctional Service Canada (CSC) to conduct a project-specific hazardous building materials assessment within the following buildings at William Head Institution, which is located at 6000 William Head Road, Victoria, BC (subject buildings):

- Inmate training (103)
- Standby power plant (115)
- Vocational training shops (105)

An overall plan of William head Institution which shows the locations of the buildings assessed is presented in the drawings in Appendix A. In addition, a list of the buildings included in this assessment, with additional information pertaining to building construction dates, is also provided in Appendix A.

The purpose of the assessment was to check for potential hazardous building materials that may require special attention in accordance with the requirements of the Canada Labour Code, Part II (Canada Labour Code) and the current version of British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97), during a planned high voltage upgrade project.

The hazardous building materials considered included asbestos-containing materials (ACMs), lead-containing materials including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould or moisture affected building materials, and silica.

The site work was conducted by Keith Irwin and Amanda Bell of Stantec on from February 8 through 12, 2016.

1.1 UNDERSTANDING OF THE PROJECT

Stantec understands that the majority of the subject buildings were constructed during time periods when hazardous building materials were commonly used in construction, and that information pertaining to the identity, location and approximate extent of hazardous building materials (if any) within the subject buildings is either not on-file or outdated. As such, and in accordance with the Canada Labour Code and BC Reg. 296/97 pertaining to identifying hazards associated with hazardous building materials in the workplace, as well as for future maintenance and/or renovation planning purposes, PWGSC commissioned this assessment.

2.0 SCOPE AND METHODOLOGY

Keith Irwin and Amanda Bell of Stantec conducted visual assessments within the subject buildings from February 8 through 12, 2016. Site work was conducted in general compliance with the requirements of the Canada Labour Code, BC Reg. 296/97 and Stantec's Safe Work Practices (SWPs).

Assessments were completed only pertaining to specific areas and/or materials in some buildings, while areas and/or materials throughout other buildings were assessed. The scope completed within each particular building was dictated to Stantec by PWGSC/CSC, and was based on the extent of impacts that each building was expected to incur during the planned fire alarm replacement project.

Mechanical systems, structures and finishes of the subject buildings (or areas, depending on scope) were visually examined to determine the suspected presence of ACMs, lead including LCPs, PCBs, mercury, ODSs, mould, and silica. Where building materials were suspected but not confirmed to contain asbestos or lead (in paint) samples were collected for analysis to confirm or deny the presence of these hazardous materials. Based on analytical results, visually similar materials were referenced to specific analyzed samples to reduce the number of samples collected.

Additional background information and the methodology used for the determination of presence or absence of each specific hazardous material considered in this assessment are outlined in the following sections.

2.1 ASBESTOS

The common use of friable (materials which, when dry, can be easily crumbled or powdered by hand pressure) ACMs in construction generally ceased voluntarily in the mid-1970s but was only banned through legislation by the late 1980s. Friable asbestos was used in many building products, primarily high temperature insulations, spray-applied structural fireproofing, and a material known as vermiculite that was commonly used as block wall insulation and may be contaminated with asbestos fibres. Asbestos was also used in many non-friable manufactured products such as floor tiles, ceiling tiles, Transite cement products, and various other construction materials. Some cement products currently used in the construction of buildings may still contain asbestos.

The presence of asbestos in federal workplaces, and pertaining to federally regulated workers is governed by the Canada Labour Code. The presence of asbestos in the workplace in British Columbia pertaining to provincially regulated workers is governed by BC Reg. 296/97. As both federally regulated workers and provincially regulated workers (e.g., contractors) are expected to carry out work activities within the subject buildings, and as the provincial regulations are generally more prescriptive pertaining to asbestos (and generally include the requirements

noted in the Canada Labour Code), this assessment was conducted to meet the requirements of BC Reg. 296/97.

According to the current version of BC Reg. 296/97, ACM means any material containing at least 0.5% asbestos, or vermiculite insulation with any asbestos.

Based on these criteria, a visual assessment of accessible areas was undertaken in order to check for the presence of materials suspected of containing asbestos. Locations to collect discrete bulk asbestos samples of suspect building materials were identified. Samples of representative materials were then collected at these locations.

Multiple samples were collected from each "homogenous application" of observed suspected ACMs (materials suspected to contain asbestos that are uniform in material type, colour, texture application and estimated installation date) and submitted to EMSL Canada Inc. (EMSL) in Mississauga, Ontario for analysis of asbestos content using polarized light microscopy (PLM) with dispersion staining, in accordance with the United States Environmental Protection Agency (EPA) 600/R-93/116 method.

The number of samples to be collected for each homogenous application of a suspected ACM was based on accepted occupational hygiene standards and protocols, along with the assessor's experience and understanding of the consistency of that building material's application.

EMSL's analytical laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

2.1.1 Sample Results Interpretation

When asbestos is detected in concentrations greater than 0.5% in one of the samples within a set that was collected to represent a "homogenous application" of a particular material (or detected in any concentration, in a set of samples collected for applications of vermiculite), the entire sample set and the entire application of that material was then considered to be an ACM.

In addition to the above, a "positive stop" option was used during the laboratory analysis of the building material samples submitted for asbestos analysis. The "positive stop" option is utilized by the laboratory when asbestos is detected at a concentration of greater than one percent in one of the samples within a set that was collected to represent a "homogenous application" of that material. At this point, further analysis of subsequent samples within the set is deemed to be unnecessary (as the entire set will be considered an ACM, per above), and the remainder of the samples within the set are not analyzed.

2.1.2 Potential Asbestos-Containing Vermiculite Insulation

As part of the assessment, Stantec assessed the subject buildings for areas where vermiculite insulation, a potential ACM, would likely be present. This included making note of and assessing attic spaces, floor cavities and masonry or brick walls, which are typical areas where vermiculite is found. Regarding this portion of the assessment, the following should be noted:

- Where masonry or brick walls were observed, destructive assessment (drilling) was conducted to assess the cavity for the presence of vermiculite
- Where non-vermiculite attic insulation (e.g., fiberglass) was observed, inspection for the presence of vermiculite under the other insulation was conducted only at the attic access point (not throughout the attic)

2.1.3 Asbestos Sampling Quality Assurance/Quality Control

Sampling activities pertaining to asbestos were conducted in accordance with Stantec's SWPs, which take into account current provincial regulations pertaining to such work (i.e., sampling procedures, required number of samples, and laboratory analytical procedures).

Representative bulk samples were collected of accessible suspect ACMs in sufficient quantities for laboratory analyses. Suspect ACM samples were sealed in polyethylene zip-lock bags labeled with the sample number, suspect material description, and sample location. As part of sampling procedures, sampling tools were cleaned between sample collection events to avoid the potential for cross-contamination of samples.

Sample bags were compiled in order and placed into a single container accompanied with a Chain of Custody form outlining the project information, date, building location, number of samples, and sample description. Samples were submitted to the analytical laboratory in a sealed container via courier.

2.2 LEAD

Lead may be used in its pure metallic form or combined chemically with other elements to form lead compounds. Metallic lead is used to make products such as electric storage batteries, ammunition, lead solder, radiation shields, pipes, and sheaths for electric cables. Metallic lead is sometimes combined with other metals such as copper, tin, and antimony as lead alloys for use in the manufacture of a variety of metal products. Lead is commonly found in buildings in the solder used on copper domestic pipes, in the caulking on bell fittings of cast iron drainage pipes and in electrical equipment.

The presence of lead-containing materials (other than paint) was assessed through visual means.

With respect to paint, the lead content of interior paint was limited to 0.5% by weight (equivalent to 5,000 mg/kg or ppm) in 1976 under the Federal *Hazardous Products Act,* which governs the

import, export and distribution of hazardous products in Canada. In 2005, the *Hazardous Products Act* had reduced the criteria for surface coatings (including paint) to 600 mg/kg (600 ppm) to define them as "lead-containing". This criterion has since (2010) been reduced to 90 ppm.

However, with respect to potential lead exposures associated with disturbance to surfaces coated with lead-containing products, WorkSafeBC has compiled a manual titled *Lead-Containing Paint and Coatings: Preventing Exposure in the Construction Industry*, (Lead Guideline) which defines a "lead-containing surface coating material" and indicates that "...the improper removal of lead paint containing 600 mg/kg lead results in airborne lead concentrations that exceed half of the exposure limit". As such, Stantec will reference this value (600 ppm) in defining paints as "lead-containing".

Based on this criterion, samples of suspected LCPs were collected from major paint applications, and were collected to substrate, where possible, in sufficient quantity to conduct analyses for total lead content. Samples collected were placed into separate, sealed, and labeled polyethylene bags, and submitted to EMSL for analyses of total lead content using Flame Atomic Absorption Spectrometry AAS (SW 846 3050B*/7000B).

EMSL's analytical laboratory is also accredited by the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Approval Program.

2.3 POLYCHLORINATED BIPHENYLS

PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. In fluorescent fixtures, PCBs were usually found within the small capacitors inside the ballast that controls the lamp. The Federal Chlorobiphenyls Regulation, SOR/91-152, prohibited the use of PCBs in electrical equipment manufactured after July 1, 1980.

The presence of PCB-containing equipment was assessed through visual means. With respect to fluorescent lamp ballasts, due to the risk of electrical shock associated with dismantling operating fixtures, fluorescent lamp ballasts were not removed to view identification numbers/information.

The total number of fluorescent lamp fixtures that may have ballasts that contain PCBs was approximated for each building assessed.

Suspected PCB-containing electrical equipment can be visually inspected and compared to the Environment Canada reference guide entitled *Identification of Lamp Ballasts Containing PCBs, Report EPS 2/CC/2*, dated August 1991 (PCB Guide).

2.4 MERCURY

Mercury is commonly found in buildings as mercury vapour lighting, thermostats/thermometers with mercury-containing glass ampoules, electrical switches and can also be found in minor amounts in fluorescent lamp tubes and vapour bulbs and may be present in stable forms in adhesives. Exposure to mercury in federal workplaces is governed by the Canada Labour Code, while provincially it is governed by BC Reg. 296/97.

The presence of mercury and mercury-containing equipment was assessed through visual means.

2.5 MOULD

Moist building materials may provide suitable conditions for mould growth, and the removal of building materials impacted by mould growth may require workers with specific training and experience using work procedures that have been developed to protect workers and work areas from exposure to elevated concentrations of airborne mould.

The presence of suspect visible mould was assessed through visual means and sampling. Material observed with dark-colored staining and/or a textured and discolored appearance is described as "suspect mould". Mould identified visually is defined as "suspect mould" unless it is confirmed as mould by laboratory analysis.

2.5.1 Mould Reference Guidelines

With respect to mould and/or moisture, the visual assessment procedures utilized during this project were based on the recommendations provided in the documents listed below:

- Standard Construction Document CCA 82 *Mould Guidelines for the Canadian Construction Industry*, Canadian Construction Association, 2004 (referred to as CCA 82)
- *Guidelines on Assessment and Remediation of Fungi in Indoor Environment*, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology, April 2000 (referred to as the NYC Guidelines)
- *Fungal Contamination in Public Buildings: Heath Effects and Investigation Methods*, Federal-Provincial Committee on Environmental and Occupational Health, 2004 (referred to as the Health Canada Guide)
- *Indoor Air Quality in Office Buildings: A Technical Guide*, report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health, 1995 (referred to as the IAQ Guide)
- *Bioaerosols: Assessment and Control*, American Conference of Governmental Industrial Hygienists (ACGIH), 1999 (referred to as the ACGIH Report)

2.6 OZONE-DEPLETING SUBSTANCES

Chlorofluorocarbons (CFCs) and other ODSs are often found in refrigeration units associated with air-conditioning or other refrigeration equipment. In September 1987, 47 countries agreed to the Montreal Protocol on Substances that Deplete the Ozone Layer. ODSs are regulated in BC by the *British Columbia Waste Management Act*—Ozone Depleting Substances and Other Halocarbons Regulation (BC Reg. 387/99 as amended by BC Reg. 109/2002) and the Federal Halocarbon Regulations, 2003 (FHR 2003).

The presence of ODSs and equipment containing these materials was assessed through visual means.

2.7 SILICA

Silica, also referred to as free crystalline silica, is found in concrete, cement, mortar, ceramic wall and floor tiles, stucco finishes and acoustic ceiling tiles. Prolonged exposure to, and inhalation of free crystalline silica, may result in respiratory disease known as silicosis, which is characterized by progressive fibrosis of the inner lung tissue and marked shortness of breath or impaired lung function.

Exposure to silica dust is governed by BC Reg. 296/97. According to both legislative instruments; the time-weighted average exposure limit for airborne silica dust is 0.025 mg/m^3.

The presence of silica was assessed through visual means.

2.8 REVIEW OF PREVIOUS REPORTS

The following report was provided to Stantec subsequent to the completion of our field assessment program:

- Pottinger Gaherty Environmental Consultants Ltd., Report No. 125-54.01 entitled *Asbestos Containing Material Survey Report – William Head Medium Security Institution, Metchosin, British Columbia*, dated March 2004, prepared for Public Works and Government Services Canada (Initial Assessment)

Due to the timing of receipt of the above-noted document, it was reviewed for information to provide clarity in those instances where labels indicating the presence of ACMs were observed in the field, but results from our assessment provided conflicting information.

3.0 ASSESSMENT LIMITATIONS

In preparation of this report, Stantec used professional judgment based on experience. The work was conducted in accordance with generally accepted professional standards. Stantec relied on information gathered during the site investigation and laboratory analytical reports.

This report reflects the observations made within accessed areas of the subject buildings and the results of analyses performed on specific materials sampled during the assessment. Analytical results reflect the sampled materials at the specific sample locations.

Sampling was conducted pertaining to suspected ACMs and suspected LCPs only. The assessment for the presence of other hazardous building materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces only. Concealed spaces were inspected via existing access panels, where present. Interior and exterior finishes, solid ceilings, walls, flooring and structural elements were not removed to access concealed areas.

It should be noted that in various buildings (as outlined in Section 4.0 of this report and associated appendices), assessments were limited to only those specific areas and/or materials dictated for assessment by PWGSC/CSC, based on their understanding of the building areas and/or materials that would be impacted during the planned fire alarm replacement project. For those buildings where assessment was limited to specific areas or materials, this report does not constitute a comprehensive hazardous building materials assessment. The information is limited strictly to the areas assessed/materials sampled.

In addition to the above, and due to limitations on the agreed to scope of work for this project as well as physical limitations in accessing concealed areas and limitations associated with working in occupied/operational spaces, there are specific limitations to the information that can be provided to each hazardous building material considered in this assessment, as outlined in the following sub-sections.

3.1 ASBESTOS

Suspected ACMs that were not sampled included, but were not limited to, the following (where present, based on building construction or as otherwise noted):

- Roofing materials associated with buildings where the roof could not be accessed safely with the equipment present on-site
- Sub-grade materials
- Interior components of mechanical equipment (e.g., inner linings or gaskets in boilers)
- Interior components of heating, ventilation and air conditioning (HVAC) units
- Heat protection materials inside mechanical installations (e.g., gaskets) and light fixtures (e.g., paper backing in sealed incandescent fixtures)

- Flooring material concealed beneath ceramic tile, brickwork, hardwood flooring, and/or concealed beneath existing sub-floors
- Drywall and/or wall plaster and associated finish materials concealed behind new and/or additional walls or ceilings
- Woven tape inside duct connection joints or inner ducting insulation
- Materials within sealed/hard wall cavities, hard ceiling cavities or crawlspaces without appropriate access points
- Insulation materials inside fire doors
- Insulation materials in attic, ceiling or crawlspace areas beyond reasonable reach from safe access points

If encountered during renovation, demolition or other activities, any suspected ACMs not identified within this report should be presumed to contain asbestos and handled as such until otherwise proven, through analytical testing.

3.2 LEAD

Assessment for the presence of lead or lead-containing materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces of the subject buildings and/or assessed areas only. The presence of lead or lead-containing materials in inaccessible areas not assessed included, but was not limited to: ceiling spaces, wall cavities, crawlspaces, and buried materials.

With respect to paint, samples of suspected LCPs were collected within the subject buildings only from surfaces of major paint applications where visually different paint colours and/or types were identified. Although the surfaces where samples were collected may be covered with more than one coat of paint, the paint samples are described by the surface (visible) colour only.

Attempts were made to represent all layers of paint in the samples collected. As analytical results are referenced to the surface paint colour only, the lead content of all painted surfaces similar to that represented by the surface paint colour will be presumed to be the same, regardless of differing sub surface paints, if any.

3.3 POLYCHLORINATED BIPHENYLS

Due to height restrictions and the risk of electrical shock in handling operational light fixtures, the ballasts present in the fixtures observed within the subject buildings were not removed for comparison to the PCB Guide. The visible labels of ballasts in several fixtures were inspected for comparison to the PCB Guide.

Conclusions and recommendations regarding the presence of PCBs within the subject buildings are based on Stantec's limited observations in combination with information provided by staff regarding lighting renovations (where requested by Stantec based on observations) and is presented to provide guidance regarding the likelihood that PCB-containing equipment is or is

not present within the subject buildings. The exact extent and/or number of fluorescent lamp ballasts containing PCBs, if any, within the subject buildings will not be commented on.

3.4 MERCURY

Visual assessment for the presence of mercury-containing equipment within the subject buildings was conducted in accessible areas only. Additional mercury or mercury-containing equipment may be present in inaccessible areas including, but not limited to: ceiling spaces, wall cavities, and crawlspaces, or as internal parts of HVAC mechanisms.

3.5 MOULD

Visual assessment for the presence of suspected visible mould and/or suitable conditions for mould growth (e.g., moist and/or water-stained building materials) were conducted in accessed portions of the subject buildings only. The assessment was not intrusive in nature and included visual assessment of exposed surfaces and closer inspection of known problem areas.

The conclusions made in this report provide description(s) of the potential source(s) of moisture within the subject buildings that may have led to suitable conditions for mould growth, only in those cases where potential source(s) of moisture were identified. These conclusions will not necessarily identify all sources of moisture leading to suitable conditions for mould growth within the subject buildings or within the impacted area(s).

This assessment does not constitute a building envelope/building systems assessment for any of the subject buildings, which would include an intrusive investigation to assess the internal condition, potential moisture sources, and expected remaining service life of the various components and systems comprising the envelope of a building.

3.6 OZONE DEPLETING SUBSTANCES

Visual assessment for the presence of ODSs within the subject buildings was conducted in accessible areas only. Additional ODS-containing equipment may be present in inaccessible areas including, but not limited to, ceiling spaces, wall cavities and crawlspaces. In addition, portable equipment that may contain ODSs (refrigerators, drink coolers, etc.) was not considered as part of this assessment.

3.7 SILICA

Visual assessment for the presence of silica-containing materials within the subject building was conducted in accessible areas only. Additional silica-containing materials may be present in inaccessible areas including, but not limited to, ceiling spaces and wall cavities.

4.0 FINDINGS

The results of our assessment are provided on a building-by-building basis in Appendices B through D. Each Appendix contains the following (where applicable):

- Indication of the scope of the assessment within the building (limited to specific areas or materials vs. assessment of accessible areas throughout)
- Separate sections with written summaries of findings pertaining to each hazardous building material, including the following:
  - Information regarding the building or the specific areas assessed
  - A listing of suspect materials observed
  - Tables that provide summaries of the sample types, locations, and analytical results
  - Interpretations of observations and/or sample analytical results
- Photographs of identified hazardous building materials, where available
- Information pertaining to condition evaluation of identified hazardous building materials
- Recommendations for identified hazardous building materials found to be in "non-compliant" condition (e.g., damaged ACMs, mould-impacted materials, etc.)
- Floor plan drawings for the buildings/structures, which include locations of the samples collected during this assessment, and locations of identified hazardous building materials (where practical)
- Copies of the analytical certificates for all suspected ACM samples collected
- Copies of the analytical certificates for all suspected LCP samples collected

It should be noted that evaluation of condition of identified ACMs was conducted using terminology and classifications as outlined in the former PWGSC document entitled *Deputy Ministers Directive 057 – Asbestos Management* (last revised June 16, 1999), and considered the friability of the material (terminology relating to how easily fibres can be released), condition (good, fair and poor) and accessibility of the material.

5.0 GENERAL RECOMMENDATIONS

Building-specific recommendations pertaining to the identified hazardous building materials that require action are provided in Appendices B through D. General recommendations pertaining to management of identified hazardous building materials in good condition and/or that may be impacted during the planned fire alarm replacement project are provided below.

5.1 ASBESTOS

For buildings with identified ACMs, Stantec recommends the following with regards to meeting the requirements of the Canada Labour Code and BC Reg. 296/97 as they pertain to managing asbestos in the workplace and/or managing asbestos during renovation/demolition projects:

- Asbestos-containing materials that may be impacted during renovations and/or demolition activities should be removed using appropriate procedures (e.g., those outlined in the WorkSafeBC 2012 publication *Safe Work Practices for Handling Asbestos*) by and an experienced contractor, prior to the initiation of other renovation and/or demolition activities.
- Prior to renovation and/or demolition activities that would disturb them, undertake testing of presumed ACMs (materials that were previously un-tested, but are presumed to contain asbestos based on application and vintage) that may be impacted to determine their asbestos content. Confirmed asbestos materials should be handled accordingly.
- In accordance with the requirements of the Canada Labour Code and BC Reg. 296/97 an asbestos exposure control plan (also known as an "asbestos management plan", or "AMP") must be developed and implemented for buildings with identified ACMs.
- Identified ACMs in good condition can be managed in place, upon development and implementation of an AMP.
- Should a material suspected to contain asbestos fibres become uncovered during renovation and/or demolition activities, all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if asbestos fibres are present. Confirmed asbestos materials should be handled in accordance with applicable guidelines and regulations.
- Suspected ACMs deemed visually similar to the ACMs identified in this report (on a building-by-building basis) should be considered asbestos-containing and handled as such, unless proven otherwise, through analytical testing.
- Asbestos-containing cement pipe may be present below ground—caution should be used if excavation is required.
- If masonry block walls are to be impacted by renovation and/or demolition work, and these walls have not been checked for the presence of vermiculite insulation, intrusive assessments for vermiculite should be undertaken prior to renovation/or demolition work. If vermiculite insulation is suspected to be present, this material should be treated as an ACM until testing can show otherwise.
- Ensure asbestos containing waste is handled, stored, and disposed of in accordance with the requirements of the Federal Transportation of Dangerous Goods Regulation and the British Columbia Hazardous Waste Regulation (BC Reg. 63/88).

5.2 LEAD

Lead-containing materials, including paints, can be managed in place, where in good condition.

If LCPs or other lead-containing equipment/materials within the subject buildings are to be disturbed and/or removed, ensure compliance with the following:

- Exposure protection requirements of BC Reg. 296/97
- Disposal requirements of BC Reg. 63/88
- Transportation requirements of the Federal Transportation of Dangerous Goods Regulation

Corrective action or remedial work on paint applications containing any concentration of lead should be undertaken in a manner so as to avoid generating fine particulate matter or dust (i.e., avoid sanding). Airborne lead dust or fumes should not exceed the Canada Labour Code and BC Reg. 296/97 8-hour Occupational Exposure Limit (OEL) of 0.05 milligram per cubic metre (mg/m^3) during the removal of paints and products containing any concentration of lead. The use of personal protective equipment is recommended to reduce the potential for over-exposure to lead dust. This can be achieved by:

- Providing workers with protective clothing and PPE or devices as necessary to protect the worker against the hazards to which the worker may be exposed
- Providing workers with adequate and training in the care and use of clothing, equipment or device before wearing or using it
- Wetting the surface of the materials to prevent dust emissions
- Providing workers with washing facilities with clean water, soap and individual towels to properly wash prior to exiting the work area

To avoid the inhalation of lead, it is essential to have the following control methods in place:

- Engineering controls
- Work practices and hygiene practices
- Respirators and personal protective equipment
- Training

The work tasks required and the ways in which lead-containing materials (including paints) will be impacted will determine the appropriate respirators, measures and procedures that should be followed to protect workers from lead exposure.

5.3 POLYCHLORINATED BIPHENYLS

Fluorescent lamp ballasts that may contain PCBs can be managed in place, where these items are operating and in good condition. No further action is currently required until such time that renovation or demolition activities are to be conducted, or until 2025, when PCB-containing ballasts will require removal and disposal.

When decommissioned, verify the PCB content of fluorescent lamp ballasts as per the Environment Canada publication *Identification of Lamp Ballasts Containing PCBs*, 1991. PCB-containing items identified for removal and disposal should be handled, transported, stored and disposed of in accordance with the following:

- Disposal requirements of BC Reg. 63/88
- Transportation requirements of the Federal Transportation of Dangerous Goods Regulation
- Federal PCB Regulations (SOR/2008-273)

Should a material suspected to contain PCBs become uncovered during renovation activities (i.e., dielectric fluids, hydraulic fluids) all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if PCBs are present. Confirmed PCBs should be handled in accordance with Federal Regulation SOR/2008-273 and BC Reg. 63/88.

5.4 MERCURY

Identified mercury-containing items can be managed in place, therefore no further action is recommended at this time. Mercury vapour within light fixtures and liquid mercury in thermostat switches pose no risk to workers or occupants provided the mercury containers remain intact and undisturbed.

Complete removal of mercury-containing equipment is required prior to renovation or demolition activities that may disturb the equipment. When mercury-containing items (e.g., fluorescent light bulbs/tubes, thermostats) are removed, ensure all mercury waste is handled, stored and disposed of in accordance with the requirements of the disposal requirements of the following:

- Disposal requirements of BC Reg. 63/88
- Transportation requirements of the Federal Transportation of Dangerous Goods Regulation

Precautions should be taken if workers may potentially be exposed to mercury or mercury vapours to ensure that workers exposure levels do not exceed the occupational exposure limit of 0.025 mg/m^3 as per the BC Reg. 296/97 This can be achieved by providing respiratory and skin protection applicable to the hazard and task to be completed.

5.5 MOULD

In general, mould-impacted building materials will require action (e.g. abatement/removal or cleaning). Recommendations pertaining to mould are provided in the building-by-building information included in Appendices B through D.

5.6 OZONE DEPLETING SUBSTANCES

As no suspect ODS-containing materials or equipment were observed within the subject buildings during the assessment, no recommendations have been provided.

5.7 SILICA

When silica-containing materials are to be removed during demolition activities, ensure dust control measures are employed such that airborne silica dust concentrations do not exceed the exposure limit as stipulated by BC Reg. 296/97 (0.025 mg/m^3). This would include, but not be limited to, the following:

- Providing workers with respiratory protection
- Wetting the surface of the materials to prevent dust emissions
- Providing workers with facilities to properly wash prior to exiting the work area

Providing dust control to mitigate the potential for demolition dust to escape from the work area into public and/or adjacent areas.

6.0 CLOSURE

This report has been prepared by Stantec Consulting Ltd. for the sole benefit of Public Works and Government Services Canada and Correctional Services Canada. Any use that a third party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The conclusions presented represent the best judgment of the assessor based on current environmental, health and safety standards and the site conditions observed on the dates cited within this report. This report is based on, and limited by, circumstances and conditions stated herein, and on information available at the time of preparation of the report. Due to the limited nature of the investigation and the limited data available, Stantec Consulting Ltd. cannot warrant against undiscovered environmental, health and/or safety liabilities. It is possible that additional, concealed hazardous materials may become evident during renovation and/or demolition activities within the subject buildings.

Closure
March 31, 2016

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

We trust that the report meets your current requirements. Should you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned.

Respectfully submitted,

STANTEC CONSULTING LTD.

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AB/TW/SB/sf

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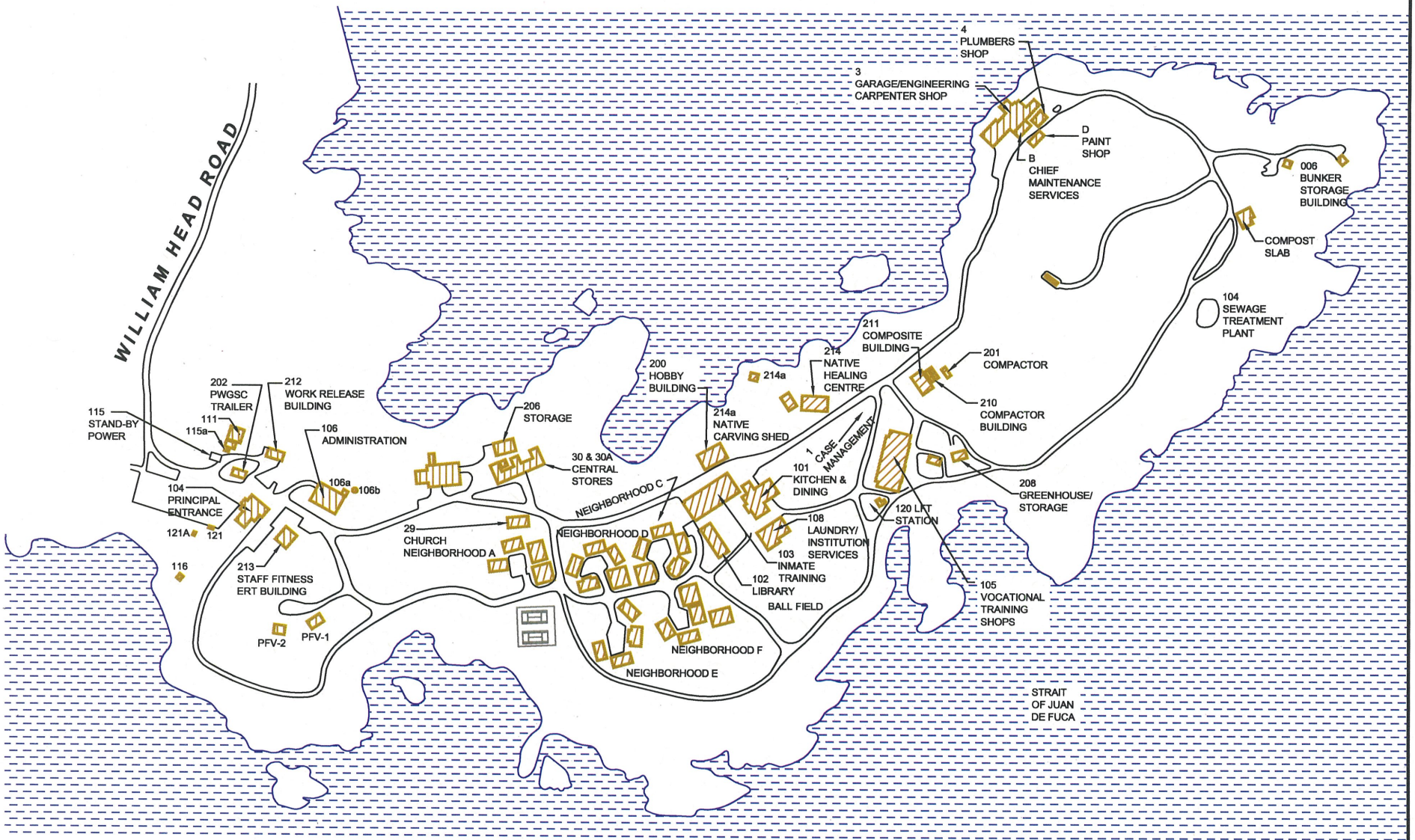
APPENDIX A
BUILDING LIST

Appendix A BUILDING LIST

Appendix	Building Name	Year of Construction
B	Inmate Training (103)	Pre-1990
C	Standby Power Plant (115)	Pre-1990
D	Vocational Training Shops (105)	Pre-1990



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

WILLIAM HEAD INSTITUTION

Client: PUBLIC WORKS AND GOVERNMENT SERVICE CANADA, PACIFIC REGION

Project No.:	123220504
Scale:	1 : 1000
Date:	16/02/24
Dwn. By:	CD VM SL2016020269
App'd By:	TW

Dwg. No.: 1

Stantec

APPENDIX B
FINDINGS AND RECOMMENDATIONS—INMATE TRAINING

Appendix B FINDINGS AND RECOMMENDATIONS—INMATE TRAINING

The inmate training building was reportedly constructed prior to 1990 and consists of one level and a basement, with a crawlspace and two steam tunnels, one in between this building and the Kitchen and Dining and the second in between this building and the Library. The typical structural components and finishes associated with this building consist of vinyl floor tiles, vinyl sheet flooring, and concrete floors, drywall, block wall, and concrete walls, and metal and drywall ceilings.

Only the following areas (subject areas) and/or materials were assessed for this project, as it was communicated that these may be disturbed by planned renovations:

- Rooms 002, 003, 004, 005, 006, 008, 009, 010, 102, 103, 104, 113, 116, and 118
- Mechanical pipes entering the north end of the steam tunnel that leads to Kitchen/Dining building 101
- Mechanical pipes entering the north end of the steam tunnel that leads to the Library 102

It should be noted that the steam tunnel was specifically not accessed during this project. Hazardous building materials may be present in the steam tunnel.

The results of the assessment for each of the considered hazardous materials within the subject areas are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

B.1 ASBESTOS

Stantec identified and sampled the following suspected ACMs:

- Drywall joint compound
- Vinyl sheet flooring
- Vinyl floor tile
- Assorted mastics, caulkings, and sealants
- Assorted fire-stops
- Duct mastic and wrap
- Parging cement
- Boiler gasket
- Stack insulation

Samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table B-1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table B-1 Suspected ACM Sample Collection and Analysis Summary Inmate Training, William Head Institution, Victoria, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
DJC-01A	Drywall joint Compound, Applied to Drywall Walls & Ceilings	Room 103	None Detected
DJC-01B	Drywall joint Compound, Applied to Drywall Walls & Ceilings	Room 103	None Detected
DJC-01C	Drywall joint Compound, Applied to Drywall Walls & Ceilings	Room 104	None Detected
VSF-01-Flooring	Vinyl Sheet Flooring, Light & Dark Beige Small Rock Pattern	Room 102	None Detected
VSF-01-Mastic	Mastic Applied to VSF-01 Vinyl Sheet Flooring	Room 102	None Detected
VSF-02	Vinyl Sheet Flooring, Blue/Grey, 1st Layer	Hallway (118)	None Detected
VFT-01-Flooring	**Vinyl Floor Tile, Dark Blue with White Streaks**	**Room 008**	**1.6% Chrysotile**
VFT-01- Mastic	Mastic Applied to VFT-01 Vinyl Floor Tile	Room 008	None Detected
VFT-02-Flooring	**Vinyl Floor Tile, Light Blue with White Streaks**	**Room 008**	**2.6% Chrysotile**
VFT-02- Mastic	Mastic Applied to VFT-02 Vinyl Floor Tile	Room 008	None Detected
VFT-03-Flooring	Vinyl Floor Tile, Grey with Light Grey Streaks	Room 102	None Detected
VFT-03-Mastic	Mastic Applied to VFT-03 Vinyl Floor Tile	Room 102	0.35% Chrysotile
VFT-04	Vinyl Floor Tile, Grey, 2nd Layer (beneath VSF-02)	Hallway (118)	None Detected
VFT-04-Mastic	Mastic Applied to VFT-04 Vinyl Floor Tile	Hallway (118)	None Detected
PS-01A	Pipe Sealant, Pink	Room 002	None Detected
PS-01B	Pipe Sealant, Pink	Room 002	None Detected
PS-01C	Pipe Sealant, Pink	Room 002	None Detected
PS-02A	Pipe Sealant, Blue	Room 002	None Detected
PS-02B	Pipe Sealant, Blue	Room 002	None Detected
PS-02C	Pipe Sealant, Blue	Room 002	None Detected
PS-03A	Pipe Sealant, Yellow	Room 002	None Detected
PS-03B	Pipe Sealant, Yellow	Room 002	None Detected
PS-03C	Pipe Sealant, Yellow	Room 002	None Detected

Table B-1 Suspected ACM Sample Collection and Analysis Summary Inmate Training, William Head Institution, Victoria, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PS-04A	Pipe Sealant, White	Room 002	None Detected
PS-04B	Pipe Sealant, White	Room 002	None Detected
PS-04C	Pipe Sealant, White	Room 002	None Detected
FS-01A	Fire Stopper, Light Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-01B	Fire Stopper, Light Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-01C	Fire Stopper, Light Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-02A	Fire Stopper, Dark Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-02B	Fire Stopper, Dark Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-02C	Fire Stopper, Dark Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-03A	Fire Stopper, Red, Mastic, Wall Penetration	Room 004	None Detected
FS-03B	Fire Stopper, Red, Mastic, Wall Penetration	Room 004	None Detected
FS-03C	Fire Stopper, Red, Mastic, Wall Penetration	Room 004	None Detected
FS-04A	Fire Stopper, Medium Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-04B	Fire Stopper, Medium Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-04C	Fire Stopper, Medium Grey, Mortar, Wall Penetration	Room 004	None Detected
FS-05A	Fire Stopper, Grey, Applied to 3" Electrical Conduit Lines, Wall Penetration	Room 004	None Detected
FS-05B	Fire Stopper, Grey, Applied to 3" Electrical Conduit Lines, Wall Penetration	Room 004	None Detected
FS-05C	Fire Stopper, Grey, Applied to 3" Electrical Conduit Lines, Wall Penetration	Room 004	None Detected
FS-06A	Fire Stopper, Grey, Putty, Applied to Electrical Conduit, Wall Penetration	Room 004	None Detected
FS-06B	Fire Stopper, Grey, Putty, Applied to Electrical Conduit, Wall Penetration	Room 004	None Detected
FS-06C	Fire Stopper, Grey, Putty, Applied to Electrical Conduit, Wall Penetration	Room 004	None Detected
DM-01A	**Duct Mastic, Grey**	**Crawlspace (011)**	**0.68% Chrysotile**
DM-01B	**Duct Mastic, Grey**	**Crawlspace (011)**	**Positive Stop (Not Analyzed)**
DM-01C	**Duct Mastic, Grey**	**Crawlspace (011)**	**Positive Stop (Not Analyzed)**
WC-01A	Window Caulking, Grey	Room 006	None Detected

Table B-1 Suspected ACM Sample Collection and Analysis Summary Inmate Training, William Head Institution, Victoria, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
WC-01B	Window Caulking, Grey	Room 006	None Detected
WC-01C	Window Caulking, Grey	Room 006	None Detected
DW-01	Duct Wrap, Applied to Fiberglass Insulation	Room 010	None Detected
PC-01	**Parging Cement, Applied to Hot Water Return Line to Steam Tunnel**	**Room 002**	**1% Amosite**
BG-01	Boiler Gasket	Room 002	None Detected
SI-01	Stack Insulation, Applied to Boiler	Room 002	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table B-2, below were identified as ACMs.

Table B-2 Summary of Identified ACMs Inmate Training, William Head Institution, Victoria, BC

Identified ACM Description and Condition Information		Photo
12"x12" vinyl floor tile, dark blue with white streaks in room 008 and 009.		
Friability	Non-friable	
Condition	Good	
Content	1.6% Chrysotile	

Table B-2 Summary of Identified ACMs Inmate Training, William Head Institution, Victoria, BC

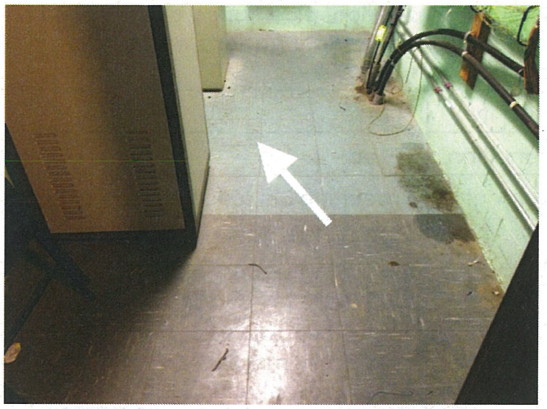
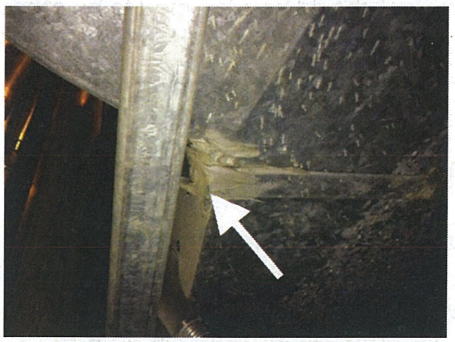
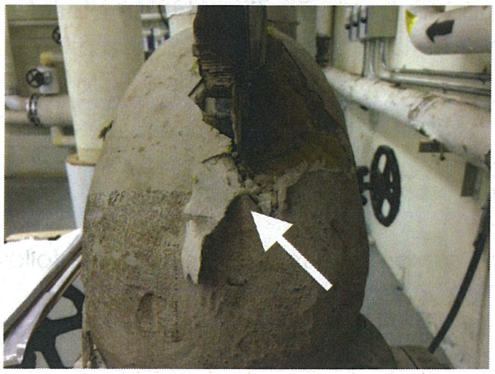
Identified ACM Description and Condition Information		Photo
12"x12" vinyl floor tile, light blue with white streaks in room 008.		
Friability	Non-friable	
Condition	Good	
Content	2.6% Chrysotile	
Grey mastic applied to seams of HVAC ducting throughout		
Friability	Non-friable	
Condition	Good	
Content	0.68% Chrysotile	
Parging cement applied to fittings (elbows and valves) on mechanical pipes throughout.		
Friability	Friable	
Condition	Good, in general Poor, at least six fittings observed in mechanical room 002	
Content	1% Amosite	

Table B-2 Summary of Identified ACMs
Inmate Training, William Head Institution, Victoria, BC

Identified ACM Description and Condition Information		Photo
Breeching insulation, pipe flange gaskets, and breeching access plate gaskets within the mechanical room 002		No Photo Available
Friability	Friable	
Condition	Good	
Content	Breeching insulation: 40-60% Amosite Pipe flange gasket: 60-80% Chrysotile Breeching access plate gasket: 70-90% Chrysotile The above materials were identified in previous reports but were not observed to be present during this assessment. If these materials are encountered they should be presumed to be asbestos-containing, additional sampling may clarify.	

B.1.1 Materials with less than 0.5% Asbestos

It should be noted that one sample of mastic associated with non-ACM vinyl floor tiles (grey with light grey streaks) was identified to contain asbestos in a concentration of 0.35%, and no asbestos was detected in the other two samples of this material. As the limited amount of asbestos detected was less than 0.5%, and as the number of samples collected for the homogenous application of this material would be considered sufficient to appropriately characterize it based on published provincial standards published (i.e., the *BC Asbestos Guide*), the mastic associated with non-ACM vinyl floor tiles (grey with light grey streaks) is not considered to be an ACM.

B.2 LEAD

Lead is expected to be present in the following:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used on domestic water lines, in bell fittings for cast iron pipes and/or in electrical equipment
- Vent and pipe flashings

With respect to paint, paint chip samples were obtained from the predominant suspected LCP applications within the subject areas. A summary of the sample types, locations and analytical

results is presented in Table B-3, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table B-3 Suspected LCP Sample Collection and Analysis Summary Inmate Training, William Head Institution, Victoria, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
L-71	White	Room 002, Walls	<510	No
L-72	**Grey**	**Room 002, Concrete Floors**	**600**	**Yes**
L-73	Dark grey	Room 001, Wall	470	No
L-74	Bright teal	Room 008, Walls	<270	No
L-75	**Red/brown**	**Room 009, Doors**	**30,000**	**Yes**
L-76	**Cream**	**Room 102, Walls**	**720**	**Yes**
L-77	**Brown**	**Room 102, Doors & Trim**	**<1,800**	**Potential**
L-78	**Tan/Brown**	**Hallway (118), Block Walls**	**<630**	**Potential**
L-79	Cream	Hallway (118), Open Web Steel Joist	480	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table B-4, below were identified as actual or potential LCPs.

Table B-4 Summary of Identified LCPs Inmate Training, William Head Institution, Victoria, BC

Identified LCP Description	Photo
Grey colored paint on concrete floors. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	

Table B-4 Summary of Identified LCPs Inmate Training, William Head Institution, Victoria, BC

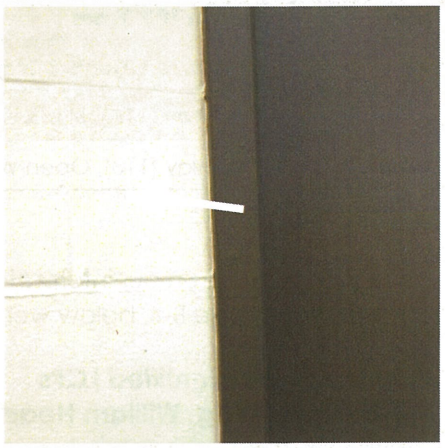
Identified LCP Description	Photo
Red/brown colored paint on doors in basement. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	
Cream coloured paint on block walls throughout. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	
Brown colored paint on the doors and trim (potential LCP – additional sampling may indicate otherwise). This paint was observed to be in good condition (not bubbling, flaking, or peeling).	

Table B-4 Summary of Identified LCPs
Inmate Training, William Head Institution, Victoria, BC

Identified LCP Description	Photo
Tan/brown coloured paint on block walls in the main floor hallways (potential LCP – additional sampling may indicate otherwise). This paint was observed to be in good condition (not bubbling, flaking, or peeling).	

B.3 POLYCHLORINATED BIPHENYLS

Based on the construction date of the subject building, PCBs may be present in the fluorescent light ballasts of the approximately 60 light fixtures observed. As the ballasts were energized, they could not be inspected at the time of the assessment for health and safety reasons.

B.4 MERCURY

Mercury vapour is likely to be present in the light tubes within the approximately 60 fluorescent light fixtures observed. Mercury may also be present in paints and adhesives.

B.5 MOULD

No mould and/or moisture-impacted building materials were observed.

B.6 OZONE-DEPLETING SUBSTANCES

No building-related refrigeration or air conditioning equipment with suspected ODS-containing refrigerants was observed.

B.7 SILICA

Silica is presumed to be present in vinyl floor tiles, drywall, cement, and concrete materials observed.

B.8 RECOMMENDATIONS

If identified hazardous building materials are to be impacted during the planned renovation project, action will be required in accordance with the material-by-material general recommendations provided in Section 5.0 of the main body of this report.

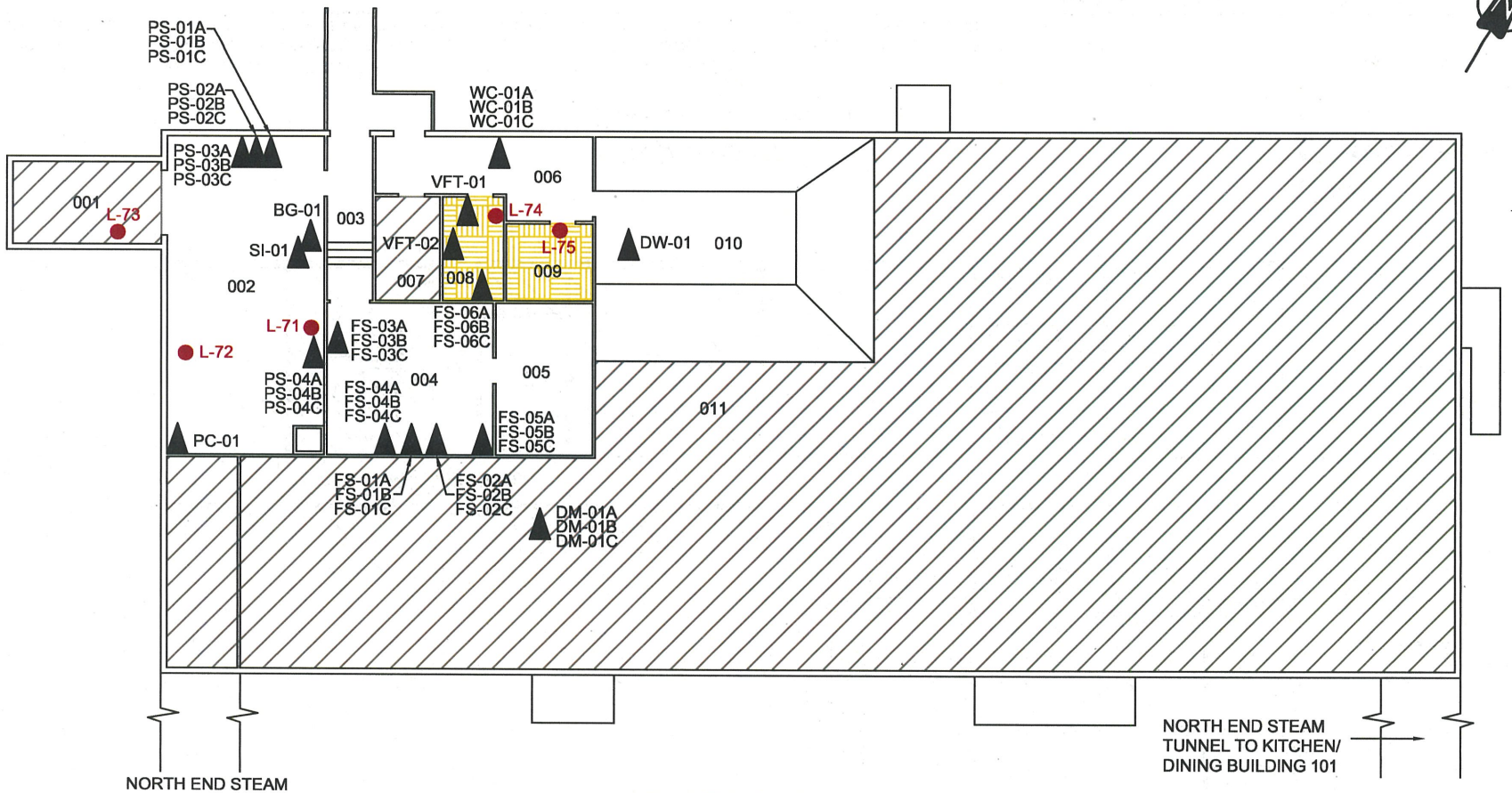
Additional building-specific recommendations to be considered are provided below.

B.8.1 Asbestos

Identified asbestos-containing parging cement observed to be in poor condition, as listed in Table B-2 (damaged material present on 6 fittings), should be abated (removed or repaired) in accordance with the requirements of the Canada Labour Code and BC Reg. 296/97 It is expected that this will require the involvement of an experienced asbestos abatement contractor.

B.8.2 Lead

If work will impact potential LCPs as outlined herein, additional sampling should be conducted to confirm lead content such that an appropriate risk assessment can be completed for the work that will be conducted.



BASEMENT
INMATE TRAINING

LEGEND

- ASBESTOS BULK SAMPLE
- LEAD PAINT SAMPLE
- ACM VINYL FLOOR TILES
- AREAS NOT INCLUDED IN ASSESSMENT

NOTES: 1. GREY MASTIC ON SEAMS OF HVAC DUCTING THROUGHOUT IS ASBESTOS-CONTAINING.
2. PARGING CEMENT APPLIED TO FITTINGS (ELBOWS AND VALVES) OF MECHANICAL PIPES THROUGHOUT IS ASBESTOS-CONTAINING.
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

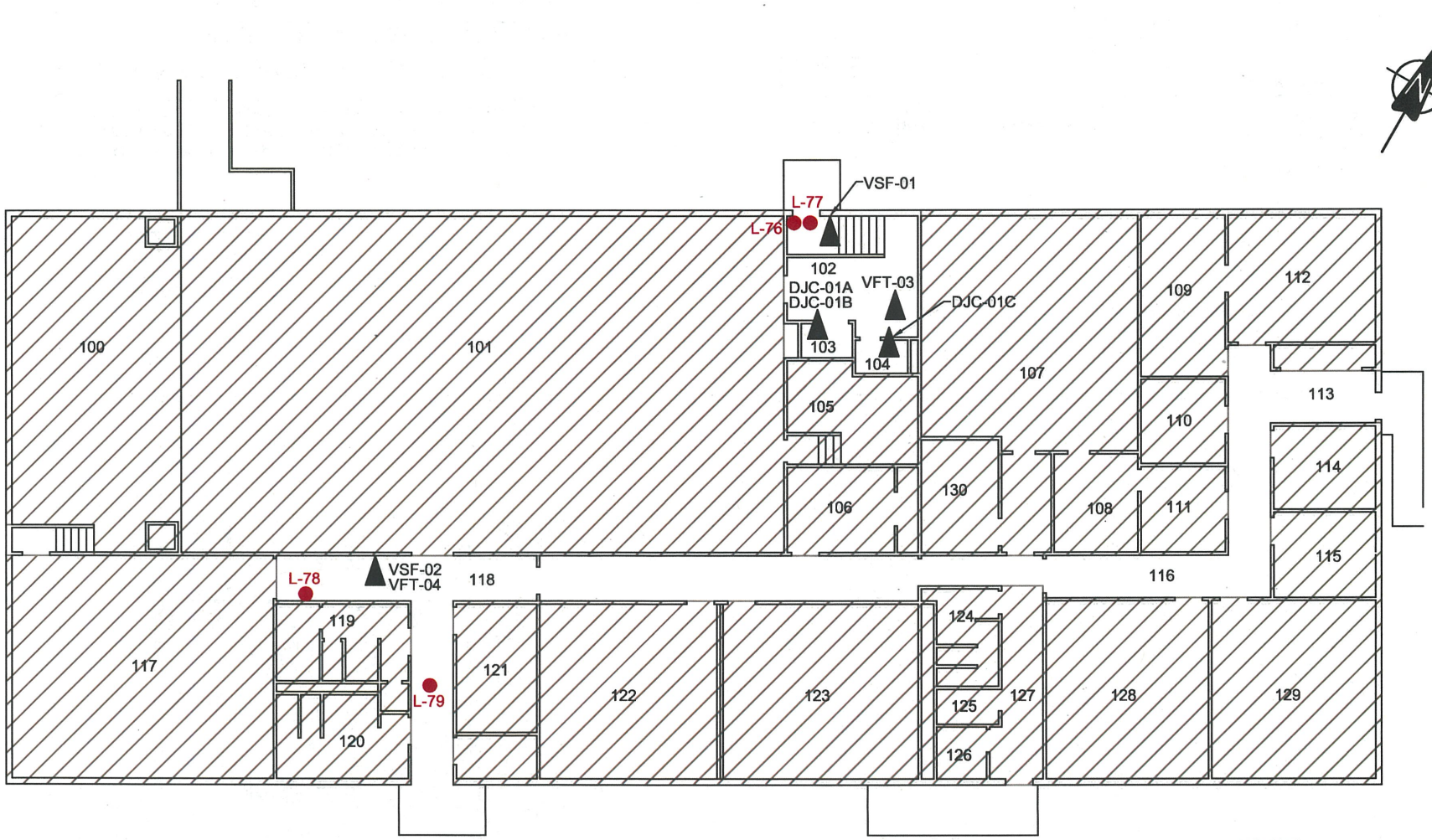
UNIT 103, WILLIAM HEAD INSTITUTION, VICTORIA, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA, PACIFIC REGION

Project No.:	123220504
Scale:	N.T.S.
Date:	16/03/30
Dwn. By:	CD SL2016030367 PK/DM
App'd By:	TW

Dwg. No.: B1

Stantec



GROUND FLOOR
INMATE TRAINING

LEGEND

- ASBESTOS BULK SAMPLE
- LEAD PAINT SAMPLE
- AREAS NOT INCLUDED IN ASSESSMENT

NOTES: 1. **GREY MASTIC ON SEAMS OF HVAC DUCTING THROUGHOUT IS ASBESTOS-CONTAINING.**
2. **PARGING CEMENT APPLIED TO FITTINGS (ELBOWS AND VALVES) OF MECHANICAL PIPES THROUGHOUT IS ASBESTOS-CONTAINING.**
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

UNIT 103, WILLIAM HEAD INSTITUTION, VICTORIA, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA, PACIFIC REGION

Project No.:	123220504
Scale:	N.T.S.
Date:	16/03/31
Dwn. By:	CD SL2016030388 PK/DM
App'd By:	TW

Dwg. No.: B2

Stantec

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Attn: Amanda Bell
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 2/16/2016
Analyzed: 2/23/2016

Proj: 123220504.200.1

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: DJC-01A ***Lab Sample ID:*** **691600131-0472**
Sample Description: Inmate Training - Room 103/Drywall Joint Compound Applied to Drywall Walls & Ceiling

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	0%	100%	None Detected	

Client Sample ID: DJC-01B ***Lab Sample ID:*** **691600131-0473**
Sample Description: Inmate Training - Room 103/Drywall Joint Compound Applied to Drywall Walls & Ceiling

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	0%	100%	None Detected	

Client Sample ID: DJC-01C ***Lab Sample ID:*** **691600131-0474**
Sample Description: Inmate Training - Room 103/Drywall Joint Compound Applied to Drywall Walls & Ceiling

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/20/2016	White	0%	100%	None Detected	

Client Sample ID: VSF-01 ***Lab Sample ID:*** **691600131-0475**
Sample Description: Inmate Training - Room 102/Vinyl Sheet Flooring, Light & Dark Beige Small Rock Pattern

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Brown	0.0%	100%	None Detected	

Client Sample ID: VSF-01-Mastic ***Lab Sample ID:*** **691600131-0475A**
Sample Description: Inmate Training - Room 102/Vinyl Sheet Flooring, Light & Dark Beige Small Rock Pattern

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Brown	0.0%	100%	None Detected	

Client Sample ID: VSF-02 ***Lab Sample ID:*** **691600131-0476**
Sample Description: Inmate Training - Hallway 118/Vinyl Sheet Flooring, Blue/Grey 1st Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	No mastic present

Client Sample ID: VFT-01 ***Lab Sample ID:*** **691600131-0477**
Sample Description: Inmate Training - Room 008/Vinyl Floor Tile, Dark Blue w/White Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	98.4%	**1.6% Chrysotile**	

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: VFT-01-Mastic ***Lab Sample ID:*** **691600131-0477A**

Sample Description: Inmate Training - Room 008/Vinyl Floor Tile, Dark Blue w/White Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Black	0.0%	100%	None Detected	

Client Sample ID: VFT-02-Floor Tile ***Lab Sample ID:*** **691600131-0478**

Sample Description: Inmate Training - Room 008/Vinyl Floor Tile, Light Blue w/White Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Blue/Green	0.0%	97.4%	**2.6% Chrysotile**	

Client Sample ID: VFT-02-Mastic ***Lab Sample ID:*** **691600131-0478A**

Sample Description: Inmate Training - Room 008/Vinyl Floor Tile, Light Blue w/White Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Black	0%	100%	None Detected	

Client Sample ID: VFT-03 ***Lab Sample ID:*** **691600131-0479**

Sample Description: Inmate Training - Room 102/Vinyl Floor Tile, Grey w/Light Grey Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: VFT-03-Mastic ***Lab Sample ID:*** **691600131-0479A**

Sample Description: Inmate Training - Room 102/Vinyl Floor Tile, Grey w/Light Grey Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Black	0.0%	99.6%	**0.35% Chrysotile**	

Client Sample ID: VFT-04-Tile ***Lab Sample ID:*** **691600131-0480**

Sample Description: Inmate Training - Hallway 118/Vinyl Floor Tile, Grey 2nd Layer Beneath VSF-02

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: VFT-04-Mastic ***Lab Sample ID:*** **691600131-0480A**

Sample Description: Inmate Training - Hallway 118/Vinyl Floor Tile, Grey 2nd Layer Beneath VSF-02

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Yellow	0%	100%	None Detected	

Client Sample ID: PS-01A ***Lab Sample ID:*** **691600131-0481**

Sample Description: Inmate Training - Room 002/Pipe Sealant, Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PS-01B ***Lab Sample ID:*** **691600131-0482**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-01C ***Lab Sample ID:*** **691600131-0483**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-02A ***Lab Sample ID:*** **691600131-0484**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Blue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Blue	0%	100%	None Detected	

Client Sample ID: PS-02B ***Lab Sample ID:*** **691600131-0485**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Blue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Blue	0%	100%	None Detected	

Client Sample ID: PS-02C ***Lab Sample ID:*** **691600131-0486**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Blue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Blue	0%	100%	None Detected	

Client Sample ID: PS-03A ***Lab Sample ID:*** **691600131-0487**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-03B ***Lab Sample ID:*** **691600131-0488**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-03C ***Lab Sample ID:*** **691600131-0489**
Sample Description: Inmate Training - Room 002/Pipe Sealant, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Yellow	0%	100%	None Detected	

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PS-04A ***Lab Sample ID:*** **691600131-0490**

Sample Description: Inmate Training - Room 002/Pipe Sealant, White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-04B ***Lab Sample ID:*** **691600131-0491**

Sample Description: Inmate Training - Room 002/Pipe Sealant, White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-04C ***Lab Sample ID:*** **691600131-0492**

Sample Description: Inmate Training - Room 002/Pipe Sealant, White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: FS-01A ***Lab Sample ID:*** **691600131-0493**

Sample Description: Inmate Training - Room 004/Fire Stopper, Light Grey, Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-01B ***Lab Sample ID:*** **691600131-0494**

Sample Description: Inmate Training - Room 004/Fire Stopper, Light Grey, Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-01C ***Lab Sample ID:*** **691600131-0495**

Sample Description: Inmate Training - Room 004/Fire Stopper, Light Grey, Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/20/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-02A ***Lab Sample ID:*** **691600131-0496**

Sample Description: Inmate Training - Room 004/Fire Stopper, Dark Grey, Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-02B ***Lab Sample ID:*** **691600131-0497**

Sample Description: Inmate Training - Room 004/Fire Stopper, Dark Grey, Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FS-02C ***Lab Sample ID:*** **691600131-0498**
Sample Description: Inmate Training - Room 004/Fire Stopper, Dark Grey, Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-03A ***Lab Sample ID:*** **691600131-0499**
Sample Description: Inmate Training - Room 004/Fire Stopper, Red, Mastic, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Red	0.0%	100%	None Detected	

Client Sample ID: FS-03B ***Lab Sample ID:*** **691600131-0500**
Sample Description: Inmate Training - Room 004/Fire Stopper, Red, Mastic, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Red	0.0%	100%	None Detected	

Client Sample ID: FS-03C ***Lab Sample ID:*** **691600131-0501**
Sample Description: Inmate Training - Room 004/Fire Stopper, Red, Mastic, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Red	0%	100%	None Detected	

Client Sample ID: FS-04A ***Lab Sample ID:*** **691600131-0502**
Sample Description: Inmate Training - Room 004/Fire Stopper, Medium Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-04B ***Lab Sample ID:*** **691600131-0503**
Sample Description: Inmate Training - Room 004/Fire Stopper, Medium Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-04C ***Lab Sample ID:*** **691600131-0504**
Sample Description: Inmate Training - Room 004/Fire Stopper, Medium Mortar, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-05A ***Lab Sample ID:*** **691600131-0505**
Sample Description: Inmate Training - Room 004/Fire Stopper, Grey Applied to 3" Electrical Conduit Lines, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FS-05B ***Lab Sample ID:*** **691600131-0506**

Sample Description: Inmate Training - Room 004/Fire Stopper, Grey Applied to 3" Electrical Conduit Lines, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-05C ***Lab Sample ID:*** **691600131-0507**

Sample Description: Inmate Training - Room 004/Fire Stopper, Grey Applied to 3" Electrical Conduit Lines, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: FS-06A ***Lab Sample ID:*** **691600131-0508**

Sample Description: Inmate Training - Room 004/Fire Stopper, Grey Putty Applied to Electrical Conduit lines, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: FS-06B ***Lab Sample ID:*** **691600131-0509**

Sample Description: Inmate Training - Room 004/Fire Stopper, Grey Putty Applied to Electrical Conduit lines, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: FS-06C ***Lab Sample ID:*** **691600131-0510**

Sample Description: Inmate Training - Room 004/Fire Stopper, Grey Putty Applied to Electrical Conduit lines, Wall Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: DM-01A ***Lab Sample ID:*** **691600131-0511**

Sample Description: Inmate Training - Crawlspace (011)/Duct Mastic, Grey

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	99.3%	**0.68% Chrysotile**	

Client Sample ID: DM-01B ***Lab Sample ID:*** **691600131-0512**

Sample Description: Inmate Training - Crawlspace (011)/Duct Mastic, Grey

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016				Positive Stop (Not Analyzed)	

Client Sample ID: DM-01C ***Lab Sample ID:*** **691600131-0513**

Sample Description: Inmate Training - Crawlspace (011)/Duct Mastic, Grey

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016				Positive Stop (Not Analyzed)	

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Customer ID: 55JACQ30L
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Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: WC-01A **Lab Sample ID:** 691600131-0514
Sample Description: Inmate Training - Room 006/Window Caulking Grey

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: WC-01B **Lab Sample ID:** 691600131-0515
Sample Description: Inmate Training - Room 006/Window Caulking Grey

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/22/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: WC-01C **Lab Sample ID:** 691600131-0516
Sample Description: Inmate Training - Room 006/Window Caulking Grey

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: DW-01A **Lab Sample ID:** 691600131-0517
Sample Description: Inmate Training - Room 010/Duct Wrap, Applied to Fiberglass Insulaiton

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	70%	30%	None Detected	

Client Sample ID: PC-01 **Lab Sample ID:** 691600131-0518
Sample Description: Inmate Training - Room 002/Parging Cement Applied to Hot Water Return Line to Steam Tunnel

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	80%	19%	**1% Amosite**	

Client Sample ID: BG-01 **Lab Sample ID:** 691600131-0519
Sample Description: Inmate Training - Room 002/Boiler Gasket

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	80%	20%	None Detected	

Client Sample ID: SI-01 **Lab Sample ID:** 691600131-0520
Sample Description: Inmate Training - Room 002/Stack Insulaiton Applied to Boiler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	60%	40%	None Detected	

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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

John Biesiadecki	PLM (15) PLM Grav. Reduction (10)
Natalie D'Amico	PLM (15) PLM Grav. Reduction (8)
Romeo Samson	PLM (4)

Reviewed and approved by:

Alice Feng, Laboratory Manager
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Burnaby, BC

Initial report from: 02/23/201614:20:05

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EMSL Canada Or	551601713
CustomerID:	55JACQ30L
CustomerPO:	123220504.200.1
ProjectID:	

Attn: **Amanda Bell**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 02/17/16 10:11 AM
Collected:

Project: **123220504.200.1 INMATE TRAINING**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
L-71	*551601713-0001*		2/22/2016	<510 ppm
	Site: WHITE- ROOM 002 Insufficient sample to reach reporting limit.			
L-72	*551601713-0002*		2/22/2016	600 ppm
	Site: GREY- ROOM 002			
L-73	*551601713-0003*		2/22/2016	470 ppm
	Site: DARK GREY- ROOM 001			
L-74	*551601713-0004*		2/22/2016	<270 ppm
	Site: BRIGHT TEAL- ROOM 008 Insufficient sample to reach reporting limit.			
L-75	*551601713-0005*		2/24/2016	30000 ppm
	Site: RED/BROWN- ROOM 009 Insufficient sample to achieve quantitative result. (Result provided is an estimate)			
L-76	*551601713-0006*		2/22/2016	720 ppm
	Site: CREAM- ROOM 102, WALLS			
L-77	*551601713-0007*		2/24/2016	<1800 ppm
	Site: BROWN- ROOM 102, DOOR & TRIM Insufficient sample to achieve quantitative result. (Result provided is an estimate)			
L-78	*551601713-0008*		2/22/2016	<630 ppm
	Site: TAN/ BROWN - HALLWAY (118) Insufficient sample to reach reporting limit.			
L-79	*551601713-0009*		2/22/2016	480 ppm
	Site: CREAM- HALLWAY (118), OWSJ			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, LLC, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 02/24/2016 15:36:47

APPENDIX C
FINDINGS AND RECOMMENDATIONS—STANDBY POWER PLANT

Appendix C FINDINGS AND RECOMMENDATIONS—STANDBY POWER PLANT

The Standby Power Plant was reportedly constructed prior to 1990. It is located outside of the main gates of the facility and consists of one level. The typical structural components and finishes associated with this building consist of concrete exterior and interior walls, concrete floor, and a metal ceiling.

Building materials throughout the structure were assessed as part of this project, as it was communicated that all materials may be disturbed by planned renovations.

The results of the assessment for each of the considered hazardous materials within the subject areas are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

C.1 ASBESTOS

Stantec identified and sampled the following suspected ACMs:

- Fire-stop/wall protector
- Assorted mastics
- Foam Insulation

Samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table C-1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table C-1 Suspected ACM Sample Collection and Analysis Summary Standby Power Plant, William Head Institution, Victoria, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
FS-01A	Fire Stopper, Red, Applied to Diesel Tank Line Penetrations	Room 100	Not Detected
FS-01B	Fire Stopper, Red, Applied to Diesel Tank Line Penetrations	Room 100	Not Detected
FS-01C	Fire Stopper, Red, Applied to Diesel Tank Line Penetrations	Room 100	Not Detected
PM-01A	Penetration Mastic, White, Wall	Exterior	Not Detected

Table C-1 Suspected ACM Sample Collection and Analysis Summary Standby Power Plant, William Head Institution, Victoria, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PM-01B	Penetration Mastic, White, Wall	Exterior	Not Detected
PM-01C	Penetration Mastic, White, Wall	Exterior	Not Detected
FM-01A	Flashing Mastic, Black	Exterior, Roof	Not Detected
FM-01B	Flashing Mastic, Black	Exterior, Roof	Not Detected
FM-01C	Flashing Mastic, Black	Exterior, Roof	Not Detected
PFI-01A	Penetration Foam Insulation, Yellow	Room 100	Not Detected
PFI-01B	Penetration Foam Insulation, Yellow	Room 100	Not Detected
PFI-01C	Penetration Foam Insulation, Yellow	Room 100	Not Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

C.2 LEAD

Lead is expected to be present in the following:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used on domestic water lines, in bell fittings for cast iron pipes and/or in electrical equipment

With respect to paint, paint chip samples were obtained from the predominant suspected LCP applications within the subject areas. A summary of the sample types, locations and analytical results is presented in Table C-2, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table C-2 Suspected LCP Sample Collection and Analysis Summary Standby Power Plant, William Head Institution, Victoria, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
L-40	**Grey**	**Room 100, Concrete Floors**	**1,400**	**Yes**
L-41	Yellow	Room 100, Walls	<170	No
L-42	**Red**	**Room 100 and Exterior, Vent, Windows, and Door Trim**	**1,800**	**Yes**

Table C-2 Suspected LCP Sample Collection and Analysis Summary Standby Power Plant, William Head Institution, Victoria, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
L-43	White	Exterior	<200	No
L-44	White	Ceiling	<290	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table C-3, below were identified as LCPs.

Table C-3 Summary of Identified LCPs Standby Power Plant, William Head Institution, Victoria, BC

Identified LCP Description	Photo
Grey coloured paint on the concrete floor within room 100. This paint was observed to be in generally good condition with localized areas where paint has worn from the surface (not bubbling, flaking, or peeling).	
Red coloured paint on the vent, windows, and door trim within room 100 and exterior. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	

C.3 POLYCHLORINATED BIPHENYLS

Based on the construction date of the subject building, PCBs may be present in the fluorescent light ballasts of the approximately seven light fixtures observed. As the ballasts were energized, they could not be inspected at the time of the assessment for health and safety reasons.

C.4 MERCURY

Mercury vapour is likely to be present in the light tubes within the approximately seven fluorescent light fixtures observed. Mercury may also be present in paints and adhesives.

C.5 MOULD

No mould and/or moisture-impacted building materials were observed.

C.6 OZONE-DEPLETING SUBSTANCES

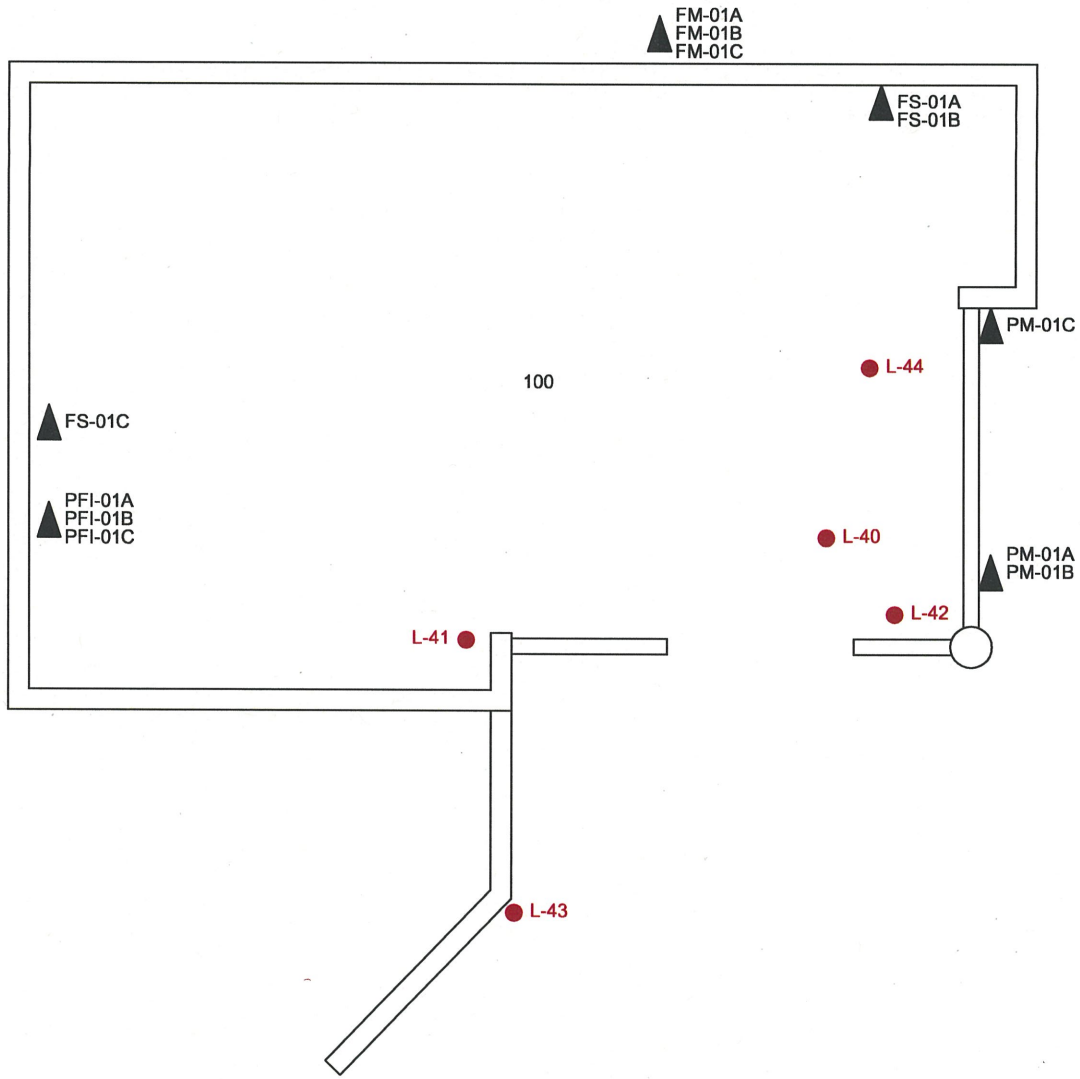
No building-related refrigeration or air conditioning equipment with suspected ODS-containing refrigerants was observed.

C.7 SILICA

Silica is presumed to be present in cement and concrete materials observed.

C.8 RECOMMENDATIONS

If identified hazardous building materials are to be impacted during the planned renovation project, action will be required in accordance with the material-by-material general recommendations provided in Section 5.0 of the main body of this report.



STANDBY POWER PLANT

LEGEND

- ASBESTOS BULK SAMPLE
- LEAD PAINT SAMPLE

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

UNIT 115, WILLIAM HEAD INSTITUTION, VICTORIA, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA, PACIFIC REGION

Project No.:	123220504
Scale:	N.T.S.
Date:	16/03/10
Dwn. By:	CD SL2016030124 PK/DM
App'd By:	TW

Dwg. No.: C1

Stantec

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Customer ID: 55JACQ30L
Customer PO:
Project ID:

Attn: Amanda Bell
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 2/16/2016
Analyzed: 2/24/2016

Proj: 123220504.200.1

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FS-01A ***Lab Sample ID:*** **691600131-0339**
Sample Description: Stanby Power Plant - Room 100/Fire Stopper, Red, Applied to Diesel Tank Line Penetrations

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Red	0.0%	100%	None Detected	

Client Sample ID: FS-01B ***Lab Sample ID:*** **691600131-0340**
Sample Description: Stanby Power Plant - Room 100/Fire Stopper, Red, Applied to Diesel Tank Line Penetrations

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Red	0.0%	100%	None Detected	

Client Sample ID: FS-01C ***Lab Sample ID:*** **691600131-0341**
Sample Description: Stanby Power Plant - Room 100/Fire Stopper, Red, Applied to Diesel Tank Line Penetrations

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Red	0.0%	100%	None Detected	

Client Sample ID: PM-01A ***Lab Sample ID:*** **691600131-0342**
Sample Description: Stanby Power Plant - Exterior/Penetration Mastic, White Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	White	0.0%	100%	None Detected	

Client Sample ID: PM-01B ***Lab Sample ID:*** **691600131-0343**
Sample Description: Stanby Power Plant - Exterior/Penetration Mastic, White Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	White	0.0%	100%	None Detected	

Client Sample ID: PM-01C ***Lab Sample ID:*** **691600131-0344**
Sample Description: Stanby Power Plant - Exterior/Penetration Mastic, White Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	White	0.0%	100%	None Detected	

Client Sample ID: FM-01A ***Lab Sample ID:*** **691600131-0345**
Sample Description: Stanby Power Plant - Exterior Roof/Flashing Mastic, Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Black	0.0%	100%	None Detected	

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Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FM-01B **Lab Sample ID:** 691600131-0346
Sample Description: Stanby Power Plant - Exterior Roof/Flashing Mastic, Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Black	0.0%	100%	None Detected	

Client Sample ID: FM-01C **Lab Sample ID:** 691600131-0347
Sample Description: Stanby Power Plant - Exterior Roof/Flashing Mastic, Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Black	0.0%	100%	None Detected	

Client Sample ID: PFI-01A **Lab Sample ID:** 691600131-0348
Sample Description: Stanby Power Plant - Room 100/Penetration Foam Insulaiton, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: PFI-01B **Lab Sample ID:** 691600131-0349
Sample Description: Stanby Power Plant - Room 100/Penetration Foam Insulaiton, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Yellow	0.0%	100%	None Detected	

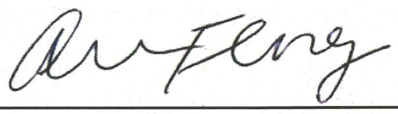
Client Sample ID: PFI-01C **Lab Sample ID:** 691600131-0350
Sample Description: Stanby Power Plant - Room 100/Penetration Foam Insulaiton, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/24/2016	Yellow	0.0%	100%	None Detected	

Analyst(s):

Alice Feng PLM Grav. Reduction (8)
Kathleen Cruz PLM Grav. Reduction (4)

Reviewed and approved by:



Alice Feng, Laboratory Manager
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Burnaby, BC
Initial report from: 02/24/201621:38:05

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551601695
CustomerID:	55JACQ30L
CustomerPO:	123220504.200.1
ProjectID:	

Attn: **Amanda Bell**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 02/17/16 10:11 AM
Collected:

Project: **123220504.200.1 STANDBY POWER PLANT**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
L-40	*551601695-0001*		2/22/2016	1400 ppm
	Site: GREY- ROOM 100, CONCRETE FLOORS			
L-41	*551601695-0002*		2/22/2016	<170 ppm
	Site: YELLOW- ROOM 100, WALLS			
L-42	*551601695-0003*		2/22/2016	1800 ppm
	Site: RED- ROOM 100, VENT, WINDOW & DOOR TRIM			
L-43	*551601695-0004*		2/22/2016	<200 ppm
	Site: WHITE- EXTERIOR			
L-44	*551601695-0005*		2/22/2016	<290 ppm
	Site: WHITE- CEILING			

Insufficient sample to reach reporting limit for sample #551601695 -0002/ -0004/ -0005.

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, LLC, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 02/22/2016 14:10:44

APPENDIX D
FINDINGS AND RECOMMENDATIONS—VOCATIONAL TRAINING SHOPS

Appendix D FINDINGS AND RECOMMENDATIONS—VOCATIONAL TRAINING SHOPS

The vocational training shops were reportedly constructed prior to 1990 and consist of one level. The typical structural components and finishes associated with this building consist of exterior block walls, vinyl floor tile and concrete floors, drywall walls, and suspended ceiling tiles and metal ceilings.

Only the following areas (subject areas) were assessed for this project, as it was communicated that these may be disturbed by planned renovations:

- Rooms 110, 120, 121, 130, and 132

The results of the assessment for each of the considered hazardous materials within the subject areas are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

D.1 ASBESTOS

Stantec identified and sampled the following suspected ACMs:

- Suspended ceiling tile
- Vinyl floor tile
- Assorted caulkings, and sealants
- Fire-stop
- Pipe wrap
- Stack, boiler and pipe fitting insulation
- Vermiculite insulation

Samples of the above-noted suspected ACMs were collected and submitted to EMSL and Wes-Har for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table D-1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table D-1 Suspected ACM Sample Collection and Analysis Summary Vocational Training Shops, William Head Institution, Victoria, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
CT-01	**Suspended Ceiling Tile, 2'x4', Worm & Pinhole Fissure**	**Hallway (130)**	**1.0% Chrysotile**
VFT-01	**Vinyl Floor Tile, Black with White Streaks**	**Hallway (130)**	**2.1% Chrysotile**
PS-01A	Pipe Sealant, Yellow	Room 120	None Detected
PS-01B	Pipe Sealant, Yellow	Room 120	None Detected
PS-01C	Pipe Sealant, Yellow	Room 120	None Detected
PS-02A	Pipe Sealant, Pink	Room 120	None Detected
PS-02B	Pipe Sealant, Pink	Room 120	None Detected
PS-02C	Pipe Sealant, Pink	Room 120	None Detected
PS-03A	Pipe Sealant, Blue	Room 120	None Detected
PS-03B	Pipe Sealant, Blue	Room 120	None Detected
PS-03C	Pipe Sealant, Blue	Room 120	None Detected
FS-01A	Fire Stopper, Grey, Mortar	Room 132	None Detected
FS-01B	Fire Stopper, Grey, Mortar	Room 132	None Detected
FS-01C	Fire Stopper, Grey, Mortar	Room 132	None Detected
FS-02A	Fire Stopper, Applied to Sprinkler Penetration	Welding Shop (110)	None Detected
FS-02B	Fire Stopper, Applied to Sprinkler Penetration	Welding Shop (110)	None Detected
FS-02C	Fire Stopper, Applied to Sprinkler Penetration	Welding Shop (110)	None Detected
WC-01A	**Window Pane Caulking, Black**	**Welding Shop (110)**	**0.92% Chrysotile**
WC-01B	**Window Pane Caulking, Black**	**Welding Shop (110)**	**Positive Stop (Not Analyzed)**
WC-01C	**Window Pane Caulking, Black**	**Welding Shop (110)**	**Positive Stop (Not Analyzed)**
PW-01A	Pipe Wrap, Applied to Copper Domestic Lines	Room 132	None Detected
PW-01B	Pipe Wrap, Applied to Copper Domestic Lines	Room 132	None Detected
PW-01C	Pipe Wrap, Applied to Copper Domestic Lines	Room 132	None Detected
SI-01	**Stack Insulation, Applied to Boiler Stacks**	**Room 120**	**75% Chrysotile**
BI-01	**Boiler Insulation**	**Room 120**	**60% Chrysotile**
PI-01	**Pipe Fitting Insulation**	**Room 120**	**35.8% Chrysotile**
V-01	**Vermiculite Insulation**	**Exterior, Masonry Wall Cavities**	**Detected, Amphibole**

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table D-2, below were identified as ACMs.

Table D-2 Summary of Identified ACMs
Vocational Training Shops, William Head Institution, Victoria, BC

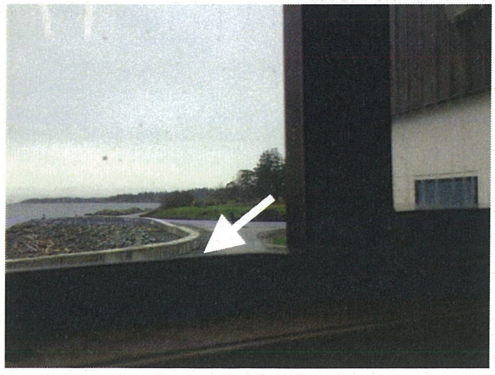
Identified ACM Description and Condition Information		Photo
Suspended ceiling tile, 2'x4', worm and pinhole fissure in Hallway (130)		
Friability	Friable	
Condition	Good	
Content	1.0% Chrysotile	
Black vinyl floor tile with white streaks within the Hallway (130).		
Friability	Non-Friable	
Condition	Good	
Content	2.1% Chrysotile	
Black window pane caulking in the Welding Shop (110).		
Friability	Non-friable	
Condition	Good	
Content	0.92% Chrysotile	

Table D-2 Summary of Identified ACMs Vocational Training Shops, William Head Institution, Victoria, BC

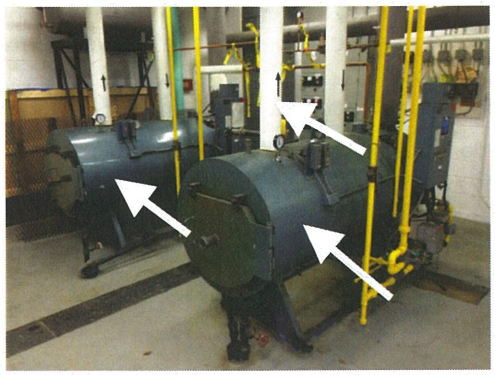
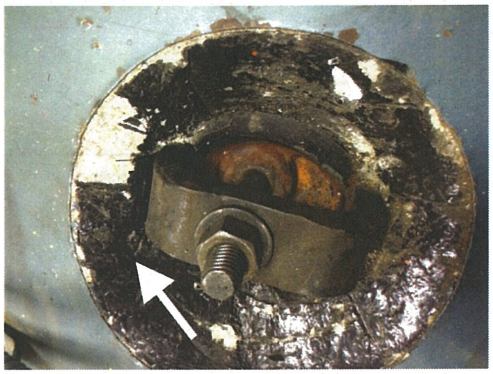
Identified ACM Description and Condition Information		Photo
Boiler insulation under the boiler jacketing of two boilers in the Mechanical Room (120) **Boiler stack insulation attached to the two boilers in the Mechanical Room (120)**		 
Friability	Friable	
Condition	Good	
Content	60% Chrysotile (Boiler Insulation) 75% Chrysotile (Stack Insulation)	

Table D-2 Summary of Identified ACMs Vocational Training Shops, William Head Institution, Victoria, BC

Identified ACM Description and Condition Information		Photo
Pipe fitting insulation on elbows, valves and two water supply and return headers in the Mechanical Room (120). This material was labelled asbestos-containing.		 
Friability	Friable	
Condition	Good	
Content	35.8% Chrysotile	
Vermiculite insulation within perimeter block wall cavities.		
Friability	Friable	
Condition	Good (where concealed within wall cavities)	
Content	Detected (not quantified), Amphibole	

D.2 LEAD

Lead is expected to be present in the following:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used on domestic water lines, in bell fittings for cast iron pipes and/or in electrical equipment
- Vent and pipe flashings

With respect to paint, six paint chip samples were obtained from the predominant suspected LCP applications within the subject areas. A summary of the sample types, locations and analytical results is presented in Table D-3, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table D-3 Suspected LCP Sample Collection and Analysis Summary Vocational Training Shops, William Head Institution, Victoria, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
L-80	White/black	Room 132, Block Walls	1,100	Yes
L-81	Grey	Sprinkler Valve Room (132), Concrete Floor	1,700	Yes
L-82	Red primer	Room 115, Open Web Steel Joist	83,000	Yes
L-83	Blue	Room 110, Walls & Ceiling	1,600	Yes
L-84	Black	Room 130, Trim	<2,600	Potential
L-85	Dark Blue	Room 120, Doors	3,800	Yes

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table D-4, below were identified as actual or potential LCPs.

Table D-4 Summary of Identified LCPs Vocational Training Shops, William Head Institution, Victoria, BC

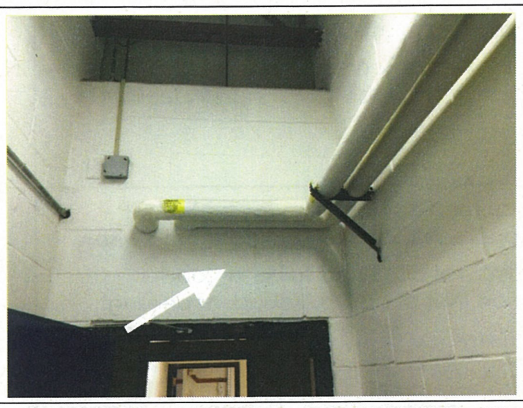
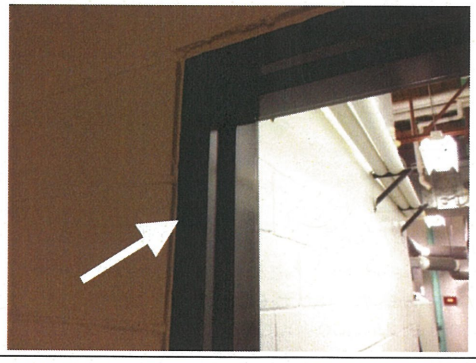
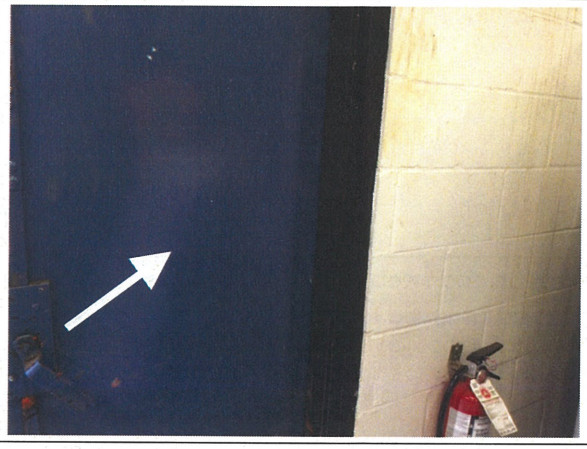
Identified LCP Description	Photo
White colored paint on block walls. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	
Grey colored paint on the concrete floor. This paint was observed to be in generally good condition with localized areas where paint has worn from the surface (bubbling, flaking, or peeling).	
Red primer on open web steel joist and pipes. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	

Table D-4 Summary of Identified LCPs
Vocational Training Shops, William Head Institution, Victoria, BC

Identified LCP Description	Photo
Blue coloured paint on walls and ceiling. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	No Photo Available
Black colored paint on trim (potential LCP – additional sampling may indicate otherwise). This paint was observed to be in good condition (not bubbling, flaking, or peeling).	
Dark blue coloured paint on doors. This paint was observed to be in good condition (not bubbling, flaking, or peeling).	

D.3 POLYCHLORINATED BIPHENYLS

Based on the construction date of the subject building, PCBs may be present in the fluorescent light ballasts of the approximately 40 light fixtures observed. As the ballasts were energized, they could not be inspected at the time of the assessment for health and safety reasons.

D.4 MERCURY

Mercury vapour is likely to be present in the light tubes within the approximately 40 fluorescent light fixtures observed. Mercury may also be present in paints and adhesives.

D.5 MOULD

No mould and/or moisture-impacted building materials were observed.

D.6 OZONE-DEPLETING SUBSTANCES

No building-related refrigeration or air conditioning equipment with suspected ODS-containing refrigerants was observed.

D.7 SILICA

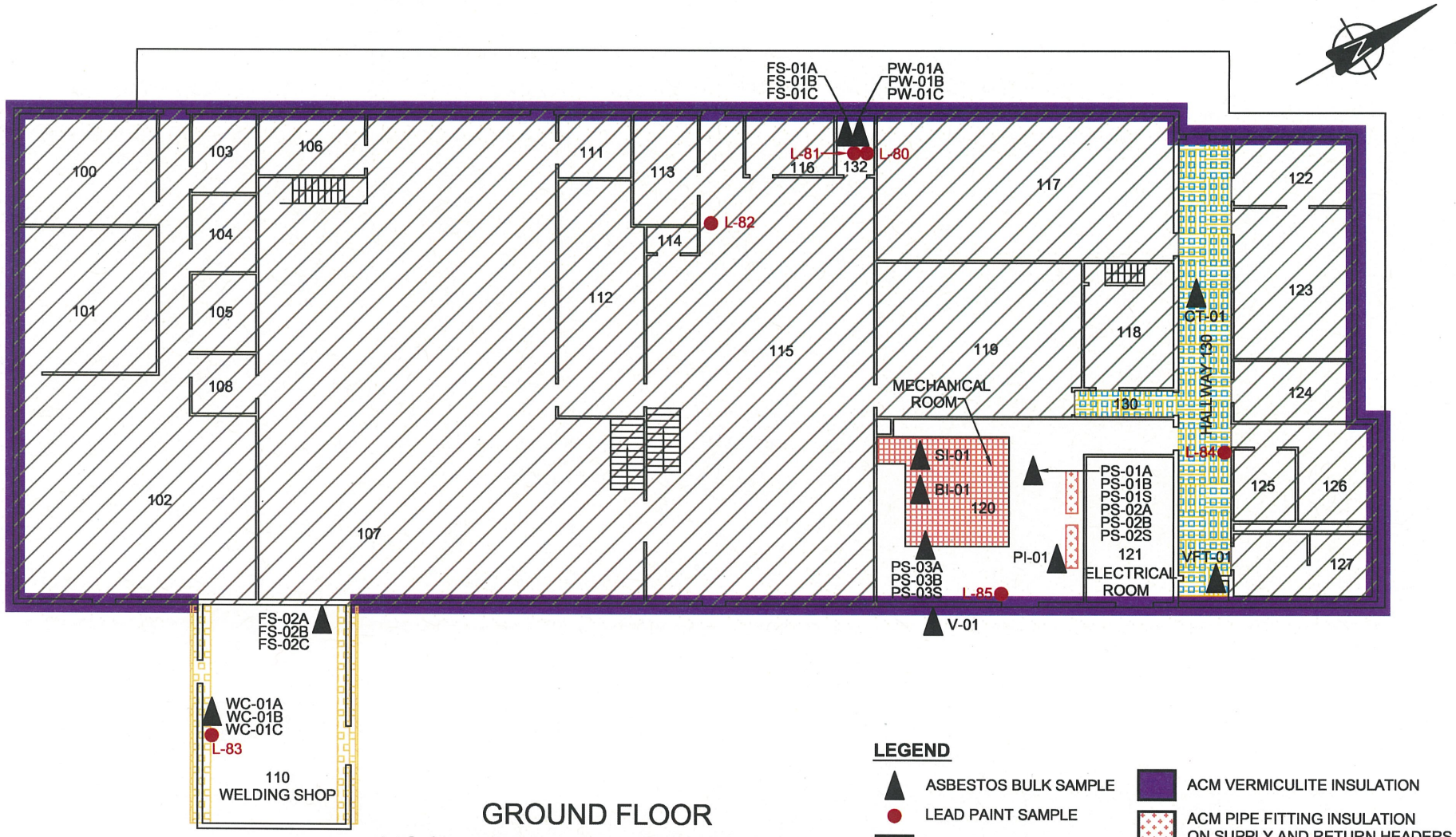
Silica is presumed to be present in ceiling tiles, vinyl floor tile, cement, and concrete materials observed.

D.8 RECOMMENDATIONS

If identified hazardous building materials are to be impacted during the planned renovation project, action will be required in accordance with the material-by-material general recommendations provided in Section 5.0 of the main body of this report.

D.8.1 Lead

If work will impact potential LCPs as outlined herein, additional sampling should be conducted to confirm lead content such that an appropriate risk assessment can be completed for the work that will be conducted.



GROUND FLOOR
VOCATIONAL TRAINING SHOPS

LEGEND

- ASBESTOS BULK SAMPLE
- LEAD PAINT SAMPLE
- ACM VINYL FLOOR TILES
- ACM CEILING TILE
- ACM VERMICULITE INSULATION
- ACM PIPE FITTING INSULATION ON SUPPLY AND RETURN HEADERS
- ACM WINDOW CAULKING
- ACM STACK AND BOILER INSULATION
- AREAS NOT INCLUDED IN ASSESSMENT

NOTES: 1. PIPE FITTING (ELBOWS AND VALVES) INSULATION THROUGHOUT IS ASBESTOS-CONTAINING.
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

UNIT 105, WILLIAM HEAD INSTITUTION, VICTORIA, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA, PACIFIC REGION

Project No.:	123220504
Scale:	N.T.S.
Date:	16/03/31
Dwn. By:	CD SL2016030389 PK/DM
App'd By:	TW

Dwg. No.: D1

Stantec

EMSL Canada Inc.

4506 Dawson Street Burnaby, BC V5C 4C1
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EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Attn: Amanda Bell
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 2/16/2016
Analyzed: 2/23/2016

Proj: 123220504.200.1

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CT-01 ***Lab Sample ID:*** **691600131-0446**

Sample Description: Vocational Training Shops - Hallway (130)/Suspended Ceiling Tile, 2'x4' Worm & Pinhole Fissure

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	Gray	80%	19%	1% Chrysotile	

Client Sample ID: VFT-01 ***Lab Sample ID:*** **691600131-0447**

Sample Description: Vocational Training Shops - Hallway (130)/Vinyl Floor Tile, Black w/White Streaks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Black	0.0%	97.9%	2.1% Chrysotile	No mastic present

Client Sample ID: PS-01A ***Lab Sample ID:*** **691600131-0448**

Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	White	0%	100%	None Detected	

Client Sample ID: PS-01B ***Lab Sample ID:*** **691600131-0449**

Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Gray	0%	100%	None Detected	

Client Sample ID: PS-01C ***Lab Sample ID:*** **691600131-0450**

Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/23/2016	Yellow	0%	100%	None Detected	

Client Sample ID: PS-02A ***Lab Sample ID:*** **691600131-0451**

Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	White/Pink	0.0%	100%	None Detected	

Client Sample ID: PS-02B ***Lab Sample ID:*** **691600131-0452**

Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	White/Pink	0.0%	100%	None Detected	

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Phone/Fax: 604-757-3158 / (604) 757-4731
http://www.EMSL.com / vancouverlab@EMSL.com

EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PS-02C **Lab Sample ID:** 691600131-0453
Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	White/Pink	0.0%	100%	None Detected	

Client Sample ID: PS-03A **Lab Sample ID:** 691600131-0454
Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Blue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Blue	0.0%	100%	None Detected	

Client Sample ID: PS-03B **Lab Sample ID:** 691600131-0455
Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Blue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Blue	0.0%	100%	None Detected	

Client Sample ID: PS-03C **Lab Sample ID:** 691600131-0456
Sample Description: Vocational Training Shops - Room 120/Pipe Sealant, Blue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Blue	0.0%	100%	None Detected	

Client Sample ID: FS-01A **Lab Sample ID:** 691600131-0457
Sample Description: Vocational Training Shops - Room 132/Fire Stopper, Grey, Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: FS-01B **Lab Sample ID:** 691600131-0458
Sample Description: Vocational Training Shops - Room 132/Fire Stopper, Grey, Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: FS-01C **Lab Sample ID:** 691600131-0459
Sample Description: Vocational Training Shops - Room 132/Fire Stopper, Grey, Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: FS-02A **Lab Sample ID:** 691600131-0460
Sample Description: Vocational Training Shops - Mechanical Room 110/Fire Stopper, Applijed to Sprinkler Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

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Phone/Fax: 604-757-3158 / (604) 757-4731
http://www.EMSL.com / vancouverlab@EMSL.com

EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FS-02B **Lab Sample ID:** 691600131-0461

Sample Description: Vocational Training Shops - Mechanical Room 110/Fire Stopper, Applijed to Sprinkler Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: FS-02C **Lab Sample ID:** 691600131-0462

Sample Description: Vocational Training Shops - Mechanical Room 110/Fire Stopper, Applijed to Sprinkler Penetration

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: WC-01A **Lab Sample ID:** 691600131-0463

Sample Description: Vocational Training Shops - Mechanical Room 110/Window Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Black	0.0%	99.1%	**0.92% Chrysotile**	

Client Sample ID: WC-01B **Lab Sample ID:** 691600131-0464

Sample Description: Vocational Training Shops - Mechanical Room 110/Window Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016				Positive Stop (Not Analyzed)	

Client Sample ID: WC-01C **Lab Sample ID:** 691600131-0465

Sample Description: Vocational Training Shops - Mechanical Room 110/Window Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016				Positive Stop (Not Analyzed)	

Client Sample ID: PW-01A **Lab Sample ID:** 691600131-0466

Sample Description: Vocational Training Shops - Room 132/Pipe Wrap, Applied to Copper Domestic Lines

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	80%	20%	None Detected	

Client Sample ID: PW-01B **Lab Sample ID:** 691600131-0467

Sample Description: Vocational Training Shops - Room 132/Pipe Wrap, Applied to Copper Domestic Lines

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	80%	20%	None Detected	

Client Sample ID: PW-01C **Lab Sample ID:** 691600131-0468

Sample Description: Vocational Training Shops - Room 132/Pipe Wrap, Applied to Copper Domestic Lines

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	2/20/2016	White	75%	25%	None Detected	

EMSL Canada Inc.

4506 Dawson Street Burnaby, BC V5C 4C1
Phone/Fax: 604-757-3158 / (604) 757-4731
http://www.EMSL.com / vancouverlab@EMSL.com

EMSL Canada Order 691600131
Customer ID: 55JACQ30L
Customer PO:
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: SI-01 ***Lab Sample ID:*** **691600131-0469**

Sample Description: Vocational Training Shops - Room 120/Stack Insulaiton, Applied to Boiler Stacks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	Gray	0%	25%	75% Chrysotile	

Client Sample ID: B1-01 ***Lab Sample ID:*** **691600131-0470**

Sample Description: Vocational Training Shops - Room 120/Boiler Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	2/19/2016	White	0%	40%	60% Chrysotile	

Client Sample ID: PI-01 ***Lab Sample ID:*** **691600131-0471**

Sample Description: Vocational Training Shops - Room 120/Pipe Fitting Insulaiton

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	2/23/2016	Gray	0.0%	64.2%	35.8% Chrysotile	

Analyst(s):

John Biesiadecki	PLM (5)
Natalie D'Amico	PLM (3) PLM Grav. Reduction (11)
Romeo Samson	PLM (1) PLM Grav. Reduction (4)

Reviewed and approved by:

Alice Feng, Laboratory Manager
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Burnaby, BC

Initial report from: 02/23/201614:15:05

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551601718
CustomerID:	55JACQ30L
CustomerPO:	123220504.200.1
ProjectID:	

Attn: **Amanda Bell**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 02/17/16 10:11 AM
Collected:

Project: **123220504.200.1 VOCATIONAL TRAINING SHOPS**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
L-80	*551601718-0001*		2/22/2016	1100 ppm
	Site: WHITE/BLACK- ROOM 132, BLOCK WALLS			
L-81	*551601718-0002*		2/22/2016	1700 ppm
	Site: GREY- SPRINKLER VALVE ROOM (132), CONCRETE FLOOR			
L-82	*551601718-0003*		2/22/2016	83000 ppm
	Site: RED PRIMER- ROOM 115, OWSJ			
L-83	*551601718-0004*		2/22/2016	1600 ppm
	Site: BLUE- ROOM 110, WALLS & CEILING			
L-84	*551601718-0005*		2/24/2016	<2600 ppm
	Site: BLACK- ROOM 130, TRIM Insufficient sample to achieve quantitative result. (Result provided is an estimate)			
L-85	*551601718-0006*		2/24/2016	3800 ppm
	Site: DARK BLUE- ROOM 120, DOORS Insufficient sample to achieve quantitative result. (Result provided is an estimate)			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, LLC, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 02/24/2016 15:38:17

Wes-Har Asbestos Analysis & Consulting Ltd.

Bulk Asbestos in Vermiculite Report

For Stantec [Burnaby]
500 - 4730 Kingsway,
Burnaby, BC, V5H 0C6

Location : William Head Institution

Project : 123220504.

14936	200.100	Sample Location / Description	Result(s)	Analyzed	Analyst	ACM
1	30V-1ABC	Vermiculite Insulation, Central Stores Attic [Sample # 30-V-01ABC - Combined From Samples 1, 2 and 3]	Asbestos Fibres Not Detected DNQ Cellulose Fibres DNQ Vermiculite DNQ Non-fibrous	Feb 24 2016	HM	---
* Results Suspected: Not Enough Sample Size [Net Weight: 33.98 grams]						
4	03V-1ABC	Vermiculite Insulation, Garage, Engineering & Carpenter Attic [Sample # 03-V-01ABC - Combined from Samples 4, 5 and 6]	Asbestos Fibres Not Detected DNQ Cellulose Fibres DNQ Fibrous Glass DNQ Vermiculite DNQ Non-fibrous	Feb 24 2016	HM	---
* Results Suspected: Not Enough Sample Size. (Net Weight:31.84 grams)						
7	**105-V-01**	**Vermiculite Insulation, Vocational Training Shops BLck Wall**	**DNQ Asbestiform Amphibole** **DNQ Vermiculite** **DNQ Non-fibrous**	**Feb 24 2016**	**HM**	**.T.**

Comments

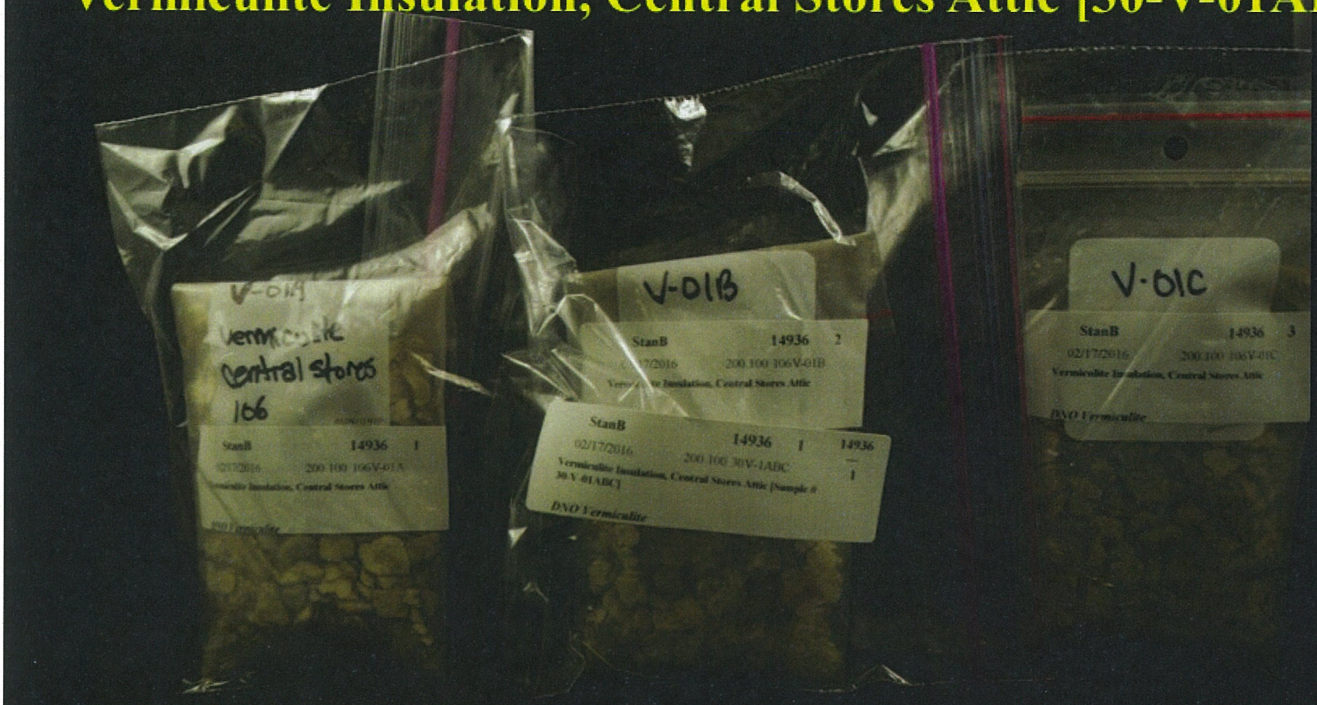
Fibrous / Mineral Components Analyzed In Accordance With The NIOSH ASBESTOS (bulk) by PLM Method 9002 [15 August 1994]
Research Method for Sampling and Analysis of Fibrous Amphibole in Vermiculite Attic Insulation EPA/600/R-04/004 January 2004
Detection Limit for Asbestiform Amphibole 'Rapid Screening' is less than 0.01 % (by weight) , Dependant on Original Sample Size
ACM Means - Asbestos Containing Material; T - Present
LP Means - Precent : Layer or Phase of Whole Sample.
DNQ Means - Detected Not Quantitated
< Means - Less Than
Samples Submitted Will Be Retained For 30 Days After Receipt And Will Be Disposed Of Thereafter Unless Otherwise Notified In Writing
Sample Submitted By Stantec [Burnaby]

February 24, 2016 [Facsimile]

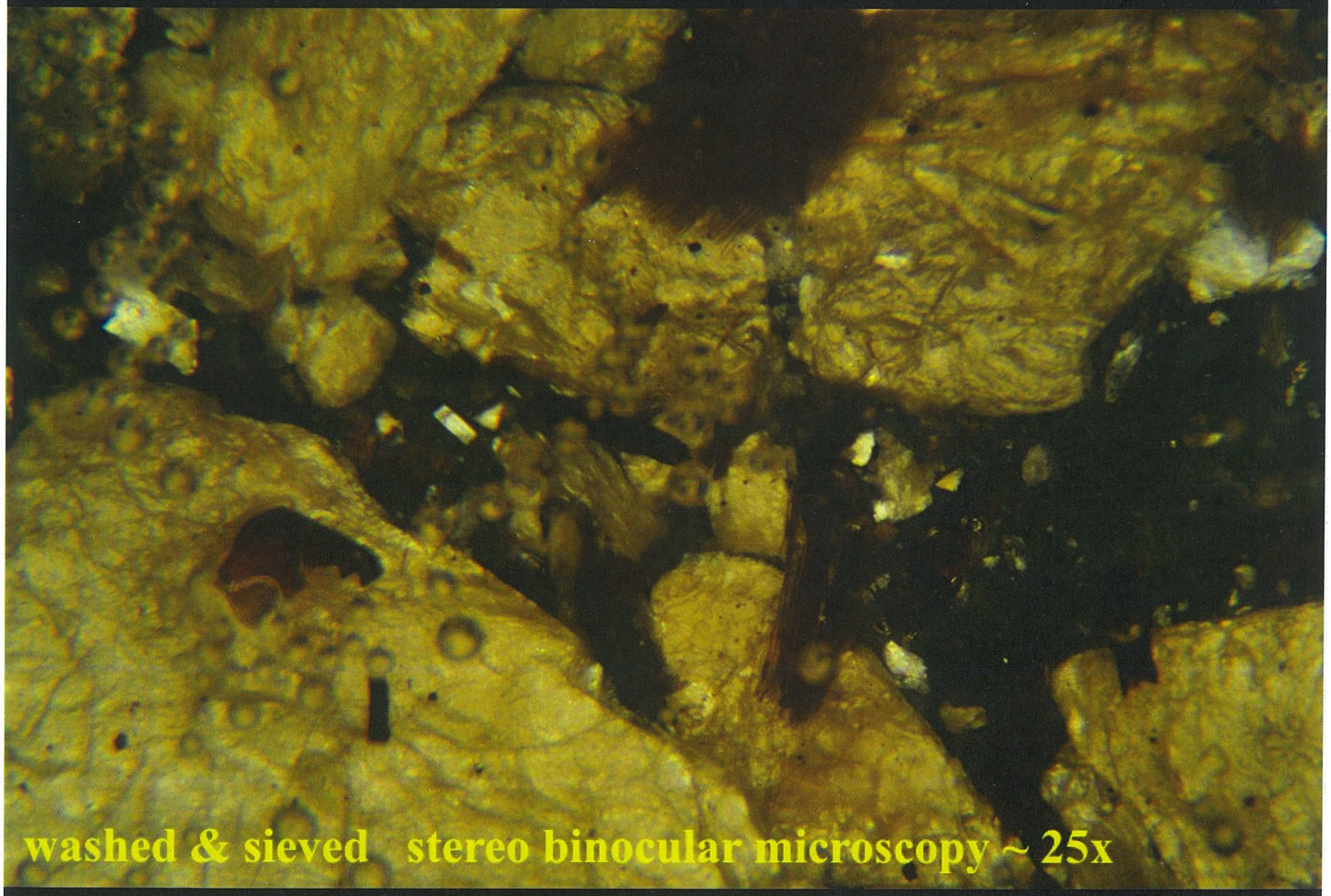
H. McKnight
Analyst

H. McKnight
Reviewed By

William Head Istitution [123220504.200.100]
Vermiculite Insulation, Central Stores Attic [30-V-01ABC]



submitted sample

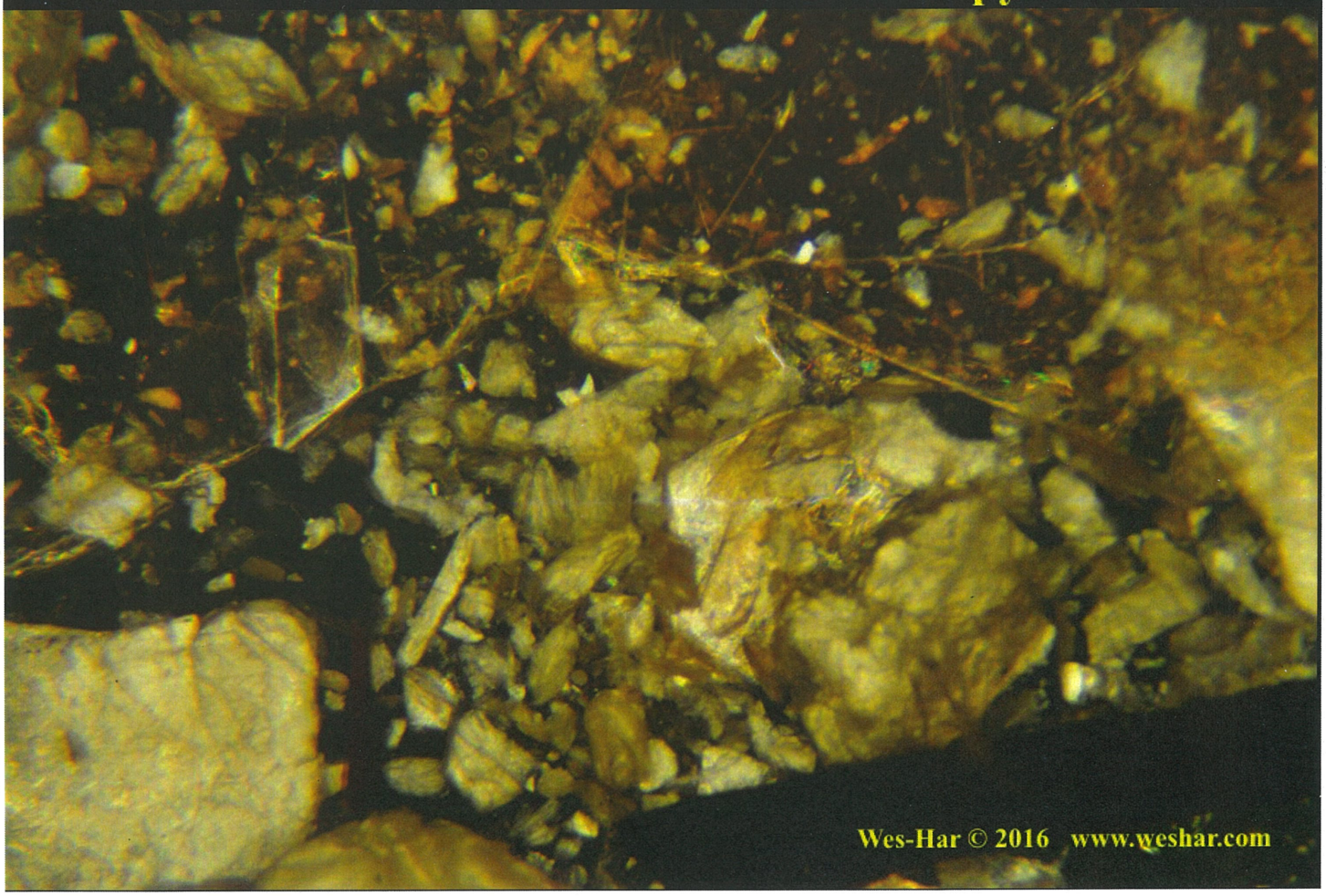


washed & sieved stereo binocular microscopy ~ 25x

William Head Istitution [123220504.200.100]
Vermiculite Insulation, Central Stores Attic [03-V-01ABC]

submitted sample

washed & sieved stereo binocular microscopy ~ 25x

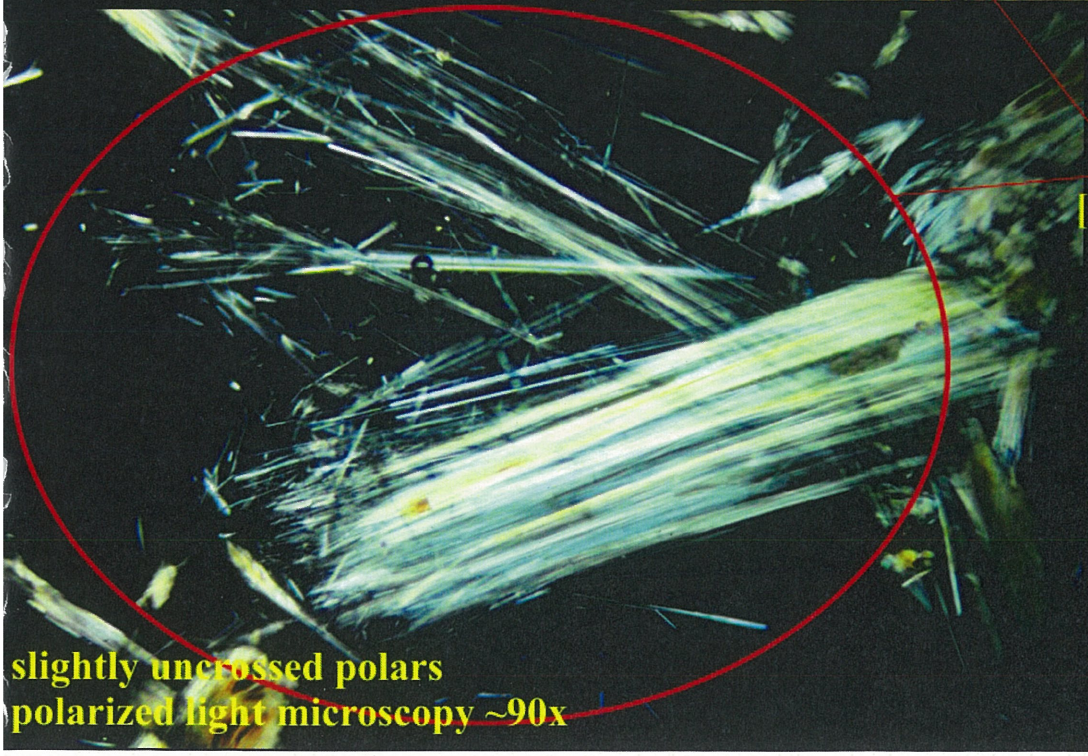


123220504.200.100 105-V-01 William Head Institution
Vocational Training Shops Block Wall
Vermiculite Insulation
14936 . 03

submitted sample

stereo binocular microscopy ~ 25x

washed & sieved



asbestos fibres
[asbestiform amphiboles]

slightly uncrossed polars
polarized light microscopy ~90x

APPENDIX B

CERTIFICATE OF EXEMPTION CONTRACTOR
DECEMBER 15, 2015

BRITISH COLUMBIA | Ministry of Finance

CERTIFICATE OF EXEMPTION
CONTRACTOR

under the *Provincial Sales Tax Act*

Responsibilities for Sellers and Eligible Contractors:

Sellers – this certificate allows you to collect the information and declaration required under the *Provincial Sales Tax Act* (the Act) in order to provide a PST exemption to your customer.

If you do not receive a completed and signed certificate or the required information and declaration before the sale, you must charge and collect PST. Failure to do so may result in an assessment, penalty and interest.

Eligible Contractors – you are responsible for ensuring that you meet all the requirements for the exemption under the Act. If you complete the certificate but you do not qualify for the exemption, you are responsible for paying the PST.

General Instructions:

- Refer to **Page 2** for detailed instructions.

Freedom of Information and Protection of Privacy Act (FOIPPA)
The personal information on this form is collected for the purpose of administering the *Provincial Sales Tax Act* under the authority of both this Act and section 26 of the FOIPPA. Questions about the collection or use of this information can be directed to the Manager, Program Services, PO Box 9442 Stn Prov Govt, Victoria, BC V8W 9V4. (Telephone: toll-free at 1 877 388-4440)

PART A – CERTIFICATION OF ELIGIBLE PERSON (*see Page 2*)

NAME OF CORPORATION, ASSOCIATION, PARTNERS, INDIAN BAND OR INDIVIDUAL	MAILING ADDRESS (*including postal code*)
Public Works Gov. Canada	219 - 800 Burrard Street Vancouver, B.C. V6Z 0B9

I certify that I have entered into a contract with the eligible contractor named below for the supply and installation of affixed machinery or improvements to real property and if I were to purchase the tangible personal property identified below I would be exempt from PST because (*check (✓) one and complete the appropriate section*):

1. ☐ I am eligible for the **Production Machinery and Equipment** (PM&E) exemption under the Act.

2. ☐ I am a **status Indian** or authorized representative of an Indian band and the items being purchased would be exempt from PST under section 87 of the *Indian Act* (Canada). If you are representating an Indian band, attach written authorization from an official of the band that you are authorized to act on behalf of the Indian band.

	BAND NAME	STATUS CARD NUMBER
Indian and Indian Bands		
Indian Bands Only	NAME OF REPRESENTATIVE	

3. ☐ I am a **qualifying aquaculturist** under the Act.	AQUACULTURE LICENCE NUMBER
4. ☐ I am a **qualifying farmer** under the Act.	PROPERTY TAX FOLIO NUMBER / ADDRESS OF FARM

5. ☐ I am eligible for a PST exemption under the **Consular Tax Exemption Regulation**.	DIPLOMATIC / CONSULAR IDENTITY CARD NUMBER	EXPIRY DATE YYYY / MM / DD

I certify that the Government of Canada has entered into a contract with the eligible contractor named below for the supply and installation of affixed machinery or improvements to real property.

6. ☑ I am an **authorized representative of the Government of Canada.**	PST NUMBER PST-1000-5001

By signing this form, I certify that the above information is correct.

FULL LEGAL NAME OF INDIVIDUAL SIGNING FORM	SIGNATURE	DATE SIGNED YYYY / MM / DD
Patrick Truong	X Patrick Truong	2015/12/15

PART B – CERTIFICATION OF ELIGIBLE CONTRACTOR (*see Page 2*)

FULL LEGAL NAME	MAILING ADDRESS (*including postal code*)

Description of all items of tangible personal property (goods) being purchased (*if you require more space, attach an additional document*):

I certify that the tangible personal property (TPP) identified above is being acquired to fulfill a contract for the supply and installation of affixed machinery or improvements to real property that meets the requirements of (*check (✓) one*):

7. ☐ **Customer is the eligible person identified in Part A:** the contract is with the eligible person identified in Part A, or	ELIGIBLE CONTRACTOR'S PST NUMBER

8. ☐ **Customer pays the PST:** you have a written agreement with your customer that they will pay PST on the TPP described above and the agreement sets out the purchase price of the TPP. You must be registered for PST before supplying this TPP to your customer. You may only use this certificate in advance of receiving your PST number.

By signing this form, I certify to the best of my knowledge that the above information and any attached information is correct. I acknowledge that if I make a false statement to avoid paying tax, the *Provincial Sales Tax Act* charges a fine of up to $10,000 and/or imprisonment up to two years, in addition to a penalty of 25% of the tax due and an assessment for the tax that should have been paid.

FULL LEGAL NAME OF INDIVIDUAL SIGNING FORM	SIGNATURE	DATE SIGNED YYYY / MM / DD
	X	