Public Works and
Government Services Canada

Travaux publics et Services
Gouvernmentaux Canada

Specification

Esquimalt Graving Dock
825 Admirals Road
Victoria, BC

Access Control Systems for Office Buildings

Requisition No. EZ108-151332

Project No. R. 016116.113
October 2014

APPROVED BY:

Nov. 6/2014.
Regional Manager AES Date

2014/11/04.
Construction Safety Coordinator Date

TENDER:

2014/11/06
Project Manager Date

PROFESSIONAL
PROVINCE OF
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ENGINEER

31/10/14

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1 General

1.1 GENERAL

.1 The word ***provide*** and its derivatives shall be taken to mean supply, install, connect, test and commission the equipment as required to complete the work outlined in the contract documents.

.2 The word ***replace*** and its derivatives shall be taken to mean to provide new and remove existing as required to complete the work.

1.2 DIVISION OF SPECIFICATIONS

.1 The specifications are subdivided in accordance with the current 6-digit National Master Specification System.

.2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.

.3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the provision of new card access controls to various buildings at the Esquimalt Graving Dock, and further identified as:

Access Control System, Esquimalt Graving Dock, Victoria, BC
Job No. R.016116.113

.2 Perform all work in accordance with National Building Code of Canada (NBC), WorkSafeBC/Workers' Compensation Board (WCB) Regulations, the Canadian Electrical Code - Part I, including all Provincial and other amendments, Electrical Bulletins and any local by-laws or rules regulating the installation of electrical equipment and their seismic restraint and these Contract Documents. All work shall be to the satisfaction of the local authorities having jurisdiction. Where there is a conflict between Contract Documents and referenced standards, the most stringent will be applied.

.3 Work of this contract shall comprise the supply, installation, testing and commissioning of card access control systems, associated power and controls wiring and conduit.

1.4 DESCRIPTION OF WORK

.1 Work under this Contract covers Card Access Control Systems at Esquimalt Graving Dock, Victoria, BC.

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

.1 Supply, installation, testing and commissioning of card access control systems for various doors in existing buildings.
.2 Supply and installation of power supplies, door reader controllers, cabinets, media converters, electronic locks, door contacts, panel system, wiring, conduit, fittings and supports.
.3 Modifications to existing Lenel access control software to accommodate the addition of new door controllers.
.4 Commissioning and testing of the card access system.
.5 Demonstration and training of personnel as directed by the Departmental Representative.

.3 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work:

E100 Electrical Site Key Plan, Legend, Building and Drawing List
E101 Enlarged Electrical Site Plan (1 of 2)
E102 Enlarged Electrical Site Plan (2 of 2)
E200 NS29 – PWGSC Electrical Shop Building – Card Access Electrical Layout
E201 NS29 – PWGSC Electrical Shop Building – Card Access and Electrical Details
E210 NS38 – PWGSC Security Trailer – Card Access Electrical Layout
E211 NS38 – PWGSC Security Trailer – Card Access and Electrical Details
E220 NS32 – PWGSC Operations Building – Card Access Electrical Layout
E221 NS32 – PWGSC Operations Building – Door Access and Electrical Details (1 of 2)
E222 NS32 – PWGSC Operations Building – Door Access and Electrical Details (2 of 2)
E230 NS31 – PWGSC Operations Office Annex – Card Access Electrical Layout
E231 NS31 – PWGSC Operations Office Annex – Card Access and Electrical Details
E240 NS6 – PWGSC Pumphouse – Card Access Electrical Layout
E241 NS6 – PWGSC Pumphouse – Card Access and Electrical Details
E250 NS39 – PWGSC Temporary Water Lot – Card Access Electrical Layout
E251 NS39 – PWGSC Temporary Water Lot – Card Access and Electrical Details
E300 Typical Wiring Details
E301 Connections Flow Diagram
E302 Access Control Matrix

.4 "Green" requirements:

.1 Use only environmentally responsible green materials/ products with no VOC emissions or minimum VOC emissions of indoor off-gassing contaminants for improved indoor air quality - subject of Departmental Representative's approval of submitted MSDS Product Data.
.2 Use materials/products containing highest percentage of recycled and recovered materials practicable - consistent with maintaining cost effective satisfactory levels of competition.

.3 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.

1.5 CONTRACT METHOD

.1 Construct Work under a single fixed-price contract.

1.6 TIME OF COMPLETION

.1 Complete the project "Access Control System" ready for use by March 31, 2015.

1.7 WORK SCHEDULE

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

.2 Commence work immediately upon notification of award of contract and complete work within the schedule specified in Instructions to Bidders.

.3 Co-ordinate work with progress schedule described in Section 01 32 17 - Construction Progress Schedule.

.4 Do not change approved Schedule – without notifying Departmental Representative.

.5 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

1.8 COST BREAKDOWN

.1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price. Information on a per door cost shall be provided alongwith a full breakdown of all costs involved

1.9 EXISTING SERVICES

.1 Notify Departmental Representative of intended interruption of services and obtain required permission. Provide minimum 1 week's notice for all interruptions.

.2 Examine site and verify with the Departmental Representative all conditions likely to affect the work before submitting tender.

.3 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

.4 Submission of a tender is deemed to be confirmation that the tenderer has inspected the site and is conversant with all conditions affecting the execution and completion of the work.

.5 Protect and maintain existing active services.

.6 Construct safety barriers when working near exposed energized electrical and operating mechanical equipment.

.7 Maintain fire alarm system and access control system throughout duration of the works.

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

.9 Limit use of premises for Work, for storage and for access to allow for continuous occupancy of building.

.10 Co-ordinate use of premises under direction of the Departmental Representative.

.11 Assume full responsibility for protection and safekeeping of Products under this Contract.

.12 Do not use any other part of property unless approved in writing by the Departmental Representative.

.13 Store materials and equipment only where directed by the Departmental Representative. Obtain and pay for use of additional storage and work areas if required.

.14 Protect environment in accordance with requirements described in Section 01 35 43 - Environmental Procedures.

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

.16 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work.

.17 Condition of existing work at completion of operations to be equal to or better than that which existed before new work started.

.18 Provide necessary protection and hoarding to prevent unauthorized entry into areas of work at all times by staff and public.

.19 Inform the Departmental Representative 3 working days prior to performing work inside the building. Entry into areas of work will be by authorized personnel only and must be delineated during execution of work.

.20 The contractor can have limited access to the site from 7:00 to 17:00. The Departmental Representative will provide and coordinate site access requirements with the Contractor at time of award.

1.10 REQUIREMENTS FOR OCCUPIED BUILDINGS

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

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

.3 Adjacent portions of building and property will remain in use during Work.

.4 Co-operate with the Departmental Representative by scheduling operations to minimize conflict and to facilitate continuous use of building. Do not impede, restrict or obstruct use of building or adjacent portions of property.

.5 Do work in a manner that will minimize creation of noise that would disturb day-to-day operation of building and adjacent property.

.6 Locate stationary noise generating equipment as far away as practical from occupied parts of building, or where directed by the Departmental Representative.

.7 Co-ordinate with the Departmental Representative for necessary shutdown of services affecting occupied parts of building and adjacent property where serviced from building. Provide 72 hours of notice prior to shutdown. Minimize occurrences and durations of shutdowns.

.8 Co-ordinate with the Departmental Representative to ensure that construction activities do not compromise security of building.

.9 Ensure that construction activities do not compromise other active systems within the building.

1.11 CONTRACTOR'S USE OF PREMISES

.1 Limit use of premises to allow:
- .1 Exclusive and complete for execution of work.
- .2 Assume responsibility for assigned premises for performance of this work.
- .3 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative such as moving contractors and furniture installers.

.2 Do not unreasonably encumber the site with materials or equipment.

.3 Perform work with minimum disturbance to operating personnel, other contractors on site, and to the public. Do not interfere with ship repair operations.

.4 Electricity, compressed air, water, crane, and forklift services are available at the site. Arrange and pay for these services with the Dock Manager. Connecting lines are the Contractor's responsibility. Unless booked ahead of time, first priority for these services is to the Graving Dock operation.

.5 Safety lockouts of electrical power for equipment to be performed by Dock staff. Place lockouts or lockout tags in addition to Dock lockouts for Contractor personnel safety. Conform to WCB and EGD requirements for safety lockouts. Coordinate lockout procedure with the Departmental Representative prior to the start of work. Electrical Lockout and Isolation Permit must be approved by Joe Lezetc, Guarantor, as per EGD Lockout Policy (see Appendix A).

.6 Do not dispose of waste or volatile materials into waterways, storm sewers, or sanitary sewers. Comply with all environmental regulations concerning the proper disposal of these materials. *The Contractor shall store any liquid waste in 45-gallon drums for disposal by PWGSC Environmental Staff.* Disposal of rubbish and waste materials at the site, by any means, is not permitted (see attached EGD Environmental Best Management Practices, Appendix B).

.7 Esquimalt Graving Dock personnel will be doing miscellaneous work on the low voltage switchgear. Cooperate and coordinate schedules with Graving Dock Management to minimize equipment downtime and interference with each other's work.

1.12 SETTING OUT OF WORK

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations as indicated.

.2 Provide devices needed to lay out and construct work.

.3 Supply devices as templates required to facilitate Departmental Representative's inspection of work.

1.13 CLEANING

.1 Refer to Section 01 74 11 – Cleaning.

.2 Vacuum clean, and wipe using manufacturers' recommended products and methods all inside and outside surfaces of switchgear, transformer, and other enclosures.

.3 Clean internal components of equipment in accordance with NETA – MTS, and manufacturers' recommendations.

.4 Vacuum clean the floors of all electrical rooms once upon commencing the work, once midway through the work, and once upon completion of work at each room.

1.14 BUILDING SMOKING ENVIRONMENT

.1 Smoking within the building is not permitted.

1.15 DUST CONTROL

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

.2 Protect furnishings within work area with polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

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

1.16 PWGSC OCCUPANCY

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

.2 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate PWGSC usage.

1.17 SAFE WORK PRACTICES

.1 The contractor must conduct an initial Job Hazard Analysis with the Departmental Representative and the EGD Safety Representative. A preliminary Job Hazard Analysis is provided in Appendix C.

.2 The contractor must prepare and submit to the Departmental Representative a Project Safety Plan in writing, no later than 4 days prior to the commencement of any work. The Safety Plan will incorporate the hazard reduction activities identified in the Job Hazard Analysis as well as activities identified below.

.3 The contractor will, as part of the Project Safety Plan, conduct an initial Safety Meeting and Tour prior to the commencement of any work. All contractor personnel expected to work on the project, the Departmental Representative, EGD Maintenance/Operations Representatives, and the EGD Safety Representative will attend this meeting.

1.18 PROJECT MEETINGS

.1 Departmental Representative will arrange project meetings and assume setting times and recording and distributing minutes.

1.19 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:
- .1 Contract Drawings
- .2 Specifications
- .3 Addenda
- .4 Change Orders
- .5 Reviewed/approved shop drawings.
- .6 Other Modifications to Contract
- .7 Field Test Reports
- .8 Copy of Approved Work Schedule
- .9 Health and Safety Plan and Other Safety Related Documents
- .10 Manufacturers' installation and application instructions.
- .11 One set of record drawings and specifications for "as-built" purposes.
- .12 Canadian Electrical Code.
- .13 Current construction standards of workmanship listed in technical Sections.
- .14 Building Safety Plan.
- .15 Other documents as specified

1.20 SUBMISSION OF TENDER

.1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analysed the Contract documents and inspected the site, and is fully conversant with all conditions.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 SCHEDULES REQUIRED

.1 Submit schedule as follows.

.1 Construction progress schedule.
.2 Submittal schedule for shop drawings and product data.
.3 Product delivery schedule.

1.2 FORMAT

.1 Prepare schedule in form of horizontal bar chart (GANTT).

.2 Provide a separate bar for each major item of work, trade or operation.

.3 Provide horizontal time scale identifying first work day of each week.

.4 Format for listings: chronological order of start of each item of work.

.5 Identification of listings: by Specification subjects or system descriptions.

1.3 SUBMISSION

.1 Submit initial schedule within 7 working days after award of Contract.

.2 Submit minimum of 3 copies to be retained by the Departmental Representative.

.3 The Departmental Representative will review schedule and return review copy within 7 working days after receipt.

.4 Re-submit finalized schedule within 3 working days after return of review copy.

.5 Submit revised progress schedule with each application for payment.

.6 Distribute copies of revised schedule to:

.1 Subcontractors.
.2 Other concerned parties.

.7 Instruct recipients to report to Contractor within 5 working days, any problems anticipated by timetable shown in schedule.

1.4 SCHEDULING

.1 Include complete sequence of construction activities.

.2 Include dates for commencement and completion of each major element of construction as follows.

.3 Show projected percentage of completion of each item as of first day of week.

.4 Indicate progress of each activity to date of submission schedule.

.5 Show changes occurring since previous submission of schedule.

.1 Major changes in scope.
.2 Activities modified since previous submission.
.3 Revised projections of progress and completion.
.4 Other identifiable changes.

.6 Provide a narrative report to define.

.1 Problem areas, anticipated delays and impact on schedule.
.2 Corrective action recommended and its effect.

1.5 PROGRESS REPORTS

.1 Maintain accurate record of the progress of the Work. Submit progress reports at times requested by the Departmental Representative.

.2 Include in reports dates of commencement and percentage of work completed for different parts of the Work.

1.6 STAFFING AND OVERTIME

.1 Cease work at any particular point and transfer workers to other designated points, when so directed, should the Departmental Representative judge it necessary to expedite the Work.

.2 Should the Work fail to progress according to the approved progress schedule, work such additional time (including weekends and holidays), employ additional workers, or both, as may be required to bring the Work back on schedule, at no additional cost to Contract.

1.7 SUBMITTALS SCHEDULE

.1 Include schedule for submitting shop drawings, product data and samples.

.2 Indicate dates for submitting, review time, re-submission time, last date for meeting fabrication schedule.

.3 Include dates when reviewed submittals will be required from the Departmental Representative.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 ADMINISTRATIVE

.1 This Section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Departmental Representative for review. Additional specific requirements for submissions are specified in individual technical sections.

.2 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

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

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

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

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

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

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

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

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

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

.12 Make any changes in submissions which Departmental Representative may require consistent with Contract documents and resubmit as directed by Departmental Representative.

.13 Notify Departmental Representative in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.

.14 Do not proceed with work until relevant submissions are reviewed and approved by the Departmental Representative.

1.2 SUBMISSION REQUIREMENTS

.1 Coordinate each submission with the requirements of the work and the Contract documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow ten (10) working days for Departmental Representative's review of each submission, unless noted otherwise.

.3 Accompany submissions with transmittal letter, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Sequential submission number.
- .6 Other pertinent data.

1.3 SUBMISSIONS SHALL INCLUDE:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

- .1 Subcontractor.
- .2 Supplier.
- .3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorised representative, certifying approval of submissions, verification of field measurements and compliance with Contract documents.

.5 Details of appropriate portions of work as applicable:

- .1 Fabrication.
- .2 Layout, showing dimensions (including identified field dimensions) and clearances.
- .3 Setting or erection details.
- .4 Capacities.
- .5 Performance characteristics.
- .6 Standards.
- .7 Operating weight.

.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.6 After Departmental Representative's review, distribute copies.

1.4 SHOP DRAWINGS

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

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

.4 After Departmental Representative's review, distribute copies.

.5 Submit one (1) hard copy of all shop drawings reviewed by Departmental Representative as an appendix in the operating and maintenance manual.

.6 Delete information not applicable to project.

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

.8 Submit shop drawings in electronic form using PDF file format for each requirement requested in the specification sections and/or as requested by the Departmental Representative.

.9 Cross-reference shop drawing information to applicable portions of the Contract documents.

.10 Maximum sheet size: 850 x 1050 mm.

1.5 SHOP DRAWINGS REVIEW

.1 Review of shop drawings by Public Works and Government Services Canada is for the sole purpose of ascertaining conformance with the general concept.

.2 This review shall not mean that Public Works and Government Services Canada approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.

.3 This review shall 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.

.4 Without restricting the generality of the foregoing, the Contractor is responsible for:

.1 Dimensions to be confirmed and correlated at the job site.
.2 Information that pertains solely to fabrication processes or to techniques of construction and installation.
.3 Coordination of the work of all sub-trades.

1.6 PRODUCT DATA

.1 Product data: manufacturers' catalogue sheets, MSDS sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products or any other specified information.

.2 Delete information not applicable to project.

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

.4 Cross-reference product data information to applicable portions of Contract documents.

.5 Submit product data in electronic form using PDF file format. Clearly indicate ordering codes and part numbers.

1.7 SAMPLES

.1 Samples: examples of materials, equipment, quality, finishes and workmanship.

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

.3 Reviewed and accepted samples will become the standard of workmanship and material against which installed work will be verified.

1.8 TEST RESULTS AND INSPECTION REPORTS

.1 Submit in test results and inspection reports as required by all sections of this specification.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

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 American National Standards Institute (ANSI):

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

.6 Province of British Columbia:

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

.7 Yukon Territory:

.1 Occupational Health and Safety Act, R.S.Y.

1.2 RELATED SECTIONS

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

.1 Construction Progress Schedule: Section 01 32 17
.2 Submittals Procedures: Section 01 33 00
.3 Construction Facilities: Section 01 52 00

.2 Refer to Appendix D - Health & Safety Plan Requirements.

1.3 WORKER'S 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 33 00 – Submittal Procedures.

.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 five (5) 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 Assume responsibility as the Prime Contractor for work under this contract.

.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 & SAFETY COORDINATOR

.1 The Health and Safety Coordinator must:

.1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
.2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.
.3 Be on site during execution of work.

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 as deemed necessary to protect site against entry.

1.9 PROJECT/SITE CONDITIONS

.1 Work at site may involve contact with:

.1 Potentially energized electrical equipment during testing to ensure all energized equipment is safely deenergized, grounded, locked open and tagged as such by a Class A Accredited Representative.
.2 Hazardous spaces inside cable manholes, pull boxes and junction boxes.
.3 Arc flash hazard in the extreme case of a fault occurring during energization of electrical equipment.

1.10 REGULATORY REQUIREMENTS

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

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

1.11 WORK PERMITS

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

1.12 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.

1.13 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.

1.14 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.

1.15 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.

1.16 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.

1.17 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 lockout procedures in accordance with EGD Lockout Policy (see Appendix A). Lockout procedures shall be 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.

1.18 OVERLOADING

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

1.19 SCAFFOLDING

.1 Design, construct, and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 and B.C. Occupational Health and Safety Regulations.

1.20 CONFINED SPACE

.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 SYSTEMS

.1 Fire protection and alarm systems shall not be:
- .1 Obstructed.
- .2 Shut off.
- .3 Left inactive at the end of a working day or shift.

.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 UNFORSEEN 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.
- .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".

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Refer to Appendix B - EGD Environmental Best Management Practices

1.2 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.3 SUBMITTALS

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

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

.3 Address topics at level of detail commensurate with environmental issue and required construction task.

.4 Environmental protection plan includes:

.1 Name(s) of person(s) responsible for ensuring adherence to Environmental Protection Plan.
.2 Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from site.
.3 Name(s) and qualifications of person(s) responsible for training site personnel.
.4 Descriptions of environmental protection personnel training program.
.5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance

with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan: to be included and updated, as required.

1.4 FIRES

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

1.5 DISPOSAL OF WASTES

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

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

1.6 DRAINAGE

.1 Provide erosion and sediment control plan that identifies type and location of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sedimentations control plan.

.3 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.4 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

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

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2m.

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

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.8 WORK ADJACENT TO WATERWAYS

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

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

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.7 Do not blast under water or within 100m of indicated spawning beds.

1.9 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities' emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.10 HISTORICAL AND ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources, and wetlands not previously known to be on site or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.11 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection Plan. Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.2 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.3 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

END OF SECTION

1 General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 REFERENCES

.1 Canadian Standards Associated (CSA International).

.1 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Workplace.

1.3 SCAFFOLDING

.1 Provide and maintain scaffolding, ladders and platforms required for performance of Work.

1.4 HOISTING

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

.2 Hoists to be operated by certified operators.

1.5 SITE STORAGE/LOADING

.1 Confine work and operations of employees to areas defined by Contract Documents unless directed otherwise in writing by Departmental Representative. Do not unreasonably encumber premises with products.

1.6 CONSTRUCTION PARKING

.1 Arrange parking in areas directed by Departmental Representative.

.2 Existing roads may be used for access to project site. Maintain construction parking area clean and free of construction-related debris, spillage and soiling.

.3 Make good damage resulting from Contractor's use of parking areas and roads at no cost to Contract.

1.7 SECURITY

.1 Refer to Section 26 05 00 – Common Work Results - Electrical for conditions governing site security and access.

1.8 EQUIPMENT, TOOL, MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, locking storage for tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds.

.3 Locate within work area in a manner to cause least interference with work activities.

1.9 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

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

.3 Locate within work area in a manner to cause least interference with work activities.

1.10 CONSTRUCTION SIGNAGE

.1 Provide project identification sign as directed by the Departmental Representative after award of contract.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 REFERENCES

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

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

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 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.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source, and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 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. Should disputes 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.

1.3 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.

1.4 TRANSPORTATION

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

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

1.5 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 will 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.

1.6 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.

1.7 COORDINATION

.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.

1.8 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.

1.9 REMEDIAL WORK

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

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

1.10 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.

1.11 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.

1.12 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.

1.13 PROTECTION OF WORK IN PROGRESS

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

1.14 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by Departmental Representative, with minimum of disturbance to Work, building occupants, pedestrian and vehicular traffic.

.2 Protect, relocate, or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 SUBMITTALS

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

.1 Submit written request in advance of cutting or alternation which affects any of the following.

.1 Structural integrity of any part of Project.
.2 Efficiency, maintenance or safety of any operational element.
.3 Visual qualities of sight-exposed elements.
.4 Interior and exterior building finishes.

.2 The structures are designated heritage in status. Due care must be taken to not alter or damage any portions of the building deemed heritage.

1.2 INCLUDE IN REQUEST

.1 Identification of Project.

.2 Location and description of affected Work.

.3 Statement on necessity for cutting or alteration.

.4 Description of proposed Work and products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on work of Other Contractor.

.7 Written permission of affected Other Contractor.

.8 Date and time work will be executed.

1.3 MATERIALS

.1 Required for original installation.

1.4 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 Cover adjacent surfaces and finishes with clean and dry drop sheets, kraft paper, cardboard or other suitable coverings during minor demolition.

1.5 EXECUTION

.1 Execute cutting, fitting and patching required to perform work. Perform minor demolition required for alterations with care not to damage adjacent construction, fittings, fixtures, surfaces and finishes scheduled to remain.

.2 Obtain Departmental Representative's approval before cutting, boring or sleeving load-bearing members.

.3 Fit several parts together to integrate with other work.

.4 Uncover work to install ill-timed work, at no cost to Contract.

.5 Remove and replace defective and non-conforming work, at no cost to Contract.

.6 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing. Make cuts with clean, true, smooth edges.

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

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

.9 Include cost of making good all surfaces, substrates and work disturbed by removal of existing work and by installation of new work.

1.6 MATCHING TO EXISTING WORK

.1 Make new work in existing areas and all alteration/renovation work match in every respect to similar items in existing areas.

.2 Use new materials to match existing items. Where perfect matches cannot be made as to quality, texture, colour and pattern remove existing materials and replace with new materials of comparable quality selected by the Departmental Representative, to extent directed by the Departmental Representative.

.3 Execute Work carefully wherever existing work is being re-used. Make repairs to such recused items after re-installation to properly restore them. Where proper restoration is impractical, such items will be rejected and replaced to the Departmental Representative's approval.

.4 After removal of reusable items, carefully patch and repair original location.

.5 Wherever existing work is being altered to make way for new work, perform such cutting and patching neatly and make finished installations equal to quality and appearance.

.6 Where new work is a continuation or an extension of existing work take care to blend both together with complete regard to appearance. Obvious joints and visible patches not acceptable.

1.7 SETTING OUT OF WORK

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as straight edges and templates required to facilitate the Departmental Representative's inspection of work.

.4 Review layouts with the Departmental Representative prior to commencement of work.

1.8 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 the Departmental Representative of impending installation and obtain his approval for actual location.

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

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 74 21 - Waste Management and Disposal

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

.3 Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings

1.2 GENERAL

.1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

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

1.3 MATERIALS

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

1.4 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 the Departmental Representative. Refer to Section 01 35 43 – Environmental Procedures for additional requirements.

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

.4 Provide on-site containers for collection of waste materials and debris. Locate where directed by the Departmental Representative.

.5 Provide and use clearly marked separate bins for recycling wherever facilities are available. Refer to Appendix B for additional requirements.

.6 Remove waste material and debris from site and deposit in waste containers at end of each working day.

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

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

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

1.5 CLEANING DURING CONSTRUCTION

.1 Provide onsite containers for collection of waste materials and debris.

.2 Dispose of waste materials and debris off site on a daily basis.

.3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces.

.4 Clean areas of construction daily.

1.6 FINAL CLEANING

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

.2 Remove waste products and debris.

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

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

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

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

.7 Vacuum clean and dust room interiors.

.8 Sweep and power wash pavement around building and all pavement parking/storage areas used by Contractor to remove all traces of construction spillage, stains and residue.

.9 Do not blast dirty water onto adjacent buildings and site features.

.10 Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from finished surfaces.

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

.12 Clean all construction-affect areas to 'as-found' cleanliness state.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Text, schedules, and procedures for systematic Waste Management Program for construction

.1 Diversion of Materials

1.2 DEFINITIONS

.1 Waste Audit (WA): relates to projected waste generation. Involves controlled separation of waste.

.2 Waste Reduction Workplan (WRW): a written report which addresses opportunities for reduction, reuse or recycling of materials.

.3 Materials Source Separation Program (MSSP): consists of a series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

1.3 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures
.2 Appendix B – EGD Environmental Best management Practices

1.4 DOCUMENTS

.1 Maintain at job site, one (1) copy of following documents
.1 Recycling List

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Before project start-up, prepare Materials Source Separation Program and provide separate containers to deposit reusable and/or recyclable materials of the following:

.1 Gypsum board
.2 Metals
.3 Wood
.4 Plastics

.2 Other materials as indicated in technical sections.

.3 Provide onsite facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Locate containers in Owner approved locations, to facilitate deposit of materials without hindering daily operations.

1.6 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

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

.3 Keep records of construction waste including

.1 Number and size of bins
.2 Waste type of each bin
.3 Total tonnage generated
.4 Tonnage reused or recycled
.5 Reused or recycled waste destination

1.7 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

2 Products

.1 Not applicable.

3 Execution

3.1 APPLICATION

.1 Materials in separate condition: collect, handle, store on site, and transport off site to an approved and authorized recycling facility. Provide documentation to Departmental Representative.

3.2 CLEANING

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

.2 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Refer to all other sections.

1.2 INSPECTION AND DECLARATION

.1 Contractor's inspection: Contractor and all Subcontractors will conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify the Departmental Representative in writing of satisfactory completion of Contractor's inspection and that corrections have been made.
.2 Request the Departmental Representative's inspection.

.2 The Departmental Representative's inspection: the Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor will correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.
.2 Defects have been corrected and deficiencies have been completed.
.3 Certificates required by authorities having jurisdiction have been submitted.
.4 Work is complete and ready for Final Inspection.

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

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 As-builts, samples and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools and maintenance materials.

.6 Warranties and bonds, BC Safety Authority Permits, and Final Inspections.

.7 Final site survey.

1.2 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative four final copies of operating and maintenance manuals in English.

.5 Ensure spare parts, maintenance materials, and special tools provided are new, undamaged not defective, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source, and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.8 Pay costs of transportation.

1.3 FORMAT

.1 Organize data in the form of an instructional manual.

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

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

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

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

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

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

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.4 CONTENTS - EACH VOLUME

.1 Provide Table of Contents including:

- .1 Title of project
- .2 Date of submission
- .3 Names, addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
- .4 Schedule of products and systems, indexed to content of volume

.2 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.5 AS-BUILTS AND SAMPLES

.1 In addition to requirements of other sections, maintain at the site for Departmental Representative one record copy of:

- .1 Contract Drawings
- .2 Specifications
- .3 Addenda
- .4 Change Orders and other modifications to the Contract

.5 Reviewed shop drawings, product data, and samples
.6 Updated cable and equipment schedule
.7 Field test records
.8 Inspection certificates
.9 Manufacturer's certificates
.10 Electrical Permits & Inspections by BCSA (BC Safety Authority).
.11 Contractor Supervisor's BC Registration, meeting BCSA requirements.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry, and legible condition. Do not use record documents for construction purposes.

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

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of drawings provided by Departmental Representative.

.2 Provide felt tip marking pens for recording information, maintaining separate colours for each major system.

.3 Record information concurrently with construction progress. Do not conceal Work until after witnessing by Departmental Representative and recording of related information.

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

.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.
.7 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

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

1.7 FINAL SURVEY

.1 Submit final site survey certificate certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Include complete list of all IP addresses for IP devices on Security System Data Network. Provide configuration details (frame rate, compression, etc) for all devices.

.3 Panelboard circuit directories: provide electrical service characteristics, controls, and communications.

.4 Update the access control matrix to fully reflex the installed equipment

.5 Provide an excel spreadsheet showing all equipment, wiring (to include wire tag reference, purpose of conductor, cable type information on from where and to where the cable is installed). Spreadsheet to be cross referenced to drawings and field wiring installation with all cables referenced and tagged

.6 Include installed colour-coded wiring diagrams.

.7 Operating Procedures: include startup, break-in, and routine normal operating instructions and sequences. Include control, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.

.8 Maintenance Requirements: include routine procedures and guide for troubleshooting; disassembly, repair and re-assembly instructions; and alignment, adjusting, cleaning, servicing, balancing and checking instructions.

.9 Provide servicing and lubrication schedule and list of lubricants required.

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

.11 Include sequence of operation by controls manufacturer.

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

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

.14 Provide installed control diagrams by controls manufacturer.

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

.16 Include test and balancing reports.

.17 Additional requirements: As specified in additional sections of this document.

1.9 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual sections of this document.

1.10 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual sections of this document.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store as directed by Departmental Representative.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative for approval. Include approved listings in Maintenance Manual.

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

1.11 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual sections of this document.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store as directed by Departmental Representative.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative for approval. Include approved listings in Maintenance Manual.

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

1.12 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification sections.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site location as directed; place and store as directed by Departmental Representative.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative for approval. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

.1 Refer to other sections for additional requirements.

.2 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.3 Store in original and undamaged condition with manufacturer's seal and labels intact.

.4 Store components subject to damage from weather in weatherproof enclosures.

.5 Store paints and freezable materials in a heated and ventilated room.

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

1.14 WARRANTIES AND BONDS, BC SAFETY AUTHORITY PERMITS & FINAL INSPECTIONS

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

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

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) 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 Substantial Performance is determined.

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

.6 Co-execute submittals when required.

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

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

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Procedure and status of tagging of equipment covered by extended warranties.

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

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

.11 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.15 COMPLETION

.1 Submit a written certificate that the following have been performed

.2 Work has been completed and inspected for compliance with the Contract Documents and BC Safety Authority requirements.

.3 Defects have been corrected and deficiencies have been completed.

.4 Equipment and systems have been tested, adjusted, and balanced and are fully operational.

.5 Operation of systems has been demonstrated to the personnel indicated by the Departmental Representative.

.6 Work is complete and ready for final inspection.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 91 13 - General Commissioning (Cx) Requirements

1.2 DESCRIPTION

.1 Demonstrate operation and maintenance of equipment and systems to Departmental Representative two (2) weeks prior to date of substantial performance.

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

1.3 QUALITY CONTROL

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

1.4 SUBMITTALS

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

.2 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.

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

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

1.5 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed in accordance with requirements in Section 01 91 00 - Commissioning (Cx) and equipment and systems are fully operational.

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

1.6 PREPARATION

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

.2 Verify that designated personnel are present.

1.7 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 Provide suitably trained personnel to update all software associated with the existing Lenel access control system to incorporate all new works included in this contract. All works to be undertaken by a Lenel Value Added Reseller (VAR)

.3 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals, and computer workstations, as basis of instruction. Provide training to EGD personnel as per the following three categories, "Operator," "Controller," and "Maintainer" listed below:

.1 Operator Level:
- .1 "Operator" level includes up to 26 commissionaires
- .2 Provide, at EGD, at least seven separate sessions, as EGD operational requirements permit, of up to four staff members at a time.
- .3 Each session to be a minimum of four hours in length.
- .4 Provide at least four computer training work stations, complete with all pertinent software used at EGD, for use by each individual during training.
- .5 Include training on the following:
  - .1 Use of workstation
  - .2 Checking access cards to verify validity
  - .3 Printing and issuing proximity cards
  - .4 Controlling access at all perimeter and building access points
  - .5 Checking database to verify identification and photo information
  - .6 Reporting of system and equipment troubles or operating errors.

.2 Controller Level:
- .1 "Controller" level includes up to five EGD staff (including security/risk management staff and Commissionaire Supervisor)
- .2 Provide, at EGD, at least two separate sessions, as EGD operational requirements permit, of up to four staff members at a time.

.3 Each session to be a minimum of one eight hour day in length.
.4 Provide at least four computer training work stations, complete with all pertinent software used at EGD, for use by each individual during training.
.5 Include training on the following:
.1 Use of workstation
.2 Checking access cards to verify validity
.3 Printing and issuing proximity cards
.4 Controlling access at all perimeter and building access points
.5 Checking database to verify identification and photo information
.6 Reporting of system and equipment troubles or operating errors.
.7 Management (including creation, editing and transfer) of EGD staff lists and photos in database,
.8 Management and control of access permissions to EGD perimeter and internal building access points,
.9 Import, management and implementation of site "User" staff lists and access permissions

.3 System Maintainer Level:
.1 "System Maintainer" level includes up to five EGD Electrical staff
.2 Provide, at EGD, at least two separate sessions, as EGD operational requirements permit, of up to four electrical staff members at a time.
.3 Each session to be a minimum of three, eight hour days in length.
.4 Provide at least four computer training work stations, complete with all pertinent software used at EGD, for use by each individual during training.
.5 Include training on the following:
.1 Use of workstation
.2 Checking access cards to verify validity
.3 Printing and issuing proximity cards
.4 Controlling access at all perimeter and building access points
.5 Checking database to verify identification and photo information
.6 Reporting of system and equipment troubles or operating errors.
.7 Management (including creation, editing and transfer) of EGD staff lists and photos in database,
.8 Import, management and implementation of site "User" staff lists and access permissions
.9 Maintenance, troubleshooting, repairs, connections and replacement of:
.1 Card readers
.2 Door striker latch components

.3 Local control panels
.4 Door control cards (including using software on server to view input and output signals at all devices, and communications)
.5 Battery change-out procedures (on circuit boards, devices and control panels)
.6 Recommended database checks and backups
.10 Server maintenance, updates and backups
.11 Internet router checks and maintenance
.12 Security system software in use on server
.13 Relocation of equipment such as portable turnstiles and card readers.

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

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

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
.2 Refer to other sections for additional requirements.

.2 Acronyms:

.1 AFD - Alternate Forms of Delivery, service provider.
.2 BMM - Building Management Manual.
.3 Cx - Commissioning.
.4 EMCS - Energy Monitoring and Control Systems.
.5 O&M - Operation and Maintenance.
.6 PI - Product Information.
.7 PV - Performance Verification.
.8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
.2 Ensure appropriate documentation is compiled into the BMM and O&M manuals.
.3 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 QUALITY ASSURANCE

.1 Testing organization: certified to perform specified services.

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

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

1.4 SUBMITTALS

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

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

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

.4 Provide Cx report from Lenel authorized representative detailing each device and point in the system to be installed. Report shall detail each device as operational and functioning.

.5 Provide detailed Cx schedule as part of construction schedule. Provide adequate time for Cx activities prescribed in other sections.

.6 Submit proposed Cx procedures and 3 preliminary specimen copies of each of report forms proposed for use to Departmental Representative.

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

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

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

.10 Provide completed Cx documentation to Departmental Representative. Departmental Representative to review and approve Cx documentation.

1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

1.6 CONFLICTS

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

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

1.7 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

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

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

.4 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

.5 Conduct start-up and testing in distinct phases. Accurately record data for each phase.

.6 Cx procedures to be repeatable and reported results are to be verifiable.

.7 Report to Departmental Representative any deficiencies or defects noted during performance of services. Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.8 Document required tests on approved forms.

1.8 CONTRACTOR'S RESPONSIBILITIES

.1 Prepare each system for testing and commissioning.

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

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

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

1.9 PREPARATION

.1 Convene Cx meetings to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.2 Provide instruments required for testing, adjusting, and balancing operations.

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

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

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

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

.7 Verify lighting is turned on when lighting is included in cooling load.

.8 Verify equipment such as computers, laboratory and electronic equipment are in full operation.

1.10 WITNESSING

.1 Departmental Representative to witness start-up, testing, activities and verify results.

.2 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.11 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.12 REPEAT VERIFICATIONS

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

.1 Verification of reported results fail to receive Departmental Representative's approval.
.2 Repetition of second verification again fails to receive approval.

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

1.13 FINAL REPORTS

.1 Organization having managerial responsibility shall make reports.

.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.

1.14 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

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

1.15 DEMONSTRATION AND TRAINING

.1 In accordance with 01 79 00 – Demonstration and Training

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED WORK

.1 Fire stopping and smoke seals within Electrical Divisions.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Waste Management and Disposal

1.3 REFERENCES

.1 Underwriter's Laboratories of Canada (ULC)

.1 ULC-S115-1995, Fire Tests of Firestop Systems

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

1.6 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

.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.

2 Products

2.1 MATERIALS

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

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

.2 Firestop system rating: 1 hour or as indicated on drawings.

.3 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.

.4 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.

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

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

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

.8 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.

.9 Sealants for vertical joints: non-sagging.

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 without interruption to vapour barrier.

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

.5 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

.6 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.

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

.8 Tool or trowel exposed surfaces to a neat finish.

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

3.2 INSPECTION

.1 Notify Departmental Representative when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

.2 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 curtain wall and precast concrete panels.
- .3 Top of fire-resistance rated masonry and gypsum board partitions.
- .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
- .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
- .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
- .7 Openings and sleeves installed for future use through fire separations.
- .8 Around mechanical and electrical assemblies penetrating fire separations.
- .9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.3 It is necessary to firestop only cables and conduits which are affected by this project.

.4 The Departmental Representative reserves the right to dismantle up to 10% of all firestopping penetrations at no cost to the owner. Should this inspection reveal a defective assembly, all firestopping assemblies may be dismantled at no cost to the owner.

3.3 CLEANUP

.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

1 General

1.1 SUMMARY

.1 This Section applies to all sealants required around internal architectural elements, external doors, mechanical and electrical penetrations of building envelope.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 21 - Waste Management and Disposal

.3 Section 07 84 00 – Firestopping

1.3 REFERENCES

.1 CGSB 19-GP-5M-76 Sealing Compound, One Component, Acrylic Base, Solvent Curing.

.2 CAN/CGSB-19.21-M87 Sealing and Bedding Compound Acoustical.

.3 CAN/CGSB-19.22-M90 Mildew Resistant, Sealing Compound for Tubs and Tiles.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.5 ENVIRONMENTAL AND SAFETY REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21.

1.7 PRODUCT DATA

.1 Submit MSDS sheets for all proposed sealants.

2 Products

2.1 SEALANT MATERIALS

.1 Sealants for general use and building joint sealing to be single-component, non-sag, high performance, non-priming, gun-grade electrometric polyurethane sealant, ASTM C920, Type S, Grade NS, Class 25, Use T, NT, M, A, G, and O, CAN/CGSB-19.13-M87, Classification MCG-2-25-A-N, No. 81026; UL.

.2 Acoustic sealant caulking.

.3 Silicone Sealants. Where used in wet interior areas such as shower rooms, at sinks, urinals and water closets, shall contain fungicide.

.4 Sealant for fireproofing: where cables, conduits, pipes, and ducts pass through fire-rated floors and walls, pack space between wire and sleeve full with penetrating foam sealant system, ULC-listed, meeting ULC S115 and ASTM E814 indicated fire barrier requirements. Coordinate with Section 07 84 00.

.5 Backer rods.

.6 Exterior sealant neutral cure silicone.

2.2 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

3 Execution

3.1 PROTECTION

.1 Protect installed work of other trades from staining or contamination.

3.2 PREPARATION OF JOINT SURFACES

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant.

.1 Apply sealant in accordance with manufacturer's written instructions.
.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
.3 Apply sealant in continuous beads.
.4 Apply sealant using gun with proper size nozzle.
.5 Use sufficient pressure to fill voids and joints solid.
.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.7 Tool exposed surfaces before skinning begins to give slightly concave shape.
.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing.

.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup.

.1 Clean adjacent surfaces immediately and leave work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 This Division 26 Section, together with all the individual Sections, forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts and Divisions.

.2 Division 01 General Requirements are applicable to all aspects of Division 26 Electrical, unless specifically stated otherwise in these Specifications.

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

1.2 CODES, STANDARDS AND REGULATORY REQUIREMENTS

.1 Any reference to Codes, Standards and Regulations in these Specifications shall be taken as the latest or the most current in effect at time of tender.

.2 Comply with all requirements of the National and British Columbia Building Codes and the Canadian Electrical Code - Part I, including all Provincial and other amendments, Electrical Bulletins and any local by-laws or rules regulating the installation of electrical equipment and their seismic restraint. All work shall be to the satisfaction of the local authorities having jurisdiction. In no instance, however, shall the standards established by the Contract Documents be reduced by any of these Codes or Regulations.

.3 Reference Standards:

.1 CSA Group

.1 CSA C22.1, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.CAN/CSA-C22.3 No.1, Overhead Systems.

.3 CAN/CSA-C22.3 No.7 Underground systems

.4 CAN3-C235-[83(R2010)], Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

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

.1 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.3 WorkSafe BC/WCB Regulations, Canada Labour Code Part II, Canada Occupational Safety and Health Regulations.

.4 All materials shall bear the approval of the Canadian Standards Association and where applicable, the Underwriters' Laboratories of Canada or alternately shall bear local approval from the Electrical Inspection Department having jurisdiction. Include in the Tender all costs associated with obtaining local approvals.

.5 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.

.6 In any case of conflict or discrepancy, the most stringent requirements shall apply.

1.3 SUMMARY OF WORK

.1 In general, the work shall include the supply, installation testing and commissioning of all the necessary materials and apparatus for the expansion of the existing access control system as indicated on the drawings and mentioned in this specification.

.2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

.3 The items of work shall include, but is not limited to, the following:
.1 Panelboard breakers
.2 Power connections and outlets
.3 Surface wireways
.4 Fiber Optic system connections
.5 Wires, conduit, connectors
.6 Media Converters
.7 Electronic door locking devices and controls
.8 Card reader/door access system
.9 Purchase of additional software licenses as necessary
.10 Reprogramming of existing Onguard Access Control software

.4 Items obviously necessary or reasonably implied to complete the work shall be included as if shown on drawings and noted in the specifications.

.5 All materials, tools, appliances, scaffolding, apparatus and labour necessary for the execution, erection and completion of the systems described herein shall be furnished. This includes providing lighting and power for own work.

.6 Complete all electrical connections to equipment and accessories pertaining to this contract and leave all in operating condition to the Departmental Representative's satisfaction.

.7 All equipment, wiring and cabling shall be labelled and tagged. Provide lamicoid labelling to all panels and cabinets, provide a diagram within each cabinet identifying all equipment within. All wiring shall be colour coded based on the type of wiring, all wiring entering terminals shall be tagged to the specified format included on the drawings. All cables shall be tagged as they enter all equipment, panels and junction boxes and at maximum 10m intervals. The contractor shall request a copy of the master excel spreadsheet from the departmental representative within 10 days of being awarding the contract. The contractor shall be responsible for keeping an up to date record of all references and tags used and will provide all necessary changes based on site conditions and installation changes.

.8 The system will be installed under the supervision of a Lenel Value added Reseller (VAR) employed directly by the contractor. All commissioning, testing, and setup will be undertaken by the VAR. The system demonstration / handover will be undertaken by the VAR.

.9 The contractor shall employ the services of the existing EGD preferred contractor to undertake all programming and alterations to the existing LENEL system software. The existing contractor is BMS Integrated Services, 420 William Street, Victoria, British Columbia, Canada V9A 3Y9

.10 Remove all existing electrical equipment and material made redundant by this contract or in conflict with work to be carried out. Reroute, reinstall or replace existing electrical material that becomes necessary due to work carried out by this contract so a complete working electrical system will be retained in all areas affected by this installation.

1.4 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 Use one label for each language.

1.5 PERMITS, FEES AND INSPECTION

.1 Before starting work submit the appropriate quantity of Drawings and Specifications to the Electrical Inspection Department, the Supply Authority and other authorities having jurisdiction and obtain all necessary approvals and permits. Include all costs of approvals and all permit fees in the tender.

.2 Departmental Representative will provide Drawings and Specifications required by the Contractor for submission to the Electrical Inspection Department, the Supply Authority and other authorities having jurisdiction, at no cost.

.3 Arrange for inspection of the work as the installation progresses and as further required (as well as attendance during verification) by all applicable authorities having jurisdiction. Include costs for all routine inspections by the Electrical Inspection Department. Any fees for follow-up inspections found to be necessary by the Electrical Inspection Department as a result of incorrect work shall be borne by this contractor without any cost to the owner.

.4 Allow the Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

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

.6 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.7 Upon completion, and before final payment will be made, present to the Departmental Representative a certificate of unconditional approval for all electrical work from the Electrical Inspection Department and other authorities having jurisdiction.

.8 Departmental Representative will carry out site visits from time to time and prepare deficiency list for corrective action by Contractor, during construction, upon completion and during the Warranty period.

1.6 SUBMITTALS

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

.2 Shop drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of British Columbia, Canada.
- .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories,

piping, and other items that must be shown to ensure coordinated 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 on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 If changes are required, notify Departmental Representative of these changes before they are made.

.3 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work.

.4 As-built Documents:

.1 The Departmental Representative will provide 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for "as-built" purposes.

.2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

1.7 QUALITY ASSURANCE

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety Requirements.

1.8 QUALIFICATION OF TRADES PERSONNEL

.1 The work shall be performed by qualified and certified trades Personnel as set out in the **Electrical Safety Regulation** within the **Electrical Safety Act**.

.2 Submit list showing names and qualifications of key supervisory personnel.

1.9 SECURITY CLEARANCES

.1 Personnel employed on this project will be subject to security check. Obtain clearances, as instructed, for each individual required to enter the premises.

.2 Personnel will be checked at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

.3 Contractor shall be fully responsible for securing the premises and its contents throughout the construction period.

1.10 QUALITY OF WORK

.1 Unless otherwise indicated, all materials supplied shall be new and of the quality indicated in these Specifications. Otherwise, they shall be of the best commercial quality obtainable for the purpose.

.2 Manufacturers' directions shall be followed in all cases where the manufacturers of equipment or materials used in this work furnish directions covering points not shown on the Drawings or Specifications.

.3 Unless otherwise directed, all installed materials or equipment exposed to view shall be plumb, true, square and/or level as the case directs and, where applicable, located symmetrically to the features of the building.

.4 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.11 DAMAGES

.1 If the finish of electrical equipment is damaged either when received or during installation, have such equipment completely refinished and restored to its original condition at no cost to the owner.

.2 Irreparably damaged equipment shall be replaced at no cost to the owner.

1.12 RESPONSIBILITY AND COORDINATION

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

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

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

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

.5 Coordinate work of subtrades:

.1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.

.6 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.

.1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

.2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.

.1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.

.2 Identify on coordination drawings, building elements, services lines, rough-in points and indicate location services entrance to site.

.3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.

.4 Publish minutes of each meeting.

.5 Plan and coordinate work in such a way to minimize quantity of service line offsets.

.6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.

.7 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.

.8 Work cooperation:

.1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.

.2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.

.3 Ensure disputes between subcontractors are resolved.

.9 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.

.10 Maintain efficient and continuous supervision

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

1.13 DRAWINGS AND MEASUREMENTS

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

.2 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work. Do not scale the Drawings.

.3 Consult the Drawings and details for locations of outlets, fixtures, devices and equipment prior to installation. Obtain this information from the Departmental Representative where definite locations are not indicated.

.4 The Drawings show approximate locations of outlets, equipment and apparatus but the right is reserved to make such changes in location before installation of the work as may be necessary to centre the lights or meet the exigencies of construction in any way. No extra will be allowed and conversely, no credit shall be expected for such changes unless for each item of work the distance moved exceeds 3m prior to final installation of same.

.5 Take field measurements where equipment and material dimensions are dependent upon building dimensions.

1.14 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.15 POWER SUPPLY

.1 Power will be available approximately where shown and of characteristics as indicated on the Drawings.

1.16 DEMONSTRATION AND SYSTEM STARTUP

.1 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.

.2 Refer to section 01 79 00 for Demonstration and Training requirements.

1.17 OPERATING 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.

1.18 CUTTING, CORING AND PATCHING

.1 All cutting and core drilling required in structure to install electrical equipment shall be carried out by the contractor.

.2 Arrange and pay for all patching to be done in such a manner as to return finishes to the same standard as surrounding finishes or to the original condition.

.3 Any dispute resulting from this shall be referred to the Departmental Representative for decision.

.4 Prior to cutting of walls or floors, review the proposed location, size and method with the Departmental Representative. This includes notification when cutting or coring into any fire rated construction.

1.19 MOUNTING HEIGHTS AND LOCATIONS

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

.2 Location of equipment and devices indicated or specified are to be considered as approximate.

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

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

.5 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the Departmental Representative and/or as specified.

.6 The Drawings show approximate locations of outlets, equipment and apparatus but the right is reserved to make such changes in location before installation of the work as may be necessary to centre the lights or meet the exigencies of construction in any way. No extra will be allowed and conversely, no credit shall be expected for such changes unless for each item of work the distance moved exceeds 3m prior to final installation of same.

.7 Provide 120V power to all equipment.

1.20 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

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

1.21 NAMEPLATES AND LABELS

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

1.22 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: [schedule 40 steel pipe] [plastic] [sheet metal], 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 Install cables, conduits and fittings surface mounted aligned with building structural lines.

1.23 INSTALLATION OF CABLE IN EXISTING CONDUITS

.1 Where cables are to be installed in existing conduits as indicated on the Drawings, the Contractor must test all existing communication cables both before and after installing the cables included in this scope of work.

1.24 DELIVERY, STORAGE AND HANDLING

.1 Store all electrical equipment and devices other than conduits, fittings, boxes and ducts in a heated and ventilated space and protect from construction damage. Include in the tender price all costs related to such storage.

.2 Conduits, fittings, boxes and ducts may be stored outside if properly protected against the weather.

.3 Ship and store floor mounted equipment in upright position.

.4 Ship equipment in adequate containers to assure it arrives undamaged at the site.

.5 Keep equipment doors locked. Protect equipment from damage and dust.

.6 Block moving parts when necessary to prevent damage during movement and shipment of equipment.

.7 Remove from the site, and replace with new, all materials showing evidence of damage or rust.

1.25 EQUIPMENT LOCKS

.1 Fit locks on the cabinet doors, where these are hinged, of all electrical equipment including panelboards, automatic lighting control cabinets, low tension and communication cabinets. All locks shall be identical. Turn over to the Owners a total of six (6) keys and obtain a receipt for same.

1.26 TESTING AND ADJUSTING

.1 The Electrical Contractor shall use his own forces and the forces of his suppliers and Subcontractors to perform all testing.

.2 The contractor shall employ the services of a manufacturer approved commissioning and intergration specialist to complete all systems testing, commissioning and integration.

.3 Coordinate and pay for all tests including further tests as required by authorities having jurisdiction.

.4 The Contractor will appoint and pay for the services of the factory technical representative for the following:

.1 Inspection and testing required of individual door controllers.
.2 Inspection and testing of the system software.

.5 All testing shall be performed after each system installation has been completed and prior to the system being put into continuous operation unless otherwise noted.

.6 Perform the testing, adjusting and balancing only when conditions are commensurate with actual operating conditions for the given system.

.7 Advise the Departmental Representative 48 hours in advance of each test. Carry out tests in the presence of Departmental Representative.

.8 Submit original copies of letters from the manufacturers of all communication systems indicating that their technical representatives have inspected and tested the respective systems and are satisfied with the methods of installation, connections and operation. Where existing systems are extended, such letter shall cover both new and existing equipment and connections.

.9 Submit detailed test reports to the Departmental Representative within seven (7) days after the completion of each test. Include all test reports in the Maintenance Manuals. Each test shall clearly indicate, in a line-by-line format, that the components (not as a group) have been tested, test results, and whether test results are within acceptable limits. Each test report shall be accompanied by a front cover sheet briefly outlining what the test report is for and clearly summarizing all items that have failed the tests. The cover sheet shall indicate names of individuals who conducted the tests and their signatures.

1.27 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

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

.3 Waste Management: separate waste materials in accordance with Section 01 74 19 - Waste Management and Disposal

2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material or equipment is not available, obtain special approval from the authority having jurisdiction and inspection authorities before delivery to site and submit such approval to the

.3 Departmental Representative.

.4 Factory assemble control panels and component assemblies.

2.2 IDENTIFICATION

.1 Identify all pieces of electrical equipment other than conduits, conductors and motors with engraved laminated plastic nameplates, having 3mm minimum height characters showing:

.1 Normal power: Black face with white letters;
.2 Life safety emergency power: Red face with white letters;
.3 Standby power: Blue face with white letters.

Attach identification pieces, unless otherwise directed, with silicone cement. For identification of major pieces of equipment, (for example, Motor Control Centres, Distribution Panels, etc.), use size 6 or 8 nameplates having 12mm minimum height characters.

.2 Nameplate sizes shall be as follows:

Size 1	10 x 50 mm (3/8" x 2")	1 line	3 mm (1/10") high letters
Size 2	12 x 70 mm (1/2" x 3")	1 line	5 mm (1/5") high letters
Size 3	12 x 70 mm (1/2" x 3")	2 lines	3 mm (1/10") high letters
Size 4	20 x 90 mm (3/4" x 3½")	1 line	8 mm (1/2") high letters
Size 5	20 x 90 mm (3/4" x 3½")	2 lines	5 mm (1/5") high letters
Size 6	25 x 100 mm (1" X 4")	1 line	12 mm (1/2") high letters
Size 7	25 x 100 mm (1" X 4")	2 lines	6 mm (1/4") high letters
Size 8	50 x 100 mm (2" X 4")	2 lines	12 mm (1/2") high letters

.3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 "Dymo" embossed tape will not be permitted except where specified for receptacle identification, but must be installed without loose edges.

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. [_____]" as directed by Departmental Representative.

.7 Engraving of communication systems' coverplates shall be as specified in respective Specification Sections.

.8 Provide identification (lamicoid nameplates), inclusive of and additional to the above, for:

.1 Each panelboard, distribution centre, relay or terminal cabinet, indicating the system and voltage characteristics.
.2 Each communication system cabinet or console and each time switch not included in a control cabinet.
.3 Control boxes: indicate security system board address on cover
.4 Transformers: indicate capacity, primary and secondary voltages.
.5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
.6 Terminal cabinets, pull boxes and junction boxes: indicate system and/or voltage characteristics.
.7 All other items where so detailed or noted on the Contract Documents.

.9 Nameplate wording shall be such as to indicate clearly the function of each piece of equipment so identified. Prior to manufacture of nameplates, obtain approval from the Departmental Representative for wording intended.

.10 Nameplates shall be in English and French.

.11 Nameplates shall be installed after all painting has been completed.

.12 All junction and pull boxes for conduits, ducts and other raceways in concealed ceiling spaces shall have color coded covers:

.1 up to 250 V: Yellow
.2 Communication Systems: Green
.3 Card Access System: Yellow

.13 Identification of junction boxes, pull boxes, conduits, ducts and other raceways shall be done on a continuous basis as the rough-in work progresses. Leaving the marking of conduits, raceways and boxes to the end of the rough-in stage will not be permitted.

.14 Wiring Identification:

.1 Identify wiring with permanent indelible identifying markings, either 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 – latest version.
.4 Use colour coded wires in communication cables, matched throughout system.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and Departmental Representative

.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 FIRESTOPPING

.1 Firestopping shall be performed by the Division 26 Contractor as required by the BC Building Code.

.2 Prior to installation, submit shop drawings, samples and product data in accordance with Section 01 33 00.

.3 Install firestops and smoke seals in accordance with ULC-S115, conduit, cables and other objects penetrating fire separations to provide fire resistance not less than the fire resistance surrounding floor, ceiling, and wall assembly.

.4 Rated sealing systems for penetrations of Fire Rated walls, ceilings and floors: Hilti, Nuco, PFP Partners, Flamesafe, or 3M. Contractors are to submit ULC, cUL, WHI, or equivalent certified Design or System Data Sheets to demonstrate compliance of a particular Floor or Wall Assembly, Through Penetrant, and Sealant with requirements and for what period of time.

.5 The Departmental Representative, at his discretion, shall disassemble up to 10% of the total firestopping assemblies for detailed inspection. The contractor shall make good the inspected firestopping assemblies at no cost to the project.

.6 Should any of the inspected firestopping assemblies not comply with the manufacturer's assembly instructions or the BC Building Code requirements, all firestopping assemblies shall be removed and replaced by the Division 26 Contractor at no cost to the client.

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

1.2 REFERENCES

.1 CSA C22.2 No. 0.3 (latest edition) - Test Methods for Electrical Wires and Cables

.2 CSA C22.2 No. 65 - Wire Connectors

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures and Section 26 05 00 – Common Work Results – Electrical.

.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 and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.5 SCOPE

.1 Provide 120V power to all equipment.

2 Products

2.1 WIRES

.1 Conductors: stranded. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

.3 All wiring shall be in conduit unless otherwise indicated.

.4 Conductors within cable trays shall have "plenum" rated (FT4 type) outer jacket to comply with all applicable regulations and bylaws.

.5 All branch circuits shall be installed with separate, dedicated neutrals.

2.2 TECK 90 CABLE

.1 Use Teck cable only where indicated on the drawings.

.2 Conductors:

.1 Size as indicated on Drawings.
.2 Grounding conductor: copper
.3 Circuit conductors: copper, size as indicated.

.3 Insulation: Chemically cross-linked thermosetting polyethylene, type RW90, rated 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: polyvinyl chloride material.

.7 Connectors: Watertight, approved for Teck cable installation.

2.3 WIRE AND BOX CONNECTORS AND MISCELLANEOUS MATERIALS

.1 Connectors for wire and cable splices and taps: Minimum standard of acceptance: use 3M Co. 'Scotchlok,' Thomas & Betts PT Series, Buchanan 'B, or ' IDI Electric 'Super Nut,' for conductors #8 AWG or smaller; Burndy 'Servit' Type KSU for conductors #1/0 AWG and smaller; and Burndy 'OKlip' Type KVSU for conductors 750 MCM or smaller.

.2 Clamps, glanding connectors, or box connectors for armoured cable, aluminum-sheathed cable, mineral-insulated cable, flexible conduit, as required.

.3 Lugs, terminals, screws used for termination of wiring shall be suitable for either copper or aluminum conductors.

.4 Plastic electrical insulation tape: minimum standard of acceptance is Scotch #88.

3 Execution

3.1 INSTALLATION OF BUILDING WIRES AND CABLES – GENERAL

.1 Unless specifically indicated otherwise, ***all wiring shall be installed in conduit.***

.2 The number of splices in any circuit shall be kept to an absolute minimum consistent with available coil length and installation conditions.

.3 Branch circuits shall be sized for a maximum 3% voltage drop.

.4 Install cable in trenches in accordance with the Canadian Electrical Code and the Drawings.

.5 Cable Color Coding: to Section 26 05 00 Common Work Results for Electrical.

3.2 INSTALLATION OF FEEDERS

.1 Feeders terminating in control cabinets shall not be installed until the terminating equipment has been placed in its final location.

3.3 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

3.4 INSTALLATION OF TECK CABLES

.1 Group cables wherever possible on channels.

.2 Install cable securely supported by hangers.

3.5 INSTALLATION OF WIRE AND BOX CONNECTORS

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure-type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.2 Wire and cable splices and taps shall be made with approved connectors used in accordance with the manufacturer's instructions.

.3 After installation, wrap connectors having exposed conductive surfaces with plastic electrical tape, applying enough servings to provide uniform covering not thinner than the insulation of the largest conductor connected and overlapping the insulation of each connected conductor by not less than 12 mm.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 74 21 - Waste Management and Disposal

.2 Section 26 05 00 - Common Work Results – Electrical

1.2 REFERENCES

.1 CSA C22.3 No. 2 General Grounding Requirements and Grounding Requirements for Electrical Supply Stations.

.2 CSA C22.2 No. 41 Grounding and Bonding Equipment.

2 Products

2.1 EQUIPMENT

.1 Bare grounding conductors: stranded copper, soft annealed, size as required.

.2 Insulated grounding conductors: green, type 'TW', size as required.

.3 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.

.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 Bonding jumpers, straps
.5 Pressure wire connectors

3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where conduit is used, run ground wire in conduit.

.2 Provide bond conductor in all non-metallic conduits for access control devices, size required.

.3 Install connectors in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors from mechanical injury.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 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.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Bond shielded cables for access control system at one end of the cable.

.10 Provide ground bus in each Control Cabinet.

.11 Bond all equipment in Control Cabinets to ground bus.

.12 Provide grounding conductors from supply to ground bus in each Control Cabinet.

.13 Ensure equipment rack in Demarc Building is bonded to existing building ground bus.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.3 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 size #2/0 AWG.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 74 19 – Waste Management and Disposal.

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

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19.

.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.

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

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

2 Products

2.1 MATERIALS

.1 Minimum standard of acceptance:

- .1 Long standard masonry expansion shields for use on concrete-filled masonry walls: Star "Stazin" or equal.
- .2 Clamps for use on structural steel members: Appleton or Unistrut devices manufactured specifically for the purpose.
- .3 Conduit and cable clamps for individual or pair runs:
  - .1 Appleton series 'CL,' (or equal) one-hole steel or galvanized malleable iron for sizes 53 mm and smaller
- .4 Two-hole steel for sizes larger than 53 mm
- .5 Conductor supports for vertical runs: O-Z Electrical Mfg. Co. Type 'S' or 'R' as required, for not more than 5 wires or cables each not greater than 250 kCMIL; or Kellems grip Type 022-11 for all manufacturer-approved combinations of wires and/or cables.
- .6 Wire and cable ties: nylon 'Ty-rap'.

.7 Threaded hanger rods: galvanized steel, minimum 6 mm diameter; larger sizes as specified herein, as shown on the Drawings or as required by Seismic/Structural Engineer.
.8 Fixture suspension chain: #3 Tenso chain.
.9 Backboards: New 21 mm G1S paint grade fir plywood.
.10 Wood: Kiln-dried to 12% maximum moisture content.

3 Execution

3.1 INSTALLATION – GENERAL

.1 Provide all supports required for secure fastening and erection of the electrical work.

.2 Support equipment using clips, spring-loaded nuts, bolts, and clamps designed as accessories to basic channel members.

.3 Install fastenings and supports as required for each type of equipment, cable, and conduit, and in accordance with manufacturer's installation recommendations.

.4 All equipment enclosures, panelboards, boxes, cabinets, and similar materials shall generally be fastened to the building near each corner; directly, by means of fasteners or, indirectly, by means of hanger assemblies; or fastened to backboards as the case directs. Install and size fasteners to the specific load in accordance with first class practice and the specific instructions, where such exist, of the manufacturer of the fasteners used. Wherever practicable, fastenings shall be made to the basic structure. Do not install fasteners supporting more than 9 kg in finish materials.

.5 Free-standing, floor-mounted equipment such as transformers, motor control centres, switchboard, distribution centres, auxiliary system control panels, etc., shall be bolted to the floor, adjacent walls, or other structural members as directed by the Seismic Engineer.

.6 Unless specifically directed to the contrary, do not use bolts or rods smaller than 6 mm diameter, wood screws smaller than #8, fibre fastenings, fasteners driven by hammer or explosive charge, or perforated strap iron pipe hangers.

.7 Unless detailed to the contrary, use wood screws only for fastening equipment weighing less than 27 kg per support.

.8 Make attachments to the following materials with fasteners of the following types, complying with the above requirements of this Section, unless otherwise directed:

.1 <u>To solid masonry, tile, and plaster surfaces</u> with lead anchors.

.2 To concrete with metal inserts manufactured specifically for the purpose and complete with proper nuts, bolts, or hanger devices as required and installed at the time of concrete pour.

.3 To concrete-filled masonry walls with long standard masonry expansion shields.

.4 To hollow-core masonry walls with toggle bolts.

.5 To wood with wood screws or lag screws. Pilot-drill holes for lag screws and wood screws larger than #10.

.6 To wood panels or composition (drywall) panels with wood screws or toggle bolts as the case directs. Do not fasten to such panels less than 16 mm thick without special permission.

.7 To structural steel members with welded-on studs or clamping devices manufactured specifically for the purpose. Alternatively, and where specifically permitted by the Departmental Representative or Structural Engineer, bolt with nuts and lock-washers may be used in holes drilled through the structure.

.8 To sheet-metal with toggle bolts unless specifically directed, do not fasten to mechanical equipment enclosures or ductwork.

.9 Provide substantial vertical channel iron support with welded 6 mm steel baseplate bolted to floor or housekeeping pad for the support of motor starters and disconnect switches at free-standing motors away from walls. Paint support channels and baseplate with one coat of zinc chromate primer and two finish coats of enamel paint to match surrounding finishes.

3.2 SECURING OF RACEWAYS, WIRES, CABLE, AND CONDUIT

.1 Provide metal brackets, frames, hangers, clamps and related types of support structures as required to support conduit and cable runs. Provide "trapeze" type conduit and cable racks consisting of minimum 10 mm threaded rods, spring nuts, strut channel, and P-type clamps for all major feeder and branch wiring routes.

.2 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.3 When part of a group of 3 or more runs, secure conduits and cables with pipe clamps to steel channels, heavy duty single or double trapeze hangers, or approved equal. Attach trapeze hangers to the structure with one-piece, threaded-end steel hanger rods, sized to suit the specific load but not less than 6 mm diameter. Prepare and submit loading calculations for all trapeze rack runs carrying cable trays, cables, and conduits. Design shall allow for a minimum of 25% future loading and shall be based upon a safety factor of four (4) for hanger rod size and spacing. Use concrete inserts or other specified attachments to fasten hanger rods. Submit proposed anchorages and attachments to the Departmental Representative and Seismic Engineer for review. The attachment of conduits and cables to the ceiling suspension system will not be permitted.

3.3 BACKBOARDS AND WOOD ITEMS

.1 When these specifications or the drawings direct that electrical equipment be mounted on backboards, or when the Contractor elects to mount equipment on such items, cut the board and/or wood square, and neatly and securely attach it to building members. Back-, front- and edge-prime all backboards and apply a second coat of neutral grey enamel to all visible surfaces prior to mounting equipment.

.2 Where backboards and other wood or timber items are to be installed in or around "non-combustible" construction, plywood and/or wood shall be treated with wood preservers and, as a result, shall bear a UL label indicating a fire hazard classification rating of 25 for flame spread.

END OF SECTION

1 GENERAL

1.1 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.

1.2 SECTION INCLUDES

.1 This section includes materials and installation for seismic restraint systems for electrical installations.

1.3 RELATED SECTIONS

.1 Section 26 05 00: Common Work Results - Electrical

1.4 REGULATOR REQUIREMENTS

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

.2 The Seismic Engineer shall be able to provide a proof of professional insurance and the related practice credentials, upon request. The Seismic Engineer shall be familiar with SMACNA, ECABC & NFPA guidelines as well as the BC Building Code requirements.

.3 The Contractors Seismic Engineer shall submit original signed Building Code "Letters of Assurance" "Schedules B and C-B" to the Departmental Representative.

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

1.5 SCOPE

.1 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake. Equipment assemblies required to be vibration/noise isolated shall be provided with seismic rated isolators and restraints which are certified as being rated for the specific application requirements.

.2 Provide fastenings and supports for all electrical equipment and components to meet the seismic requirements of the B.C. Building Code (BCBC).

.3 It is the responsibility of manufacturers to provide equipment and components so that the strength, fastening, and anchorage of internal components meet the requirements of the BCBC and other CSA or regulatory requirements relating to seismic restraint.

.4 The Standard shall be the B.C. Building Code and Revisions including design to resist forces on equipment and component parts and their anchorage to the primary structure.

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

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

.7 The total electrical seismic restraint design and field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements. Contractor shall allow for coordination, provision of seismic restraints, as well as all costs for the services of a Professional Engineer registered in the Province of British Columbia. This Professional Engineer shall be referred to as the *Seismic Engineer* hereafter in this and other sections of these Specifications. The Seismic Engineer will provide normal engineering functions as they pertain to seismic restraint of electrical installations.

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

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

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

1.6 SHOP DRAWINGS

.1 Provide certified professionally sealed shop and placement drawings for all electrical equipment and equipment assemblies including runs of cable trays and conduit/cable racks showing the methods of attachment to the particular structure for each piece of equipment and assembly and provide anchorage/attachment details approved and sealed by the Seismic Engineer for review by the Departmental Representative.

.2 If requested by the Departmental Representative, calculations sealed by the Seismic Engineer shall be provided for the seismic restraint design shown on the shop drawings. Shop drawings shall show the equipment type, manufacturer's name, model number and weight of the equipment to be restrained.

1.7 SUBMITTALS

.1 Submit samples of materials required to complete the seismic restraint work for review if and when required.

2 PRODUCTS

2.1 GENERAL MATERIALS

.1 All equipment shall be tested in an independent testing laboratory or shall be certified by the Seismic Engineer to demonstrate that the equipment meets the requirements of all Codes and Bylaws in terms of "withstanding" the lateral forces in any direction to be expected in the Project seismic zone. *Withstanding* shall generally mean remaining in one piece and not breaking away from moorings.

3 EXECUTION

3.1 INSTALLATION

.1 Provide seismic restraint and anchorage for all equipment and services in accordance with the B.C. Building Code and all applicable Building By-laws.

.2 Arrange and pay for the Seismic Engineer who designed all anchorage/attachments to inspect same on Site (note that multiple inspections will be required as the Work progresses) and to provide typewritten Inspection Reports to the Departmental Representative throughout construction and to provide as required by the authorities having jurisdiction all required Letters of Assurance and Conformance with the specified Codes, Standards and Bylaws.

.3 The Seismic Engineer shall examine the basic building structure to which equipment is to be attached for adequacy of seismic support and report to the Contractor if the building structure is considered inadequate to support the equipment. The Contractor shall notify the Departmental Representative of the Seismic Engineer's findings and provide a copy of this Report to the Departmental Representative.

.4 Free-standing equipment shall be fastened to the basic structure using anchorage/attachments to overcome seismic overturning forces as designed by the Seismic Engineer.

.5 Provide seismic restraint for all cables, raceways, cable trays and bus ducts exceeding 50 mm in any cross-sectional dimension and which are supported more than 300 mm vertically from the basic structure.

.6 Provide slack cable restraint systems as designed by the Seismic Engineer, generally as follows:

.1 Connect slack cable restraints to suspended equipment in such a way that the axial projection of the wires passes through the centre of gravity of the equipment.

.2 Orient restraint wires on suspended equipment at approximately 90° to each other (in plan), and tie back to the structure at an angle not exceeding 45° to the horizontal.

.3 Select each anchor in the structure for a load equal to twice the weight of the equipment with a safety factor of 4.

.4 Install cable using appropriate grommets, shackles, thimbles, u-bolts and other hardware to ensure alignment of the restraints and to avoid bending the cables at connection points.

.5 Restraints shall be installed at least 50 mm clear of all other equipment and services.

.6 Adjust restraint cables such that they are not visibly slack, but such that the flexibility is approximately 35 mm under thumb pressure for a 1500 mm cable length (equivalent ratio for other cable lengths).

.7 Provide transverse and axial restraints within 4 m of a vertical bend.

.8 Cables, cable trays, raceways and bus ducts. shall be restrained utilizing minimum 10 mm diameter slack cable restraints which shall be provided at a maximum transverse spacing of 12.5 m and longitudinal restraints at 25 m maximum spacing, or as otherwise limited by anchor/slack cable performance. Adjacent spacing of restraints on a run shall vary by 10% to 30% to avoid coincident resonances. Trapeze hangers may be used.

.9 Transverse bracing for one raceway section may also act as longitudinal bracing for the raceway connected perpendicular to it, provided the bracing is installed within 610 mm of the elbow or junction box. Branch runs shall not be used to restrain main runs.

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

.11 Install a 300 mm length of flexible conduit and a braided bonding jumper in each surface-mounted conduit where it crosses a building expansion or seismic joint.

.12 Install expansion-deflection fittings in each conduit embedded in concrete where it crosses a building expansion or seismic joint. The fitting shall include an integral bonding strap where the conduit is metallic.

.13 Provide custom fabricated flexible sections allowing horizontal and vertical movement of cable trays at building expansion or seismic joint.

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

.15 Rigid support systems shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. (Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.) Provide loops in cables and flexible connections in raceways where such services leave a suspended trapeze rack or other support and extend down to floor-braced equipment or wall-mounted equipment. Freedom of movement shall be up to 300 mm in all directions.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Waste Management and Disposal

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 – Submittal Procedures and Section 26 05 00 – Common Work Results – Electrical

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging, and corrugated cardboard.

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

2 Products

2.1 JUNCTION BOXES

.1 The Contractor shall supply plastic junction boxes complete with all necessary incidentals, as required.

.2 Junction box sizes shall be in accordance with Canadian Electrical Code for the given conduit sizes and arrangement and number of conductors and splices in the boxes.

.3 For surface mounted conduits in wet or damp location and in all instances where surface mounted conduits are exposed and are located less than 3 metres above the floor (other than in mechanical and electrical service rooms), junction boxes shall be cast, type FS or FD single or two gang, with threaded hubs and gasketted cover plates.

3 Execution

3.1 INSTALLATION OF JUNCTION BOXES

.1 Where raceways are exposed, and unless directed otherwise, use surface mounted boxes.

.2 Where standard make boxes are not suitable for a particular device or conduit connection, provide boxes of special design to fit space and other applicable requirements.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 74 21 – Waste Management and Disposal

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

1.2 REFERENCES

.1 CSA C22.1, Canadian Electrical Code, Part 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging, and corrugated cardboard.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 MATERIALS

.1 Unless otherwise directed, outlet boxes shall be one-piece formed, galvanized, code gauge steel as specified below. Plastic or PVC type boxes are not acceptable.

.2 Galvanized Steel Boxes

- .1 103 mm square box - 52151 or 52171 with appropriate device mounting cover (ring) or blank cover
- .2 129 mm square box - 72151 or 72171 with appropriate device mounting cover (ring) or blank cover
- .3 103 mm octagon box - 54151 or 54171 with appropriate cover plate
- .4 103 mm utility box - 1110

.5 100 mm masonry box - MBD series with number of gangs as needed (MBS series in shallow walls)
.6 103 mm gang boxes - GSB series with appropriate device mounting cover and number of gangs
.7 One-piece electro-galvanized steel construction (sectional boxes shall not be used)
.8 Knock-out arrangement to suit site conditions
.9 Mounting brackets welded to the back as required
.10 Extension rings of same general construction as the box, with depth to suit construction
.11 Ground screw

.3 Cast Aluminum Boxes

.1 Weatherproof surface-mounted boxes
.2 FS (shallow) or FD (deep) single- and two-gang boxes with appropriate gasketted device cover approved for use with such boxes
.3 Threaded hubs to accept threaded conduits

2.3 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76mm x 50mm x 38mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102mm x 54mm x 48mm.

.3 102mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.

2.4 CONDUIT BOXES

.1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

2.5 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Outlet boxes installed flush in metal stud walls shall be fastened to the wall in a minimum of two places, located on the opposite sides of the box. Provide additional mounting channel and/or brackets if required to support each box in such a manner. Box shall be firmly attached to the wall, independent of subsequent device cover plate installation.

.6 Unless otherwise noted or specified herein, surface mount all outlet boxes

.7 Where standard make boxes are not suitable for a particular device or conduit connection, provide boxes of special custom design to fit space and other applicable requirements.

.8 Unless otherwise directed, do not install outlets back-to-back. Allow a minimum of 150 mm horizontal clearance between outlet boxes. Where it is required that outlets be installed back-to-back or where recessed outlets are installed in close proximity to one another on both sides of a common stud construction "party-wall," install within the wall between the outlets extending from stud to stud (minimum height to be 600 mm centred on the box) a non-combustible, rated fire barrier and sound septum (21 mm drywall or other approved equal) for reduction of noise transmission from outlet to outlet and to act as a fire barrier, to the satisfaction of the authorities having jurisdiction.

.9 Caulk all cracks and openings between outlet boxes and finished wall with an expansive non-shrinking grout. Provide duct seal in conduits between boxes after all conductors are installed so as to reduce noise transmission.

.10 Recessed outlet boxes in metal grid ceilings (e.g. T-bar) shall be fastened to metal support channels spanning the ceiling grid. Two channels shall be fastened to the ceiling grid.

.11 Unless otherwise directed, use boxes not smaller than No. 54151 or No. 52151 or deeper, for surface-mounted or concealed general use junction boxes and outlets.

.12 Fit flush-mounted lighting fixture outlet for fixtures whose mounting surfaces or stem canopies will not cover the outlet box opening with plaster ring of correct size and depth.

.13 All outlet boxes installed in concrete and masonry shall be protected from the concrete pour and the weather by filling the boxes with paper, sponges, or foam, or similar approved material during construction. Immediately after concrete pour, outlet boxes shall have their conduits positively plugged to avoid the entrance of water and debris. After closing in of the work, all outlet boxes showing evidence of rusting or intrusion of concrete shall be cleaned out and protected with a rust-inhibiting paint. Remove all temporary filling and protecting material upon completion of work.

.14 When boxes of sizes and arrangements other than standard single- or multi-gang types are required, use factory-manufactured boxes without knock-outs of Code gauge steel with screw-fastened painted covers. At locations exposed to weather or frequent wetting, boxes shall have continuous welded seams and shall be hot-dipped galvanized after fabrication. At such locations, fit special hot-dipped galvanized covers with neoprene gasketting.

.15 Generally, for surface-mounted single-gang switch or receptacle outlets, use "two-piece" surface boxes of the proper configuration. For surface-mounted multi-gang switch or receptacle outlets, use solid boxes with the correct number of gangs and special covers with rolled back edges as directed elsewhere. Do not use boxes with device covers.

.16 For single- or multi-gang surface-mounted outlets at locations exposed to the weather or frequent wetting, and at other locations where directed, use Type FS or FD boxes as required. Outlet box and cover to be of a material that is compatible with the conduit used in order to avoid galvanic corrosion. Covers to be of the type to suit the devices to be installed.

.17 Provide all outlet boxes required for heavy duty and high ampacity receptacles. Where required, boxes shall be specially made to fit within walls specified.

.18 Outlet boxes installed in concrete or masonry shall be masonry boxes, 103 mm octagonal concrete rings, or 103 mm square or multi-gang MBD boxes approved for use in concrete with device covers as the use dictates. Boxes intended to be mounted at the same height in block walls shall be mounted so that the bottoms of the boxes are set on the same block joint. Patch all voids between boxes and masonry with low conductivity, high tensile strength, expansive, non-shrinking concrete grout.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 11 - Cleaning

.3 Section 01 74 21 - Waste Management and Disposal

1.2 REFERENCES

.1 Canadian Standards Association (CSA International) – latest edition

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada
- .2 CSA C22.2 No. 45, Rigid Metal Conduit
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
- .4 CSA C22.2 No. 83, Electrical Metallic Tubing
- .5 CSA C22.2 No. 211.1, Rigid types EB1 and DB2/ES2 PVC Conduit
- .6 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit
- .7 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada

1.3 SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

- .1 Submit cable manufacturing data.

.3 Quality assurance submittals.

- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.2 Discard materials defined as hazardous or toxic waste in accordance with environmental analysis and EGD procedures.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.5 LOCATION OF CONDUIT

.1 Electrical drawings are diagrammatic and do not show all conduits, wire, cable, etc. Electrical contractor shall provide conduit, wire cable, etc., for a complete operating job to meet in all respects the intent of the drawings and specifications.

.2 Locate electrical devices on walls with regard given for convenience of operation and conservation of wall space.

.3 Exact conduit runs shall be coordinated with Departmental Representative, prior to rough-in, to ensure maximum accessibility to other services. Relocate any item installed without Departmental Representative's confirmation as required by the Departmental Representative at no cost to the Contract as long as the relocation is within 3m of the location originally shown on the drawings.

2 Products

2.1 CONDUITS

.1 Unless otherwise indicated, rigid conduit shall be galvanized steel-threaded type.

.2 Flexible conduit and liquid tight flexible conduit shall be aluminum.

.3 Rigid metal conduit: to CSA C22.2 No. 45

.4 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.

.5 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.6 Flexible metal conduit: to CSA C22.2 No. 56.

.7 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work. P-clamps shall be used to secure surface conduits.

.3 Channel type supports for two or more conduits at 1500mm O.C.

.4 Threaded rods, 6 mm dia., 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 Rigid PVC fittings shall be of the same manufacturer as the conduit. All fittings with removable covers shall be complete with VC gaskets and brass securing screws and inserts. All metal components shall be brass or stainless steel.

.3 Ensure factory "ells" where 90 degrees bends are required for 25mm and larger conduits.

.4 Couplings and connectors for rigid conduit: threaded type, galvanized steel.

.5 EMT couplings, connectors and fittings shall be steel. Connectors shall have insulated throats. Cast type units shall not be used on this installation.

.6 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

.7 Connectors for flexible conduit: of the type clamping the outside surface of the conduit, and with insulated throats.

.8 Liquid-tight fittings for liquid-tight flexible conduit: steel liquid tight type that fit over PVC jacket and seal uniformly all round, equivalent to T&B 'Super-Tite' 5000 Series. All connectors shall have insulated throats.

.9 Nylon-Insulated Conduit Bushings minimum standard of acceptance: T&B.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

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 Use electrical metallic tubing (EMT) surface mounted.

.3 Do not install EMT where it may be subject to mechanical injury.

.4 Use rigid PVC conduit surface mounted in wet areas not subject to damage.

.5 Use flexible metal conduit for connections where devices require a moving connection such as door hinges.

.6 Minimum conduit size for power circuits: 21mm.

.7 Use flexible metal conduit for connection to devices in dry areas.

.8 Use liquid tight flexible metal conduit for connection to devices in damp, wet or corrosive locations.

.9 For any one conduit section, use the maximum possible conduit length. Installations which use partial lengths and/or excessive number of couplings shall not be acceptable and shall be replaced at Contractor's expense.

.10 Ream and de-burr the ends of each conduit length prior to installation.

.11 Submit sketches to Departmental Representative prior to installation showing intended conduit runs.

.12 Trapeze style hangers shall be used throughout the ceiling space, generally located in corridors for ease of access to junction boxes. In areas with minimal ductwork, pipework, and other obstructions, horizontal conduit runs shall, wherever easily accessible, be tight to the underside of concrete slab.

.13 BX or flexible conduit in accessible ceiling spaces shall not be draped on ceiling tiles but shall be fastened to the underside of the structure using manufacturer's approved fastening devices. Flexible conduits shall not run draped below pipes and ducts but shall be fished over such obstructions.

.14 Use galvanized steel-threaded conduit for the following:

- .1 At all locations where conduit is both exposed and within 450 mm of the floor.
- .2 At all locations where the conduit is subject to mechanical injury
- .3 At all exterior locations where conduit is exposed to the weather.
- .4 In masonry, at all locations where EMT cannot or will not be effectively protected from damage during construction.
- .5 At all points where conduits emerge from concrete floors, columns, walls, etc.

.15 All conduits shall be fastened to structure with steel straps (no cast type straps allowed).

.16 Conduits shall be installed at a minimum depth of 450mm in all areas of the site except for the rock bluff. Conduits installed in the rock bluff shall be installed a minimum depth of 150mm. Marker tape shall be installed 300mm below finished grade. Minimum depth means the distance between the top of the conduit and the finished grade.

.17 Install exposed conduits in close parallel groups wherever two or more conduits running in the same direction would otherwise be within 1800 mm of each other.

.18 Install all conduits parallel or at right angles to building lines, as the case directs.

.19 Where more than three conduits are run parallel in ceiling cavity, they shall be installed on cantruss type channel, complete with all manufacturers' fittings to secure channel to structure and to conduit.

.20 Do not install conduit through structural members unless specific contrary instructions are given.

.21 Do <u>not</u> attach conduits to any portion of the ceiling suspension system or to mechanical ductwork or piping or its suspension system.

.22 Adjust the locations of conduits and other raceway components as required to provide proper access and operating clearance for convector dampers, air mixing boxes, access hatches, inspection and/or service parts, and other similar items installed throughout the building.

.23 Conduit stub-outs for the extension of open communication wiring shall be fitted with nylon insulated bushings.

.24 Bend conduit cold:

- .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.25 Mechanically bend steel conduit over 19mm.

.26 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.27 Install fish cord in empty conduits.

.28 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.29 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run conduits in flanged portion of structural steel.

.2 Group conduits wherever possible on suspended or surface channels.

.3 Do not locate conduits less than 75mm parallel to steam or hot water lines with minimum of 25mm at crossovers.

.4 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

3.4 CONCEALED CONDUITS

.1 Do not install horizontal runs in masonry walls.

.2 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC accepted) with heavy coat of bituminous paint.

3.6 FIRESTOPPING

.1 Provide in accordance with Section 01 84 00 – Firestopping.

3.7 CLEANING

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

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Circuit breakers required in existing panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

2 Products

2.1 PANELBOARDS, BREAKERS

.1 Panelboard breakers: Breakers shall match existing panel manufacturer.

.2 Breakers shall be rated for maximum 10kA at 208/120V.

.3 Plug-in type circuit breakers shall not be used.

.4 Provide all necessary connectors and mounting hardware in every space to facilitate installation of breakers.

.5 Two- and three-pole circuit breakers shall have a common tripping mechanism and single handle. Handle ties are not acceptable.

.6 Provide Lock-on devices for Access Control Equipment circuits.

.7 Provide updated panel directory showing circuit number, location, load, and description of each circuit.

3 Execution

3.1 INSTALLATION - GENERAL

.1 Install breakers in existing panelboards as recommended by panel manufacturer.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 21 - Waste Management and Disposal

1.2 REFERENCES

.1 CAN/CSA W59.2 – Welded Aluminum Construction.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for enclosures and equipment including detailed fabrication drawings showing materials of construction and assembly.

.2 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

.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 for recycling in accordance with Waste Management Plan.

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

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

1.5 STANDARDS

.1 Security Control Cabinets shall comply with relevant sections of CSA 22.2 No. 31, bear CSA approval label, and meet the requirements of the local Inspection Authority.

2 Products

2.1 SECURITY CONTROL CABINET

.1 Enclosure constructed with 3.2mm (1/8") minimum thick marine grade aluminum.

.2 Removable interior back and side panels with formed edges, stainless steel external component fasteners removable on from inside enclosure.

.3 Size: minimum 36"W x 48"H x 22"D or as indicated on the Drawings.

.4 Color: powder coated ASA 61 Grey.

.5 Enclosure shall be NEMA 3R rated and CSA or ULC certified.

.6 Enclosure shall be equipped with fan, heater, two stage electric temperature control, lights, 120V GFI receptacle and door switch.

.7 Heater shall be of suitable wattage and fan of suitable CFM for the volume and internal heat generation of the enclosure components to prevent condensation from -20° to +50° C under all conditions.

.8 Fan shall be covered with a protective guard.

.9 Ventilation panel constructed to allow air circulation yet preventing entry of foreign objects, wild life, vermin and rain. Panel shall be located on the lower portion of the door.

.10 Provide ground bar in cabinet and bond all equipment.

.11 Provide one 5kVA dry-type 600V-120/240V transformer, in enclosure as indicated on Drawings. Note not all enclosures require transformer, refer to equipment lists on Drawings. Transformer shall meet the energy efficiency per CAN/CSA-C802.2-00, Minimum Efficiency Values for Dry-Type Transformers. Transformer shall be:

- .1 ANC self cooled
- .2 Encapsulated - epoxy potted/resin encapsulated/epoxy encapsulated
- .3 1-phase, 600V primary, 120/240 V secondary, 60Hz
- .4 Voltage taps: primary taps ± 5% brought out to a terminal board.
- .5 Insulation: Class 200°C, 130°C temperature rise
- .6 Basic Impulse Level (BIL): standard
- .7 Windings: copper
- .8 Hipot: standard
- .9 Average sound level: per CSA-C9
- .10 Impedance at 170°C: standard
- .11 Enclosure: CSA, with removable metal front panel.
- .12 Mounting: floor

.12 Roof: angled to repel rain, ice and snow with drip guard.

.13 Door: minimum 36" wide, hinged, gasketed, padlockable 3-point latch mechanism on door.

.14 Door shall be provided with a doorstop assembly capable of holding the door open at 90°.

.15 Gasket: closed cell neoprene gasket material, one continuous piece per side permanently bonded to the metal.

.16 Hinges: heavy duty, stainless steel, non-removable pin for secure compartments.

.17 Provide a fold down shelf inside of the door to support a laptop computer.

.18 Entire enclosure capable of withstanding maximum impact force of 86mN/m^2.

.19 Enclosure grounding stud and door grounding stud.

.20 Enclosure suitable to accommodate weight and size of equipment mounted inside as shown on the Drawings.

.21 Provide DIN rail on back panel for equipment mounting as per Drawings.

.22 Provide 24VDC power supply unit in Security Control Cabinets as shown on Drawings, refer to equipment lists. Power supply requirements:

- .1 Nominal input voltage: 100VAC – 240VAC.
- .2 Transient surge protection.
- .3 Nominal output voltage: 24VDC +/- 1%.
- .4 Output current: 2.5A.
- .5 Mounting: horizontal DIN rail.
- .6 Connection method: screw connection.
- .7 UL/CSA approval.
- .8 Minimum standard of acceptance: Phoenix Contact 2868651 STEP-PS/ 1AC/24DC/2.5.

.23 Mounting: wall mount bracket with removable pole mount flanges.

.24 All mounting hardware shall be stainless steel.

.25 Enclosure shall include one heavy duty document pouch inside door.

.26 Provide external cabinet nameplates as per cabinet reference on Drawings. Nameplates shall be laser engraved label on outside of each enclosure. The nameplates shall have 15mm high characters and shall be attached to the door using a minimum of 4 stainless steel 8-32 machine screws complete with blind PEM fasteners. All labelling on enclosure shall be set square. Adhesive stickers

shall not be used for labelling the enclosure. Indicate proposed labelling on the shop drawings.

.27 All welds shall be in accordance with CAN/CSA W59.2 – Welded Aluminum Construction.

.28 Dimensions on Drawings indicate approximate sizes available in the industry. Final size of enclosure dependent of equipment provided.

.29 Enclosure capable of being shipped in knocked-down condition.

2.2 UPS CABINET

.1 Enclosure constructed with 3.2mm (1/8") minimum thick marine grade aluminum.

.2 Size: minimum 45"W x 45"H x 36"D or as indicated on the Drawings.

.3 Color: powder coated ASA 61 Grey.

.4 Enclosure shall be NEMA 3R rated and CSA or ULC certified.

.5 Enclosure shall be single-sided, single hinged door with gasket and lockable latch mechanism on door.

.6 Enclosure shall provide easy maintenance pull-out trays mounted on sliders for access to:

.1 Three (3) 12"H x 18"W x 30"D batteries and
.2 One (1) 17.5"H x 9"W x 19.5"D UPS

.7 Enclosure shall be equipped with fan, heater, and two stage electric temperature control.

.8 Heater shall be of suitable wattage and fan of suitable CFM for the volume and internal heat generation of the enclosure components to prevent condensation from -20° to +50° C under all conditions.

.9 Fan shall be covered with a protective guard.

.10 Ventilation panel constructed to allow air circulation yet preventing entry of foreign objects, wild life, vermin and rain. Panel shall be located on the lower portion of the door.

.11 Door shall be provided with a doorstop assembly capable of holding the door open at 90°.

.12 Gasket: closed cell neoprene gasket material, one continuous piece per side permanently bonded to the metal.

.13 Hinges: heavy duty, stainless steel, non-removable pin for secure compartments.

.14 Entire enclosure capable of withstanding maximum impact force of 86mN/m^2.

.15 Enclosure suitable to accommodate weight and size of equipment mounted inside as shown on the Drawings.

.16 Mounting: enclosure shall be pad mounted as shown on Drawings.

.17 All mounting hardware shall be stainless steel.

.18 Provide external cabinet nameplates as per cabinet reference on Drawings. Nameplates shall be laser engraved label on outside of each enclosure. The nameplates shall have 15mm high characters and shall be attached to the door using a minimum of 4 stainless steel 8-32 machine screws complete with blind PEM fasteners. All labelling on enclosure shall be set square. Adhesive stickers shall not be used for labelling the enclosure. Indicate proposed labelling on the shop drawings.

.19 All welds shall be in accordance with CAN/CSA W59.2 – Welded Aluminum Construction.

.20 Dimensions on Drawings indicate approximate sizes available in the industry. Final size of enclosure dependent of equipment provided.

.21 Enclosure capable of being shipped in knocked-down condition.

2.3 SECURITY CONTROL CABINET WIRING

.1 Conductors inside cabinets shall be stranded copper TEW 105 degree C insulation with 26 strands per conductor.

.2 Neatly bundle and ty-rap wiring to the equipment mounting panel at 150mm intervals. Panduit or equivalent wireways may be used in places where there is a large quantity of wire travelling vertically and horizontally. Show proposed location and use of Panduit wireways on the equipment layout drawings.

.3 Lugs, terminals and screws used for termination of wiring to be suitable for copper conductors. All wires connected to terminal blocks shall be terminated using copper ferrules.

.4 All wiring shall be sized as indicated on the drawings.

.5 All wiring shall take the neatest route to its termination point.

.6 All wires shall be free of splices or through connections in their entirety.

.7 Wiring and terminal blocks shall be labelled according to the conventions in Section 26 05 00.

.8 Provide terminal blocks, circuit breakers, fuses, as indicated on Security Control Cabinet Drawings.

.9 Terminal blocks shall be supplied from Wiedmuller, Weilland, or Phoenix Contact.

2.4 CLOSEOUT SUBMITTALS

.1 Submit enclosure as built drawings and wiring diagrams, test certificates, spare parts, and maintenance materials in accordance with Section 01 78 00 Closeout Submittals.

3 Execution

3.1 INSTALLATION

.1 Assemble enclosure in accordance with manufacturer's instructions and mount to wall or pad mount as indicated on Drawings.

.2 Top entry of conduits into Security Control Cabinets and UPS Cabinets shall not be permitted.

.3 Enclosure shall be vacuumed clean and interior dusted, behind grilles, louvers and screens prior to installation. Remove dirt and other disfiguration from exterior surfaces.

.4 Install Security Control Cabinets and UPS Cabinets in locations as shown on the Drawings; confirm exact location with Departmental Representative on site.

.5 Mount equipment in enclosure.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 01 91 00 – Commissioning (Cx)

.4 Section 26 05 00 - Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-T530, Building Facilities, Design Guidelines for Telecommunications.

.2 CAN/CSA-T529, Design Guidelines for Telecommunications Wiring System in Commercial Buildings.

.3 CAN/CSA-C22.2 No. 214, Communications Cables.

.4 CAN/CSA-C22.2 No. 182.4, Plugs, Receptacles, and Connectors for Communication Systems.

.2 Electronic Industries Association (EIA)

.1 EIA/TIA Bulletin TSB-36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables,.

1.3 SYSTEM DESCRIPTION

.1 Structured system of telecommunications cables (copper and optical fibre) installed within buildings for distributing voice and data (including video) signals.

.2 Installed in physical star configuration with separate horizontal and backbone sub-systems. Horizontal cables link work areas to telecommunications closet located on same floor. Telecommunications closets linked to central equipment room by backbone cables.

2 Products

2.1 STATION WIRE (ZSW)

.1 4-pair, 24 AWG, 100 ohm cable with insulated copper conductor in separate outer jacket: to C22.2 No.214. FT-4 fire-rated jacket.

.2 Voice-grade electrical transmission requirements: to CAN/CSA T529 and TSB-36, Category 6.

.3 Data-grade electrical transmission requirements to: CAN/CSA T529 and TSB-36, Category 6.

2.2 SHIELDED TWISTED PAIR (STP) CABLE

.1 2 pair 150 ohm cable: to CAN/CSA-T529.

2.3 UNSHIELDED TWISTED PAIR CABLE

.1 100 OHM Category 6 U/UTP Balanced Twisted Pair Cable

.2 Cable shall be 4 pr U/UTP construction and available in CMR and CMP jacket types

.3 Cable shall be available in 305 Meter put ups in Reel-in-a- Box containers.

.4 Cable shall be available in (W) White and (L) Blue, jacket colors.

.5 Cable shall exceed TIA-568-C.2 CAT 6, ISO/IEC 11801 Class E, IEC 61156-5, EN50173 standards and be RoHS Compliant.

.6 Cable must guarantee a minimum of 5dB of crosstalk margin beyond the CAT 6 standard for NEXT, PSNEXT, ACR and PSACR

.7 Cable shall have an outer diameter of no greater than 5.84mm (.230") for Plenum and 5.79mm (.228") for Riser.

.8 Cable shall have alpha numeric code printed every 1 meter

.9 Cable shall have easily identifiable color bands.

2.4 COMMUNICATIONS FLAT CABLE (CFC)

.1 4 pair 22 AWG insulated copper conductors in separate flat outer jacket.

2.5 COMMUNICATIONS BUILDING CABLE (CBC)

.1 24 AWG insulated copper conductors grouped in 25-pair separately identified modules surrounded by metallic tape shield and covered with thermoplastic jacket: to CAN/CSA C22.2 No. 214 and CAN/CSA-T529. FT-4 fire-rated jacket.

.2 Voice-grade electrical performance to: CAN/CSA T529.

2.6 PREMISES COMMUNICATION CABLE (PCC)

.1 22 AWG 100 ohm impedance insulated copper conductors grouped in 25-pair separately identified modules with metallic shield and surrounded with jacket: to C22.2 No. 214. FT-1 FT-4 fire-rated jacket.

.2 Electrical/transmission performance to: CAN/CSA-T529.

2.7 COAXIAL CABLE (CXC)

.1 Coaxial members, 75 ohm impedance each having metallic centre conductor surrounded by dielectric material and metal outer conductors separated by dielectric material and surrounded by jacket: to CAN/CSA C22.2 No. 214. FT-4 fire-rated jacket.

.2 For data communications, 24 AWG, 50 ohm impedance. Electrical transmission performance: to CAN/CSA-T529.

.3 For cable television, 75 ohm impedance. Centre conductor No. 22 AWG solid; insulation of solid polyethylene shield of aluminum foil plus braid shield coverage 97%. Loss at 500 MHz not to exceed 3.5 dB per 30 m.

.4 For 50 ohm coaxial cable systems, type BNC connector for service outlet to: CAN/CSA-T529.

2.8 OPTICAL/FIBRE CABLE (OFC)

.1 Number of pair as required tight buffer tube 50/125 micrometre multi-mode graded index fibre: to CAN/CSA T529.

3 Execution

3.1 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install ZSW, STP, PCC, OFC, and CXC horizontal cables as indicated in conduits, cable troughs, underfloor ducts or ceiling space from termination in telecommunications closet to outlets.

.2 Terminate 1 ZSW cables per work station terminated in accordance with CAN/CSA C22.2 No.182.4 and CAN/CSA-T529, Figure 11-1.

.3 Terminate STP cable in accordance with CAN/CSA-T529.

.4 Install CFC cables under carpet from wall termination points.

.1 1 service outlet(s) terminated in accordance with C22.2 No.182.4 and CAN/CSA-T529, Figure 11-1.

.2 Wall termination unit interconnecting ZSW to CFC wiring transition.

.5 For distribution of television signals, terminate CXC cable on type F connectors. For distribution of data signals, terminate CXC cable in accordance with CAN/CSA-T529.

.6 Terminate OFC cables with SC connectors.

.7 Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.

.8 A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.

.9 Cable raceways shall not be filled greater than the ANSI/TIA/EIA-569-B maximum fill for the particular raceway type.

.10 Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

.11 Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

.12 The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.

.13 If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 1.0 to 1.5 meter intervals. At no point shall cable(s) rest on acoustic ceiling grids, T-bars, ceiling support wires, acoustical panels or other components of the suspended ceiling.

.14 Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

.15 Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

.16 Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Contractor shall install appropriate carriers to support the cabling.

.17 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.

.18 Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-C document, manufacturer's recommendations and best industry practices.

.19 Leave a minimum of 12" of slack for twisted pair cables at the work outlet. Cables shall be coiled in the in-wall box, surface-mount box or modular furniture raceway if adequate space is present to house the cable coil without exceeding

the manufacturers bend radius. In hollow-wall installations where box-eliminators are used, excess wire can be stored in the wall. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

.20 A 3 meter (10ft) service loop shall be coiled neatly in ceiling at top of wall as close to conduit stub up or hollow wall exit point to drop ceiling.

.21 Cables shall be neatly bundled and dressed to their respective termination device. Each terminating device shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

.22 Each cable shall be clearly labeled on the cable jacket behind the termination device at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.2 INSTALLATION OF BACKBONE CABLES

.1 Install CBC, OFC, CXC and ZSW cable as indicated in conduit from termination in each telecommunications closet to equipment room. Termination: to CAN/CSA-T529.

.2 Terminate CBC and ZSW cables in accordance with CAN/CSA-T529 on patch panel.

.3 For distribution of television signals, terminate CXC cable on type F connectors. For distribution of data signals, terminate CXC cable in accordance with CAN/CSA-T529.

.4 Terminate OFC cables on patch panel with SC connectors.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 00 –Commissioning.

.2 Test UTP cable installations for using a Level IV tester. Refer to Section 27 10 50, sentence 3.4.3 for number and type of tests.

.3 Test optical fibre cables for:

.1 End-to-end loss at 850 nm.
.2 OTDR tests.

.4 Test coaxial cables for:

.1 Continuity.
.2 Attenuation at 20 MHz.

.5 Test STP cables for:

.1 Continuity.

.2 Attenuation at 20 MHz.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 This section specifies materials and installation for fibre optic cable systems.

1.2 SCOPE

.1 Installation of fibre optic cabling from card access control media converters to existing fibre patch panels, complete with provisions of cables and connectors as indicated.

1.3 REFERENCE

.1 Canadian Standards Association (CSA International)

- .1 CSA-T529-latest edition, Telecommunications Cabling Systems in Commercial Buildings (Adopted ANSI/EIA TIA 568a with modifications).
- .2 CAN/CSA-C22.2 No. 182.4-latest edition. Plugs, Receptacles, and Connectors for Communication Systems.

.2 Telecommunications Industry Association (TIA)

- .1 TIA/EIA-568-latest edition, Commercial Building Telecommunications Cabling Standard Set.

1.4 DESCRIPTION OF SYSTEM

.1 Install a complete fibre optic data cabling system as defined on the drawings and in these specifications

.2 The contract includes the supply and installation of cabling for a complete system, including but not limited to:

- .1 Raceways and wireway systems as indicated on plans.
- .2 Supply of fibre optic interconnect components.
- .3 Installation of connectors and terminations for all fibres.
- .4 Testing of all fibres.

.3 The supply of all patch cords.

1.5 WARRANTY

.1 There shall be a minimum one year vendor warranty on all cables, components and equipment including installation. The one year warranty period begins upon substantial performance or when the system is fully functional, whichever is later.

1.6 PRODUCT DATA AND SHOP DRAWINGS

.1 Submit product data and shop drawings in accordance with Section 01 33 00 – Submittal Procedures. This includes any test results provided by the cable manufacturer, and cable test results as specified hererin.

.2 Shop drawings to include dimensions and performance characteristics of equipment and cable routing diagrams.

1.7 MAINTENANCE AND OPERATIONAL DATA

.1 Provide maintenance data for all fibre optic cables and equipment for insertion into the project Operations and Maintenance Manual.

.2 Contractor shall supply the Departmental Representative with a complete, up-dated, and accurate set of "As-built" drawings at job completion. These drawings will form part of the project Operations and Maintenance Manual.

2 Products

2.1 STANDARD OF ACCEPTANCE

.1 Minimum Standard of Acceptance for all cables and system components: Commscope LazrSPEED.

2.2 CONNECTORS

.1 All fibre connectivity components are to be included in contract.

.2 All fibres will be terminated using SC style duplex connectors for multimode.

2.3 FIBRE OPTIC CABLES

.1 Fibre optic cables will be provided and installed by the electrical contractor from the card access system ethernet-to-fibre media converter to the existing fibre patch panel inside each building.

.2 Provide 2 strand pre-terminated 50/125µm fibre between the existing patch panel and the media converter hardware.

.3 Provide WHMIS sheets for fibre cable supplied, showing characteristics of cable construction, etc.

2.4 PATCH PANELS

.1 All fibres will be terminated onto existing patch panels.

3 Execution

3.1 FIBRE OPTIC CABLING – OTDR TESTING

.1 Test all fibres prior to and after installation to ensure fibre integrity.

.2 Arrange to obtain all required fibre optic cabling. This contractor is to terminate as necessary, and to perform optical time-domain reflectometer (OTDR) tests on cables intended for use on this project, prior to proceeding with, and after completion of installation to ensure that the fibre optic cables are free from faults. Submit all test results to Consultant.

.3 Transmission testing performance parameters:

Wavelength (nm)	Maximum Attenuation (dB/km)	Min. Information Transmission Capacity (MHz-km)
Multimode 850	3.2	1500
Multimode 1300	1.5	500

3.2 FIBRE OPTIC CABLING – INSTALLATION

.1 Install all runs and terminations in strict accordance with industry standards, grouped together by type and in sequence, top down and/or left to right.

.2 Do not apply excessive tension to the cable. Pulling tension shall be less than the cable manufacturer's recommendation.

.3 The cable shall be installed such that it will not be crushed or damaged during or after installation.

.4 Any damaged cable, or cable installed with excessive force will be replaced by the electrical contractor at no cost to the project.

.5 Do not exceed the minimum bend radius of 20 times cable outer diameter for installation, and 10 times cable outer diameter upon completion of the installation.

.6 Vertical run cables will be supported using intermediate tension relief as recommended by the manufacturer. Use a split wire mesh grip and install the cable from the top down. Vertical cables should be installed using a pulling grip to ensure the stress is placed on the cable itself and not the fibre.

.7 Cabling shall not be installed in 90° elbows or junction boxes unless the minimum bend radius requirements for the cable are met.

.8 If lubricant is used, ensure it meets the manufacturer's recommendations.

.9 Bushings and grommets shall be used on all metal ends, edges, and openings where cables pass through to ensure the cable is not damaged.

.10 Cables will be continuous with no splices points.

.11 Label all individual cables.

.12 Install all fibre runs in separate conduits for other systems cables. Do not install fibre optic cables in conduits with copper cables.

3.3 INSTALLATION INSPECTION

.1 The completed installation will be inspected visually by the Departmental Representative prior to the commencement of functional and electrical performance testing. The installation will be inspected for compliance with the industry standards referenced above, and particular attention will be given to the following criteria:

.1 Neatness, clamping and harnessing of cables and wiring.
.2 Wire and cable management, identification, and labelling.
.3 Overall system completeness.
.4 Nameplates, identification plates and markings.
.5 Construction and finishes.
.6 System grounding.
.7 Mechanical installation including compliance with seismic restraint requirements.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 This section specifies the components for a complete card access control system, including door locking, control/release and answering to form a complete and operating door release system.

.2 Door release panel and controllers.

.3 Magnetic door locks.

.4 Electronic locksets with integral reader, keypad and request-to-exit sensor.

.5 Pushbuttons.

.6 Power supplies.

.7 Electrical supervision circuits.

.8 Wiring.

.9 Card readers.

.10 Keypads.

.11 Accessory software upgrades and re-programming.

1.2 REFERENCE STANDARDS

.1 Underwriters' Laboratories (UL)

.1 UL 294, Standard for Safety for Access Control System Units.
.2 UL 1981-1994, Standard for Central-Station Automation Systems.

1.3 DEFINITIONS

.1 Electronic Access Control (EAC): The control of people through entrances and exits of a controlled area. An aspect of security that utilizes hardware systems and specialized procedures to control and monitor movements into, out of, or within a controlled area. Access to various areas may be a function of authorized level or time or a combination or both.

.2 DRS:. Door Release System.

.3 PIN: Personal Identification Number.

1.4 DESIGN PERFORMANCE REQUIREMENTS

.1 Design access control and security access systems using only ULC/UL Listed products.

.2 Security access system design and integration shall be completed by Public Works and Government Services Canada (PWGSC) certified Value Added Reseller (VAR) for the system outlined in the contract documents. Minimum Standard of Acceptance: BMS Integrated Services Inc or alternate approved VAR.

.3 Design security access system as a ULC/UL Certified Alarm System alarm system.

.4 Central System: Design operation of electrical protection circuits and devices for signalled automatically to, recorded in, maintained and supervised from central station with arming and disarming supervised by central station.

.1 Remote monitoring:

.1 Monitoring location: Commissionaire Gatehouse.
.2 System with no investigator response.
.3 Primary signal transmission method.
.4 Standard line security employed.
.5 Monitor for fault or alarm.
.6 Identify fault location.
.7 Monitor all power.

.5 Design access control systems to meet safety requirements specified in accordance with UL 294.

.6 Design system to provide door manual and automatic control functions from locations indicated to central monitoring system.

.7 Each activation unit must have door panel control function/equipment item located as indicated.

.8 Allow all costs associated with updating all existing software to current version.

.9 The system will be installed under the supervision of a Lenel Value added Reseller (VAR) employed directly by the contractor. All commissioning, testing, and setup will be undertaken by the VAR. The system demonstration / handover will be undertaken by the VAR.

.10 The contractor shall employ the services of the existing EGD preferred contractor to undertake all programming and alterations to the existing LENEL system software. The existing contractor is BMS Integrated Services, 420 William Street, Victoria, British Columbia, Canada V9A 3Y9

.11 Door activation units

.1 Fully complement and function and match door manufacturers controls and hardware.
.2 Fully function with OEM supplied door controls and hardware to activate system in routine and emergency conditions.
.3 Fully function within supplied electrical supervision circuits as specified.

.12 Control Panel

.1 Fully compatible, compliment and operate components provided by door manufacturer of system or OEM supplied door-operating hardware.
.2 Complete with card reader to release and secure each door, as indicated.
.3 Permanently label (paper labels are not acceptable) or electronically identified each door location on panel or associated display unit
.4 Fully function within supplied electrical supervision circuits as specified.

1.5 SUBMITTALS

.1 Product Data: Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit manufacture's literature for each system component.
.3 Submit:
.1 Functional description of equipment.
.2 Technical data for all devices.
.3 Device location plans and cable lists.
.4 Devices mounting location detail drawings.
.5 Typical devices connection detail drawings.

.2 Shop Drawings: Submit in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit shop drawings to indicate project layout, including details as follows:
.1 Indicate mounting heights and locations.
.2 Zone layout drawing indicating number and location of zones and areas covered.
.3 Wiring diagrams.
.4 Complete equipment list.

.3 Quality Assurance Submittals: Submit the following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Test Reports: Submit certified test reports 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.
.1 Submit ULC/UL Product Safety Certificates.

.2 Submit verification Certificate that service company is ULC/UL List alarm service company.
.3 Submit verification Certificate that monitoring facility is ULC/UL "Listed central station".
.4 Submit verification Certificate that security access system is "Certified alarm system".

.3 Instructions: Submit manufacturer's installation instructions.

.4 Manufacturer's Field Services: Submit copies of manufacturer's field reports.

.4 Maintenance Data: Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.1 Include:
.1 System configuration and equipment physical layout.
.2 Functional description of equipment.
.3 Instructions of operation of equipment.
.4 Illustrations and diagrams to supplement procedures.
.5 Operation instructions provided by manufacturer.
.6 Cleaning instructions.

2 Products

2.1 MATERIALS

.1 Door controls Items and panels.

.1 Provide standard "off the shelf" equipment items to form a complete and operating DRS system.

.2 Provide as required: Equipment cabinets, equipment panels, AC power strips, power line conditioner, uninterrupted power supplies, system power supply, junction box, door control panels, door activation units, electronic supervising master panel, electronic supervising remote panels, system connectors, and system cables.

.2 Provide system cables including multi-conductor control cable, fibre optic, RS-485, and AC power cable required.

.3 Power supplies: to CAN/ULC-S318 or UL 603.

.4 Connectors and switches: to ORD-C634.

.5 Basic System Criteria

.1 Hard wired Combination Card Readers, Keypad, Request-To-Exit Locksets:
.1 Quantity of units required: as indicated on plans..
.2 Proximity technology.
.3 Fitted with LED indicator light.
.4 Reading range: 300mm.

.5 Compatible with existing access cards system.
.6 Open Architecture platform.
.7 Full electronic lockset with integral card reader on non- secure side and request-to-exit sensor on secure site. Lockset to have key cylinder matching keys at the Esquimalt Graving Doc site.
.8 Minimum Standard of Acceptance: Ingersoll-Rand Schage AD-300 hard wired electronic lock Cat. # AD-300-CY-70-MT-SPA-626PD-S123-RH-10- O25-XX, where "XX" door thickness varies, Contractor to confirm door thickness in each location prior to ordering lockset.

.2 Wireless Combination Card Readers, Keypad, Request-To-Exit Locksets:
.1 Quantity of units required: as indicated on plans..
.2 Proximity technology.
.3 Fitted with LED indicator light.
.4 Reading range: 300mm.
.5 Compatible with existing access cards system.
.6 Open Architecture platform.
.7 Full electronic lockset with integral card reader on non- secure side and request-to-exit sensor on secure site. Lockset to have key cylinder matching keys at the Esquimalt Graving Doc site.
.8 Minimum Standard of Acceptance: Ingersoll-Rand Schage AD-400 hard wired electronic lock Cat. # AD-400-CY-70-MT-SPA-626PD-S123-RH-8B-O25-XX, where "XX" door thickness varies, Contractor to confirm door thickness in each location prior to ordering lockset.

.3 System Accessories:
.1 Power Supplies:
.1 Continuous low voltage operation output.
.2 Equipped with secondary protection for each output.
.3 Individual outputs for connection of devices.
.4 AC power failure output.
.5 DC power failure output and low battery output.
.6 Fitted with tamper contact.
.7 Wall mounted cabinet with locked door complete with 2 keys.

.2 Media Converter
.1 50/125µm fibre to fast Ethernet
.2 SC duplex connection for fibre input
.3 RJ45 for Ethernet output
.4 Complete with wall / box mount kit
.5 Link test
.6 Status indicator lights for power, link, activity
.7 Round trip delay – 0.4µs maximum
.8 BER - <10-12
.9 RoHS compliant

.10 Minimum standard of acceptance Allied Telesis AT-MC102XL

.4 Card Reader Interface:
- .1 Card reader interfaces to be compatible with existing LENEL system on site.
- .2 Communications: Wiregard Data1/Data0 or clock communication.
- .3 Bidirectional RS-485 open supervised device protocol.
  Minimum Standard of Acceptance: LENEL LNL-1320 Series 2.

.5 Panel Interface Board / module
- .1 Panel interface board / module to allow integration of Schlage Lock with Lenel Onguard system
- .2 Wireless doors Minimum standard of acceptance: Schlage PIM-400-TD
- .3 Hardwired doors Minimum standard of acceptance: Schlage PIB-300-2D

.6 System Software:
- .1 Existing OnGuard access control system software. Re-program to accommodate new door control devices.

.7 Uninterrupted Power Supplies (UPS):
- .1 Provide a UPS inside door card reader control panels to maintain system functionality during a BC Hydro power outage.
- .2 UPS to be 350VA, 120 Volt input and output.
- .3 Minimum Standard of Acceptance: APC BE600-BR.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and datasheet.

3.2 INSTALLATION: SECURITY ACCESS

.1 Install components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.

.2 Install required boxes in inconspicuous accessible locations. Boxes to contain all hardware, including power supply, UPS, media converter, system controller cards, door interface cards, panel interface boards.

.3 Boxes to be sized to manufacturers requirements and guidelines all wiring to be labelled at each end and installed in a neat and tidy fashion. Individual

conductors shall be provides with ferrules or similar to identify conductor label used.

.4 Contractor to determine quantity and size of all power supplies based on number of devices served and proximity of devices. Where a local power supply is to be provided for the Combination Card Readers, Keypad, Request-To-Exit Locksets, the contractor shall install the power supply in a suitably sized, lockable box, wall mounted on the secure side of the door served

.5 Allow for a review of all wiring and installation by the system manufacturer and integrator to ensure all required work is included prior to commencing installation

.6 Prepare demonstration for departmental representative to ensure systems from different manufacturers are operating together per design intent. Install door hardware, complete with all control panel hardware at one location for demonstration purposes. See section 01 79 00 for Demonstration and Training requirements.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Services:

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.2 Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, at stages listed:

.1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of the Work, after cleaning is carried out.

.4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.

3.4 VERIFICATION

.1 Perform verification inspections and test in the presence of Consultant.

.1 Provide all necessary tools, ladders and equipment.

.2 Ensure appropriate subcontractors, manufacturer's representatives are present for verification.

.2 Pretesting Procedure

.1 Verify that System is fully operational and meets all System performance requirements of this specification.

.2 Measure and record, control carrier levels of every System channel at each of following points in the system:
- .1 Door located actuating devices.
- .2 Door control panel functions.
- .3 Electronic supervisory control units inputs and outputs.
- .4 Distribution system input and output.

.3 Provide and submit to Consultant two copies of recorded system pre-test measurements, along with pre-test certification.

.3 Performance Testing

.1 Test Procedure: perform test on a "go-no-go" basis.
- .1 Make only operator adjustments required to show proof of performance.
- .2 Test to demonstrate and verify that installed System complies with installation and technical requirements of this specification under operating conditions.
- .3 Test results to be evaluated by Departmental Representative as either acceptable or unacceptable using following procedures.

.2 Documentation Review
- .1 This review will determine if information provided is sufficient to meet requirements of this specification.
- .2 Provide for review all System manuals, as installed drawings, pre-test forms, antenna radiation patterns, equipment cabinet pictorials, antenna pictorial, antenna mount pictorial, video and audio equipment details.

.3 Mechanical Inspection
- .1 Departmental Representative and Contractor to tour all areas to insure that all Systems and Subsystems are installed in place for proof of performance testing.
- .2 Take system inventory at this time. Verify following items before beginning proof of performance tests:
  - .1 All electrical power circuits designated for system equipment are properly labelled, wired, phased, protected and grounded.
  - .2 Conductor ends are protected by heat shrink wrap; audio spade lugs, barrier strips and punch blocks are used.
  - .3 Dust, debris, solder splatter, etc. are cleaned and removed from site.
  - .4 All equipment is properly labelled.
  - .5 All equipment identified in System's equipment list[s] are in place and properly installed.
  - .6 Each system ground is installed in accordance with manufacturer's instructions and this specification.

.4 Subsystem Functional Test

.1 Conduct operational testing after review of documentation and mechanical inspection completed. Proceed as follows.

.1 Perform operational test of each Subsystem to verify that all equipment is properly connected, interfaced and is functionally operational to meet requirements of this specification.

.2 Control Units

.1 Take S/N readings from control unit's input and output in manual and/or automatic mode. Check output of DC/Data converter for S/N. Evaluate entire signal quality at baseband connector output of control unit and remote equipment.

.3 Distribution (or Interface) System

.1 Check each door utilizing a volt/ohm or signal level meter to confirm each function and to insure that System meets all performance requirements.

.2 Test each interconnection point (i.e: Door unit, junction box "cross connection", control unit, etc.) to ensure compliance with this specification.

.4 Total System Test

.1 Proceed with testing when System and Subsystems are functionally tested and accepted. Total System tests to verify that requirements have been met for DC and/or audio, sub carrier, and control signals in accordance with this specification.

.5 Safety

.1 Demonstrate with documentation that access control system meets safety requirements specified in UL 294.

.5 Visual Verification: Objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:

.1 Sturdiness of equipment fastening.
.2 Non-existence of installation related damages.
.3 Compliance of device locations with reviewed shop drawings.
.4 Compatibility of equipment installation with physical environment.
.5 Inclusion of all accessories.
.6 Device and cabling identification.
.7 Application and location of ULC approval decals.

.6 Technical Verification: Purpose to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:
- .1 Validate sensitivity of readers and applicability and application of cards.
- .2 Connecting joints and equipment fastening.
- .3 Compliance with manufacturer's specification, product literature and installation instructions.

.7 Operational Verification: Purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:
- .1 Operation of each device individually and within its environment.
- .2 Operation of each device in relation with programmable schedule and or/specific functions.

3.5 CLEANING

.1 Remove protective coverings from accessories and components.

.2 Adjust all components for correct function.

.3 Clean housings and system components, free from marks, packing tape, and finger prints, in accordance with manufacturer's written cleaning recommendations.

.4 Clean all components free from dirt and fingerprints.

END OF SECTION

Appendix A

EGD Lockout Policy and Procedures

LOCKOUT POLICY, PROCEDURES & RECORDS

ESQUIMALT GRAVING DOCK

Canada

Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

Prepared For:	*Approved By:*	*Date Issued:*	*Version:*	*Controlled Copy:*
Risk Management	Jim Milne	18 July 2012	FINAL	01

LIST OF CURRENT AMENDMENTS

AMENDMENT ***NUMBER***	***DATE***	***SECTION***	PAGE ***NO.***	***SUBJECT***
001	6 Jan/10	All		Reviewed and updated. Removed use of Re-energization form; PPE modifications; remove Treasury Board requirements; Mods to reflect BC Safety Authority requirements regarding qualifications.
002	16 May/12	All		Reviewed & Updated. Applicable regulations updated.
003	16 May/12	6	15	Added sequence of operations to allow for orderly startup
004	16 May/12	6	17	Added note re non-electrical isolation; requirement for contractors to provide list of qualified workers.
005	16 May/12	10	24	Add WorkSafeBC19.24 reference re informing workers of H.V.
006	16 May/12	10	25-27	Added Authorization by Owner: WorkSafeBC 19.29 New limits of approach for H.V. by WorkSafeBC Feb 2011
007	16 May/12	10		Added reference to Assurance in writing: WorkSafeBC 19.25

NOTE: Copies of this manual identified as "UNCONTROLLED" may not be the latest release. CONTROLLED copies are numbered and kept by the following individuals:
Copy 1 – Guarantor
Copy 2 – EGD Best Practices Coordinator
Copy 3 – PWGSC Operations Manager at EGD

Every Manual Holder is required to update their manual immediately when amendments are issued and to record the changes on their amendment sheet in the front of their book. Personnel are requested not to make additional copies of this manual as important revisions will not be made available to any manual not issued by the EGD Health & Safety Department.

To initiate a revision contact the PWGSC Operations Manager at EGD.

Table of Contents

Safe Work Policy# EGD- 001	***Applicable Regulations:*** • ***WorkSafeBC B.C. OH&S*** ➢ ***Part 10 - De-energization & Lockout.*** ➢ ***Part 19 – Electrical Safety*** • ***PWGSC Departmental Policy 058 (containing reference to numerous regulations)*** • ***Canada Labour Code Part VIII Electrical Safety*** • ***Treasury Board of Canada Policy, Part VIII, 2008:04:01*** • ***Canadian Electrical Code*** • BC Hydro *Safety Practice Regulations*, issued March 2011, with revisions from BC Hydro Safety Practices Committee up to May 31, 2011 • *National Electrical Safety Code*, ANSI/IEEE C2 - 2007 • ***DND BCEO Local Operating Orders***

1.0 BACKGROUND AND APPLICATION:

The intent of this policy is to create a standard policy and procedures that will apply to all work for PWGSC/ Esquimalt Graving Dock (EGD) that requires isolation/lockout.

This policy will apply to the following personnel and/or contractors:

1. PWGSC Employees at all times
2. Any Contractor working for PWGSC on PWGSC/EGD contracts.

The procedures and requirements of this policy are intended primarily to ensure compliance with WORKSAFEBC regulations. Exceptions arise from the need to also comply with PWGSC Departmental Policy 058 and all Departments with the Canada Labour Code/ Treasury Board Policy. These exceptions are identified in sidebars in the document. Most sections are required in order to meet WORKSAFEBC Regulations PARTS 10 and 19 and some specific references are also noted. **NOTE that sections with references to regulations are not intended to provide the regulation wording verbatim.**

Note that there are numerous requirements within the Canadian Electrical Code, general requirements of PWGSC Departmental Policy 058, WORKSAFEBC regulations etc regarding design criteria for electrical installations and regular operating requirements that also have an impact on safety. It is not the intent of this policy to deal with those requirements. Workers and supervisors must familiarize themselves with applicable regulations/directives.

It is expected that Ship Repair Contractors (e.g. Jenkins Marine, Victoria Shipyards etc.) will establish their own lockout policy and ensure it meets all applicable regulations.

2.0 PURPOSE:

The purpose of a lockout policy is to prevent an energy-isolating device (such as a switch, circuit breaker, disconnect, or valve) from accidentally or inadvertently being operated while workers are performing maintenance or other work on machinery or equipment.

The purpose of this policy/procedure is to ensure the safety of workers by making sure machinery or equipment won't start and injure a worker. The EGD PWGSC Supervisors, PWGSC Project Managers, will ensure that every Contractor has a copy of this policy prior to engaging in work requiring lockout. In the case of Contract Workers on maintenance or construction activities, the Contractor's Superintendent will be responsible for ensuring Worker training has occurred and providing documentation thereof to the Project Manager. PWGSC Supervisors will ensure that persons performing work that requires lockout, are trained in and adhere to this policy. It is expected this document will be used as part of any lockout training/orientation package.

Serious injury (see Appendix 1) may result if lockout rules are not followed in every detail. If there are details of the policy or rules not understood, workers are encouraged to discuss them with their Supervisor.

3.0 DEFINITIONS:

ABBREVIATIONS

EGD EA: EGD Electrical Authority. Currently the PWGSC Electrical Supervisor.

DND BCEO: Department of National Defense Base Construction Engineering & Operations. Note that only Monroe Head is fed directly by B.C. Hydro. Power to EGD is supplied by DND BCEO. EGD Electrical personnel do not deal directly with B.C. Hydro.

EGD: Esquimalt Graving Dock

PIC: Person in Charge of actually carrying out or supervision of the work.

AERIAL MANLIFT:
Includes all types of equipment such as boom mounted buckets, cages, or baskets and truck mounted ladders. These are designed to place personnel, their equipment and tools, aloft in a position to work on Elevated Structures and equipment. Note: Buckets shall not in themselves, be considered an insulating device.

ALIVE or LIVE:
Means capable of delivering power or containing stored energy or being energized.

AUTHORIZED PERSONS:
Persons confirmed by supervision as being thoroughly familiar with the process or operation are authorized persons to operate valves, breakers etc.

For specific equipment in specific circumstances (i.e. Main Power Disconnect on site service power pole, main electrical vault disconnect etc.), those persons authorized by the Guarantor may operate electrical disconnect devices after they have been properly instructed and are considered thoroughly capable.

See also definition of Electrical Worker and Qualified Person/Qualified Electrician.

CLEARANCE:
An assurance that a specific Line or specified Electrical Apparatus is isolated and it is safe to apply Safety Grounds and go to work.

DEAD:
Incapable of delivering power and not containing stored energy.

DE-ENERGIZED:
Means the normal sources of energy have been interrupted by disconnection apparatus.

DIFFERENT OPERATING AUTHORITY:
D.N.D. Base Construction Engineering Operations and EGD EA (EGD Electrical Authority) are recognized as the different Operating Authorities for the purposes of these procedures described herein.

ELECTRICAL APPARATUS:
Means all electrical machines, equipment, fuses, switches, disconnects, bus bars, electrical conductors, cables, transformers, capacitors, etc, together forming an electrical system.

ELECTRICAL WORKER:
means a Qualified person who meets the requirements of the B.C. Electrical Safety Act for installing, altering or maintaining electrical equipment.

WORKSAFE BC 19.1

GUARANTOR:
means a representative of the EGD Director or designated representative, responsible for the electrical equipment, the electrical installation or power system and authorized by PWGSC as the exclusive authority to establish conditions for isolation, provide a guarantee of isolation and approve a "REQUEST FOR ELECTRICAL ISOLATION" and to authorize live line work. The Guarantor is like a "gatekeeper" who will ensure a number of critical activities have taken place prior to authorizing the work to proceed.

DP058

The Guarantor is a Field Service Representative (FSR) as defined by B.C. Safety Authority, with a Class A certificate who holds the Operating Permit for EGD. The Guarantor may assign a Qualified Electrician to act as alternate Guarantor subject to conditions as outlined under "Qualified Electrician".

The Guarantor must be authorized in writing by his/her employer to perform the role of Guarantor. Note that all original copies of log-books, guarantees of isolation and other associated documentation will be kept on site at EGD with the Guarantor. The Guarantor will ensure that persons with knowledge are involved in defining procedures when ***non-electrical isolation*** is required as part of the lockout process.

Note that WORKSAFEBC refers to the Guarantor as the "Person in Charge" per paragraph 19.19

The Guarantor will also:

DP058

1. Ensure that a log of minor electrical repair and renovation projects is established and maintained and necessary inspections are carried out by local Electrical Inspection Authorities.
2. Ensure that a permit is obtained from local electrical authorities when necessary, and work is subsequently inspected as required. See Departmental Policy DP058 Appendix 7 located in Section 6 of the Lockout Manual for equipment/installations requiring inspection certificates.
3. Inform all occupants who will be affected that the isolation is taking place.
4. Inform anyone that may be affected, of any unscheduled interruptions.
5. Maintain a log of switching details, safety protection guarantees and operational events
6. Authorize the commencement of work.
7. Ensure only workers authorized by the owner receive a safety protection guarantee and are permitted to do work on the system.
8. Ensure there is effective communication between the Guarantor, Person in Charge, others on site (as required) and the workers doing the work.
9. Ensure that other groups of workers, contractors, etc. that may be affected are informed of the Lockout Plan about to be implemented and that no other work that could interfere is authorized to commence during the isolation.

10. If work is taking place near live electrical equipment, determine when a Safety Watcher should be used.
11. Ensure that all operating procedures, schematics and related documents are updated promptly on completion of the work.
12. Ensure required signage is in place at each approach to High Voltage electrical equipment.
13. Provide alternate Switching Routing or Isolating Procedures required to restore or maintain Emergency Electrical Service when existing Standard Operating Procedures do not exist covering such unforeseen emergencies.

QUALIFIED PERSON/ QUALIFIED ELECTRICIAN

DP058

Means, with respect to a specified duty, an individual who, because of knowledge, training and experience, is qualified to safely and properly perform the duty. A Qualified Electrician is a qualified person who is also licensed to perform electrical work in the Province of B.C. The operating permit holder (Guarantor) has the authority to assign the work to certified and qualified electrical workers. "Qualified", has been defined as a person who is familiar with the equipment being installed or altered, is aware of required safety procedures and the hazards involved. So the FSR should assign the work to one with training and experience. Qualified Journeymen Electricians will have a Trade Qualification (TQ) and/or Interprovincial Ticket.

The Qualified Electrical Worker can be assigned to work involving any voltage provided the Guarantor has selected the Worker based on specific competency parameters, knowledge, experience to be able to complete the work safely.[1]

PERSON IN CHARGE (PIC)

DP058

Relative to this policy, means a Qualified Person in charge of carrying out Isolation, appointed by management, to ensure the safe and proper conduct of an operation, or the work of employees to implement isolation (e.g. Electrician, Electrical Foreman, etc.).

The Person in Charge will:

1. Secure the input of persons qualified to carry out mechanical isolations as required to ensure the overall safe conduct of the operation.
2. Prepare the Request for Electrical Isolation and Procedures for Isolation forms (see sample in Appendix 4) in consultation with the Guarantor. The Person In Charge must be authorized in writing by his/her employer to receive a Guarantee of Isolation.

PWGSC ELECTRICAL SUPERVISOR at EGD:

An individual charged with supervising EGD Electricians or coordinating the procurement of Electrical Contract Resources to carry out electrical work at the EGD site. Relevant records regarding electrical

[1] BC Safety Authority, Ted Gilbert 8 Sept 2009

work (Requests for Isolation, Procedures, Line diagrams, etc.) will be stored in his/her office. Also, the Electrical Supervisor will coordinate reviews/revisions to this policy and act as the Guarantor.

BEST PRACTICES COORDINATOR:
The Coordinator is an individual at EGD who is responsible (among other things) for the maintenance of Health & Safety Policies. Requests for changes to this document will be initiated through the PWGSC Electrical Supervisor who will bring them to the Best Practices Coordinator for documentation and subsequent approval by the PWGSC Electrical Supervisor and the EGD Director.

MANAGER IN CHARGE OF WORKSITE OR OPERATIONS SUPERVISOR
Regarding box "E" on the "REQUEST FOR ELECTRICAL ISOLATION" (PWGSC-13), this individual is usually the Supervisor accepting the COMPLETED WORK back into service. However, this can also be the Guarantor accepting the work as properly completed in the event of work completed on an off shift or weekend.

ISOLATED:
Means the normal source of electrical energy has been disconnected by opening all associated switches and securing them in this condition. For other energy sources (e.g. mechanical, hydraulic, pneumatic etc.) it means use of an energy-isolating device and locks to secure the points and prevent accidental energy release.

LIVE TESTING:
Means the Line or Electrical Apparatus is under the Direct Control of the Person In Charge who may authorize him/herself or others to conduct Live Testing. "Do Not Operate - Testing" tags are to be affixed to the appropriate switches or isolating devices for the duration of the tests.

SAFETY WATCHER:

Where a Worker is working on/near live equipment and because of the nature of the work, the condition or location of the workplace, it is necessary the work be observed, the Person in Charge shall appoint a Safety Watcher. His/her duties are:

1. Warn workers of the hazard and
2. Ensure all safety precautions/procedures are complied with.

The Safety Watcher shall be:

1. A Qualified Person informed of the duties and of the hazards involved.
2. Trained and instructed in emergency procedures
3. Authorized to immediately stop work he/she considers to be dangerous or not being properly conducted; and

4. Free of other duties that might interfere with the Safety Watcher duties.
5. Identified to all parties as the official Safety Watcher and included in a pre-project safety review of the work with all Workers.

SCISSORS:
A clamp-like device that allows multiple locks to be attached to a single isolation point. The Electrical Supervisor will issue scissors as required.

TAILBOARD DISCUSSION:
Any job involving two or more workers must be planned in detail before any work commences. To work safely a "Tailboard Discussion" must be held. All employees involved in a job must have a clear understanding of their role and procedures. Tailboard discussions must be held prior to work and again if there is a change in plans. The tailboard meetings shall be recorded, and kept with the Request for Isolation, Procedures and other documents related to the job for future reference.

4.0 LOCKOUT DEFINED AND WHEN REQUIRED:

What is Lockout?

WORKSAFEBC 10.1

Lockout is the use of a lock or locks to render machinery or equipment inoperable or to isolate an energy source, in accordance with a written procedure. The equipment cannot be operated or energized without the consent of the person(s) who rendered it inoperable.

Energy sources can be: Electrical, Mechanical, Hydraulic, Pneumatic, Chemical, Thermal or can be Potential Energy. The objective of lockout is to achieve a "zero energy state".

When is Lockout Required?

Lockout is required under the following circumstances.

WORKSAFEBC 10.2, 10.3

1. If the machinery or equipment could unexpectedly activate, or
2. If the unexpected release of an energy source could cause injury.

When is Lockout not required?

If there is no hazard to workers, no lockout is required. The application of a lock is not required if:

WORKSAFEBC 10.11

a. The energy-isolating device is under the *exclusive and immediate control* of the worker *at all times* while working on the equipment and has been de-energized.

b. The tool, machine or equipment which receives power through a readily disconnected supply such as an electrical cord or quick release air or hydraulic line, is disconnected from its power supply and it's connection point is kept under the immediate control of the worker at all times while the work is being done.

5.0 PERSONAL SAFETY LOCKS AND PERSONAL PROTECTIVE EQUIPMENT:

Personal Safety Locks

WORKSAFEBC 10.4

Every worker who is required to lock out machinery or equipment will be issued personal safety lock(s) by their supervisor, in the quantity required to comply with lock out requirements. This lock(s) ensures the safety of the individual worker. Workers are **FORBIDDEN** from removing locks belonging to other workers. Workers are **FORBIDDEN** from giving their key(s) for personal lock(s) to anyone.

Your key is your life insurance!

Only individually keyed locks of substantial construction are acceptable (no locks with one master key and no multiple keys). ***No combination locks*** are permitted. All locks issued to workers will be recorded in a lock registry with the name of the worker owning the lock opposite the lock's serial number. When using Personal Safety Locks, each worker will attach a tag identifying the lock owner, his/her company and date/time applied to each lock. Alternatively, locks can be permanently identified with the owner's name. Contractors are expected to supply sufficient locks for all of their workers to carry out the required procedure.
If used in conjunction with a Live Test, mark the tag as a Testing Tag.

If multiple workers must apply locks to an isolation point, scissor adapters will be provided or possibly a Group Lockout procedure (see section 10) will be used to reduce lock requirements. EVERY Worker must apply their Personal Safety Lock. ***DO NOT work under someone else's lock!*** You will not be adequately protected!

A TAG applied to the energy-isolating device will NOT be considered adequate protection without personal lock(s) also being applied.

Locks are not to be used for any other purpose than Lockout!

1. When a lock or key is damaged or the lock identification is not readable, it must be returned to the Electrical Supervisor's Office for repair or replacement. If a lock or key is lost, notify the Electrical Supervisor immediately.
2. Contractors are required to supply their own safety locks and to apply and remove these locks. These locks must meet WorkSafeBC requirements.

3. Lock-out by attaching your personal lock(s) securely to each disconnect switch and isolation valves. Isolation valves are to be closed, locked and tagged. When in doubt as to how a device is to be locked out, ask the Person in Charge, or Supervisor. The lock(s) must make the equipment inoperative and be attached to the shut off device or a scissor clamp, but never directly to another lock and never to the last hole on a scissor clamp.

Personal Protective Equipment (PPE):

WORKSAFEBC 10.4 DP058

All PPE and tools shall be CSA approved and used only for the intended purpose. It is the responsibility of the Supervisor (or the Contractor's Superintendent for contract workers), to ensure that adequate supplies are on hand **BEFORE** commencing the work and that workers have received training and instruction in the proper use, fit and care of equipment and tools. This will include applicable items from the list in Appendix 2B:

DP058

The Person in Charge will also ensure that all tools and equipment are stored, maintained, inspected and tested by a Qualified Person. The Person in Charge will also remove from service all tools/equipment failing testing and tag until repaired or removed from the workplace. Contractors must supply their own tested and approved grounding devices and not use EGD grounding equipment.

6.0 PRIOR TO ISOLATION:

Before implementing a lockout the following must take place:

Prepare a Job Hazard Analysis

The Person in Charge or the Contractor's Superintendent will assist in finalization of a **Job Hazard Analysis** for discussion with the Guarantor. This will involve a discussion of the work to be performed and a tour with knowledgeable persons to become familiar with the equipment or installation. The purpose of this is to identify hazards and additional precautionary measures to prevent accidents. The appropriate requirements will be included in the isolation procedure.

For jobs that are repetitive, the Job Hazard Analysis should be kept on file in the PWGSC Electrical Supervisor's office for use as a starting point for the next time the job is performed. However, be sure to work through the analysis again. **Do not assume** that nothing has changed in the interim! Discuss with the PWGSC Electrical Supervisor to ensure single line diagrams are up to date and conduct a review of Maintenance Management System (MMS) records for relevant information on the equipment involved in the job.

For Demolition work, ensure all services are accurately located and disconnected as part of the procedures as required by the owner of the applicable utility.

When excavating, ensure underground utility services are accurately located and excavation/drilling work is undertaken in conformance with the requirements of the owner of the service and applicable regulations. Do not use pointed tools to probe for gas/electrical services.

Confined Space Entry & Manholes

If work requires the entry into manholes or other CONFINED SPACES, ensure that PWGSC procedures regarding entry to Confined Spaces are followed. Confined Spaces present special hazards and it is imperative that all workers be trained in Confined Space Entry prior to entering and that provisions for emergency rescue etc have been addressed.

Protection From Ship's Power:

The Person In Charge and the Guarantor will establish proper contact with ship's officials when planning work in order to determine if any hazard exists to either workers covered by the planned isolation or ship's personnel and the necessary steps to eliminate the risk. Ships in port and their service needs are subject to change. Therefore it is important to review the situation at the time of lockout to be sure all contingencies are covered.

Prepare a Lockout Procedure

The Person in Charge will prepare the **PROCEDURES FOR ISOLATION** form (PWGSC-12) for work requiring more than one operation. This details all steps to be taken in performing the **lockout and re-energizing** after the work is completed. This procedure shall include the following:

DP058

a. A sequence of operations to allow for orderly shutdown; including any mechanical isolation in logical sequence.
b. The point(s) for safety grounding, where required;
c. The locations and quantity of locks required;
d. A sequence of operations to allow for orderly startup

If the form has insufficient lines, start a second page and number the pages (pg 1of 2 etc.)

- Ensure an effective means of communication between the Person in Charge and the Workers is built into the procedure as required.
- Be sure to consider Interlocks.
- If working in/near Battery Rooms consider risks of ignition of flammable gases and ensure ventilation systems are working.
- Ensure access to every electrical switch, control device or meter is maintained free of obstruction. Lockout of a panel door preventing access to other live breakers is unacceptable as part of a lockout procedure.
- Ensure that no flammable materials are stored or placed close to electrical equipment.

- Note lockout of Control Circuits is not sufficient for total isolation.
- Ensure lockout points are uniquely identified to prevent errors.

Prepare written Emergency Procedures for critical tasks.

Prepare a REQUEST FOR ELECTRICAL ISOLATION and Obtain Approval

The Person in Charge will complete a "**REQUEST FOR ELECTRICAL ISOLATION** form **(PWGSC-13)** and present it along with the PROCEDURES FOR ISOLATION (PWGSC-12) for approval by the Guarantor prior to work commencing. The Guarantor will ensure, prior to providing approval, that there is no other work being undertaken that will interfere or conflict during the requested time for isolation and that the Single Line Drawings have been reviewed. Ensure the Guarantor is given sufficient time to authorize the isolation. See Appendix 5 for a SAMPLE document.

DP058

Use of Qualified, Trained Workers Only

The Person in Charge or the Contractor's Superintendent will ensure that any electrical repairs, renovations, alterations and installations are undertaken only **by qualified electricians, or apprentices** as per the conditions of the B.C. Electrical Safety Act respecting personnel vocational training and qualification. They will also ensure that these workers are trained in the requirements of this policy and the specifics of the Lockout Procedure ***prior*** to any work commencing.

DP058

Note that lockout of Control Circuits alone is not considered total isolation and would require WORKSAFEBC approval to be acceptable.

WORKSAFEBC 10.10

Note that when an energy-isolating device is locked out, the lock must not prevent access to other energy-isolating devices supplying machinery and equipment that could cause injury to workers.

WORKSAFEBC 10.5

Only workers authorized in writing by the Guarantor to work on H.V. systems may receive a Guarantee of Isolation and work on the power system.

WORKSAFEBC 19.19(4)

FOR CONTRACT WORK

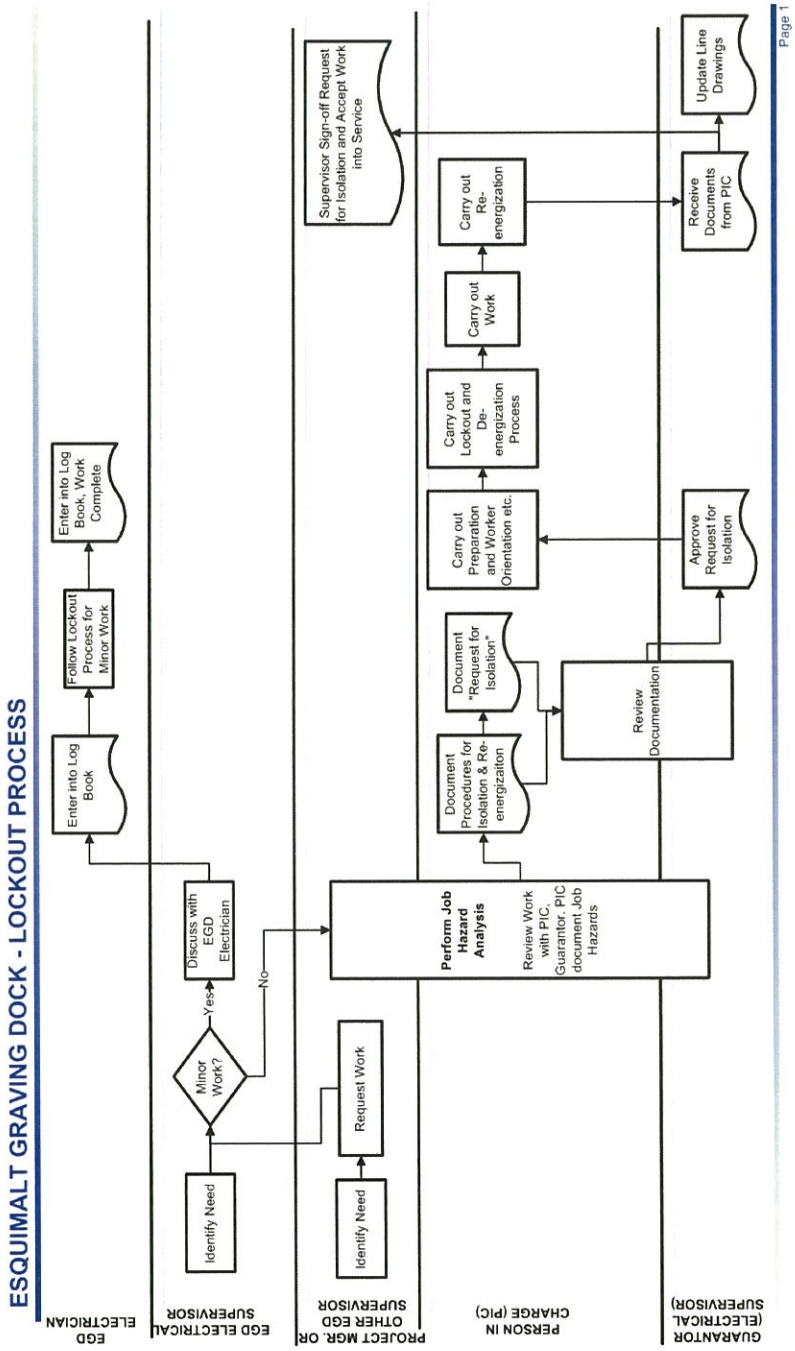
The following procedure applies. See Appendix 4 for Sample Forms. PWGSC will perform the isolation and review the details with the Contractor's Superintendent. A Group Lockout will be performed permitting all affected workers to apply their personal lock to the lock box (see section 11).

1. The EGD Project Manager will request the work to proceed verbally and follow up with an e-mail to the Electrical Supervisor detailing the project name and number and work activity to be performed and Contractor's Superintendent name.
2. The PWGSC Person In Charge will document the isolation procedures and review them with the Guarantor and the Contractor's Superintendent.
3. The Person in Charge on the REQUEST FOR ELECTRICAL ISOLATION form (PWGSC-13) is the Qualified Person in charge of doing the isolation. The Person in Charge completes boxes A, C & D and the detailed Procedures for Isolation form (PWGSC-12), in consultation with the Guarantor and the Contractor's Superintendent.
4. The Contractor will provide a written list of all Workers and those persons Qualified to work within the Limits of Approach to the Guarantor along with their qualifications. If additional persons will work on the power system after the work begins the names and qualification must be provided to the Guarantor before they are authorized to work on the system. (WorkSafeBC 19.29)

EGD Basic Lockout Process Flowchart:

See next page. A larger version of this chart is available.

Note that isolation and lockout for non-electrical work is also carried out by the Electrical Dept.


ESQUIMALT GRAVING DOCK - LOCKOUT PROCESS
EGD ELECTRICIAN
EGD ELECTRICAL SUPERVISOR
PROJECT MGR. OR OTHER EGD SUPERVISOR
PERSON IN CHARGE (PIC)
GUARANTOR (ELECTRICAL SUPERVISOR)
Identify Need
Minor Work?
Yes
No
Discuss with EGD Electrician
Enter into Log Book
Follow Lockout Process for Minor Work
Enter into Log Book, Work Complete
Identify Need
Request Work
Perform Job Hazard Analysis
Review Work with PIC, Guarantor, PIC document Job Hazards
Document Procedures for Isolation & Re-energizaiton
Document "Request for Isolation"
Review Documentation
Approve Request for Isolation
Carry out Preparation and Worker Orientation etc.
Carry out Lockout and De-energization Process
Carry out Work
Carry out Re-energization
Receive Documents from PIC
Update Line Drawings
Supervisor Sign-off Request for Isolation and Accept Work into Service
Page 1

7.0 LOCKOUT STEPS FOR MINOR LOW VOLTAGE JOBS:

For minor low voltage (</=750V) jobs involving 3 or fewer steps (generally one isolation point) and one worker the following procedures apply:

1. The requirement for written procedures will be replaced by an entry in the Minor Maintenance Log controlled by the Guarantor or worker's Supervisor.
2. The Qualified Person will discuss the work with the Guarantor/Supervisor who will complete the "Record of Electrical Work for Minor Projects" (PWGSC 69) or an equivalent form – See Appendix 6. The Guarantor/Supervisor must be satisfied that the worker has the proper safety equipment and procedures to carry out the work.
3. All of the steps under Basic Lockout Steps in section 8.0 must still be followed ***except*** the on-site documentation requirements (Detailed Procedures, Request For Isolation, Request for Re-Energization described in section 6 above).
4. When finished, the worker will record the completion in the Record of Electrical Work for Minor Projects log.

8.0 BASIC LOCKOUT STEPS (L.V. & H.V.):

The following apply to all types of lockout situations except as noted. See also the additional requirements specific to Low Voltage (policy section 9.0) or to High Voltage (policy section 10.0)

BE SURE - ASSUME NOTHING!

1. ***Identify the machinery or equipment*** that needs to be locked out to ensure worker safety. Be sure to consider interlocks to multiple sources.
2. ***Shut off the machinery or equipment.*** The Person in Charge or Contractor's Superintendent will
   a. Make sure that all moving parts have come to a complete stop
   b. Ensure that the act of shutting off equipment will not cause a hazard to other workers prior to shutting it off.
   c. Ensure potential energy is blocked and any pneumatic, hydraulic or other pressure has been bled or rendered safe.
3. The Person in Charge or Contractor's Superintendent will identify and ***de-energize the main energy-isolating device*** (feeder) for each energy source. Wear eye protection, and standing to the side of the panel (in case of explosion), turn off the breaker or activate the isolating equipment.
4. **Visually verify** disconnecting means for possible defects and ensure blades are open; or if blades are not visible remove and insulate conductors or remove fuses with an insulated Fuse Puller.
5. **Check with a tester** on a known voltage and then test on the load side to be sure the circuit is de-energized. Only a Qualified Electrician shall use the Potential Tester.
6. In the case of air or hydraulic systems ensure the system has been bled and all potential energy is either blocked or eliminated.

7. Person in Charge will apply his/her personal lock(s) with ID tag. Record the isolation and initial the Procedures for Isolation (PWGSC-12) form next to each operation.

NOTE:
Initials of TWO (2) Qualified Persons are required next to each step of the Procedure for High Voltage work or Group Lockout.

8. Doors of electrical disconnect switches must be closed before installing any locks and the locks are to be applied in such a manner that the doors are locked closed.
9. ***Each worker applies a personal lock*** with ID tag (identifying worker, his/her company and date/time applied) to the energy-isolating device for each energy source, and observes that all parts and attachments are secured against inadvertent movement.
10. Ensure that all ***workers are in the clear*** and that no hazard will be created if the testing of the lockout fails. Ensure no one can inadvertently energize the equipment while testing or work is underway.
11. ***TEST the lockout*** to make sure it's effective and to verify that each energy source has been effectively locked out. Attempt to start the de-energized piece of equipment. Repeat for each piece of equipment.
12. Lockout will be tested after each energy-isolating device is locked out or after a group of devices is locked out. ***Treat all equipment as LIVE until locked out and tested!***
13. Carry out the work for which de-energization and lockout is necessary.
14. Upon completion of the work and being ready to re-energize, the Person in Charge of Isolation will ensure that all ***workers are in the clear and that all guards have been re-installed***. Remove grounding chains, where applied. Place warning signs close to the equipment to be re-energized stating " Danger, Energized Equipment".

    WORKSAFEBC 19.11

15. All workers will ***remove their locks*** at the end of each shift with the Person in Charge of Isolation being the last to do so. In the event work has not been completed and will be continued the next shift/day, see the Continuity of Lockout provision, Section 11.
16. Person in Charge of Isolation ***Re-energize*** the machinery or equipment again standing to the side of the panel. To prevent loading the disconnect, be sure the Control Station is in the OFF position when re-energizing the disconnect.
17. Complete the "REQUEST FOR ELECTRICAL ISOLATION" form and provide to the Guarantor to be filed for 1 year in the office of the PWGSC Operations Manager.

    DMD58

9.0 WORKING ON LOW VOLTAGE (</=750V) EQUIPMENT:

De-Energized Low Voltage Equipment:

Low Voltage means a potential difference (voltage) from 31 to 750 volts inclusive, between conductors or between a conductor and ground. The following steps will apply to all lockouts **except Group Lockouts**, (see section11). For minor L.V. jobs, see section 7.0 above.

WORKSAFEBC 19.1

The steps in section 8.0 must be followed whenever lockout is required in addition to L.V. requirements noted below. Supervisors must ensure every worker knows these steps and follows them. The steps to be followed ***must be in writing*** and ***must be posted*** in the area where lockout is taking place. The procedure will be the result of completing the steps under Section 6.0 (Prior To Isolation).

WORKSAFEBC Lockout Pamphlet & 10.4 DP058

If work is to be done by a Contractor, the Person In Charge of isolation is responsible for documenting and posting the detailed Procedures for Isolation (PWGSC-12), including the procedures for re-energization and approved Request for Electrical Isolation Form (PWGSC-13). The Guarantor will identify and confirm all sources of power to equipment and assess the impact of equipment isolation on other systems and/or equipment.

The Guarantor may also be involved in actually supervising or carrying out the work.

Be sure to check steps in the lockout process against the single line diagram(s) in Manual Section 3.

Capacitors:

If disconnecting a capacitor that could be dangerous to Workers allow at least 5 minutes before short-circuiting or applying a safety ground. Ensure procedures prevent any Worker from contacting the terminals before grounds are applied and ensure a Safety Watcher is present if the Person In Charge considers it necessary.

Working on/near Low Voltage Energized Equipment:

Work shall not be carried out on live equipment or installations. However, sometimes machinery or equipment has to be energized for a specific task (e.g. fine adjustments or troubleshooting).

Work on energized equipment must be performed ONLY by workers who:

1. Are qualified to do the work
2. Have been authorized by their supervisor to perform the work.

3. Have been informed of the potential hazards and provided with and follow appropriate ***written*** safe work procedures.

WORKSAFEBC 19.5

The procedures will require:

1. The use of appropriate electrical protective equipment including rubber gloves and cover up, approved eye protection, and other necessary line tools.

WORKSAFEBC 19.10

2. If practicable, uncontrolled liquid is not permitted close to any worker working on the equipment.
3. Where practicable, prohibit the use of metal ladders, metal scaffolds, metal work platforms and wooden ladders with wire reinforced side rails.

Suitable physical barriers or covers must be provided to cover any un-insulated, live, energized parts if a worker unfamiliar with the hazards is working within 1m (3.3ft.) of the parts.

WORKSAFEBC 19.12

Where it is absolutely necessary to have power on and operate equipment while repairs or adjustments are made, a responsible person MUST BE AT THE CONTROLS AND IN DIRECT AND PERSONAL COMMUNICATION with the Person in Charge at all times.

Working on ***energized*** parts of lighting circuits operating at over 250V to ground is prohibited without first obtaining written permission of the WORKSAFEBC.

WORKSAFEBC 19.10

LIVE TESTS:

A separate Guarantee of Isolation is required to conduct live tests.

No Guarantee of Isolation shall be issued for live tests unless:

1. Any other Guarantee of Isolation respecting the subject equipment has been terminated, and all workers working under the guarantee informed of its termination.
2. Steps are taken to ensure the health and safety of anyone conducting the live test
3. The person(s) conducting the live test have informed anyone that could be affected by the test of the potential hazard.

10.0 LOCKOUT ON HIGH VOLTAGE EQUIPMENT (>750V)

De-energizing High Voltage Equipment:

High Voltage means a potential difference (voltage) of more than 750V between conductors or between conductors and ground. **Follow the basic lockout procedures in section 8.0 and also the following:**

WORKSAFEBC 19.1

1. At EGD, H.V. electrical equipment must be completely isolated, *grounded*, and locked out before starting work on it. To ensure nothing is overlooked, Electrical Personnel should use Checklists (see Appendix for example) and ensure workers sign acknowledging agreement to proceed with isolation or re-energization. Note this DOES NOT REPLACE properly completed and approved forms PWGSC-12 and 13. WORKSAFEBC 19.16
2. When working on H.V. systems, isolating devices used for safety protection guarantees must provide for *visual verification* of the isolation point. WORKSAFEBC 19.21
3. ***In addition*** to applying personal locks as required by this policy, a distinctive "DANGER - DO NOT OPERATE" tag must be securely placed on each isolating device used for a safety protection guarantee. See sample in Appendix. WORKSAFEBC 19.16(2)
4. All H.V. work requires 2 or more Qualified Electricians authorized by the Guarantor, to be present while the work is being done. WORKSAFEBC 19.18
5. Barriers or distinctive identification must be used to differentiate de-energized from energized equipment at the work location when lack of identification could result in undue risk to workers. DP 058
6. Outer clothing of non-flammable material with long sleeves fastened at the wrists shall be worn
7. No person shall work on electrical equipment unless the Worker uses such protective and insulated clothing and equipment as necessary.

Grounding of H.V. Equipment and Conductors:

Safety grounding shall be applied for hand contact work on isolated lines or apparatus either existing or under construction, wherever a hazard of energizing may occur from any source, including the following:

b) Faulty apparatus, conductors or adjacent lines.
c) Accidental energizing from a power source.
d) Accidental backfeed.
e) Contact with crossed or fallen live conductors.
f) Lightning strikes.

f) Electromagnetic or electrostatic sources (eg. Wind, dust storms, adjacent lines, static capacitors, etc.).

Grounding will be built into the Procedures for Isolation as appropriate.

Note: In the following procedure, a second Qualified Person will always accompany the Person In Charge. Both individuals must be Qualified Electricians and be authorized by the Guarantor

WORKSAFEBC 19.22

1. After a safety protection guarantee has been approved, the Person in Charge will ensure equipment is tested for isolation before any safety grounds are attached or blocking begins. The Person in Charge will then verify that a Guarantee of Isolation and required grounding and blocking devices are in place before work begins.
2. Ensure that there is no possibility of back feed, and that approved procedures to discharge equipment have been taken.
3. Temporary grounding devices, when required by the Canadian Electrical Code or CSA, will be installed between the location where the work is being carried out and all possible sources of supply. Grounding and blocking of equipment must be carried out as close as practicable to the worksite.
4. Grounding devices shall be connected to the low resistance ground (i.e.. ground grid) *before* being brought into contact with any isolated conductors. Remove from conductors first, and then from the ground connection when removing.
5. When isolating H.V. electrical equipment, use a grounding stick to allow discharge of capacitance in the conductors and H.V. cables before grounding.
6. Grounding and blocking may be removed for the purpose of conducting tests.
7. See also Canada Labour Code Part VIII "Safety Grounding" (Section 7 of Lockout Manual) for additional details regarding requirements for grounding equipment.
8. Connect a "Grounded" tag (green) to the equipment to indicate it has been grounded out.
9. Contractors must supply their own tested grounding devices and not use EGD grounding equipment.

Work on/near Energized High Voltage Equipment or Electrical Parts:

Informing workers about high voltage electrical equipment and conductors (WorkSafeBC19.24):

Before a person starts work close to high voltage electrical equipment or conductors that are exposed or that might become exposed during work at a workplace, the person must be informed of

(a) the existence, location and voltage of the high voltage electrical equipment and conductors, and

(b) the work arrangements and procedures to be followed to ensure compliance with this Part.

Authorization by Owner: WorkSafeBC 19.29

Qualified workers and workers under their direct supervision may work within the minimum distances to energized high voltage electrical equipment and conductors, as specified below when authorized by the owner of the power system and using work procedures acceptable to the Board.

Contractors will provide a written list of all Workers and those persons Qualified to work within the Limits of Approach to the Guarantor along with their qualifications. If additional persons will work on the power system after the work begins the names and qualification must be provided to the Guarantor before they are authorized to work on the system.

Work on or near ***energized*** High Voltage Equipment or Electrical Parts at EGD is NOT permitted.

If testing is to be done on energized H.V. Equipment or Electrical Parts ensure that the following limits of approach are adhered to by Workers and Qualified Electricians under the direction of a PIC authorized by the Guarantor:

Limits of Approach:

The following are combined limits per WorkSafeBC Regulations Part 19 and those of CLC and reflect the most stringent.

Voltage Range of Phase to Phase	Limit of Approach for Qualified Electrician only	General Limit of Approach for any Worker [2]
Over 736 to 20,000 [3]	0.9 Meters	3 Meters

1. Ensure, through barricades and supervision, that unqualified personnel and any equipment, material, or work they could come in contact with (including inadvertent movement) are kept at least three (3) metres from the live parts.
2. Limits of approach apply to workers, a tool, a machine, material or equipment at the workplace.
3. At EGD the maximum nominal voltage encountered is 7,200V to ground or 12500V AC line to line.

Note that a separate Request for Isolation is required for the live test and the requirements listed under LIVE TESTS in section 8 also apply for High Voltage.

Where Workers are working on or near electrical equipment that is live or could become live, the PIC will ensure the equipment is guarded and warning signs attached or if guarding is not practicable, take measures to protect Workers by insulating either the equipment or the Worker from the other. See also

[2] CLC Lower limit is 736 and WorkSafeBC Upper Limit is 75000V Phase to Phase
[3] Lower limit CLC and Upper limit WorkSafeBC

CLC Occupational Health & Safety PART VIII Electrical Safety 8.4 to 8.7 re working near energized equipment (Section 7 of the EGD Lockout manual).

Assurance in writing: WorkSafeBC 19.25

(1) If the minimum distance of 3 metres cannot be maintained because of the circumstances of work or the inadvertent movement of persons or equipment, an assurance in writing on a form acceptable to the Board and signed by a representative of the owner of the power system, must be obtained.

(2) The assurance must state that while the work is being done the electrical equipment and conductors will be displaced or rerouted from the work area, if practicable.

(3) If compliance with subsection (2) is not practicable the assurance must state that the electrical equipment will be isolated and grounded, but if isolation and grounding is not practicable the assurance must state that the electrical equipment will be visually identified and guarded.

(4) The safeguards specified in the assurance must be in place before work commences and effectively maintained while work is taking place.

(5) If guarding is used,

(a) neither equipment nor unqualified persons may touch the guarding, and

(b) a safety watcher must be designated, or range limiting or field detection devices acceptable to the Board must be used.

(6) The assurance must be available for inspection at the workplace, as close as practicable to the area of work, and must be known to all persons with access to the area.

[Amended by B.C. Reg. 312/2010, effective February 1, 2011.]

Minimum clearance distance when passing under exposed electrical equipment and conductors (WorkSafeBC 19.24.2):

1) This section applies in the circumstances where a person working at a workplace is moving or is involved in moving equipment under exposed electrical equipment or conductors and is not performing any work other than work related to moving the equipment.

(2) Unless otherwise permitted by this Part, in the circumstances set out in subsection (1), if exposed electrical equipment or conductors have a voltage within a range set out in Column 1 of Table 19-1B, the following must maintain at least the clearance distance from the exposed electrical equipment and conductors that is set out in Column 2 opposite that range of voltage:

(a) a person moving or involved in moving the equipment under the exposed electrical equipment or conductor;

(b) the equipment that a person referred to in paragraph (a) is moving;

(c) the load carried by the equipment referred to in paragraph (b).

Table 19-1B

Column 1 Voltage	Column 2 Minimum clearance distance for passing under exposed electrical equipment or conductors	
Phase to phase	Metres	Feet
Over 750 V to 75 kV	2	6.5
Over 75 kV to 250 kV	3	10
Over 250 kV to 550 kV	4	13

[Enacted by B.C. Reg. 312/2010, effective February 1, 2011.]

Assurance not practicable: WorkSafeBC 19.26

(1) If exposed high voltage electrical equipment and conductors cannot be isolated, rerouted or guarded, work must not be done within the 3 metre limit of approach until the following precautions are taken:

(a) the area within which equipment or materials are to be moved must be barricaded and supervised to restrict entry only to those workers necessarily engaged in the work;

(b) a safety watcher must be designated;

(c) a positive means must be provided for the safety watcher to give a clear, understandable stop signal to workers in the area, and the watcher must give the stop signal by no other means.

(2) While equipment is in motion in an area in proximity to energized electrical equipment or conductors, no person other than the equipment operator may touch any part of the equipment or the material being moved by it.

(3) No person may move a load or any rigging line from its position of natural suspension if it is in proximity to an energized electrical conductor or equipment.

[Amended by B.C. Reg. 312/2010, effective February 1, 2011.]

[Amended by B.C. Reg. 188/2011, effective February 1, 2012.]

11.0 GROUP LOCKOUT PROCEDURES:

In some cases the number of points to be isolated and the numbers of workers required to lockout may be large enough that a "lock-box" or "key-box" approach would be beneficial. If a group lockout is required, the following procedure will be followed. **Note:** In the following procedure, a second Qualified Person will always accompany the Person In Charge and both persons must be authorized by the Guarantor.

WORKSAFEBC 10.9

The following outlines the variations required for a Group Lockout.

BE SURE - ASSUME NOTHING!

1. **The steps under Section 6 "Prior to Isolation" also apply to a Group Lockout.** Prepare the required Procedures and approval forms.
2. **FOLLOW THE PROCEDURES DEFINED IN SECTIONS 8, 9 AND 10 ABOVE FOR THE APPROPRIATE LOW OR HIGH VOLTAGE SITUATION**.
3. The approved REQUEST FOR ELECTRICAL ISOLATION and PROCEDURES FOR ISOLATION (including Re-energization procedures) will be conspicuously posted at the place where the system is in use and the "lock-box" is kept. The Lockout Policy will be readily available through the Electrical Supervisor, or Contractor's Superintendent.
4. Lockout will be tested after each energy-isolating device is locked out or after a group of devices is locked out. The 2 qualified persons will initial the PROCEDURES FOR ISOLATION (PWGSC-12) to verify the isolation of each point and post the sheet along with the approved REQUEST FOR ELECTRICAL ISOLATION near the lock box.
5. The keys for the locks applied in step 4 will then be placed into a "lock-box" and the 2 qualified individuals will apply their personal locks with ID Tags, to the lock box. ***Each worker will apply a personal lock*** with ID tag, to the "lock-box" only after ensuring his/her work area is listed as isolated on the Lockout Procedure form.
6. Workers working under the Group Lockout will check the Lockout Procedure form prior to starting work each day to ensure their specific work area has been locked out.
7. Complete the necessary work.
8. The Person in Charge of Isolation is responsible for having the detailed "PROCEDURES FOR ELECTRICAL ISOLATION" approved by the Guarantor prior to re-energization. Follow the procedures for re-energization as on the PROCEDURES FOR ISOLATION (PWGSC-12) form and both Qualified Persons initial completion of each step. When ready to re-energize, the 2 qualified persons will ensure that all ***workers are in the clear, all guards have been re-installed and the machinery or equipment is safe to operate.*** Place warning signs close to the equipment to be re-energized stating " Danger, Energized Equipment".

WORKSAFEBC 19.17

9. All workers will ***remove their locks*** at the end of each shift with the Person in Charge or the Contractor's Superintendent being the last to do so. In the event work has not been completed and will be continued the next shift/day, follow the "Continuity of Lockout" provisions below.

12.0 CONTINUITY OF LOCKOUT:

In some cases lockout must be maintained between shift changes. To maintain lockout continuity and ensure no one is at risk between the time one shift removes their locks and the next applies theirs, the Person in Charge or Contractor's Superintendent will apply his/her lock(s) to all points requiring isolation before locks are removed and leave his/her lock(s) in place until the next shift has established their lockout as per the agreed process. Complete and attach information tags to the lockout points or the lock-box (for group lockout).

NOTE:
In some cases, the same workers will continue work the next day and there is no need to activate the equipment in the meantime. Under these circumstances it is acceptable to leave all locks in place provided it is ***part of the documented lockout procedure*** and all workers are aware of the practice.

13.0 EMERGENCY LOCK REMOVAL:

Only the Guarantor, or failing that, the Person in Charge may order the removal of a worker's lock. This task may not be delegated to anyone else. Lock removal may take place ONLY IF he or she ensures **ALL** of the following are done:

WORKSAFEBC 10.8

a) The Guarantor/Person in Charge must:
   - Make every attempt to ensure that the employee whose lock(s) are to be removed is not on the premises
   - Enter an explanation in the Lock-Out Log Book stating what steps have been taken to contact the owner of the Personal Lock.
   - Refer to any available documentation including logbooks, to determine if work has been completed upon the device or system to which the lock was applied.
   - Contact personnel who performed repairs on the device or system to which the lock was applied.

   These steps are taken to assure that it is safe to proceed to remove the lock and place the device or system into service. **AND**

b) The Guarantor/Person in Charge has made sure the machinery or equipment can be operated safely before removing the lock.

c) The Guarantor/Person in Charge will then obtain the duplicate key for the lock from the Duplicate Key Locker located in the Electrical Supervisor's Office. The Guarantor/Person in

Charge will open the Duplicate Key Locker, remove the required key and log this event in the Lockout Log Book's Chapter on "Lock-Out Events". When the lock has been opened the Guarantor/Person in Charge will return the key to the Key Locker. **AND**

d) The Guarantor/Person in Charge must also notify the worker whose lock is removed at the start of his/her next shift that the worker's personal lock was removed and return the lock. Only the person to whom the lock was issued may reinstall it.

14.0 REQUIRED CLOTHING/ PROPER ATTIRE:

Those required to work on electrical equipment and installations shall wear:

DP 058

- Protective Headwear Class E (formerly Class B) rated meeting CSA Z94.1- 92 (R2003) Industrial Protective Headwear
- Electrical shock resistant protective footwear meeting CSA Z195-M-92 Protective Footwear - Grade 1 indicated by a green triangle showing
- Safety glasses or other eye protection meeting CSA Z94.3-00 specifically designed for the work to be done.
- Rubber insulating gloves/mitts etc. are required to meet CSA standard Z259.4-M
- When working on/near High Voltage outer clothing with full length sleeves fastened at wrists and fabricated from a non-flammable material or other material meeting ASTM D120-95 *'Standard Specification for Rubber Insulating Gloves'* . Treasury Board standard 8.4

The following is required before entering a workplace where machinery or energized electrical equipment is in operation:

- secure/cover/remove loose clothing
- secure/cover long hair
- dangling accessories, rings or other jewellery that could become entangled in machinery or contact energized electrical equipment must be removed

15.0 NEW CONSTRUCTION (BY LICENSED ELECTRICAL CONTRACTORS):

When new electrical construction involves modifications or additions to the existing EGD Building Electrical Services or to EGD Primary/Secondary Electrical System, the Electrical Contractor shall obtain a Province of British Columbia Safety Engineering Services Electrical Permit to cover the work.

When the installation is ready for the electrical connection and/or energization, the Electrical contractor shall apply to the Provincial Electrical Safety Branch for Electrical Inspection of the work.

The Electrical Inspector may choose to look at the installation and/or will sign the Authorization Form accepting the installation on the basis of the Electrical Contractors Certification.

The Electrical Contractor will submit a copy of the signed Provincial Inspection Authorization Form to the PWGSC Electrical Supervisor. The Provincial Inspection Authority may forward the signed Inspection Form directly to the EGD EA.

No electrical connections will be made to the EGD Electrical System unless the Electrical Inspector signs the Provincial Electrical Inspection Authorization Form and the PWGSC Electrical Supervisor receives a signed copy of the Inspection Form.

Prior to the energization of any new electrical construction, the PWGSC Electrical Supervisor reserves the right to cause an inspection of any electrical work installed at EGD to ensure that the electrical installation complies with EGD safety requirements. Authorization for connection to EGD Electrical System shall only be granted when all Electrical Standards and Safety Requirements have been complied with.

16.0 PLANNED & EMERGENCY POWER OUTAGES:

PLANNED OUTAGES: Requests for planned power outages will be directed to and obtained from only the PWGSC Electrical Supervisor.

EMERGENCY POWER OUTAGES:
During silent hours, the Commissionaire will initiate the Emergency Call Out List as required.

17.0 EGD SITE GENERAL H.V. RULES

EGD NORMAL POWER SUPPLY:
The EGD normal power supply is the responsibility of the PWGSC Electrical Supervisor who is the Operating Authority of the electrical system as described in this manual.

IDENTIFICATION OF THE ELECTRICAL FACILITY:
Name or number shall identify all EGD High Voltage Lines, Power Poles, Transformers, Switch Gear, Apparatus and Switching Stations and workers shall use this identification when referring to them.

All Lines, Electrical Apparatus, or Transformers, whether newly constructed or out of service for any reason, which may be operated or energized by conventional means or by back feed shall be treated as Live.

No electrical work, including switching or tree trimming or arborist work, shall be done on any Line or Electrical Apparatus without prior arrangement and approval of the PWGSC Electrical Supervisor /Guarantor who will issue a Switching order and/or a Guarantee of Isolation to initiate the work.

When a Line or Electrical Apparatus is de- energized for hand contact work by disconnecting means of an oil or air circuit breaker, associated disconnecting switches shall be opened and visual separation of disconnecting contacts shall be observed prior to Clearance being issued.
(Note: The racking-out of draw-out CIRCUIT BREAKER type switchgear shall constitute the opening of disconnect switches.) Apply a Lockout to this equipment.

No one shall start work on the strength of a promise that the Line or Electrical Apparatus will be Dead or made inoperative at a certain time.

18.0 PROTECTION OF EQUIPMENT:

In the event equipment must be rendered inoperative and protected from use (e.g. while waiting for parts), the equipment must be ***Locked Out and a Tag Attached*** indicating who locked it out and the reason for doing so. It will not be acceptable to only tag the equipment.

If a Supervisor is to install a protection lock, he must be satisfied that the lockout is effective before the trades person's lock is removed and his is installed.

Although, at times, only equipment damage could result if the tag was removed and equipment activation attempted, EGD Management have decided it is best to always require a lock and accompanying tag. This requirement will ensure removing the tag and starting equipment will injure no one. Also, it reinforces the mindset that tags alone are not acceptable for lockout under any circumstance.

19.0 TESTING OF CLOTHING AND EQUIPMENT:

Every article of insulated protective clothing, insulated equipment and insulated devices/tools shall be so designed, constructed, and maintained as to be safe, adequate and reliable under all conditions of intended use.
Unless certified by a recognized testing agency prior to initial use, a qualified person shall test each article.

Test annually by an approved method and clearly mark to show date of test.

Any article that fails a test shall be immediately removed from service, so marked, tagged or disabled as to prevent its use until repaired and the test has been passed.

Tests of insulating gloves & mitts shall follow CSA standard Z259.4-M1979

Users shall inspect clothing, equipment, devices and tools prior to use to ensure they are safe for intended use.

20.0 MISCELLANEOUS:

TREE PRUNING:
Tree Pruning and falling near energized conductors must conform to the requirements of WORKSAFEBC regulations in WORKSAFEBC regulations - section 19.

NO SMOKING:

NO SMOKING is permitted in any EGD Buildings or Electrical Substations. Besides reducing fire hazards, workers can better detect burning conductors or other apparatus if no cigarette smoke is present.

21.0 MONITORING/REVIEW:

The EGD Guarantor shall initiate a review of this policy annually or earlier should circumstances indicate such a review is required (e.g. changes to Regulations or incident involving lockout failure).

The EGD Health & Safety Committee shall undertake a quarterly review and report to the EGD Director to ensure:

DP058 (6)

- Log Books are established and in use.
- Procedures have been developed and Requests For Isolation used as required.
- Appropriate signage is in place identifying cabinets/equipment, live H.V. equipment, etc.

See checklist available for Committee use.

Reviewed By:_____ Date: _____
Joe Lezetc, EGD Electrical Supervisor and Guarantor

Approved By:_____ Date: _____
Jim Milne, EGD Director

APPENDIX 1- LIST OF AUTHORIZED PERSONS

GUARANTOR/PERSON IN CHARGE:

The Guarantor/Person In charge at EGD is Joe Lezetc.

ALTERNATE PERSON IN CHARGE

Besides the Person In Charge, the following personnel are recognized by PWGSC as competent, trained and familiar with the PWGSC Primary Power Distribution and the PWGSC De-energization and Lockout Policy Manual and are authorized to issue or receive a Guarantee of Isolation (Clearances) as defined in the PWGSC De-energization and Lockout Policy Manual.

The following individuals are qualified and authorized as Alternate Person In Charge:

- Acting Electrical Supervisor
-
-

QUALIFIED ELECTRICAL WORKERS:

Class "A" License:

- Joe Lezetc
-

Journeyman Electricians:

- Remainder of Electrical Staff
-
-
-
-

The following is a summary of PWGSC and DND BCEO personnel who may be involved in the EGD Electrical Distribution System, when required. Also included are various telephone numbers that may be relevant to the system operation.

The following personnel are approved for receiving a Guarantee of Isolation when required from either of the two Operating Authorities (DND BCEO and PWGSC).

- EGD Electrical Supervisor
- Contractor Resources retained by PWGSC specifically for this purpose
-

DND BCEO PERSONNEL

Power Outages and Electrical Emergencies (24-hour) CFB Fire Hall Watch Room 7 days/week 250-363-2224. .

Electrical Business Mgr. – 250-213-5271 (cell) 250-363-2917 (land)

The following PWGSC personnel may be involved during Electrical Distribution interruptions and during an emergency. Personnel would be telephoned in the following descending order:

- Joe Lezetc 250-213-2545 (cell) Office -250-363-3991
- Mark Cammiade 778-977-6262 (cell)
- EGD Electricians 250-363-3984 (office) 250-508-9364 (cell)
-

The following personnel are recognized by PWGSC as competent, trained and familiar with the EGD Primary Power Distribution and the EGD De-energization and Lockout Policy Manual and are authorized to issue or receive a Guarantee of Isolation (Clearances) as defined in the EGD De-energization and Lockout Policy Manual.

- Joe Lezetc
- Acting Electrical Supervisor
-
-

The PWGSC individuals listed above are authorized by PWGSC Management to fulfill the roles to which they are assigned.

Approved By:_____ Date: _____

Jim Milne, Director EGD

APPENDIX 2A- HIGH VOLTAGE LOCKOUT CHECKLIST & SIGN-OFF

Note: This checklist is used with a detailed procedure document & does not replace it.

Qualified Person In Charge (as designated by the Guarantor):_____.
Date:_____.
Location:_____.
Isolation Points:_____.

_____

The Person In Charge is required to:

1. Ensure procedures are documented and authorization received from Guarantor. _____.
2. Explain written procedures to everyone involved prior to commencing work, including use of mimic or single line drawings.
3. Ensure all Equipment is checked prior to use. _____.

- Hotsticks, including test date within last year
- Mats, including test date within last year
- Gloves, roll tested prior to each use
- Grounds, inspected for mechanical integrity
- Proximity Meters
- Required numbers of locks, scissors, lockbox, tags present, ready for use.

4. Explain the safe Limits of Approach (minimum .9 meters).
5. Disconnect power from all sources as per procedures and initial procedures along with second Qualified Electrician and visually ensure isolation.
6. Wear gloves and use proximity detector to test for residual voltage on all points to be grounded.
7. Wear gloves and ground isolated points of work and determine it is safe to begin work in conjunction with second Qualified Electrician.
8. **Have all workers involved sign that it is safe to begin.**

_____ _____ _____

_____ _____ _____

9. After all work is complete, wear gloves and remove grounds in conjunction with second Qualified Electrician
10. Ensure all tools, nuts, bolts etc. are removed, enclosures closed and warning signs placed close to the equipment to be re-energized stating " Danger, Energized Equipment".
11. **Have all workers sign that it is safe to reenergize prior to completing re-energization.**

_____ _____ _____

_____ _____ _____

APPENDIX 2B- CHECKLIST OF EQUIPMENT FOR LOCKOUT

The Supervisor will ensure appropriate items are available before commencing lockout.

- ❑ Personal Locks in quantity to permit all points to be locked out.
- ❑ Lock Identification Tags for each lock
- ❑ Information Tags
- ❑ Scissors for the application of multiple locks at a lockout point
- ❑ Lock/Key Boxes for group lockout and/or multiple lockout point work.
- ❑ Valve lockout covers
- ❑ Valve locking devices
- ❑ Circuit Breaker switch lockout devices
- ❑ Devices for locking cord plug ends
- ❑ Blanks or Blinds engineered and fabricated for blocking flow of material at specific points
- ❑ Blocking device (specially made) to control potential energy in specific situations
- ❑ Cables/chains for securing valve stem wheels against rotation
- ❑ Insulating Blankets, live line tools etc. appropriate for High Voltage work.
- ❑ Arc Flash Face Masks
- ❑ Arc Flash Protective Coveralls
- ❑ Hotsticks, including test date within last year
- ❑ Mats, including test date within last year
- ❑ Insulating Rubber Gloves, roll tested prior to each use
- ❑ CSA approved grounding devices/chains, inspected for integrity
- ❑ Proximity Meters, Electrical Testing Equipment meeting the requirements of WorkSafeBC Reg. 19.8
- ❑ "PROCEDURES FOR ISOLATION" Form (PWGSC-12); Document all steps, including mechanical and Re-energization procedures.
- ❑ Clear Plastic covers for holding lockout procedures and other forms at the worksite.
- ❑ CSA approved UV Safety Eye Glasses, CSA approved Safety Footwear, Hearing Protection and protective Headwear appropriate to the work to be carried out.

The Supervisor will also ensure that:

- ❑ Adequate supplies are on hand and that workers have received training and instruction in the proper use, fit and care of equipment and tools, **BEFORE** commencing the work.
- ❑ All tools and equipment are stored, maintained, inspected and tested by a Qualified Person.
- ❑ All tools/equipment failing testing are removed from service and tagged until repaired or removed from the workplace.

APPENDIX 3- RECORD OF SAFETY DISCUSSION FORM

Contractors may use their own form. A larger version is available.

Public Works and Government Services Canada — Travaux publics et Services gouvernementaux Canada

RECORD OF SAFETY DISCUSSION

DATE:	TIME:
LOCATION:	
DESCRIPTION OF JOB/TASK	
PERMIT NUMBER:	

LOG OF PERSONNEL AT WORK SITE

POINTS CONSIDERED/ DISCUSSED

	DISCUSSED	N/A		DISCUSSED	N/A
DETAILED PROCEDURES/ PERMITS			FIRST AID		
PERSONAL PROTECTIVE EQUIPMENT			CLIMBING HAZARDS		
LIMITS OF APPROACH			COMMUNICATIONS		
OTHER WORKERS/CONTRACTORS			CONFINED SPACE ENTRY		
COVER-UP REQUIREMENTS			UNDERGROUND UTILITIES		
TEST FOR POTENTIAL			WEATHER CONDITIONS		
INDUCTION HAZARDS			ENVIRONMENTAL CONCERNS		
FEEDBACK HAZARDS			CONDUCTOR CONDITION		
GROUNDING/ EQUIPOTENTIAL			ADJACENT STRUCTURES		
ADEQUATE DRAWINGS ON SITE			HOUSEKEEPING		
QUALIFICATIONS OF PERSONNEL			FALL PROTECTION		
RIGGING SAFE WORKING LOAD			VEHICLE STABILITY		
PUBLIC SAFETY			TRAFFIC CONTROL		
INSPECTION OF TOOLS & EQUIPMENT			HELICOPTER PROCEDURES		

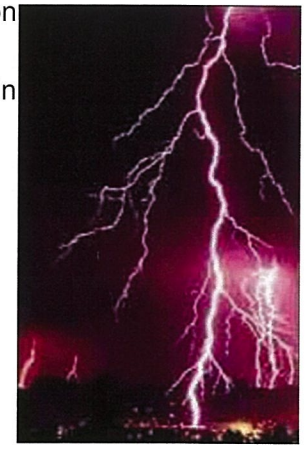
OTHER CONCERNS DISCUSSED

DESCRIPTION OF UNEXPECTED HAZARDS

APPENDIX 4- EFFECTS OF ELECTRICAL CONTACT

The following are effects at various current levels provided by OSHA.

How Electrical Current Affects the Human Body



Three primary factors affect the severity of the shock a person receives when he or she is a part of an electrical circuit:

- Amount of current flowing through the body (measured in amperes).
- Path of the current through the body.
- Length of time the body is in the circuit.

Other factors that may affect the severity of the shock are:

- The voltage of the current.
- The presence of moisture in the environment.
- The phase of the heart cycle when the shock occurs.
- The general health of the person prior to the shock.

Effects can range from a barely perceptible tingle to severe burns and immediate cardiac arrest. Although it is not known the exact injuries that result from any given amperage, the following table demonstrates this general relationship for a 60-cycle, hand-to-foot shock of one second's duration:

Current level (in milliamperes)	Probable effect on human body
1 mA	Perception level. Slight tingling sensation. Still dangerous under certain conditions.
5 mA	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range may lead to injuries.
6-30 mA	Painful shock, muscular control is lost. This is called the freezing current or "let-go" range.
50-150 mA	Extreme pain, respiratory arrest, severe muscular contractions. Individual cannot let go. Death is possible.
1000-4300 mA	Ventricular fibrillation (the rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is

	most likely.
10,000 mA	Cardiac arrest, severe burns and probable death.

Wet conditions are common during low-voltage electrocutions. Under dry conditions, human skin is very resistant. Wet skin dramatically drops the body's resistance.

Dry Conditions: Current = Volts/Ohms = 120/100,000 = 1mA
a barely perceptible level of current

Wet conditions: Current = Volts/Ohms = 120/1,000 = 120mA
sufficient current to cause ventricular fibrillation

If the extensor muscles are excited by the shock, the person may be thrown away from the circuit. Often, this can result in a fall from elevation that kills a victim even when electrocution does not.

When muscular contraction caused by stimulation does not allow the victim to free himself from the circuit, even relatively low voltages can be extremely dangerous, because the degree of injury increases with the length of time the body is in the circuit. LOW VOLTAGE DOES NOT IMPLY LOW HAZARD!

100mA for 3 seconds = 900mA for .03 seconds
in causing fibrillation

Note that a difference of less than 100 milliamperes exists between a current that is barely perceptible and one that can kill.

High voltage electrical energy greatly reduces the body's resistance by quickly breaking down human skin. Once the skin is punctured, the lowered resistance results in massive current flow.

Ohm's law is used to demonstrate the action.
At 1,000 volts, Current = Volts/Ohms = 1,000/500 = 2 Amps
which can cause cardiac standstill and serious damage to internal organs.

http://www.osha.gov/SLTC/etools/construction/electrical_incidents/eleccurrent.html - death%20is%20most%20likely

http://www.osha.gov/SLTC/etools/construction/electrical_incidents/eleccurrent.html#certain%20conditions

ARC FLASH:

When High Voltage, or High Current switchgear fails during operation, maintenance, or repair, the resulting arc flash and blast can produce temperatures in excess of 35,000°. The resulting heat can instantly ignite clothing, burn skin, and causes the metal and air in the switchgear to expand rapidly. This rapid expansion causes a high-pressure explosion of molten metal and hot gases.

Arc Flash events were responsible for over 2000 burn-unit hospitalizations and 700 deaths in North America last year. The majority of all hospitalizations due to electrical accidents each year are due to arc flash burns, and not electrocution. Many of these events occur during routine events as racking a breaker into its cell, or closing a load break switch onto a live bus.

The harm caused by these accidents can be greatly reduced by proper adjustment of the electrical protection system on a site, and the use of NFPA 70E compliant, flash rated, personal protective equipment. The national Fire Protection Association 70E is the adopted American standard for Electrical Worker Safety.

Above provided courtesy Elite Engineering Ltd.

APPENDIX 5 - SAMPLE LOCKOUT DOCUMENTS

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

Job Hazard Analysis (JHA)		
Job Name: Isolate Crane Functions for Wheel Change **Frequency**: Infrequent		
Analysis By: **Joe Legetc**	**Reviewed By**: **Mike Ledson**	**Approved By**: **Joe Legetc**
Date: 13/03/02	**Date: 13/03/02**	**Date: 13/03/02**
SEQUENCE OF STEPS	**POTENTIAL HAZARDS**	**NEW PROCEDURE/ PREVENTIVE MEASURES**
1. Gantry Drive Disconnect Power off	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
2. Apply locks and test	Lockout fails and drive reenergized	Ensure all workers stay at a distance
3. Main Hoist Disconnect power off	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
4. Apply locks and test	Lockout fails and hoist reenergized	Ensure all workers stay at a distance
5. Slew Drive Disconnect power off	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
6. Apply locks and test	Lockout fails and drive reenergized	Ensure all workers stay at a distance
7. Place all keys in lock box and all workers apply locks		
8. Chock wheels		
9. Relieve weight with hydraulic jacks	Jack failure and crane drops	Remove/replace one wheel at a time; do not place any body part near pinch pints
10. Remove wheel and replace	Potential for back injury and/or pinched fingers and abrasions	Get assistance; use hydraulic lift; check rigging; wear gloves
RE-ENERGIZATION		
12. Remove locks from lock box		
13. Remove locks from Slew Drive disconnect		
14. Slew Drive Disconnect power on	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
15. Remove locks from Main Hoist disconnect		
16 Main Hoist power on	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
17. Remove locks from Main Hoist disconnect		
18. Gantry Drive Power on	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REQUEST FOR ELECTRICAL ISOLATION
DEMANDE DE COUPURE À LA SOURCE

A. Building Name and Address - Nom et adresse de l'immeuble

Specific Location of Installation or Equipment to be Isolated (indicate floor, wing, room no., cabinet no., etc.)
Endroit précis de l'installation ou de l'appareillage devant être coupé à la source (indiquer l'étage, l'aile, le n° de la pièce, le n° du panneau, etc.)

E.G.D. YARD S. SIDE

Description of Installation or Equipment to be Isolated
Description de l'installation ou de l'appareillage devant être coupé à la source

30T CRANE GANTRY, MAIN HOIST & SLEW FUNCTIONS & CHOCK WHEELS

Isolation Request No.
N° de demande de coupure à la source: EGD - 473

Date and Time of Request - Date et heure de la demande
Date (Y-A M DJ): 02 03 15 — Hour / Heure (HH:MM): 09:00

Isolation to Start On
Coupure à la source devant débuter le
Date (Y-A M DJ): 02 03 20 — Hour / Heure (HH:MM): 07:00

Isolation to End On
Coupure à la source devant se terminer le
Date (Y-A M DJ): 02 03 22 — Hour / Heure (HH:MM): 16:00

Procedures for Isolation - Procédures de coupure à la source
(NOTE: When procedures involve more than one operation a Procedures for Isolation Form must be completed and attached.)
(NOTA : Lorsqu'un procédé comporte plus d'une opération, vous devez remplir le formulaire «Procédures de coupure à la source» et l'annexer au présent formulaire.)

SEE ATTACHED (2 PGS.)

Voltage / Tension: 480

When high voltage equipment is to be isolated a Procedures for Isolation Form must be completed and attached.
Pour la coupure à la source d'appareillages haute tension, le formulaire «Procédures de coupure à la source» doit être rempli et joint.

Update of Line Drawings Required Upon Completion
Nécessité de mettre à jour les schémas électriques une fois les travaux terminés: ☐ Yes / Oui ☒ No / Non

Requested by - Demandé par

Name of Person in Charge - Nom de la personne responsable	Signature	Date (Y-A M DJ)	Hour - Heure (HH:MM)
MIKE LEDSON	M Ledson	02 03 10	08:00

B. Request Approved - Demande autorisée

Name of Guarantor - Nom du garant	Signature	Date (Y-A M DJ)	Hour - Heure (HH:MM)
JOE LEZETC	J. Lezetc	02 03 15	09:00

C. Isolation Confirmed - TO BE COMPLETED PRIOR TO COMMENCEMENT OF WORK
Isolation confirmée - À COMPLÉTER AVANT DE COMMENCER LES TRAVAUX

Isolation has been tested and it is determined safe for workers to perform the work.
Le procédé de coupure à la source a été mis à l'essai et les travaux peuvent être exécutés en sécurité

Name of Person in Charge - Nom de la personne responsable	Signature	Date (Y-A M DJ)	Hour - Heure (HH:MM)
MIKE LEDSON	M. Ledson	02 03 20	07:30

D. Approval of Requested Isolation Made and Completion of Work Confirmed
Approbation de l'opération demandée pour la coupure à la source et confirmation de l'exécution des travaux

Line Drawings Updated as Required
Les schémas électriques ont été mis à jour tel que demandé: ☐ Yes / Oui ☒ No / Non

Name of Person in Charge - Nom de la personne responsable	Signature	Date (Y-A M DJ)	Hour - Heure (HH:MM)
MIKE LEDSON			

E. Approval of Completion of Work and Confirmation that Equipment or Installation has been Re-energized
Approbation d'achèvement des travaux et confirmation de la remise sous tension de l'appareil ou de l'installation

Name of Manager in Charge of Worksite or Supervisor / Nom du gestionnaire responsable du lieu de travail ou du superviseur	Signature	Date (Y-A M DJ)	Hour - Heure (HH:MM)
WYATT WRIGHT	W. Wright	02 03 22	16:00

PWGSC-TPSGC 13 (12/1997)

THIS RECORD MUST BE KEPT FOR ONE YEAR FOLLOWING COMPLETION OF WORK
À CONSERVER PENDANT UN AN APRÈS LA FIN DES TRAVAUX

Copy 1 (White) / Copie 1 (Blanc) ▶ Manager in Charge of Worksite or Supervisor / Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow) / Copie 2 (Jaune) ▶ To be submitted to, and retained by the Guarantor (upon completion of the work) / À remettre au garant à la fin des travaux. Le garant doit garder cette copie.

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada — SAMPLE

PROCEDURES FOR ISOLATION
PROCÉDURES DE COUPURE À LA SOURCE

PROCEDURES

This form must be completed when high voltage equipment or installations are to be isolated.

This form must be completed and attached to all Request for Electrical Isolation forms when more than one operation is required in the isolation process

These procedures must indicate the correct sequence to be followed in the isolation process and the correct procedures to follow to re-energize.

This sequence must be followed without deviation

See reverse for additional instructions.

PROCÉDURES

Vous devez remplir ce formulaire lorsque vous avez à couper à la source un appareil ou des installations à haute tension.

Vous devez remplir ce formulaire et l'annexer à toutes les «demandes de coupure à la source électricité» lorsque le procédé d'isolation comporte plus d'une opération.

Ces procédures doivent indiquer la séquence exacte des étapes du procédé de coupure à la source et la marche à suivre normale pour la remise sous tension.

Vous devez sans faute suivre cette séquence.

Voir les renseignements complémentaires au verso.

These operating procedures shall be carried out in conjunction with Request for Isolation No.
La procédure est liée à la demande de n° de coupure à la source

Request for Isolation No. - Demande de n° de coupure à la source	Date (YY-MM-DD)
EGD xxx Pg. 1 of 2	02-03-15

Purpose of order / Objet de la commande: ISOLATE CRANE FUNCTIONS FOR WHEEL CHANGE.

Sequence no. N° séquentiel	Equipment affected Appareillage concerné	Tag no. installed on Equipment N° d'étiquette installée	Functions to be performed and specific safety measures required / Fonctions à remplir et mesures de sécurité spéciales requises	Initials Initiales
1	GANTRY DRIVE		ARMATURE POWER OFF	J.L. M.L.
2	GANTRY DRIVE		FIELD POWER OFF	J.L. M.L.
3	MAIN HOIST		ARMATURE POWER OFF	J.L. M.L.
4	MAIN HOIST		FIELD POWER OFF	J.L. M.L.
5	SLEW DRIVE		ARMATURE POWER OFF	J.L. M.L.
6	SLEW DRIVE		FIELD POWER OFF	J.L. M.L.
7	GANTRY WHEELS		INSTALL CHOCKS (2 REQ'D)	J.L. M.L.
8	GANTRY WHEELS		REMOVE CHOCKS (2 REQ'D)	J.L. M.L.
9	SLEW DRIVE		FIELD POWER ON	J.L. M.L.
10	SLEW DRIVE		ARMATURE POWER ON	J.L. M.L.
11	MAIN HOIST		FIELD POWER ON	J.L. M.L.

Prepared by - Préparé par

Name - Nom	Time - Heure	Date (YY-MM-DD)
MIKE LEDSON M. Ledson	09:00	02-03-13

Checked by - Vérifié par

Name - Nom	Time - Heure	Date (YY-MM-DD)
JOE LEZETC J. Lezetc	08:00	02-03-14

Issued by - Émis par

Name - Nom	Time - Heure	Date (YY-MM-DD)
JOE LEZETC J. Lezetc	09:00	02-03-15

Performed by - Effectué par

Name - Nom	Time - Heure	Date (YY-MM-DD)
M. Ledson J. Lezetc MIKE LEDSON & JOE LEZETC	07:30	02-03-20

Operating diagram adjusted by - Schéma fonctionnel corrigé par

Name - Nom	Time - Heure	Date (YY-MM-DD)

PWGSC-TPSGC 12 (12/1997)

THIS RECORD MUST BE KEPT FOR ONE YEAR FOLLOWING COMPLETION OF WORK
À CONSERVER PENDANT UN AN APRÈS LA FIN DES TRAVAUX

Copy 1 (White) / Copie 1 (Blanc) ▶ Manager in Charge of Worksite or Supervisor / Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow) / Copie 2 (Jaune) ▶ Originator / Demandeur

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SAMPLE

PROCEDURES FOR ISOLATION
PROCÉDURES DE COUPURE À LA SOURCE

PROCEDURES

This form must be completed when high voltage equipment or installations are to be isolated.

This form must be completed and attached to all Request for Electrical Isolation forms when more than one operation is required in the isolation process.

These procedures must indicate the correct sequence to be followed in the isolation process and the correct procedures to follow to re-energize.

This sequence must be followed without deviation

See reverse for additional instructions.

PROCÉDURES

Vous devez remplir ce formulaire lorsque vous avez à couper à la source un appareil ou des installations à haute tension.

Vous devez remplir ce formulaire et l'annexer à toutes les «demandes de coupure à la source électricité» lorsque le procédé d'isolation comporte plus d'une opération.

Ces procédures doivent indiquer la séquence exacte des étapes du procédé de coupure à la source et la marche à suivre normale pour la remise sous tension.

Vous devez sans faute suivre cette séquence.

Voir les renseignements complémentaires au verso.

These operating procedures shall be carried out in conjunction with Request for Isolation No.
La procédure est liée à la demande de n° de coupure à la source

Request for Isolation No. - Demande de n° de coupure à la source	Date (YY-MM-DD)
EGD xxx Pg. 2 of 2	02-03-15

Purpose of order
Objet de la commande

Sequence no. N° séquentiel	Equipment affected Appareillage concerné	Tag no. installed on Equipment N° d'étiquette installée	Functions to be performed and specific safety measures required Fonctions à remplir et mesures de sécurité spéciales requises	Initials Initiales
12	MAIN HOIST		ARMATURE POWER ON	J.L. M.L.
13	GANTRY DRIVE		FIELD POWER ON	J.L. M.L.
14	GANTRY DRIVE		ARMATURE POWER ON	J.L. M.L

	Name - Nom	Time - Heure	Date (YY-MM-DD)
Prepared by - Préparé par	MIKE LEDSON M. Ledson	09:00	02-03-13
Checked by - Vérifié par	JOE LEZETC J. Lezetc	08:00	02-03-14
Issued by - Émis par	JOE LEZETC J. Lezetc	09:00	02-03-15
Performed by - Effectué par	M. Ledson J. Lezetc MIKE LEDSON & JOE LEZETC	07:30	02-03-20
Operating diagram adjusted by - Schéma fonctionnel corrigé par			

PWGSC-TPSGC 12 (12/1997)

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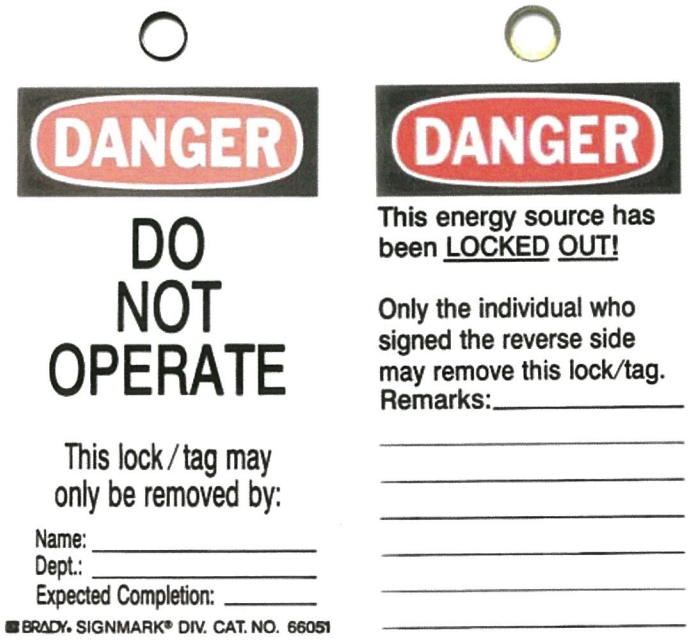
Copy 1(White) / Copie 1 (Blanc) ▶ Manager in Charge of Worksite or Supervisor / Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow) / Copie 2 (Jaune) ▶ Originator / Demandeur

APPENDIX 6 - TAGS ASSOCIATED WITH LOCKOUT

Note: Tags are examples only; to be modified for PWGSC.



DANGER
DO NOT OPERATE

TESTING
PWGSC - EGD ELECTRICAL DEPT.

GROUNDED

PWGSC - EGD ELECTRICAL DEPT.

DANGER
DO NOT OPERATE
LIVE LINE WORK
PWGSC - EGD ELECTRICAL DEPT.

APPENDIX 7 – RECORD OF ELECTRICAL WORK FOR MINOR PROJECTS (PWGSC-69)

See separate LOGBOOK in EGD Electrical Shop for record of Minor Projects. These are projects requiring inspection by an Electrical Inspector at a later date. Major Projects or those where work will be closed in, must be inspected immediately. Record equivalent information to that on form PWGSC 69.

MANUAL SECTION 2: EMERGENCY CALL OUT LIST

See Section 2 in the Lockout Manual for the Call-out List and related information

MANUAL SECTION 3: EGD ELECTRICAL SINGLE LINE DRAWINGS

See Section 3 of the Lockout Manual for list of Single Line Drawings located in the Electrical Shop.

MANUAL SECTION 4: STANDARD OPERATING PROCEDURES FOR ISOLATION/ RE-ENERGIZATION

See Section 4 of the Lockout Manual for list of Standard Operating Procedures

MANUAL SECTION 5: COMPLETED LOCKOUT FORMS

See Section 5 of the Lockout Manual for completed forms.

MANUAL SECTION 6: PWGSC DEPARTMENTAL POLICY 058

MANUAL SECTION 7: OTHER REFERENCES

Treasury Board Of Canada Policy Part Viii, Canada Labour Code COHS Regulations Part Viii,

Appendix B

EGD Environmental Best Management Practices

Esquimalt Graving Dock

Environmental Best Management Practices

Prepared By:
Public Works and Government Services Canada
Environmental Services

Date: October 6, 2010
Version: 04

Table of Contents

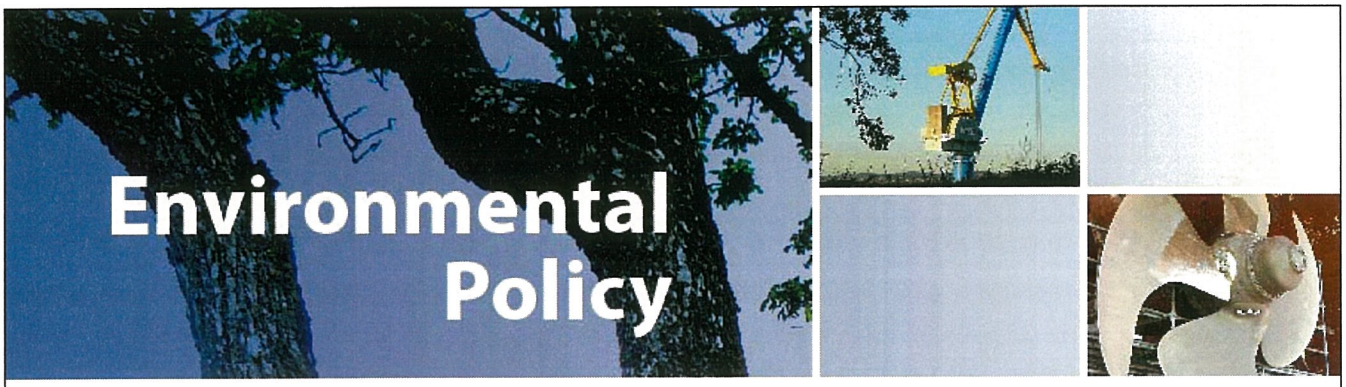
Overview

The **Esquimalt Graving Dock (EGD)** is a federal-government-operated, multi-user ship repair and maintenance facility located in Esquimalt, British Columbia. The facility has been in operation since 1925, and provides service to local, Federal, and international vessels. The vessel repair and maintenance work at the EGD is carried out by privately owned shipyards that rent the required sections of the drydock and lease upland work space from the government, and pay a fee for services such as cranes, compressed air, water and power.

Industrial ship maintenance and repair operations have the potential to result in significant environmental issues and impacts. To help identify and manage these potential impacts, the EGD has implemented an **Environmental Management System (EMS)** certified under the internationally recognized standard **ISO 14001**. The EMS provides the framework for identifying potential impacts, and ensures adequate controls are in place to effectively manage them.

This manual contains a series of recommended **Environmental Best Management Practices (EBMPs)** to reduce potential environmental impacts of common activities and operations at the Esquimalt Graving Dock. The manual contains guidance for those operating at the EGD, and is intended to complement existing environmental legislation. It does not remove the responsibility of all contractors and companies operating at the facility to abide by all applicable regulatory requirements and industry standards. All users of the facility are expected to follow the EBMPs.

For further information on environmental rules and standards contact the EGD Environmental Department.



Environmental Policy

It is the goal of the Esquimalt Graving Dock, in partnership with the ship repair industry, to be the premier ship repair, construction and maintenance facility on the west coast of North America.

The Esquimalt Graving Dock and its Users realize that environmental management is an integral part of attaining that goal. Through the implementation of an ISO 14001 Environmental Management System, we are committed to managing the actual and potential environmental impacts of our operations.

To meet our commitment we will:

- *Protect the natural environment and prevent pollution.*
- *Meet or exceed applicable federal, provincial and municipal legislation and regulations; uphold departmental policies; and abide by industry standards, practices and other requirements related to our identified environmental aspects.*
- *Establish and review our programs, objectives and targets to ensure we are meeting our environmental commitments.*
- *Communicate openly with our employees, Users, tenants, contractors, suppliers, neighbours and other stakeholders regarding our Environmental Management System and the nature of our operations.*
- *Educate our employees and the Users of our facility to ensure they are aware of and understand their roles and responsibilities in protecting the environment.*
- *Meet the evolving needs and expectations of our industry and community through the continual improvement of our systems, programs and procedures.*

Bonnie MacKenzie	Jim Milne	David Latoski
Director General	Director	Operations Manager
Engineering Assets	Esquimalt Graving Dock	Esquimalt Graving Dock
Strategy Sector	Engineering Assets	Engineering Assets
	Strategy Sector	Strategy Sector

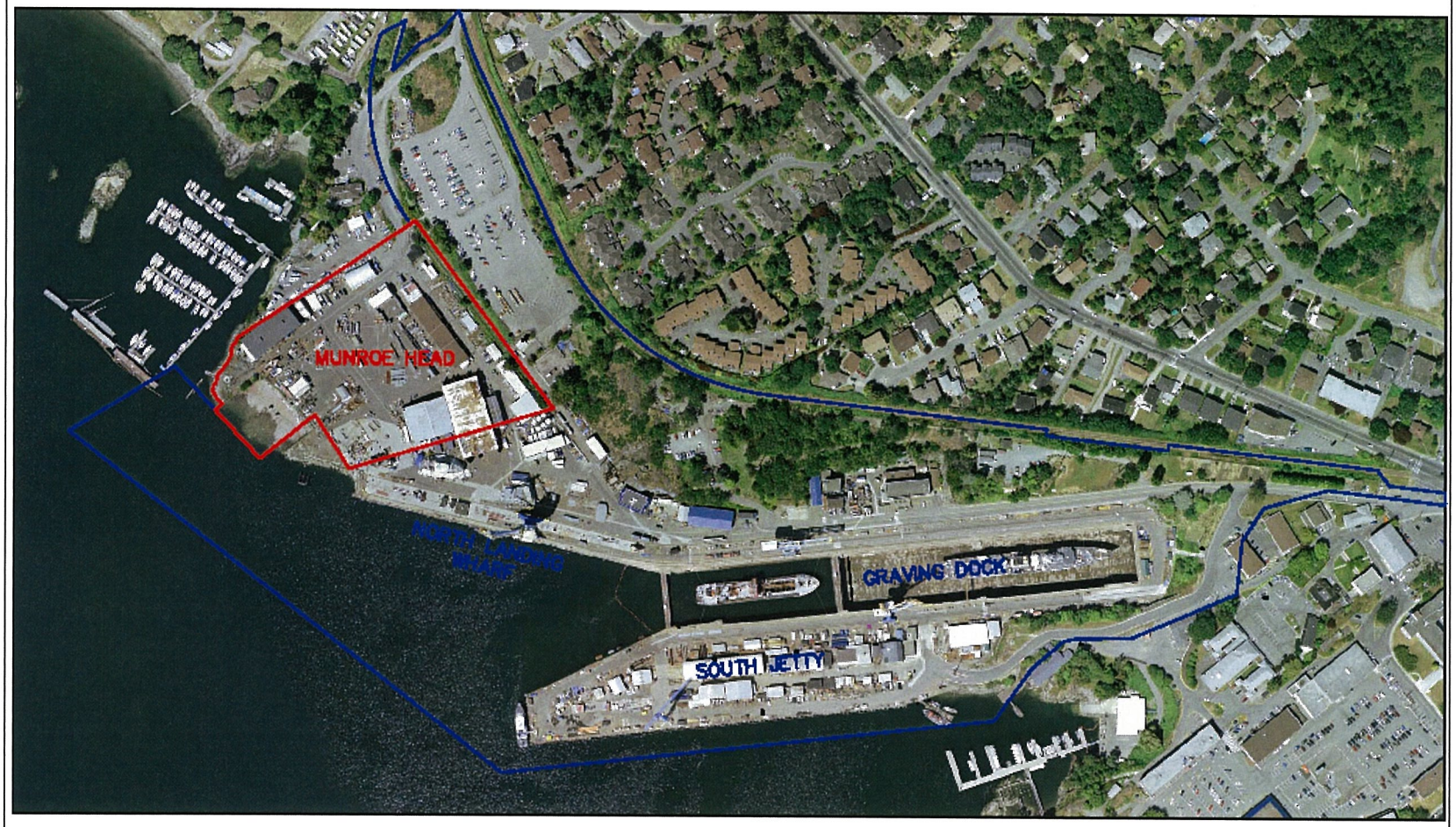
JULY 2009

Public Works Government Services Canada | Travaux publics et Services gouvernementaux Canada

ISO 14001
EMS-011
CGSB

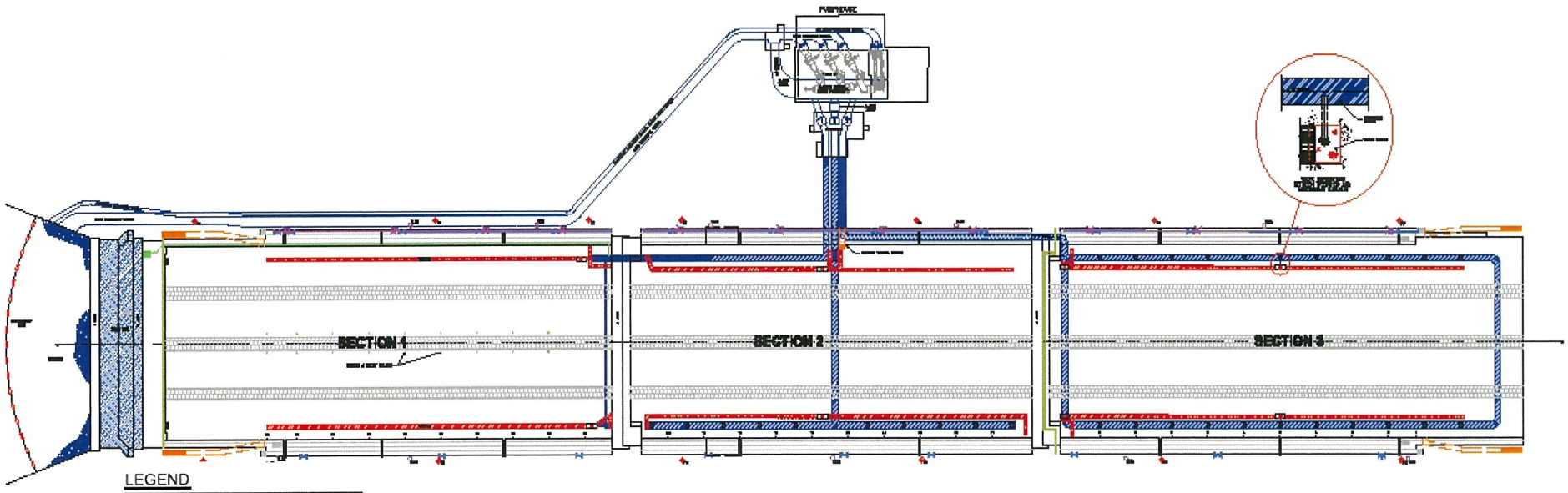
Canada

Esquimalt Graving Dock



ESQUIMALT GRAVING DOCK
DRAINAGE PLAN

Note: It is intended that this drawing be printed in colour.
If printed in black and white some detail will be lost.



LEGEND

LADDER	
STAIR	
FIRE ACCESS	
ELECTRICAL CONN.	
AIR CONNECTION	
WATER CONNECTION	
WATER PIPE	
TRENCH GRATE	
TUNNEL GRATE	
TUNNEL MANHOLE	
NET CAGE- MAIN TUNNEL ACCESS	
TRENCH DRAIN	
DE-WATERING TUNNEL	
SILL PUMP & PIPE	
MOON POOL	

ESQUIMALT GRAVING DOCK:
1178' (361.8m) LONG
125' (41.2m) WIDE
48.5' (16m) DEEP

THIS DRAWING IS NOT TO SCALE

BMP #1

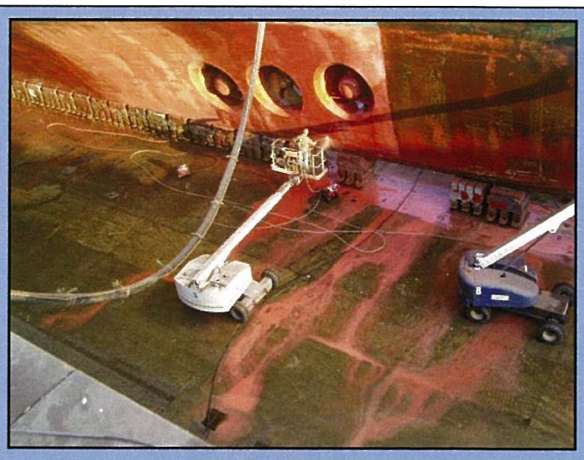
High Pressure/ Ultrahigh Pressure Washing

One of the first activities to occur on a dry-docked vessel is the high pressure washing of the vessel hull to remove salts and marine growth prior to surface preparation or painting. This typically involves pressure washing the hull and/or super structure with water at 2,000 – 3,500 psi, which may produce large volumes of paint contaminated wastewater. Shipyards may use an Ultra High Pressure (UHP) washing process (from 40,000 – 55,000 psi) to completely remove all paints, eliminating the need for further surface preparation prior to painting. This operation generates even larger volumes of wastewater and solids, which will need to be managed.

Management of Wastewater on the Graving Dock Floor

- Ensure all wastes and wastewater discharges resulting from hull washing activities are collected and disposed properly.
- Coordinate high pressure washing operations to ensure effective collection of wastewater.
- Close all sump well valves in the floor collection system prior to and during high pressure washing operations.
- Divert contaminated wastewater that falls outside of the dock floor containment area away from the tunnel drains.
- Direct non-contaminated water (i.e. ballast water, cooling water) away from contaminants on the dock floor.
- Collect and dispose of stormwater that comes into contact with contaminants.
- Do not use environmentally harmful detergents or additives in wash water.

All wastewater containing paint contaminants must be directed to the collection drains and sumps on the drydock floor, collected, and sent for treatment.



Antifoulant contaminated wash water entering the trench drain sump wells on dock bottom.

Section 1 Considerations – Caisson Leakage and Sediment

Diversion of sill water away from pressure washing areas
Water leaking into Section 1 of the graving dock from the caisson can be diverted from the work area by using a sump pump hooked to the PVC pipe installed along the north wall of the graving dock (Section 1).

Managing Entrained Sediment
Harbour sediment may become trapped in section 1, and accumulate in the corners, trenches and sumps. The users of the section will need to be aware of this. This sediment will have to be removed if it becomes contaminated with pressure washing wastewater, sandblast grit, paint chips, paint overspray, or other contaminants.

The sill diversion pump removes clean saltwater from the pool at the front of Section 1(moon pool) and discharges to the tunnel drains through a hard pipe on the dock wall.

Sediment from the harbour often settles on dock bottom after dewatering. This may become contaminated with paint, etc. and must be disposed of.

Ultra High Pressure (UHP) Washing

Ultra high pressure washing generates significant volumes of wastewater and sludge that may pose a challenge for collection and disposal.

- Prepare in advance for the management of the UHP waste.
- Remove all water, sludge and debris generated from UHP washing from the dock.
- Ensure the sludge is disposed of at an appropriately permitted facility.

The hull of a cruise ship being ultra high pressure washed. Inset: sludge produced during ultra high pressure washing.

Management of Small Vessel High Pressure Wastewater in the Upland Areas

- Perform pressure washing only in designated areas where wastewater management can be effectively achieved.
- Completely block off all drains prior to use for collecting wastewater from pressure washing.
- Ensure sufficient equipment is available for the timely collection and removal of wash water.
- Clean up work area and drains prior to removal of collection equipment. (i.e. filter cloth, plugs, tarps)

A small vessel is power washed on the North Landing Wharf (NLW).

The trench drain is blocked and a sump pump is installed to collect wash water into a tote.

Example of styrofoam blocks used as a drain blocker on the NLW.

Example of a pump set up used to collect wash water on the NLW.

BMP #2

Abrasive Blasting

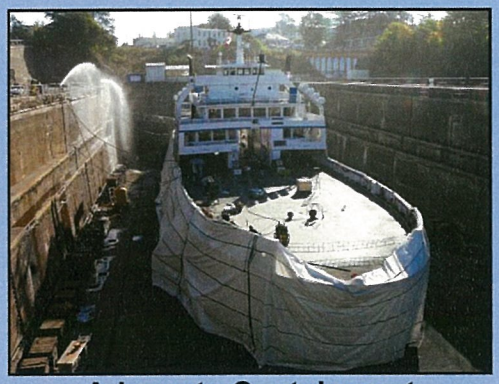
Abrasive blasting is a common operation performed at the Esquimalt Graving Dock (EGD) to prepare vessel surfaces for painting. However, this operation creates challenges with respect to controlling air emissions and the waste materials generated.

Fugitive emissions from blasting operations have the potential to negatively affect employees, facility users, neighbours, equipment and infrastructure. The dust from blasting may contain harmful environmental pollutants which may enter the harbour directly or via stormwater runoff.

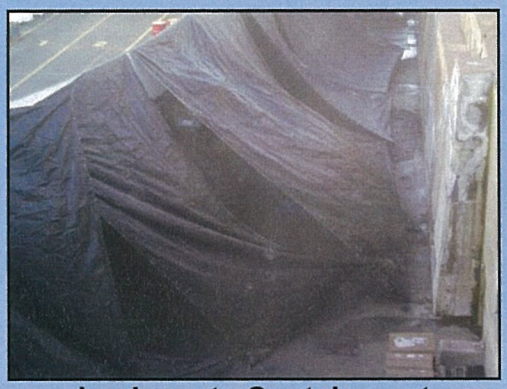
Waste grit may be contaminated with antifouling paint which poses a risk to marine life if not handled properly.

Dust Control

- Cover all blast media (new and used) during transport.
- Use containment such as tarps, shrouds or portable structures to prevent airborne particles from entering the atmosphere and surface waters.
    - Containment should be large enough to adequately enclose or segregate the working area.
    - Ensure containment devices are connected so there are no gaps.
    - Ensure that containment reaches the dock floor or walls



Adequate Containment



Inadequate Containment

- Where physical containment techniques are not sufficient to prevent fugitive emissions water curtains may be used to mitigate dust emissions in problem areas.
- Do not abrasive blast during conditions that render containment ineffective (i.e. during windy conditions)
- Minimize dust emissions by ensuring blast nozzles are angled close to perpendicular and aimed slightly downward during blasting.
- No abrasive blasting of vessels shall be performed while vessels are docked at the North Landing Wharf or South Jetty

Air Quality Alarm

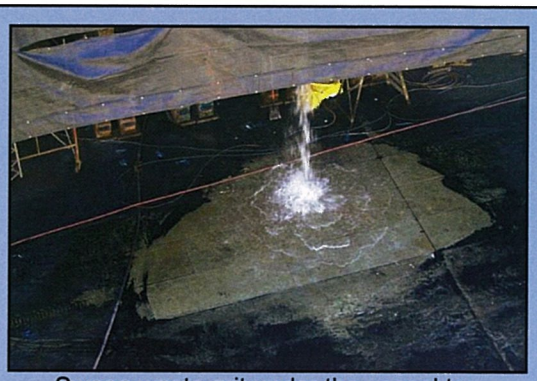
The Esquimalt Graving Dock has an onsite PM_{10} monitor in partnership with the Ministry of Environment.

If particulate matter levels in the air exceed 100µg/m^3 an alarm sounds in the Pumphouse, at which time corrective actions must be taken.

Waste Grit Management

- Remove waste grit from work areas as soon as possible.
- Store all waste grit in appropriate containers to prevent stormwater and wind impacts.
- Cover all skips, storage bins, tanks, and hoppers to prevent dust emissions.
- Dispose of waste grit in accordance with applicable provincial regulations.

Store all waste grit away from drains, to prevent contaminated water migrating into the marine environment.



Sweep waste grit under the vessel to prevent it from being washed down the drain.

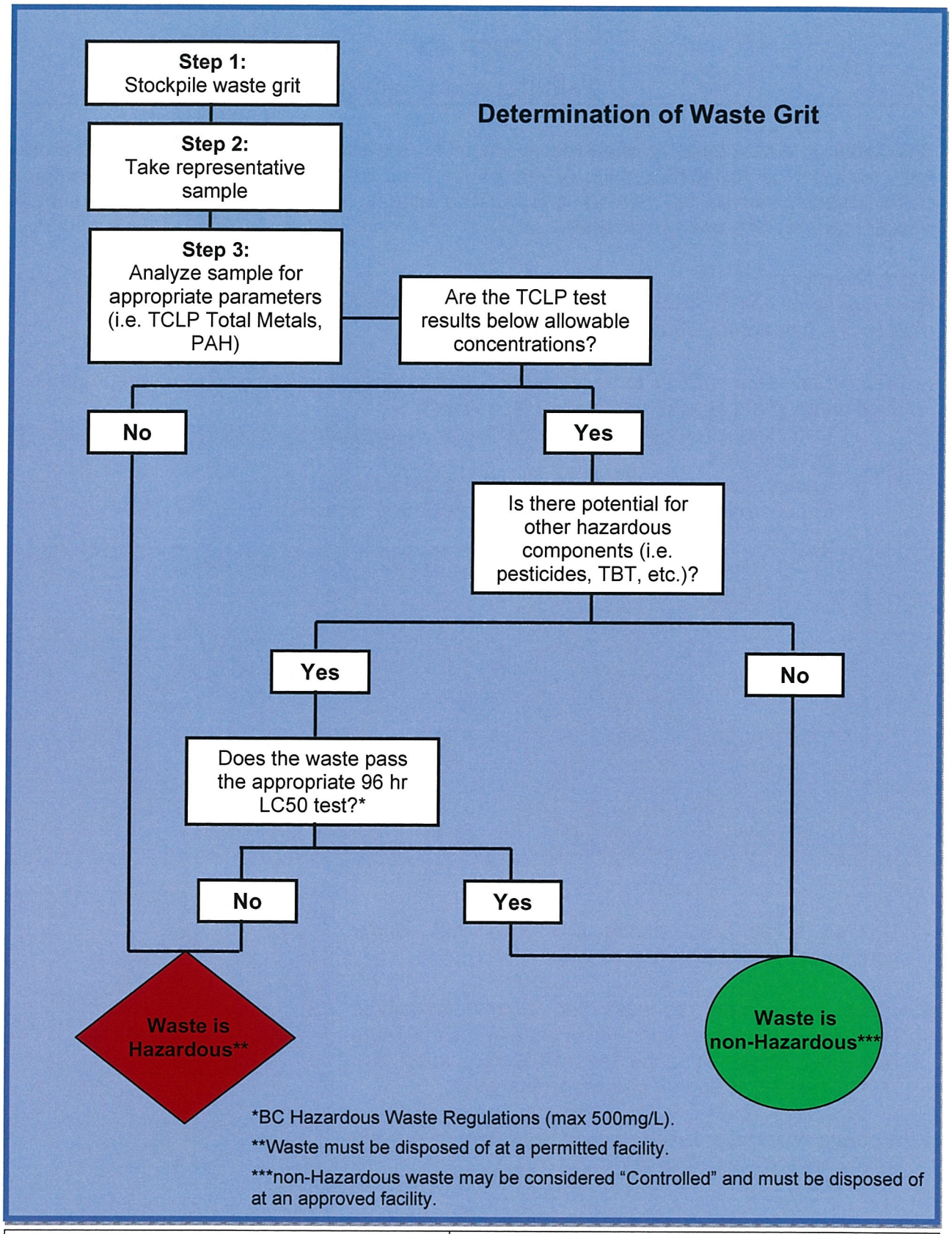
Store waste grit in appropriate containers, protected from inclement weather.

Remove waste grit from work areas as soon as possible.

Keel/Bilge Blocks

Keel and bilge blocks on dock bottom present a challenge for clean up of spent waste grit.

Excess blocks stored in dock bottom may be moved prior to sandblasting, or covered to prevent grit from collecting between the blocks.


Determination of Waste Grit
Step 1:
Stockpile waste grit
Step 2:
Take representative sample
Step 3:
Analyze sample for appropriate parameters (i.e. TCLP Total Metals, PAH)
Are the TCLP test results below allowable concentrations?
No
Yes
Is there potential for other hazardous components (i.e. pesticides, TBT, etc.)?
Yes
No
Does the waste pass the appropriate 96 hr LC50 test?*
No
Yes
Waste is Hazardous**
Waste is non-Hazardous***
*BC Hazardous Waste Regulations (max 500mg/L).
**Waste must be disposed of at a permitted facility.
***non-Hazardous waste may be considered "Controlled" and must be disposed of at an approved facility.

BMP #3
Painting and Coating

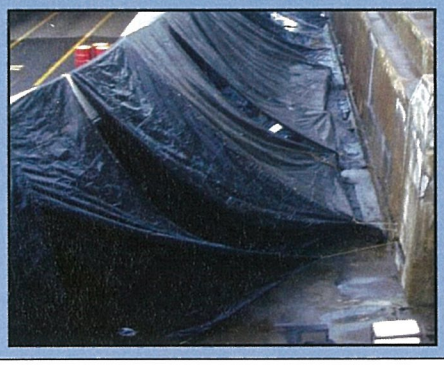
Ship repair and maintenance often requires painting and coating of vessel surfaces to protect from corrosion or to inhibit growth of marine life. The industrial nature of marine paints, in particular antifouling paints, may result in negative impacts to the environment and surrounding infrastructure if not properly managed.

Paint Overspray
Paint overspray has the potential to impact the marine environment, soils, neighbouring residences, and nearby equipment and infrastructure.

- Use containment such as tarps, shrouds or portable structures to prevent airborne particles from entering the atmosphere and surface waters.
  - Containment should be large enough to adequately enclose or segregate the working area.
  - Ensure containment is secured so there are no gaps.
  - Ensure that containment reaches the dock floor or walls.

Adequate Containment

Inadequate Containment



- Do not spray paint during conditions that render containment ineffective (i.e. windy).
- Place containment beneath and around structures being painted on dock floor and in work areas to ensure overspray does not reach the surrounding area (i.e. during painting of anchor chains, grates, etc.).
- Manage overspray on the graving dock floor to prevent safety hazards (e.g. slippage).

For vessels docked in **Section 1** ensure that overspray does not reach the sill water. Avoid docking vessels so they extend over sill area.

Painting Dockside

- Do not spray paint vessels docked at the North Landing Wharf or South Jetty.
- Use rollers and brushes to paint vessels dockside
- Ensure tarps are in place below work areas, as well as in between the vessel and the dock to prevent spills and drips from entering the water.
- Ensure paint cans are stored securely when working alongside vessel edges.
- Ensure floor grates of manlifts are covered to prevent spills to the marine environment
- Waste generated from grinding and hand tooling must be prevented from entering the marine environment.

Ensure tarps are in place to prevent overspray impacting the surrounding work area.

While painting vessels berthed at the North Landing Wharf and the South Jetty do not spray paint, and take measures to prevent paint from entering the marine environment.

Temporary Paint Storage/Mixing Areas

- Must be under cover to protect from inclement weather
- Only in designated areas
- Must be on secondary containment (a tarp at minimum)
- Ensure empty paint cans and other associated wastes from painting are stored properly, protected from the weather, and removed from dock bottom as soon as possible.

In **rare** situations (i.e. shape of the vessel combined with ideal weather conditions) containment may not be necessary to prevent overspray from escaping the area.

In this situation, the User must notify PWGSC **prior** to beginning the work, and obtain approval, **in writing**, to paint without completely enclosing the vessel. Restrictions and monitoring requirements will be applied.

To this date this has only been allowed in three situations:

- painting underneath a flat bottom barge
- painting the underwater hull portion of the midsection of a cruise ship
- painting of a C-class ferry underwater hull area during calm wind conditions

BMP #4

Dry Dock Floor Management and Cleanup

Drain Management

- All sump well valves must be closed prior to and during power washing operations.
- Cover all tunnel drains and net cages during sandblasting, painting and power washing to prevent contaminants from entering the marine environment.
- In the case of a spill or release on dock bottom all sump well valves must be closed and all contaminated material contained and removed from dock bottom.
- Direct all contaminated water to the trench drain system, to avoid entering the tunnel drains.
- Collect and properly dispose of all contaminated water. Ensure sufficient equipment is available for contaminated water collection.
- Ensure all non-contaminated water is directed away from work areas and into the tunnel drain system. (i.e. ballast water, cooling water, caisson sill water).

Sediment Management

- Segregate any marine sediment which may enter the dock during vessel transfer from pollutants generated from vessel repair in order to reduce the amount of wastes requiring disposal.
- Collect and properly dispose of marine sediment that becomes contaminated with waste generated from vessel repair.
- Remove all contaminants and residues from the trench drains and sump wells prior to flooding at the end of work period.

Hazardous Materials Management

- Store hazardous materials (i.e. fuel, paint, waste oils) away from the drains on dock bottom.
- Store hazardous materials to the inside of the trench drains so that any spills or releases can be captured.
- Store hazardous materials in areas protected from the weather, water curtains and other water sources.
- Ensure adequate spill response equipment is in close proximity to hazardous material transfer operations. At a minimum one spill kit is required per section of the graving dock.

Housekeeping

- Remove waste sandblast grit from the work area as soon as possible to prevent migration of grit contaminants into tunnel drain system.
- Store wastes collected from the dock floor in appropriate secondary containment and removed from dock bottom as soon as possible.

Residual paint in the cans, may drip out of the skip and enter the marine environment through the drain systems.

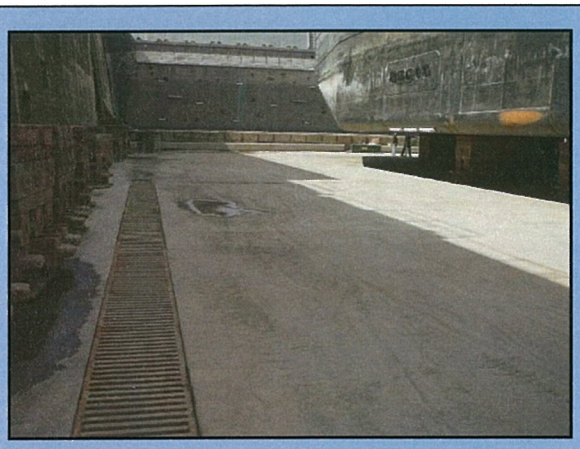
Leaving garbage around the work site attracts wildlife such as seagulls, racoons, and rats.

When cleaning dock bottom, skips of waste sandblast grit may leak contaminated water and should be removed as soon as possible.

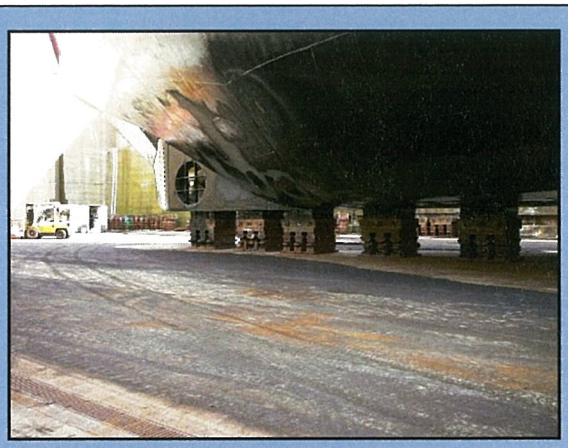
All hazardous materials must be stored in appropriate containment and away from tunnel drain system.

Inspection and Cleanliness

- Prior to flooding, the drydock must be cleaned to meet the Esquimalt Graving Dock (EGD) Standard of Cleanliness, as determined by the EGD undocking supervisor.
- Users must ensure that the dock floor is free of deleterious substances prior to flooding.
- Water may be used to clean the dock floor; however, any wastewater generated must be collected and disposed of properly.
- If a vessel occupies a shared portion of a dock section each User must clean the trench drains up to and including the section sump well.



Example of a dock floor that would pass inspection.



Example of a dock floor that would not pass inspection.

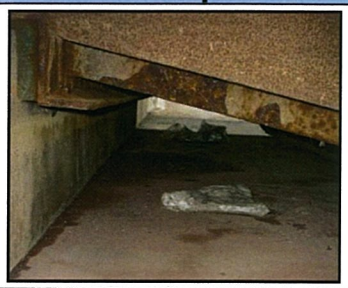
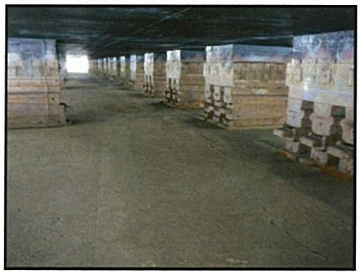
EGD Standard of Cleanliness

Due to the importance of drydock cleanliness prior to flooding, and since quantitative testing is impractical due to time and cost restrictions, the following guidelines will be used to assess cleanliness of drydock surfaces.

- All drydock surfaces, including stairwells and sills must meet the standard for "**residue free**" prior to flooding of the drydock. **"Residue free"** is considered met when a person of normal visual acuity, while standing, is unable to detect visible accumulations of potential pollutants.

- This includes, but is not restricted to, the removal of abrasive grit, paint residues, cutting and grinding wastes, oil and grease, food and drink containers, ear plugs, dust masks, rope, cigarette packs, or any other refuse that may have been deposited during the work period.

- Debris of natural origin that may have been deposited during the previous flooding of the drydock, such as wood, sand, silt, seaweed, or marine life may be exempt from these requirements, as long as it will not contaminate the environment upon reintroduction.

Important Locations	Acceptable	Not Acceptable
Ramps		
Sills		
Keel Blocks		
Trench Drains		
Sump Wells		

BMP #5

Hazardous Materials Handling and Storage

A variety of materials are used, stored and transported by the Users at the Esquimalt Graving Dock (EGD). If not handled appropriately, these materials have the potential to negatively impact worker health and safety, infrastructure or the environment.

Long Term Storage

Users must have designated storage areas suitable for the materials they use on site. These areas must:

- Have appropriate secondary containment suitable to the quantity and nature of the material in that area
- Ensure materials are stored in accordance with compatibility requirements
- Be protected from the weather
- Have placards and ventilation (where applicable)
- Have controlled access

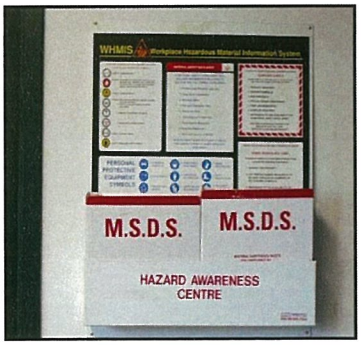
Short Term Storage and Working Areas

These areas must be:

- Clearly identified and labelled
- Located away from pathways to the marine environment
- Located on impervious surfaces (i.e. concrete, asphalt)
- Protected from the weather

Materials must be:

- Stored in containers appropriate for the nature of the material
- Labelled appropriately with product name, first aid information, and PPE requirements.
- Secured appropriately during transport



MSDS for all products stored on site must be available to all employees.

Empty containers must be labelled "Empty".

Inspect all valves and storage containers for rust or damage before use.

Federal Regulation for Fuel Storage Tanks

As the EGD is a Federal facility, any storage tanks onsite may fall under the Petroleum and Allied Petroleum Products *Storage Tanks Regulations* (2008). Tenants may be required to register their tanks with Environment Canada.

National Fire Code

This code outlines the containment, labelling and location requirements for flammable liquid storage.

Areas to Avoid Storing Containers of Hazardous Materials	
Drains: Although the trench drains provide the opportunity to collect accidentally released materials, if a tote or drum is placed directly over top or beside a drain the material will flow directly into it and the spill may not be noticed until it is too late.	
Fire Holes: On the South Jetty the fire holes flow directly into the harbour. If any containers fail near the fire holes, the material will not be able to be recovered once it is in the harbour..	
South Jetty and North Landing Wharf Edges: Any containers placed near the edge of the jetties have the potential to spill directly into the harbour as there are no berms or secondary containment available.	

BMP #6

Waste Management and Recycling

Operations at the Esquimalt Graving Dock (EGD) generate a variety of waste streams including hazardous waste, international wastes, and general refuse and recyclables.

Hazardous Waste

Hazardous wastes generated at the EGD may include waste oil and oil filters, antifreeze, batteries, paint and solvents, oily rags and absorbent materials, spent grit, solids generated during power washing, and asbestos. Appropriate management of hazardous waste will reduce environmental liability associated with inappropriate disposal and storage as well as reduce the risk of human injury and environmental impact.

Hazardous waste storage shall be segregated from new product storage.

- Ensure designated storage areas are away from active work areas.
- Ensure areas are covered to reduce exposure to environment and wildlife.
- Ensure that waste accumulation areas are organized.

Hazardous waste should be segregated into separate containers.

- Ensure containers used are appropriate for the type of waste (i.e. separate drums for waste oil, oil filters, antifreeze, batteries, paint and solvents, oily rags and absorbent material, spent grit)
- Store batteries in a manner that prevents leakage of acid to the environment.
- Properly dispose of contaminated clean-up materials (i.e. absorbents, rags, etc.)
- Do not dilute or mix hazardous waste other hazardous or non-hazardous wastes.
- Cover waste containers to prevent exposure to weather (i.e. rain)

Clearly label all hazardous waste containers.

- Labels should Include: type of waste, generator/company name, and contact information

Asbestos

All asbestos containers and asbestos-containing materials must be identified by signage and labelling in accordance with applicable legislation.

Companies which engage in asbestos related work at the EGD must be qualified to do so.

Biological Waste

Marine life removed from vessel hulls may contain paint contaminants. This waste may be considered a controlled or hazardous waste and would need to be handled and disposed of accordingly.

Recycling

All Users of the EGD are responsible for collecting and disposing of the solid waste they generate from their activities, properties and vessels they are responsible for.

- Recycle solid waste such as plastic, glass, aluminum, mixed paper and cardboard. Recycling areas should be conveniently located and easily identifiable.
- Segregate other solid waste, such as scrap metal, wood, electronics, polystyrene foam and soft plastics for recycling at an approved facility.
- Leaf and yard waste collected on property should be composted at designated sites located on dock property.
- Construction and demolition waste should be reused or recycled wherever cost effective and technically feasible.
- Encourage the use of recyclable products to reduce the solid waste impact on the environment.

International Waste

Like hazardous waste, International Wastes may pose a threat to human health and the environment.

Dunnage from vessels has been known to carry invasive insects to local areas. Foreign dunnage must be identified, stored, and disposed of at an approved facility.

Food wastes may carry pathogenic organisms that could cause illness to those handling it. Food wastes shall be kept in separate, closed containers. The Canadian Food Inspection Agency (CFIA) will inspect foreign vessels and issue directions on disposal.

BMP #7

Fuelling and Oil Transfer

At the Esquimalt Graving Dock (EGD) the transfer of oil and fuel is a common activity. An accidental release during these operations has the potential to negatively impact the environment, and health and safety of those at the facility.

- Prior to any fuelling or oil transfer operations an emergency plan must be in place, adequate spill response equipment must be available, and employees aware of spill response procedures must be on hand.
- All transfer and storage equipment must be in good condition, tested, and properly connected.
- Do not place storage and transfer equipment near pathways to the marine environment (i.e. storm drains, edge of the dock).
- Berthed vessel fuelling operations involving trucks and barges as well as bulk oil transfers exceeding 10 tonnes (10,000 L) per day must comply with the **EGD Fuelling and Oil Transfer Policy and Checklist**.

Vessel Fuelling and Bulk Oil Transfer

Definition of Oil: as described in the Canada Shipping Act oil is considered petroleum in any form, including: crude oil, fuel oil, sludge, oil refuse, and refined products.

- All berthed vessels receiving fuel from a truck or a barge require a containment boom.
- Transfers of greater than 10 tonnes of oil per day to/from a berthed vessel require a containment boom.
- An **EGD Oil Transfer Checklist** must be filled out and signed by representatives from the truck and the vessel and submitted to EGD representatives in the pumphouse prior to fuelling or oil transfer operations.
- Transfer operations must comply with the *Canada Shipping Act*, *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals Subdivision 5.*

Containment Boom Rental

The Esquimalt Graving Dock has a boom and deployment equipment available for rent. To arrange for booking or rental contact the EGD Operations Manager.

An orange containment boom surrounds the vessel while being fuelled

The EGD boom reel and containment boom

Example Scenario Requirements

Scenario 1: Fuelling a berthed vessel

- Completed and signed EGD Oil Transfer Checklist submitted to EGD Pumphouse
- Containment boom adequately secured at both ends.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 2: Fuelling a vessel or bulk oil transfer (greater than 10 tonnes a day) in the drydock

- Completed and signed EGD Oil Transfer Checklist submitted to EGD Pumphouse.
- Pumphouse operator on site prepared to shut down auxiliary pumps in case of an emergency.
- Receiving containers located away from pathways to the harbour (i.e. tunnel drains).
- Adequate spill response equipment and qualified personnel available.
- Emergency response plan in place.

Scenario 3: Bulk oil transfer from berthed vessel (greater than 10 tonnes a day)

- Completed and signed EGD Oil Transfer Checklist submitted to EGD Pumphouse.
- Containment boom adequately secured at both ends.
- Receiving containers located away from pathways to the harbour (i.e. storm drains, edge of dock).
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 4: Onshore oil transfer between containers

- All containers located away from pathways to the harbour (i.e. storm drains, edge of dock).
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

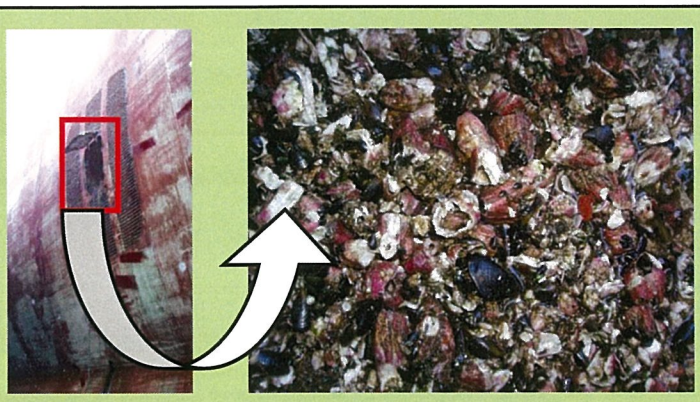
BMP #8

Invasive Species (Ballast Tanks and Hulls)

Invasive species are a significant threat to the marine ecosystems of British Columbia and Esquimalt Harbour. In 2000 a Fisheries and Oceans sponsored study of invasive species found that Esquimalt Harbour had a disproportionately high number of non-indigenous species. It has been widely recognized that the primary source of non-indigenous marine species in local waters are the ballast tanks and hull surfaces of transoceanic vessels.

Marine growth removed from vessel hulls must not be allowed to enter the harbour through the graving dock drainage system.

- Ballast Water
  - Vessels must follow Transport Canada Ballast Water Control and Management Regulations
- Ballast Tank Sediment
  - Shipyards must follow Transport Canada Ballast Water Control and Management Regulations
  - Sediments removed from the ballast tanks at the EGD must be contained, collected and disposed of at an authorized facility.
  - **Sediments must not be allowed to enter the harbour.**
- Anchor chain-growth
  - All biological material removed from anchor chains must be contained, collected and disposed of appropriately.
- Sea chests
  - All biological material removed from sea chests must be contained, collected and disposed of appropriately.



Sea chests such as this one from a cruise ship docked at the EGD often contain a significant amount of marine life. If not managed appropriately this marine life has the potential to negatively impact the local ecosystem of the harbour

BMP #9

Fish and Wildlife Management

The daily operations and activities of the Esquimalt Graving Dock (EGD) have the potential to negatively impact wildlife which frequents the property.

Fish

Fish and other marine life have the potential to become stranded in the graving dock during normal vessel docking/undocking operations. This may include, but is not limited to: salmon, octopus, other fish species, and seals.

- The bubble curtain must be employed during vessel transfer into and out of the graving dock.
- EGD employees must monitor the graving dock for stranded fish and/or other marine life during dewatering.
- Whenever possible, EGD employees must retrieve fish and marine life and safely return them to the Esquimalt Harbour.
- Users are prohibited from removing fish and marine life from the graving dock.

Report all instances of fish and marine life interaction with the Graving Dock to EGD Environmental Services

Authorization for the Destruction of Fish (Section 32)

The EGD has received authorization for the destruction of fish associated with normal operation of the graving dock from the Department of Fisheries and Oceans.

Conditions of the Authorization:

- Take all reasonable precautions to prevent the trapping and mortality of fish
- Monitor the success of preventative measures and retrieval success
- Report to the DFO annually

Wildlife

A variety of wildlife is known to occupy areas of the EGD property. In some cases wildlife may use the facility as a nesting/breeding ground, while others are present for short periods of time to pass to another location or to feed. Activities and operations at the EGD have the potential to impact the well being of wildlife at the facility.

Such wildlife includes: deer, raccoon, mink, river otter, great blue heron, osprey, raven, cormorants and a variety of other common nesting and song birds.

- All wildlife must be left alone
- Injured or orphaned wildlife must not be handled without proper experience and equipment.
- Dispose of dead wildlife appropriately.
- Prior approval from EGD Environmental Services is required for the relocation or removal of nesting wildlife.

In all cases, call EGD Environmental Services for wildlife related incidents

EGD Wildlife Management Plan Contact Information

Conservation Officer
T: (250) 391-2225 (daytime)
1-800-663-9453 (after hours call centre-will take messages and pass along to the Conservation Officer)

BC SPCA Wild ARC
(Animal Rehabilitation Centre)
T: (250) 478-9453

Vancouver Aquarium Rehabilitation/Rescue
T: (604) 258-7325

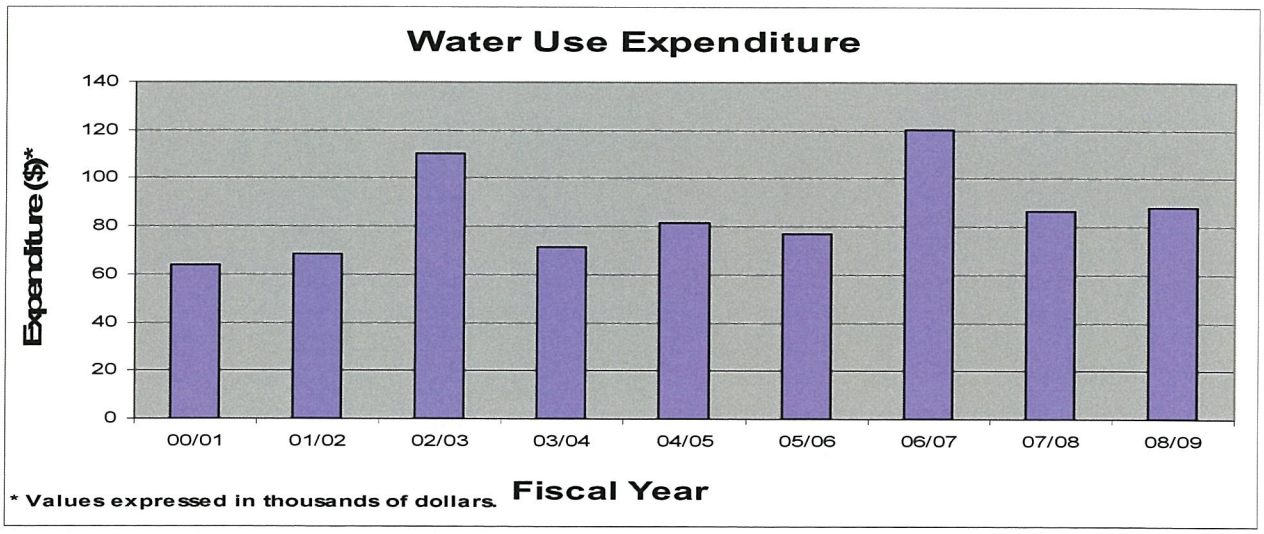
BMP #10

Water Use

Water consumption and the quality of water are considerations of the environmental management system at the Esquimalt Graving Dock (EGD).

Water Consumption

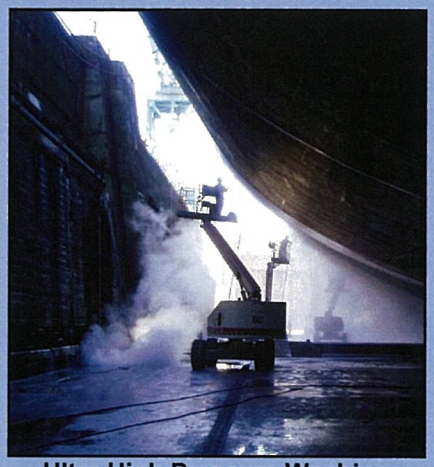
Large volumes of water are used during normal operations at the facility; because of this the EGD is considered a high volume user of fresh water in the Capital Region.



Significant Water Consuming Activities

Water Curtains

Water curtains are used to mitigate the escape of dust from sandblasting operations in dock bottom



Ultra High Pressure Washing

Ultra high pressure washing uses large amounts of water at high pressure to scour paint and biological material from the hulls of ships

In order to reduce the amount of water consumed onsite:

- Only use water curtains when all other attempts to contain particulate emissions from sandblasting have failed.
- Avoid use of freshwater to clean work areas (e.g. graving dock bottom, wharves, jetties).
- Maintain fittings in buildings and on equipment to prevent leakages.

Metered Water Use at the Esquimalt Graving Dock

- Users must ensure that water is accessed from a metered line when connecting to the water distribution system
- Portable meters are to be used where necessary.
- Pumphouse must be contacted for proper access to the water distribution system.

The EGD maintains the water distribution system.

- Flushing of the entire system is conducted on an annual basis.
- Collection and analysis of water in comparison to drinking water quality guidelines is conducted regularly.

The water distribution system at the EGD was originally designed as a firefighting system; therefore, the water in certain areas of the system may not be considered potable.

- Users are responsible for ensuring that the water they use meets guidelines for the purpose intended.

BMP #11

Energy Conservation

The Esquimalt Graving Dock (EGD), as a facility, is a major energy consumer. Inefficient energy use may result in a negative economical and environmental impact. Economical impacts are associated with inefficient electrical usage (i.e. cost). Environmental impacts include those associated with the consumption of fuel (i.e. air emissions).

Electrical Consumption

There are a number of opportunities to increase the efficiency of electrical usage at the EGD:

- Turn off lights when not in use (flood lights, office buildings)
- Turn off equipment when not in use
- Use energy efficient equipment whenever possible
- Stagger equipment start-up to decrease load on electrical system

Fuel Consumption and Emissions

The second largest source of greenhouse gas emissions from the dock is employee commuting and fuel consumption. Some opportunities to decrease the amount of fuel consumed by day to day activities are:

- Use energy efficient vehicles
- Use alternative fuels/energy sources if possible
- Avoid idling vehicles
- Use shore power whenever possible
- Encourage staff to find alternative means for commuting to work (i.e. carpool, public transit, cycling)

Idling Vehicles

Idling Vehicles produce unnecessary air emissions and noise.

- Do not idle vehicles near building doorways or air intakes
- Vehicles must be turned off if idling for more than 3 minutes in a 60 minute period

Greenhouse Gas Emissions:

Energy consumption results in the production and release of greenhouse gas emissions through the combustion of fossil fuels. Every aspect of work at the EGD results in the release of greenhouse gases whether it is running the cranes or printing a report. It is important to minimize energy consumption wherever possible to mitigate the release of harmful greenhouse gases.

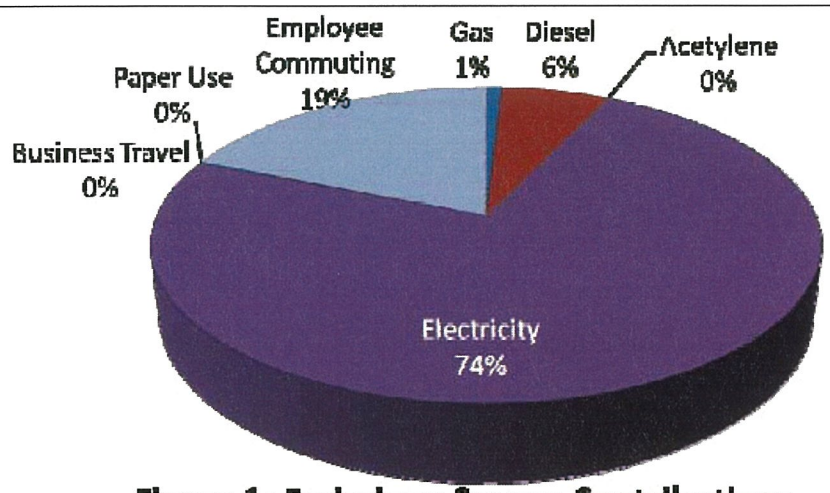


Figure 1: Emissions Source Contributions 2006/2007

The Royal Roads University (RRU) Greenhouse Gas Audit determined that the largest source of carbon emissions at the EGD was electricity use. Employee commuting was the second largest greenhouse gas producer.

Shore Power

When vessels are moored at the North Landing Wharf or the South Jetty it is important that they utilize shore power. With shore power the generator can be turned off thereby saving fuel and preventing the release of harmful air pollutants.

BMP #12

Nusiance Pollution (Noise/Odour/Light)

The daily operations of the Esquimalt Graving Dock (EGD) tenants have the potential to negatively impact the work and living environment of neighbouring businesses and homes. Nuisance pollution is often created by noise, odour and light.

Noise

- The main sources of noise at the EGD include sandblasting, drilling, hammering, compressors, generators and the crane warning bell. Even general shop repair activities generate large amounts of noise.
- Whenever possible schedule noisy activities for daytime hours 0700 hrs to 2300 hrs on weekdays, and from 0700 hrs to 1900 hrs on weekends and holidays. Through worker education and good practice the generation of high-level intermittent or non-continuous noises can be minimized.
- The EGD Environmental Policy makes a commitment to follow all applicable municipal laws and regulations, therefore it is expected that the daily operations at the EGD will meet the Esquimalt Noise Control Bylaw (2677).

The EGD is considered an "Activity Zone" and the neighbouring area is considered a "Quiet Zone". Building and infrastructure related projects at the EGD may fall under the definition of a "Construction Zone" as per the Esquimalt Noise Control Bylaw.

Esquimalt Noise Control Bylaw		Noise Receiver Zone	
		Quiet	
		Day	Night
Noise Source Zone	Activity	60 dBA	55 dBA

Construction Zone

Building and infrastructure related projects at the EGD may fall under the definition of a "Construction Zone" as per the Esquimalt Noise Control Bylaw. The definition of a construction zone according to the Esquimalt Noise Control Bylaw is:

a) the erection, alteration, repair, relocation, dismantling, demolition and removal of a building;
b) structural maintenance, power-washing, painting, land clearing, earth moving, grading excavating, the laying of pipe and conduit, concrete placement, and the installation, or removal of construction equipment, components and materials in any form or for any purpose;
c) any work being done in connection with any of the work listed in paragraphs (a) or (b);

The noise level limit for a "Construction Zone" is **85 dBA** day and night.

Odour

- Daily dock operations often create strong and unpleasant odours whether from the release of VOCs, H_2S, organic materials, or chemicals an offensive smell can reduce the quality of the work environment for neighbouring tenants and home owners.
- In the event that odours are negatively affecting other tenants or stakeholders odour mitigating measures may be required.
- Contact EGD Environmental Services in the event of a nuisance odour from an unknown source.

H_2S Meter
The EGD utilizes an H_2S meter to ensure that any emissions released from the sanitary sewer system that create nuisance odours are not hazardous to adjacent work areas.

Light

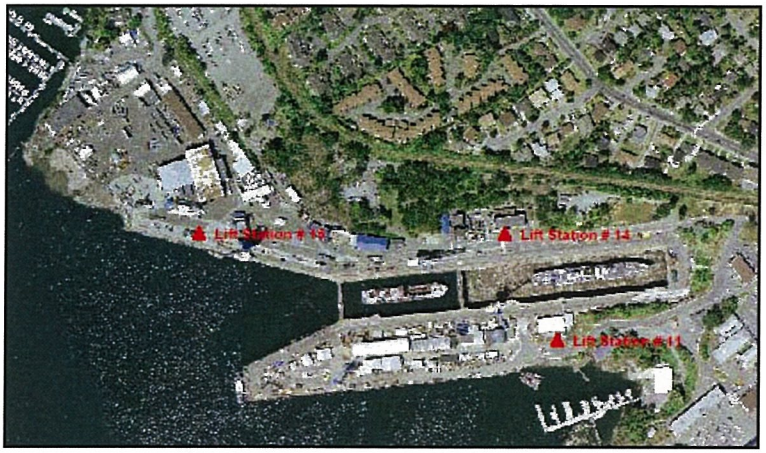
- Night time dock operations require spotlights to provide a safe work environment. However for residential neighbours strong spotlights can be a significant intrusion.
- Utilizing spotlights only when absolutely necessary will help prevent disturbing the neighbours as well as provide a more energy efficient work environment.
- Changing the direction of the lights may reduce the effect they have on the neighbours.
- Turn off or report to your supervisor any unnecessary lights left on.

BMP #13

Sanitary Waste Management and Sewer Use

The Esquimalt Graving Dock is authorized by the Capital Regional District (CRD) as a ship and boat waste disposal facility.

Discharge to the sanitary sewer at any location other than at the LS#15, LS#11 or the four vessel connections at the Graving Dock is prohibited.



The EGD is authorized to discharge to the sanitary sewer at the:

- Lift Station #15 (LS#15),
- Lift Station #11 (LS#11) and
- And the four vessel connections in the graving dock.

Permitted wastes include:

- sanitary waste
- grey water
- treated superchlorinated water*

Prohibited wastes include:

- bilge and ballast water
- wastewater sludge
- fuel and oil, paint, paint thinner, solvents, and products containing toxic chemicals

***Superchlorinated Water:** must not be discharged to the sanitary sewer unless it has been dechlorinated to less than 5 ppm chlorine.

- Users must notify the Pumphouse before conducting any discharges to the sanitary sewer. Typical methods of discharge are: large (connection to a vessel), and small (portable discharges from totes).
- Users must complete a Sanitary Sewage Discharge Form and provide it to the Pumphouse prior to discharging to the sanitary sewer.
- Pumphouse Operators will ensure that sanitary sewer discharges are in accordance with applicable regulations and authorizations.
- Pumphouse Operators will provide all completed Sanitary Sewer Discharge Forms to EGD Environmental Services, who will submit quarterly reports to the CRD.
- Users must ensure a sample collection point is accessible at the point of discharge.

BMP #14

Spill Preparedness and Response

The Esquimalt Graving Dock (EGD) is committed to the protection of human health and the environment. Safety and environmental management programs have been implemented at the EGD to reduce the potential for accidents and spills. Emphasis is placed on the prevention of spills, and although the potential for spills can be reduced through these programs, spills do happen.

All Users operating at the EGD must have the capability to effectively manage spills resulting from their activities and operations.

- User employees must have adequate training in spill response
- User employees must have access to appropriate spill response equipment and materials
- Users must have plans and procedures in place to respond to spills

For spills which are beyond the capability of the User or are not being effectively responded to by the User, the EGD will provide assistance. The EGD has additional resources available, including:

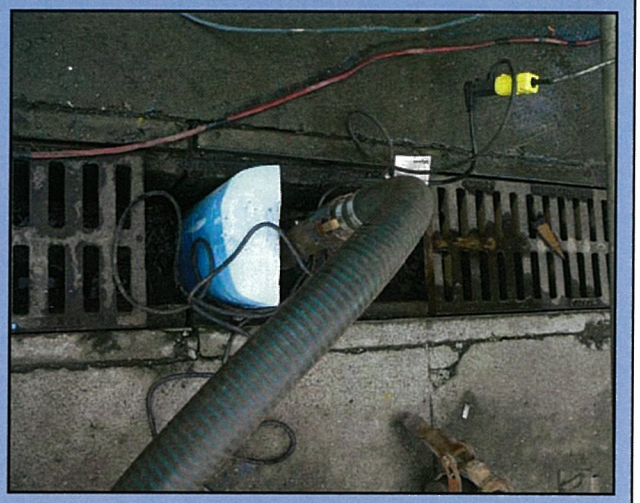
- Spill kits and response materials for land and water based spills
- Spill response boom, deployment reels and boat
- Staff trained to deal with land and water based spills

For access to the EGD spill response resources, contact EGD Management or Commissionaires.

For spills beyond the capability of the facility to manage, the DND, Port Operations and Emergency Services Branch (DND POESB) will provide support for response to land and water based spills.

ALL Spills Must Be Reported to EGD Management

Trench Drains: The EGD has installed trench drains throughout the site. These drains are easily accessible and allow for rapid containment and recovery of materials spilled on the property or in the drydock.



Environmental Emergency Contacts (24 Hours):

EGD Commissionaires	250-363-3784
Provincial Emergency Program (PEP)	1-800-663-3456
DND POESB/QHM	250-363-2160 or VHF Channel 10
Canadian Coast Guard	1- 800-889-8852 or VHF Channel 12
Environment Canada	604-666-6100

BMP #15

In-water Hull Cleaning and Maintenance

The cleaning of the underwater hull in water has the potential to release harmful contaminants into the marine environment.

In-water Hull Cleaning

- In-water hull cleaning of vessel hulls that are coated with antifouling paint is prohibited at the Esquimalt Graving Dock.
- Vessels coated in non-biocide containing paints (such as silicone based), may be considered on a case by case basis and must be approved by EGD Management prior to the commencement of hull cleaning activities.

Did you know?

Antifouling paints and their residues contain heavy metals, such as copper, that are toxic to aquatic organisms, including salmon and shellfish. Wash water and solid residues from the washing, scraping, sanding, and blasting of antifouling paints from boat hulls are considered "deleterious substances" under the *Fisheries Act*. Releasing these wastes to fish bearing waters is a violation of the Act.

Vessel berthed at the North Landing Wharf for in-water hull washing. In-water hull washing must not release antifouling paint. Discoloured water is an indication that you may be harming the environment.

In-water Hull Maintenance

- Users must receive approval from EGD Management prior to commencement of hull maintenance.
- Cleaning of the anodes, inlets, props, transducers, etc.
- Underwater maintenance required for operational and inspection purposes is permitted at the Esquimalt Graving Dock.

For inquiries regarding in-water hull washing please contact the Esquimalt Graving Dock Management at (250) 363-8056

BMP #16
Housekeeping

An organized, clean facility provides an environment that reduces the potential for pollutants to enter surface and ground water through spills and accidents. General cleanliness will lead to more organized and consistent handling of hazardous materials and waste products.

Clean-Up

- Clean debris from work areas immediately after any maintenance activity. Dispose of collected material appropriately.
- Ensure garbage and recycling containers are available in all leased areas and are emptied regularly.
- Do not use running water to clean the work areas where the contaminated water could enter the storm drainage system.

- Ensure trench and storm drains within designated leased areas are kept clean and free of debris.
- Sweep and/or clean the active working area of the yard on a regular basis.

Storage

- Do not store material/equipment outside of identified boundaries of leased areas.

- Regularly inspect the lease areas for unidentified or improperly stored materials.
- Place a drip pan underneath vehicles and equipment when performing maintenance. Promptly transfer the used fluids to the proper waste or recycling drums.
- Ensure all containers (i.e. drums, totes, etc.) are in good condition and have a clean exterior at all times.

BMP #17

Stormwater Management

Stormwater has been identified as one of the primary pathways of contaminant loading to the harbour from daily Esquimalt Graving Dock (EGD) operations. Common contaminants found in stormwater samples include cadmium, copper, chromium, arsenic, tributyltin (TBT), extractable petroleum hydrocarbons (LEPH/HEPH), and total suspended solids (TSS). Five stormwater catchment areas terminate into the harbour from the EGD property.

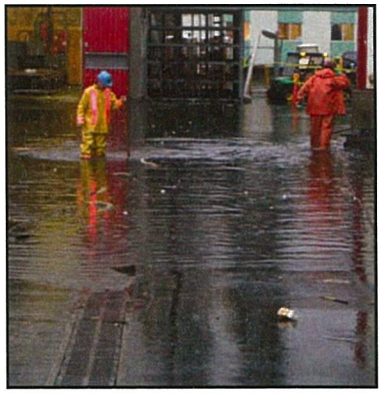
A stormwater monitoring program has been implemented at the EGD. The stormwater outfalls will be sampled semi-annually in the spring and fall. Waste grit separators have been installed upstream of the five stormwater outfalls. These help to remove contaminants or debris that enter the storm drain system from daily operations at the EGD, in particular they remove: fuel or oil, paint, sandblast grit, general debris.

Materials Storage:

- Store hazardous materials away from storm drains and trenches.
- Store hazardous materials away from the South Jetty fire holes. These holes lead directly to the marine environment.
- Ensure totes, drums and pails containing hazardous materials are protected from the weather.

Storm Drains:

- Ensure storm drains are kept clear of debris to prevent flooding during heavy stormwater events.
- When using trench drains for secondary containment, ensure the containment system is monitored and removed in a stormwater event. A blocked trench drain may cause flooding of the area.
- Conduct regular inspections of trench drains in lease areas to ensure they are kept clear of debris.



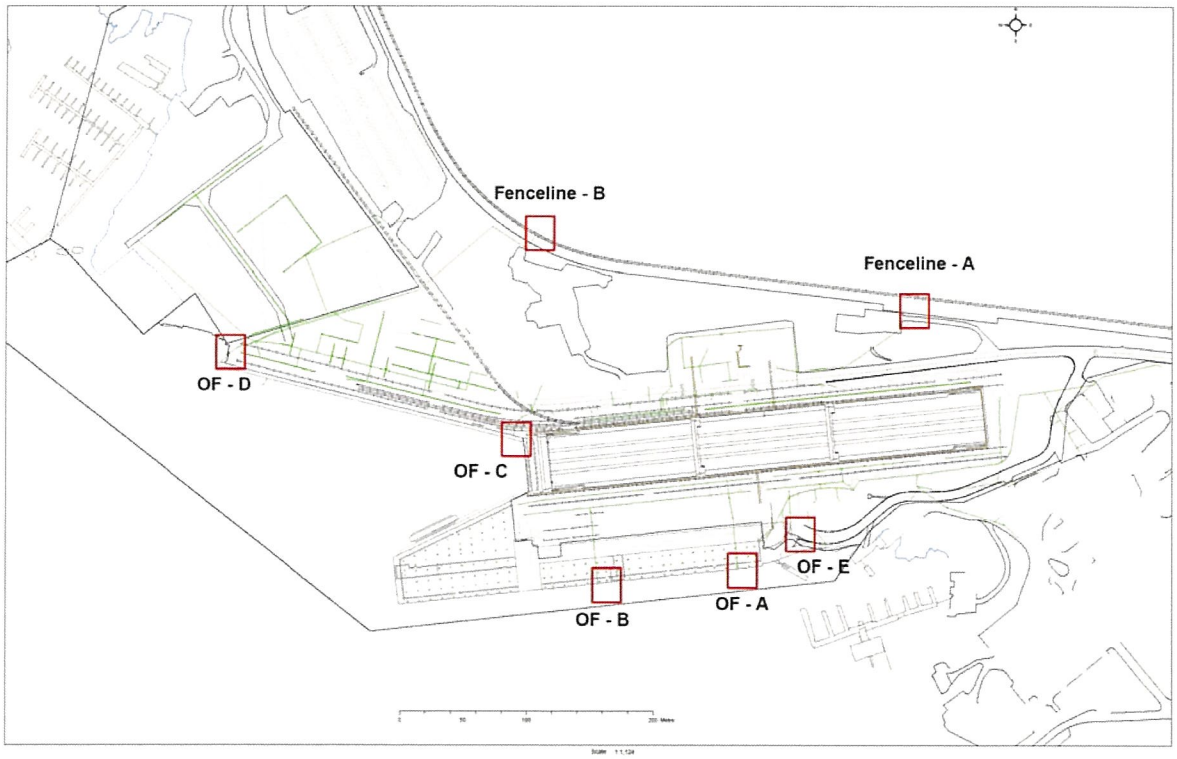
During heavy rain events in dock bottom:
Stormwater has the potential to mix with wash water during power washing operations in dock bottom. To reduce the amount of wash water requiring treatment it is good practice to stop power washing operations until storm water can be controlled.

- Sump well valves may be opened to allow storm water to drain in to the tunnel drains if the area is clear of contaminants and debris.
- Sump wells containing visibly contaminated material must be pumped out and cleaned prior to opening the valves.
- Ensure there is capacity in the trench drain/sump well system to manage the expected stormwater volume to prevent flooding of the dock floor.

Stormwater Monitoring Program

- Stormwater sampling is conducted semi-annually in the spring and fall by EGD Environmental Services.
- Stormwater samples are tested for: total metals, total suspended solids, tributytin, LEPH/HEPH and microbiological parameters.

EGD Stormwater Monitoring Program Sample Sites



BMP #18

Property and Infrastructure Maintenance, Modifications and Construction

There are significant environmental issues and potential impacts related to the management of Esquimalt Graving Dock properties and infrastructure. Any new construction or modifications to the infrastructure at the EGD must consider environmental issues in the project planning.

Infrastructure Maintenance

Maintenance and repair of the aging EGD infrastructure often results in waste generation and other environmental issues which need to be addressed.

Minor Concrete Work

- Contain dust from cutting and drilling.
- Prevent runoff to the storm drains.

Use of Preserved Wood

- Avoid use of creosote preserved timbers where possible.
- Follow applicable guideline for use of preserved wood products.
- Creosote wood waste may be considered a hazardous, restricted or controlled waste.

Demolition/Renovation

- Ensure structures are assessed for the presence of hazardous materials (i.e. lead paint, asbestos) prior demolition or renovation.

Infrastructure Modification and Construction

All construction projects taking place at the EGD need to be assessed for environmental impacts, and plans put in place to mitigate these impacts.

Environmental Impact Assessment

- Any significant changes to infrastructure, changes to an existing lease or application for a new lease, must be approved by EGD Management.
- Prior to the approval of an infrastructure project, a CEAA Environmental Impact Assessment may be required.
- An Environmental Approval Form must be filled out for new lease applications and changes to existing leases.

*****The Environmental Impact Assessment and Environmental Approval Form outlines specific environmental protection and mitigation measures required*****

Common project related aspects that require management include: noise, dust, hazardous materials, storm water runoff, and prevention and management of accidental releases and spills. Requirements for the operational aspects are identified in previous sections of these EBMPs.

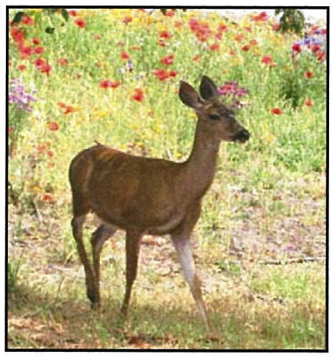
Significant non-operational aspects related to construction projects may include:

- Loss of Green Space and Vegetation
- Management of Archaeological Impacts
- Soil Management

Loss of Green Space and Vegetation

The EGD property includes an area of vegetation that provides many benefits. It is home to a number of sensitive native plant species, provides habitat for wildlife, and acts as a buffer between the industrial operations of the drydock and ship repair operations and the neighbouring residential area.

All projects which have the potential to impact vegetation must be reviewed and approved by EGD Management.



Archaeological Considerations

The EGD property and surrounding area has a rich First Nations history. There are four Provincially Registered Archaeological Sites listed within the property boundaries of the EGD.

- All excavation projects must be reviewed and approved by EGD management prior to work beginning
- Depending on the scale of the project a detailed Archaeological Impact Assessment may be required.

Esquimalt Graving Dock Archaeological Overview Assessment

An Archaeological Overview Assessment was carried out in 2010 which outlines the archaeologically sensitive areas on the EGD property and identifies areas of high archaeological potential. Archaeological significant materials found during excavation projects at the facility include artefacts, shell midden, faunal and human remains.

Soil Management

The EGD has undergone significant capital and operation and maintenance projects in recent years. Extensive investigations into the soil conditions (chemical contamination and structure), utility mapping and identification of archaeological conditions have taken place. The industrial history of the facility has resulted in the contamination of the soil and in-fill material used on site. The primary contaminants commonly found at levels exceeding industrial soil standards include: arsenic, cadmium, copper, lead, mercury, zinc, and polycyclic aromatic hydrocarbons (PAH).

Requirements for Excavations at the EGD

Planning Excavation

1. Consult with EGD Facility Management to identify:
   - Project area and excavation boundaries.
   - Known utilities, structures, and historical information regarding the proposed excavation area.
   - Known contaminated soil locations, the nature and level of contaminants potentially in the soils to be excavated.
   - Archaeologically significant areas, requirements for mitigation archaeological impacts, and dealing with unanticipated archaeological finds.

2. Prepare a plan for management, stockpiling, and sampling of soils to be excavated. Key issues to be identified include:
   - Turnaround times for samples may be up to 2 weeks.
   - Parameters to be sampled may vary depending area of excavation. Common parameters include total metals, leachable metals, PAHS, and hydrocarbons (LEPH, HEPH).
   - Stockpile areas must be approved by EGD Management.
   - Soils which exceed the CCME Industrial Levels or BC CSR Industrial levels must be disposed of off site at an approved location.
   - Soils which are below industrial standards may remain on site if geotechnically suitable, approved by EGD Management, and there is an identified use for the soil.

3. Ensure contractors and employees are aware of the health and environmental risks associated with the suspected contaminated soils and have procedures in place to mitigate these risks. This includes adequate Personal Protective Equipment (PPE) and hygiene practices (i.e. no smoking, wear gloves)

Conducting Excavation

1. Ensure appropriate PPE and hygienic precautions are in place to prevent exposure to contaminants in the soils.
2. Monitor all excavations for visible soil contamination or archaeologically significant material.
3. Ensure soil is stockpiled, sampled and analysed in accordance with the BC MOE Technical Guidance on Contaminated Sites (January 2009).
4. Ensure soils suspected of contamination are stockpiled on an impervious surface and covered with a minimum 6 mil PVC or plastic liner to prevent exposure to wind, storm water runoff or people.
5. Imported fill material must be certified clean by the supplier.

After Excavation

1. Ensure all soil is disposed of at approved facilities.
2. Obtain disposal certificates from the receivers of contaminated soils.
3. Report to EGD Management on the volume, analysis of results, excavation details and dimensions.
4. Provide all as-builts and project drawings to EGD management in the format compatible with the EGD drawing standards.

Requirements for Small Excavations (less than $10m^3$)

In areas of suspect contamination: soil must be removed, stockpiled and sampled. Soil cannot go back into the excavation or used elsewhere on site until it is determined through analysis to contain contaminants less than industrial soil standards. The EGD management must give approval for any reuse of excavated soil on site.

In areas of non-suspect contamination: soil may go back into the excavation if geotechnical suitable. The EGD management must give approval for any reuse of excavated soil on site.

Appendix C

PRELIMINARY JOB HAZARD ANALYSIS

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

Preliminary JOB HAZARD ANALYSIS CHECK LIST

February 2014

APPENDIX C

Project Title: EGD Access Control Systems for Office Buildings

Project No. R.016116.113

Inspection Date:

Inspection/Job Hazard Analysis Conducted By: S. Windl

Note:

1. This form is also intended for use as a checklist when making daily inspections of the worksite. Therefore some questions will not apply to the initial inspection/job hazard analysis.

2. This form is intended as a guide only and does not necessarily cover every situation regulated by WORKSAFEBC or other jurisdictions. It is imperative that the Contractor be familiar with safety requirements and add anything that is relevant but not listed below. New items should be noted to the attention of the Project Manager for inclusion in future revisions. Contractors must finalize the JHA to reflect the methods/equipment etc. they will use to do the work.

3. Project Managers must review all items as part of creating preliminary JHA. Do not simply reuse this form from a previous project. Delete or add to "Hazard/action required" items as appropriate for your project and enter checkmarks or NA (not applicable) or TBD (to be determined with Contractor) under "Existing" column as appropriate.

4. CODES:

- **"*" indicates covered in Basic Site Orientation for Contractors presentation by PWGSC.**
- **"S" indicates item covered in startup meeting with Contractor and up to Contractor to carry out appropriate action. Not covered in EGD orientation session.**
- **"O" indicates item covered in EGD project specific orientation session. This does not relieve the contractor of responsibility for training workers with regards to this item.**

5. Column "WORKSAFEBC Ref." May also contain Canadian Occupational Safety & Health (COSH) regulation references.

NOTE: This project involves the regular maintenance of the High Voltage switchgear. It includes inspection, cleaning, and re-calibration of the 12.5kV and 2.3kV switchgear, transformers, and all distribution panels. Carry out verification and calibration and report of all protective relays. Verification and report of the FPE Mk II ground fault relays. Cleaning and Inspection of the 120 VDC Battery station. Carry out minor repairs to the existing electrical distribution equipment as directed by the Engineer.

Significant hazards include but are not limited to:

1. Electrocution resulting in injury or death if safe work procedures are not followed. Follow EGD Standard Operating Procedure for Electrical Isolation
2. Falls from ladders.
3. Potential exposure to Asbestos from arc chutes in 2.4kv motor starters
4. Potential exposure to PCBs in breaker oil.

Project Title: EGD Access Control Systems for Office Buildings

Project No. R.016116.113

	Cond. No.	Condition	Existing √	CODE	WORKS AFEBC Ref. #	Hazard/ Action Required
GENERAL	1.2	Multiple Contractor Coordination. - 2 or more employers? - Overlapping work areas - Appoint qualified safety coordinator - Post construction procedures and JHA	√	S	Review WORKS AFEBC 20.3	Contractor to appoint Worker Safety Representative and Construction Superintendent. Coordination with EGD personnel and others on site will be through Project Manager. Post Final JHA and procedures.
	1.5	Post emergency response plan and site plan? Workers trained in emergency response? Conduct risk assessment for: Work at high-angles Special needs individuals Others as required by 4.13 or identified in other sections below	√	*	4.13-4.18 20.3	Site plan and emergency response to be posted on safety notice board. Contractor to ensure all workers trained in emergency response for fire, earthquake, medical, bomb threats and hazardous materials accidents before starting work. Note the special rescue requirements for high-angle work and the need for written agreements to provide service.
	1.6	Regular Safety Meeting Minutes Posted?	√	*	3.2	Weekly safety meeting to be held. Contractor to provide minutes to Project Manager for posting.
	1.7	WORKSAFEBC Orders, Inspections or "Notice to Workers" Posted? Notification of compliance posted?	√	S	Div. 10 183	Contractor to provide any WORKSAFEBC inspections and/or orders to Project Manager and post any inspections and compliance reports.
	1.8	Regular Inspections carried out with Safety Rep and Posted? Conduct special inspection if required due to malfunction or accident.	√	S	3.5 3.7 3.8	Provide inspection reports to P.M. and post.
	1.9	Contractor's workers safety representative identified for each employer? Alternatively, a Joint Committee set up if required by WORKSAFEBC Div. 4?	√	S	20.3 Div4 125-140	Worker Safety representative if 9 or more workers.
	1.10	Insufficient lighting?	√	S	4.65	Contractor to ensure lighting levels are sufficient for work to be performed. Provide portable lighting where necessary.
	1.11	Workers informed of the hazards of the job and that they have the right to refuse work they consider too hazardous without discriminatory action?	√	*	Review 3.12	To be covered in orientation session and reinforced by Contractor
	1.12	Workers with physical or mental impairment that could affect work must inform their supervisor.	√	*	4.19	To be covered in orientation session and reinforced by Contractor. Do not work at heights if subject to dizziness or if worker has a fear of heights

	1.13	Workers informed no alcohol, drugs or other substance so as to endanger self or others?	√	*	4.20	To be covered in orientation session and reinforced by Contractor. Inform First Aid attendant of any medications being taken as they may be important in case of accident.
	1.14	Firearms of any kind are prohibited on site.	√	*		To be covered in orientation session and reinforced by Contractor
	1.15	Duties of Employers, Workers, Supervisors and Owners	√	*	Div.3 115-119	Review duties/responsibilities of parties involved. To be covered in orientation session.
	1.16	General Duty: In the absence of a specific reqmt. all work must be carried out without undo risk of injury or disease to anyone.	√	*	2.2	To be covered in orientation session and reinforced by Contractor
	1.17	Do not remove or render inoperative any safeguard and ensure safeguards are in place before operating equipment.	√	*	4.11 4.12	To be covered in orientation session and reinforced by Contractor
	1.17a	All workers must be given adequate instruction in the fire prevention and emergency evacuation procedures applicable to their workplace	√	O	4.16	To be covered in orientation session and reinforced by Contractor
	1.18	Do not operate any EGD equipment. Only those trained and authorized by the contractor are to operate contractor's equipment.	√	*	4.10	
	1.19	Ensure equipment inspection & maintenance record(S) are readily available to equipment operators or inspectors.	√	*	4.9	To be covered in orientation session and reinforced by Contractor
	1.20	Workers must not engage in improper activity that could constitute a hazard to themselves or others including horseplay threats or physical force. Improper activity must be investigated.	√	*	4.24-4.31	To be covered in orientation session and reinforced by Contractor. Violence or harassment will not be tolerated. Contractor carry out risk assessment of injury from violence if there is potential for violence. Inform workers and prepare plans to minimize risk as required by 4.30
	1.21	Workers to restrict activity to designated areas of the site.	√	*		Restrictions to be discussed at pre-start-up safety orientation meeting.
	1.22	Workers informed of location of copy of WORKSAFEBC Regulations and Worker's Compensation Act.	√	*		Cover at orientation meeting. Contractor to ensure current copy of Regulations and the Act is available on site.
	1.23	Written work procedures developed? Provided to P.M. and workers?	√	S & O		Contractor to document work procedures and sequence of activities and provide to Project Manager and workers before starting work.
	1.24	Do not work on site outside of agreed working hours.	√	*		EGD must ensure an employee is on site anytime contractors are on site. Therefore notice is required.

FIRST AID & INVESTIGATIONS	2.1	Has the Contractor carried out an assessment and identified the numbers of workers who may require first aid at any time; the types of injuries that might occur; barriers to first aid being provided to an injured worker; and time required to transport an injured worker to medical attention?	√	*	3.16 & 3.17	Contractor to provide written first aid assessment and written procedures for providing first aid to comply with first aid amendments effective 1 Feb/08
	2.2	Workers instructed to report ALL injuries or near misses, hazardous conditions?	√	*	3.10	To be covered at the pre-startup safety orientation meeting.
	2.3	Workers know where first aid is located and how to call for first aid? Communication between first aid attendant and ambulance service defined?	√	*	3.17 & 3.18	Contractor MUST have own F.A. Before starting work. Identify location & adequacy of Contractor's F.A. equipment. Cover procedures in orientation.
	2.4	First Aid qualified person(s) on contractor's crew? ORIGINAL Certificate(s) must be with person(s) on site. Provide photocopy to Project Manager.	√	S	Part 3	Required. Provide certificate(s) to Project Manager before orientation session.
	2.5	F.A. equipment on site where required? Must comply with "High" Hazard class 20 min or less travel to hospital.	√	S	3.16	Provide location and type.
	2.6	Provide immediate investigation & notice to WORKSAFEBC for: - serious injury/death - major structural failure of bldg., bridge, tower, crane, hoist, excavation, temp. construction support system. - major release of a hazardous substance - incident required to be reported.	√	S	Div. 10 172	To be covered in project startup meeting with Contractor. Do not disturb the accident site except to attend injured persons, prevent further injuries or protect property. Assist investigators every way possible.
	2.7	Provide emergency transport to hospital as required by WORKSAFEBC and written procedures for transport	√	S	3.17	Contractor to define procedures for provision of first aid, calling ambulance service etc. as required by regulation. Post them and ensure workers are informed.
	2.8	Is the first aid attendant available to render prompt service?	√	S	3.18	Do not assign activities that will interfere with the attendant's ability to receive and respond to call for first aid. Ensure coverage during lunch and other breaks. Provide backup first aid immediately for planned absences. About ½ shift absence is permissible for unplanned absence until replacement attendant is in place.

	2.9	Has the general contractor included all subs in determining the numbers or workers and first aid requirements	√	S	3.20	General Contractor's first aid assessment and procedures to include sub-contractors.
	2.91	Has the contractor assigned a person to manage first aid service?	√	S	3.17	Assign someone to ensure attendants, supplies, facilities and equipment are always available.
CHEMICAL/ BIOLOGICAL - WHMIS	3.1a	Hazardous Substances Used? Provide details.	√	O	PART 5	Isopropynol and PCB hazards exist. MSDS to be reviewed by Contractor and workers advised of protective action and appropriate spill response. Other substances may be identified by contractor. Check on corn blast and paint to be used and take appropriate action. Reduce pressure to 50 psi when blasting transformer fins. Contractor to provide Material Safety Data (MSD) Sheets for all hazardous substances to be used including welding materials and gases. Sheets must be provided by contractor at first meeting with the engineer in order to complete the Job Hazard Analysis and define safe work practices. Ensure effective written procedures are prepared and implemented to prevent exposure by any route that could cause an adverse health effect, and to address emergency and cleanup procedures in the event of a spill or release of the substance. Ensure the supervisor and the workers are trained in and follow the established procedures.
	3.1b	Environmental Assessment completed? Check identified hazards and measures to be taken.	TBD	S		Environmental Assessment to be provided to Contractor. Contractor to follow Best Management Practices provided by Environmental Services.
	3.2	Implementation Plan Checklist completed?	√	S	5.7	Contractor to follow Implementation plan checklist for hazardous substances. See WORKSAFEBC section 5.7
	3.3	Material Safety Data Sheets Available?	√	O	5.16	Contractor to provide MSD Sheets and make available at worksite to all workers.
	3.5	Emergency Response Defined?	√	O		Contractor to define emergency response as appropriate for hazardous substances.
	3.6	Training Checklist Completed?	TBD	S	5.7	Contractor to follow education & training checklist for hazardous substances provided by WORKSAFEBC. See 5.7
	3.7	Flammable/Combustible Substances?	TBD	O	5.27-5.35	
	3.8	Substances under pressure?	TBD		5.36-5.47	
	3.9	Controlling Worker Exposure	√	O	5.48-5.59	

	3.10	Ventilation controls?	TBD	O	5.60-5.71	
	3.11	Internal Combustion Engines operated in poorly ventilated areas?	TBD		5.72-5.75	
	3.12	Hazardous Wastes & Emissions	TBD	O	5.76-5.81	
	3.13	Personal Hygiene	√	O	5.82-5.84	Wash hands before eating or smoking or at breaks as required by regulation.
	3.14	Emergency Washing Facilities, eyewash required?	TBD	O	5.85-5.96	Contractor to provide emergency washing facilities where required due to hazardous substances.
	3.15	Emergency Procedures defined? Review First Aid, Fire, Spill Control.	√	O	5.97-5.102	Contractor to review emergency procedures with workers
	3.16	First Aid and Fire depts. aware of substance and quantities used and locations stored?	TBD	S	4.17	Contractor provide notice if required by regulations.
	3.17	Supervisor & Workers trained? General WHMIS instruction as well as substance specific training?	√	S		Contractor to ensure Workers and Supervisors have WHMIS training and training in dealing with specific substances.
	3.18	Substance specific requirements?	√	S	PART 6	Review Part 6 and ensure compliance as per MSD sheets. See also sections 25, 28 and 29 below.
	3.19	Evaluate worker understanding of substance specific requirements and emergency/spill procedures during inspections.	√	S		Inspection item.
	3.20	Ensure containers for hazardous substances are maintained to ensure secure containment. Keep covered when not in use.	TBD	S	5.20-5.22	Inspection item.
	3.21	Keep only enough for one shift, store balance of quantity in designated separate area. Ensure workplace/supplier labels are on EVERY container.	TBD	S	5.23	To reduce the risk of a major spill, fire etc. minimize quantities on site. Ensure workers can easily tell what is in every container. Inspection item.
	3.22	Store incompatible substances so that they can not mix in event of leakage, breakage etc.	TBD	S	5.24	Serious consequences can result from mixing certain substances. Ensure they can not mix. Inspection item.
	3.23	Store hazardous substances so they can't fall, be damaged or exposed to extreme temperatures.	TBD	S	5.25	Inspection item.
	3.24	Ensure the designated storage area meets design requirements.	TBD	S	5.26	Inspection item.
	3.25	Protective and spill equipment available?	√	O		Contractor to ensure all personal protective equipment and spill response equipment is readily available where required by MSDS or EGD Environmental policy and workers are trained in spill response plan.

	3.26	Follow proper procedures in disposing of hazardous substances.	√	S		Follow MSD Sheet instructions.
	3.27	Other	TBD			
		Note: Refer to WHMIS Implementation Plan checklist when doing inspections for hazardous substances	TBD	S		Create inspection checklist where required.
WORKING ALONE	4.1	Working alone process defined for workers assigned to work alone? Note new guidelines Nov./08 for determining if working alone regs apply. Amongst other things a "person check" system alone is unlikely to meet the "readily available" test.	No working alone	*	4.21-4.23	There will generally be no working alone. Document special procedures and agree with Project Manager if working alone is necessary. Note regulation changes 1 Feb/08
	4.3	Restricted Access area?	√	O		Contractor to ensure workers follow procedures for restricted access.
CONFINED SPACE	5.0	Confined Space Entry Control required?	NA	S		Considerable danger may exist if personnel enter designated confined spaces without proper ventilation and other controls/procedures being in place. No confined space identified on this project.
LOCK-OUT & ELECTRICAL	6.1	Has the EGD Lockout policy been reviewed and relevant sections complied with?	√	S		Policy to be reviewed by Contractor with workers as part of training. Follow EGD Standard Operating Procedure for Electrical Isolation.
	6.2	Each worker has own lock, no combination locks? Means of identifying lock owner?	√	O	PART 10	Every worker must have own lock and tag identifying worker and company.
	6.3	Lockout procedures documented for project?	√	O	PART 10	To be documented and agreed with J. Lezetc and permit issued before initiating lockout.
	6.4	Workers and Supervisors trained in lockout? Only certified electricians to do electrical work.	√	O	PART 10	Contractor to ensure all Workers and Supervisors are trained in the lockout procedure. Contractor to provide proof of certification to Project Manager before start of work.
	6.5	All isolation points identified?	√	S	PART 10	To be done in conjunction with J. Lezetc and documented in lockout procedure.
	6.6	Electrical ground hazard?	√	S		To be done in conjunction with J. Lezetc and documented in lockout procedure.
	6.7	Pneumatic Devices hazard?	√	S		No hazard of this type foreseen.

	6.8	Potential Energy hazards? All parts secured against inadvertent movement?	√	S		No hazard of this type foreseen.
	6.9	Kinetic Energy hazards? All parts secured against inadvertent movement?	√	S		No hazard of this type foreseen.
	6.10	Hydraulic Energy hazards?	√	S		No hazard of this type foreseen.
	6.11	Chemical Energy hazards (eg. Flammable, Combustible, corrosive) ?	√	S		No hazard of this type foreseen.
	6.12	Radiation hazards (eg microwave, lasers, Ultraviolet, infrared)	√	S		No hazard of this type foreseen.
	6.13	Thermal Energy hazards (eg, steam, hot water or other substances, refrigeration lines)	√	S		No hazard of this type foreseen.
	6.14	If over 750V follow H.V. guidelines in lockout policy.	√	O		Include in lockout plan document.
	6.15	No working NEAR energized H.V. equipment or conductors.	Not permitted	S	Lockout Policy	Not permitted.
	6.16	No working on energized lighting circuits.	Not permitted	S	Lockout Policy	Not permitted.
	6.17	Control the use of metal ladders, wire reinforced ladders,, metal scaffolds or work platforms.	√	S	19.10	Planned use of ladders, scaffolds etc. to be determined with Contractor and electrical risks assessed.
	6.18	No Qualified workers within 1 m. of uninsulated, energized parts.	Not permitted	S	Lockout Policy	Not permitted. Keep unqualified personnel at least 3 m. from energized parts. May apply to the transformer cleaning and painting. No climbing foreseen other than on permanent ladders/stairs indoors.
	6.19	If using an insulated aerial device has it been tested as required by WORKSAFEBC Reg. 19.9	√	S	19.9	Check plans to use aerial device & insure compliance.
	6.20	Is all portable electrical equipment either double insulated and so marked or effectively grounded? Workers trained to inspect?	√	S	19.14	Contractor to check any portable equipment and ensure workers trained in inspecting electrical equipment for safe operation.
	6.21	Is all portable electrical equipment used outdoors or in wet/damp conditions protected by Class A Type ground fault circuit interrupters?	√	S	19.15	Contractor to check any portable equipment and ensure workers trained in inspecting electrical equipment for safe operation.
	6.22	Ensure good access to electrical equipment and that no flammable materials are stored or placed close to electrical equipment.	√	O	19.7	Practice good housekeeping. Keep areas clear in front of electrical panels, fire alarms & extinguishers. No flammables inside work areas unless agree by Project Manager.
	6.23	Other, specify:				

	6.24	Are lockout points easily identifiable (eg. By number) to prevent lockout errors and identify the equipment it serves?	√	S	19.13	All lockout points are labelled.
	6.25	Note that lockout of a panel door preventing access to other live breakers is unacceptable.	√	S		Generally there should be no other users of panels while the project work is underway. Confirm.
	6.26	Note lockout of Control Circuits is not sufficient for total isolation.	√	S		Reminder item
	6.27	Be SURE to understand what will happen if an energy source is activated.	√	S		Reminder item
	6.28	Consider severity of injury, frequency of doing the job and probability of injury in assessing tasks.	√	S		Reminder item
	6.29	Before the conclusion of the job and after energizing, have conspicuous signs been placed near the equipment stating "Danger – Energized Equipment"?	√	O	19.11 19.17	Place signs when finished.
	6.30	Ensure electrical instrumentation is functioning properly and has not been the subject of recall by the manufacturer.	√			Note that some Fluke Model 179 Multimeters have exhibited faulty readings and need to be replaced.
FALL PROTECTION	7.0	Fall Protection required?	√	S	11.2	1.Work over 7.5 ft. (CLC requirement) or shorter distance if risk of injury greater than fall to flat surface 2.Use guardrails or similar restraint if practicable. 3.Use other fall restraint if 2 not practicable. 4.If 3 not practicable use fall arrest system 5.If 4 not practicable ensure work procedures acceptable to WORKSAFEBC are used. Note changes to WORKSAFEBC regulations 1 Jan/05
	7.1	Fall Protection System defined in writing?	√	S&O	11.3	Contractor to define fall protection plan for any work over 7.5 ft. (CLC requirement) above ground on unguarded surfaces from which fall greater than 7.5m.(25ft) can occur or 11.2(5) applies.
	7.2	Workers & Supervisors Trained?	√	S&O	11.2(6)	Contractor to ensure all workers & supervisors trained in fall protection procedures before work starting and provide documentation to Project Manager.
	7.3	Workers trained & Fall Protection Procedures followed?	√		11.2(6)	Inspection item.

	7.4	Inspection of fall arresting equipment before each use by a qualified person being done?	√	S	11.9-	Qualified Person to perform inspection before use on each shift. Keep free from foreign substances & conditions that can contribute to deterioration & keep in good working order.
	7.5	Fall Protection System used?	√	S	11.2(7)	Ensure workers use system
	7.6	Safety Belts used for fall restraint only? Otherwise use body harness.	√	S	11.4	Follow written fall protection plan.
	7.7	Ensure equipment meets standards	√	S	11.5	Ensure components are suitable and compatible, sufficient to support the forces and meet and are used in accordance with standards.
	7.8	Ensure anchors meet standards	√	S	11.6	Check anchors meet WORKSAFEBC requirements. Changed 17 May/06
	7.9	Temporary horizontal lifeline system used?	√		11.7	Acceptable if 1) manufactured for commercial use and installed and used per written instructions and drawings (available on site) 2)designed, installed & used per written instruction and drawings (available on site) certified by P.Eng. 3) other acceptable to WORKSAFEBC Changed 17 May/06
	7.10	Need to remove from service?	√	s	11.10	If fall protection system has arrested fall of a worker remove from service until inspected and recertified safe by manufacturer or P.Eng.
FIRE RELATED	8.1	Workers aware they generally do not fight fires? First priority is to raise the alarm and get selves and others to safety.	√	*		Workers to fight fires only if small (2'x2') and they have been trained in fire extinguisher use and they are confident they can extinguish the fire. To be reinforced at orientation meeting and reinforced by Contractor.
	8.2	Fire Extinguishers Available and accessible?	√	O		Contractor to ensure proper type and number of extinguishers available. Check monthly inspection and tags.
	8.3	Electrostatic Discharge	√	O		Contractor to determine risk of ignition due to discharge and take preventive measures.
	8.4	Ignition Sources eliminated or controlled if flammable gas or liquid used or stored?	√	O	5.27	No smoking on this project except in designated areas defined by Project Manager. Define any other ignition sources and controls required.
	8.5	Flammable gas concentrations	√	S&O		Ensure adequate ventilation to comply with WORKSAFEBC regulations. Monitor flammable gas concentrations and use forced ventilation if required.
	8.6	Combustible materials	√	O		Keep area clear of combustibles. Practice good housekeeping. Store oily rags in approved metal containers with tight fitting lids and empty daily. Burning of waste is prohibited.

	8.7	No smoking in buildings, on cranes, in caissons or tunnels. Define other restrictions. Rules being followed?	√	O	4.81	Contractor to enforce no smoking except in areas designated by the Project Manager.
	8.11	Do not use flammable liquids as a manual cleaning solvent.	√	S	5.32	Flammable fumes can collect on clothes and result in the worker being engulfed in flames should ignition occur. Also, these substances are often hazardous to health and can be absorbed through the skin. Contractor to reinforce with workers and monitor for compliance.
	8.12	Hot Work Permits issued and posted?	√	*		Obtain permit from Project Manager before starting any cutting, welding, brazing, soldering, grinding, heat-treating or other hot work like roof tarring, thawing pipe, hot riveting or using powder-driven fasteners.
	8.13	Fire Alarms explained?	√	*		To be covered at pre-startup meeting and worker orientation session.
LADDERS/SCAFFOLDS & TEMP WORK PLATFORMS						
	9.1a	Workers trained and authorized to use temporary work platform?	√	S	COSH 3.5	Ensure all workers trained before authorizing use.
	9.1b	Weather conditions likely to be hazardous to use of temporary structure?	√	S	COSH 3.3	No work in rain, snow, hail or electrical/wind storm likely to be hazardous to worker safety
	9.2	Has Qualified Person inspected temporary structure before use each shift?	√	S	COSH 3.6	If defect found, do not use until remedied.
	9.3	Could temporary structure be contacted by person or vehicle?	√	S	COSH 3.7	Install hi-viz barricade around base or post a person.
	9.4	Ladder type and condition? Meet specifications per WORKSAFEBC?	√	S	PART 13	Contractor to ensure all ladders are in good condition and meet WORKSAFEBC requirements for the application. Ensure portable ladders are marked with grade of material and use for which ladder constructed.
	9.5	Ladder Inclination, Footing and Support and use according to WORKSAFEBC regulations	√	S	PART 13 COSH 3.11	Check for minimum ¼ maximum 1/3 inclination, solid footing and support. Projects at least 1m (3ft.) above upper landing to which it supplies access. Check extension overlap. Tie off if possible for stability during use.
	9.6	Contractor to ensure work off ladders meets regulations. If work cannot be done safely from a ladder provide work platform.	√	O	13.6	Follow safe ladder work practices
	9.7	Heavy/bulky objects or others that may make ascent or descent unsafe not to be carried up ladders	√	O	13.6	Use an assist to raise & lower tools.

	9.8	Scaffold or other work platforms to be designed and approved by a P.Eng.?	√	S	Check WORKS AFEBC PART 13 13.11	Contractor to provide P.Eng. certified scaffolding plan where required by regulation 13.11. Follow instructions including fall protection during erection/ dismantling and use of the system. Signed copy to be available on site.
	9.9	Employer must ensure scaffold is in a safe condition regardless of who erected it. Ensure scaffold manufacturer's technical data & instructions for erection available on site.	√	O	13.13, 13.15 COSH 3.10	Ensure manufacturer's documentation is on site or follow P.Eng. instructions. Contractor ensure compatibility if different manufacturers of components used. Ensure qualified Person supervises erection, use and dismantling and scaffold capable of holding 4 times load likely to be imposed. (COSH)
	9.10	Guardrails and toe boards installed at every open edge of platform?	√		4.55-4.60 COSH 3.8	Ensure guardrails and toeboards installed
	9.11	Tools/equipment/materials arranged to prevent being accidentally knocked off platform?	√		COSH 3.4	Ensure safe arrangement on platform
	9.12	Check Scaffold Stability, Bracing, Access and all connections secure.	√	S	13.17 13.18	Ensure scaffold is stable, plumb and level and WORKSAFEBC requirements are met. If height 3 times min. base dimension or other circumstance requiring stability- bldg ties/guys required. Inspection item.
	9.13	Plank type & condition inspection. Planks secured?	√	S	13.14 13.16	Contractor Inspect planks regularly and secure to scaffold frame. Dimensions and guardrails meet requirements?
	9.14	Scaffold grounded if near high voltage or hazardous level of voltage likely to be induced in scaffold?	√	S	13.19	Ensure grounding. Inspection item
	9.15	Safe access provided to work platform?	√	S	13.7 COSH 3.9	Provide safe access. Temporary stairs have uniform steps, slope not exceeding 1.2 in 1; hand-rail between 90 and 110cm above stair level. Ensure temporary ramps securely fastened; safe footing, braced if necessary; slope 1 in 3 except in stairwells check COSH Inspection item
	9.16	Work platform strength sufficient for load and secured against separation form supporting equipment, structure or surface?	√	S	13.8	Ensure scaffold can support 4 times load likely to be imposed on it (COSH 3.10)
	9.17	Work platform subjected to sudden drop, contact with electrical conductors or showing signs of mechanical damage/wear?	√	S	13.12	Remove from service until certified safe by manufacturer or P.Eng.

	9.18	Ensure movable work platforms are clearly marked with rated capacity	√	S	13.20	Also check for marking on components (e.g. rigging capacity, counterweight, etc.) as required by regulations
	9.19	For elevating work platforms ensure operation manual, maintenance instructions, replacement parts information are reasonably available to workers.	√	S	13.21	If information is not available, equipment must not be used until obtained or written instructions provided by P.Eng.
	9.20	Employer must keep records regarding inspection, maintenance, repair or modification for each elevating work platform, swing stage, and permanent powered platform	√	S	13.22	If inspection and maintenance records other than pre-shift inspections not available, do not use until certified safe by manufacturer or P.Eng.
	9.21	Vehicle-mounted and self-propelled boom-supported elevating work platforms tested?	√	S	13.23	Inspect and certified by manufacturer or P.Eng. every 12 months. In 10th year after manufacture & every 5 years thereafter include structural inspection to verify integrity and stability. Dielectric test insulated units at least annually- certified by testing agency.
	9.22	If a movable work platform is not designed to be moved while a worker is on it, ensure it is secured before being accessed by the worker. Move platforms designed to be moved while occupied only as specified by the manufacturer.	√	S	13.24	Exceptions: If the height of the work platform of a rolling scaffold is: (a) not more than 1 1/2 times the least base dimension of the scaffold, the scaffold may be moved by the effort of the person occupying the platform or a person on the floor or other supporting surface, (b) more than 1 1/2 times the least base dimension of the scaffold, the scaffold must be moved only by the effort of a person on the floor. (c) more than 2 times the least base dimension of the scaffold, the scaffold must not be moved while the person is occupying the platform
	9.23	Elevating work platform meets requirements for warning devices and controls?	√	S	13.25 13.26	Ensure intermittent horn or flashing light and warning system for deviation from level are provided as required by regulation. Ensure controls including STOP are clearly marked. Clearly mark overriding lowering control to be used in emergency.
	9.24	Guardrails installed? Ensure temporary guardrails meet specs.	√	S	4.58	Contractor to ensure guardrails are installed and meet regulations. Inspection item.
	9.25	Forklift mounted work platform not to be used except as defined by WorkSafeBC regulation.	√	S	13.30	Check revised regulations 1 Feb/08. Inform Project Manager before using a forklift mounted platform.

	9.26	Work platforms suspended from a crane or hoist must be certified and loaded weight including rigging not over 50% of crane/hoist rated capacity at the working radius or configuration.	√	S	13.27-	Boom must be powered or fixed. No platform suspended from articulating boom crane unless approved by manufacturer. Secondary hoisting line must not be used when workers are on platform suspended from a crane.
	9.28	Hoisting and lowering work platforms done according to safe practices?			13.29	Operate as slowly as practicable. Lower under power if device powered. May not be controlled only by brakes. Ensure lower travel limit device is used where required. Carry out a trial lift before platform is occupied.
	9.29	Portable powered platform capable of raising/lowering by 2 or more separately controlled hoists?	√	S	13.31	Ensure controls located so one person can operate all hoists simultaneously.
	9.30	Ensure fall protection meeting WORKSAFEBC requirements is in place for suspended or elevating work platforms	√	S	13.33	Include in fall protection plan. Each person on a work platform attached to a crane boom must use a personal fall arrest system secured to an anchor on the boom or on the platform that is designated by the manufacturer, or a professional engineer.
	9.31	WORKSAFEBC approval obtained for high risk situations?	√	S	13.32	A swing stage, boatswain's chair and portable powered platform must not be used without prior permission of the Board if (a) one work platform will be used above or below any portion of another work platform, (b) a deck or planking will be used to span a gap between two independent work platforms, (c) the work platform will exceed 10 m (32 ft) in length, or (d) the suspension height will exceed 91 m (300 ft).
PROTECTIVE EQUIPMENT	10.1	Hard Hats Worn at all times. Chinstraps available for high wind/ bending over?	√	*	8.11-8.13	Contractor to monitor and enforce hardhat and chinstrap usage.
	10.2	High Visibility Clothes, correct type for the job.	√	O	8.24-8.25	Wear high viz vests when required. Traffic Control Persons will have special requirements.
	10.3	Buoyancy Equipment	NA	O	8.26-8.30	Not working within 5 feet of water.
	10.4	Safety Footwear	√	*	8.22-8.33	Approved steel-toed footwear in good repair, required at all times meeting WORKSAFEBC requirements for the work to be performed.
	10.5	Approved Safety Eyewear/ Face Shields. Note new guidelines re acceptable standards Nov/08	√	O	8.14-8.18	Eye protection required when energizing and de-energizing breakers. Also when doing any other work where flying objects may be encountered. Also may be required when using hazardous substances (TBD).

	10.6	Wear Hearing Protection when required by WORKSAFEBC regulations.	√	O	7.1-7.9	Hearing protection required when in high noise situations exceeding WORKSAFEBC noise exposure limits. Implement and provide evidence of noise control and hearing conservation program where required by regulation. Post warning signs in high noise areas.
	10.7	Respiratory Protection & Fit	√	O	8.32-8.37	Wear approved respiratory protection considering the respirator protection factor and maximum use concentration, MSD Sheets, exposure to oxygen deficient atmosphere when selecting respirators for workers that may be exposed to dusts or hazardous fumes/mists above exposure limits.
	10.71	Respirator fit tests conducted?	√	O	8.38-8.41 8.44	Ensure proper fit tests per regulations and keep records. Workers must perform a positive or negative pressure user seal check in accordance with *CSA Standard before each use.*
	10.72	Worker's ability to use a respirator in doubt for medical reasons?	√	O	8.42	Ensure worker examined by a physician, and advice obtained re the ability of the worker to wear a respirator.
	10.8	Gloves, Aprons, leg protection	√	O	8.19-8.21	Wear protective clothing when performing work that could result in cuts, slivers, abrasions, etc. Check added requirements from MSD Sheets.
	10.14	Personal clothing, rings, hair etc. OK	√	O	8.10	Ensure workers do not have loose clothing, long hair or rings which could become entangled if operating rotating power tools.
	10.15	Apply Sunscreen, to protect against sunburn on exposed skin.	√	O		Wear sunscreen when working outdoors.
	10.16	Safety belts, harnesses, lanyards & shock absorbers	√	O		Follow fall protection plan and use prescribed equipment.
	10.17	Employees must wear suitable personal clothing for the work they are doing to reduce risk of injury.	√	S		Contractor to ensure workers wear suitable clothing.
		Note: Check all protective equipment for proper fit and condition.	√	S		Contractor responsible for ensuring proper fit and care of all protective equipment and documentation thereof.
HEAT STRESS	11.1	Heat Stress Control Required? Followed?	√	S	7.27	To be determined by Contractor's Superintendent based on section 7 WORKSAFEBC regulations (Jan/05), weather conditions, and worker proximity to heat sources and clothing worn.

	11.2	Check for heat stress if temp warrants.	√	S	7.28- 7.30	Contractor to monitor environmental conditions and take action accordingly if ACGIH standard requires. If required, conduct assessment and develop exposure control plan. Provide engineering controls if practicable, otherwise reduce exposure or provide admin controls or PPE.
	11.3	Potable drinking water nearby?	√	O	7.31	Contractor to supply adequate drinking water for Workers
	11.4	Workers & Supervisors trained to recognize?	√	O	7.32	Contractor to ensure Workers and Supervisor recognize symptoms and know proper response. Contractor's F.A. attendant to be instructed to monitor workers for signs. Remove workers exhibiting stress from exposure and provide First Aid or physician treatment.

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COLD STRESS	12.1	Cold Stress Control Required? Followed?	√	S	7.33	Cold stress not likely to be a factor during summer months. Contractor to be aware of conditions under which cold stress could be a concern based on ACGIH standard (Jan /05)
	12.2	Check Table 7-4 for conditions	√	S	7.34- 7.37	Contractor to monitor for cold stress risk conditions and take appropriate action. if ACGIH standard requires. If required, conduct assessment and develop exposure control plan. Provide engineering controls if practicable, otherwise reduce exposure or provide admin controls or PPE.
	12.3	Workers & Supervisors trained to recognize?	√	O	7.38	Ensure workers trained. First Aid attendant may be asked to monitor for cold stress. Remove workers exhibiting stress from exposure and provide First Aid or physician treatment
CRANES, HOISTS & RIGGING	13.1a	Only EGD Operators operate EGD Cranes/hoists or other equipment.	√	*		No plans to use any EGD equipment. Contractor to reinforce that only EGD workers are to operate EGD equipment. No requirement to use lifting equipment is foreseen.
MOBILE EQUIPMENT & TRANSPORT OF WORKERS	14.1	Does the contractor intend to use any mobile equipment on site other than trucks for transporting workers?	TBD	S		To be determined. Define equipment to be used and any special requirements.
	14.2	Are contractor's vehicles safe for transport of worker's?	√	S	16.3	Contractor to ensure vehicles are properly equipped and maintained.
	14.3	Are workers obeying speed limits? Max speed 20kph	√	*		Cover at start up orientation meeting.
	14.4	Are vehicles properly parked?	√	*		Workers will be shown the designated parking areas. Do not park in areas where crane travels, Fire Lanes, blocking fire hydrants, fire/emergency alarm pull stations or fire extinguishers.
	14.5	Elevating work platform(s) operations manual and inspection certificate on site? Daily inspection log available?	√	S		Requirements depend on contractor use of this type of equipment. TBD in final JHA
	14.6	Ensure seat belts used and roll over protection provided if required.	TBD	O		Requirements depend on contractor use of this type of equipment. TBD in final JHA
	14.7	Suspended work platforms/chairs used? Conform to specifications? Verify engineering design. Support structures in place?	NA	S		Generally, not planned to be used. Check WORKSAFEBC regulations if suspended platforms to be used.

	14.8	Do not leave delivery vehicles unattended for extended periods.	√	*		
	14.9	Do not hitch a ride on forklifts unless proper seats exist for this purpose.	√	*		Contractor to enforce.
	14.10	Ensure volatile, flammable, or hazardous materials transported in isolated compartment accessible only from outside & properly ventilated & drained	√	S	17.6	Contractor to ensure vehicles meet WORKSAFEBC requirements.
	14.11	Ensure tools/materials/ equipment are carried in separate designated area for that purpose.	√	S	17.5	Contractor to ensure workers cannot be injured by unsecured items in the vehicle.
	14.12	Equipment properly secured if elevated? No use of hydraulic or pneumatic lifts as blocks unless collapse not possible.	√	S	16.37	Ensure workers do not leave equipment parts unattended in an elevated condition or work under equipment unless properly secured.
	14.13	Loads secured according to regulations? Loads do not interfere with lift truck operation?	√	S	16.44-16.46	Contractor to ensure loads are properly secured.
	14.14	Workers have procedures, equipment and training for tire repairs?	√	S	16.47 16.48	Contractor to ensure workers have training & equipment if they will change tires.
TRAFFIC CONTROL	15.1	Is there any blocking of roadways, or aisles during the project? If so install signs, barricades etc.	NA	S&O		No blocking planned or required.
	15.2	Will gantry crane travel through the work area? Coordinate with the crane supervisor.	√	*		Workers to be instructed regarding crane travel and alarms during pre-startup meeting as they may encounter them enroute to work location. Ensure work is planned and communicated to crane supervisor before start.
	15.3	Is there operations activity near the project site? Ensure coordination and minimize impact.	√	S&O		The Engineer will ensure all supervisors and contractors on site are aware of the work and schedule.
	15.4	Control boat traffic and ensure flags and markers are in place.	√	S&O		Provide controls if working near water.
	15.5	Is there a need to protect Public Roadways? Review WORKSAFEBC PART 18.	√	S&O	PART 18	Define need and document special traffic control measures. Ensure traffic control plan prepared by a qualified person is in place meeting MoTH requirements and WORKSAFEBC regulations.
	15.4	Is there a defined inspection program for traffic control devices to ensure they are well maintained and effective under all weather and light conditions? Documentation of inspections & repairs made kept?	√	S&O		Contractor to define an inspection program including repair/replacement procedures, inventory of devices, Contractor to ensure documentation is maintained including follow-up to ensure work has been done.

	15.5	Are pavement markings clear and old markings removed?	√	S&O		Ensure markings are clear and not confusing. Remove old markings.
	15.6	Are markings removed/covered when not in use?	√	S&O		Contractor to ensure markings are removed/covered when not required.
	15.7	Is there an individual assigned supervisory responsibility for traffic control?	√	S&O		Contractor to assign an individual. Ensure all workers and supervisors are trained in safe work requirements and supervisors ensure workers follow prescribed procedures.
	15.8	Are Traffic Control Persons trained?	√	S&O		Contractor to ensure only trained individuals engage in traffic control and that they have written instructions. Provide proof of completion of MoTH approved course.
	15.9	Has the Contractor kept records of changes in traffic control?	√	S&O		Contractor to maintain records to assist investigation in event of an accident.
	15.10	Are there risks to workers due to vehicles/equipment operating on the construction work site?	√	S&O		Contractor to define risks to workers on the construction site due to vehicles and measures to minimize risks of injury. Risks to employees of other companies to be acknowledged, minimized and communicated to appropriate supervisors.
EVACUATION & RESCUE	16.1	Written procedures developed?	√	S&O	4.13	Contractor to ensure need for emergency rescue assessed and procedures for rescue documented. Call 911. Rescue will be by DND/Esquimalt Fire Dept. Ensure all workers understand process to call for assistance and have emergency numbers. Review emergency procedures at orientation session.
	16.2	Simulations/ Training completed?	NA		32.2	Fire Dept. Rescuers are trained.

HOUSEKEEPING; MATERIALS STORAGE	20.1	Refuse spills and waste materials not allowed to accumulate and create a hazard	√	O	4.41	Cover at start up orientation meeting.
	20.2	No use of compressed air to clean clothing of any potentially hazardous dusts etc.	√	O	4.42	Compressed air can penetrate skin, enter bloodstream and result in death. Cover at start up orientation meeting.
	20.3	Check state of repair of floors, ramps, stairs and free of tripping and slipping hazards	√	O	4.39	Cover at start up orientation meeting.
	20.4	Material stacked securely and stable?	√	S	4.43	Check plans for stacking materials. Also Inspection item.
	20.5	Are areas free of risk of entrapment or falling materials? If not take appropriate measures per 4.44 and 4.45	√	S	4.44-4.45	Evaluate risks. Also Inspection item.
	20.6	Use metal containers with tight fitting lids for oily or painting rags & empty daily.	√	O		Oily or paint soaked rags can ignite through spontaneous combustion. Store properly. Also Inspection item
	20.7	Use proper containers for refuse.	√	O		Inspection item
	20.8	Are work areas free of protruding nails?	√	O		Ensure nails are either removed or bent over to eliminate the hazard of stepping on them.
	20.9	Are nuts/bolts etc. stored in containers to reduce tripping hazards?	√	O		Clean up components frequently to reduce risks.
	20.10	Returned tools to proper place after use.	√	O		Ensure tools are properly stored.
EQUIPMENT MAINTENANCE & USE	21.1	Equipment operator's manuals at site?	√	S		Keep manuals on site with equipment. Includes equipment like concrete pumping trucks
	21.2	Equipment operated by qualified persons?	√	S		Contractor to provide proof of qualification of equipment operators.
	21.3	Equipment maintained according to manufacturer's instructions?	√	S		Maintain equipment as specified by manufacturer and maintain a record of maintenance.
	21.4	Equipment inspection before use carried out?	√	S	16.34	Operators inspect equipment before use, record results (where required by WORKSAFEBC) and report any defects to Supervisor. Do not use defective equipment until defect is remedied.
	21.5	Explosive operated tools maintained, and used properly? Operator's trained? Equipment & shots stored in restricted area?	√	S		Provide proof of training to Project Manager for users of this equipment before starting work. Check with P.M. for Hot Work permit requirement also.
	21.6	Air operated nailing guns trigger mechanism working properly?	√	S		Ensure safety mechanisms working properly.
	22.0	Follow safe lifting practices. Use mechanical lifting assist wherever feasible or get assistance.	√	S		Contractor to train all workers in safe lifting practices and monitor for compliance.

ASBESTOS	25.0	Workers possibly exposed to potentially hazardous levels of asbestos? E.g. - workplace has asbestos-containing materials present or used - operation involves abatement of asbestos-containing materials - exposure to asbestos fibre in excess of 50% of exposure limits may occur	√	O	PART 6 6.2	There is potential exposure to asbestos under this Contract. The 2.4kV motor starters in the Pumphouse contain asbestos arc chutes. Many have been found with varying degrees of cracks. The asbestos in these arc chutes are a health related concern. The Contractor should incorporate safe work procedures for dealing with the potential for asbestos dust in these panels. Should the Contractor encounter any questionable situation involving asbestos, lead paints or other potentially hazardous substance, immediately stop work and report to Project Manager for direction.
	25.2	Workplace exposure monitoring done and results provided to workers	√	O	5.53	
	25.3	Contractor exposure control plan developed meeting WORKSAFEBC 5.54?	√	O	6.3	Plan to include: - Purpose & Responsibilities - Risk identification; assessment & control - Education & training - Written work procedures - Hygiene facilities & decontamination procedures, when required - Health monitoring, when required - Documentation, when required
	25.4	Qualified person prepare and keep current an inventory of all asbestos-containing materials; identify all such materials by signs, labels etc.	√	O	6.4 6.5	EGD has inventory of asbestos containing materials.
	25.5	Qualified Risk assessment conducted by qualified person before any demolition, repair, etc work where asbestos-containing materials may be disturbed.	√	O	6.6	
	25.6	Procedures documented providing task-specific work direction addressing both hazards & controls and eliminating or minimizing the airborne release of asbestos fibres	√	O	6.7 6.8	WORKSAFEBC publication "Safe Work Procedures for Handling Asbestos" provides procedures acceptable to the Board.
	25.8	No use of compressed air to clean up or remove asbestos-containing materials, dusts, fibres. Also no dry sweeping or dry mopping.	√	O	6.9	Use approved procedures for cleaning starters assuming asbestos dusts may be present.

	25.10	Workers trained in hazards, means of identification, procedures, correct use of protective equipment, operation of engineering controls, and purpose/significance of health monitoring	√	O	6.12	
	25.11	Monitoring carried out as req'd by PART5?	√	O	6.12	
	25.12	Monitoring during high risk activities carried out and provided to workers within 24 hrs?	√	O	6.12	During high risk activities, provide regular sampling of workers, areas outside the containment area but nearby, clean room, contaminated area as required by regulations.
	25.13	Glove bags used for containment? Adhere to requirements of WORKSAFEBC 6.15	√	O	6.15 6.12(4)	If not, provide sampling as defined in WORKSAFEBC 6.12 (4)
	25.14	Work area boundary defined, all objects not required for the work removed, openings secured to prevent release of fibres?	√	O	6.13	Prepare area before starting work
	25.15	Signs posted restricting entry?	√	O	6.13	Restrict access to essential workers only when cleaning starters.
	25.16	For HIGH RISK WORK provide maintain & inspect a containment and a decontamination facility	√	O	6.16	Not required if using glove bag containment. See detailed requirements in 6.16
	25.17	Ventilation airflow from clean area into contaminated area only?	√	O	6.17 6.18 6.19	Airflow through decontamination exhausted through containment area. Exhaust from containment thru effective HEPA filter. All ventilation exhaust thru HEPA filter tested maintained and used per manufacturer instructions.
	25.18	Is asbestos spread being controlled/	√	O	6.20 6.21 6.22 6.23	Use measures to keep work surfaces and other work areas adjacent to containment area, as free as practicable from dust accumulation. Wet asbestos containing material before and during work whenever practicable Repair damaged asbestos-containing materials
	25.19	Proper waste collection and disposal measures followed?	√	O	6.25	All asbestos waste and asbestos contaminated material including clothing, cleanup equipment etc. placed in sealed containers identified as containing Asbestos.
	25.20	Clean up equipment.	√	O	6.26	Ensure exterior of waste containers, reusable equipment cleaned after work complete
	25.21	Work area cleaned?	√	O	6.27 6.28	Ensure work area is cleaned after each shift and at completion of work involving asbestos and dispose of containers promptly.

	25.22	Proper respiratory protection used? Fit checked?	√	O	6.29	No single-use respirators permitted. Ensure adequate protection and enforce usage.
	25.23	Proper protective clothing supplied and worn & maintained?	√		6.30	Ensure asbestos resistant clothing with proper coverage and fit is used. Repair/replace damaged clothing immediately. Clean clothing using HEPA filter vacuum before removal. Remove protective clothing/equipment before leaving designated work area. Protective clothing being sent to an acceptable laundry must be HEPA vacuum cleaned, placed in a soluble plastic bag, sealed and labelled before being sent.
	25.24	Workers to launder own clothing?	√		6.31	Ensure workers informed of hazards of asbestos and precautions required.
	25.25	Documentation maintained?	√		6.32	Employer to keep records of inventories, risk-assessments, inspections and air monitoring results at least 10 yrs. Keep records of corrective actions to control release, training/instruction to workers, work procedures and notification to WORKSAFEBC for at least 3 years.
MUSCULOSKELETAL INJURY	30.1	Is there a risk of musculoskeletal injury?	TBD	S	4.47	Contractor to eliminate or control risk
	30.2	Are controls required?	TBD	S	4.50-4.52	Contractor to define control measures and train workers in risks and safe work procedures, use of PPE etc. Contractor to monitor for compliance and effectiveness.

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Contractor's Superintendent: _____ **Date:**_____.

Distribution:

EGD Operations Manager
EGD Supervisors
Engineer-of Record
Resident Engineer/Construction Coordinator
Project File

Appendix D

HEALTH & SAFETY PLAN REQUIREMENTS

CHECKLIST OF HEALTH & SAFETY PLAN REQUIREMENTS

Prepare and comply with a site-specific project Health and Safety Plan (see sample below) based on hazard assessment, including, but not limited to, the following:

- ❑ Reference to Contractor's health & safety policy.
- ❑ Indication Health & Safety has been fully considered in the bid.
- ❑ General safety rules for the project.
- ❑ Commitment to comply with all applicable regulations and applicable policies and procedures of PWGSC and Esquimalt Graving Dock.
- ❑ Confirmation that PWGSC will be informed of any sub-contractors before they enter the site and that PWGSC has the right to remove any sub it deems unsatisfactory.
- ❑ Commitment to completion of a Job Hazard Analysis and ensuring workers are made aware of the hazards and comply with specific requirements.
- ❑ Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations.
- ❑ Commitment to the documentation of job-specific safe work procedures and ensuring workers are trained in those procedures before starting work.
- ❑ Define regular communication channels to ensure information is transferred between the Construction team and the Departmental Representative/ operations and record keeping procedures.
- ❑ Commitment to provision of plans by Qualified Persons when required by regulation (e.g. fall arrest program, etc.), ensuring workers are trained in the plan, have approved equipment and follow the agreed plan.
- ❑ Commitment to ensuring no worker (including sub-trades) enters the job site without proper training. Ensuring Workers are made aware of their right to refuse work they consider too hazardous. Acknowledgement that the PWGSC orientation is not to be considered complete training.
- ❑ Commitment to using only "Qualified Persons" on the project and provision of proof of qualification as required.
- ❑ Definition of roles & responsibilities for project safety/organization for project specifically the Construction Superintendent, OH&S Representative and Worker Safety Representative. Identify any alternates and the qualifications of all individuals.
- ❑ A commitment to holding Occupational Health and Safety Meetings at a frequency agreed with the Departmental Representative and provision of minutes within 2 days of the meeting.
- ❑ Define Inspection Policy & Procedures. A commitment to holding formal site inspections at a frequency agreed with the Departmental Representative and provision of a report within 2 days of the inspection. The Worker Safety Representative will participate whenever possible.
- ❑ A commitment to conform to all environmental requirements and safe work procedures for hazardous materials. This includes provision of MSD Sheets and training of workers in correct use, handling, disposal and personal protective measures to be used.

- Definition of how First Aid will be provided and how medical emergencies will be treated.
- Incident reporting and investigation policy and procedures. Commitment to reporting all incidents, accidents, near-miss and WORKSAFEBC inspections/ orders to the Departmental Representative immediately followed by copies of relevant reports etc. within 2 days.
- Occupational Health and Safety Committee/Representative procedures.
- Occupational Health & Safety communications and record keeping procedures.
- List hazardous materials to be brought on site as required by work.
- Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
- Identify personal protective equipment (PPE) to be used by workers.
- Identify personnel and alternates responsible for site safety and health.
- Identify personnel training requirements and training plan, including site orientation for new workers.

XYZ CONSTRUCTION

CONTRACTOR'S HEALTH & SAFETY PLAN – sample only

XYZ Construction (XYZ) considers safety to be an integral part of doing the work and takes pride in its safety program and record. See XYZ safety policy and program documentation attached.

XYZ's Safety Plan to ensure compliance with WORKSAFEBC Regulations and Environmental practices as required under this contract includes the following elements.

Safety & Health Considered in Bid:

XYZ confirms all known hazards and safety requirements have been considered in the bid and that it will follow all applicable policies and procedures of PWGSC as the owner's representative and comply with all applicable regulations.

Sub-Contracting:

XYZ confirms it will not enter into any sub-contracting agreements without the approval of the PWGSC Departmental Representative. XYZ confirms PWGSC will retain the right to remove any sub-XYZ from the work site if the Departmental Representative deems it necessary and has so informed its sub-contractors.

Sub contractors will be identified to the Departmental Representative prior to entering the work site.

Job Hazard Analysis

XYZ will work with sub-trades and other resources to complete the Job Hazard Analysis to the extent possible. XYZ will then assist in finalizing the Job Hazard Analysis documentation with the Departmental Representative, Safety specialists and IOS Operations Representatives ***prior*** to starting work. The Departmental Representative will review the Job Hazard Analysis provided by the XYZ prior to worker orientation proceeding. XYZ will ensure worker compliance with requirements included in the Job Hazard Analysis, job/site specific procedures and all regulations.

XYZ will comply with the PWGSC Lockout Policy, Confined Space Entry Policy and other applicable site rules/ policies.

Safe Work Procedures:

XYZ will work with safety professionals, engineers and others as required to document safe working procedures for all hazardous work and ensure workers are trained in these procedures prior to starting work. Where required, Personal Protective Equipment will be provided and a list is attached.

Provision of Plans by Qualified Persons:

Where regulations require plans provided by Qualified Persons (e.g. Fall Protection Plan, Crane lifting plans, Confined Space Entry procedures) XYZ will identify the requirement, provide the plan and commit to ensuring

workers are trained in the plan, have suitable approved equipment and follow the agreed plan. ABC Engineering will provide the required documentation for the 3 identified needs.

Worker Training:

XYZ will ensure no worker (including sub-trades) enters the job site without proper training in applicable WORKSAFEBC Regulations and project specific procedures as defined in the Job Hazard Analysis, Emergency Response /Rescue Plans, or detailed work procedure. XYZ will ensure all workers understand the hazards of the work and those inherent in working at IOS and that they have the right to refuse work they consider to be too hazardous. XYZ will provide documentation confirming training to the Departmental Representative prior to the workers starting work. It is understood that the Orientation to be conducted by PWGSC cannot be considered complete training in everything the worker must know and Supervisors are ultimately responsible for workers being fully trained. No worker will enter the site without a complete orientation.

Qualified Persons:

XYZ will ensure that only "Qualified Persons" are used on the project and provide proof of qualification prior to the Pre-startup Orientation and Tour for workers as requested by the Departmental Representative. The list of designated qualified persons for this project is attached.

Construction Superintendent:

XYZ will ensure that the Construction Superintendent is qualified to supervise the work and will be capable of carrying out the following roles & responsibilities. John Smith, an employee with 34 years experience in building/construction type of work will supervise during the most critical activities and otherwise Dustin Brown, a senior employee with 10 years experience will act as alternate Construction Superintendent. Resumes are attached. The Construction Superintendent and Alternate meet the requirements outlined below:

1. To document a Project Safety Plan (this document) for both his people and any sub-trades involved on the project. This will be prepared in conjunction with the sub-contractor management as necessary and provides the framework for safety and health related activity on the project.
2. To train and/or ensure training has been done for any worker under his/her supervision including sub-trades.
3. To monitor the daily activities of his workers, including sub-trades, for compliance with safe work practices and immediately correct any violations.
4. To ensure no worker operates IOS equipment of any kind.
5. To re-train and coach workers as required for the purpose of correcting improper practices. To ensure the same is done for workers of sub-trades.
6. To report any injury, near miss or hazardous condition observed or brought to his attention to the PWGSC Departmental Representative immediately.
7. To report any WORKSAFEBC Orders or Inspections received by XYZ to the PWGSC Departmental Representative immediately.
8. To conduct safety meetings as outlined in the section below.

XYZ will ensure sufficient supervision to monitor the activities of the workers and ensure compliance with safe

work practices. For this project, the Construction Superintendent or his alternate Construction Superintendent will be on site at all times when work is proceeding.

Designated O H & S Person:

XYZ will employ and assign to the work, a competent and authorized representative as the Health and Safety Officer. Jack Brown, the Health and Safety Officer meets the following requirements (resume attached):

1. Have a minimum of 2 years of site-related working experience specific to activities associated with the work.
2. Have basic working knowledge of specified occupational safety and health regulations and site-specific safe work procedures.
3. To finalize the Job Hazard Analysis and safe work practices with the Departmental Representative, Safety Representative(s) and Operations Representative(s).
4. Be responsible for completing Health and Safety Worker Training and Site Orientation sessions, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
5. Be responsible for implementing and enforcing daily and monitoring, the site-specific Health and Safety Plan.
6. Be on site during execution of work.
7. To be responsible for carrying out accident/incident investigations and provide a copy of the report to the PWGSC Departmental Representative. The Departmental Representative and/or his representative will *assist* in doing this.
8. Conduct regular drills, in co-ordination with Departmental Representative, to test adequacy of emergency response procedures and worker knowledge of their roles and responsibilities.
9. To conduct site inspections daily, as agreed with the PWGSC Departmental Representative and provide documentation of inspections to the Departmental Representative on a weekly basis.
10. To participate in safety meetings as outlined in the section below.

Worker Safety Representative:

The Worker Safety Representative on this project will be Sam White. Sam has been XYZ's worker safety rep for 5 years and is very familiar with applicable WORKSAFEBC regulations and safe work practices. Workers will be encouraged to contact their safety rep regarding safety and health issues that may arise. The Worker Safety Rep will participate in safety meetings and inspections and the resolution of health & safety issues.

Safety Meetings:

It is agreed that safety meetings with workers will consist of weekly meetings to be held every Monday morning with minutes to be provided to the Departmental Representative by the following Wednesday. The Construction Superintendent will document the actions of the meetings, who attended and provide a copy to the PWGSC Departmental Representative or his designate.

Typical topics for meetings will include but are not limited to:
- Review of hazards and safe work procedures and use of protective equipment.
- Changes in work practices, schedule or adjacent work areas which could affect worker safety,

- A review of critical procedures (e.g. Fall arrest plan, Fire and Emergency procedures,)
- Discussion of any injury, near miss or accident and steps to prevent recurrence.
- Worker health & safety concerns.

If changing conditions require communication to the workers prior to the next safety meeting, a "tail-gate" meeting will be held to train the workers prior to commencing work.

Inspections:

The Construction Superintendent/ OH&S resource will carry out daily inspections to identify new hazards, observe adherence to safe work practices and record findings and actions in his log. Written Inspection Reports will be provided to the PWGSC Departmental Representative weekly. Whenever possible, the weekly inspection will be conducted together with the Worker Safety Representative. This inspection will make use of the Job Hazard Analysis as a checklist of items to inspect.

Hazardous Materials & Environmental:

XYZ confirms it will conform to all environmental requirements as defined in the contract and comply with Environmental Services best practices and directives. Material Safety Data Sheets will be provided prior to finalizing the Job Hazard Analysis for all potentially hazardous materials to be used. Workers will be fully trained by XYZ in the hazards of these materials and the proper use, storage, handling, Personal Protective Equipment (PPE) usage, disposal of these materials, appropriate emergency response and any other relevant information from the MSD Sheets. XYZ will ensure workers have received WHMIS training as required by regulations. A list of hazardous materials and PPE to be used on this job is attached.

First Aid/ Medical Assistance:

XYZ will provide a written risk assessment and detailed procedures for dealing with various types of possible injuries to comply with WORKSAFEBC First Aid amendments effective 31 Mar/04 and ensure required First Aid coverage is in place ***prior*** to the first day of work. A Level 1 First Aid Kit will be kept at the XYZ field office trailer near the work area. All First Aid Attendants will have their *Original* certificates on site for inspection by WORKSAFEBC if required. Three employees, Bob Horvath, Brian West, and George Taylor have level 1First Aid training.

In the case of non-serious injury not requiring a stretcher or ambulance, the injured worker will be taken to: Admirals Walk Health Centre, 105-1505 Admirals Rd. (PH. 380-9070) using a company truck.

In the case of more serious injury, 911 will be called and ambulance service will be provided. Two XYZ workers will have 4-channel radios and can raise the alarm. The Construction Superintendent has a cell phone and will call 911.

Emergency Response Plan

XYZ will work with sub-trades, fire departments and others to document the response procedures in the event of an emergency or serious injury if work is of a nature that requires these details. Documentation will be posted

and all workers trained. Plans will be compatible with IOS emergency response for fire, bomb threat, earthquake and confined space rescue.

Accident/Incident/Injury/WORKSAFEBC Order Reporting & Investigation:

XYZ will emphasize to employees that ALL accidents, injuries, equipment damage and incidents are to be reported and will ensure they are documented and reported to the PWGSC Departmental Representative immediately. Also, report to WORKSAFEBC as required by regulation and cooperate with any officer performing inspections or investigations. Any WORKSAFEBC Order or Inspection will be immediately reported to the PWGSC Departmental Representative.

XYZ will complete a full investigation of all incidents, near misses and accidents and take immediate corrective action as required to prevent recurrence. The Departmental Representative will participate with XYZ in investigations and planning appropriate action to prevent recurrence.

Approved by (XYZ): _____ Date: _____.

General Manager, XYZ Construction