



Specification

Esquimalt Graving Dock
825 Admirals Road
Victoria, BC


Electrical High Voltage Refurbishment

Requisition No.

EZ108-151321

Project No. R.016116.123
October 2014

APPROVED BY:


Regional Manager AES

2014-12-16.
Date


Construction Safety Coordinator

Dec. 15, 2014
Date

TENDER:


Project Manager

Dec. 15, 2014
Date

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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 RELATED SECTIONS

- .1 Section 26 08 01: HV System Refurbishment, Inspection, and Calibration

1.3 REFERENCE STANDARDS

- .1 CSA Z462 – Workplace Electrical Safety
- .2 CSA C22.1 – Canadian Electrical Code

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work under this contract covers the refurbishment and testing of power supply and distribution switchgear and auxiliary equipment including minor modification and repairs at Esquimalt Graving Dock (EGD), 825 Admirals Road, Victoria B.C. Refer to Appendix C for details of the electrical system configuration.
- .2 In general, the work includes:
 - Inspection, cleaning, testing, and re-calibration of the 12.5 kV and 2.4 kV switchgear
 - Testing of high voltage cables
 - Testing of 208 V FPE GFR5M, 480V and 600 V ground fault relays as listed
 - Testing of ground fault relays performing tripping on 12.5 kV and 2.4 kV breakers including FPE DSP Mk II relays, and FPE DSP6 relays
 - High current testing of low voltage air circuit breakers
 - Cleaning and inspection of 120 VDC battery station
 - Minor modification and repair work on existing equipment as indicated
 - Submission of test reports
 - Submission of mark-ups on existing documentation, including but not limited to single line drawings and coordination study graphsRefer to section 26 08 01 for detailed equipment lists and locations.
- .3 Provide labour, materials, tools, supplies, and equipment including portable generator, where required, and vacuum cleaner, and carry out work as specified

herein in a careful and workmanlike manner and to the satisfaction of the Departmental Representative.

- .4 Provide labour, tools, supplies, and equipment to carry out *minor repairs* as indicated.
- .5 Any *repair* work shall be first approved by Departmental Representative.
- .6 The work shall include the following:
 - .1 Review of previous maintenance test reports, refer to Appendix A and B.
 - .2 Visual Inspection and Functional Testing of equipment.
 - .3 Thermographic inspection of load-carrying components including switch-gear, cable connections, circuit breakers, and transformers during high-load period as described under Work Schedule.
 - .4 Electrical maintenance of equipment including calibration, adjustments, lubrication, and replacement of worn parts.
 - .5 Preparation of a Maintenance Test plan for review by the Departmental Representative outlining all equipment to be tested and indicating the tests required and whether the equipment is to be removed from service. The plan shall indicate the maintenance work to be done, estimated times each piece of equipment will be out of service, and provide a space for comments as a result of actual tests and maintenance.
 - .6 A Completion Report to be prepared and submitted to the Departmental Representative at the completion of the work. The report shall summarize the work done, recommended upgrading, and any important issues requiring further action.
 - .7 Protective Relay testing in accordance with the requirements outlined herein. Refer to the Attached Appendix B, Coordination and Fault Study, indicating the number and type of relays to be tested. Include as-modified mark-ups of coordination curves wherever as-found device settings are modified or differ from as-left settings of Appendix B.
 - .8 Mark-ups of drawings contained in Appendix C, including as-found and/or as-modified data on all circuit components included in the work, and investigation and mark-ups of items identified as "Temporary Notes" or "Key Notes" on same drawings. Submit marked-up drawings to Departmental Representative with the Completion Report.
- .7 All document submissions shall identify all EGD equipment maintained and tested during the course of this work, in accordance with the Numbering System outlined in Appendix C, Drawing EMD E1.

1.5 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .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.

1.6 EXISTING SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Examine site and verify with the Departmental Representative all conditions likely to affect the work before submitting tender.
- .3 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.
- .4 Protect and maintain existing active services.
- .5 Construct safety barriers when working near exposed energized electrical and operating mechanical equipment.
- .6 Maintain fire access/control.

1.7 CONTRACT METHOD

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

1.8 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 Schedule shutdowns shall be: Feb 28, 2015 – March 01, 2015
And March 07, 2015 – March 08, 2015
- .4 Priority shall be given to critical operations at Esquimalt Graving Dock. The Contractor may have to stop work for up to 4 hours if electrical equipment is required to be energized for critical operations. Should the work stoppage be required to extend beyond four hours, the contractor shall stop work until advised otherwise by the Departmental Representative.
- .5 Provide to the Departmental Representative a work schedule encompassing the entire Contract within 1 week of award of Contract. Revision and resubmission of the schedule may be required.

- .6 Schedule shutdown work as identified in Instructions to Bidders. Identify the required duration and time of each shutdown in the work schedule. Notify the Departmental Representative of any proposed changes to the shutdown schedule at least 24 hours in advance of the shutdown.
- .7 Work on the 12.5 kV switchgear will require shutdown coordination with DND. Public Works & Government Services Canada (PWGSC) will arrange for the shutdown and advise the contractor in writing prior to the start of work.
- .8 All work on the 12.5 kV and 2.4 kV equipment is to be done within the scheduled shutdown periods only. Any minor repairs to existing equipment may be carried out on weekdays.
- .9 Perform all thermographic inspections during maximum loading period, typically in March or in September. Confirm exact date with the Departmental Representative. If a re-visit to the site is required, include all associated costs in the tender price.

1.9 CONTRACTOR'S USE OF PREMISES

- .1 Limit use of premises to allow:
 - .1 PWGSC occupancy and use.
 - .2 Work by other contractors.
 - .3 Public usage.
- .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 D).
- .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 Environmental Assessment, Appendix E).

- .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.

1.10 CLEANING

- .1 Vacuum clean, and wipe using manufacturers' recommended products and methods all inside and outside surfaces of switchgear, transformer, and other enclosures.
- .2 Clean internal components of equipment in accordance with NETA – MTS, and manufacturers' recommendations.
- .3 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.

1.11 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.

1.12 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 F.
- .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.

1.13 PRODUCTS SUPPLIED BY THE DEPARTMENTAL REPRESENTATIVE

- .1 The Departmental Representative will provide manufacturer's installation drawings, existing electrical drawings, and instructions whenever possible or available.

1.14 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings
 - .2 Specifications
 - .3 Addenda
 - .4 Change Orders
 - .5 Other Modifications to Contract
 - .6 Field Test Reports
 - .7 Copy of Approved Work Schedule
 - .8 Health and Safety Plan and Other Safety Related Documents
 - .9 Other documents as specified

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED SECTIONS

- .1 Section 26 08 01: HV System Refurbishment, Inspection, and Calibration

1.2 ADMINISTRATIVE

- .1 Submit to Departmental Representative the submittals listed for review. Submit with reasonable promptness and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 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.
- .4 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
- .7 Keep one reviewed copy of each submission on site.

1.3 SUBMITTALS

- .1 Submit 4 hard copies of test results bound together with the completion report.
- .2 Submit mark-ups of Appendix C drawings and Appendix B coordination graphs. Mark-ups shall be in red ink on one set of clean white prints or coloured coordination graphs and shall be stamped, signed, and dated by the Contractor.
- .3 Allow 10 days for Departmental Representative's review of each submission.
- .4 Make changes in submittal documents as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

- .5 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 submittal document
 - .5 Other pertinent data

- .6 Submissions include:
 - .1 Date and revision dates
 - .2 Project title and number
 - .3 Name and address of:
 - .1 Supplier
 - .2 Manufacturer
 - .4 Subcontractor

- .7 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements, and compliance with Contract Documents

- .8 After Departmental Representative's review and acceptance, distribute copies.

- .9 Provide an electronic copy of test results and completion report on a CD. Completion report format shall match that of Appendix A, complete with colour digital photographs. Include high quality scanned copies of marked-up drawings. Files shall be in MS Office-compatible format.

- .10 Supplement standard information to provide details applicable to project.

- .11 If, upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, submissions will be accepted. If submissions are rejected, noted copy will be returned and resubmission of corrected submissions, through same procedure indicated above, must be performed before final payment is effected.

- .12 The review of submittals by PWGSC is for the sole purpose of ascertaining conformance with general concept. This review shall not mean that PWGSC approves details inherent in submittals, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions or of responsibility for meeting all requirements of Contract Documents.

1.4 PROGRESS PHOTOGRAPHS

- .1 Submit progress photographs in same format as Appendix A.

1.5 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

2 Products

- .1 Not used

3 Execution

- .1 Not used

END OF SECTION

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.

2 Related Sections

- .1 Refer to the following current NMS sections as required:
 - .1 Submittal Procedures: Section 01 33 00
 - .2 Temporary Utilities: Section 01 51 00

3 Workers' Compensation Board Coverage

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

4 Compliance with Regulations

- .1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

5 Submittals

- .1 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.

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.

7 Health and Safety Coordinator

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

8 General Conditions

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
 - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
 - .2 Secure site at night time as deemed necessary to protect site against entry.

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.

10 Regulatory Requirements

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

11 Work Permits

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

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.

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.

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.

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.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 013300.
 - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.
 - .3 Provide adequate means of ventilation in accordance with Section 015100.

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.

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 the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
- .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

18 Overloading

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

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.

20 Confined Spaces

- .1 Carry out work in confined spaces in compliance with Provincial Regulations.

21 Powder-Actuated Devices

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

22 Fire Safety and Hot Work

- .1 Obtain Departmental Representative's authorization before any welding, cutting, or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices, and grinding with equipment which produces sparks.

23 Fire Safety Requirements

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

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

24 Fire Protection and Alarm System

- .1 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.

25 Unforeseen Hazards

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

26 Posted Documents

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

27 Meetings

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

28 Correction of Non-Compliance

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "Stop Work Order".

END OF SECTION

1 General

1.1 INSTALLATION AND REMOVAL

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

1.2 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during shutdown work as required, including attendance, maintenance, and fuel.
- .2 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .5 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.3 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power, including portable generator and fuel, during shutdown work for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance, and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of the Departmental Representative.
- .4 Provide and maintain temporary lighting throughout project. Ensure general level of illumination on all floors and stairs is not less than 162 lx and that additional task lighting is provided for specific work.

1.4 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone service (cellular telephones) necessary for own use.

1.5 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations, and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

2 Products

- .1 Not used

3 Execution

- .1 Not used

END OF SECTION

1 General**1.1 RELATED SECTIONS**

- .1 Section 01 11 00 - Summary of Work
- .2 Section 01 33 00 - Submittal Procedures

1.2 DESCRIPTION OF WORK

- .1 Refer to Section 01 11 00 - Summary of Work

1.3 QUALIFICATION OF CONTRACTOR

- .1 Employ only personnel who are qualified and experienced in high voltage work. Personnel must be familiar with the equipment and maintenance procedures necessary to complete the work as specified herein. Personnel must have continuous work experience with at least 5 high voltage projects of similar scope within the past 5 years.
- .2 Provide evidence of relevant experience and accreditation of at least 2 personnel who would be assigned to perform work as specified.
- .3 Retain the services of a qualified Testing Agency to carry out the tests and calibration as required herein. Testing Agency shall be familiar with NETA Standards as specified herein and shall have accreditation equivalent to a full NETA member company.
- .4 Submit detailed records of tests and calibrations for each device for Departmental Representative's review and records.

1.4 CODES AND STANDARDS

- .1 Perform work in accordance with the Workers' Compensation Board and the latest edition of the National Building Code of Canada (NBC), the Fire Code of Canada (FCC), Canadian Electrical Code (CEC), and any other code of provincial or local application provided that, in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Refurbishment and Testing work shall be conducted in accordance with NETA MTS-2011, Maintenance Testing Specifications for Electrical Power and Distribution Systems, per the InterNational Electrical Testing Association Inc. (NETA). It is expected that the Contractor will have a copy of this document.

2 Equipment Covered by this Contract

2.1 MAIN SUBSTATION BUILDING

- .1 12.5 kV switchgear 12.5MS comprised of main section and seven (7) distribution sections including switches.
- .2 2.4 kV switchgear 2.4MS comprised of main section and five (5) distribution sections including switches.
- .3 One (1) 5 MVA ONAN transformer located at outdoor transformer yard adjacent to the building, and three (3) AN indoor transformers (1500/2000 kVA, 750 kVA, and 450 kVA).
- .4 2.4 kV FPE DSP 6, 600 V FPE TLR 3, 480V FPE DSP MKII and 208 V FPE TLR 3 ground fault relays. Test all points as required.
- .5 One (1) 2.4 kV system neutral grounding resistor.

2.2 NORTH GENERATOR ROOM

- .1 One (1) 500 kVA AN transformer on standby system.
- .2 One (1) 2.4 kV system neutral grounding resistor.

2.3 PUMPHOUSE BUILDING

- .1 2.4 kV switchgear 2.4PH comprised of main section and eleven (11) distribution sections and motor starters.

2.4 NORTH LANDING WHARF SUBSTATION BUILDING

- .1 12.5 kV unit substation main section 12.5NL.
- .2 One (1) 1500/1725 kVA AN transformer.
- .3 208 V FPE GFR5M, 208V Eaton D64D1, and 480V FPE DSP MKII ground fault relays. Test all points as required.

2.5 HV SHIP-SHORE SERVICE

- .1 One (1) 5 MVA ONAN transformer with manual secondary switchgear, located at outdoor transformer yard adjacent to Main Substation building.
- .2 One (1) 12.5/11/6.6 kV neutral grounding resistor.
- .3 One (1) 12.5/11/6.6 kV service box with HV power receptacles and control plugs located in service vault north of the drydock.

2.6 SOUTH SIDE SUBSTATION BUILDING

- .1 12.5 kV unit substation main section 12.5SS, and one (1) 2MVA transformer.
- .2 2.4 kV switchgear 2.4SS with two (2) distribution sections.
- .3 480V FPE DSP MKII, and 208V FPE DSP MKII ground fault relays. Test all points as required.

2.7 SOUTH COMPRESSOR ROOM

- .1 2.4 kV unit substation 2.4SC consisting of one (1) main section and one (1) 1 MVA transformer
- .2 600 V FPE TLR 3, and 600V FPE GFR ground fault relays.

2.8 150-TONNE CRANE

- .1 2.4 kV substation consisting of a main switch, a fuse box for two branches, and two (2) transformers.
- .2 2.4 kV slip rings.

2.9 NORTH SIDE 30-TONNE CRANE

- .1 2.4 kV unit substation consisting of a main switch and transformer.
- .2 2.4 kV slip rings.

2.10 SOUTH SIDE 30-TONNE CRANE

- .1 2.4 kV unit substation consisting of a main switch and transformer.
- .2 2.4 kV slip rings.

2.11 DND FEEDER

- .1 Comply with DND requirements for isolation.
- .2 The point of responsibility for this work starts at the isolation switch on EGD side of DND's 12kV pole-top recloser.

2.12 120 VDC BATTERY STATION

- .1 120 VDC station battery cells and battery cabinet in the Main Substation Building.

2.13 HIGH VOLTAGE CABLES

- .1 12.5 kV main feed to Main Substation from DND isolation switch via local man-hole at Naden.
- .2 2.4 kV feed to South Side Compressor Building fed from 2.4PH at Pump House.
- .3 12.5/11/6.6 kV feed to ship-to-shore service vault box 12.5 SVB, via 5 MVA transformer T12.5MS-2 fed from Main Substation.
- .4 12.5 kV feed to South Side Substation fed from Main Substation.
- .5 12.5 kV feed to Landing Wharf Substation Building fed from Main Substation.
- .6 2.4 kV feed to Pumphouse Building fed from Main Substation.
- .7 2.4 kV feed to south side 30-tonne crane fed from South Side Substation.
- .8 2.4 kV feed to 150-tonne crane fed from Main Substation.
- .9 2.4 kV feed to north side 30-tonne crane fed from Main Substation.
- .10 2.4 kV feed to Main Substation fed from 500 kVA transformer in North Generator Room.
- .11 2.4 kV from Pumphouse Building to the three (3) main pumps, the two (2) auxiliary pumps, two (2) compressor breakers, one (1) compressor starter feeder switch, and one (1) remote starter for No. 1 compressor.

3 Execution

3.1 GENERAL

- .1 Complete the work per schedule.
- .2 Arrange for equipment shutdowns with Departmental Representative.
- .3 Do not undertake extra work such as equipment repairs without prior approval of the Departmental Representative.
- .4 Refer to Appendix A and B for preliminary protective device coordination settings. Updated coordination settings will be provided by the Departmental Representative prior to commencement of the work. Perform any recommended changes wherever a clear improvement is achievable over the existing protective device coordination. Provide hand-drawn mark-ups on existing coordination graphs, wherever such changes to device settings are performed, clearly showing the improved coordination. Obtain the written approval of the Departmental Representative for each change.
- .5 Verify the electrical system configuration and component device ratings are as per the attached Single-Line Diagrams (SLDs) in Appendix C. Mark up the SLDs with any noted changes and deliver to the Departmental Representative at the completion of the work.
- .6 Provide test reports for all equipment tested in a complete and organized format.

3.2 TESTING AND REFURBISHMENT

- .1 High Voltage Switchgear
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.1.1.
 - .2 Perform Electrical Tests per NETA Clause 7.1.2 with Test Values per NETA Clause 7.1.3.
 - .3 Perform air circuit breaker inspection and test procedures per NETA Clause 7.6.1.3
 - .4 Perform oil circuit breaker inspection and test procedures per NETA Clause 7.6.2.
- .2 Protective Relays
 - .1 Perform Visual and Mechanical Inspections per NETA Clauses 7.9.1 and 7.9.2.
 - .2 Perform Electrical Tests per NETA Clauses 7.9.1 and 7.9.2.
- .3 Instrument Transformers
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.10.1.
 - .2 Verify the PT and CT ratios and polarities are as per the SLD. If different, mark up the SLD with the correct values.

- .3 Perform Electrical Tests per NETA Clauses 7.10.2, with Test Values per NETA Clause 7.10.3.
- .4 Metering Devices
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.11.1.
 - .2 Perform Electrical Tests per NETA Clause 7.11.2.
- .5 High Voltage Cables
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.3.3.1.
 - .2 Perform Electrical Tests per NETA Clause 7.3.3.2 with megohmmeter. D.C. High-Potential Testing is not required. Test values shall be per NETA Clause 7.3.3.3.
- .6 Transformer, Liquid-Filled
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.2.2.1.
 - .2 Perform Electrical Tests per NETA Clause 7.2.2.2 with Test Values per NETA Clause 7.2.2.3. Compare historical results for each transformer.
- .7 Transformer, Dry Type
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.2.1.2.1.
 - .2 Perform Electrical Tests per NETA Clause 7.2.1.2.2.
- .8 Neutral Grounding Resistor, Dry Type
 - .1 Perform visual and mechanical inspections and cleaning.
 - .2 Perform resistance measurements using low-resistance ohmmeter.
- .9 Direct Current System
 - .1 Perform Visual and Mechanical Inspections per NETA Clause 7.18.1.3.1 and 7.18.2.1.1.
 - .2 Perform Electrical Tests per NETA Clause 7.18.1.3.
- .10 Ground Fault Relay System
 - .1 Test, calibrate, and verify the control wiring for 2.4 kV FPE DSP 6, 600 V FPE TLR 3, 480V FPE TLR 3, 208 V FPE TLR 3 and GFR5M, and 150-tonne crane gantry FPE DSP Mark II ground fault relays as listed.
 - .2 Provide written report.
 - .3 Refer to Section 2 for detailed list of relays.

3.3 MINOR MODIFICATION AND REPAIR WORK

- .1 Inspect all O-Rings in all minimum oil circuit breakers for leaks and replace as required.
- .2 Inspect oil level in all minimum oil circuit breakers and top up as required.
- .3 Inspect all SACE oil circuit breaker motor charging wiring, replace or repair as required.
- .4 Verify existing Main Substation 600V and 208V transformer temperature monitors are in operating condition, replace or repair as required.
- .5 Replace Main Substation 208V transformer phase A high voltage insulator.

- .6 Inspect housing of neutral grounding plug at Shore Power Connection Pit. Resolve all drainage and issues as required.
- .7 Replace 2.4PH-8DS B phase switch contact.
- .8 Compare 30T North Crane 500kVA transformer core megger test results with original commissioning report and previous HV Maintenance report results. Report any discrepancies.
- .9 In addition to all tests and maintenance as indicated in section 3.2.1 for the 2.4kV motor starters in the Pumphouse, check all contacts, check all connections, measure and record all contacts resistance, visually inspect, test overloads, clean contacts if needed, and note recommendations in completion report. Do not perform any repairs to 2.4kV motor starters unless authorized by Departmental Representative. Arc shuts do contain Asbestos.
- .10 Review repairs completed as part of 2012 thermographic inspection report, confirm all issues identified have been resolved. Repair or resolve outstanding issues as required.
- .11 Review installation of 2.4kV neutral grounding resistor in Main Substation for code and safety requirements. Provide engineered solution for Departmental Representative's consideration.
- .12 Review manual operating mechanism of MVOCB in North Landing Wharf Substation for code and safety requirements. Provide engineered solution for Departmental Representative's consideration. If no solution is available, breaker to be replaced.

3.4 CONTRACTOR'S TOOLS AND EQUIPMENT

- .1 In addition to all testing instruments and equipment, make the following equipment and tools available for the duration of the work.
 - .1 Minimum of 5 high voltage hot sticks, 1 m long, extendable to 2 m, Pfisterer Part No. 364-169-170, or equal.
 - .2 Minimum of 10 3-phase grounding cable sets with 70 mm² cable, 1.5 m phase lengths, 3 m ground length, complete with 3 hot stick-applied and 1 hand-applied ground clamp, Pfisterer Part No. 368-620-070 or equal.

END OF SECTION

APPENDICES

- Appendix A Esquimalt Graving Dock – High Voltage Maintenance Report 2012 – Eaton Corporation and Emery Electric
- Appendix B Esquimalt Graving Dock - High Voltage Maintenance Report 2012 Coordination Study Review - Eaton Corporation and Emery Electric
- Appendix C Drawings
- Appendix D EGD Lockout Policy and Procedures
- Appendix E EGD Environmental Best Management Practices
- Appendix F Preliminary Job Hazard Analysis
- Appendix G Health & Safety Plan Requirements

APPENDIX A

ESQUIMALT GRAVING DOCK – 2012 HIGH VOLTAGE MAINTENANCE REPORT – EATON CORPORATION AND EMERY ELECTRIC

Thursday, March 15, 2012

Public Works and Government Services

825 Admirals Road,
Victoria BC
V9A 2P1

**Re: Esquimalt Graving Dock
2012 Medium Voltage Maintenance & Minor Repair Work
Solicitation No. EZ899-122269/A**

Dear: Steve Windl, Ken Nielson & Joe Lezetc,

This letter is followed by an in depth report that covers the results and recommendations from the 2012 Esquimalt Graving Dock medium voltage maintenance. The report also contains any specifications or useful information pertaining to the equipment and the material that Eaton supplied under this contract.

The new hinged doors for the 12.5kV and 2.4kV switchgear in the main substation have been designed and fabricated in accordance with CSA standard C22.2 No. 31-10. *Switchgear Assemblies* section 4.5 *Doors and Covers*. The four missing panels for the 12.5kV equipment will be shipped to Eemery Electric as soon as they are ready.

Lorne Cowley has completed hand markup drawing verifications. Hard copies of these markups will follow this report.

Thank you for using Eaton Electrical Services and Systems. Should you have any questions please do not hesitate to contact me.

Best regards,



Colin Green, P.Eng.

Project Engineer
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Eaton Corporation

Eaton Electrical Services & Systems

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Executive Summary

Results & Corrective Actions

Main Substation

- **T12.5MS-4 oil analysis results indicate overheated cellulose insulation and discharging of gasses, this transformer should have regular gas in oil samples taken at 6 month intervals in order to determine rate of off-gassing**
- Feeder 12.5MS-8 isolation switch was missing an 'E' type circlip, Cody Gander installed a new circlip that is identical to the existing ones
- Several of the SACE oil circuit breaker motor charging wires inside the chassis showed signs of heating and insulation damage, when this was observed the wires were taped with standard electrical tape
- Protection relay settings do not match the coordination study supplied by Genivar
- Several lamp indication lights were burnt out, refer to test sheets for specific identifications
- The main circuit breaker closed indication light is burnt out
- The key interlock system for the Eaton VCP-T25 vacuum circuit breaker is custom fabricated and causes issue with the racking mechanism, Eaton has an interlock kit that goes inside the breaker to prevent closing when the key is removed, there is no standard interlock kit associated with the racking mechanism
- Several control wires were found loose, all found were tightened
- An electromechanical relay for feeder 2.4MS20 was removed from service and replaced with an identical relay that was a spare inside the substation
- **Wire #2-6 for circuit breaker 2.4MS21 is disconnected from the AC control voltage monitoring relay, the wire was left unconnected as the reason for this was unknown, the screw was missing from the proper terminal**
- **Clearance between the 2.4kV neutral grounding resistor and the switchgear door is very small, in the event of a ground fault arcing may occur from the NGR line side terminal to the switchgear structure**
- **T12.5MS-4 high voltage bushings and temperature monitor show signs of oil leaks, these locations should be monitored closely to determine if the leaks are persistent**
- 600V and 208V transformer temperature monitors are not functional
- 480V transformer shows signs of overheating, core varnish is degrading and coils operate at a high temperature
- 208V transformer phase A high voltage insulator has a small chip in it

Shore Power Connection Pit

- **the aluminum box that houses the neutral grounding plug has a layer of white crystalline goo in the bottom, this debris was cleaned out, a drain hole(s) should be made and the source of the water (salt air) should be found and corrected and possibly a heater installed**
- The lid area outer rim was clogged with dirt and was not letting it drain and therefore there was water in the chamber, this was cleaned and lock and hasp cleaned and oiled
- **the emergency light in the pit had power to it but did not operate on test or when unplugged**

Pump House Substation

- 2.4PH-8DS B phase switch contact is pitted and should be replaced
- Several of the isolation switches in the Pump House switchboard required exercise and contact cleaning in order to improve contact resistance
- Cell #15 kirk key interlocking scheme has been modified, see the detailed outline of the new interlocking scheme contained within this report

North Landing Warf Substation

- **The manual operating mechanism of the MVOCB was found dysfunctional, extensive operation and lubrication of the mechanism repaired operation, this breaker should be considered non-operable and only isolated using the upstream feeder equipment**

South Side Substation

- No comments

South Compressor No. 4 Substation

- **The transformer is not seismically restrained, recommend installing properly rated seismic restraints to prevent damage during earthquake**

South Crane Switchboard

- No comments

30T North Crane

- **The 500kVA transformer core megger result indicated that the core was bonded to ground even with the ground strap removed, this transformer should be monitored for overheating and the original commissioning report should be consulted to see if this was an issue then**
- The slip rings had some filings below the outboard bearing that were cleaned out

30T South Crane

- The slip ring box had some water pooling in it and requires repair or a different gasket on the side cover

150T Crane

- The slip ring cover was siliconed on and was VERY difficult to remove, all of the old silicone was removed and new gasketing was installed that will (hopefully) seal it and future removal will not be so difficult

Merlin Gerin LVACB High Current Testing

- **Several of the MG trip unit I²t elements to not operate properly, the I²t element should be considered non-operable by PWGSC, all time elements that are in service should have the I²t function turned off**

Scope of Eaton Contract

Testing

- Test 12.5kV switchgear c/w 7 feeders (switch over breaker c/w overcurrent relays)
- Test 2.4 kV switchgear c/w 5 feeders (switch over breaker c/w overcurrent relays)
- Test one 5MVA transformer (oil type)
- Test three indoor transformers (dry 1500/2000kVA, 750kVA, 450kVA)
- Test ground fault DSP (2.4kV - 6 units), TLR (600V - 3 units and 208V - 3 units)
- Test 2.4kV neutral grounding resistor
- Test one 500kVA AN transformer (dry)
- Test one 2.4kV neutral grounding resistor
- Test one 2.4kV breaker
- Test two 2.4kV cross-the-line starter
- Test eight 2.4kV autotransformer starter
- Test 2.5kV unit substation main section transformer feeder
- Test 1500kVA transformer (oil)
- Test 208V ground fault system - seven feeder
- Test one 5MVA transformer (oil)
- Test one 12.5/11/6.6 kV neutral grounding resistor
- Test one 12.5/11/6.6 kV service box with HV power receptacles and control plugs
- Test one 12.5kV unit substation main section 12.5SS feeder breaker
- Test one 2MVA transformer
- Test 2.4kV switchgear 2.4SS with 2 distribution sections
- Test 2.4kV 2.4SC main section
- Test 1MVA transformer
- Test 600V FPE TLR three ground fault relay
- Test 150 tonne crane substation (switch and transformer)
- Test 30 tonne crane north (switch and transformer)
- Test 30 tonne crane south (switch and transformer)
- Test high voltage cable testing - 12.5 kV main feed to main substation
- Supply test report
- Primary injection of 3 x MG 2000A, 600V power circuit breaker
- Take oil sample of 2 x oil fill transformer
- Oil sample test
- Check transformer temperature gauge

Supply

- O-Rings for oil circuit breakers
- Voltesso 35 oil for OCB's
- Neoprene Gasket material
- Transformer pressure gauge
- Transformer temperature thermostat
- Ground sets as per approved data sheet (qty 2)
- MG test cables
- Lab test for OCB oil
- Copper link for existing OCB in cell #15 & hardware
- Kirk key interlock for Pump House cell #15
- New current transformers for North Landing Warf ground fault relays
- New rear switchgear doors (qty 30)

Work Performed

Ground Fault Protection System

1. The Ground Fault system has been visually and mechanically inspected for physical damage, proper installation, operating environment and general condition.
2. Electrical tests were performed to determine the functionality of the Ground Fault system.
3. All test data and inspection results have been recorded for evaluation and historical reference. Any problems found, corrective actions taken, abnormal results or recommendations noted have been summarized in this field service report.

Grounding Resistor

1. Field data was collected and recorded for the Ground Resistor.
2. A thorough inspection was performed of the devices physical condition, cleanliness, internal components and installation. The results of these inspections were noted on the data form.
3. The Ground Resistor was electrically tested and the results were noted.
4. Any issues or discrepancies are noted in this field service report.

Liquid Filled Transformer

1. Transformer visual and mechanical inspections were performed and results recorded.
2. Electrical tests were conducted. The results of these tests were evaluated to insure the transformer was suitable for energization and continued use.
3. Oil samples were taken and sent for analysis. Oil results will follow this report once received from the laboratory.
4. All inspection and test results were recorded on the appropriate data form and are attached for reference. All problems found, corrective actions taken and recommendations were noted on the data sheet and are included in this report.

Medium Voltage Cable

1. A visual inspection was performed to evaluate the condition of the cables to be tested. The inspection included installation, physical condition, terminations, shield grounding, bend radius and concentric neutral.
2. An Insulation Resistance test was performed.
3. All results and inspections were recorded and evaluated. All problems found, corrective actions taken and recommendations are detailed in this field service report.

Medium Voltage Oil Breaker

1. The Medium Voltage Oil Breaker was visually and mechanically inspected for physical damage, proper installation and operating condition.
2. Insulation Resistance tests were performed for the breaker and the results were documented.
3. Contact Resistance measurements were taken, recorded and evaluated.
4. All inspections and test results were recorded and can be found on the attached data sheet. All results were evaluated and any problems found, corrective actions taken and recommendations are provided in this field service report.

Medium Voltage Starter

1. General information and field data were collected for the Medium Voltage Starter.
2. Inspections were performed and the results recorded and evaluated. These inspections included the physical and mechanical condition, cell condition, connections, moving linkages and assemblies, primary and secondary disconnects, insulators and bracing, ground connections, interlocks and main contacts.
3. Electrical tests were conducted for further evaluation of the starter. These tests included contact and fuse resistance measurements, insulation resistance, electrical interlocks and trip/function tests.
4. All test and inspection results were documented and evaluated and any problems found, corrective actions taken and recommendations are included in this report.

Medium Voltage Vacuum Breaker

1. The Medium Voltage Vacuum Breaker was visually and mechanically inspected for damage and operating condition.
2. The trip circuit was tested to insure correct operation.
3. Breaker contact resistance measurements were taken and recorded.
4. Additional electrical tests were performed to evaluate the performance of the circuit breaker. Refer to the attached data sheet for specific tests performed and the results.
5. The data and test results obtained in the inspection of the Medium Voltage Circuit Breaker were recorded and evaluated. Any problems found, corrective actions taken and recommendations are detailed in this field service report.

Motor Overload

1. Field data was gathered and recorded for the Motor Overload.
2. Electrical tests were conducted to evaluate the overloads ability to perform as intended.
3. All inspection and tests results were recorded and evaluated. These records are attached to this report for review. Any problems found, corrective actions taken and recommendations that resulted from the evaluation are contained in this field service report.

Medium Voltage Switch

1. The Medium Voltage Switch was visually and mechanically inspected for damage and operating condition.
2. The main contacts resistance was measured and recorded.
3. Additional electrical tests were performed to evaluate the performance of the switch. Refer to the attached data sheet for specific tests performed and the results.
4. The data and test results obtained during the inspection of the Medium Voltage Switch were recorded and evaluated. Any problems found, corrective actions taken and recommendations are detailed in this field service report.

Protective Relay

1. All protective relays were tested in accordance with the manufacturer's recommendations.
2. In general, the mechanical checks included cleaning the relay and cover, inspection for physical damage, correct installation, wiring connections and screws for tightness. If the relay was electro-mechanical it was also inspected for dust, iron fillings, rust, or foreign matter. The relay contacts were inspected for freedom of movement.
3. The electrical checks performed were pickup, time delay and instantaneous trip.

4. All test results and observations were recorded for evaluation and are attached to this report. Any deficiencies, corrective actions or recommendations noted can be found in this field service report.

Station Battery

1. A visual inspection was performed to determine the general condition of the Station Battery. Specific inspections were performed to determine the operating condition of the system.
2. Charger information was obtained and reviewed.
3. All applicable data collected during the inspection has been recorded on data sheets and is attached to this report. Any corrective actions taken, abnormal results or recommendations noted are summarized in this field service report.

Dry Type Transformer

1. Transformer visual and mechanical inspections were performed and results recorded.
2. Electrical tests were conducted. The results of these tests were evaluated to make sure the transformer was suitable for energization and continued use.
3. Transformer winding resistance measurements were taken.
4. All inspection and test results were recorded on the appropriate data form and are attached for reference. All problems found, corrective actions taken and recommendations were noted on the data sheet and are included in this report.

New Interlock for Pump House Cell #15

Description

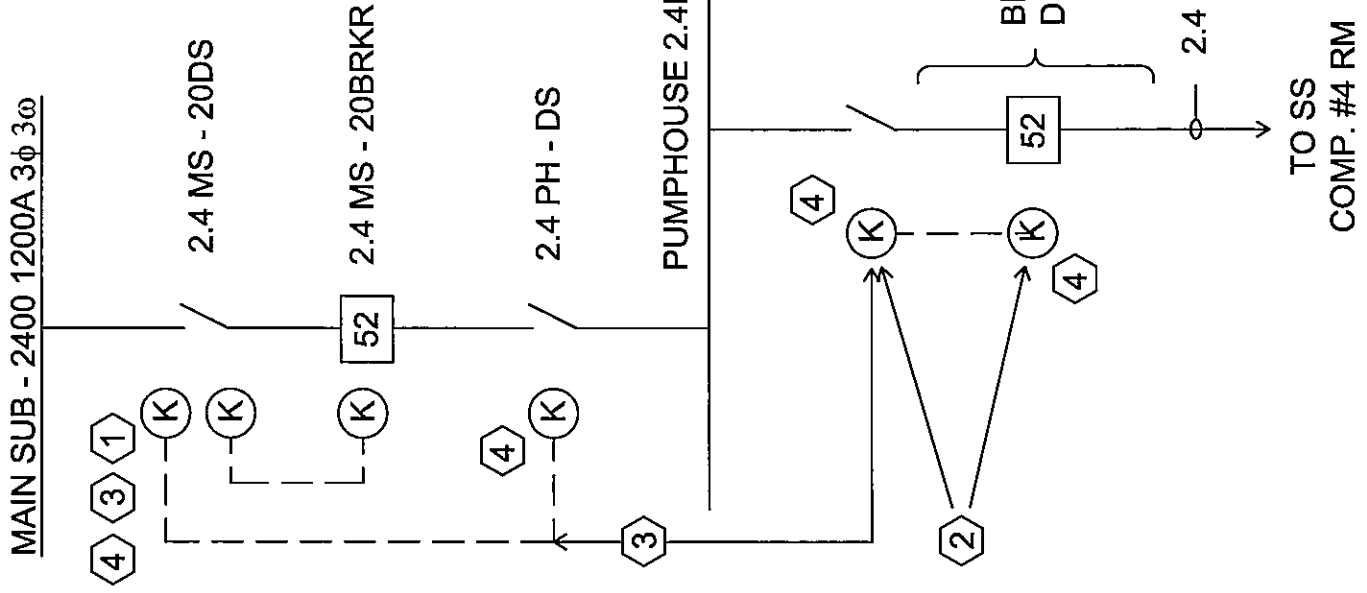
The disconnect switch at 2.4kV switchboard in the Pump House feeding "South Compressor #4 Room" oil circuit breaker has been removed by Emery Electric Ltd. The existing disconnect interlock at 2.4PH-15DS has been re-keyed to match the interlock at 2.4PH-DS and 2.4MS-20DS. Interlock number K1 is now labeled K11 and is keyed 373793 (former master keying in K1 has been removed). Normal state will have the K11 key resident at 2.4MS-20DS and captive when 2.4MS-20DS is in the closed position. The system contains only one key to insure that 2.4PM-DS and 2.4-15DS cannot change state unless 2.4MS-20DS is in the open position.



Eaton Job Number: EVC12J0027

Kirk Key Alteration Diagram

PUMPHOUSE CELL 15 - INTERLOCK REVISION - EGD



ALL WORK DURING NORMAL HOURS WITH NO INTERRUPTION TO POWER

1. REMOVE INTERLOCK AT 2.4 MS - 20DS (REMAINING INTERLOCKS/PROVIDE SAFETY ON SYSTEM).
2. REMOVE INTERLOCKS ON DISCONNECT AND BREAKER FEEDING S.S. COMP.#4. THE INTERLOCK ON THE DISCONNECT FEEDING SS COMP #4 CAN NOW BE KEYED. THE SAME AS THE INTERLOCK 2.4 PH - DS.
3. REPLACE INTERLOCKS (WITH THE KEY CAPTIVE AT 2.4 MS - 20 DS) TO GET KEY 2.4 MS - 20 BREAKER MUST BE OPENED TO ALLOW 2.4 MS - 20 DS TO BE OPENED AND THEREBY ALLOWING ACCESS TO INTERLOCK KEY FOR 2.4 PH - DS AND DISCONNECT FEEDING SS COMP #4.
4. RE-LABEL "K11".
5. INTERLOCK CAN BE RE-INSTALLED TO ALLOW LOCK OUT IN OPEN POSITION. (BREAKER & INTERLOCK TO BE REMOVED DURING SHUTDOWN).

Coordination Study Comparisons



Powering Business Worldwide

Eaton Job # EVC12J0027

Relay settings versus coordination study

Main Substation

Feeder ID	As Found	CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-1 - Phase	As Found	200:5	IEC-B	1.62x (324A pri.)	0.20		
	Coordination study	600:5		0.54 (324A pri.)			
	As Found	600:5	Off				
12.5MS-1 - Ground	Coordination study		V Inv.	0.5x	0.05		
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-2 - Phase - SEL501 X Winding	As Found	300:5	U4	3.9A	1.00	39A	
	Coordination study		U1	2.15		Off	
	As Found		Off				
12.5MS-2 - Ground - SEL501 X Winding	Coordination study	300:5	U4	0.10	0.50	0.30	
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-2 - Phase - SEL501 Y Winding	As Found	300:5	U4	3.9A	1.00	39A	
	Coordination study		U1	2.15		Off	
	As Found		Off				
12.5MS-2 - Ground - SEL501 Y Winding	Coordination study	300:5	U4	0.10	0.50	0.30	
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-2 - Phase - SEL351	As Found	300:5	U4	0.5A	6.00	40A	
	Coordination study		U5	4A	3.00	50A	
	As Found		U4	0.1A	1.00	0.5A	
12.5MS-2 - Ground - SEL351	Coordination study	300:5					
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-3 - Phase	As Found	150:5	E Inv.	1x	0.50	10x	
	Coordination study						
	As Found		D2	0.5x	0.10	1x	
12.5MS-3 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-4 - Phase	As Found	300:5	V Inv.	0.8x	0.25	12x	
	Coordination study						
	As Found		D2	0.5x	0.10	1x	
12.5MS-4 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-5 - Phase	As Found	75:5	V Inv.	2.4x	0.30	8x	
	Coordination study						
	As Found		D2	0.5x	0.30	1x	
12.5MS-5 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-6 - Phase	As Found	25:5	V Inv.	1x	0.50	10x	
	Coordination study						
	As Found		D2	0.5x	0.10	1x	
12.5MS-6 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-7 - Phase	As Found	40:5	V Inv.	1x	0.30	10x	
	Coordination study						
	As Found		D2	0.5x	0.10	1x	
12.5MS-7 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5MS-8 - Phase	As Found	75:5	V Inv.	1.6x	0.30	9x	
	Coordination study						
	As Found		D2	0.5x	0.10	1x	
12.5MS-8 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4MS-20 - Phase	As Found	1200:5	V Inv.	5A	1.00	50A	
	Coordination study			4A			
	As Found		None				Ground fault protection implemented through FPE system
2.4MS-20 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4MS-21 - Phase	As Found	300:5	E Inv.	220%	5.00	20x	
	Coordination study						
	As Found		DT	15%	1.00	1x	
2.4MS-21 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4MS-22 - Phase	As Found	75:5	E Inv.	2.01x	5.60	18.74x	Coordination settings taken from Turkan coordination report supplied by Emery
	Coordination study						
	As Found		None	None	None	1x	Coordination settings taken from Turkan coordination report supplied by Emery
2.4MS-22 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4MS-23 - Phase	As Found	100:5	E Inv.	120%	8.00	12x	Coordination settings taken from Turkan coordination report supplied by Emery
	Coordination study						
	As Found		Off				Coordination settings taken from Turkan coordination report supplied by Emery
2.4MS-23 - Ground	Coordination study						
	As Found						
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4MS-24 - Phase	As Found	150:5	V Inv.	4A	2.00	60A	
	Coordination study						
	As Found		None				Ground fault protection implemented through FPE system
2.4MS-24 - Ground	Coordination study						
	As Found						

Tested by: Colin Green / Brent Hughes



Eaton Job # EVC12J0027

Relay settings versus coordination study

South Side Substation

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5SS-1 - Phase	As Found	150:5	V Inv.	6A	0.20	48A	
	Coordination study						
12.5SS-1 - Ground	As Found	150:5	V Inv.	0.5A	1.00	20A	Cannot locate settings in coordination study for this feeder
	Coordination study						
Tested by: Sean Gray							



Eaton Job # EVC12J0027

Relay settings versus coordination study

South Crane Switchboard

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4SS-30T - Phase	As Found	50:5	E Inv.	2.38x	5.60	20x	Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						
2.4SS-30T - Ground	As Found	200:5		1x	2.5s		Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						
2.4SS-Spare - Phase	As Found	50:5	E Inv.	2.38x	5.60	20x	Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						
2.4SS-Spare - Ground	As Found	200:5		1x	2.5s		Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						

Tested by: Lorne Cowley



Eaton Job # EVC12J0027

Relay settings versus coordination study

South Compressor Room

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4SC-BKR1 - Phase	As Found		V Inv.	3.75A	0.50	40A	Cannot locate settings in coordination study for this feeder
	Coordination study						
2.4SC-BKR1 - Ground	As Found		None				Cannot locate settings in coordination study for this feeder
	Coordination study						

Tested by: Lorne Cowley



Eaton Job # EVC12J0027

Relay settings versus coordination study

North Landing Warf Substation

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5NL-105 - Phase	As Found	75:5	V Inv.	6A (120)	0.50	80A (1600)	
	Coordination study					70A (1400)	
12.5NL-105 - Ground	As Found	75:5	V Inv.	1.5A (30)	0.50	12A (240)	
	Coordination study			2A (40)		10A (200)	

Tested by: Sean Gray

Transformer Oil Analysis Results

The 12.5kV to 2.4kV transformer 12.5MST-4 should have another gas-in-oil sample and analysis performed at the earliest opportunity in order to establish a baseline for the rate of degradation.

EATON ELECTRICAL SERVICES & SYSTEMS 1693 CLIVEDEN AVENUE	Serial#: PID0263	Mfr: ALSTOM	Control#: 6396246
DELTA, BC V3M 6V5 CA ATTN: COLIN GREEN PO#: 4368-2535 Project ID: EVC12J0027 Customer ID:	Location: ESQUIMALT GRAVING DOCK Equipment: TRANSFORMER Compartment: MAIN(BOTTOM) Breathing: SEAL Bank: Phase: Fluid: ENV USGal: 920 Liters:	kV: 12.5 kVA: 5000 Year Mf'd: 2003 Syringe ID: 6001057 Bottle ID: 1 Sampled By:	Order#: 386326 Account: 6096 Received: 03/12/2012 Reported: 03/14/2012

Lab Control Number:		6396246
Date Sampled:		03/03/2012
Order Number:		386326
Oil Temp:		10
Dissolved Gas Analysis (DGA) ASTM D-3612	Hydrogen (H2) (ppm):	38
	Methane (CH4) (ppm):	4
	Ethane (C2H6) (ppm):	64
	Ethylene (C2H4) (ppm):	5
	Acetylene (C2H2) (ppm):	<1
	Carbon Monoxide (CO) (ppm):	92
	Carbon Dioxide (CO2) (ppm):	660
	Nitrogen (N2) (ppm):	62649
	Oxygen (O2) (ppm):	<500
	Total Dissolved Gas (TDG) (ppm):	63610
Total Dissolved Combustible Gas (TDCG) (ppm):		203
Equivalent TCG (%):		0.2169
DGA Diagnostics	DGA Keys Gas / Interpretive Method: (most recent sample)	IEEE Guidelines are not applicable for this fluid type.
	DGA TDCG Rate Interpretive Method: (two most recent sample)	IEEE Guidelines not applicable for this fluid type.
	DGA Cellulose (Paper) Insulation:	CO2/CO Ratio not applicable for this fluid type.
	WDS DGA Condition Code: WDS Recommended Action:	WDS DGA Condition Code & Recommended Action for Transformers with Mineral Oil only.
Comment:		
General Oil Quality (GOQ)		
D-1533	Moisture in Oil (ppm):	18
D-971	Interfacial Tension (dynes/cm):	24.39
D-974	Acid Number (mg KOH/g):	0.038
D-1500	Color Number (Relative):	L0.5
D-1524	Visual Exam. (Relative):	CLR&SPRK
D-1524	Sediment Exam. (Relative):	L
D-877	Dielectric Breakdown (kV):	35
D-924	Power Factor @ 25C (%):	0.064
D-924	Power Factor @ 100C (%):	3.238
D-4052	Specific Gravity (Relative):	0.9179
GOQ Diagnostics PER IEC 61203-1992 (most recent sample)	Moisture in Oil:	Acceptable for in-service oil (400 ppm max).
	Interfacial Tension:	Diagnostic not applicable.
	Acid Number:	Acceptable for in-service oil (2 mg KOH/g max).
	Color Number and Visual:	Diagnostic not applicable. Acceptable for in-service oil (CLR&SPRK).
	Dielectric Breakdown D-877:	Diagnostic not applicable.
	Dielectric Breakdown D-1816:	

Notations: 1. The WDS laboratory has received ISO/IEC 17025:2005 accreditation for this test, L-A-B certificate #L2303.01. 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test.

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EATON ELECTRICAL SERVICES &
SYSTEMS

1693 CLIVEDEN AVENUE

DELTA, BC V3M 6V5 CA

ATTN: COLIN GREEN

PO#: 4368-2535

Project ID: EVC12J0027

Customer ID:

Serial#: PID0263

Location: ESQUIMALT GRAVING
DOCK

Equipment: TRANSFORMER

Compartment: MAIN(BOTTOM)

Breathing: SEAL

Bank: Phase:

Fluid: ENV USGal: 920

Liters:

Mfr: ALSTOM

kV: 12.5

kVA: 5000

Year Mf'd: 2003

Syringe ID: 6001057

Bottle ID: 1

Sampled By:

Control#: 6396246

Order#: 386326

Account: 6096

Received: 03/12/2012

Reported: 03/14/2012

Lab Control Number:	6396246
Date Sampled:	03/03/2012
Order Number:	386326
Oil Temp:	10
Power Factor @25C:	Exceeds limit for in-service oil (0.01% max).
Power Factor @100C:	Diagnostic not applicable.
Oxidation Inhibitor:	
Comment:	

End of Test Report

Authorized By: 

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EATON ELECTRICAL SERVICES &
 SYSTEMS
 1693 CLIVEDEN AVENUE

Serial#: S874301
 Location: ESQUIMALT GRAVING
 DOCK

Mfr: FEDERAL
 PACIFIC
 kV: 12.5

Control#: 6396249
 Order#: 386326

DELTA, BC V3M 6V5 CA
 ATTN: COLIN GREEN
 PO#: 4368-2535

Equipment: TRANSFORMER
 Compartment: MAIN(BOTTOM)
 Breathing: SEAL
 Bank: Phase: 3

kVA: 5000
 Year Mf'd: 1980
 Syringe ID: 6000947
 Bottle ID: 2

Account: 6096
 Received: 03/12/2012
 Reported: 03/14/2012

Project ID: EVC12J0027
 Customer ID:

Fluid: MIN USGal:
 Liters:

Sampled By:

Lab Control Number:	6396249
Date Sampled:	03/03/2012
Order Number:	386326
Oil Temp:	

Dissolved Gas Analysis (DGA) ASTM D-3612	Hydrogen (H2) (ppm):	13
	Methane (CH4) (ppm):	14
	Ethane (C2H6) (ppm):	4
	Ethylene (C2H4) (ppm):	34
	Acetylene (C2H2) (ppm):	<1
	Carbon Monoxide (CO) (ppm):	561
	Carbon Dioxide (CO2) (ppm):	2420
	Nitrogen (N2) (ppm):	73176
	Oxygen (O2) (ppm):	576
	Total Dissolved Gas (TDG) (ppm):	76798
	Total Dissolved Combustible Gas (TDCG) (ppm):	626
	Equivalent TCG (%):	0.5876

DGA Diagnostics	DGA Keys Gas / Interpretive Method: PER IEEE C57.104-2008 (most recent sample)	Hydrogen within condition 1 limits (100 ppm). Methane within condition 1 limits (120 ppm). Ethane within condition 1 limits (65 ppm). Ethylene within condition 1 limits (50 ppm). Acetylene within condition 1 limits (1 ppm). Carbon Monoxide: Condition 2 Indications of overheated cellulose insulation (350 ppm). Carbon Dioxide within condition 1 limits (2500 ppm). TDCG within condition 1 limits (720 ppm).
	DGA TDCG Rate Interpretive Method: PER IEEE C57.104-2008 (two most recent sample)	No previous sample available.
	DGA Cellulose (Paper) Insulation:	CO2/CO Ratio not applicable - neither gas exceeds its limit.
	WDS DGA Condition Code:	CAUTION
	WDS Recommended Action:	Resample at earliest opportunity to establish gas generation rate.

Comment:

General Oil Quality (GOQ)	
D-1533	Moisture in Oil (ppm): 8
D-971	Interfacial Tension (dynes/cm): 35.47
D-974	Acid Number (mg KOH/g): 0.011
D-1500	Color Number (Relative): L3.0
D-1524	Visual Exam. (Relative): CLR&SPRK
D-1524	Sediment Exam. (Relative): T
D-877	Dielectric Breakdown (kV): 48
D-924	Power Factor @ 25C (%): 0.301
D-924	Power Factor @ 100C (%): 4.781
D-4052	Specific Gravity (Relative): 0.8689

GOQ Diagnostics Moisture in Oil: Acceptable for in-service oil (35 ppm max).

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EATON ELECTRICAL SERVICES &
SYSTEMS
1693 CLIVEDEN AVENUE

Serial#: S874301

Mfr: FEDERAL
PACIFIC

Control#: 6396249

Location: ESQUIMALT GRAVING
DOCK

kV: 12.5

Order#: 386326

Equipment: TRANSFORMER

kVA: 5000

Account: 6096

DELTA, BC V3M 6V5 CA

Compartment: MAIN(BOTTOM)

Year Mf'd: 1980

Received: 03/12/2012

ATTN: COLIN GREEN

Breathing: SEAL

Syringe ID: 6000947

Reported: 03/14/2012

PO#: 4368-2535

Bank: Phase: 3

Bottle ID: 2

Project ID: EVC12J0027

Fluid: MIN USGal:

Sampled By:

Customer ID:

Liters:

Lab Control Number:	6396249
Date Sampled:	03/03/2012
Order Number:	386326
Oil Temp:	
PER IEEE C57.106-2006 (most recent sample)	Interfacial Tension: Acceptable for in-service oil (25 dynes/cm min). Acid Number: Acceptable for in-service oil (0.2 mg KOH/g max). Color Number and Visual: Diagnostic not applicable. Diagnostic not applicable. Dielectric Breakdown D-877: Diagnostic not applicable. Dielectric Breakdown D-1816: Power Factor @25C: Acceptable for in-service oil (0.5% max). Power Factor @100C: Acceptable for in-service oil (5% max). Oxidation Inhibitor:
Comment:	

End of Test Report

Authorized By: 

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Test Sheets

* Note: Some test sheets may indicate a 100A or other ductor test was performed. This is a bug in the Eaton test sheet database software. All ductor tests were performed at 10A.

Feeder Megger Results



Eaton Job # EVC12J0027

Tested date: March 3, 2012
EGD Cable Test Results

Canada Wire Extreme
XLPE, 15kV, (1983), 100% Insul, 4/0 CU

Main DND supply @ 5kV DC

Feeder ID	Ω (giga)	PI	Cap (μF)	Current (mA)	DAR
A - front	257.4	1.06	0.137	19.76	1.39
A - rear	517	2.73	0.139	9.838	1.22
B - front	2954	9.85	0.139	1.722	1.63
B - rear	167.7	1.1	0.138	30.35	1.41
C - front	708	2.47	0.139	7.182	1.18
C - rear	223.6	7.98	0.138	22.76	0.12

Comments:

- NETA maintenance testing standards clause 7.3.3.3.5 states "Minimum insulation-resistance values should be comparable to previously obtained results but not less than two megohms."
- **NETA does not contain references with regards to medium voltage cable PI test results**
- NETA MTS table 10.1 lists the minimum insulation resistance results for 15kV cables as 5 gigohms

Tested by: Lorne Cowley

Esquimalt Graving Dock Cable Test Results

Results in Giga Ohms

Feeder ID	A	B	C	Test Voltage
Main DND supply	Refer to separate test sheet			
12.5kV T12.5MS-4 from Main Sub - set 1	700.00	595.00	869.00	5kV DC
12.5kV T12.5MS-4 from Main Sub - set 2	25.50	19.30	20.20	5kV DC
12.5kV T12.5MS-2 from Main Sub	700.00	595.00	869.00	5kV DC
Ship to shore service vault	188.60	236.10	397.40	5kV DC
12.5kV S. Side Sub from Main Sub	10.68	28.70	6.90	5kV DC
12.5kV N. Landing Warf from Main Sub	17.90	19.80	17.60	5kV DC
2.4kV S. Comp Bldg from Pump House	24.49	13.85	23.61	2.5kV DC
2.4kV Pump House from Main Sub	12.54	21.07	9.88	2.5kV DC
2.4kV 30T from S. Side Crane Swgr	1.68	1.48	1.63	2.5kV DC
2.4kV 150T from Main Sub	3.04	1.58	1.22	2.5kV DC
2.4kV 30T from Main Sub	6.66	11.30	11.58	2.5kV DC
2.4kV 500kVA Emerg from Main Sub	2.09	2.09	2.09	2.5kV DC
2.4kV Main Pump #1 from Pump House	0.13	0.13	0.13	2.5kV DC
2.4kV Main Pump #2 from Pump House	0.14	0.14	0.14	2.5kV DC
2.4kV Main Pump #3 from Pump House	0.11	0.11	0.11	2.5kV DC
2.4kV Aux Pump #1 from Pump House	0.63	0.63	0.63	2.5kV DC
2.4kV Aux Pump #2 from Pump House	0.47	0.47	0.47	2.5kV DC
2.4kV Compressor #1 from Pump House	33.20	33.20	33.20	2.5kV DC
2.4kV Compressor #2 from Pump House	87.50	87.50	87.50	2.5kV DC
2.4kV Compressor #3 from Pump House	14.80	14.80	14.80	2.5kV DC
2.4kV S. Compressor #4 from Pump House	23.43	23.77	22.57	2.5kV DC
Tested by: Lorne Cowley / David Norris / Chris Lai / Sean Gray / Colin Green				



Eaton Job Number: EVC12J0027

Main Substation

Battery Bank / Charger Periodic Inspection

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	N/A
DEVICE / FEEDER ID:	Main Substation DC Supply	DATE TESTED:	March 3, 2012

FIELD DATA

BATTERY INFORMATION:		TYPE:	
MANUFACTURER:		NUMBER OF CELLS:	
RATED AMP - HOURS:			
CHARGER INFORMATION:	SB5-120/10-AB-1	LIGHTS:	
MANUFACTURER:	RIC	TYPE:	
INPUT RATED VOLTAGE:	120/208/240 VAC	OUTPUT RATED VOLTAGE:	120 VDC
INPUT RATED CURRENT:	22/13/12 A	OUTPUT RATED CURRENT:	10A
SERIAL NUMBER:	G9791	INSPECTION INTERVAL:	

INSPECTION DATA

DATE OF INSPECTION:	March 2012									
TOTAL BANK VOLTAGE:	123.4									
POSITIVE TO GROUND:	+60.5									
NEGATIVE TO GROUND:	-59.49									
CHARGER INPUT VOLTS:	205.6									
CHARGER INPUT AMPS:	1.23									
CHARGER OUTPUT VOLTS:	123.4									
CHARGER OUTPUT AMPS:										
ELECTROLYTE LEVEL:										
CONNECTIONS:	A									
AMOUNT OF WATER ADDED:										
PILOT CELL TEMP.:										
EYE WASH STATION:	N									
FUME HOOD:										
FIRE EXTINGUISHER:	A									
BATTERY RACK:	A									
CELL CAPS:	A									
VISUAL:	A									
MAINTENANCE ACCESSORIES:										
VENTILLATION:										
INSPECTED BY:										

Legend: A - ACCEPTABLE C - CORRECTED N - NEEDS REPAIR NA - NOT APPLICABLE NS - NOT IN SCOPE

COMMENTS:

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-1
DEVICE / FEEDER ID:	Main Breaker	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1820130	SYSTEM VOLTAGE	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	44100	A-B 87800	A-A' 1370
B-G	28320	B-C 86400	B-B' 885
C-G	34270	C-A 91600	C-C' 695

Contact Resistance	
A	70
B	72
C	81

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS:

CT Ratio 100/300:5
 Closed indication light is burnt out
 Lightning arrester megger results: A-77,600M, B-128,500M, C-169,400M
 Lightning arrester specifications: Tranquell (GE) 10kA CL2 Class Surge Arrester Cat No. 8L12PPA012AS

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-1
DEVICE / FEEDER ID:	Main Switch	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 100 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 93	A-B 128	A-G 174
B-G 54	B-C 106	B-G 187
C-G 64	C-A 138	C-G 159

Contact Resistance	
A	86
B	50
C	52

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	B	C
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	B	C
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	B	C
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G	B-G	C-G

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Ductor test performed at 10A, not 100A as shown above. Problem with test sheet database program.



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION	12.5MS-1
DEVICE / FEEDER ID:	INCOMING MAIN OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Multilin	ANSI DEVICE #:	50/51	TYPE:	
MODEL / STYLE NUMBER:	750-P5-G5-S5-HI-A20-R	SERIAL / S.O. NUMBER::	A27190196	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT)	MULTIPLIER			
PHASE	200:5	IEC - B	1.62	0.2			

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
O/C P/U	8.1 A sec.	8.13A		8.13A		8.11A			
O/C TIMING x2	2.7s@16.2A	2.73s		2.73s		2.74s			
O/C TIMING x3	1.35s@24.3A	1.37s		1.37s		1.36s			
UV P/U	96V	96.2V		96.3V		96.2V			
U/V TRIP	5s	5.05s		5.05s		5.05s			

COMMENTS:

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-2
DEVICE / FEEDER ID:	12.5MS-2 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	SCHWEITZER	ANSI DEVICE #:	50/51	TYPE:	
MODEL / STYLE NUMBER:	501	SERIAL / S.O. NUMBER::	2003056170	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U	TIME DIAL	INST.		
X WIND. PHASE	300:5	U4	3.9 sec.	1	39A		
YWIND. PHASE	300:5	U4	3.9 sec.	1	39A		

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TEST SWITCH:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	NEUT. AS FOUND/LEFT	
W1 OC P/U	3.9A								
W1 OC TIMING x2	1.92s@7.8A	1.92s		1.92s		1.91s			
W1 OC TIMING x4	0.413@15.6A	0.42s		0.42s		0.42s			
W2 OC P/U	3.9A								
W2 OC TIMING x2	1.92s@7.8A	1.95s		1.92s		1.95s			
W2 OC TIMING x4	0.413@15.6A	0.42s		0.42s		0.42s			

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks, ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks, ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-2
DEVICE / FEEDER ID:	12.5MS-2 OCR -- GROUP 5	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	SCHWEITZER	ANSI DEVICE #:	50/51	TYPE:	
MODEL / STYLE NUMBER:	351	SERIAL / S.O. NUMBER.:	2003057088	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U	TIME DIAL	INST.		
I PHASE	300:5	U4	0.5A sec	6	40A sec.		
I NEUTRAL	200:5	U4	0.1A sec.	1	0.5A sec.		
V PHASE	300:5						

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TEST SWITCH:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	NEUT. AS FOUND/LEFT	
OC P/U	0.5A								
OC TIMING x2	11.55s@1A	11.7s		11.69s		11.7s			
OC TIMING x4	2.47@2A	2.49s		2.5s		2.49s			
INST	INST@7A	0.03s		0.02s		0.04s			
N OC TIMING x2	1.92s@0.2A							1.99s	
N OC TIMING X4	0.413s@0.3A							0.43s	
INST	INST							0.1s	
UV TRIP	108V	107.6V		107.7V		107.6V			
OV TRIP	132V	132.2V		132.5V		132.3V			
UNDER FREQ. TRIP	59.8Hz	-		-		-			
OVER FREQ. TRIP	60.5Hz	-		-		-			

COMMENTS: INST SET TO 7A sec FOR TESTING. WILL NOT TRIP ON OVER OR UNDER FREQUENCY.

Medium Voltage Vacuum Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-2
DEVICE / FEEDER ID:	5MVA Ship to Shore Line CB	DATE TESTED:	March 4, 2012

MANUFACTURER:	Eaton	VOLTAGE RATING:	15,000
TYPE:	150 VCP-T 25	CURRENT RATING:	600
MODEL/STYLE #:	67A3085G41 - 20240 20200 00001 01000	INTERRUPT RATING:	25,000
IB NUMBER:	N/A	WIRING DIAGRAM:	69C3061H01
SERIAL NUMBER:	03030001	SYSTEM VOLTAGE:	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/> 100-140 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/>	Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/> 100-140 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/>	N/A
CLOSE COIL:	<input checked="" type="checkbox"/> 100-140 VDC	Acceptable	MAINT. ACCESSORIES	<input checked="" type="checkbox"/>	Acceptable
SHUNT TRIP:	<input checked="" type="checkbox"/> 100-140 VDC	Acceptable	(Other)	<input type="checkbox"/>	N/A
UNDERVOLTAGE:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A
FUSES:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	FRAME CONDITION:	Acceptable	Acceptable
CONTACT GAP:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	Acceptable	Acceptable
OPEN/CLOSE INDICATOR:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	Acceptable	Acceptable
AUX SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	MANUAL CLOSE / TRIP:	Acceptable	Acceptable
INTERLOCKS:	Marginal	Marginal	ELECTRICAL CLOSE / TRIP:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	OPERATIONS COUNTER:	Acceptable	Acceptable
CONTACT EROSION:	Acceptable	Acceptable	OPER. COUNT. READING:	122	126

ELECTRICAL TESTS

Insulation Resistance:						Contact Resistance:			
MegOhms @ 5000 VDC						MicroOhms @ 10 Amps			
As Found:			As Left:			As Found		As Left	
Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)	A	B	C	
A-G	A-B	A-A'	A-G	A-B	A-A'	31	31	31	
B-G	B-C	B-B'	B-G	B-C	B-B'	31	31	31	
C-G	C-A	C-C'	C-G	C-A	C-C'	31	31	31	

Overpotential Test:									Bottle Integrity:			
Readings in Milliamps @ 27 KV <input checked="" type="radio"/> AC <input type="radio"/> DC									@ 27 KV <input checked="" type="radio"/> AC <input type="radio"/> DC			
AS FOUND:					AS LEFT:				A1		A2	
A-G	A-B	A-A'	A-G	A-B	A-A'	A1	A2	B1	B2	C1	C2	
1.13	1.2	0.92	1.13	1.2	0.92	Pass	N/A	Pass	N/A	Pass	N/A	
1.24	1.14	1.12	1.24	1.14	1.12							
1.09	1.14	1.08	1.09	1.14	1.08							

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):	PF Test Performed	Timing Test Performed	
Coil #1 Minimum Trip Voltage	U.V. Dropout voltage		

COMMENTS:

Key interlock needs adjustment, currently non-functional
 Key interlock is mounted using custom bracket, recommend replacing interlock bracket with standard Eaton components
 RHS bolt shoot does not fully engage unless it is pried out, this appears to be caused by the custom interlock system



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-3
DEVICE / FEEDER ID:	South Side Sub	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822975	SYSTEM VOLTAGE:	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	AUX SWITCH(ES):	<input checked="" type="checkbox"/>	Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A	N/A
CLOSE COIL:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	MAINT. ACCESSORIES:	<input type="checkbox"/> N/A	N/A
SHUNT TRIP:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	(Other):	<input type="checkbox"/> N/A	N/A
UNDERVOLTAGE:	<input type="checkbox"/> N/A	N/A	(Other):	<input type="checkbox"/> N/A	N/A
FUSES:	<input type="checkbox"/> N/A	N/A	(Other):	<input type="checkbox"/> N/A	N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Corrected
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 176	A-B 6100	A-A' 5000
B-G 170	B-C 472	B-B' 2000
C-G 179	C-A 3640	C-C' 8400

Contact Resistance	
A	111
B	108
C	122

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: CT Ratio 150:5
Close coil wire found loose, it has been tightened

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-3
DEVICE / FEEDER ID:	12.5MS-3 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50/51	TYPE:	OC
MODEL / STYLE NUMBER:	MCGG	SERIAL / S.O. NUMBER::	PH-347345J G-764760D	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.		
PHASE	150:5	E. INV.	1	0.5	10		
GROUND		D2	0.5	0.1	1		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND/LEFT
OC P/U	5A	5.3A				5.3A		
OC TIMING x2	@10A	13.25s				13.16s		
OC TIMING x3	@15A	4.95s				4.91s		
INST	INST	0.19s				0.19s		
GRD P/U	2.5A							2.9A
GRD TIMING x2	@5A							0.11s
INST	INST							0.11s

COMMENTS: INST TESTED AT 1xCT



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-3
DEVICE / FEEDER ID:	South Side Sub	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 93	A-B 128	A-G 3880
B-G 54	B-C 106	B-G 400
C-G 64	C-A 138	C-G 1300

MicroOhms @ 10 Amps

Contact Resistance	
A	48
B	38
C	50

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-4
DEVICE / FEEDER ID:	2.4kV Transformer	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 100 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 93	A-B 128	A-G 174
B-G 54	B-C 106	B-G 187
C-G 64	C-A 138	C-G 159

Contact Resistance	
A	82
B	78
C	73

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Ductor test performed at 10A, not 100A as shown above. Problem with test sheet database program.



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-4
DEVICE / FEEDER ID:	2.4kV Transformer	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17.5
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822976	SYSTEM VOLTAGE:	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 69	A-B 2280	A-A' 346
B-G 66.5	B-C 2220	B-B' 320
C-G 63.5	C-A 2080	C-C' 318

MicroOhms @ 10 Amps

Contact Resistance	
A	129
B	110
C	126

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):	N/T	Power Factor Test	No	Timing Test Performed	No
Coil #1 Minimum Trip Voltage	VDC	U.V. Dropout voltage			

COMMENTS: CT Ratio: 300-5

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-4
DEVICE / FEEDER ID:	12.5MS-4 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50/51	TYPE:	OC
MODEL / STYLE NUMBER:	MCGG	SERIAL / S.O. NUMBER::	PH-347347J G-764764D	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.		
PHASE	300:5	VERY IN.	0.8	0.25	12		
GROUND		D2	0.5	0.1	1		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
OC P/U	4A	4.3A				4.3A			
OC TIMING x2	@8A	3.38s				3.38s			
OC TIMING x3	@12A	1.69s				1.69s			
INST	INST	0.15s				0.15s			
GRD P/U	2.5A						2.9A		
GRD TIMINGx2	@5A						0.11s		
INST	INST						0.11s		

COMMENTS: INST TESTED AT 1xCT



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-5
DEVICE / FEEDER ID:	North Landing Warf	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822978	SYSTEM VOLTAGE:	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	176	A-B 4520	A-A' 3200
B-G	170	B-C 2580	B-B' 1450
C-G	179	C-A 3620	C-C' 1330

Contact Resistance	
A	123
B	111
C	109

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: CT Ratio 75:5

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-5
DEVICE / FEEDER ID:	12.5MS-5 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50/51	TYPE:	OC
MODEL / STYLE NUMBER:	MCGG	SERIAL / S.O. NUMBER: :	PH-347343J G-764748D	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.		
PHASE	75:5	VERY IN.	2.4	0.3	8		
GROUND		D2	0.5	0.1	1		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GRD AS FOUND/AS LEFT
OC P/U	12A	12.4A				12.5A		
OC TIMING x2	@24A	3.97s				4.06s		
OC TIMING x2.5	@30A	2.67s				2.71s		
INST	INST	0.2s				0.21s		
GRD P/U	2.5A							2.9A
GROUND TIMING x2	@5A							0.11s
INST	INST							0.11s

COMMENTS: INST. TESTED AT 1XCT



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-5
DEVICE / FEEDER ID:	North Landing Warf	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd	Closed (Ph. - Ph.	Closed (Ph. - Gnd			
A-G	93	A-B	128	A-G	2620
B-G	54	B-C	106	B-G	1220
C-G	64	C-A	138	C-G	1050

MicroOhms @ 10 Amps

Contact Resistance	
A	48
B	56
C	81

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Lamp indication light on outside of switchgear is burnt out

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-6
DEVICE / FEEDER ID:	120/208V Transformer	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 93	A-B 128	A-G 290
B-G 54	B-C 106	B-G 280
C-G 64	C-A 138	C-G 200

Contact Resistance	
A	88
B	68
C	61

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION	12.5MS-6
DEVICE / FEEDER ID:	120/208V Transformer	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1820129	SYSTEM VOLTAGE	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 83	A-B 1700	A-A' 540
B-G 88	B-C 1700	B-B' 454
C-G 88	C-A 1580	C-C' 444

MicroOhms @ 10 Amps

Contact Resistance	
A	116
B	139
C	128

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: CT Ratio 25:5

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-6
DEVICE / FEEDER ID:	12.5MS-6 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50/51	TYPE:	OC
MODEL / STYLE NUMBER:	MCGG	SERIAL / S.O. NUMBER::	PH-347344J G-764734D	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.		
PHASE	25:5	VERY IN.	1	0.5	10		
GROUND		D2	0.5	0.1	1		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GRD AS FOUND/LEFT
OC P/U	5A	5.3				5.3		
OC TIMING x2	@10A	6.62s				6.65s		
OC TIMING x3	@15A	3.34s				3.34s		
INST	INST	0.19s				0.19s		
GRD P/U	2.5A							2.7A
GRD TIMING x2	@5A							0.1s
INST	INST							0.1s

COMMENTS: INST TESTED AT 1xCT



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-7
DEVICE / FEEDER ID:	347/600V Transformer	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1820133	SYSTEM VOLTAGE:	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Corrected
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	64	A-B 1570	A-A' 800
B-G	66	B-C 1090	B-B' 302
C-G	70	C-A 1170	C-C' 820

Contact Resistance	
A	126
B	124
C	134

Overpotential test			
A-G	N/A	A-B	N/A
B-G	N/A	B-C	N/A
C-G	N/A	C-A	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS:

CT Ratio 40:5
Loose wire on limit switch fixed

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-7
DEVICE / FEEDER ID:	12.5MS-7 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50/51	TYPE:	OC
MODEL / STYLE NUMBER:	MCGG	SERIAL / S.O. NUMBER::	OC-347342J G-764759D	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.		
PHASE	40:5	VERY IN.	1	0.3	10		
GROUND		D2	0.5	0.1	1		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GRD AS FOUND/LEFT	
O/C P/U	5A	5.1A							
O/C TIMING x2	@10A	4.06s				3.96s			
O/C TIMING x3	@15A	2.04s				2.01s			
INST	INST	0.19s				0.19s			
GRD P/U	2.5A							2.7A	
GRD TIMING x2	@5A							0.1s	
INST	INST							0.1s	

COMMENTS: INST TESTED AT 1xCT



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-7
DEVICE / FEEDER ID:	347/600V Transformer	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G	93	A-B 128	A-G 640
B-G	54	B-C 106	B-G 102
C-G	64	C-A 138	C-G 188

Contact Resistance	
A	59
B	44
C	77

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-8
DEVICE / FEEDER ID:	12.5MS-8 OCR	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50/51	TYPE:	O/C
MODEL / STYLE NUMBER:	MCGG42F1CD1003D	SERIAL / S.O. NUMBER.:	OC-347346J, G-764745D	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.		
PHASE	75:5	VERY IN.	1.6	0.3	9		
GROUND		D2	0.5	0.1	1		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
METERING:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND/LEFT	
OC P/U	8A								
OC TIMING x2	@16A	4.01s				4.00			
OC TIMING x3	@24A	2.01s				2.01s			
INST.	8A	0.2s				0.2s			
GRD P/U	2.5A					2.7A			
GRD TIMING x2	@5A					0.1s			
INST	INST					0.1s			

COMMENTS: INST. TESTED AT 1xCT



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	12.5MS-8
DEVICE / FEEDER ID:	277/480V Transformer	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822974	SYSTEM VOLTAGE	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Corrected
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 595	A-B 1000	A-A' 5800
B-G 590	B-C 2280	B-B' 890
C-G 575	C-A 5750	C-C' 3440

Contact Resistance	
A	122
B	122
C	123

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS:

CT Ratio 75:5
Loose wires on cam switch and trip coil fixed

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION	12.5MS-8
DEVICE / FEEDER ID:	277/480V Transformer	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Corrected	Corrected
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 93	A-B 128	A-G 6450
B-G 54	B-C 106	B-G 860
C-G 64	C-A 138	C-G 3780

MicroOhms @ 10 Amps

Contact Resistance	
A	58
B	40
C	54

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: B phase insulated switch operating arm was missing 'E' type circlip, Emery installed new clip identical to existing clip



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-20
DEVICE / FEEDER ID:	Pump House Switchboard	DATE TESTED:	March 4, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	CGE	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	53B46A	SERIAL / S.O. NUMBER:.		IB NUMBER:	

RELAY ID	CT RATIO	Tap	TD	Inst			
A/B/C	1200:5	5A	1	50A			

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	Acceptable	Acceptable	Acceptable	N/A	JEWEL BEARING:	Acceptable	Acceptable	Acceptable	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	Acceptable	Acceptable	Acceptable	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	Acceptable	Acceptable	Acceptable	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Corrected	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	TEST VALUE	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
Pickup	5A	5.2A	5.2A	5.05A	5.05A	6.15A	5.05A		
2x Trip	10A	1.23s	1.23s	1.27s	1.27s	1.43s	1.29s		
4x Trip	20A	0.32s	0.32s	1.43s	1.43s	0.35s	0.33s		
Inst Trip	50A	0.04s	0.04s	0.03s	0.03s	0.04s	0.04s		

COMMENTS: C phase relay was replaced with spare found in substation, original relay has been placed inside spare case with note, the pickup was not working properly

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION	2.4MS-20
DEVICE / FEEDER ID:	Pump House Switchboard	DATE TESTED:	March 4, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RG12-75	CURRENT RATING:	1250
MODEL/STYLE #:	N/A	INTERRUPT RATING:	40,000
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1823841	SYSTEM VOLTAGE	2,400

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	Acceptable
CONTACT WIPE:	Acceptable
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Open (Line - Gnd.	Closed (Ph. - Ph.	Open (Line - Load
A-G 326	A-B 42	A-A' 326
B-G 258	B-C 36	B-B' 258
C-G 260	C-A 42	C-C' 260

MicroOhms @ 100 Amps

Contact Resistance	
A	45
B	44
C	49

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: CT Ratio 1200:5



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-20
DEVICE / FEEDER ID:	Pump House Switchboard	DATE TESTED:	March 4, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	
TYPE:	Indoor	CURRENT RATING:	
MODEL/STYLE #:	36917-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G	23	A-B 47	A-G 326
B-G	26	B-C 37	B-G 248
C-G	29	C-A 43	C-G 260

Contact Resistance	
A	15
B	16
C	16

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION	2.4MS-21
DEVICE / FEEDER ID:	150T Crane	DATE TESTED:	March 4, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RM12-25	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822958	SYSTEM VOLTAGE	2,400

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Open (Line - Gnd.	Closed (Ph. - Ph.)	Open (Line - Load
A-G 110	A-B 42	A-A' 110
B-G 278	B-C 37	B-B' 278
C-G 404	C-A 43	C-C' 404

Contact Resistance	
A	75
B	81
C	81

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS:

Wire #2-6 si not connected to the loss of control power relay moduel and screw is missing from the terminal
CT Ratio 300:5



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-21
DEVICE / FEEDER ID:	150T Crane	DATE TESTED:	March 4, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Multilin	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	SR735-5-5-HI-485	SERIAL / S.O. NUMBER:::	D2583504	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.	TIME DELAY
A/B/C	300:5	E Inv.	220%	5	20x	
G	300:5	DT	15%	1	1x	

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	TEST VALUE	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND	GROUND AS LEFT
PU	11A	10.95A	10.95A	10.95A	10.95A	10.95A	10.95A		
2x Trip	22A	8.78s	8.78s	8.61s	8.61s	8.74s	8.74s		
4x Trip	44A	1.83s	1.83s	1.81s	1.81s	1.83s	1.83s		
Inst Trip	30A	0.04s	0.04s	0.03s	0.03s	0.04s	0.04s		
PU	0.75A							0.76A	0.76A
2x Trip	1.5A							0.1s	0.1s
4x Trip	3A							0.1s	0.1s
Inst Trip	5A							0.03s	0.03s

COMMENTS: Instantaneous trip tested at lower setting because 100A set point is not practical

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-21
DEVICE / FEEDER ID:	150T Crane	DATE TESTED:	March 4, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	36914-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 23	A-B 47	A-G 110
B-G 26	B-C 37	B-G 278
C-G 29	C-A 43	C-G 404

Contact Resistance	
A	55
B	63
C	51

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:

Lamp indication light is burnt out



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-22
DEVICE / FEEDER ID:	North Side 30T Crane	DATE TESTED:	March 4, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Multilin	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	350-EP5S5HSSNN1EDN	SERIAL / S.O. NUMBER:.	BL0A10000254	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.	INST. DELAY
A/B/C	75:5	E Inv.	2.01	5.6	18.74x	
G		None	None	None	1x	2.5s

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND	GROUND AS LEFT
PU	10.05A	10.05A	10.05A	10.05A	10.05A	10.05A	10.05A		
2x Trip	20.1A	9.78s	9.78s	9.8s	9.8s	9.83s	9.83s		
4x Trip	40.2A	2.07s	2.07s	2.07s	2.07s	2.07s	2.07s		
Inst	93.7A	N/T		N/T		N/T			
Inst	5A							2.55s	2.55s

COMMENTS: Cannot access relay to reduce instantaneous element to reasonable test value

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-22
DEVICE / FEEDER ID:	North Side 30T Crane	DATE TESTED:	March 4, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RM12-25	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822954	SYSTEM VOLTAGE	2,400

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/>	Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/>	N/A
CLOSE COIL:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/>	N/A
SHUNT TRIP:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	(Other)	<input type="checkbox"/>	N/A
UNDERVOLTAGE:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A
FUSES:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Corrected
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Open (Line - Gnd.)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 175	A-B 43	A-A' 175
B-G 434	B-C 37	B-B' 434
C-G 288	C-A 43	C-C' 288

MicroOhms @ 10 Amps

Contact Resistance	
A	51
B	49
C	64

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: Terminal block for charging motor inside circuit breaker chassis shows signs of arcing and wire insulation degradation, applied black tape to protect wires CT Ratio 75:5



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-22
DEVICE / FEEDER ID:	North Side 30T Crane	DATE TESTED:	March 4, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	36914-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 23	A-B 47	A-G 175
B-G 26	B-C 37	B-G 434
C-G 29	C-A 43	C-G 288

Contact Resistance	
A	61
B	59
C	64

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-23
DEVICE / FEEDER ID:	South Side Cranes	DATE TESTED:	March 4, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Multilin	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	SR737-5-5-HI-485	SERIAL / S.O. NUMBER::	D2690778	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.	TIME DELAY	
A/B/C	100:5	E Inv.	120%	8	12x		

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	TEST VALUE	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
PU	6A	6A	6A	6A	6A	6A	6A		
2x Trip	12A	13.73s	13.73s	13.77s	13.77s	13.91s	13.91s		
4x Trip	24A	2.76s	2.76s	2.9s	2.9s	2.94s	2.94s		
Inst Trip	60A	0.02s	0.02s	0.02s	0.02s	0.02s	0.02s		

COMMENTS: Relay settings do not match coordination study

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-23
DEVICE / FEEDER ID:	South Side Cranes	DATE TESTED:	March 4, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	36914-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 23	A-B 47	A-G 570
B-G 26	B-C 37	B-G 238
C-G 29	C-A 43	C-G 436

MicroOhms @ 10 Amps

Contact Resistance	
A	69
B	71
C	70

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-23
DEVICE / FEEDER ID:	South Side Cranes	DATE TESTED:	March 4, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RM12-25	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822956	SYSTEM VOLTAGE:	2,400

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/>	Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/>	N/A
CLOSE COIL:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/>	N/A
SHUNT TRIP:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	(Other)	<input type="checkbox"/>	N/A
UNDERVOLTAGE:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A
FUSES:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Open (Line - Gnd.		Closed (Ph. - Ph.		Open (Line - Load	
A-G	570	A-B	43	A-A'	570
B-G	238	B-C	37	B-B'	238
C-G	436	C-A	43	C-C'	436

Contact Resistance	
A	47
B	49
C	48

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):	Power Factor Test	Timing Test Performed
Coil #1 Minimum Trip Voltage	U.V. Dropout voltage	

COMMENTS: CT Ratio 100:5



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-24
DEVICE / FEEDER ID:	2.4kV Switchboard Stand by Generator	DATE TESTED:	March 4, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	CGE	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	53B46A	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT RATIO	Tap	TD	Inst			
A/B/C	150:5	4A	2	60A			

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	Acceptable	Acceptable	Acceptable	N/A	JEWEL BEARING:	Acceptable	Acceptable	Acceptable	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	Acceptable	Acceptable	Acceptable	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	Acceptable	Acceptable	Acceptable	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	Value	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
Pickup	4A	4.05A	4.05A	3.95A	3.95A	3.95A	3.95A		
2x Trip	8A	2.66s	2.66s	2.58s	2.58s	2.75s	2.75s		
4x Trip	16A	0.65s	0.65s	0.66s	0.66s	0.69s	0.69s		
Inst Trip	60A	0.04s	0.04s	0.04s	0.04s	0.04s	0.04s		

COMMENTS:

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-24
DEVICE / FEEDER ID:	2.4kV Switchboard Stand by Generator	DATE TESTED:	March 4, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RM12-25	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1822957	SYSTEM VOLTAGE:	2,400

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/>	Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/>	N/A
CLOSE COIL:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/>	N/A
SHUNT TRIP:	<input checked="" type="checkbox"/> 120 VDC	Acceptable	(Other)	<input type="checkbox"/>	N/A
UNDERVOLTAGE:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A
FUSES:	<input type="checkbox"/> N/A	N/A	(Other)	<input type="checkbox"/>	N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Corrected
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

 MicroOhms @ 10 Amps

Readings in Milliamps @ KV AC DC

Open (Line - Gnd.)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	270	A-B	43	A-A'	270
B-G	300	B-C	37	B-B'	300
C-G	260	C-A	43	C-C'	260

Contact Resistance	
A	49
B	51
C	46

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):	Power Factor Test	Timing Test Performed
Coil #1 Minimum Trip Voltage	U.V. Dropout voltage	

COMMENTS:

CT Ratio 150:5
Charging motor control wires had signs of arcing, wires were tapped to prevent short from occurring



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-24
DEVICE / FEEDER ID:	2.4kV Switchboard Stand by Generator	DATE TESTED:	March 4, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	36914-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 23	A-B 47	A-G 270
B-G 26	B-C 37	B-G 300
C-G 29	C-A 43	C-G 260

Contact Resistance	
A	55
B	61
C	63

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-DS
DEVICE / FEEDER ID:	2.4kV Switchboard Main	DATE TESTED:	March 4, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	
TYPE:	Indoor	CURRENT RATING:	
MODEL/STYLE #:	36918-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 23	A-B 47	A-G 23
B-G 26	B-C 37	B-G 26
C-G 29	C-A 43	C-G 29

Contact Resistance	
A	16
B	16
C	16

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____



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Electrical Services & Systems

Grounding Resistor

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	2.4MS-DS
DEVICE / FEEDER ID:	2.4kV Switchboard Main	DATE TESTED:	March 4, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE	SYSTEM VOLTAGE:	2400
CATALOG #:	N/A	SYSTEM TYPE:	N/A
PRI. CONDUCTOR SIZE:	#10	MAX TIME:	N/A
PRI. CONDUCTOR RATED VOLTAGE:	600V	BIL:	N/A
SEC. CONDUCTOR SIZE:	#10	RATED VOLTAGE:	2400
SEC. CONDUCTOR RATED VOLTAGE:	600V	RATED OHMS:	N/A
CT RATIO:	1000:1	TAP RANGE AF/AL:	
CT RATED VOLTAGE:	N/A	RATED AMPS:	N/A

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	CURRENT TRANSFORMER:	Acceptable
CLEANLINESS:	Corrected	CONDUCTORS:	Acceptable
BUSHINGS:	Acceptable	CONNECTIONS:	Acceptable
INSULATORS:	Acceptable	ISOLATION SWITCH:	N/A
RESISTOR STACKS:	Acceptable	PROPER GROUNDING:	Acceptable
RESISTOR LINK CONNECTIONS:	Acceptable	RESISTOR TAP CONNECTION:	N/A

ELECTRICAL TEST DATA

OVERALL RESISTANCE (OHMS):	489.3		
TAP POINT:	Tap 1 - 45	TAP RESISTANCE:	Tap 2 - 44.9
TAP POINT:	Tap 3 - 44.8	TAP RESISTANCE:	Tap 4 - 45.6
TAP POINT:	Tap 5 - 44.7	TAP RESISTANCE:	Tap 6 - 44.4
TAP POINT:	Tap 7 - 44.7	TAP RESISTANCE:	Tap 8 - 44.8
TAP POINT:	Tap 9 - 45.3	TAP RESISTANCE:	Tap 10 - 44.8, Tap 11 - 44.1
INSULATION RESISTANCE TEST		OVERPOTENTIAL TEST: <input checked="" type="radio"/> AC <input type="radio"/> DC	
@	1000 VDC	51.5 MEGOHMS	@ VOLTS MICRO-AMPS

COMMENTS:

Resistor does not have any nameplate information.
 Resistor is mounted directly behind switchgear door, clearance may not be as per CEC

Grounding Resistor

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Emergency Generator Room
DEVICE / FEEDER ID:	Emergency Step Up Transformer	DATE TESTED:	March 4, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE	SYSTEM VOLTAGE:	2,400
CATALOG #:	NGR-1390-2	SYSTEM TYPE:	HRG
PRI. CONDUCTOR SIZE:		MAX TIME:	
PRI. CONDUCTOR RATED VOLTAGE:		BIL:	
SEC. CONDUCTOR SIZE:		RATED VOLTAGE:	1390
SEC. CONDUCTOR RATED VOLTAGE:		RATED OHMS:	634
CT RATIO:		TAP RANGE AF/AL:	
CT RATED VOLTAGE:		RATED AMPS:	2

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	CURRENT TRANSFORMER:	N/A
CLEANLINESS:	Acceptable	CONDUCTORS:	Acceptable
BUSHINGS:	Acceptable	CONNECTIONS:	Acceptable
INSULATORS:	Acceptable	ISOLATION SWITCH:	N/A
RESISTOR STACKS:	Acceptable	PROPER GROUNDING:	Acceptable
RESISTOR LINK CONNECTIONS:	Acceptable	RESISTOR TAP CONNECTION:	N/A

ELECTRICAL TEST DATA

OVERALL RESISTANCE (OHMS):	698		
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
INSULATION RESISTANCE TEST		OVERPOTENTIAL TEST: <input checked="" type="radio"/> AC <input type="radio"/> DC	
@	2500	VDC	155000
		MEGOHMS	
@		VOLTS	
		MICRO-AMPS	

COMMENTS:



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Dry Type Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Emergency Generator Room
DEVICE / FEEDER ID:	Emergency Step Up Transformer	DATE TESTED:	March 4, 2012

FIELD DATA

MANUFACTURER:	Rex	TYPE:	ANN
SERIAL NUMBER:	B61184	IMPEDANCE (%):	5
CLASS:	220C	NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	500	WINDING TEMPERATURE: (°C)	20
CONFIG.: Primary Delta <input type="radio"/> Wye <input checked="" type="radio"/> Secondary Delta <input checked="" type="radio"/> Wye <input type="radio"/>		MAX. TEMP.	35
PRIMARY VOLTS	L-L: 2,400 L-N: 1,386	TEMP RISE (°C)	150
SECONDARY VOLTS:	L-L: 600	WINDING MATERIAL:	Primary: Copper Secondary: Copper
SYSTEM VOLTAGE:	600	BIL PRIMARY (KV):	60
HUMIDITY:		BIL SECONDARY (KV)	30

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Corrected
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>			3
PRIM. VOLTAGE: (✓ 2.5% equal taps)	1,454.923 V	1,420.282 V	1,385.641 V	1,351.000 V	1,316.359 V	V	V	1,385.641 V
CALCULATED RATIO:	2.425 :1	2.367 :1	2.309 :1	2.252 :1	2.194 :1	:1	:1	2.309 :1
H 3 -H 1 X 0 -X 1	2.444 :1	2.399 :1	2.315 :1	2.275 :1	2.200 :1	:1	:1	2.315 :1
H 1 -H 2 X 0 -X 2	2.444 :1	2.398 :1	2.314 :1	2.275 :1	2.199 :1	:1	:1	2.314 :1
H 2 -H 3 X 0 -X 3	2.444 :1	2.399 :1	2.315 :1	2.275 :1	2.199 :1	:1	:1	2.315 :1
GREATEST % DIFF. vs. CALCULATED:	0.789 %	1.346 %	0.242 %	1.036 %	0.277 %	%	%	0.242 %

INSULATION RESISTANCE IN MegOhms	@ HI to LO & GND 5000 VDC	@ LO to HI & GND 1000 VDC	@ HI to LO 5000 VDC	@ CORE INSULATION 500 VDC
ACTUAL VALUE:	2,090	3,950	127,000	66,900
CORRECTED TO 20°C:	2,090.00	3,950.00	127,000.0	66,900.00

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
	88,500	117,000	137,000	1.17	NO

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)			
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	STAGE 1:	STAGE 2:	ALARMS:
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c
	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in	H 3 -H 1	8.83	H 1 -H 2	8.83	H 2 -H 3	8.95
CORRECTED TO 20°C:	H 3 -H 1	8.83	H 1 -H 2	8.83	H 2 -H 3	8.95
ACTUAL VALUE: in	X 0 -X 1	53	X 0 -X 2	53.1	X 0 -X 3	53.3
CORRECTED TO 20°C:	X 0 -X 1	53.00	X 0 -X 2	53.10	X 0 -X 3	53.30

COMMENTS:

NLTC 2 Winding Liquid Transformer

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	MS Outdoor Yard
DEVICE / FEEDER ID:	T12.5MS-4	DATE TESTED:	March 3

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE	TYPE:	ONAN
SERIAL NUMBER:	28743.01	IMPEDANCE (%) :	6.37
CLASS:		NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	5000	TEMP RISE (°C)	65
CONFIG: Primary	Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary	Delta <input type="radio"/> Wye <input checked="" type="radio"/>
LIQUID TEMPERATURE: (°C)	MAX. TEMP.	PRIMARY VOLTS	L-L: 12,470
BIL PRIMARY (KV):	110	SECONDARY VOLTS:	L-L: 2,400 L-N: 1,386
BIL SECONDARY (KV)	45	WINDING TEMPERATURE: (°C)	MAX. TEMP.
SYSTEM VOLTAGE:	12470	HUMIDITY:	
TANK TYPE:		WINDING MATERIAL:	Primary: Copper Secondary: Copper
FLUID LEVEL:	Normal	FLUID TYPE:	
		PRESSURE (in PSI):	0

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	BUSHINGS:	Acceptable
LIQUID LEVEL CONTACTS:	Acceptable	RADIATORS:	Needs Repair
CONTROL BOX / SPACE HEATER:	Acceptable	FUSE WELL:	N/A
PRESSURE RELAY:	Acceptable	RAPID RISE RELAY:	N/A
EXPLOSION / RELIEF VENT:	Acceptable	TAP CHANGER:	Acceptable
CONNECTIONS FOR TIGHTNESS:	Acceptable	TEMPERATURE CONTACTS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	SAMPLING PORTS:	Acceptable
MOUNTING / LEVEL:	Acceptable	COOLING FANS:	N/A
GASKETS / COVERS:	Corrected	SILICA GEL BREATHER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>		3	
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps	13,093.50 V	12,781.75 V	12,470.00 V	12,158.25 V	11,846.50 V	V	V	12,470.00 V
CALCULATED RATIO:	9.449 :1	9.224 :1	8.999 :1	8.774 :1	8.549 :1	:1	:1	8.999 :1
H 3 -H 1 X 0 -X 1	9.460 :1	9.255 :1	9.026 :1	8.800 :1	8.570 :1	:1	:1	9.026 :1
H 1 -H 2 X 0 -X 2	9.481 :1	9.275 :1	9.052 :1	8.821 :1	8.596 :1	:1	:1	9.052 :1
H 2 -H 3 X 0 -X 3	9.456 :1	9.255 :1	9.023 :1	8.797 :1	8.570 :1	:1	:1	9.023 :1
GREATEST % DIFF. vs. CALCULATED:	0.334 %	0.548 %	0.584 %	0.530 %	0.544 %	%	%	0.584 %
INSULATION RESISTANCE IN MegOhms	HI to LO & GND @ 5000 VDC		LO to HI & GND @ 2500 VDC		HI to LO @ 5000 VDC		CORE INSULATION @ VDC	
ACTUAL VALUE:	2,250		110		2,480			
CORRECTED TO 20°C:								
POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:			
	103	120	235	1.96				

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
LIQUID TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
LIQUID TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 3 -H 1	0.134	H 1 -H 2	0.133	H 2 -H 3	0.133
CORRECTED TO 20°C:	H 3 -H 1		H 1 -H 2		H 2 -H 3	
ACTUAL VALUE: in (MilliOhms)	X 0 -X 1	2.34	X 0 -X 2	2.48	X 0 -X 3	2.49
CORRECTED TO 20°C:	X 0 -X 1		X 0 -X 2		X 0 -X 3	



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Electrical Services & Systems

NLTC 2 Winding Liquid Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	MS Outdoor Yard
DEVICE / FEEDER ID:	T12.5MS-4	DATE TESTED:	March 3

CAPACITANCE AND DISSIPATION FACTOR TEST

CONNECTION	MULTIPLIER	CAPACITANCE	DISSIPATION FACTOR	CORRECTED TO 20°C
CH-L + CH-G				
CH-G				
CH-L				
CL-G				
CL-H& CL-G				

COMMENTS: High voltage side oil leak evidence on phase B and C bushings. Oil spill on the bottom of the junction box. Oil leak appears to be very minimal however this should be closely monitored over time.
 Oil leak around temperature gauge appears to have been occurring steadily over time.

Grounding Resistor

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Ship to Shore
DEVICE / FEEDER ID:	T12.5MS-NGR	DATE TESTED:	February 13, 2012

FIELD DATA

MANUFACTURER:	IPC Resistors Inc.	SYSTEM VOLTAGE:	12,470/7,200
CATALOG #:	NGR 7200-10-8732	SYSTEM TYPE:	HRG
PRI. CONDUCTOR SIZE:	1	MAX TIME:	
PRI. CONDUCTOR RATED VOLTAGE:	15,000	BIL:	
SEC. CONDUCTOR SIZE:		RATED VOLTAGE:	
SEC. CONDUCTOR RATED VOLTAGE:		RATED OHMS:	720
CT RATIO:	200:5	TAP RANGE AF/AL:	
CT RATED VOLTAGE:		RATED AMPS:	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	CURRENT TRANSFORMER:	Acceptable
CLEANLINESS:	Acceptable	CONDUCTORS:	Acceptable
BUSHINGS:	N/A	CONNECTIONS:	Acceptable
INSULATORS:	Acceptable	ISOLATION SWITCH:	Acceptable
RESISTOR STACKS:	Acceptable	PROPER GROUNDING:	Acceptable
RESISTOR LINK CONNECTIONS:	Acceptable	RESISTOR TAP CONNECTION:	Acceptable

ELECTRICAL TEST DATA

OVERALL RESISTANCE (OHMS):	703		
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
INSULATION RESISTANCE TEST		OVERPOTENTIAL TEST: <input checked="" type="radio"/> AC <input type="radio"/> DC	
@	5000	VDC	28
		MEGOHMS	
@		VOLTS	
		MICRO-AMPS	

COMMENTS:

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Ship to Shore
DEVICE / FEEDER ID:	12.5MS-2 NGR DS	DATE TESTED:	February 13, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	46914-LF3	BIL (KV):	95
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Gnd.)
A-G	A-B	A-G 28
B-G	B-C	B-G
C-G	C-A	C-G

MicroOhms @ 10 Amps

Contact Resistance	
A	46
B	
C	

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	B	C
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	B	C
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	B	C
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G	B-G	C-G

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Single pole switch

NLTC 2 Winding Liquid Transformer

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Ship to Shore
DEVICE / FEEDER ID:	T12.5MS-2	DATE TESTED:	February 13, 2012

FIELD DATA

MANUFACTURER:	ALSTOM	TYPE:	
SERIAL NUMBER:	PID - 0263	IMPEDANCE (%) :	7.63/8.75/7.97
CLASS:		NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	5000	TEMP RISE (°C)	
CONFIG: Primary	Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary	Delta <input type="radio"/> Wye <input checked="" type="radio"/>
LIQUID TEMPERATURE: (°C)	10	MAX. TEMP.	
BIL PRIMARY (KV):		WINDING TEMPERATURE: (°C)	10
BIL SECONDARY (KV)		HUMIDITY:	
SYSTEM VOLTAGE:	12470	WINDING MATERIAL:	Primary: <input type="text"/> Secondary: <input type="text"/>
TANK TYPE:	Sealed	FLUID TYPE:	
FLUID LEVEL:	Normal	PRESSURE (in PSI):	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	BUSHINGS:	Acceptable
LIQUID LEVEL CONTACTS:	Acceptable	RADIATORS:	Acceptable
CONTROL BOX / SPACE HEATER:	N/A	FUSE WELL:	Acceptable
PRESSURE RELAY:	N/A	RAPID RISE RELAY:	N/A
EXPLOSION / RELIEF VENT:	Acceptable	TAP CHANGER:	Acceptable
CONNECTIONS FOR TIGHTNESS:	Acceptable	TEMPERATURE CONTACTS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	SAMPLING PORTS:	Acceptable
MOUNTING / LEVEL:	Acceptable	COOLING FANS:	N/A
GASKETS / COVERS:	Corrected	SILICA GEL BREATHER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>		3
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps	13,093.50 V	12,781.75 V	12,470.00 V	12,158.25 V	11,846.50 V	V	V
CALCULATED RATIO:	1.819 :1	1.775 :1	1.732 :1	1.689 :1	1.645 :1	:1	1.732 :1
H 1 -H 3 X 1 -X 0	1.816 :1	1.775 :1	1.730 :1	1.685 :1	1.644 :1	:1	1.73 :1
H 1 -H 2 X 2 -X 0	1.816 :1	1.775 :1	1.730 :1	1.685 :1	1.644 :1	:1	1.730 :1
H 2 -H 3 X 3 -X 0	1.816 :1	1.775 :1	1.730 :1	1.685 :1	1.644 :1	:1	1.730 :1
GREATEST % DIFF. vs. CALCULATED:	0.146 %	0.020 %	0.118 %	0.222 %	0.088 %	%	0.118 %

INSULATION RESISTANCE IN GigOhms	@ HI to LO & GND 5000 VDC	@ LO to HI & GND 5000 VDC	@ HI to LO VDC	CORE INSULATION @ VDC
ACTUAL VALUE:	328,000	406,000		
CORRECTED TO 20°C:	206,640.0	255,780.0		

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
		2,100	3,280	1.56	

COOLING CONTROL SETPOINTS

(a value of N/A°c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
LIQUID TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
LIQUID TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 1 -H 3	161	H 1 -H 2	160	H 2 -H 3	161
CORRECTED TO 20°C:	H 1 -H 3		H 1 -H 2		H 2 -H 3	
ACTUAL VALUE: in (MilliOhms)	X 1 -X 0	50.5	X 2 -X 0	50	X 3 -X 0	51
CORRECTED TO 20°C:	X 1 -X 0		X 2 -X 0		X 3 -X 0	



Powering Business Worldwide

Electrical Services & Systems

NLTC 2 Winding Liquid Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Ship to Shore
DEVICE / FEEDER ID:	T12.5MS-2	DATE TESTED:	February 13, 2012

CAPACITANCE AND DISSIPATION FACTOR TEST

CONNECTION	MULTIPLIER	CAPACITANCE	DISSIPATION FACTOR	CORRECTED TO 20°C
CH-L + CH-G				
CH-G				
CH-L				
CL-G				
CL-H& CL-G				

COMMENTS:

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Ship to Shore
DEVICE / FEEDER ID:	T12.5MS-2GS	DATE TESTED:	February 13, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Areva	VOLTAGE RATING:	15,000
TYPE:	Load Break / Grounding	CURRENT RATING:	600
MODEL/STYLE #:	10-02-04	BIL (KV):	
SYSTEM VOLTAGE:	12,470	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Open (Line - Load	Closed (Ph. - Ph.)	Closed (Ph. - Gnd
A-A'	4620	A-B 653000
B-B'	4990	B-C 653000
C-C'	5170	C-A 773000

Contact Resistance	
A	40
B	40
C	36

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	3	B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

Potential Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Ship to Shore
DEVICE / FEEDER ID:	T12.5MS-GS2	DATE TESTED:	February 13, 2012

FIELD DATA

MANUFACTURER:	Current Transformers Inc.	CIRCUIT ID:	Shore Power
SYSTEM VOLTAGE:	12,470	BIL PRIMARY (KV):	
VA:	1500	BIL SECONDARY (KV)	
NUMBER OF WINDINGS:	1	PRIMARY VOLTS	14,400
ACCURACY CLASS:		SECONDARY VOLTS:	120
STYLE / CAT#:	AE-0431	TEMPERATURE: (please choose	
PT PRIMARY CONNECTION:	Open Delta	HUMIDITY: (%)	
PT SECONDARY CONNECTION	Wye	GND SWITCH POSITION:	120
PRIMARY FUSES		SECONDARY FUSES	
MANUFACTURER:		MANUFACTURER:	
RATED AMPS:	1	RATED AMPS:	1
STYLE / CAT#:		STYLE / CAT#:	

INSPECTION DATA

DRAW OUT TRAY:	Acceptable	FUSE INDICATORS:	N/A
INTERLOCKS:	Acceptable	FUSE HOLDERS:	Acceptable
PHYSICAL CONDITION:	Acceptable	OIL LEVEL:	N/A
GROUNDING STRAP:	Acceptable	BUSHINGS:	N/A
PRIMARY CONNECTIONS:	Acceptable	CLEARANCES:	Acceptable
SECONDARY CONNECTIONS:	Acceptable	CLEANLINESS:	Acceptable
EQUIPMENT GROUNDING:	Acceptable	GROUNDING SWITCH:	Acceptable
BARRIERS:	N/A		

ELECTRICAL TEST DATA

RATIO TEST

	SERIAL NUMBER	PRIMARY VOLTS	SECONDARY VOLTS	NAMEPLATE RATIO	MEASURED RATIO	POLARITY	% VARIANCE
PT1:	1222226	14,400 V	120 V	120 :1	119.9 :1	OK	0.08 %
PT2:	1222225	14,400 V	120 V	120 :1	119.8 :1	OK	0.17 %
PT3:		V	V	120 :1	:1		%

INSULATION RESISTANCE TEST

	HIGH TO LOW AND GROUND @ 1000 VDC (MegOhms)		LOW TO HIGH AND GROUND @ 1000 VDC (MegOhms)		HIGH TO LOW @ 1000 VDC (MegOhms)	
	ACTUAL	CORRECTED TO 20° C	ACTUAL	CORRECTED TO 20° C	ACTUAL	CORRECTED TO 20° C
PT1:						
PT2:						
PT3:						

FUSE RESISTANCE (READINGS IN OHMS -- Measured with DMM)

PRIMARY 1:	PRIMARY 2:	PRIMARY 3:	PRIMARY 4:	SECONDARY 1:	SECONDARY 2:	SECONDARY 3:

MISC.

POWER FACTOR TEST:		FLUID ANALYSIS TEST:	
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COMMENTS:

Dry Type Transformer

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Transformer Mezzanine
DEVICE / FEEDER ID:	Main Substation 600V	DATE TESTED:	March 3, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE		TYPE:	ANN	
SERIAL NUMBER:	S7850.01		IMPEDANCE (%) :	5.91	
CLASS:	150 SYS		NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>	
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>		SELECTED TAP:	FREQUENCY: (Hz) 60	
KVA:	750		WINDING TEMPERATURE: (°C)	60	
CONFIG.:	Primary Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary Delta <input type="radio"/> Wye <input checked="" type="radio"/>	MAX. TEMP.	60	
PRIMARY VOLTS	L-L:	12,470	TEMP RISE (°C)	80	
SECONDARY VOLTS:	L-L:	600	L-N:	346	WINDING MATERIAL: Primary: Copper Secondary: Copper
SYSTEM VOLTAGE:	12,470		BIL PRIMARY (KV):	95	
HUMIDITY:			BIL SECONDARY (KV)		

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Corrected
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)							AS LEFT
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>	6 <input type="radio"/>	7 <input type="radio"/>	3
PRIM. VOLTAGE: (✓) 2.5% equal taps)	13,405.25 V	13,093.50 V	12,781.75 V	12,470.00 V	12,158.25 V	11,846.50 V	11,534.75 V	12,781.75 V
CALCULATED RATIO:	38.698 :1	37.798 :1	36.898 :1	35.998 :1	35.098 :1	34.198 :1	33.298 :1	36.898 :1
H 3 -H 1 X 0 -X 1	37.911 :1	37.034 :1	36.119 :1	35.189 :1	34.316 :1	:1	:1	36.119 :1
H 1 -H 2 X 0 -X 2	37.925 :1	37.034 :1	36.132 :1	35.213 :1	34.327 :1	:1	:1	36.132 :1
H 2 -H 3 X 0 -X 3	37.191 :1	37.034 :1	36.132 :1	35.201 :1	34.327 :1	:1	:1	36.132 :1
GREATEST % DIFF. vs. CALCULATED:	3.893 %	2.020 %	2.111 %	2.247 %	2.228 %	0.000 %	0.000 %	2.111 %

INSULATION RESISTANCE IN MegOhms	HI to LO & GND 5000 VDC		LO to HI & GND 1000 VDC		HI to LO 5000 VDC		CORE INSULATION 500 VDC	
	@		@		@		@	
ACTUAL VALUE:		954		214		1,170		374
CORRECTED TO 20°C:		6,010.20		1,348.20		7,371.00		2,356.20

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
		1,130	1,170			1,340	1.15	NO

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 3 -H 1	1.658	H 1 -H 2	1.657	H 2 -H 3	1.663
CORRECTED TO 20°C:	H 3 -H 1	1.43	H 1 -H 2	1.43	H 2 -H 3	1.44
ACTUAL VALUE: in (MilliOhms)	X 0 -X 1	1.33	X 0 -X 2	1.35	X 0 -X 3	1.35
CORRECTED TO 20°C:	X 0 -X 1	1.15	X 0 -X 2	1.17	X 0 -X 3	1.17

COMMENTS: Temperature indicator is not functional, winding temperature is an estimate only



Powering Business Worldwide

Electrical Services & Systems

Dry Type Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Transformer Mezzanine
DEVICE / FEEDER ID:	Main Substation 480V	DATE TESTED:	March 3, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE	TYPE:	ANN
SERIAL NUMBER:	S7849.01	IMPEDANCE (%):	5.68
CLASS:	150 SYS	NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	1500	WINDING TEMPERATURE: (°C)	99
CONFIG.: Primary Delta <input checked="" type="radio"/> Wye <input type="radio"/> Secondary Delta <input type="radio"/> Wye <input checked="" type="radio"/>		MAX. TEMP.	99
PRIMARY VOLTS	L-L: 12,470	TEMP RISE (°C)	80
SECONDARY VOLTS:	L-L: 480 L-N: 277	WINDING MATERIAL:	Primary: Copper Secondary: Copper
SYSTEM VOLTAGE:	12,470	BIL PRIMARY (KV):	95
HUMIDITY:		BIL SECONDARY (KV)	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Corrected
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	Acceptable
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Needs Repair	AIR FILTER:	Acceptable

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>			3
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps)	13,093.50 V	12,781.75 V	12,470.00 V	12,158.25 V	11,846.50 V	V	V	12,470.00 V
CALCULATED RATIO:	47.247 :1	46.122 :1	44.997 :1	43.872 :1	42.747 :1	:1	:1	44.997 :1
H 3 -H 1 X 0 -X 1	47.341 :1	46.272 :1	45.090 :1	44.500 :1	42.845 :1	:1	:1	45.090 :1
H 1 -H 2 X 0 -X 2	47.319 :1	46.251 :1	45.110 :1	44.500 :1	42.827 :1	:1	:1	45.110 :1
H 2 -H 3 X 0 -X 3	47.341 :1	46.272 :1	45.110 :1	44.500 :1	42.845 :1	:1	:1	45.110 :1
GREATEST % DIFF. vs. CALCULATED:	0.199 %	0.325 %	0.251 %	1.431 %	0.228 %	%	%	0.251 %

INSULATION RESISTANCE IN MegOhms	@ HI to LO & GND 5000 VDC	@ LO to HI & GND 1000 VDC	@ HI to LO 5000 VDC	CORE INSULATION @ 500 VDC
ACTUAL VALUE:	1,170	656	1,630	247
CORRECTED TO 20°C:	44,834.40	25,137.92	62,461.60	9,465.04

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
		1,600	1,690	1,850	1.09	NO

COOLING CONTROL SETPOINTS

(a value of N/A°c indicates specified control is not applicable to this transformer)				
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (MilliOhms)	H 3 -H 1	387	H 1 -H 2	388	H 2 -H 3	386
CORRECTED TO 20°C:	H 3 -H 1	295.33	H 1 -H 2	296.09	H 2 -H 3	294.56
ACTUAL VALUE: in (MilliOhms)	X 0 -X 1	0.755	X 0 -X 2	0.798	X 0 -X 3	0.823
CORRECTED TO 20°C:	X 0 -X 1	0.58	X 0 -X 2	0.61	X 0 -X 3	0.63

COMMENTS: Temperature relay installed and tested by Emery Electric Ltd. on March 1, 2012
Insulation burn marks on edge of insulating sheets between coils, core varnish has visible degradation

Dry Type Transformer

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Main Sub	EQUIPMENT POSITION:	Transformer Mezzanine
DEVICE / FEEDER ID:	Main Substation 208V	DATE TESTED:	March 3, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE		TYPE:	ANN
SERIAL NUMBER:	S7851.01		IMPEDANCE (%) :	5.14
CLASS:	150 SYS		NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/>	3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	450		WINDING TEMPERATURE: (°C)	60
CONFIG.:	Primary Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary Delta <input type="radio"/> Wye <input checked="" type="radio"/>	MAX. TEMP.	60
PRIMARY VOLTS	L-L:	12,470	TEMP RISE (°C)	80
SECONDARY VOLTS:	L-L:	208	L-N:	120
SYSTEM VOLTAGE:	12,470		WINDING MATERIAL:	Primary: Copper Secondary: Copper
HUMIDITY:			BIL PRIMARY (KV):	95
			BIL SECONDARY (KV)	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Corrected
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	Acceptable
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	Acceptable

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)					AS LEFT
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>	
PRIM. VOLTAGE: (✓) 2.5% equal taps)	13,093.50 V	12,781.75 V	12,470.00 V	12,158.25 V	11,846.50 V	12,470.00 V
CALCULATED RATIO:	109.032 :1	106.436 :1	103.840 :1	101.244 :1	98.648 :1	103.840 :1
H 3 -H 1 X 0 -X 1	109.400 :1	106.800 :1	104.200 :1	101.500 :1	99.030 :1	104.200 :1
H 1 -H 2 X 0 -X 2	109.400 :1	106.900 :1	104.200 :1	101.500 :1	99.032 :1	104.200 :1
H 2 -H 3 X 0 -X 3	109.400 :1	106.900 :1	104.200 :1	101.500 :1	99.080 :1	104.200 :1
GREATEST % DIFF. vs. CALCULATED:	0.338 %	0.436 %	0.347 %	0.253 %	0.438 %	0.347 %

INSULATION RESISTANCE IN MegOhms	HI to LO & GND 5000 VDC	LO to HI & GND 1000 VDC	HI to LO 5000 VDC	CORE INSULATION 500 VDC
ACTUAL VALUE:	1,640	413,000		428
CORRECTED TO 20°C:	10,332.00	2,601,900		2,696.40

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
	150,000	341,000	5e+006	14.66	NO

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 3 -H 1	2.77	H 1 -H 2	2.7	H 2 -H 3	2.71
CORRECTED TO 20°C:	H 3 -H 1	2.39	H 1 -H 2	2.33	H 2 -H 3	2.34
ACTUAL VALUE: in (MilliOhms)	X 0 -X 1	378	X 0 -X 2	411	X 0 -X 3	437
CORRECTED TO 20°C:	X 0 -X 1	326.66	X 0 -X 2	355.18	X 0 -X 3	377.65

COMMENTS: Temperature monitor not functional, temperature is estimate only
Phase A insulator has a small chip in it



Eaton Job # EVC12J0027

Tested date: March 4, 2012

Main Substation
480V Ground Fault Relay Test Results -> FPE DSP-MKII

480V Ground Fault Test Results				
Feeder ID	50% Meter	100% Meter	Alarm	80A Trip
Main	NT	NT	NT	NT
2000A Splitter	OK	OK	OK	86
Crane Rec.	OK	OK	OK	76
Panel #1	OK	OK	OK	83
Panel #2	OK	OK	OK	78
Panel #3	OK	OK	OK	82
1 Sec W.	OK	OK	OK	81
1 Sec Cmtr.	OK	OK	OK	81
1 Sec E.	OK	OK	OK	81
2 Sec W.	OK	OK	OK	81
2 Sec Cntr.	OK	OK	OK	84
Filter Panel	NT	NT	NT	NT
2 Sec E.	OK	OK	OK	82
3 Sec W.	OK	OK	OK	82
3 Sec Cntr	OK	OK	OK	82
3 Sec E.	OK	OK	OK	81
Comments: - Ground fault current transformers for Main and Filter Panel feeders cannot be located or accessed				
Tested by: Lorne Cowley / Colin Green				



Eaton Job # EVC12J0027

Tested date: March 3, 2012

Main Substation
208V Ground Fault Relay Test Results

600V Ground Fault Test Results				
Feeder ID	Relay	Trip Set (A)	Time Set (s)	Trip
Dine in Victoria	TLR-3-25-F	25	0.1	28
Main No.2 Sec. Dockside Pnl	TLR-3-25-F	25	0.1	27.7
Main No.1 Sec. Dockside Pnl	TLR-3-25-F	25	0.1	27.2
Spare	TLR-3-25-F	25	0.1	27.7
Spare #2	TLR-3-25-F	25	0.1	29.6*
Washrooms	TLR-3-25-F	25	0.1	27.3
Main Breaker 120/208V Swbd	TLR-3-100-F	100	0.1	NT
Pumphouse Switchboard	TLR-3-100-F	100	0.1	115.5
Comments:				
- *Spare feeder TLR relay trip flag does not operate fully, only comes down half way				
- Main Breaker 120/208V Swbd ground fault current transformer cannot be located or accessed				
Tested by: Lorne Cowley / Colin Green				



Eaton Job # EVC12J0027

Tested date: March 4, 2012

Main Substation
2.4kV Ground Fault Relay Test Results -> FPE DSP-MKII

2.4kV Ground Fault Test Results

Feeder ID	50% Meter	100% Meter	Alarm	80A Trip
Pump House	OK	OK	OK	77
150T Crane	OK	OK	OK	76
N. 30T Crane	OK	OK	OK	76
S. 30T Crane Switchgear	OK	OK	OK	79
2.4kV winding of T12.5MS-4	OK	OK	OK	71*

Comments:
- Initial tests were problematic. Trips were at 47A with no flag. After multiple tests the problem corrected itself.
- *Trip at relay only, no breaker in cell

Tested by: Lorne Cowley / Colin Green



Eaton Job # EVC12J0027

Tested date: March 4, 2012

Main Substation
600V Ground Fault Relay Test Results

600V Ground Fault Test Results				
Feeder ID	Relay	Trip Set (A)	Time Set (s)	Trip
Pump House Swbd	TLR-3-100-F	100	0.1	100
Frane Trailing Cable Thru Htr Cntrl Pnl	TLR-3-25-F	25	0.1	27.5
Pnl 6C	TLR-3-25-F	25	0.1	28.1
Highmast Lighting Panel	TLR-3-25-F	25	0.1	29.1
6MS-9	Startco SE-701	100	0.05	109
Vic Ship Work Shop Bldg	Startco SE-701	200	0.05	192
Peninsula Waste Water	Startco SE-701	30	0.05	30*
Comments: - *Peninsula Waste Water ground fault relay operates properly but breaker dose not trip				
Tested by: Lorne Cowley / Colin Green				



Eaton Job Number: EVC12J0027

Pump House

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-1
DEVICE / FEEDER ID:	2.4PH-1DS	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2400
TYPE:	Isolation switch	CURRENT RATING:	1200
MODEL/STYLE #:	S15673	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE:	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ _____ VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	N/T
B-G	N/T	B-C	N/T	B-B'	N/T
C-G	N/T	C-A	N/T	C-C'	N/T

Contact Resistance	
A	25
B	30
C	24

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:

No megger tests performed because of safety grounds and other workers
Cables feeding this bus have been meggered and results are available on the cable megger spreadsheet



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-10
DEVICE / FEEDER ID:	Auxiliary Pump #2	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	7000
CAT#:	FLR	CURRENT RATING:	100A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)	
A-G	A-B	A-A'	470
B-G	B-C	B-B'	410
C-G	C-A	C-C'	553

MicroOhms @ 10 Amps

Contact Resistance	
A	198
B	127
C	210

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	6.32	B	6.3	C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	6.71	B	6.31	C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.39	B	0.01	C	NA
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry
Switch contact resistance was improved from as found by excerscise and contact cleaning

Medium Voltage Starter

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-10
DEVICE / FEEDER ID:	Auxiliary Pump #2	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
------------------------	---------------------

As Found: MegOhms @ 2500 VDC

As Left:

 MicroOhms @ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.)	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.)	Open (Line - Load
A-G	Comments	A-A'	470	A-G	Comments
B-G	Comments	B-B'	502	B-G	Comments
C-G	Comments	C-C'	577	C-G	Comments

As Found	As Left
A	150
B	155
C	138

Overpotential Test:

Readings in Milliamps @ KV AC DC

Bottle Integrity:

@ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ <u> </u> Amps:	A:	B:	C:
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Additional Tests: (May be documented on additional forms)

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COMMENTS:

See isolation switch test sheet for fuse resistance results
 See cable megger test sheet for load side megger results
 Connected load does not permit phase-to-phase megger test
 500A'SC' contactor 5 pole contact resistance in micro Ohms= 1-149, 2-125, 3-130, 4-170, 5-126

MP-3000 Motor Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-10
DEVICE / FEEDER ID:	Auxiliary Pump #2	DATE TESTED:	March 10, 2012

FIELD DATA

Static / Nameplate Data

MANUFACTURER:	Cutler-Hammer	CAT #:	MP3000	STYLE #:	66D2205G01	SERIAL NUMBER:	23640
DEVICE ADDRESS:	0x	INCOM BAUD RATE:		FIRMWARE VERSION:			

MOTOR

FULL LOAD AMPS (FLA):	47 Amps	ULTIMATE TRIP CURRENT:	115 % FLA	FREQUENCY:	60 Hz.
LOCKED ROTOR CURRENT:	600 % FLA	PHASE CT RATIO:	(50 : 5)	STARTER TYPE:	Non-Reversing
MAX STALL TIME:	5 Seconds	GROUND CT RATIO:	(50 : 5)	STOP CURR. LEVEL:	2 % Ø-Curr. CT. Prim. Rating

RTD SETTINGS

WINDING TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)	MOTOR BEARING TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)
WINDING TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)	MOTOR BEARING TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)
LOAD BEARING TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)	AUX TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)
LOAD BEARING TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)	AUX TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)
LOCAL DISPLAY:		RTD DIAGNOSTICS:	

TRIP SETTINGS

GROUND FAULT		UNDERLOAD	
GROUND FAULT TRIP LEVEL (GFT):	(disabled <input type="checkbox"/>) 25 % Gnd CT	UNDERLOAD TRIP LEVEL (ULT):	(disabled <input type="checkbox"/>) 30 % FLA
GROUND FAULT START DELAY (GFSD):	60 Cycles	UNDERLOAD START DELAY (ULSD):	10 Seconds
GROUND FAULT RUN DELAY (GFRD):	5 Cycles	UNDERLOAD RUN DELAY (ULTR):	10 Seconds
JAM		UNBALANCE	
JAM TRIP LEVEL (JMT):	(disabled <input type="checkbox"/>) 1,000 % FLA	UNBALANCE TRIP LEVEL (UBT):	(disabled <input type="checkbox"/>) 25 % FLA
JAM START DELAY (JMST):	60 Seconds	UNBALANCE START DELAY (UBSD):	10 Seconds
JAM RUN DELAY (JMTR):	2 Seconds	UNBALANCE RUN DELAY (UBTR):	2 Seconds
INSTANTANEOUS			
INSTANTANEOUS OVERCURRENT (IOC):	(disabled <input type="checkbox"/>) 600 % FLA	INSTANTANEOUS CURRENT START DELAY (IOCSD):	3 Cycles

RELAY MODE

TRIP:	Mode 1: Energizes on Trip	AUX 1:	Mode 1: Energizes on Trip
ALARM:	Mode 1: Energizes on Trip	AUX 2:	Mode 1: Energizes on Trip

INSPECTION DATA

INDICATORS / LEDs:	Acceptable	TRIP CONTACTS:	Acceptable	SCREWS TIGHTENED:	Acceptable
AUX CONTACTS:	N/A	ALARM CONTACTS:	N/A	DISCRETE INPUTS:	N/A

ELECTRICAL TEST DATA

Current Display Check

Phase:	Input:	CT Multiplier:	Calculated Display:	Actual:	% Error:
A	5	10.00	50.00	50	0.00
B	5	10.00	50.00	50	0.00
C	5	10.00	50.00	50	0.00
Gnd / Neut.	5	10.00	50.00	50	0.00

THERMAL

FLA Test Level	Test Current	Limits		As Found		
		Min	Max	A	B	C
300 %	2.82 Amps	Sec.	Sec.	19.7 Sec.	19.7 Sec.	19.7 Sec.
400 %	3.76 Amps	Sec.	Sec.	12.7 Sec.	12.7 Sec.	12.7 Sec.
500 %	4.70 Amps	Sec.	Sec.	9.1 Sec.	9.1 Sec.	9.1 Sec.

UNDERLOAD

Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
ULT:	30		Amps	Amps	Amps	Amps	Amps
ULSD:	10	Amps	Sec.	Sec.	Sec.	Sec.	Sec.
ULTR	10	Amps	Sec.	Sec.	Sec.	Sec.	Sec.

MP-3000 Motor Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-10
DEVICE / FEEDER ID:	Auxiliary Pump #2	DATE TESTED:	March 10, 2012

JAM							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
JMT:	1,000 %		Amps	Amps	Amps	Amps	Amps
JMSD:	60	49.35 Amps	Sec.	Sec.	Sec.	Sec.	Sec.
JMTR:	2	49.35 Amps	Sec.	Sec.	Sec.	Sec.	Sec.

UNBALANCE							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
UBT LO:	25 %		Amps	Amps	Amps	Amps	Amps
UBT HI:	25 %		Amps	Amps	Amps	Amps	Amps
UBSD:	10	Amps	Sec.	Sec.	Sec.	Sec.	Sec.
UBTR:	2	Amps	Sec.	Sec.	Sec.	Sec.	Sec.

INSTANTANEOUS							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
IOC:	600 %		Amps	Amps	Amps	Amps	Amps
IOCS:	3	29.61 Amps	Cycles	Cycles	Cycles	Cycles	Cycles

GROUND FAULT							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
GFT:	25 %		Amps	Amps	Amps	Amps	Amps
GFSD:	60	1.31 Amps	Cycles	Cycles	Cycles	Cycles	Cycles
GFRD:	5	Amps	Cycles	Cycles	Cycles	Cycles	Cycles

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-11
DEVICE / FEEDER ID:	Spare	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	FID5G22	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT Ratio	Setting				
OL Coil	75:5	2.65A				

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	N/A	N/A	N/A	N/A	JEWEL BEARING:	N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	N/A	N/A	N/A	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
10.6A secondary	25s	28.42	28.42	27.22	27.22	27.43	27.43		

COMMENTS:

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-11
DEVICE / FEEDER ID:	Spare	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE:	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	7000
CAT#:	235920-L	CURRENT RATING:	80A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	682
B-G	N/T	B-C	N/T	B-B'	696
C-G	N/T	C-A	N/T	C-C'	836

Contact Resistance	
A	194
B	112
C	187

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	9.5	B	8.5	C	9.7
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	11.2	B	10.9	C	11.5
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	1.7	B	2.4	C	1.8
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:

Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry
Switch contact resistance was improved from as found by exercise and contact cleaning



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Starter

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-11
DEVICE / FEEDER ID:	Spare	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
-------------------------------	----------------------------

As Found: MegOhms @ 2500 VDC

As Left:

MicroOhms @ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load
A-G	Comments	A-A'	682	A-G	Comments
B-G	Comments	B-B'	696	B-G	Comments
C-G	Comments	C-C'	836	C-G	Comments

As Found	As Left
A	
B	
C	

Overpotential Test:

Readings in Milliamps @ _____ KV AC DC

Bottle Integrity:

@ _____ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ _____ Amps:	A:	B:	C:
--	----	----	----

Additional Tests: (May be documented on additional forms)

COMMENTS:

See isolation switch test sheet for fuse resistance results
 See cable megger test sheet for load side megger results
 Connected load does not permit phase-to-phase megger test
 No contact resistance results recorded

Medium Voltage Starter

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-12
DEVICE / FEEDER ID:	Air Compressor #1	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	Acceptable	Acceptable
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:						Contact Resistance:					
As Found: <u> </u> MegOhms @ <u>2500</u> VDC						As Left: <u> </u> MicroOhms @ <u>10</u> Amps					
Open (Load - Gnd	Closed (Ph. - Ph.)	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.)	Open (Line - Load						
A-G	Comments	A-B	Comments	A-A'	Comments	A-G	Comments	A-B	Comments	A-A'	Comments
B-G	Comments	B-C	Comments	B-B'	Comments	B-G	Comments	B-C	Comments	B-B'	Comments
C-G	Comments	C-A	Comments	C-C'	Comments	C-G	Comments	C-A	Comments	C-C'	Comments

Overpotential Test:						Bottle Integrity:					
Readings in Milliamps @ <u> </u> KV <input type="radio"/> AC <input type="radio"/> DC						@ <u> </u> KV <input type="radio"/> AC <input type="radio"/> DC					
AS FOUND:			AS LEFT:								
A-G	A-B	A-A'	A-G	A-B	A-A'	A1	A2	N/A	B1	B2	N/A
B-G	B-C	B-B'	B-G	B-C	B-B'	C1	C2	N/A			
C-G	C-A	C-C'	C-G	C-A	C-C'						

Fuse Test:			
Fuse Resistance in MilliOhms @ <u> </u> Amps:	A:	B:	C:

Additional Tests: (May be documented on additional forms)			

COMMENTS: See isolation switch test sheet for fuse resistance results
 Contactor is bypassed and being used for parts

MP-3000 Motor Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-12
DEVICE / FEEDER ID:	Air Compressor #1	DATE TESTED:	March 10, 2012

FIELD DATA

Static / Nameplate Data

MANUFACTURER:	Cutler-Hammer	CAT #:	MP3000	STYLE #:	66D2032GX1	SERIAL NUMBER:	200001060743
DEVICE ADDRESS:	0x	INCOM BAUD RATE:		FIRMWARE VERSION:			

MOTOR

FULL LOAD AMPS (FLA):	70 Amps	ULTIMATE TRIP CURRENT:	115 % FLA	FREQUENCY:	60 Hz.
LOCKED ROTOR CURRENT:	500 % FLA	PHASE CT RATIO:	(100 : 5)	STARTER TYPE:	Non-Reversing
MAX STALL TIME:	5 Seconds	GROUND CT RATIO:	(50 : 5)	STOP CURR. LEVEL:	5 % Ø-Curr. CT. Prim. Rating

RTD SETTINGS

WINDING TEMPERATURE TRIP:	(disabled <input type="checkbox"/>)	100 °C	MOTOR BEARING TEMPERATURE TRIP:	(disabled <input type="checkbox"/>)	100 °C
WINDING TEMPERATURE ALARM:	(disabled <input type="checkbox"/>)	80 °C	MOTOR BEARING TEMPERATURE ALARM:	(disabled <input type="checkbox"/>)	80 °C
LOAD BEARING TEMPERATURE TRIP:	(disabled <input type="checkbox"/>)	100 °C	AUX TEMPERATURE TRIP:	(disabled <input type="checkbox"/>)	100 °C
LOAD BEARING TEMPERATURE ALARM:	(disabled <input type="checkbox"/>)	80 °C	AUX TEMPERATURE ALARM:	(disabled <input type="checkbox"/>)	80 °C
LOCAL DISPLAY:			RTD DIAGNOSTICS:		

TRIP SETTINGS

GROUND FAULT		UNDERLOAD		
GROUND FAULT TRIP LEVEL (GFT):	(disabled <input type="checkbox"/>)	6 % Gnd CT	UNDERLOAD TRIP LEVEL (ULT):	(disabled <input checked="" type="checkbox"/>)
GROUND FAULT START DELAY (GFSD):		5 Cycles	UNDERLOAD START DELAY (ULSD):	
GROUND FAULT RUN DELAY (GFRD):		2 Cycles	UNDERLOAD RUN DELAY (ULTR):	
JAM		UNBALANCE		
JAM TRIP LEVEL (JMT):	(disabled <input type="checkbox"/>)	300 % FLA	UNBALANCE TRIP LEVEL (UBT):	(disabled <input type="checkbox"/>)
JAM START DELAY (JMSD):		14 Seconds	UNBALANCE START DELAY (UBSD):	6 Seconds
JAM RUN DELAY (JMTR):		6 Seconds	UNBALANCE RUN DELAY (UBTR):	2 Seconds
INSTANTANEOUS				
INSTANTANEOUS OVERCURRENT (IOC):	(disabled <input type="checkbox"/>)	1,150 % FLA	INSTANTANEOUS CURRENT START DELAY (IOCSD):	3 Cycles

RELAY MODE

TRIP:	Mode 1: Energizes on Trip	AUX 1:	Mode 1: Energizes on Trip
ALARM:	Mode 1: Energizes on Trip	AUX 2:	Mode 1: Energizes on Trip

INSPECTION DATA

INDICATORS / LEDs:	Acceptable	TRIP CONTACTS:	Acceptable	SCREWS TIGHTENED:	Acceptable
AUX CONTACTS:	Acceptable	ALARM CONTACTS:	N/A	DISCRETE INPUTS:	N/A

ELECTRICAL TEST DATA

Current Display Check

Phase:	Input:	CT Multiplier:	Calculated Display:	Actual:	% Error:
A	5	20.00	100.00	50	50.00
B	5	20.00	100.00	50	50.00
C	5	20.00	100.00	50	50.00
Gnd / Neut.	5	10.00	50.00	50	0.00

THERMAL

FLA Test Level	Test Current	Limits		As Found		
		Min	Max	A	B	C
300 %	2.10 Amps	Sec.	Sec.	15.76 Sec.	15.76 Sec.	15.76 Sec.
400 %	2.80 Amps	Sec.	Sec.	8.876 Sec.	8.876 Sec.	8.876 Sec.
500 %	3.50 Amps	Sec.	Sec.	5.688 Sec.	5.688 Sec.	5.688 Sec.

UNDERLOAD

Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C

MP-3000 Motor Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-12
DEVICE / FEEDER ID:	Air Compressor #1	DATE TESTED:	March 10, 2012

JAM							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
JMT:	300 %		Amps	Amps	Amps	Amps	Amps
JMSD:	14	11.02 Amps	Sec.	Sec.	Sec.	Sec.	Sec.
JMTR:	6	11.02 Amps	Sec.	Sec.	Sec.	Sec.	Sec.

UNBALANCE							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
UBT LO:	20 %		Amps	Amps	Amps	Amps	Amps
UBT HI:	20 %		Amps	Amps	Amps	Amps	Amps
UBSD:	6	Amps	Sec.	Sec.	Sec.	Sec.	Sec.
UBTR:	2	Amps	Sec.	Sec.	Sec.	Sec.	Sec.

INSTANTANEOUS							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
IOC:	1,150 %		Amps	Amps	Amps	Amps	Amps
IOCSD:	3	42.26 Amps	Cycles	Cycles	Cycles	Cycles	Cycles

GROUND FAULT							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
GFT:	6 %		Amps	Amps	Amps	Amps	Amps
GFSD:	5	0.32 Amps	Cycles	Cycles	Cycles	Cycles	Cycles
GFRD:	2	Amps	Cycles	Cycles	Cycles	Cycles	Cycles

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-12
DEVICE / FEEDER ID:	Air Compressor #1	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	7000
CAT#:	439215-01	CURRENT RATING:	125A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)	
A-G	A-B	A-A'	36200
B-G	B-C	B-B'	33200
C-G	C-A	C-C'	35700

Contact Resistance	
A	132
B	83
C	95

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	2.52	B	2.56	C	2.42
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	2.58	B	2.6	C	2.5
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.06	B	0.04	C	0.08
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:

Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry
Switch contact resistance was improved from as found by excersise and contact cleaning

Medium Voltage Starter

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-12
DEVICE / FEEDER ID:	Air Compressor #1	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:		PT RATIO:	
CONTROL VOLTAGE:	120 VAC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	Eaton	
TYPE:	Ampgard MVMC	
MODEL / STYLE NUMBER:	W210SCA	
SERIAL NUMBER:		
VOLTAGE RATING:	2400	
CURRENT RATING:		
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	Acceptable	Acceptable
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	Acceptable	Acceptable
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	Acceptable	Acceptable
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:						Contact Resistance:			
As Found: MegOhms @ 2500 VDC						As Left: MicroOhms @ 10 Amps			
Open (Load - Gnd)	Open (Line - Gnd)	Open (Load - Gnd)	Open (Load - Gnd)	Open (Line - Gnd)	Open (Load - Gnd)	As Found	As Left	As Found	As Left
A-G	A-G	A-G	A-G	A-G	A-G	A	Comments	A	Comments
B-G	B-G	B-G	B-G	B-G	B-G	B	Comments	B	Comments
C-G	C-G	C-G	C-G	C-G	C-G	C	Comments	C	Comments

Overpotential Test:						Bottle Integrity:			
Readings in Milliamps @ 6 KV <input checked="" type="radio"/> AC <input type="radio"/> DC						@ 6 KV <input checked="" type="radio"/> AC <input type="radio"/> DC			
AS FOUND:			AS LEFT:						
A-G	A-B	A-A'	A-G	A-B	A-A'	A1	Pass	A2	N/A
B-G	B-C	B-B'	B-G	B-C	B-B'	B1	Pass	B2	N/A
C-G	C-A	C-C'	C-G	C-A	C-C'	C1	Pass	C2	N/A

Fuse Test:			
Fuse Resistance in MilliOhms @ 10 Amps:	A:	3.23	B: 3.22 C: 3.24

Additional Tests: (May be documented on additional forms)

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COMMENTS: Bus resistance through switch in mili Ohms: A-17.5, B-24, C-17.5

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-13
DEVICE / FEEDER ID:	Air Compressor #2	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	FID5G24	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT Ratio	Setting				
OL Coil	100:5	3.2A				

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	N/A	N/A	N/A	N/A	JEWEL BEARING:	N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	N/A	N/A	N/A	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
12.8A secondary	25s	30.39s	30.39s	29.71s	29.71s	30.84s	30.84s		

COMMENTS:

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-13
DEVICE / FEEDER ID:	Air Compressor #2	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	7000
CAT#:	439215-01	CURRENT RATING:	125A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	N/T	A-B	N/T
B-G	N/T	B-C	N/T
C-G	N/T	C-A	N/T

Contact Resistance	
A	178
B	107
C	113

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	4.45	B	4.47	C	4.58
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	4.93	B	4.94	C	5.06
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.48	B	0.47	C	0.48
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Starter

Table with customer, user, substation, device, job number, plant, equipment position, and date tested information.

FIELD DATA

Table for system voltage, CT ratio, control voltage, wiring diagram, PT ratio, and protection type.

Table for starter and fuses details including manufacturer, type, model, serial number, voltage rating, current rating, interrupt rating, and IB number.

INSPECTION DATA

Table for overall condition, main contact condition, contact wipe, arc chute condition, aux contact/switch, insulation/barriers, interlocks, lubrication, interconnection cables, vacuum bottles, ground connection, primary fingers, secondary disconnects, control wiring, connection tightness, electrical operation, protection trips, and isolation switch.

ELECTRICAL TESTS

Table for Insulation Resistance and Contact Resistance.

Table for Insulation Resistance test results (Open/Closed/Line-Load) and Contact Resistance test results (As Found/As Left).

Table for Overpotential Test and Bottle Integrity.

Table for Overpotential Test results (AS FOUND/AS LEFT) and Bottle Integrity results (A1, B1, C1, A2, B2, C2).

Table for Fuse Test results (Fuse Resistance in MilliOhms @ Amps).

Table for Additional Tests (May be documented on additional forms).

COMMENTS: See isolation switch test sheet for fuse resistance results. Contact resistance readings not recorded.

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-14
DEVICE / FEEDER ID:	Spare	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	FID5G20	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT Ratio	Setting				
OL Coil	50:5	2.2A				

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	N/A	N/A	N/A	N/A	JEWEL BEARING:	N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	N/A	N/A	N/A	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
8.8A secondary	25s	27.6s	27.6s	29.66s	29.66s	27.68s	27.68s		

COMMENTS:

Electrical Services & Systems

Medium Voltage Starter

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-14
DEVICE / FEEDER ID:	Spare	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
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As Found: MegOhms @ 2500 VDC

As Left:

 MicroOhms @ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load
A-G	Comments	A-A'	954	A-G	Comments
B-G	Comments	B-B'	934	B-G	Comments
C-G	Comments	C-C'	941	C-G	Comments

As Found	As Left
A	
B	
C	

Overpotential Test:

Readings in Milliamps @ KV AC DC

Bottle Integrity:

@ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ <u> </u> Amps:	A:	B:	C:
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Additional Tests: (May be documented on additional forms)

COMMENTS:

See isolation switch test sheet for fuse resistance results
Contact resistance readings not recorded

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-14
DEVICE / FEEDER ID:	Spare	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	7000
CAT#:	235930L	CURRENT RATING:	63A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	954
B-G	N/T	B-C	N/T	B-B'	934
C-G	N/T	C-A	N/T	C-C'	941

Contact Resistance	
A	137
B	87
C	77

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	15.9	B	16.7	C	16.3
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	16.1	B	17	C	16.8
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.2	B	0.3	C	0.5
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-15
DEVICE / FEEDER ID:	Southside Compressor #4	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2400
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15673	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Unacceptable	Corrected
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	A-B	A-A'
B-G	B-C	B-B'
C-G	C-A	C-C'

Contact Resistance	
A	141
B	88
C	91

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	15.9	B	16.7	C	16.3
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	16.1	B	17	C	16.8
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.2	B	0.3	C	0.5
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: See maintenance report for key interlock modifacaitons

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-6
DEVICE / FEEDER ID:	2.4PH-6DS	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE:	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	3500
CAT#:	FLP	CURRENT RATING:	1600A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	109
B-G	N/T	B-C	N/T	B-B'	250
C-G	N/T	C-A	N/T	C-C'	232

Contact Resistance	
A	350
B	280
C	224

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	0.87	B	0.94	C	0.89
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.9	B	0.94	C	0.93
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.03	B	0	C	0.04
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry

Electrical Services & Systems

Medium Voltage Starter

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-6
DEVICE / FEEDER ID:	Main Pump #1	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

STARTER		FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
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As Found: MegOhms @ 2500 VDC

As Left:

 MicroOhms @ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load
A-G	Comments	A-A'	109	A-G	Comments
B-G	Comments	B-B'	250	B-G	Comments
C-G	Comments	C-C'	232	C-G	Comments

As Found	As Left
A	202
B	199
C	200

Overpotential Test:

Readings in Milliamps @ KV AC DC

Bottle Integrity:

@ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ <u> </u> Amps:	A:	B:	C:
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Additional Tests: (May be documented on additional forms)

COMMENTS:

See isolation switch test sheet for fuse resistance results
 See cable megger test sheet for load side megger results
 Connected load does not permit phase-to-phase megger test
 500A'SC' contactor 5 pole contact resistance in micro Ohms= 1-129, 2-125, 3-128, 4-134, 5-138

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-6
DEVICE / FEEDER ID:	Main Pump #1	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	FID5G22	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT Ratio	Setting					
OL Coil		2.65A					

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	N/A	N/A	N/A	N/A	JEWEL BEARING:	N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	N/A	N/A	N/A	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
10.6A secondary	25s	30.39s	30.39s	29.5s	29.5s	27.3s	27.3s		

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-7
DEVICE / FEEDER ID:	Main Pump #2	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	3500
CAT#:	FLR	CURRENT RATING:	1600A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Corrected
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	273
B-G	N/T	B-C	N/T	B-B'	585
C-G	N/T	C-A	N/T	C-C'	398

Contact Resistance	
A	87
B	166
C	300

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	0.85	B	0.83	C	0.9
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.87	B	0.87	C	1.03
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.02	B	0.04	C	0.13
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry
Switch contact resistance was improved from as found by excerscise and contact cleaning

Medium Voltage Starter

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-7
DEVICE / FEEDER ID:	Main Pump #2	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
------------------------	---------------------

As Found: _____ MegOhms @ _____ 2500 VDC

As Left: _____

MicroOhms @ _____ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.)	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.)	Open (Line - Load
A-G	Comments	A-B	Comments	A-A'	273
B-G	Comments	B-C	Comments	B-B'	585
C-G	Comments	C-A	Comments	C-C'	398

As Found	As Left
A 136	A 136
B 137	B 137
C 137	C 137

Overpotential Test:

Readings in Milliamps @ _____ KV AC DC

Bottle Integrity:

@ _____ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ _____ Amps:	A:	B:	C:
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Additional Tests: (May be documented on additional forms)

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COMMENTS:

See isolation switch test sheet for fuse resistance results
 See cable megger test sheet for load side megger results
 Connected load does not permit phase-to-phase megger test
 500A'SC' contactor 5 pole contact resistance in micro Ohms= 1-146, 2-119, 3-126, 4-125, 5-126

Electrical Services & Systems

General Protective Relay

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-7
DEVICE / FEEDER ID:	Main Pump #2	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	FID5G22	SERIAL / S.O. NUMBER:.		IB NUMBER:	

RELAY ID	CT Ratio	Setting				
OL Coil		2.65A				

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	N/A	N/A	N/A	N/A	JEWEL BEARING:	N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	N/A	N/A	N/A	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
10.6A secondary	25s	23.06s	23.06s	26.94s	26.94s	26.53s	26.53s		

COMMENTS:

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-8
DEVICE / FEEDER ID:	Main Pump #3	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	GE	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	FID5G22	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT Ratio	Setting				
OL Coil		2.65A				

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	N/A	N/A	N/A	N/A	JEWEL BEARING:	N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	N/A	N/A	N/A	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
10.6A secondary	25s	32.54s	32.54s	31.13s	31.13s	28.57s	28.57s		

COMMENTS:

Electrical Services & Systems

Medium Voltage Starter

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks, ;	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks, ;	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-8
DEVICE / FEEDER ID:	Main Pump #3	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
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As Found: MegOhms @ 2500 VDC

As Left: MicroOhms @ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load
A-G	Comments	A-A'	296	A-G	Comments
B-G	Comments	B-B'	640	B-G	Comments
C-G	Comments	C-C'	373	C-G	Comments

As Found	As Left
A	168
B	168
C	175

Overpotential Test:	Bottle Integrity:
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Readings in Milliamps @ KV AC DC

@ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ <u> </u> Amps:	A:	B:	C:
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Additional Tests: (May be documented on additional forms)

COMMENTS:

See isolation switch test sheet for fuse resistance results
 See cable megger test sheet for load side megger results
 Connected load does not permit phase-to-phase megger test
 500A'SC' contactor 5 pole contact resistance in micro Ohms= 1-130, 2-128, 3-124, 4-126, 5-134

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-8
DEVICE / FEEDER ID:	Main Pump #3	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	3500
CAT#:	FLR	CURRENT RATING:	1600A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Marginal
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

 MicroOhms @ 10 Amps

Readings in Milliamps @ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	296
B-G	N/T	B-C	N/T	B-B'	640
C-G	N/T	C-A	N/T	C-C'	373

Contact Resistance	
A	126
B	410
C	140

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	0.88	B	0.86	C	0.87
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.91	B	0.87	C	0.89
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.03	B	0.01	C	0.02
ARRESTER INSULATION RESISTANCE @ <u> </u> VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:

Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry
 Switch contact resistance was improved from as found by exercise and contact cleaning
 Phase B contact on switch is pitted and should be replaced



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Starter

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-9
DEVICE / FEEDER ID:	Auxiliary Pump #1	DATE TESTED:	March 10, 2012

FIELD DATA

SYSTEM VOLTAGE:	2400	WIRING DIAGRAM	
CT RATIO:	400:5	PT RATIO:	2300:115
CONTROL VOLTAGE:	115 VDC	PROTECTION TYPE:	OL

	STARTER	FUSES:
MANUFACTURER:	GE	
TYPE:		
MODEL / STYLE NUMBER:	123L886-2	
SERIAL NUMBER:		
VOLTAGE RATING:	5000	
CURRENT RATING:	400A	
INTERRUPT RATING:		
IB NUMBER:		

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	VACUUM BOTTLES:	N/A	N/A
MAIN CONTACT CONDITION:	Acceptable	Acceptable	GROUND CONNECTION:	Acceptable	Acceptable
CONTACT WIPE:	Acceptable	Acceptable	PRIMARY FINGERS:	N/A	N/A
ARC CHUTE CONDITION:	Acceptable	Acceptable	SECONDARY DISCONNECTS:	N/A	N/A
AUX CONTACT / SWITCH:	Acceptable	Acceptable	CONTROL WIRING:	Acceptable	Acceptable
INSULATION / BARRIERS:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
INTERLOCKS:	Acceptable	Acceptable	ELECTRICAL OPERATION:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	PROTECTION TRIPS:	Acceptable	Acceptable
INTERCONNECTION CABLES:	Acceptable	Acceptable	ISOLATION SWITCH:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance:	Contact Resistance:
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As Found: MegOhms @ 2500 VDC

As Left:

 MicroOhms @ 10 Amps

Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load	Open (Load - Gnd	Closed (Ph. - Ph.	Open (Line - Load
A-G	Comments	A-A'	76	A-G	Comments
B-G	Comments	B-B'	66	B-G	Comments
C-G	Comments	C-C'	153	C-G	Comments

As Found	As Left
A	139
B	140
C	143

Overpotential Test:

Readings in Milliamps @ KV AC DC

Bottle Integrity:

@ KV AC DC

AS FOUND:			AS LEFT:		
A-G	A-B	A-A'	A-G	A-B	A-A'
B-G	B-C	B-B'	B-G	B-C	B-B'
C-G	C-A	C-C'	C-G	C-A	C-C'

A1	A2	N/A
B1	B2	N/A
C1	C2	N/A

Fuse Test:

Fuse Resistance in MilliOhms @ <u> </u> Amps:	A:	B:	C:
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Additional Tests: (May be documented on additional forms)

COMMENTS:

See isolation switch test sheet for fuse resistance results
 See cable megger test sheet for load side megger results
 Connected load does not permit phase-to-phase megger test
 500A'SC' contactor 5 pole contact resistance in micro Ohms= 1-128, 2-130, 3-123, 4-134, 5-140

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-9
DEVICE / FEEDER ID:	Auxiliary Pump #1	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Cemco	VOLTAGE RATING:	2300
TYPE:	Isolation switch	CURRENT RATING:	400A
MODEL/STYLE #:	S15676	BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE:	N/A

FUSE INFORMATION

MANUFACTURER:	Delle	VOLTAGE RATING:	7000
CAT#:	FLR	CURRENT RATING:	100A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Marginal	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	N/T	A-B	N/T	A-A'	739
B-G	N/T	B-C	N/T	B-B'	729
C-G	N/T	C-A	N/T	C-C'	872

Contact Resistance	
A	116
B	183
C	705

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	7.5	B	6.3	C	6.3
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	NA	B	NA	C	NA
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:

Phase-to-ground and phase-to-phase megger testing not possible because of control circuitry
Switch contact resistance was improved from as found by exercise and contact cleaning

MP-3000 Motor Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-9
DEVICE / FEEDER ID:	Auxiliary Pump #1	DATE TESTED:	March 10, 2012

FIELD DATA

Static / Nameplate Data

MANUFACTURER:	Cutler-Hammer	CAT #:	MP3000	STYLE #:	66D2205G01	SERIAL NUMBER:	23639
DEVICE ADDRESS:	0x	INCOM BAUD RATE:		FIRMWARE VERSION:			

MOTOR

FULL LOAD AMPS (FLA):	47 Amps	ULTIMATE TRIP CURRENT:	115 % FLA	FREQUENCY:	60 Hz.
LOCKED ROTOR CURRENT:	600 % FLA	PHASE CT RATIO:	(50 : 5)	STARTER TYPE:	Non-Reversing
MAX STALL TIME:	5 Seconds	GROUND CT RATIO:	(50 : 5)	STOP CURR. LEVEL:	2 % Ø-Curr. CT. Prim. Rating

RTD SETTINGS

WINDING TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)	MOTOR BEARING TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)
WINDING TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)	MOTOR BEARING TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)
LOAD BEARING TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)	AUX TEMPERATURE TRIP:	(disabled <input checked="" type="checkbox"/>)
LOAD BEARING TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)	AUX TEMPERATURE ALARM:	(disabled <input checked="" type="checkbox"/>)
LOCAL DISPLAY:		RTD DIAGNOSTICS:	

TRIP SETTINGS

GROUND FAULT		UNDERLOAD	
GROUND FAULT TRIP LEVEL (GFT):	(disabled <input type="checkbox"/>) 25 % Gnd CT	UNDERLOAD TRIP LEVEL (ULT):	(disabled <input type="checkbox"/>) 30 % FLA
GROUND FAULT START DELAY (GFSD):	60 Cycles	UNDERLOAD START DELAY (ULSD):	10 Seconds
GROUND FAULT RUN DELAY (GFRD):	5 Cycles	UNDERLOAD RUN DELAY (ULTR):	10 Seconds
JAM		UNBALANCE	
JAM TRIP LEVEL (JMT):	(disabled <input type="checkbox"/>) 1,000 % FLA	UNBALANCE TRIP LEVEL (UBT):	(disabled <input type="checkbox"/>) 25 % FLA
JAM START DELAY (JMST):	60 Seconds	UNBALANCE START DELAY (UBSD):	10 Seconds
JAM RUN DELAY (JMTR):	2 Seconds	UNBALANCE RUN DELAY (UBTR):	2 Seconds
INSTANTANEOUS			
INSTANTANEOUS OVERCURRENT (IOC):	(disabled <input type="checkbox"/>) 600 % FLA	INSTANTANEOUS CURRENT START DELAY (IOCS):	3 Cycles

RELAY MODE

TRIP:	Mode 1: Energizes on Trip	AUX 1:	Mode 1: Energizes on Trip
ALARM:	Mode 1: Energizes on Trip	AUX 2:	Mode 1: Energizes on Trip

INSPECTION DATA

INDICATORS / LEDS:	Acceptable	TRIP CONTACTS:	Acceptable	SCREWS TIGHTENED:	Acceptable
AUX CONTACTS:	N/A	ALARM CONTACTS:	N/A	DISCRETE INPUTS:	N/A

ELECTRICAL TEST DATA

Current Display Check

Phase:	Input:	CT Multiplier:	Calculated Display:	Actual:	% Error:
A	5	10.00	50.00	50	0.00
B	5	10.00	50.00	50	0.00
C	5	10.00	50.00	50	0.00
Gnd / Neut.	5	10.00	50.00	50	0.00

THERMAL

FLA Test Level	Test Current	Limits		As Found		
		Min	Max	A	B	C
300 %	2.82 Amps	Sec.	Sec.	17.7 Sec.	17.7 Sec.	17.7 Sec.
400 %	3.76 Amps	Sec.	Sec.	12.18 Sec.	12.18 Sec.	12.18 Sec.
500 %	4.70 Amps	Sec.	Sec.	9.31 Sec.	9.31 Sec.	9.31 Sec.

UNDERLOAD

Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
ULT:	30		Amps	Amps	Amps	Amps	Amps
ULSD:	10	Amps	Sec.	Sec.	Sec.	Sec.	Sec.
ULTR	10	Amps	Sec.	Sec.	Sec.	Sec.	Sec.

MP-3000 Motor Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	2.4PH-9
DEVICE / FEEDER ID:	Auxiliary Pump #1	DATE TESTED:	March 10, 2012

JAM							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
JMT:	1,000 %		Amps	Amps	Amps	Amps	Amps
JMSD:	60	49.35 Amps	Sec.	Sec.	Sec.	Sec.	Sec.
JMTR:	2	49.35 Amps	Sec.	Sec.	Sec.	Sec.	Sec.

UNBALANCE							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
UBT LO:	25 %		Amps	Amps	Amps	Amps	Amps
UBT HI:	25 %		Amps	Amps	Amps	Amps	Amps
UBSD:	10	Amps	Sec.	Sec.	Sec.	Sec.	Sec.
UBTR:	2	Amps	Sec.	Sec.	Sec.	Sec.	Sec.

INSTANTANEOUS							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
IOC:	600 %		Amps	Amps	Amps	Amps	Amps
IOCSD:	3	29.61 Amps	Cycles	Cycles	Cycles	Cycles	Cycles

GROUND FAULT							
Element	Setpoint	Test Current	Limits		As Found		
			Min	Max	A	B	C
GFT:	25 %		Amps	Amps	Amps	Amps	Amps
GFSD:	60	1.31 Amps	Cycles	Cycles	Cycles	Cycles	Cycles
GFRD:	5	Amps	Cycles	Cycles	Cycles	Cycles	Cycles

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	Air Compressor #3
DEVICE / FEEDER ID:	N/A	DATE TESTED:	March 10, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Westinghouse	VOLTAGE RATING:	5000
TYPE:	HLF 430 Contactor	CURRENT RATING:	400A
MODEL/STYLE #:		BIL (KV):	N/A
SYSTEM VOLTAGE:	2400	CONTROL VOLTAGE	125 VAC/DC

FUSE INFORMATION

MANUFACTURER:	Westinghouse	VOLTAGE RATING:	2400/4800
CAT#:	827C601A05	CURRENT RATING:	130A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	N/A	N/A
WINDOW:	N/A	N/A	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	N/A	N/A	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	947000	A-B 539000	A-A' 205000
B-G	93700	B-C 226000	B-B' 378000
C-G	263000	C-A 1170000	C-C' 253000

Contact Resistance	
A	297
B	321
C	276

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	2.868	B	2.661	C	2.875
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	2.869	B	2.663	C	2.878
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0.001	B	0.002	C	0.003
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	PASS	AUX CONTACT:	N/A

COMMENTS: _____

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Pump House	EQUIPMENT POSITION:	Air Compressor #3
DEVICE / FEEDER ID:	N/A	DATE TESTED:	March 10, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Square D	ANSI DEVICE #:	50	TYPE:	Overload
MODEL / STYLE NUMBER:	LAD7B10	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT Ratio	Setting				
AC #3 OL	100:5	4A				

INSPECTION DATA

VISUAL INSPECTION	A	B	C		VISUAL INSPECTION	A	B	C	
MOISTURE / RUST:	Acceptable	Acceptable	Acceptable	N/A	ZERO ADJUSTMENT CHECK:	Acceptable	Acceptable	Acceptable	N/A
SPIRAL SPRING:	Acceptable	Acceptable	Acceptable	N/A	MAGNET:	Acceptable	Acceptable	Acceptable	N/A
DISK CLEARANCE:	Acceptable	Acceptable	Acceptable	N/A	JEWEL BEARING:	Acceptable	Acceptable	Acceptable	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	N/A	POLAR UNITS:	Acceptable	Acceptable	Acceptable	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	N/A	ICS UNIT:	Acceptable	Acceptable	Acceptable	N/A
PADDLE:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	Acceptable	Acceptable	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT		
12A secondary		22s	22s	22s	22s	22s	22s		

COMMENTS:



Eaton Job Number: EVC12J0027

South Side Substation

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	12.5 SS - 1
DEVICE / FEEDER ID:	12.5 SS - 1	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	B511105	SYSTEM VOLTAGE	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 100 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Open (Line - Gnd)	Open (Line - Load)
A-G	46600	A-G 142000	A-A' 32400
B-G	56000	B-G 193000	B-B' 37400
C-G	48600	C-G 140000	C-C' 34400

Contact Resistance	
A	125
B	108
C	85

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: CT Ratio 100:5

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	12.5 SS - 1
DEVICE / FEEDER ID:	12.5SS-1DS	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pacific / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	N/A	BIL (KV):	95
SYSTEM VOLTAGE:	46914 - LF3	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Fusetek - Kingston	VOLTAGE RATING:	15,500
CAT#:	FC 467	CURRENT RATING:	

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	Acceptable	Acceptable
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 31000	A-B 134000	A-A' 294000
B-G 26400	B-C 260000	B-B' 324000
C-G 36800	C-A 194000	C-C' 346000

MicroOhms @ 10 Amps

Contact Resistance	
A	60
B	84
C	97

Readings in Milliamps @ _____ KV AC DC

Overpotential test

A-G	A-B	A-A'
N/A	N/A	N/A
B-G	B-C	B-B'
N/A	N/A	N/A
C-G	C-A	C-C'
N/A	N/A	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	1,200	B	1,198	C	1,349
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Fuse size was not noted during maintenance

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	12.5 SS - 1
DEVICE / FEEDER ID:	12.5 SS - 1	DATE TESTED:	March 4, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	CDG	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	23AF111X6	SERIAL / S.O. NUMBER::	007023(2,3,&4)N	IB NUMBER:	

RELAY ID	CT RATIO	Tap	TD	Inst			
A/C	100:5	6A	0.2	48A			
G	100:5	0.5A	1.0	20A			

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
MOISTURE / RUST:	Acceptable	N/A	Acceptable	Acceptable	ZERO ADJUSTMENT CHECK:	Acceptable	N/A	Acceptable	Acceptable
SPIRAL SPRING:	Acceptable	N/A	Acceptable	Acceptable	MAGNET:	Acceptable	N/A	Acceptable	Acceptable
DISK CLEARANCE:	Acceptable	N/A	Acceptable	Acceptable	JEWEL BEARING:	Acceptable	N/A	Acceptable	Acceptable
OVERHEATING:	Acceptable	N/A	Acceptable	Acceptable	POLAR UNITS:	Acceptable	N/A	Acceptable	Acceptable
COVER / CASE:	Acceptable	N/A	Acceptable	Acceptable	ICS UNIT:	Acceptable	N/A	Acceptable	Acceptable
PADDLE:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	Value	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND	GROUND AS LEFT
Pickup	6A	6.1A	6.1A			6.01A	6.01A		
2x Trip	12A	12.64s	12.64s			11.19s	11.19s		
4x Trip	24A	3.1s	3.1s			3.2s	3.2s		
Inst Trip	48A	48A	48A			46.5A	46.5A		
Pickup	0.5A							0.51A	0.51A
2x Trip	1A							14.21s	14.21s
4x Trip	2A							2.266s	2.266s
Inst Trip	20A							21.6A	21.6A

COMMENTS: Capacitor trip device passed self test



Powering Business Worldwide

Electrical Services & Systems

General Comments

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	12.5 SS - 1
DEVICE / FEEDER ID:	12.5 SS - 1	DATE TESTED:	March 3, 2012

Potter& Brumfield voltage relay test

Left hand side:
Pickup - 101VAC
Drop out - 97VAC

Middle:
Pickup - 97VAC
Drop out - 94VAC

Right hand side:
Pickup - 99VAC
Drop out - 95VAC

Grounding Resistor

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	12.5 SS - 1
DEVICE / FEEDER ID:	12.5 SS - 1	DATE TESTED:	March 3, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE	SYSTEM VOLTAGE:	480
CATALOG #:		SYSTEM TYPE:	HRG
PRI. CONDUCTOR SIZE:		MAX TIME:	60 cycles
PRI. CONDUCTOR RATED VOLTAGE:		BIL:	
SEC. CONDUCTOR SIZE:		RATED VOLTAGE:	1390
SEC. CONDUCTOR RATED VOLTAGE:		RATED OHMS:	634
CT RATIO:		TAP RANGE AF/AL:	
CT RATED VOLTAGE:		RATED AMPS:	2

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	CURRENT TRANSFORMER:	Acceptable
CLEANLINESS:	Acceptable	CONDUCTORS:	Acceptable
BUSHINGS:	Acceptable	CONNECTIONS:	Acceptable
INSULATORS:	Acceptable	ISOLATION SWITCH:	N/A
RESISTOR STACKS:	Acceptable	PROPER GROUNDING:	Acceptable
RESISTOR LINK CONNECTIONS:	Acceptable	RESISTOR TAP CONNECTION:	N/A

ELECTRICAL TEST DATA

OVERALL RESISTANCE (OHMS):	58.6		
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
INSULATION RESISTANCE TEST		OVERPOTENTIAL TEST: <input checked="" type="radio"/> AC <input type="radio"/> DC	
@	1000	VDC	40000
		MEGOHMS	
@		VOLTS	
		MICRO-AMPS	

COMMENTS:

Electrical Services & Systems

Dry Type Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	12.5 SS - 1
DEVICE / FEEDER ID:	12.5SS-1	DATE TESTED:	March 3, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE	TYPE:	ANN
SERIAL NUMBER:	T - 91046	IMPEDANCE (%):	6.05%
CLASS:	220 SYS	NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	2000	WINDING TEMPERATURE: (°C)	80
CONFIG.: Primary Delta <input checked="" type="radio"/> Wye <input type="radio"/> Secondary Delta <input type="radio"/> Wye <input checked="" type="radio"/>		MAX. TEMP.	100
PRIMARY VOLTS	L-L: 12,500	TEMP RISE (°C)	170
SECONDARY VOLTS:	L-L: 480 L-N: 277	WINDING MATERIAL:	Primary: Copper Secondary: Copper
SYSTEM VOLTAGE:	12,470	BIL PRIMARY (KV):	95
HUMIDITY:		BIL SECONDARY (KV)	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	Acceptable
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	Acceptable

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>		3
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps)	13,125.00 V	12,812.50 V	12,500.00 V	12,187.50 V	11,875.00 V	V	12,500.00 V
CALCULATED RATIO:	47.361 :1	46.233 :1	45.105 :1	43.978 :1	42.850 :1	:1	45.105 :1
H 1 -H 2 X 0 -X 2	47.341 :1	46.272 :1	45.090 :1	44.005 :1	42.827 :1	:1	45.090 :1
H 2 -H 3 X 0 -X 3	47.341 :1	46.251 :1	45.090 :1	44.024 :1	42.845 :1	:1	45.090 :1
H 31 -H 0 X 0 -X 1	47.341 :1	46.272 :1	45.110 :1	44.024 :1	42.845 :1	:1	45.090 :1
GREATEST % DIFF. vs. CALCULATED:	0.042 %	0.084 %	0.034 %	0.105 %	0.054 %	%	0.034 %

INSULATION RESISTANCE IN MegOhms	@ HI to LO & GND 5000 VDC	@ LO to HI & GND 1000 VDC	@ HI to LO 1000 VDC	CORE INSULATION @ VDC
ACTUAL VALUE:	35,400	1,610	34,000	
CORRECTED TO 20°C:	559,320.0	25,438.00	537,200.0	

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
					NO

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GAUGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GAUGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 1 -H 2	1.2	H 2 -H 3	1	H 31 -H 0	0.9
CORRECTED TO 20°C:	H 1 -H 2	0.97	H 2 -H 3	0.81	H 31 -H 0	0.73
ACTUAL VALUE: in (Milliohms)	X 0 -X 2	0.423	X 0 -X 3	0.412	X 0 -X 1	0.335
CORRECTED TO 20°C:	X 0 -X 2	0.34	X 0 -X 3	0.33	X 0 -X 1	0.27

COMMENTS: Could not access core ground strap for megger test

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	Crane Switchboard
DEVICE / FEEDER ID:	2.4SS-30T	DATE TESTED:	February 21, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Multilin	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	350-EP5S5HSSNN1EDN	SERIAL / S.O. NUMBER::	BL0A10000255	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.	INST. DELAY
A/B/C	50:5	E Inv.	2.38	5.6	20x	
SG	200:5	DT	1x	2.5s		

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND	GROUND AS LEFT
PU	11.9A	11.7A	11.7A	11.7A	11.7A	11.7A	11.7A		
3x Trip	35.7A	3.79s	3.79s	3.79s	3.79s	3.79s	3.79s		
5x Trip	59.5	1.406s	1.406s	1.406s	1.406s	1.406s	1.406s		
Inst	NT								
PU& Trip								200A pri	200A pri

COMMENTS: Startco pilot wire function test OK
 Instantaneous element not tested because pick (20x5A=100A) is not practical for secondary injection



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Oil Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	Crane Switchboard
DEVICE / FEEDER ID:	2.4SS-30T	DATE TESTED:	February 21, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RM12-25	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1906407	SYSTEM VOLTAGE:	2,400

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Open (Line - Gnd.)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 129	A-B 680	A-A' 126
B-G 129	B-C 791	B-B' 126
C-G 129	C-A 729	C-C' 126

Contact Resistance	
A	164
B	194
C	150

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS: _____

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	Crane Switchboard
DEVICE / FEEDER ID:	2.4SS-SPARE	DATE TESTED:	February 21, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	12,000
TYPE:	RM12-25	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER:	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1906407	SYSTEM VOLTAGE:	2,400

ACCESSORIES

		RATING	CONDITION			RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/>		Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/>	N/A	N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/>	N/A	N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/>	N/A	N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/>	N/A	N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/>	N/A	N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Acceptable
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Acceptable
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 2500 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Open (Line - Gnd.	Closed (Ph. - Ph.	Open (Line - Load
A-G 154	A-B 905	A-A' 88700
B-G 154	B-C 896	B-B' 88700
C-G 154	C-A 941	C-C' 88700

Contact Resistance	
A	185
B	157
C	183

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):	Power Factor Test	Timing Test Performed
Coil #1 Minimum Trip Voltage	U.V. Dropout voltage	

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks, ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks, ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	Crane Switchboard
DEVICE / FEEDER ID:	2.4SS-1DS	DATE TESTED:	February 21, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pioneer / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	36914-LF3	BIL (KV):	60
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	N/A	N/A
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	N/A	N/A	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Closed (Ph. - Gnd)
A-G 154	A-B 905	A-G 169
B-G 154	B-C 896	B-G 169
C-G 154	C-A 941	C-G 169

MicroOhms @ 10 Amps

Contact Resistance	
A	79
B	110
C	87

Readings in Milliamps @ _____ KV AC DC

Overpotential test

A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	Crane Switchboard
DEVICE / FEEDER ID:	2.4SS-SPARE	DATE TESTED:	February 21, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	Multilin	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	350-EP5S5HSSNN1EDN	SERIAL / S.O. NUMBER:.	BL0A10000253	IB NUMBER:	

RELAY ID	CT / PT RATIO	CURVE	P/U (xCT S)	TIME DIAL	INST.	INST. DELAY	
A/B/C	50:5	E Inv.	2.38	5.6	20x		
SG	200:5	DT	1x	2.5s			

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
ENVIRONMENT:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
DISPLAY:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
METERING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
OVERHEATING:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
COVER / CASE:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TEST SWITCH:	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	Acceptable	Acceptable	Acceptable		N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	AS SPEC.	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND	GROUND AS LEFT
PU	11.9A	11.86A	11.86A	11.86A	11.86A	11.86A	11.86A		
3x Trip	35.7A	3.616s	3.616s	3.616s	3.616s	3.616s	3.616s		
5x Trip	59.5	1.38s	1.38s	1.38s	1.38s	1.38s	1.38s		
Inst	NT								
PU & Trip								200A pri	200A pri

COMMENTS: Startco pilot wire function test OK
 Instantaneous element not tested because pick (20x5A=100A) is not practical for secondary injection



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

Table with customer, user, substation, device, job number, plant, equipment position, and date tested information.

FIELD DATA

SWITCH INFORMATION

Table with manufacturer, type, model/style, system voltage, voltage rating, current rating, and control voltage.

FUSE INFORMATION

Table with manufacturer, cat#, voltage rating, and current rating.

SURGE ARRESTER INFORMATION

Table with manufacturer, type/style, voltage rating, and MCOV.

INSPECTION DATA

Large inspection data table with columns for AS FOUND and AS LEFT for various components like overall condition, window, labels, cleanliness, etc.

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ KV AC DC

Table for Insulation Resistance tests (A-G, B-G, C-G).

Table for Contact Resistance tests (A, B, C).

Table for Overpotential test (A-G, B-G, C-G).

Table for FUSE RESISTANCE, FUSE AND HOLDER RESISTANCE, FUSE HOLDER RESISTANCE, and ARRESTER INSULATION RESISTANCE.

ELECTRICAL OPERATION

Table for CHARGE, CLOSE, TRIP, and AUX CONTACT status.

COMMENTS: [Empty box for notes]

Ground Fault Protection System

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Southside Sub	EQUIPMENT POSITION:	Southside 480V
DEVICE / FEEDER ID:	12.5 SS - 1	DATE TESTED:	March 3, 2012

FIELD DATA

GENERAL

SWGR DESIGNATION:	4SS1	SO/SERIAL NUMBER:	
CIRCUIT DESIGNATION:	Several	UL NUMBER:	OF
SWBD MANUFACTURER:	Federal Pacific / FPE	CONTROL PWR XFRMR:	
SWBD CURRENT RATING:	3,000 Amps	Prim. Volts:	Sec. Volts: VA:
SYSTEM VOLTAGE:	480 Volts	480VAC	120VAC

OVERCURRENT DEVICE

MAIN OVERCURRENT DEVICE TYPE:	Circuit Breaker	CAT. NUMBER:	
MAIN OVERCURRENT MANUFACTURER:	Sace	CURRENT RATING:	630 Amps
TYPE:		VOLTAGE RATING:	17,500 Volts

SYSTEM DATA

SYSTEM TYPE:	HRG	SYSTEM MODEL:	DSP-MKII
SYSTEM MANUFACTURER:	Federal Pacific / FPE	CAT. NUMBER:	SSR30
PICK UP RANGE:	Amps	TIME RANGE:	Seconds
PICK UP SETTING (As Found):	Amps	TIME SETTING (As Found):	Seconds
PICK UP SETTING (As Left):	Amps	TIME SETTING (As Left):	Seconds
SETTINGS SUPPLIED BY:	As found at site		

INSPECTION DATA

MAIN BONDING JUMPER:	Acceptable	NEUTRAL DISCONNECT LINK:	N/A
GROUND ELECTRODE:	Acceptable	CONTROL PWR XFRMR INSTALLATION:	Acceptable
NEUTRAL/GROUND LOCATION:	Acceptable	MONITOR / TEST PANEL:	Acceptable
NEUTRAL SENSOR LOCATION:	Acceptable		

ELECTRICAL TEST DATA

BASIC TESTS

PICKUP CURRENT:	Amps	55% RATED VOLTAGE (264 Volts)	
BREAKER / SWITCH REACTION TIME: (Check if applicable) <input type="checkbox"/>		NEUTRAL SENSOR POLARITY:	
SYSTEM NEUTRAL RESISTANCE TO GND	MegOhms	CPT: Prim. Volts:	Sec. Volts:

TIME -- CURRENT TESTS

PRIMARY CURRENT	PERCENT PICK - UP	TOTAL TIME	REACTION TIME	TRIP TIME
AMPS	%	Seconds		Seconds
AMPS	%	Seconds		Seconds

COMMENTS:

Unit was function tested
Trip test was successful



Eaton Job # EVC12J0027

Tested date: March 10, 2012

South Side Substation
FPE Ground Fault Relay Test Results

Ground Fault Test Results				
Feeder ID	Alarm	Meter	Trip (A)	Flag
#1 Sec E. Rec	OK	OK	119	OK
#1 Sec C. Rec	OK	OK	116	OK
#1 Sec W. Rec	OK	OK	81	OK
#2 Sec E. Rec	OK	OK	79	OK
#2 Sec C. Rec	OK	OK	114	OK
#2 Sec W. Rec	OK	OK	81	OK
#3 Sec E. Rec	OK	OK	87	OK
#2 Sec C. Rec	OK	OK	80	OK
#2 Sec W. Rec	OK	OK	77	OK
CDP#3 Main	OK	OK	81	OK
Jetty Mount #1	OK	OK	82	OK
Jetty Mount #2	OK	OK	76	OK
Jetty Mount #3	OK	OK	80	OK
Jetty Mount #4	OK	OK	82	OK
Jetty Mount #5	OK	OK	77	OK
Em. Gen	See Comments			
Comments: - No CT found for Em. Gen, functional test trips breaker 4SS2-30				
Tested by: Lorne Cowley				



Eaton Job Number: EVC12J0027

North Landing Warf Substation



Powering Business Worldwide

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	North Landing Warf	EQUIPMENT POSITION:	N/A
DEVICE / FEEDER ID:	12.5NL	DATE TESTED:	March 3, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Federal Pacific / FPE	VOLTAGE RATING:	15,000
TYPE:	Indoor	CURRENT RATING:	600A
MODEL/STYLE #:	N/A	BIL (KV):	95
SYSTEM VOLTAGE:	46914 - LF3	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
CAT#:	N/A	CURRENT RATING:	N/A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	N/A	N/A
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	Acceptable	Acceptable
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 29500	A-B 48600	A-A' 33700
B-G 17900	B-C 29300	B-B' 21200
C-G 11700	C-A 39800	C-C' 11600

Contact Resistance	
A	76
B	45
C	65

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	1,200	B	1,198	C	1,349
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

Medium Voltage Oil Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	North Landing Warf	EQUIPMENT POSITION	N/A
DEVICE / FEEDER ID:	12.5NL	DATE TESTED:	March 3, 2012

MANUFACTURER:	Sace	VOLTAGE RATING:	17,500
TYPE:	RM17.5-35	CURRENT RATING:	630
MODEL/STYLE #:	N/A	INTERRUPT RATING:	12,500
IB NUMBER	N/A	WIRING DIAGRAM:	N/A
SERIAL NUMBER:	1907760	SYSTEM VOLTAGE	12,470

ACCESSORIES

	RATING	CONDITION		RATING	CONDITION
CHARGE MOTOR:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	AUX SWITCH(ES)	<input checked="" type="checkbox"/> Acceptable
CONTROL RELAY:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	BLOWN FUSE IND:	<input type="checkbox"/> N/A
CLOSE COIL:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	MAINT. ACCESSORIES	<input type="checkbox"/> N/A
SHUNT TRIP:	<input checked="" type="checkbox"/>	120 VDC	Acceptable	(Other)	<input type="checkbox"/> N/A
UNDERVOLTAGE:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A
FUSES:	<input type="checkbox"/>	N/A	N/A	(Other)	<input type="checkbox"/> N/A

INSPECTION DATA

	CONDITION
OVERALL CONDITION:	Acceptable
CONTACT GAP:	N/A
CONTACT WIPE:	N/A
OPEN / CLOSE INDICATOR:	Acceptable
AUX SWITCH:	Acceptable
INSULATION / BARRIERS:	Acceptable
INTERLOCKS:	Acceptable
LUBRICATION:	Corrected
FRAME CONDITION:	Acceptable
COMPRESSOR OPERATION:	N/A

	CONDITION
GROUND CONNECTION:	Acceptable
PRIMARY FINGERS:	N/A
SECONDARY DISCONNECTS:	N/A
CONTROL WIRING:	Acceptable
MANUAL CLOSE / TRIP:	Corrected
ELECTRICAL CLOSE / TRIP:	Acceptable
OPERATIONS COUNTER:	N/A
OIL LEVEL:	Corrected
SAMPLING PORT:	N/A
COMPRESSOR BELTS:	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 100 Amps

Readings in Milliamps @ _____ KV AC DC

	Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G	29500	A-B 48600	A-A' 70500
B-G	17900	B-C 29300	B-B' 70300
C-G	11700	C-A 39800	C-C' 70500

Contact Resistance	
A	84
B	94
C	83

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

Additional Tests: (may be documented on additional forms)

Control Wiring Insulation @ 500 VDC (MegOhms):		Power Factor Test		Timing Test Performed	
Coil #1 Minimum Trip Voltage		U.V. Dropout voltage			

COMMENTS:

The manual mechanism was not working when work started, mechanism was lubricated and repaired, breaker exercised, functioning properly



Powering Business Worldwide

Electrical Services & Systems

Grounding Resistor

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	North Landing Warf	EQUIPMENT POSITION:	N/A
DEVICE / FEEDER ID:	12.5NL	DATE TESTED:	March 3, 2012

FIELD DATA			
MANUFACTURER:	Federal Pacific / FPE	SYSTEM VOLTAGE:	480
CATALOG #:		SYSTEM TYPE:	HRG
PRI. CONDUCTOR SIZE:		MAX TIME:	60 cycles
PRI. CONDUCTOR RATED VOLTAGE:		BIL:	
SEC. CONDUCTOR SIZE:		RATED VOLTAGE:	
SEC. CONDUCTOR RATED VOLTAGE:		RATED OHMS:	
CT RATIO:		TAP RANGE AF/AL:	
CT RATED VOLTAGE:		RATED AMPS:	

INSPECTION DATA			
PHYSICAL AND MECHANICAL CONDITION:	Acceptable	CURRENT TRANSFORMER:	N/A
CLEANLINESS:	Acceptable	CONDUCTORS:	Acceptable
BUSHINGS:	Acceptable	CONNECTIONS:	Acceptable
INSULATORS:	Acceptable	ISOLATION SWITCH:	N/A
RESISTOR STACKS:	Acceptable	PROPER GROUNDING:	Acceptable
RESISTOR LINK CONNECTIONS:	Acceptable	RESISTOR TAP CONNECTION:	N/A

ELECTRICAL TEST DATA			
OVERALL RESISTANCE (OHMS):	57.9		
TAP POINT:	45.9	TAP RESISTANCE:	44.6
TAP POINT:	44.6	TAP RESISTANCE:	42.9
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
TAP POINT:		TAP RESISTANCE:	
INSULATION RESISTANCE TEST		OVERPOTENTIAL TEST: <input checked="" type="radio"/> AC <input type="radio"/> DC	
@	1000	VDC	72200
		MEGOHMS	
@		VOLTS	
		MICRO-AMPS	

COMMENTS: First three resistor tap points are in parallel. Three parallel resistors are then in series with fourth tap point.

General Protective Relay

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	North Landing Warf	EQUIPMENT POSITION:	N/A
DEVICE / FEEDER ID:	12.5NL	DATE TESTED:	March 3, 2012

ELECTRO-MECHANICAL: SOLID-STATE:

FIELD DATA

MANUFACTURER:	CDG	ANSI DEVICE #:	50/51	TYPE:	Overcurrent
MODEL / STYLE NUMBER:	020862M	SERIAL / S.O. NUMBER::		IB NUMBER:	

RELAY ID	CT RATIO	Tap	TD	Inst			
A/C	75:5	6A	0.5	80A			
G	75:5	1.5A	0.5	12A			

INSPECTION DATA

VISUAL INSPECTION	A	B	C	GROUND:	VISUAL INSPECTION	A	B	C	GROUND:
MOISTURE / RUST:	Acceptable	N/A	Acceptable	Acceptable	ZERO ADJUSTMENT CHECK:	Acceptable	N/A	Acceptable	Acceptable
SPIRAL SPRING:	Acceptable	N/A	Acceptable	Acceptable	MAGNET:	Acceptable	N/A	Acceptable	Acceptable
DISK CLEARANCE:	Acceptable	N/A	Acceptable	Acceptable	JEWEL BEARING:	Acceptable	N/A	Acceptable	Acceptable
OVERHEATING:	Acceptable	N/A	Acceptable	Acceptable	POLAR UNITS:	Acceptable	N/A	Acceptable	Acceptable
COVER / CASE:	Acceptable	N/A	Acceptable	Acceptable	ICS UNIT:	Acceptable	N/A	Acceptable	Acceptable
PADDLE:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP FUNCTION TEST:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
RELAY CLEANED:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
SCREWS TIGHTENED:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
TRIP INDICATOR RESET:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A
INST UNITS:	Acceptable	N/A	Acceptable	Acceptable		N/A	N/A	N/A	N/A

ELECTRICAL TEST DATA

TEST DESCRIPTION	Value	PHASE A AS FOUND	PHASE A AS LEFT	PHASE B AS FOUND	PHASE B AS LEFT	PHASE C AS FOUND	PHASE C AS LEFT	GROUND AS FOUND	GROUND AS LEFT
Pickup	6A	6.1A	6.1A			6.1A	6.1A		
1.5x Trip	12A	32.15s	32.15s			28.79s	28.79s		
2x Trip	24A	9.27s	9.27s			7.4s	7.4s		
Inst Trip	80A	88.32A	88.32A			78.4A	78.4A		
Pickup	1.5A							1.34A	1.34A
1.5x Trip	3A							23.65s	23.65s
2x Trip	6A							6.87s	6.87s
Inst Trip	12A							10.3A	10.3A

COMMENTS:

Electrical Services & Systems

Dry Type Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	North Landing Warf	EQUIPMENT POSITION:	N/A
DEVICE / FEEDER ID:	12.5NL	DATE TESTED:	March 3, 2012

FIELD DATA

MANUFACTURER:	Federal Pacific / FPE		TYPE:	ANN
SERIAL NUMBER:	S8391.01		IMPEDANCE (%):	5.94
CLASS:	185 SYS		NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>		SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	1500		WINDING TEMPERATURE: (°C)	80
CONFIG.:	Primary	Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary	Delta <input type="radio"/> Wye <input checked="" type="radio"/>
PRIMARY VOLTS	L-L:	12,500	TEMP RISE (°C)	115
SECONDARY VOLTS:	L-L:	480	L-N:	277
SYSTEM VOLTAGE:	12,470		WINDING MATERIAL:	Primary: Copper Secondary: Copper
HUMIDITY:			BIL PRIMARY (KV):	95
			BIL SECONDARY (KV)	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>			3
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps	13,125.00 V	12,812.50 V	12,500.00 V	12,187.50 V	11,875.00 V	V	V	12,500.00 V
CALCULATED RATIO:	47.361 :1	46.233 :1	45.105 :1	43.978 :1	42.850 :1	:1	:1	45.105 :1
H 1 -H 2 X 0 -X 2	47.694 :1	46.524 :1	45.349 :1	44.137 :1	42.989 :1	:1	:1	45.349 :1
H 2 -H 3 X 0 -X 3	47.694 :1	46.545 :1	45.309 :1	44.176 :1	42.971 :1	:1	:1	45.309 :1
H 31 -H 0 X 0 -X 1	47.605 :1	46.566 :1	45.269 :1	44.137 :1	42.953 :1	:1	:1	45.269 :1
GREATEST % DIFF. vs. CALCULATED:	0.704 %	0.720 %	0.540 %	0.451 %	0.324 %	%	%	0.540 %

INSULATION RESISTANCE IN MegOhms	@ HI to LO & GND 5000 VDC	@ LO to HI & GND 1000 VDC	@ HI to LO 1000 VDC	CORE INSULATION @ 500 VDC
ACTUAL VALUE:	194,000	1,370	239,000	245,000
CORRECTED TO 20°C:	3,065,200	21,646.00	3,776,200	3,871,000

POLARIZATION INDEX HI to LO @ 5000 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
					NO

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)				STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL SET POINT:				N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:				N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 1 -H 2	0.692	H 2 -H 3	0.692	H 31 -H 0	0.69
CORRECTED TO 20°C:	H 1 -H 2	0.56	H 2 -H 3	0.56	H 31 -H 0	0.56
ACTUAL VALUE: in (MilliOhms)	X 0 -X 2	0.465	X 0 -X 3	0.49	X 0 -X 1	0.51
CORRECTED TO 20°C:	X 0 -X 2	0.38	X 0 -X 3	0.40	X 0 -X 1	0.41

COMMENTS:



Eaton Job # EVC12J0027

Tested date: March 10, 2012

North Landing Warf
FPE & Cutler Hammer Ground Fault Relay Test Results

Ground Fault Test Results

Feeder ID	Alarm	Meter	Trip (A)	Flag
Main (FPE)	OK	OK	80	OK
1000A Splitter (FPE)	OK	OK	82	OK
West 480V (FPE)	OK	OK	78	OK
East 480V (FPE)	OK	OK	80	OK
Kiosk #1 (FPE)	OK	OK	84	OK
Kiosk #4 (FPE)	OK	OK	83	OK
Filter (FPE)	OK	OK	81	OK
Outlets Panel #1 (CH)	N/A	OK	39 @ 5s	OK
House Panel 2N (CH)	N/A	OK	39 @ 5s	OK

Comments:

- FPE GFR5M F/A relay not connected and not used
- Cutler Hammer ground fault relays repaired and functioning properly

Tested by: Lorne Cowley



Eaton Job Number: EVC12J0027

150T Crane

Medium Voltage Switch

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	150T Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 22, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Westinghouse	VOLTAGE RATING:	4,800
TYPE:	AWP2	CURRENT RATING:	600
MODEL/STYLE #:	3416A42G	BIL (KV):	60KV
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Westinghouse	VOLTAGE RATING:	25,000
CAT#:	RBA400	CURRENT RATING:	Must be dismantled to view

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

MicroOhms @ 10 Amps

Readings in Milliamps @ _____ KV AC DC

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	930	A-B	2480	A-A'	855
B-G	754	B-C	2290	B-B'	708
C-G	858	C-A	2460	C-C'	863

Contact Resistance	
A	29
B	29
C	32

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	385	B	307	C	387
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A		B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS:



Powering Business Worldwide

Electrical Services & Systems

General Comments

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	150T Crane
DEVICE / FEEDER ID:	Slip Ring	DATE TESTED:	February 22, 2012

Slip ring contact resistnace results:

- A - 480 uOhms
- B - 76 uOhms
- C - 361 uOhms
- G - 107 uOhms
- PW - 198 uOhms

Dry Type Transformer

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	150T Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 22, 2012

FIELD DATA

MANUFACTURER:	Rex	TYPE:	ANN
SERIAL NUMBER:	B43826	IMPEDANCE (%) :	3
CLASS:	220C	NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	300	WINDING TEMPERATURE: (°C)	
CONFIG: Primary Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary Delta <input checked="" type="radio"/> Wye <input type="radio"/>	MAX. TEMP.	
PRIMARY VOLTS	L-L: 2,400	TEMP RISE (°C)	150
SECONDARY VOLTS:	L-L: 480	WINDING MATERIAL:	Primary: Copper Secondary: Copper
SYSTEM VOLTAGE:	2400	BIL PRIMARY (KV):	30
HUMIDITY:		BIL SECONDARY (KV)	10

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input checked="" type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>			1
PRIM. VOLTAGE: (✓) 2.5% equal taps	2,520.000 V	2,460.000 V	2,400.000 V	2,340.000 V	2,280.000 V	V	V	2,520.000 V
CALCULATED RATIO:	5.250 :1	5.125 :1	5.000 :1	4.875 :1	4.750 :1	:1	:1	5.250 :1
H 1 -H 3 X 1 -X 3	5.252 :1	5.138 :1	5.001 :1	4.863 :1	4.751 :1	:1	:1	5.252 :1
H 3 -H 2 X 3 -X 1	5.252 :1	5.138 :1	5.001 :1	4.861 :1	4.751 :1	:1	:1	5.252 :1
H 2 -H 1 X 2 -X 1	5.250 :1	5.140 :1	5.001 :1	4.863 :1	4.751 :1	:1	:1	5.250 :1
GREATEST % DIFF. vs. CALCULATED:	0.038 %	0.293 %	0.020 %	0.287 %	0.021 %	%	%	0.038 %

INSULATION RESISTANCE IN MegOhms	HI to LO & GND @ 2500 VDC	LO to HI & GND @ 500 VDC	HI to LO @ 1000 VDC	CORE INSULATION @ VDC
ACTUAL VALUE:	568,000	64,000	694,000	
CORRECTED TO 20°C:				

POLARIZATION INDEX HI to LO @ 2500 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
	402,000	673,000	694,000	1.03	

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (MilliOhms)	H 1 -H 3	19.46	H 3 -H 2	20	H 2 -H 1	20.8
CORRECTED TO 20°C:	H 1 -H 3		H 3 -H 2		H 2 -H 1	
ACTUAL VALUE: in (MilliOhms)	X 1 -X 3	5.07	X 3 -X 1	4.64	X 2 -X 1	4.95
CORRECTED TO 20°C:	X 1 -X 3		X 3 -X 1		X 2 -X 1	

COMMENTS: Cannot access ground strap for core to ground megger test

Electrical Services & Systems

Dry Type Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	150T Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 22, 2012

FIELD DATA

MANUFACTURER:	Westinghouse		TYPE:	ANN	
SERIAL NUMBER:	80TSA441		IMPEDANCE (%):	5.93	
CLASS:			NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>	
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>		SELECTED TAP:	FREQUENCY: (Hz) 60	
KVA:	1000		WINDING TEMPERATURE: (°C)		
CONFIG.:	Primary	Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary	Delta <input type="radio"/> Wye <input checked="" type="radio"/>	MAX. TEMP.
PRIMARY VOLTS	L-L:	2,400	TEMP RISE (°C)	150	
SECONDARY VOLTS:	L-L:	480	L-N:	277	WINDING MATERIAL:
SYSTEM VOLTAGE:	2400		BIL PRIMARY (KV):	30	
HUMIDITY:			BIL SECONDARY (KV)	10	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>			3
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps)	2,520.000 V	2,460.000 V	2,400.000 V	2,340.000 V	2,280.000 V	V	V	2,400.000 V
CALCULATED RATIO:	9.093 :1	8.877 :1	8.660 :1	8.444 :1	8.227 :1	:1	:1	8.660 :1
H 3 -H 1 X 0 -X 1	9.065 :1	8.881 :1	8.686 :1	8.437 :1	8.250 :1	:1	:1	8.686 :1
H 1 -H 2 X 0 -X 2	9.065 :1	8.876 :1	8.686 :1	8.440 :1	8.252 :1	:1	:1	8.689 :1
H 2 -H 3 X 0 -X 3	9.065 :1	8.876 :1	8.689 :1	8.440 :1	8.252 :1	:1	:1	8.689 :1
GREATEST % DIFF. vs. CALCULATED:	0.311 %	0.048 %	0.332 %	0.080 %	0.301 %	%	%	0.332 %

INSULATION RESISTANCE IN MegOhms	@ HI to LO & GND 2500 VDC	@ LO to HI & GND 1000 VDC	@ HI to LO 1000 VDC	CORE INSULATION @ VDC
ACTUAL VALUE:	5,120	63,300	8,820	
CORRECTED TO 20°C:				

POLARIZATION INDEX HI to LO @ 2500 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
	338	1,289	5,120	3.97	

COOLING CONTROL SETPOINTS

(a value of N/A°c indicates specified control is not applicable to this transformer)				STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL SET POINT:				N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:				N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (Ohms)	H 3 -H 1	55	H 1 -H 2	55.3	H 2 -H 3	55.3
CORRECTED TO 20°C:	H 3 -H 1		H 1 -H 2		H 2 -H 3	
ACTUAL VALUE: in (MilliOhms)	X 0 -X 1	1.18	X 0 -X 2	1.14	X 0 -X 3	1.1
CORRECTED TO 20°C:	X 0 -X 1		X 0 -X 2		X 0 -X 3	

COMMENTS: Cannot access ground strap for core to ground megger test



Eaton Job Number: EVC12J0027

30T South Crane



Powering Business Worldwide

Electrical Services & Systems

General Comments

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	30T South Crane
DEVICE / FEEDER ID:	Slip Ring	DATE TESTED:	February 21, 2012

Slip ring contact resistnace results:

A - 3.924 mOhms

B - 1.6443 mOhms

C - 2.679 mOhms

G - 1.4131 mOhms

PW - 2.955 mOhms

Dry Type Transformer

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	30T South Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 21, 2012

FIELD DATA

MANUFACTURER:	Beaver	TYPE:	ANN
SERIAL NUMBER:	C77487	IMPEDANCE (%):	5.95
CLASS:	185	NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>	SELECTED TAP:	FREQUENCY: (Hz) 60
KVA:	550	WINDING TEMPERATURE: (°C)	135
CONFIG.: Primary Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary Delta <input type="radio"/> Wye <input checked="" type="radio"/>	MAX. TEMP.	185
PRIMARY VOLTS	L-L: 2,400	TEMP RISE (°C)	150
SECONDARY VOLTS:	L-L: 480 L-N: 277	WINDING MATERIAL:	Primary: Secondary:
SYSTEM VOLTAGE:	2400	BIL PRIMARY (KV):	30
HUMIDITY:		BIL SECONDARY (KV)	10

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>	4 <input checked="" type="radio"/>	5 <input type="radio"/>		4
PRIM. VOLTAGE: (✓) 2.5% equal taps	2,520.000 V	2,460.000 V	2,400.000 V	2,340.000 V	2,280.000 V	V	V 2,340.000 V
CALCULATED RATIO:	9.093 :1	8.877 :1	8.660 :1	8.444 :1	8.227 :1	:1	:1 8.444 :1
H 1 -H 2 X 1 -X 0	9.081 :1	8.888 :1	8.657 :1	8.426 :1	8.195 :1	:1	:1 8.426 :1
H 2 -H 3 X 2 -X 0	9.078 :1	8.845 :1	8.654 :1	8.423 :1	8.192 :1	:1	:1 8.423 :1
H 3 -H 1 X 3 -X 0	9.081 :1	8.888 :1	8.657 :1	8.426 :1	8.194 :1	:1	:1 8.426 :1
GREATEST % DIFF. vs. CALCULATED:	0.168 %	0.358 %	0.072 %	0.246 %	0.428 %	%	% 0.246 %

INSULATION RESISTANCE IN MegOhms	@ HI to LO & GND 2500 VDC	@ LO to HI & GND 500 VDC	@ HI to LO 2500 VDC	CORE INSULATION @ VDC
ACTUAL VALUE:	113,000	69,800	333,000	
CORRECTED TO 20°C:	0.00	0.00	0.00	

POLARIZATION INDEX HI to LO @ 2500 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
	131,000	333,000	2.5e+006	7.51	

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)	STAGE 1:	STAGE 2:	ALARMS:	TRIPS:
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	N/A °c	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:	N/A °c	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in (MilliOhms)	H 1 -H 2	80	H 2 -H 3	77	H 3 -H 1	80
CORRECTED TO 20°C:	H 1 -H 2		H 2 -H 3		H 3 -H 1	
ACTUAL VALUE: in (MilliOhms)	X 1 -X 0	1.07	X 2 -X 0	1.1	X 3 -X 0	1.11
CORRECTED TO 20°C:	X 1 -X 0		X 2 -X 0		X 3 -X 0	

COMMENTS: Cannot access core ground strap for megger test

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks, ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks, ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	30T South Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 21, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Areva	VOLTAGE RATING:	15,000
TYPE:	L-TR15/17.5	CURRENT RATING:	600
MODEL/STYLE #:	LB	BIL (KV):	95
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Siba	VOLTAGE RATING:	3/7.5 kV
CAT#:	200RC160A	CURRENT RATING:	200A

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	N/A	N/A
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	N/A	N/A

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 1030000	A-B 2500000	A-A' 2500000
B-G 1030000	B-C 2500000	B-B' 2500000
C-G 1430000	C-A 2500000	C-C' 2500000

MicroOhms @ 10 Amps

Contact Resistance	
A	30
B	30
C	30

Readings in Milliamps @ _____ KV AC DC

Overpotential test					
A-G	N/A	A-B	N/A	A-A'	N/A
B-G	N/A	B-C	N/A	B-B'	N/A
C-G	N/A	C-A	N/A	C-C'	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	1,790	B	1,815	C	387
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	1,793	B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	3	B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: Contact resistnace on grounding switch in micro Ohms - A-589, B-539, C-525
3 spare fuses located in door



Eaton Job Number: EVC12J0027

30T North Crane

Electrical Services & Systems

Medium Voltage Switch

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	30T North Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 23, 2012

FIELD DATA

SWITCH INFORMATION

MANUFACTURER:	Westinghouse	VOLTAGE RATING:	4,800
TYPE:	AWP2	CURRENT RATING:	600
MODEL/STYLE #:	3416A42G01	BIL (KV):	60KV
SYSTEM VOLTAGE:	2,400	CONTROL VOLTAGE	N/A

FUSE INFORMATION

MANUFACTURER:	Westinghouse	VOLTAGE RATING:	25,000
CAT#:	RBA200	CURRENT RATING:	Must be dismantled to view

SURGE ARRESTER INFORMATION

MANUFACTURER:		VOLTAGE RATING:	N/A
TYPE/STYLE:	N/A	MCOV:	N/A

INSPECTION DATA

	AS FOUND	AS LEFT		AS FOUND	AS LEFT
OVERALL CONDITION:	Acceptable	Acceptable	KEY INTERLOCKS:	Acceptable	Acceptable
WINDOW:	Acceptable	Acceptable	OPERATING MECHANISM:	Acceptable	Acceptable
WARNING LABELS:	Acceptable	Acceptable	MAIN BLADES AND JAW:	Acceptable	Acceptable
OVERALL CLEANLINESS:	Acceptable	Acceptable	ARCING BLADES & CHUTES:	Acceptable	Acceptable
EQUIPMENT INSTALLATION:	Acceptable	Acceptable	FUSE HOLDERS:	Acceptable	Acceptable
EQUIPMENT GROUNDING:	Acceptable	Acceptable	CONNECTION TIGHTNESS:	Acceptable	Acceptable
BARRIERS & INSULATORS:	Acceptable	Acceptable	HEATERS:	Acceptable	Acceptable
MECHANICAL INTERLOCKS:	Acceptable	Acceptable	ARRESTER INSPECTION:	N/A	N/A
GROUND MAT:	Acceptable	Acceptable	WORKING SPACE:	Acceptable	Acceptable
LUBRICATION:	Acceptable	Acceptable	JUMPER CABLE INSPECTION:	Acceptable	Acceptable

ELECTRICAL TESTS

Insulation Resistance - MegOhms @ 5000 VDC

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 4630	A-B 4630	A-A' 878
B-G 3730	B-C 3730	B-B' 878
C-G 4690	C-A 4630	C-C' 878

MicroOhms @ 10 Amps

Contact Resistance
A 40
B 28
C 33

Readings in Milliamps @ _____ KV AC DC

Overpotential test

A-G	A-B	A-A'	B-G	B-C	B-B'	C-G	C-A	C-C'
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

FUSE RESISTANCE:	(Readings in MilliOhms)	A	584	B	1,314	C	387
FUSE AND HOLDER RESISTANCE:	(Readings in MilliOhms)	A	584	B		C	
FUSE HOLDER RESISTANCE:	(Readings in MilliOhms)	A	0	B		C	
ARRESTER INSULATION RESISTANCE @ _____ VDC:	(Readings in MegOhms)	A-G		B-G		C-G	

ELECTRICAL OPERATION

CHARGE:	N/A	TRIP:	N/A
CLOSE:	N/A	AUX CONTACT:	N/A

COMMENTS: _____

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	30T North Crane
DEVICE / FEEDER ID:	Slip Ring	DATE TESTED:	February 22, 2012

Slip ring contact resistnace results:

- A - 0.994 mOhms
- B - 1.915 mOhms
- C - 1.493 mOhms
- G - 7.220 mOhms
- PW - 2.334 mOhms

Electrical Services & Systems

Dry Type Transformer

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	Cranes	EQUIPMENT POSITION:	30T North Crane
DEVICE / FEEDER ID:	N/A	DATE TESTED:	February 23, 2012

FIELD DATA

MANUFACTURER:	Delta		TYPE:	ANN	
SERIAL NUMBER:	41004-585		IMPEDANCE (%):	5.5%	
CLASS:			NUMBER OF TAPS:	1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> Other <input type="radio"/>	
PHASE:	1 <input type="radio"/> 3 <input checked="" type="radio"/>		SELECTED TAP:	FREQUENCY: (Hz) 60	
KVA:	500		WINDING TEMPERATURE: (°C)		
CONFIG.:	Primary	Delta <input checked="" type="radio"/> Wye <input type="radio"/>	Secondary	Delta <input type="radio"/> Wye <input checked="" type="radio"/>	MAX. TEMP.
PRIMARY VOLTS	L-L:	2,400	TEMP RISE (°C)	150	
SECONDARY VOLTS:	L-L:	480	L-N:	277	WINDING MATERIAL:
SYSTEM VOLTAGE:	2400		BIL PRIMARY (KV):	30KV	
HUMIDITY:			BIL SECONDARY (KV)	10KV	

INSPECTION DATA

PHYSICAL AND MECHANICAL CONDITION:	Acceptable	TAP CONNECTION:	Acceptable
SHIPPING BRACES REMOVED:	Acceptable	TIGHTNESS OF CONNECTIONS:	Acceptable
VIBRATION PADS:	Acceptable	INSULATORS/BARRIERS:	Acceptable
MOUNTING SUPPORTS:	Acceptable	CLEANLINESS:	Acceptable
GROUNDING OF FRAME AND CORE:	Acceptable	FAN INSPECTION:	N/A
TERMINATION CLEARANCES:	Acceptable	ARRESTERS INSPECTION:	N/A
SIGNS OF OVERHEATING, MOISTURE, CORONA:	Acceptable	AIR FILTER:	N/A

ELECTRICAL TEST DATA

TAP POSITION:	AS TESTED: (check radio button to indicate as left tap setting)						AS LEFT	
	1 <input type="radio"/>	2 <input type="radio"/>	3 <input checked="" type="radio"/>	4 <input type="radio"/>	5 <input type="radio"/>			3
PRIM. VOLTAGE: <input checked="" type="checkbox"/> 2.5% equal taps)	2,520.000 V	2,460.000 V	2,400.000 V	2,340.000 V	2,280.000 V	V	V	2,400.000 V
CALCULATED RATIO:	9.093 :1	8.877 :1	8.660 :1	8.444 :1	8.227 :1	:1	:1	8.660 :1
H 1 -H 3 X 1 -X 0	9.084 :1	8.888 :1	8.666 :1	8.418 :1	8.228 :1	:1	:1	8.666 :1
H 1 -H 2 X 2 -X 0	9.081 :1	8.888 :1	8.666 :1	8.443 :1	8.223 :1	:1	:1	8.666 :1
H 3 -H 2 X 3 -X 0	9.081 :1	8.888 :1	8.666 :1	8.471 :1	8.226 :1	:1	:1	8.666 :1
GREATEST % DIFF. vs. CALCULATED:	0.135 %	0.127 %	0.066 %	0.323 %	0.052 %	%	%	0.066 %

INSULATION RESISTANCE IN MegOhms	@	HI to LO & GND 2500 VDC	@	LO to HI & GND 2500 VDC	@	HI to LO 2500 VDC	@	CORE INSULATION 500 VDC
ACTUAL VALUE:		324		93		383		0
CORRECTED TO 20°C:								

POLARIZATION INDEX HI to LO @ 2500 VDC (MEGOHMS)	30 SEC:	1 MIN:	10 MIN:	CALC. INDEX:	POWER FACTOR TEST:
	164	174	314	1.80	

COOLING CONTROL SETPOINTS

(a value of N/A °c indicates specified control is not applicable to this transformer)			
WINDING TEMPERATURE GUAGE CONTROL SET POINT:	STAGE 1:	STAGE 2:	ALARMS:
	N/A °c	N/A °c	N/A °c
WINDING TEMPERATURE GUAGE CONTROL ACTUAL:			TRIPS:
	N/A °c	N/A °c	N/A °c

WINDING RESISTANCE TEST

ACTUAL VALUE: in	H 1 -H 3	0.217	H 1 -H 2	0.219	H 3 -H 2	0.219
CORRECTED TO 20°C:	H 1 -H 3		H 1 -H 2		H 3 -H 2	
ACTUAL VALUE: in	X 1 -X 0	2.6	X 2 -X 0	2.6	X 3 -X 0	2.6
CORRECTED TO 20°C:	X 1 -X 0		X 2 -X 0		X 3 -X 0	

COMMENTS: With core ground strap removed core to ground megger indicated that core was still bonded to ground



Eaton Job Number: EVC12J0027

MG Breaker High Current Testing



Powering Business Worldwide

Electrical Services & Systems

Low Voltage Breaker

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION:	Main Sub Filter B
DEVICE / FEEDER ID:	Filter B	DATE TESTED:	3/14/2012

BREAKER DATA

MANUFACTURER:	Merlin Gerin	SO/SERIAL NUMBER:	MP005087C
TYPE:	C20 H1 3DCCS	INTERRUPT RATING:	65,000
FUSE MANUFACTURER:	N/A	FRAME SIZE:	2000A
FUSE CAT #:	N/A	OPERATIONS CNTR:	N/A
I. B. NUMBER:	N/A	WIRING DIAGRAM:	N/A

M.O. E.O. Fixed Drawout

ACCESSORIES

	EQUIPPED	RATING		EQUIPPED	RATING
CHARGE MOTOR:			AUXILLARY SWITCH(ES):		
CONTROL RELAY:			BLOWN FUSE IND:		
CLOSE COIL:			NEUTRAL SENSOR:		
SHUNT TRIP:					
UNDERVOLTAGE:					
FUSES:					

INSPECTION DATA

	CONDITION:		CONDITION:
OVERALL CONDITION:	Acceptable	PRIMARY DISCONNECTS:	Acceptable
MAIN CONTACTS:	Acceptable	MANUAL CLOSE / TRIP:	Acceptable
ARCING CONTACTS:	Acceptable	CONTROL WIRING:	
ARC CHUTE CONDITION:	Acceptable	SECONDARY DISCONNECTS:	Acceptable
FRAME CONDITION:		ELECTRICAL DEVICES:	
INSULATION / BARRIERS:	Acceptable	GENERAL CLEANLINESS:	Acceptable

TRIP UNIT INFORMATION

MANUFACTURER:
TRIP UNIT TYPE:
FUNCTIONS:
TRIP UNIT CURVE:
RTG PLUG SIZE#
C.T. TAP USED:
C.T. RANGE:

Trip Unit Nameplate Data	
Merlin Gerin	
STR 58U	
LSI	
N/A	
2,000	
0.8	
0.4-1.0	

CUSTOMER SETTINGS

LONG DELAY PICK UP:
LONG DELAY TIME:
SHORT DELAY PICK UP:
SHORT DELAY TIME:
INSTANTANEOUS:
GROUND FAULT PICK UP:
GROUND FAULT TIME:
COMMUNICATION ADDRESS:

	AS FOUND	AS LEFT
LONG DELAY PICK UP:	0.8x	0.8x
LONG DELAY TIME:	240	240
SHORT DELAY PICK UP:	2x	2x
SHORT DELAY TIME:	0.3 (on)	0.3 (on)
INSTANTANEOUS:	12x	12x
GROUND FAULT PICK UP:	N/A	N/A
GROUND FAULT TIME:	N/A	N/A
COMMUNICATION ADDRESS:	N/A	N/A

2,000

ELECTRICAL TESTS

Primary Injection Secondary Injection NPU=NO PICKUP NT=NO TRIP NTD=NO TIME DELAY

Function	Test Settings	Test Value (Mult. of Current)	Test Current (Amps)	Limits MIN/MAX	As Found			As Left		
					A	B	C	A	B	C
LDPU (Amps)	Comments									
LDT (Seconds)	Comments									
SDPU (Amps)	Comments									
SDT (Seconds)	Comments									
INSTPU (Amps)	12x				0.028s	0.028s	0.028s	0.028s	0.028s	0.028s
GFPU (Amps)	N/A									
GFT (Seconds)	N/A									

Insulation Resistance - MegOhms @ 1000 VDC

MicroOhms @ 10 Amps

Readings in: MicroOhms @ Amps

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 695000	A-B 451000	A-A' 833000
B-G 629000	B-C 439000	B-B' 593000
C-G 789000	C-A 512000	C-C' 840000

Contact Resistance	
A	12
B	13
C	16

Limiter Resistance	
A	
B	
C	

COMMENTS:

Cell, control wiring, and carriage not in scope of work
For LT and ST high current test results refer to General Comments sheet covering this unit

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION	Main Sub Filter B
DEVICE / FEEDER ID:	Filter B	DATE TESTED:	March 9, 2012

For breaker information refer to breaker test sheet.

High current test results for Filter B MG low voltage air circuit breaker:

LT:

- 1.5x (2400A) expected 240s - trip in 219s
- 3.0x (4800A) expected 50-60s - trip in 53s

ST:

- 3282A @ 0.1 I²t ON - trip in 0.73s
- 3282A @ 0.2 I²t ON - NO TRIP
- 3283A @ 0.3 I²t ON - NO TRIP
- 3154A @ 0.3 I²t OFF - trip in 0.029s

Comments:

- I²t function not operating properly



Powering Business Worldwide

Electrical Services & Systems

Low Voltage Breaker

Table with customer and job information: CUSTOMER, USER, SUBSTATION, DEVICE / FEEDER ID, JOB NUMBER, PLANT, EQUIPMENT POSITION, DATE TESTED.

BREAKER DATA

Table with breaker specifications: MANUFACTURER, TYPE, FUSE MANUFACTURER, FUSE CAT #, I. B. NUMBER, SO/SERIAL NUMBER, INTERRUPT RATING, FRAME SIZE, OPERATIONS CNTR, WIRING DIAGRAM.

M.O. E.O. Fixed Drawout

ACCESSORIES

Table with accessory status: CHARGE MOTOR, CONTROL RELAY, CLOSE COIL, SHUNT TRIP, UNDERVOLTAGE, FUSES, AUXILLARY SWITCH(ES), BLOWN FUSE IND, NEUTRAL SENSOR.

INSPECTION DATA

Table with inspection results: OVERALL CONDITION, MAIN CONTACTS, ARCING CONTACTS, ARC CHUTE CONDITION, FRAME CONDITION, INSULATION / BARRIERS, PRIMARY DISCONNECTS, MANUAL CLOSE / TRIP, CONTROL WIRING, SECONDARY DISCONNECTS, ELECTRICAL DEVICES, GENERAL CLEANLINESS.

TRIP UNIT INFORMATION

Table with trip unit details: MANUFACTURER, TRIP UNIT TYPE, FUNCTIONS, TRIP UNIT CURVE, RTG PLUG SIZE#, C.T. TAP USED, C.T. RANGE, CUSTOMER SETTINGS, AS FOUND, AS LEFT.

ELECTRICAL TESTS

Primary Injection Secondary Injection NPU=NO PICKUP NT=NO TRIP NTD=NO TIME DELAY

Table with electrical test results: Function, Test Settings, Test Value, Test Current, Limits MIN/MAX, As Found, As Left.

Insulation Resistance - MegOhms @ 1000 VDC MicroOhms @ 10 Amps Readings in: MicroOhms @ Amps

Table with insulation resistance values: Closed (Ph. - Gnd), Closed (Ph. - Ph.), Open (Line - Load).

Table with contact resistance values: A, B, C.

Table with limiter resistance values: A, B, C.

COMMENTS: Cell, control wiring, and carriage not in scope of work For LT and ST high current test results refer to General Comments sheet covering this unit

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION	Main Sub Splitter
DEVICE / FEEDER ID:	2000A Splitter	DATE TESTED:	March 9, 2012

For breaker information refer to breaker test sheet.

High current test results for Main Substation 2000A Splitter MG low voltage air circuit breaker:

LT:

2x (1603A) - trip in 40.1s

4x (3201A) - trip in 11.4s

ST:

2000A x 0.4 x2 @ 2s

A phase 1584A - NO TRIP

A phase 1603A - trip in 1.697s

B phase 1569A - NO TRIP

B phase 1599A - trip in 1.73s

C phase 1574A - NO TRIP

C phase 1606A - trip in 1.759s

Comments:

- I²t function was problematic with results in excess of 3 seconds
- breaker left at 0.3 set point with I²t OFF



Powering Business Worldwide

Electrical Services & Systems

General Comments

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION	North Landing Warf Sub Filter
DEVICE / FEEDER ID:	Filter Bank	DATE TESTED:	March 9, 2012

For breaker information refer to breaker test sheet.

High current test results for North Landinf Warf Filter Bank MG low voltage air circuit breaker:

LT:

- 1.5x (2421A) expected 240s - trip in 212s
- 3.0x (4800A) expected 50-60s - trip in 53s

ST:

- 3159A @ 0.3 I²t ON - NO TRIP
- A phase 3179A I²t OFF - trip in 0.304s
- B phase 3190A I²t OFF - trip in 0.281s
- C phase 3216A I²t OFF - trip in 0.291s

Comments:

- I²t function not operating properly
- Testing with I²t gave results in excess of 3 seconds
- Breaker was left with the I²t function OFF

Low Voltage Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION:	North Landing Warf Sub Filter
DEVICE / FEEDER ID:	Filter Bank	DATE TESTED:	March 9, 2012

BREAKER DATA

MANUFACTURER:	Merlin Gerin	SO/SERIAL NUMBER:	MP005087C
TYPE:	C20H13DCCS	INTERRUPT RATING:	65,000
FUSE MANUFACTURER:	N/A	FRAME SIZE:	2000A
FUSE CAT #:	N/A	OPERATIONS CNTR:	N/A
I. B. NUMBER:	N/A	WIRING DIAGRAM:	N/A

M.O. E.O. Fixed Drawout

ACCESSORIES

	EQUIPPED	RATING		EQUIPPED	RATING
CHARGE MOTOR:			AUXILLARY SWITCH(ES):		
CONTROL RELAY:			BLOWN FUSE IND:		
CLOSE COIL:			NEUTRAL SENSOR:		
SHUNT TRIP:					
UNDERVOLTAGE:					
FUSES:					

INSPECTION DATA

	CONDITION:		CONDITION:
OVERALL CONDITION:	Acceptable	PRIMARY DISCONNECTS:	Acceptable
MAIN CONTACTS:	Acceptable	MANUAL CLOSE / TRIP:	Acceptable
ARCING CONTACTS:	Acceptable	CONTROL WIRING:	
ARC CHUTE CONDITION:	Acceptable	SECONDARY DISCONNECTS:	Acceptable
FRAME CONDITION:		ELECTRICAL DEVICES:	
INSULATION / BARRIERS:	Acceptable	GENERAL CLEANLINESS:	Acceptable

TRIP UNIT INFORMATION

	Trip Unit Nameplate Data	CUSTOMER SETTINGS	AS FOUND	AS LEFT
MANUFACTURER:	Merlin Gerin	LONG DELAY PICK UP:	0.8x	0.8x
TRIP UNIT TYPE:	STR 58U	LONG DELAY TIME:	240	240
FUNCTIONS:	LSI	SHORT DELAY PICK UP:	2x	2x
TRIP UNIT CURVE:	N/A	SHORT DELAY TIME:	0.3 (on)	0.3 (on)
RTG PLUG SIZE#	2,000	INSTANTANEOUS:	12x	12x
C.T. TAP USED:	0.9	GROUND FAULT PICK UP:	N/A	N/A
C.T. RANGE:	0.4-1.0	GROUND FAULT TIME:	N/A	N/A
		COMMUNICATION ADDRESS:	N/A	N/A

2,000

ELECTRICAL TESTS

Primary Injection Secondary Injection NPU=NO PICKUP NT=NO TRIP NTD=NO TIME DELAY

Function	Test Settings	Test Value (Mult. of Current)	Test Current (Amps)	Limits MIN/MAX	As Found			As Left		
					A	B	C	A	B	C
LDPU (Amps)	Comments									
LDT (Seconds)	Comments									
SDPU (Amps)	Comments									
SDT (Seconds)	Comments									
INSTPU (Amps)	12x				0.027s	0.027s	0.027s	0.027s	0.027s	0.027s
GFPD (Amps)	N/A									
GFT (Seconds)	N/A									

Insulation Resistance - MegOhms @ 1000 VDC MicroOhms @ 10 Amps Readings in: MicroOhms @ _____ Amps

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	665000	A-B	640000	A-A'	802000
B-G	772000	B-C	574000	B-B'	1000000
C-G	1000000	C-A	739000	C-C'	1000000

Contact Resistance	
A	14
B	15
C	14

Limiter Resistance	
A	
B	
C	

COMMENTS: Cell, control wiring, and carriage not in scope of work
For LT and ST high current test results refer to General Comments sheet covering this unit



Powering Business Worldwide

Electrical Services & Systems

General Comments

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION:	SS Sub Filter
DEVICE / FEEDER ID:	SS Sub Filter Main	DATE TESTED:	March 9, 2012

For breaker information refer to breaker test sheet.

High current test results for South Side Substation Filter MG low voltage air circuit breaker:

LT:

1.5x (2668A) expected 240s - trip in 222s

3.0x (5398A) expected 50-60s - trip in 54s

ST:

A phase 2798A - trip in 0.294s

B phase 2764A - trip in 0.294s

C phase 2798A - trip in 0.294s

Comments:

- I²t function was problematic with results in excess of 3 seconds
- breaker left at 0.3 set point with I²t OFF

Low Voltage Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION:	SS Sub Filter
DEVICE / FEEDER ID:	SS Sub Filter Main	DATE TESTED:	March 9, 2012

BREAKER DATA

MANUFACTURER:	Merlin Gerin	SO/SERIAL NUMBER:	MP005087C
TYPE:	C20H13DCCS	INTERRUPT RATING:	65,000
FUSE MANUFACTURER:	N/A	FRAME SIZE:	2000A
FUSE CAT #:	N/A	OPERATIONS CNTR:	N/A
I. B. NUMBER:	N/A	WIRING DIAGRAM:	N/A

M.O. E.O. Fixed Drawout

ACCESSORIES

	EQUIPPED	RATING		EQUIPPED	RATING
CHARGE MOTOR:			AUXILLARY SWITCH(ES):		
CONTROL RELAY:			BLOWN FUSE IND:		
CLOSE COIL:			NEUTRAL SENSOR:		
SHUNT TRIP:					
UNDERVOLTAGE:					
FUSES:					

INSPECTION DATA

	CONDITION:		CONDITION:
OVERALL CONDITION:	Acceptable	PRIMARY DISCONNECTS:	Acceptable
MAIN CONTACTS:	Acceptable	MANUAL CLOSE / TRIP:	Acceptable
ARCING CONTACTS:	Acceptable	CONTROL WIRING:	
ARC CHUTE CONDITION:	Acceptable	SECONDARY DISCONNECTS:	Acceptable
FRAME CONDITION:		ELECTRICAL DEVICES:	
INSULATION / BARRIERS:	Acceptable	GENERAL CLEANLINESS:	Acceptable

TRIP UNIT INFORMATION

MANUFACTURER: TRIP UNIT TYPE: FUNCTIONS: TRIP UNIT CURVE: RTG PLUG SIZE# C.T. TAP USED: C.T. RANGE: <input type="text" value="2,000"/>	Trip Unit Nameplate Data	CUSTOMER SETTINGS	AS FOUND	AS LEFT
	Merlin Gerin	LONG DELAY PICK UP:	0.9x	0.9x
	STR 58U	LONG DELAY TIME:	240	240
	LSI	SHORT DELAY PICK UP:	2x	2x
	N/A	SHORT DELAY TIME:	0.3 (on)	0.3 (on)
	2,000	INSTANTANEOUS:	12x	12x
	0.9	GROUND FAULT PICK UP:	N/A	N/A
	0.4-1.0	GROUND FAULT TIME:	N/A	N/A
		COMMUNICATION ADDRESS:	N/A	N/A

ELECTRICAL TESTS

Primary Injection Secondary Injection NPU=NO PICKUP NT=NO TRIP NTD=NO TIME DELAY

Function	Test Settings	Test Value (Mult. of Current)	Test Current (Amps)	Limits MIN/MAX	As Found			As Left		
					A	B	C	A	B	C
LDPU (Amps)	Comments									
LDT (Seconds)	Comments									
SDPU (Amps)	Comments									
SDT (Seconds)	Comments									
INSTPU (Amps)	12x				0.027s	0.027s	0.027s	0.027s	0.027s	0.027s
GFPD (Amps)	N/A									
GFT (Seconds)	N/A									

Insulation Resistance - MegOhms @ 1000 VDC MicroOhms @ 10 Amps Readings in: MicroOhms @ _____ Amps

Closed (Ph. - Gnd)		Closed (Ph. - Ph.)		Open (Line - Load)	
A-G	981000	A-B	429000	A-A'	640000
B-G	784000	B-C	459000	B-B'	755000
C-G	593000	C-A	1000000	C-C'	586000

Contact Resistance	
A	17
B	14
C	15

Limiter Resistance	
A	
B	
C	

COMMENTS: Cell, control wiring, and carriage not in scope of work
For LT and ST high current test results refer to General Comments sheet covering this unit



Powering Business Worldwide

Electrical Services & Systems

General Comments

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks, ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks, ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION:	SS Sub Splitter
DEVICE / FEEDER ID:	4SS2-27	DATE TESTED:	March 9, 2012

For breaker information refer to breaker test sheet.

High current test results for South Side Substation splitter MG low voltage air circuit breaker:

LT:

Cannot primary injection test due to ground fault function

ST:

Cannot primary injection test due to ground fault function

GF:

GF Trip successful between 0.4 and 0.5 seconds

Comments:

Low Voltage Breaker

Electrical Services & Systems

CUSTOMER:	Public Works and Government Works Esquimalt Graving Docks; ,	JOB NUMBER:	EVC12J0027
USER:	Public Works and Government Works Esquimalt Graving Docks; ,	PLANT:	Esquimalt Graving Dock
SUBSTATION:	MG Breaker Testing	EQUIPMENT POSITION:	SS Sub Splitter
DEVICE / FEEDER ID:	4SS2-27	DATE TESTED:	March 9, 2012

BREAKER DATA

MANUFACTURER:	Merlin Gerin	SO/SERIAL NUMBER:	11869585
TYPE:	M20 H1 3DPPS	INTERRUPT RATING:	75,000
FUSE MANUFACTURER:	N/A	FRAME SIZE:	2000A
FUSE CAT #:	N/A	OPERATIONS CNTR:	N/A
I. B. NUMBER:	N/A	WIRING DIAGRAM:	N/A

M.O.
 E.O.
 Fixed
 Drawout

ACCESSORIES

	EQUIPPED	RATING		EQUIPPED	RATING
CHARGE MOTOR:			AUXILLARY SWITCH(ES):		
CONTROL RELAY:			BLOWN FUSE IND:		
CLOSE COIL:			NEUTRAL SENSOR:		
SHUNT TRIP:					
UNDERVOLTAGE:					
FUSES:					

INSPECTION DATA

	CONDITION:		CONDITION:
OVERALL CONDITION:	Acceptable	PRIMARY DISCONNECTS:	Acceptable
MAIN CONTACTS:	Acceptable	MANUAL CLOSE / TRIP:	Acceptable
ARCING CONTACTS:	Acceptable	CONTROL WIRING:	
ARC CHUTE CONDITION:	Acceptable	SECONDARY DISCONNECTS:	Acceptable
FRAME CONDITION:		ELECTRICAL DEVICES:	
INSULATION / BARRIERS:	Acceptable	GENERAL CLEANLINESS:	Acceptable

TRIP UNIT INFORMATION

MANUFACTURER:
TRIP UNIT TYPE:
FUNCTIONS:
TRIP UNIT CURVE:
RTG PLUG SIZE#
C.T. TAP USED:
C.T. RANGE:

Trip Unit Nameplate Data	
Merlin Gerin	
STR 58U	
LSIG	
N/A	
2,000	
1	
0.4-1.0	

CUSTOMER SETTINGS

LONG DELAY PICK UP:
LONG DELAY TIME:
SHORT DELAY PICK UP:
SHORT DELAY TIME:
INSTANTANEOUS:
GROUND FAULT PICK UP:
GROUND FAULT TIME:
COMMUNICATION ADDRESS:

	AS FOUND	AS LEFT
1x	1x	
120	120	
6x	6x	
0.2 (on)	0.2 (on)	
8x	8x	
1200A	1200A	
0.4 (on)	0.4 (on)	
N/A	N/A	

2,000

ELECTRICAL TESTS

Primary Injection
 Secondary Injection

NPU=NO PICKUP
NT=NO TRIP
NTD=NO TIME DELAY

Function	Test Settings	Test Value (Mult. of Current)	Test Current (Amps)	Limits MIN/MAX	As Found			As Left		
					A	B	C	A	B	C
LDPU (Amps)	Comments									
LDT (Seconds)	Comments									
SDPU (Amps)	Comments									
SDT (Seconds)	Comments									
INSTPU (Amps)	12x									
GFPU (Amps)	Comments									
GFT (Seconds)	Comments									

Insulation Resistance - MegOhms @ 1000 VDC

MicroOhms @ 10 Amps

Readings in: MicroOhms @ _____ Amps

Closed (Ph. - Gnd)	Closed (Ph. - Ph.)	Open (Line - Load)
A-G 593000	A-B 477000	A-A' 1000000
B-G 600000	B-C 382000	B-B' 1000000
C-G 724000	C-A 405000	C-C' 1000000

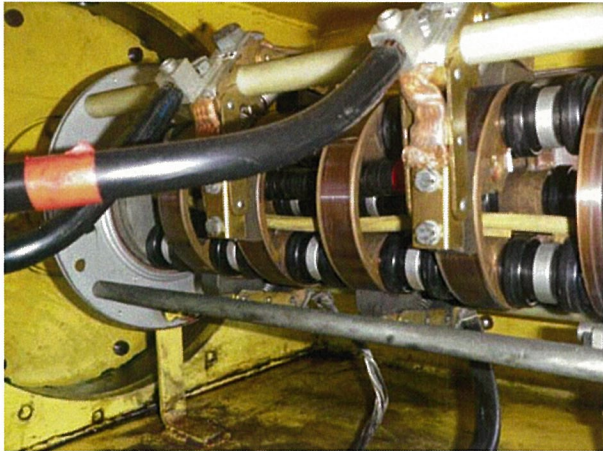
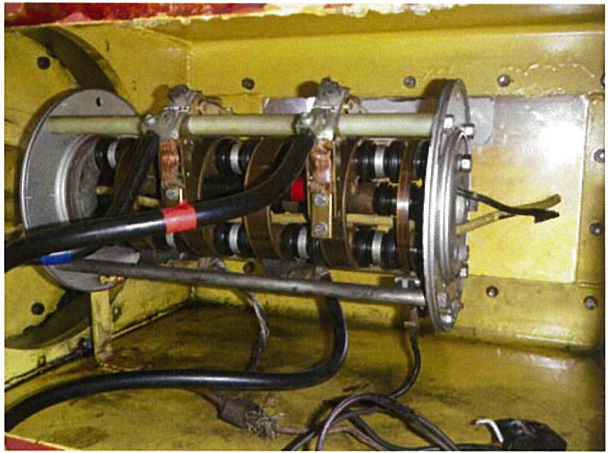
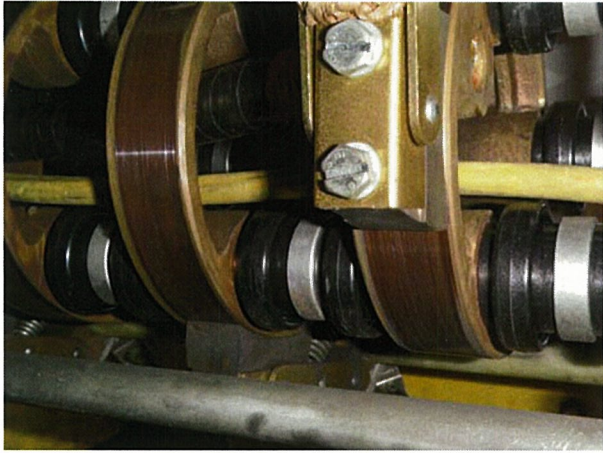
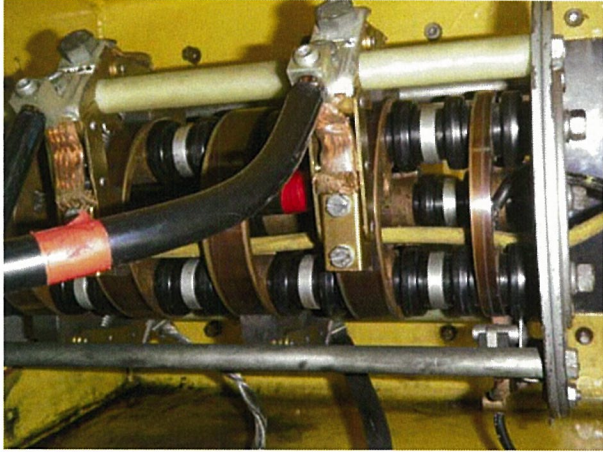
Contact Resistance	
A 26	
B 26	
C 31	

Limiter Resistance	
A	
B	
C	

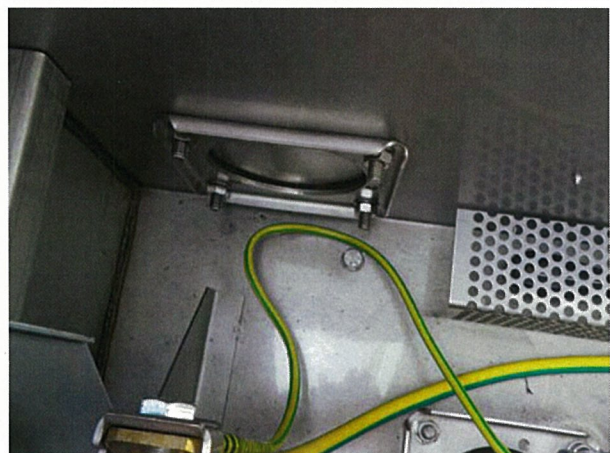
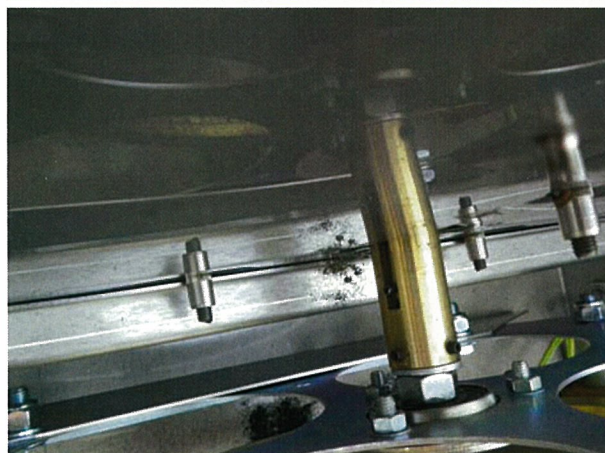
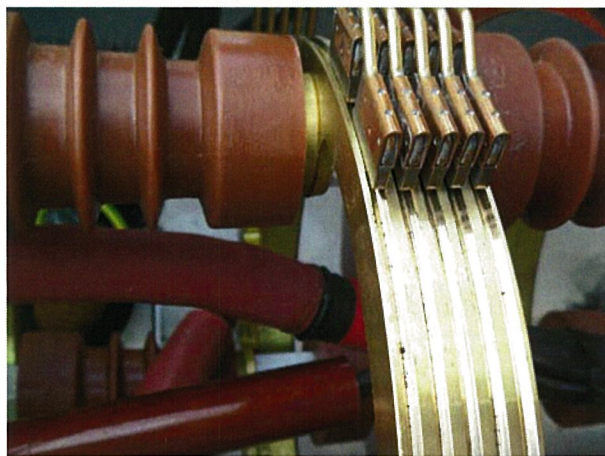
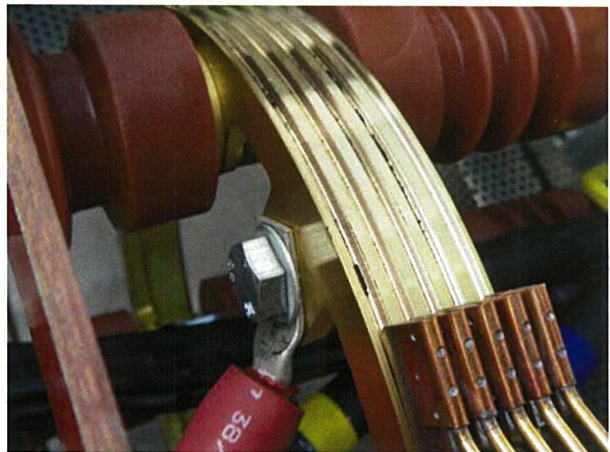
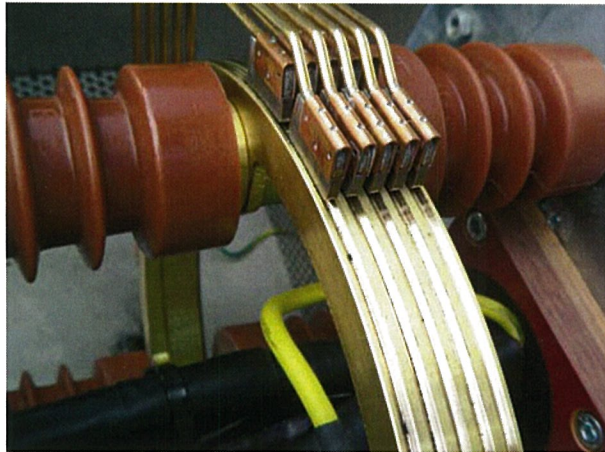
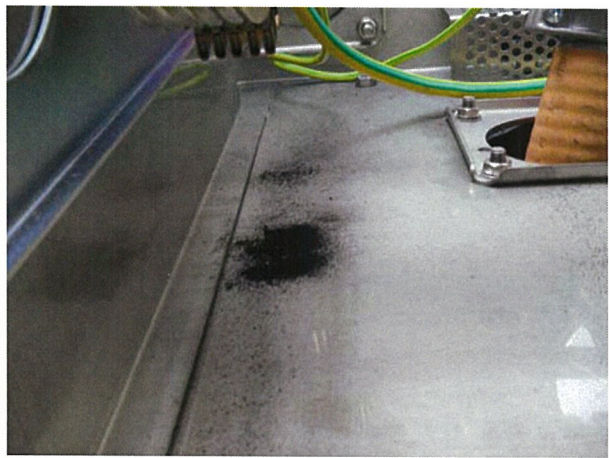
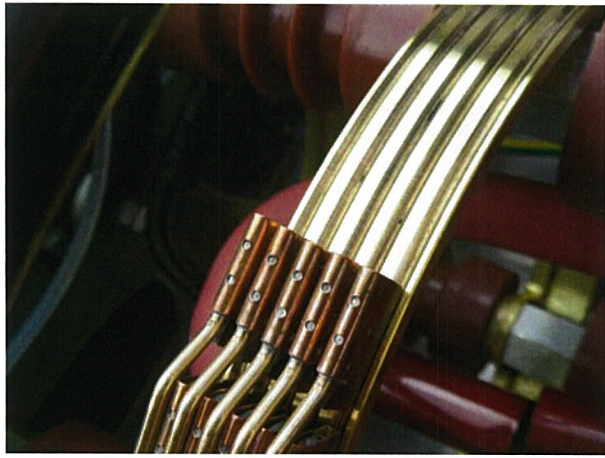
COMMENTS:

Cell, control wiring, and carriage not in scope of work
For LT, ST, and GF high current test results refer to General Comments sheet covering this unit

Appendix A: Crane Slip Ring Photos



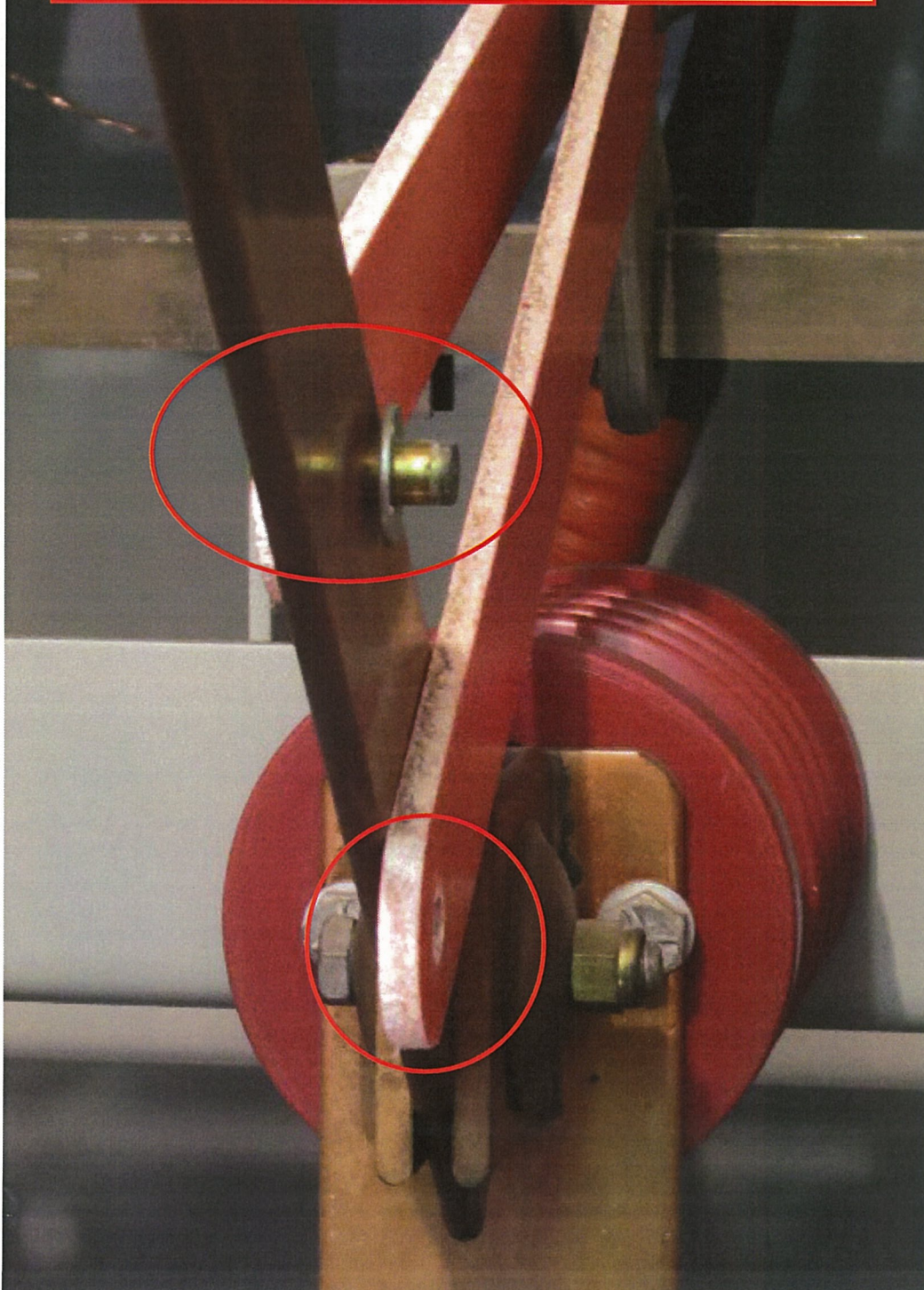
EGD - 150 Ton Crane - Feb 22, 2012



EGD - 30 Ton Ebco Crane - Feb 23, 2012

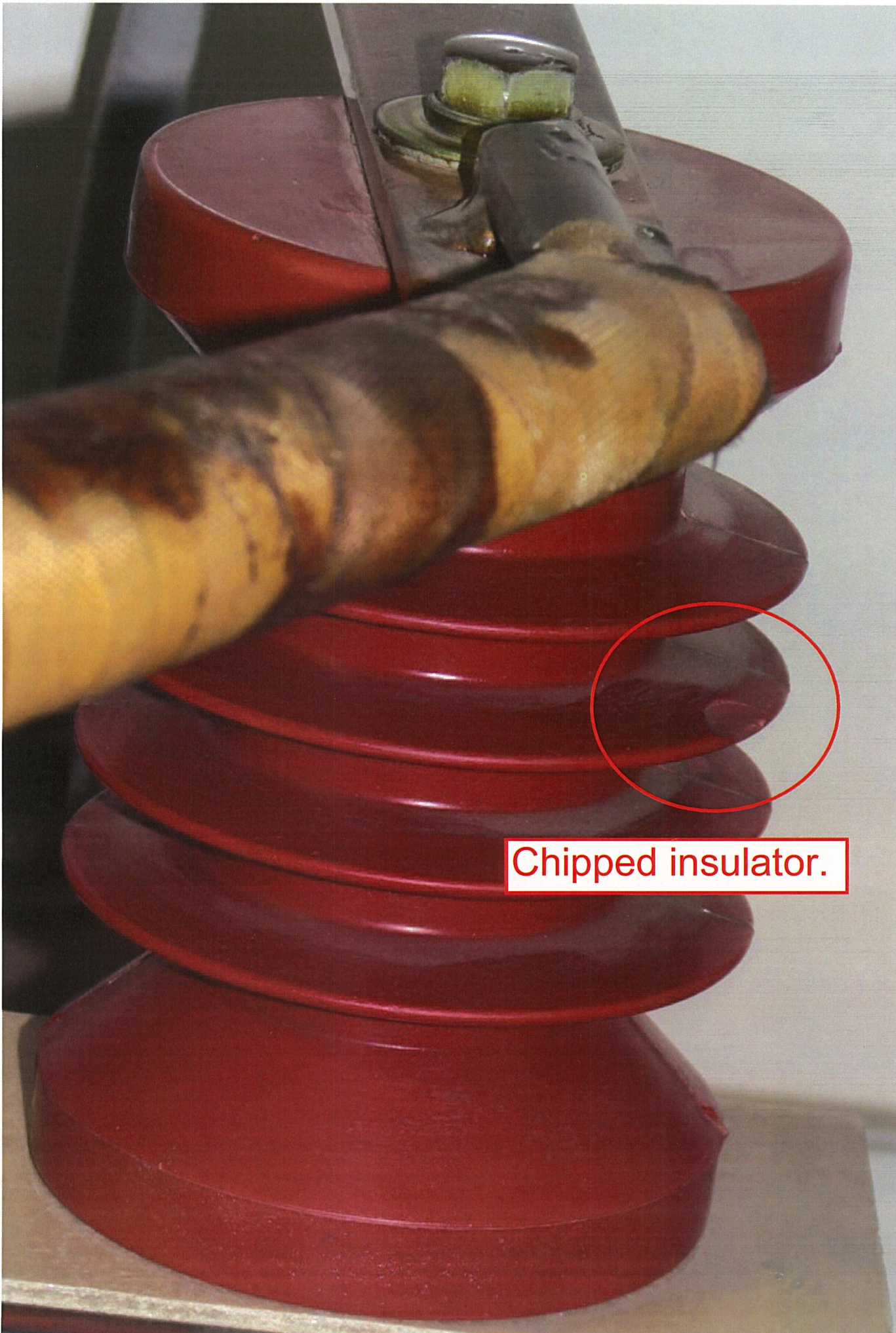
Appendix B: Report Images

'E' type circlip was missing from the pin in the blade of the switch. Insulator operating arm was removed from pin for visual demonstration purposes. Replacement clip installed by Emery.



Transformer core
varnish that has
been damaged due
to heat.





Chipped insulator.

Visible oil leak around
bushing base.



H2

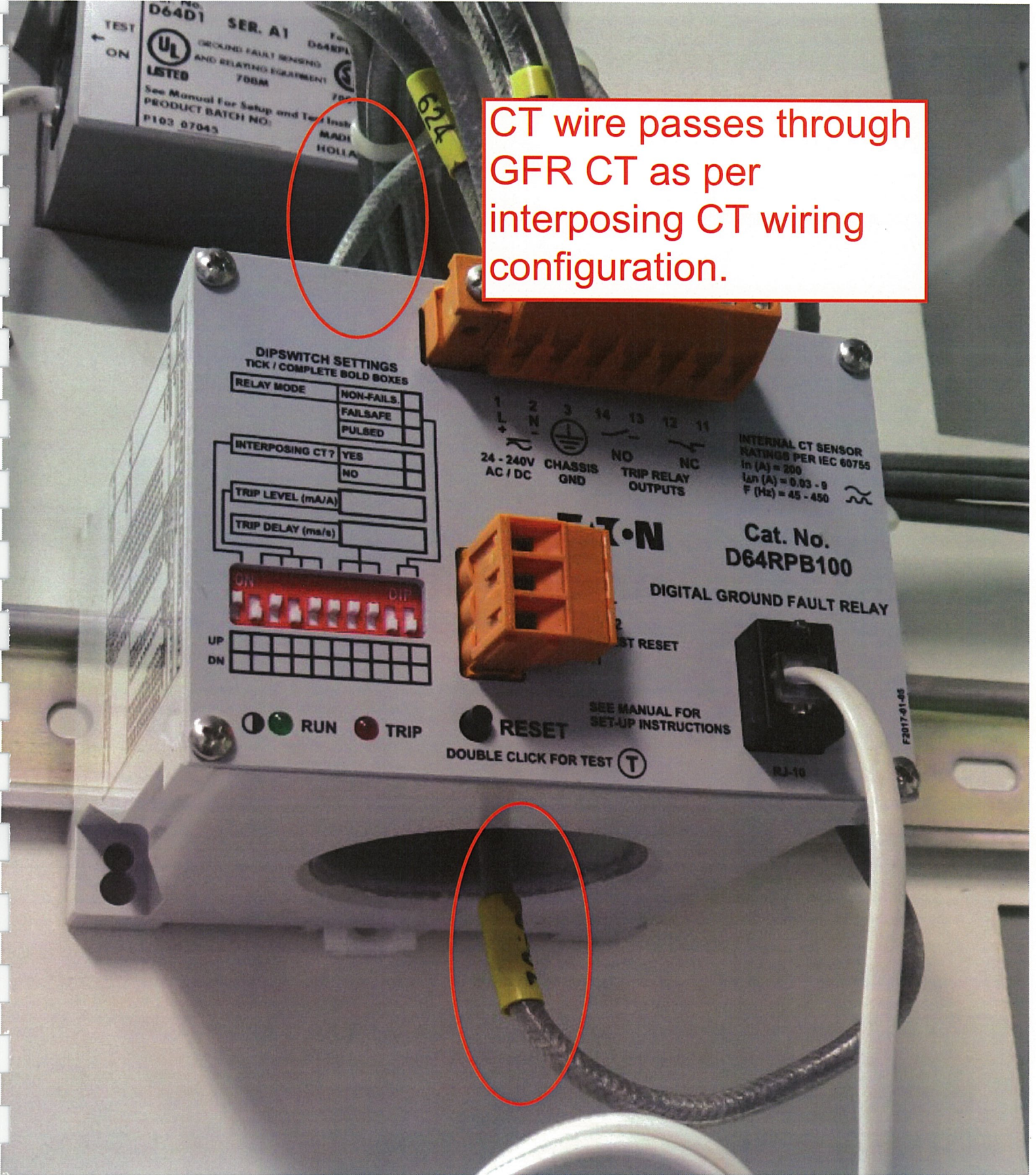


Typical gasket installation example.



Evidence of transformer oil in bottom of bushing compartment.

CT wire passes through GFR CT as per interposing CT wiring configuration.



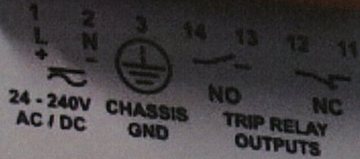
DIPSWITCH SETTINGS
TICK / COMPLETE BOLD BOXES

RELAY MODE	NON-FAILS.	<input type="checkbox"/>
	FAILSAFE	<input type="checkbox"/>
	PULSED	<input type="checkbox"/>

INTERPOSING CT?	YES	<input type="checkbox"/>
	NO	<input type="checkbox"/>
TRIP LEVEL (mA/A)		<input type="text"/>
TRIP DELAY (ms/s)		<input type="text"/>

ON	DIP
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

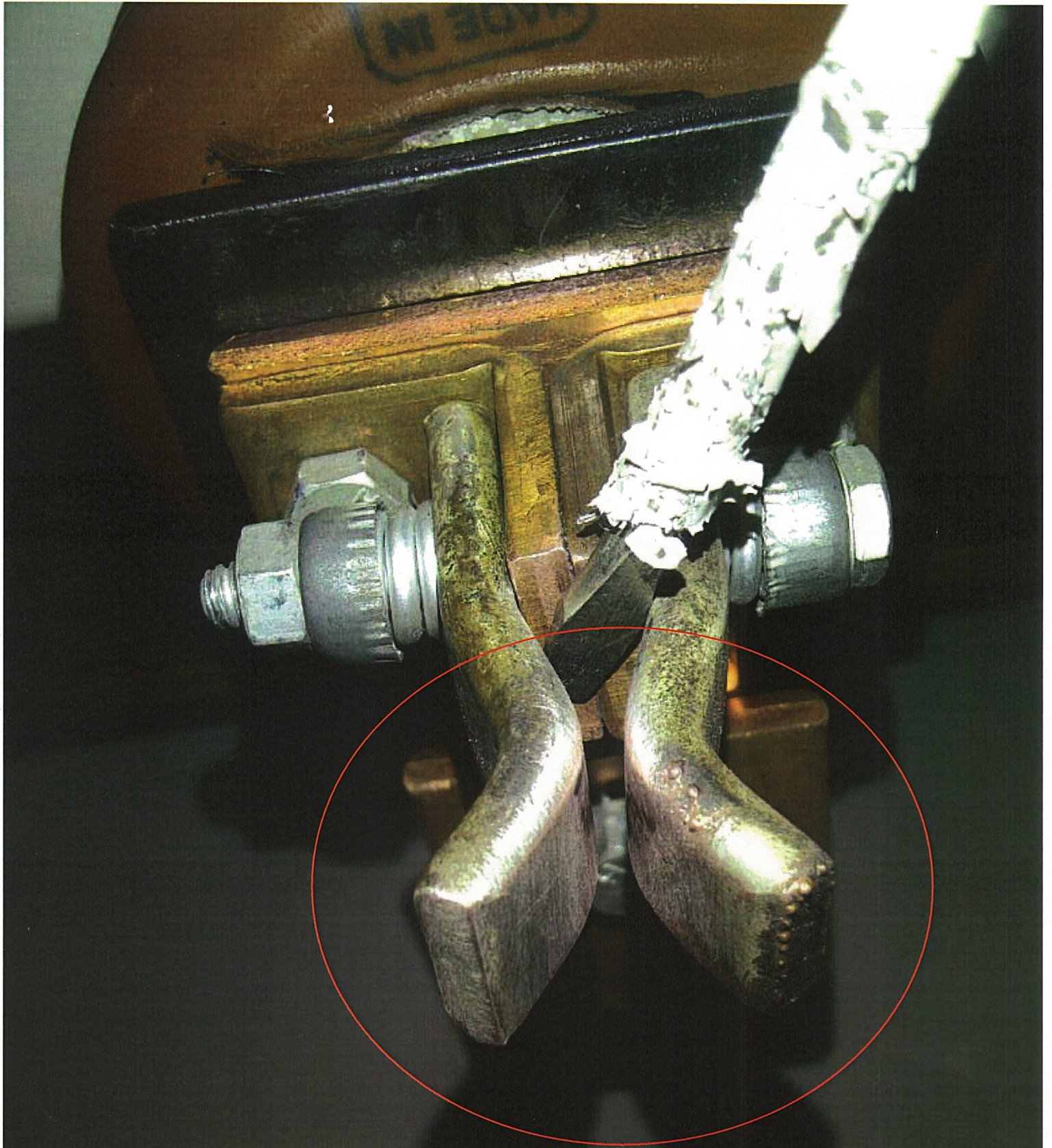
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DN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



INTERNAL CT SENSOR
RATINGS PER IEC 60755
In (A) = 200
I_{sn} (A) = 0.03 - 9
F (Hz) = 45 - 450

EATON
Cat. No. D64RPB100
DIGITAL GROUND FAULT RELAY

RUN TRIP RESET
DOUBLE CLICK FOR TEST (T)



Pump House Main Pump #3 switch contacts are pitted.

Appendix C: New North Landing Warf CT Specifications

TRANSFORMER

Model 8

Window Diameter 3.25"



APPLICATION:
For relaying and metering

FREQUENCY:
50-400 Hz.

INSULATION CLASS:
0.6 Kv. BIL 10 Kv. full wave.

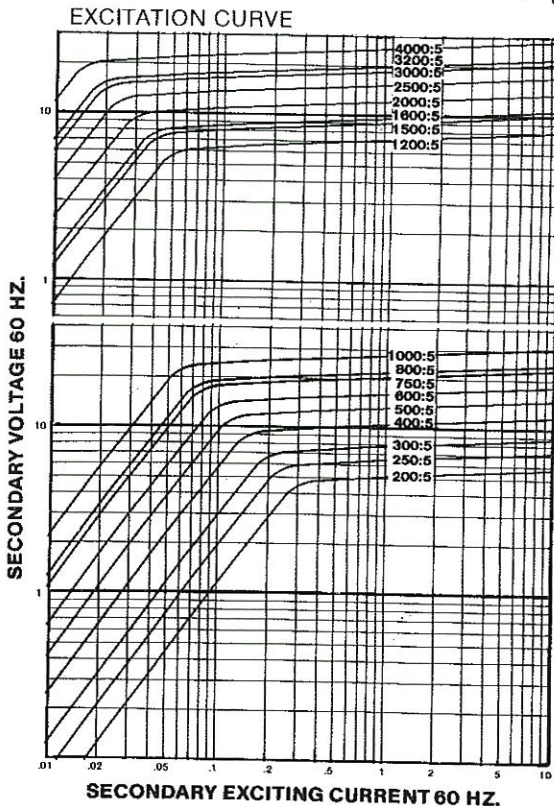
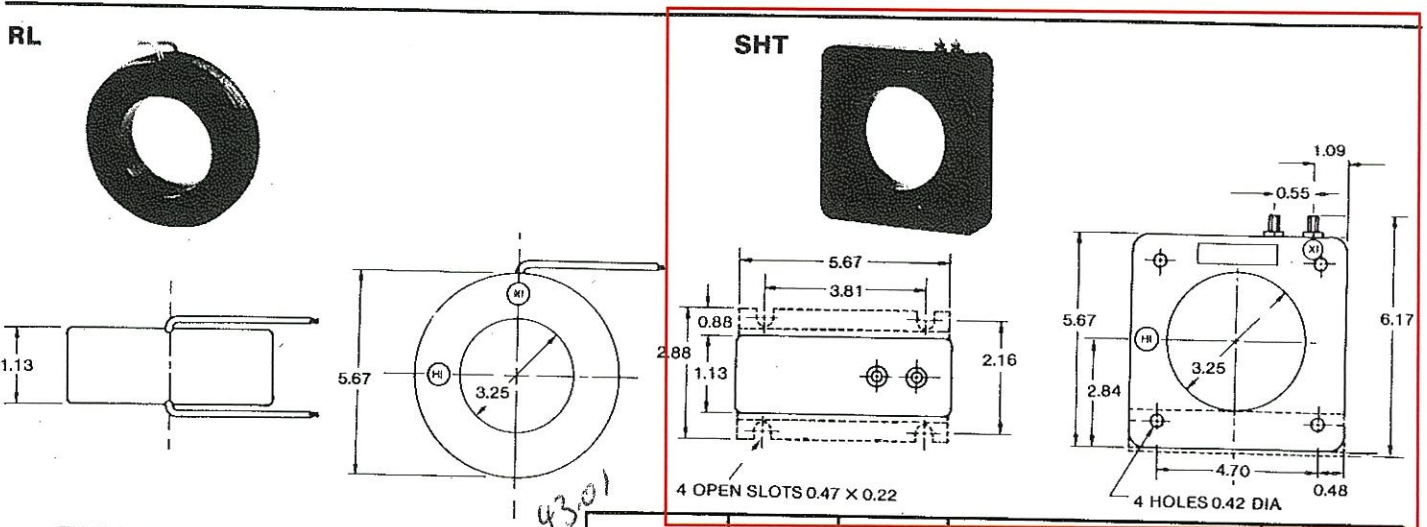
CONTINUOUS THERMAL CURRENT RATING FACTOR:
1.33 at 30°C amb.; 1.0 at 55°C amb.

NOTE: This series transformer is approved for revenue metering in Canada by consumer and Corporate Affairs Canada, Standards Branch. Consult factory for approved rating, burden data and ordering information.

- Flexible leads are UL 1015 105°C, CSA approved, #16 AWG, 24" long.
- Non-standard length to be specified.
- Terminals are brass studs No. 8-32 UNC with one flat washer, lockwasher & regular nut.
- Model 8 SHT also available as 8 SHL with leads.
- Order mounting bracket kit 0221B00183 separately.
- Approximate weight 2.5 lbs.
- Multi-ratios available on request.



All models on this page U.L. recognized - file no. E93779.



CATALOG NUMBER	CURRENT RATIO	VA FOR 1% CLASS	ANSI METERING CLASS AT 60 Hz					SECONDARY WINDING RESISTANCE (OHMS @ 75°C)
			BO.1	BO.2	BO.5	BO.9	BI.8	
8**201	200:5	5.0	1.2	1.2	-	-	-	0.035
8**251	250:5	7.5	0.6	1.2	2.4	-	-	0.044
8**301	300:5	15.0	0.6	0.6	1.2	2.4	-	0.052
8**401	400:5	25.0	0.3	0.6	1.2	1.2	-	0.070
8**501	500:5	35.0	0.3	0.3	0.6	1.2	2.4	0.088
8**601	600:5	50.0	0.3	0.3	0.6	1.2	1.2	0.105
8**751	750:5	50.0	0.3	0.3	0.3	0.6	1.2	0.132
8**801	800:5	60.0	0.3	0.3	0.3	0.6	1.2	0.140
8**102	1000:5	75.0	0.3	0.3	0.3	0.6	0.6	0.178
8**122	1200:5	75.0	0.3	0.3	0.3	0.3	0.6	0.155
8**152	1500:5	90.0	0.3	0.3	0.3	0.3	0.6	0.194
8**162	1600:5	100.0	0.3	0.3	0.3	0.3	0.6	0.207
8**202	2000:5	120.0	0.3	0.3	0.3	0.3	0.3	0.258
8**252	2500:5	50.0	0.3	0.3	0.3	0.3	0.6	0.255
8**302	3000:5	60.0	0.3	0.3	0.3	0.3	0.3	0.311
8**322	3200:5	70.0	0.3	0.3	0.3	0.3	0.3	0.332
8**402	4000:5	80.0	0.3	0.3	0.3	0.3	0.3	0.415

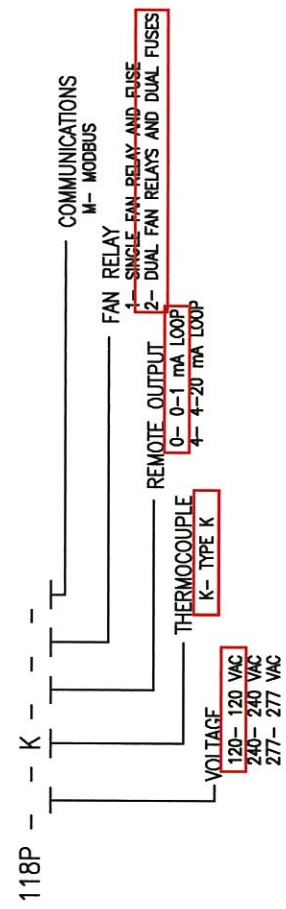
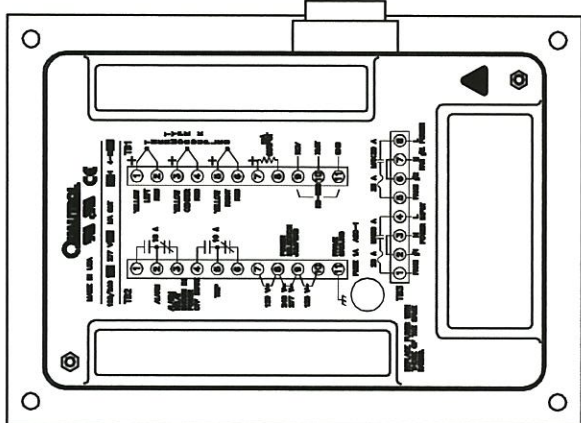
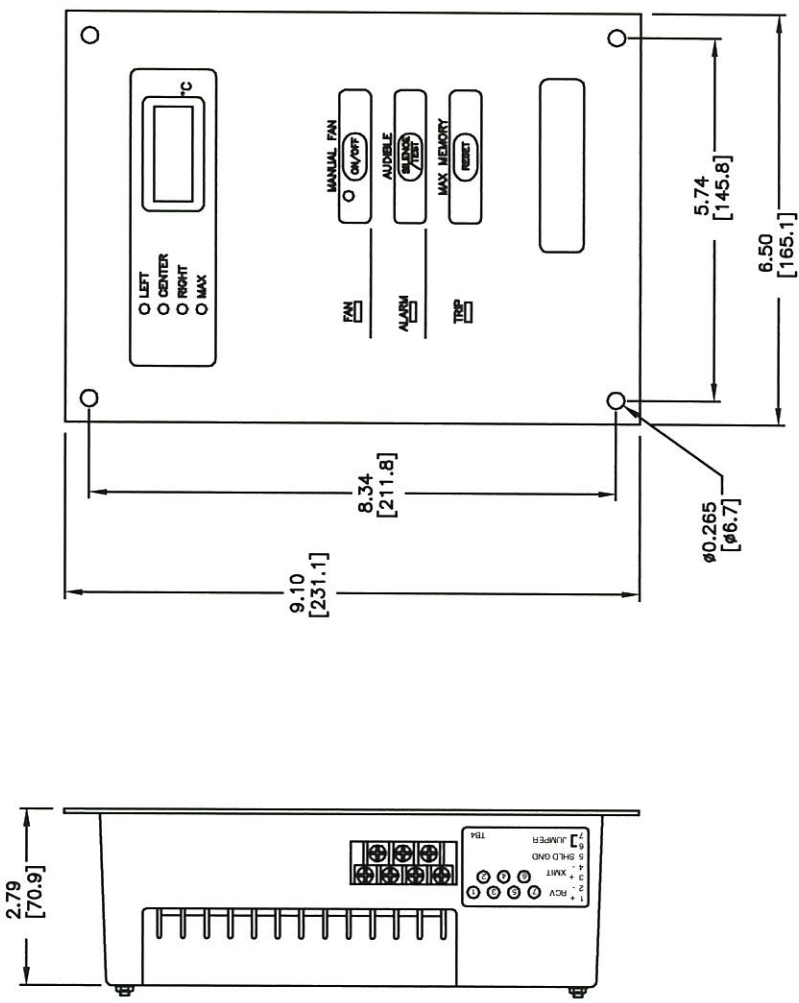
**NOTE: When ordering, prefix Cat. No. with model designation required. i.e. 8 SHT201.

CCAC approval number T188

Appendix D: Transformer Temperature Gauge Specifcaitions

MODEL NO. 118P SERIES

NOTICE: THIS DRAWING IS THE PROPERTY OF QUALITROL CORPORATION AND IS LOANED ONLY ON THE CONDITION THAT IT WILL BE USED TO FACILITATE THE PURPOSE FOR WHICH INTENDED AND NOT BE REPRODUCED, COPIED OR OTHERWISE DISPOSED OF, AND IS NOT TO BE USED IN WHOLE OR IN PART FOR ANY OTHER PROJECT WITHOUT THE WRITTEN APPROVAL OF QUALITROL CORPORATION.



NOTE:
1.) ALL DIMENSIONS ARE REFERENCE ONLY.

TITLE: 118P SERIES
ETM PRODUCT DRAWING
MODEL NO. 118P SERIES

PH. (585) 586-1515
FAX (585) 377-0220
1385 FAIRPORT ROAD
FAIRPORT, NY 14450
FORM 0-473 REV.D 10/22/02

9-4-03	COMPLETED REAR & SID VIEWS	23991
1-16-03	ADDED COMMUNICATIONS OPTION TO P/N	23516
11-6-01	ADDED "K" AS A PERMANENT PART OF P/N	22561
LET	DATE ALTERATION	C.N.

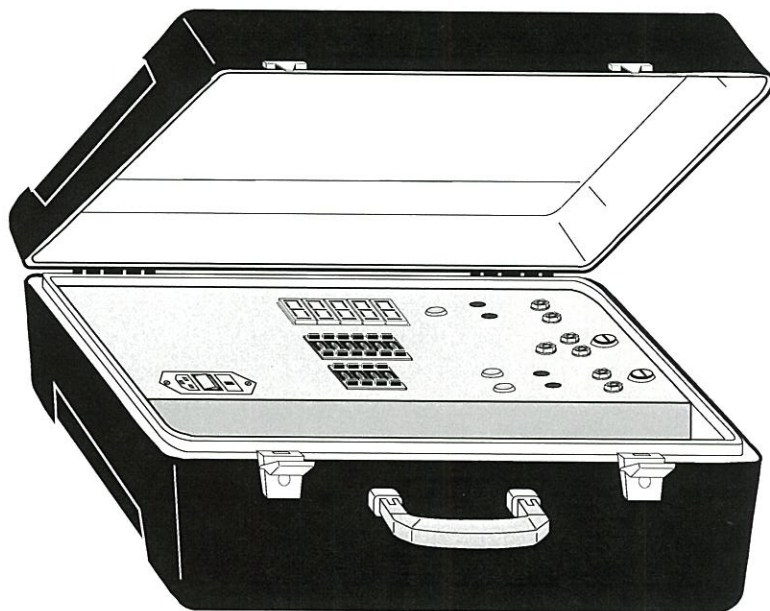
QUALITROL CORPORATION
DIMENSIONS AND TOLERANCES IN ACCORDANCE WITH ASME Y14.5M-1994

Appendix E: Merlin Gerin 34547 Test Kit Manual

Mallette d'essais ME (34547)

Merlin Gerin

ME test kit (34547)



Partie A

Part A

Sommaire. / *Summary.*

1A. Description de la mallette ME.
Description of the ME test kit.

2A. Contenu de la mallette.
Contents of the test kit.

3A. Comment utiliser l'outil de test.
How to use your test kit.

4A. Spécification technique.
Technical data.

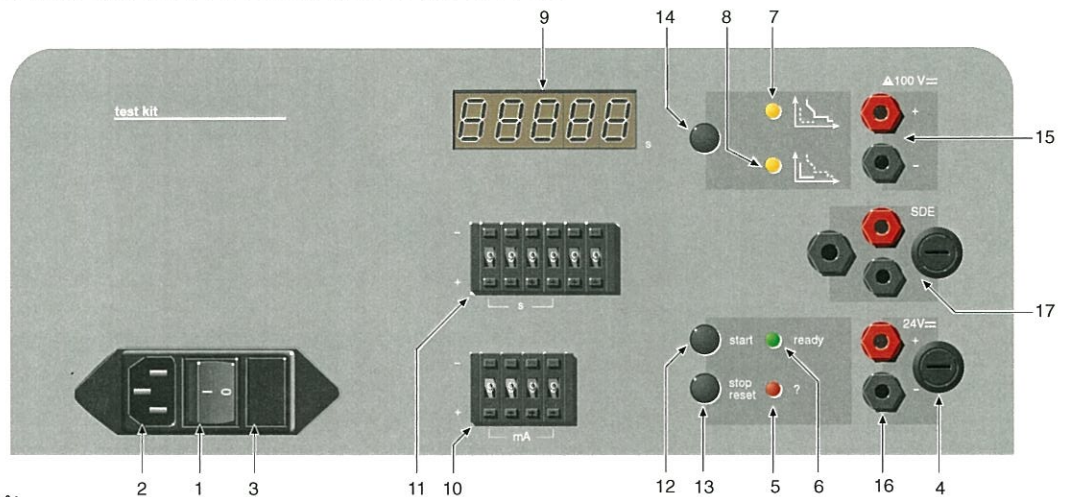
5A. Vérifier les performances de votre mallette d'essais.
Checking the performances of your test kit.



GROUPE SCHNEIDER

■ Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

1A. Description de la mallette test. / Description of the test kit.



1. Interrupteur marche / arrêt.
2. Prise secteur.
3. Porte fusible secteur + sélecteur de tension.
4. Porte fusible 24V=.
5. Led "?" : circuit injection ouvert ou arrêt de l'injection par la protection thermique de la mallette.
6. Led "Ready" : mallette prête à injecter.
7. Led " " : test long retard, court retard, instantané.
8. Led " " : test protection terre.
9. Afficheur à led indiquant le temps de déclenchement (en secondes).
10. 4 roues codeuses pour le réglage du courant d'injection.
11. 6 roues codeuses pour le réglage de la durée d'injection.
12. Bouton poussoir "Start".
13. Bouton poussoir "Stop / reset".
14. Bouton poussoir selecteur entre test long retard + court retard + instantané, test protection terre et test STR22ME.
15. Bornes "injection" à raccorder au déclencheur.
16. Bornes "24V=" (utilisées pour l'outil 689755).
17. Bornes et jack "OF / SDE": pour l'arrêt injection (prise jack utilisée avec l'outil 689755).
18. Porte fusible SDE.

1. "ON / OFF" switch.
2. Input power socket.
3. Input fuse holder and voltage selector.
4. 24V= fuse holder.
5. " ?" LED : injection circuit open or injection stopped by the test kit thermal protection.
6. " Ready" LED : test kit ready to inject.
7. " " LED : long time tripping test, short time tripping, instantaneous tripping.
8. " " LED : earth fault protection test.
9. Display indicating the tripping time (in seconds).
10. 4 thump-wheels to set the injected current.
11. 6 thump-wheels to set the duration of the injection.
12. " Start" push button.
13. " Stop / reset" push button.
14. Selector push button between long time tripping + short time tripping + instantaneous tripping, earth fault protection and STR22ME test.
15. Current "injection" outlets to be connected to the trip unit.
16. " 24V=" outlets (used with test tool 689755).
17. " OF / SDE" auxiliary switch jack and 2 terminals (jack socket used with test tool 689755).
18. SDE fuse holder.

2A. Contenu de l'ensemble mallette test. / Contents of the test kit.

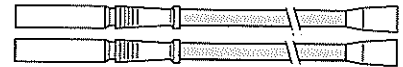
- 1 câble de test pour STxxx (rouge). n°1519932
- 1 test cable for STxxx (red) n°1519932



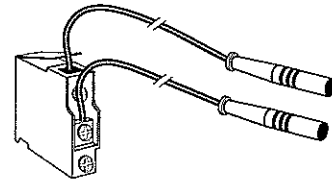
- 1 câble de test pour STxxx (noir). n°1519933
- 1 test cable for STxxx (black) n°1519933



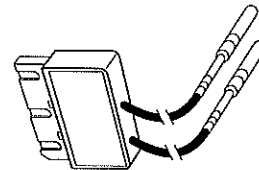
- 2 câbles (bleus) pour le raccordement du SDE. n°29128011CK
- 2 cable for SDE connection (blue) n°29128011CK



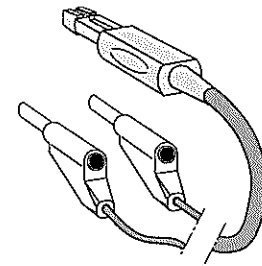
- 1 filerie comportant un bloc OF pour le test Compact NS. n°1519936
- 1 wiring assembly including an OF switch for Compact NS. n°1519936



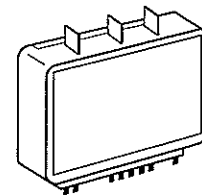
- 1 cordon de raccordement SDE pour le test des Masterpact. n°1519935
- 1 SDE connection cable for Masterpact. n°1519935



- 1 câble de test pour STRxx. n°1519999
- 1 test cable for STRxx. n°1519999

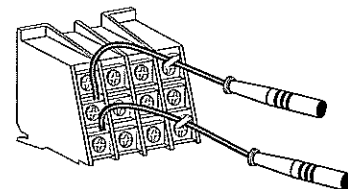


- 1 adaptateur de test CM. n°0677928
- 1 adaptater for CM test. n°0677928



- 1 câble d'alimentation d'une longueur de 2 mètres.
- 1 power supply cable (2 meters long).

- 1 filerie comportant un bloc OF pour le test Compact C. n° 5100511516
- 1 wiring assembly including an OF switch for Compact C. n°5100511516



- 1 kit de rechange contenant tous les accessoires ci dessus (sauf le câble d'alimentation) est disponible sous le n° 34546
- A spare wiring kit containing all these accessories (except the power supply cable) is available under part number n°34546

3A. Comment utiliser l'outil test. / How to use your test kit.

raccordement au réseau.

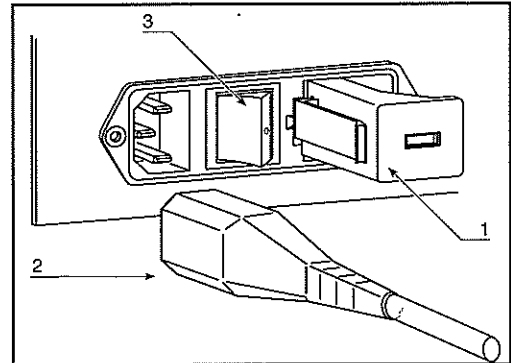
connection to AC power supply.

1. Choisir la bonne tension avec le sélecteur de tension / porte fusible.
2. Brancher le cordon secteur 2.
3. Basculer l'interrupteur marche / arrêt.

1. Chose the right voltage with the voltage selector.

2. Plug on the input power cable.

3. Switch on the ON/OFF switch.



mettre sous tension.

power-up.

Afficheur et leds allumés pendant: 1 seconde environ.

Afficheur et leds éteintes pendant: 1 seconde environ.

Affichage de **0.00** seconde, Led "ready" et Led "📉" allumées.

Display and LEDs on for approximately 1 second.

Then display and LEDs off for approximately 1 second.

Then LED remains on. **0.00** on the display. "ready" and "📉" LEDs on.

connecter.

connection to device under test.

Connecter le déclencheur à la mallette en respectant les polarités.

Pour le raccordement détaillé des disjoncteurs, voir :

- Masterpact => partie B.
- Compact => partie C.
- Compact NS => partie D.

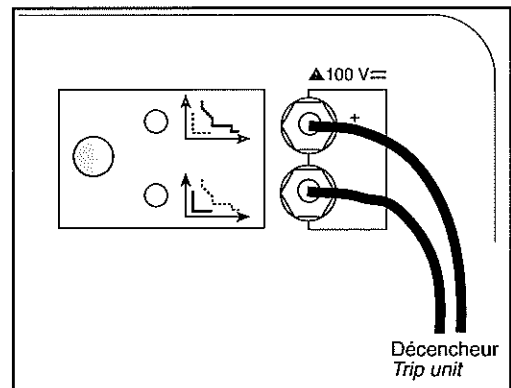
Connect trip units to the kit, taking care to respect the polarities.

For detailed instructions on connecting circuit breaker, see:

for Masterpact => part B

for Compact => part C

for Compact NS => part D

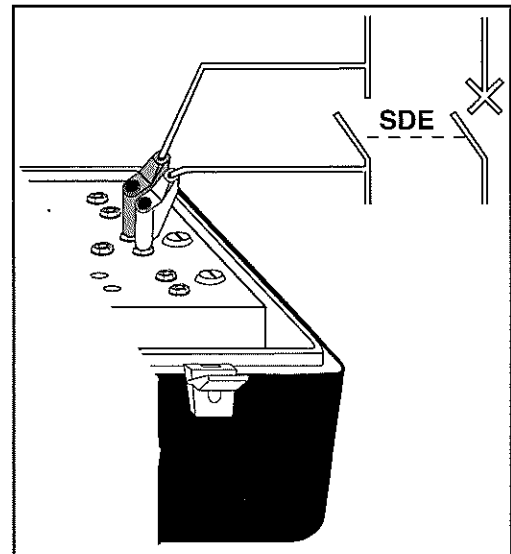


Si vous voulez mesurer le temps de déclenchement, connecter aux bornes "SDE" :

- un contact "OF": (ouverture ou fermeture) ou
- un contact "SDE": (ouverture ou fermeture) ou
- les contacts principaux: (disjoncteur déconnecté du réseau).

To measure the tripping time, connect the following device to the "SDE" terminals :

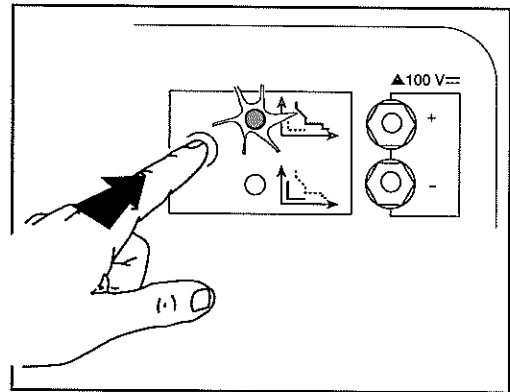
- "OF" auxiliary contact (N/O or N/C) or
- "SDE" auxiliary contact : (N/O or N/C) or
- the main contact (circuit breaker disconnected from the protected power circuit)



Régler.

Settings.

- Régler le courant de test avec les roues codeuses de courant.
- Régler le temps d'injection avec les roues codeuses de temps.
- Pour le test d'un long retard, court retard ou instantané:
Appuyer sur le bouton poussoir jusqu'à ce que la led "↑" s'allume.
- Pour le test de la protection terre:
Appuyer sur le bouton poussoir jusqu'à ce que la led "↑" s'allume. (sauf STCM3).
- Pour le test du STR22ME appuyer sur le bouton poussoir jusqu'à ce que la led "↑" et led "↓" s'allument.



- Set the test current using the injection current thumb-wheels.
- Set the current injection duration using the corresponding thumb-wheels.
- For the long time, short time and instantaneous tripping test:
Press the push button till the "↑" LED lights on.
- For the earth fault protection test:
Press the push button till the "↑" LED lights on. (except STCM3)
- For the STR22ME test press the push button till "↑" LED and "↓" LED on.

Tester.

Tests.

Appuyer sur le bouton "start". L'injection s'arrête dans plusieurs cas:

- On appuie sur le bouton "stop-reset".
- Au changement d'état du contact branché sur les bornes SDE de la mallette.
- Le temps de passage programmé atteint.
- L'arrêt causé par la protection thermique de la mallette (led "?" allumée).
- Le circuit injection ouvert (par exemple: mauvais contact de la fiche test) led "?" allumée.

Un autre test est possible quand la led "ready" est allumée. (fin du temps de refroidissement).

Refermer votre appareil après chaque test.

Les valeurs de test indiquées dans la notice sont des valeurs nominales.

Tenir compte des précisions annoncées dans notre documentation.

Press the "start" button.

Current injection stops on any of the following events:

- Pressing of the "stop-reset" button.
- Change of state of the contact connected to the "SDE" terminals of the test kit.
- End of set duration.
- Tripping of the kit's thermal protection system ("?" LED on).
- Injection circuit open, for example due to a faulty test plug connection ("?" LED on).



Another test may be carried out when the "ready" LED comes on. (end of cooling period).

Reclose the circuit breaker after each test.

The test values indicated on the manual are nominal values.

Take account into accuracy specified on the documentation.

4A. Spécification techniques. / Technical data.

Courant injecté de type: "redressé double alternance" pour le test  " ou  " et continu pour le test du STR22ME.

De 8 mA eff. à 2820 mA eff.

précision sur le courant : $\pm 5\%$ pour $I \leq 20$ mA eff.
 $\pm 2\%$ pour $I > 20$ mA eff.

Durée d'injection maximale :



- Infini si $I < 120$ mA eff. (mettre les roues codeuses du temps sur 9999,99 secondes).
- 600 msec. si $I \geq 1200$ mA eff.
- Proportionnel à I^2 eff. pour : 120 mA eff. $< I < 1200$ mA eff.
- Précision sur le chronomètre: $\pm 1\%$.

Alimentation :

- Position 110 Vac: 100Vac (-20%) à 127Vac (+15%).
- Position 220 Vac: 200Vac (-20%) à 240 Vac (+ 15%).
- Fréquence : 50 à 60 Hz.

Type de fusible :

- 24V= : 200mA temporisé.
- Secteur : 630mA temporisé.
- SDE: 200mA temporisé.

Type of injection current: "rectified full-wave" for the test " " or " " and direct for the test at STR22ME.

8 mA RMS. to 2820 mA RMS.

Current accuracy: $\pm 5\%$ for $I \leq 20$ mA RMS.
 $\pm 2\%$ for $I > 20$ mA RMS.

Maximum injection duration:

- Infinite if $I < 120$ mA RMS. (set the corresponding thumb-wheels to 9999.99).
- 600 msec. if $I \geq 1200$ mA RMS.
- Proportional to I^2 eff. for : 120 mA RMS. $< I < 1200$ mA RMS.
- Time setting accuracy: $\pm 1\%$.

Input power:

- 110 Vac position: 100Vac (-20%) to 127Vac (+15%).
- 220 Vac position: 200Vac (-20%) to 240Vac (+15%).
- Frequency range: 50 to 60 Hz.

Fuse type :

- 24V= : time delayed 200mA.
 - Mains : delayed 630mA.
 - SDE: delayed 200mA.
-

5A. Vérifier les performances de votre mallette test. / Checking the performances of your test kit.

□ Mettre un ampèremètre en série avec une résistance de 10Ω 3w et les bornes d'injection de la mallette. Vérifier la correspondance entre le courant affiché sur les roues codeuses et le courant mesuré.

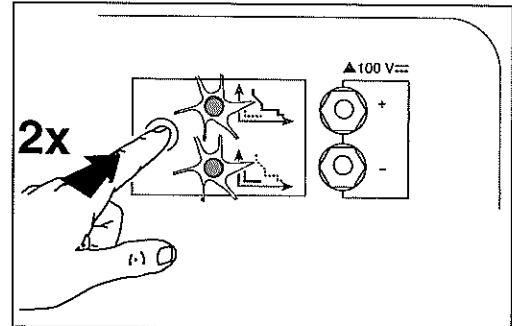
Attention:

L'ampèremètre doit pouvoir mesurer la valeur efficace d'un courant alternatif sinusoïdal redressé double alternance.


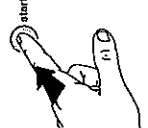
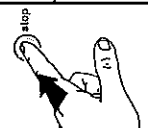
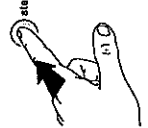
□ Connect an ammeter in series with the resistor 10Ω 3w and the test kit injection outlets. Check that the current set using the thumb-wheels corresponds to the value read on the ammeter.

Caution:

The ammeter used must be capable of measuring the rms values of an rectified full-wave sinusoidal AC current.



Périodicité préconisée: 1 an. / Recommended checking frequency: 1 year.

								
chronomètre chronometer	mini 12,9sec. .....Sec. maxi 13,1sec.							
appuyer push								
position roues codeuses thumb-wheels position	t = 0100.00sec. I = 01000mA							
appuyer push								
courant mesuré measure current	mini 96mA.....mA maxi 102mA							
appuyer push								
position roues codeuses thumb-wheels position	t = 0100.00sec. I = 01000mA							
24V 24V	mini 22,8Vcc.....Vcc maxi 25,2Vcc							
date date	mesure measure .. / .. /	mesure measure .. / .. /	mesure measure .. / .. /	mesure measure .. / .. /	mesure measure .. / .. /	mesure measure .. / .. /	mesure measure .. / .. /	mesure measure .. / .. /

Test kit N°

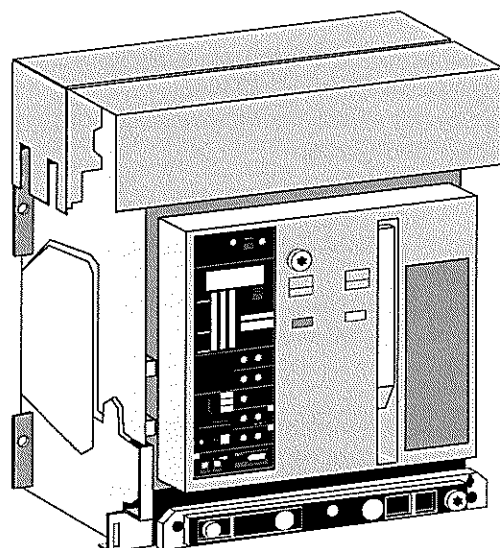
Schneider Electric SA

Merlin Gerin
F-38050 Grenoble cedex 9
tel. 76 57 60 60
telex : merge 320 842 F

En raison de l'évolution des normes et du matériel, les caractéristiques indiquées par le texte et les images de ce document ne nous engagent qu'après confirmation par nos services.
As standards, specifications and designs develop from time to time, always ask for confirmation of the information given in this publication.

Réalisation : MARRY JN

Tester votre déclencheur Masterpact Merlin Gerin *Testing Masterpact circuit breaker trip unit*



Partie B *Part B*

Sommaire. / *Summary.*

1B. Préliminaires.
Preliminary

2B. STR18 à STR58.
STR18 to STR58

Test long retard

Long time tripping test

Test court retard.

Short time tripping test

Test instantané.

Instantaneous tripping test

Test protection terre.

Ground fault protection test

3B. ST208 à ST418.
ST208 to ST418

Test long retard / test court retard.

Long time tripping test / short time tripping test

Test instantané.

Instantaneous tripping test

Test protection terre.

Ground fault protection test

4B. ST608 à STR68.
ST608 to STR68.



GROUPE SCHNEIDER

1B. Préliminaires. / Preliminary.

Vérification des courbes de déclenchements de disjoncteurs équipés de STxxx ou STRxx.

Check the time / current characteristic curves of trip units STxxx and STRxx.

Avant chaque test, fermer le disjoncteur en position test ou débouché.

Before each test, make sure the circuit breaker is closed (in test or disconnected position).

Raccorder l'unité de contrôle à la mallette.

- Raccordement de l'injection.

Connect the control unit to test kit.

- *Current injection connection.*

- Raccordement du SDE.

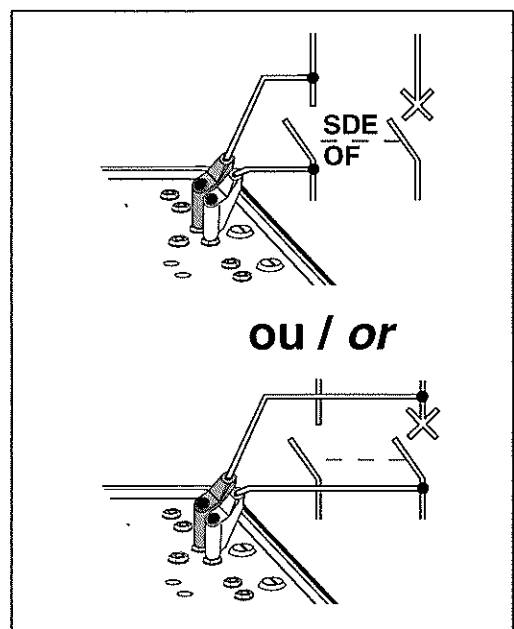
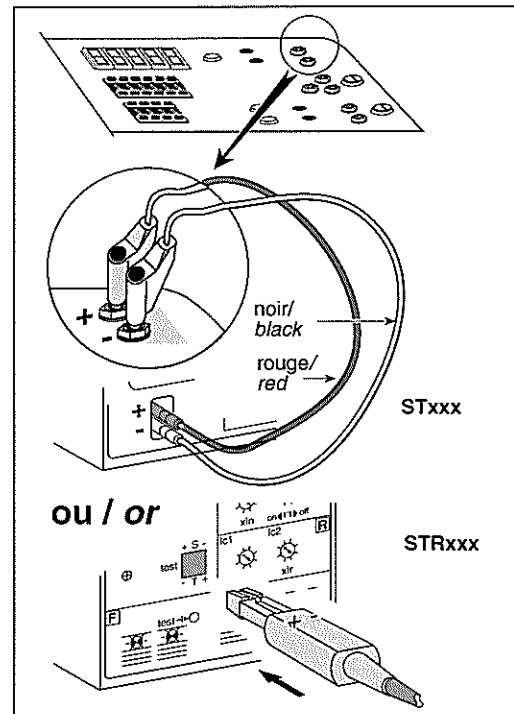
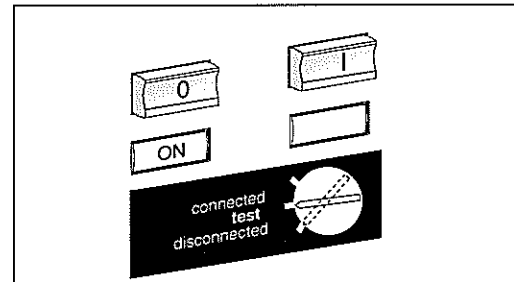
- *SDE connection.*

Attention :

Le disjoncteur doit être déconnecté du réseau.

-Caution:

The circuit breaker must be disconnected from the protected power circuit.




2B. De STR18 à STR58. / STR18 to STR58.

Pour tester un point de la courbe de déclenchement, vous devez déterminer le courant à injecter dans votre déclencheur en utilisant les tableaux suivant :

To test a point on the time / current characteristic curve, first use the following table to determine the current to be injected in the trip unit:

Test Long Retard.

long time tripping test

Vérifier que la led "" est allumée.

Check the LED "" is on.

X In =>	.....	2	3	4	5	6	7	8	9	10
Calibres/Ratings										
200 to 630		100 mA / In								
800 to 1250		297	396	494	595	693	796	885	996	
1600		300	399	488	578	670	767	851	956	
2000		289	376	465	556	645	739	821	923	
2500		300	387	467	557	623	695	758	839	
3000 / 3200		298	377	458	543	609	680	743	823	
4000		299	390	481	576	668	765	850	955	
5000		294	369	447	543	602	667	725	799	
6000 / 6300		300	373	442	510	567	630	686	757	

Courant à injecter (mA) / Current to be injected (mA)

Exemple :

Appareil 5000A

- Réglage du déclencheur $I_r = 0,5 I_n$.
- Test de la fonction long retard à $6 \times I_r$ d'où l'équivalent de $6 \times 0,5 I_n = 3 I_n$
- Le tableau nous indique le courant à générer : **294 mA**
- Le temps de déclenchement obtenu doit être comparé avec la courbe de déclenchement officielle.



Example :

5000A a device

- Trip unit setting $I_r = 0,5 I_n$
- Long time tripping test $6 \times I_r$, i.e an equivalent of $6 \times 0,5 I_n = 3 I_n$
- The table indicates the current that must be injected **294 mA**
- The tripping time obtained must be compared to the value on the official time / current characteristic curve of the device.

De STR18 à STR58. / STR18 to STR58.



- Test Court Retard.
- Short time tripping test.

Vérifier que la led  " est allumée.
 Check the LED "" is on.

X In =>	.....	6	7	8	9	10
Calibres/Ratings						
200 to 500		100 mA / In				
600 to 800		705	810	915	1020	
1000		705	809	914	1018	
1200/1250		706	813	919	1025	
1600		708	815	923	1030	
2000		700	800	900	1000	
2500		693	785	878	970	
3000/3200		681	763	844	925	
4000		705	810	915	1020	
5000 to 6300		687	773	860	946	

Courant à injecter (mA) / Current to be injected (mA)


- Test Instantané.
- Instantaneous tripping test.

Vérifier que la led  " est allumée.
 Check the LED "" is on.

X In =>	.....	10	12	14	17	19	20	22	24	28
Calibres/Ratings										
		100 mA / In								
200 to 630 H1/H2		960	1100	1470	1710	1930	2000	2130	2250	2480
200 to 630 L1/L2		960	1260	1470	1710	1930	2000	2130	2250	2480
800 / 1000		960	1260	1470	1710	1930	2000	2130	2250	2480
1200 à 1600		960	1270	1470	1690	1880	1940	2050	2170	
2000		1020	1180	1320	1500	1600	1660			
2500		980	1113	1240						
3000 to 6300		960	1100							


Courant à injecter (mA) / Current to be injected (mA)

- Test Protection Terre.
- Ground fault protection test.

La Led  " doit être allumée.

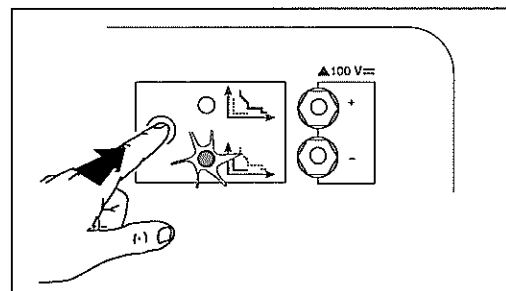
Attention :

Ne pas inverser les cordons d'injection.
 Courant: 100mA par In pour tous les calibres.

 " LED must be on.



Caution :

Do not reverse the injection cable.
 current: 100mA / In for all ratings



3B. De ST208 à ST418. / ST208 to ST418.



- Test Long retard / Court Retard.
- Long time tripping test / Short time tripping test.

Vérifier que la led  est allumée.
 Check the LED "" is on.

X In =>	.....	4	5	6	7	8	9	10
Calibres/Ratings								
200 to 6300	100 mA / In	500	580	685	790	850	940	

Courant à injecter (mA) / Current to be injected (mA)

- Test Instantané.
- Instantaneous tripping test.

Vérifier que la led  est allumée.
 Check the LED "" is on.

X In =>	.....	6	8	11	12	14	18	22	28
Calibres/Ratings	100 mA / In								
200 to 3200		585	780	1000	1085	1329	1730	1941	2369
4000 to 6300		585	780	1100	1200				

Courant à injecter (mA) / Current to be injected (mA)


- Test Protection Terre.
- Ground fault protection test.

La Led  doit être allumée.

Attention:

Ne pas inverser les cordons d'injection.

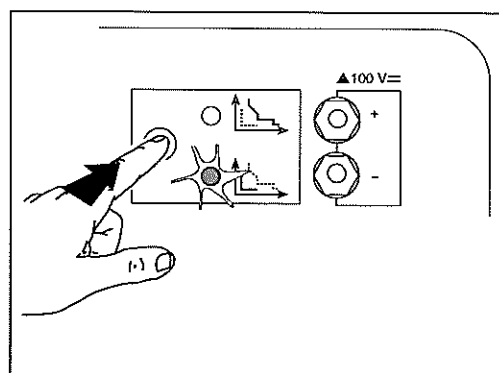
Courant: 100mA par In pour tous les calibres.

 LED must be on.

Caution :

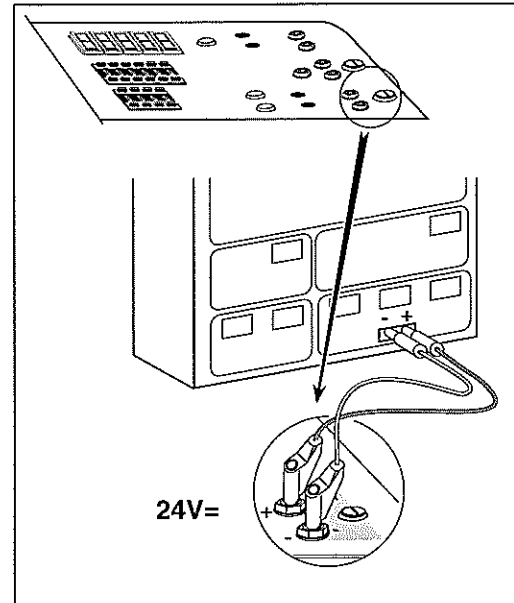
Do not reverse the injection cable.

Current: 100mA / In for all ratings



4B. De ST608 à STR68. / *ST608 to STR68.*

- Ces déclencheurs disposent d'un test intégré.
Alimenter le déclencheur suivant le schéma ci-contre, et réaliser le test conformément à la notice d'instruction Masterpact n° 689990 livrée avec le disjoncteur.
- These trip units come with a built-in test.
Supply the trip unit as indicated in the diagram opposite, realise the test according to the Masterpact instruction notice n° 689990 delivered with the circuit-breaker.*



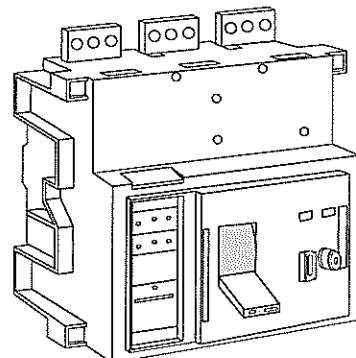
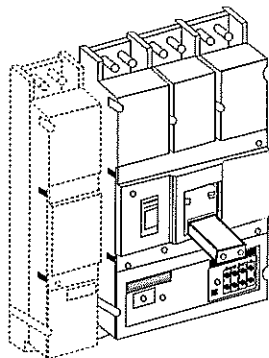
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Merlin Gerin
F-38050 Grenoble cedex 9
tel. 76 57 60 60
telex : merge 320 842 F

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Réalisation : MARRY JN

Tester votre déclencheur Compact Merlin Gerin *Testing Compact circuit breaker*



Partie C *Part C*

Sommaire. / *Summary.*

1C. STR25 à STR55.

STR25 to STR55.

Raccordement.

Connection.

Test long retard / test court retard.

Long time tripping test / short time tripping test.

Test instantané.

Instantaneous tripping test.

Test protection terre.

Ground fault protection test.

2C. STCM2 à STCM3.

STCM2 to STM3.

Raccordement.

Connection.

Test long retard / test court retard.

Long time tripping test / short time tripping test.

Test protection terre.

Ground fault protection test.

3C. ST204 à ST224.

ST204 to ST224.

Raccordement.

Connection.

Test.

Testing.

4C. ST205 à ST315.

ST205 to ST315.

Raccordement.

Connection.

Test.

Testing.



GROUPE SCHNEIDER

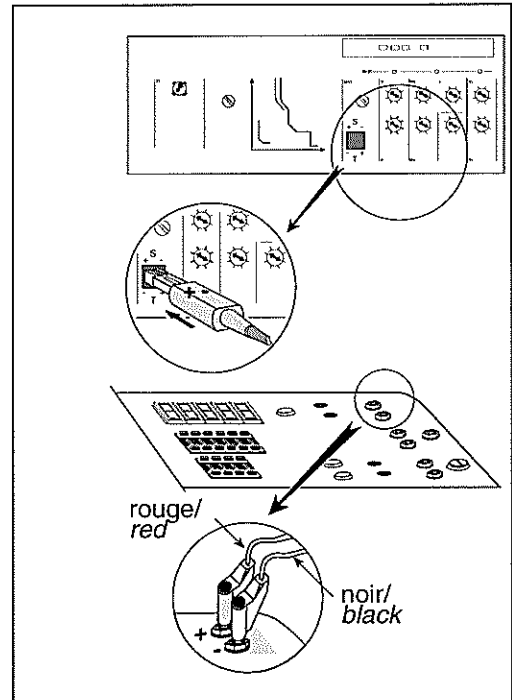
1C. De STR25 à STR55. / STR25 to STR55.

Raccordement.

Connection.

Avant chaque test, fermer le disjoncteur en position test ou débrosché.

Before each test, make sure the circuit breaker is closed in test or connected position.



Raccordement SDE.

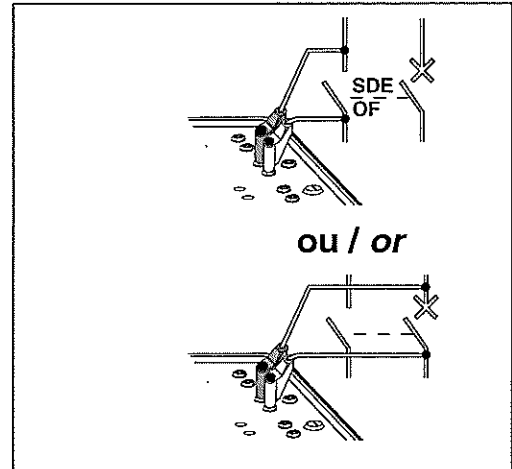
SDE connection.

Attention:

Le disjoncteur doit être déconnecté du réseau.

Caution:

The circuit breaker must be disconnected from the protected power circuit.





De STR25 à STR55. / STR25 to STR55.

Pour tester un point de la courbe de déclenchement, vous devez déterminer le courant à injecter dans votre déclencheur en utilisant les tableaux suivant :

To test a point on the time/current characteristic curve, first use the following table to determine the current to be injected in the trip unit:

Test Long Retard / Court Retard.

Long time tripping test / short time tripping test.

Vérifier que la led "" est allumée.
Check the LED "" is on.

X In =>	.....	6	7	8	9	10
Calibres/Ratings						
400 to 1250	100mA /In	600	700	800	900	950

Courant à injecter (mA) / *Current to be injected (mA)*

Exemple :

Appareil 1250A

- Réglage du déclencheur $I_r = 0,9 I_n$
- Test de la fonction long retard à $6 \times I_r$ d'où l'équivalent de $6 \times 0,9 I_n = 5,4 I_n$
- Le tableau nous indique le courant à générer : 100mA/In soit **540mA**.
- Le temps de déclenchement doit être comparé à la courbe de déclenchement officielle de l'appareil.



Example :

1250A device.

- Trip unit setting $I_r = 0,9 I_n$.
- Long time tripping test $6 \times I_r$ i.e an equivalent of $6 \times 0,9 I_n = 5,4 I_n$
- The table indicates the current that must be injected **540mA**.
- The tripping time obtained must be compared to the value on the official time / current characteristic curve of the device.

Test Instantané.


Instantaneous tripping time.

Vérifier que la led "" est allumée.
Check the LED "" is on.

X In =>	.....	8	12	15
Calibres				
400 à 1250	100mA /In	959	1211	1515

Courant à injecter (mA) / *Current to be injected (mA)*

- Test Protection Terre.
- Ground fault protection test.

La Led "  " doit être allumée.

Attention:

Ne pas inverser les cordons d'injection.

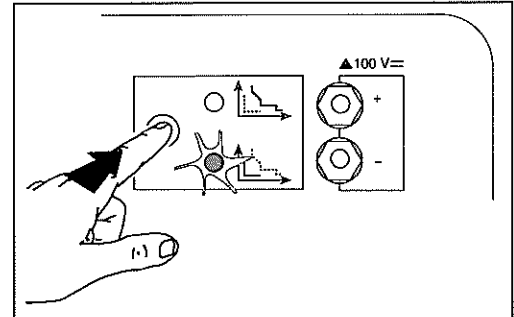
Courant: 100mA par In pour tous les calibres.

"  " LED must be on.

Caution:

Do not reverse the injection cables.

current: 100mA / In for all ratings.



2C. STCM2 et STCM3. / STCM2 and STCM3.

Raccordement.

Connection.

Avant chaque test, le disjoncteur doit être fermé, circuit hors tension.

Before each test, make sure the circuit breaker is closed and that the protected circuit is not energized.

Raccorder l'unité de contrôle à la mallette.

- Raccordement de l'injection.

Connect the control unit to test kit.

- *Current injection connection.*

- Raccordement long retard / court retard.

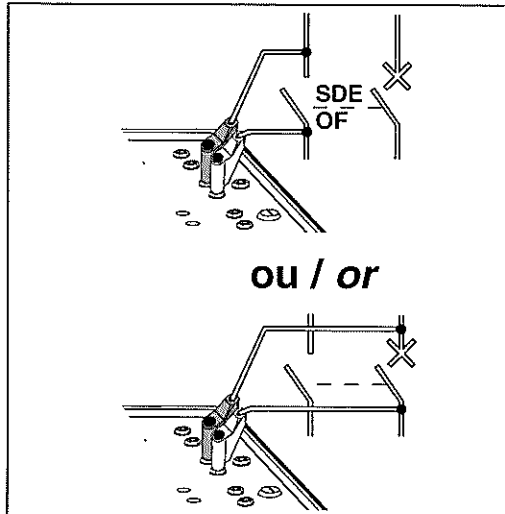
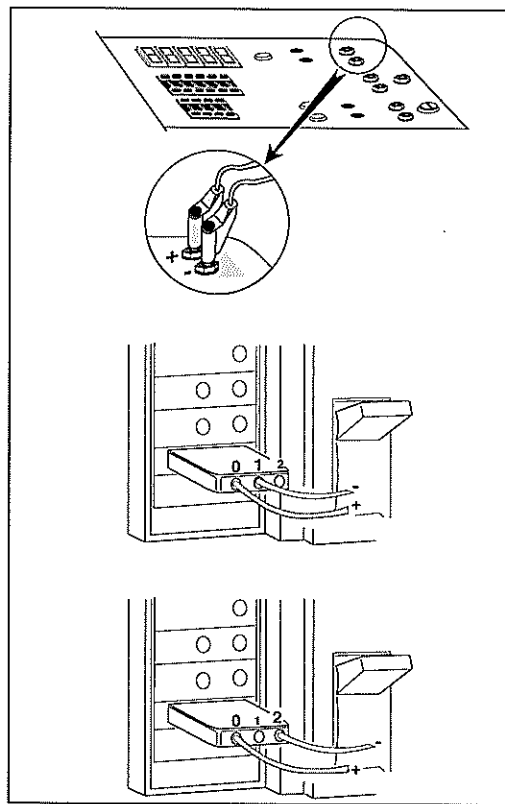
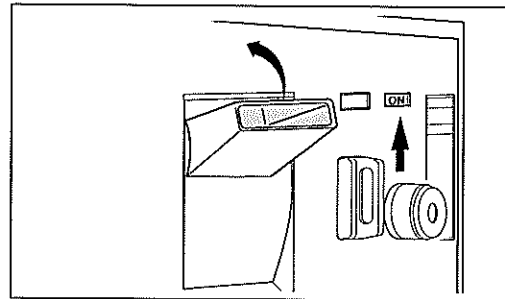
- *Long time tripping test / short time tripping test connection.*

- Raccordement protection terre.

- *Ground fault protection connection.*



- Raccordement du SDE.

- *SDE connection.*



STCM2 et STCM3. / STCM2 and STCM3.

- Test Long Retard / Court Retard.
- Long time tripping test / short time tripping test

La led "  " doit être allumée.
 Check the "  " LED is on.


X In =>	.....	2	3	4	5	6	7	8	9	10
Calibres/Ratings										
400 to 3200	100mA/In	300	385	475	565	652	740	822	905	

Courant à injecter (mA) / Current to be injected (mA)

- Test Protection Terre.
- Ground fault protection test.


Effectuer le branchement indiqué dans le paragraphe "raccordement".

Attention :

La Led "  " doit être allumée.

Make the connection described at the "connection" paragraph.

Caution:

"  " LED must be on.

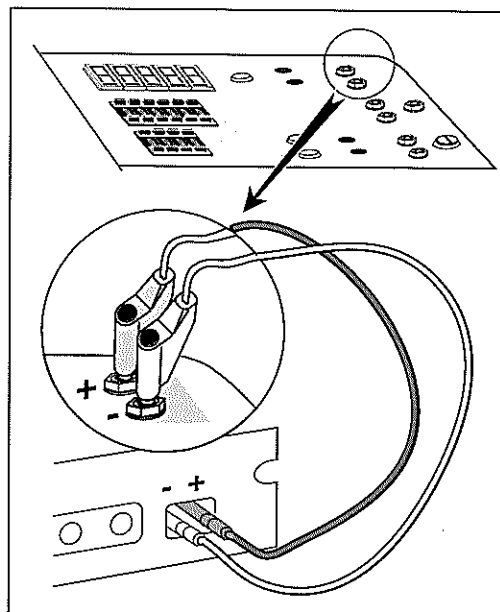
X In =>	0,2	0,3	0,4	0,5
Calibres/Ratings				
400 to 3200	46	70	94	118

Courant à injecter (mA) / Current to be injected (mA)

3C. De ST204 à ST224. / ST204 to ST224.

- Raccordement.
- Connection.

Avant chaque test le disjoncteur doit être fermé, circuit hors tension.
Before each test, make sure the circuit-breaker is closed, and that the protected circuit is not energized.



- Test long retard/court retard.
- Long time tripping test/short time tripping test.

La led "⏏" doit être allumée.
Check the "⏏" LED is on.

ST204 à ST224. / ST204 to ST224.

X In =>	.....	6	7	8	9	10	11	12	13	14	15
Calibres/Ratings											
400 à 630	50mA / In avant/before 1990										
400 to 630	100mA après/after 1990										

Courant à injecter (mA) / Current to be injected (mA)



ST224.

X In =>	.....	6	7	8	9	10	11	12	13	14	15
Calibres/Ratings											
200 / 250	50mA / In										
200 / 250	50mA / In										

Courant à injecter (mA) / Current to be injected (mA)

4C. De ST205 à ST315. / ST205 to ST315.


- Test Long Retard / Court Retard.
- Long time tripping test / short time tripping test.

Vérifier que la led "" est allumée.
 Check the LED "" is on.

X In =>	..... 4	5	6	7	8	9	10
Calibres/Ratings							
200 to 6300	100mA / In	500	580	685	790	850	940

Courant à injecter (mA) / Current to be injected (mA)

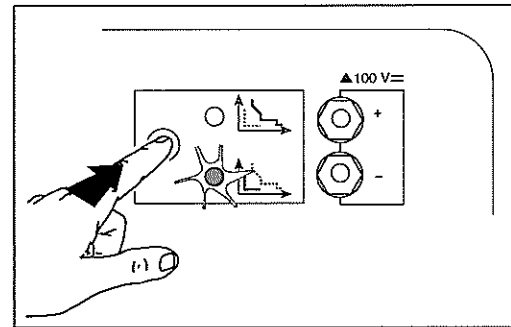
- Test Protection Terre.
- Ground fault protection test.

La Led "" doit être allumée.

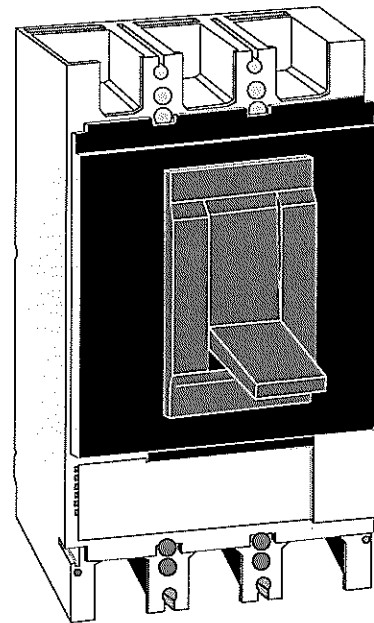
Attention:
 Ne pas inverser les cordons d'injection.
 Courant: 100mA par In pour tous les calibres.

"" LED must be on.

Caution:
 Do not reverse the injection cables.
 Current: 100mA / In for all ratings.



Tester votre déclencheur Compact NS Merlin Gerin *Testing Compact NS circuit breaker*



Partie D *Part D*

Sommaire. / *Summary.*

1D. Préléminaires.
Preliminary.

2D. STR22 et STR23.
STR22 and STR23

3D. STR43 à STR53.
STR43 to STR53

Test long retard / test court retard (tempo cran 0,1 ,0,2 et 0,3).

Long time tripping test / short time tripping test (time delay setting 0.1, 0.2, and 0.3).

Test court retard (tempo cran 0) et instantané.

Short time tripping (time delay setting 0) and instantaneous tripping test.

Test protection terre.

Ground fault protection test.

4D. STR22ME.

STR22ME.

Test long retard / test court retard.

Long time tripping test / short time tripping test

Mémoire thermique.

Thermal memory.

Test instantané.

Instantaneous tripping test.



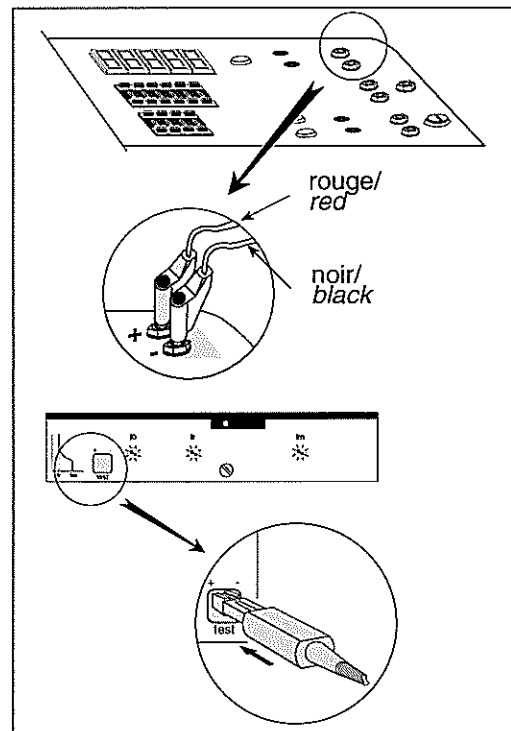
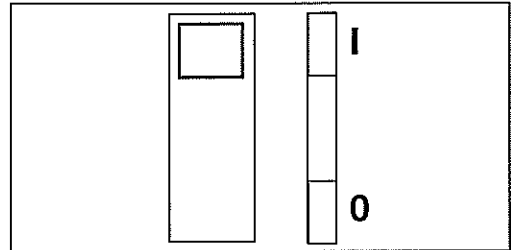
GROUPE SCHNEIDER

1D. Préliminaires. / Preliminary.

Vérification des courbes de déclenchements des déclencheurs Compact NS.
 Test the time / current characteristic curves of the Compact NS trip units.

Avant chaque test le disjoncteur doit être fermé, circuit isolé.
 Before each test, make sure the circuit breaker is closed, and that the protected circuit is not energized.

Raccorder l'unité de contrôle à la mallette.
 Connect the control unit to the test kit.





2D. STR22 (sauf STR22ME) et STR23. / STR22 (except STR22ME) and STR23.

Pour tester un point de la courbe de déclenchement, vous devez déterminer le courant à injecter dans votre déclencheur en utilisant les tableaux suivant :

To test a point on the time / current characteristic curve, first use the following table to determine the current to be injected in the trip unit:

- Test Long Retard / Instantané.**
- Long time / Instantaneous tripping test.**

Vérifier que la led "" est allumée.
Verify LED "" is on.

X In =>	.....	5	6	7	8	9	10
Calibres/Rating							
all ratings	100mA / In	500	600	700	800	900	1000

courant à injecter (mA) / *Current to be injected (mA)*

Exemple:

example :

Appareil 160A
 - Réglage du déclencheur $\left\{ \begin{array}{l} I_m = 10I_r \\ I_r = 0,8 I_n \end{array} \right.$

- Test de la fonction long retard à 6 x I_r d'où l'équivalent de 6 x 0,8 I_n = 4,8 I_n

- Le tableau nous indique le courant à générer: 100mA / I_n soit **480mA**

- Le temps de déclenchement obtenu doit être comparé avec la courbe de déclenchement catalogue.

160A device

- Trip unit setting $\left\{ \begin{array}{l} I_m = 10I_r \\ I_r = 0,8 I_n \end{array} \right.$

- *Long time tripping test at 6 x I_r i.e an equivalent of 6 x 0,8 I_n = 4,8 I_n*

- *The table indicates the current that must be injected **480mA***

- *The tripping time obtained must be compared to the value on the published time / current characteristic curve of the device.*

Mémoire thermique:



Thermal memory:

Si un test long retard est effectué moins de 15 minutes après un autre test, le temps de déclenchement sera divisé par 2,5.

If a long time tripping test is repeated within 15 minutes after a previous test, the published tripping time will be divided by 2,5.

3D. STR43 à STR53. / STR43 to STR53.

- Test Long Retard / Test Court Retard.** (STR53 tempo cran 0,1, 0,2 et 0,3).
- Long time tripping test / short time tripping test** (STR53 time delay settings 0,1, 0,2 and 0,3).

La led "  " doit être allumée.
 Check LED "  " is on.

STR53 ancienne variante (4 crans de réglage I0). / STR53 first generation (4 settings I0).

X In =>	.....	4	5	6	7	8	9	10	11	12
Calibres/Ratings										
150 to 630A	100mA / In	500	572	644	716	788	860	932	1040	

courant à injecter (mA) / Current to be injected (mA).

STR53 nouvelle variante (6 crans de réglage I0) et STR43. / STR53 generation (6 settings I0) and STR43.



X In =>	.....	4	5	6	7	8	9	10	11	12
Calibres/Ratings										
150 to 630A	100mA / In	400	500	600	700	800	900	1000	1100	1200

courant à injecter (mA) / Current to be injected (mA).

- Mémoire thermique:**
- Thermal memory:**

Si un test long retard est effectué moins de 10 minutes après un autre test, le temps de déclenchement correspond à la temporisation la plus courte.
 If a long time tripping test is performed within 10 minutes after a previous test, the tripping time will correspond to the lowest time delay.



- Test Court Retard** (STR43 et STR53 tempo cran 0) **et Instantané.**
- Short time tripping test** (STR43 and STR53 time set at delay time 0) **and instantaneous tripping test.**

La led "  " doit être allumée.
 Check LED "  " is on.

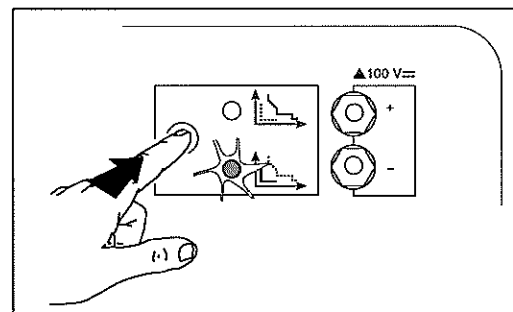
X In =>	.....	4	5	6	7	8	9	10	11	12
Calibres/Ratings										
100 to 630A	100mA / In	700	789	866	944	1022	1100			

courant à injecter (mA) / Current to be injected (mA).

- Test Protection Terre.**
- Ground fault protection test.**

La Led "  " doit être allumée.
 - 100 mA par In pour tous les calibres.
 Check LED "  " must be on.
 - current: 100mA/In for all ratings.

Attention :
 Ne pas inverser les cordons d'injection.
Caution :
 ensure correct test connector polarity.

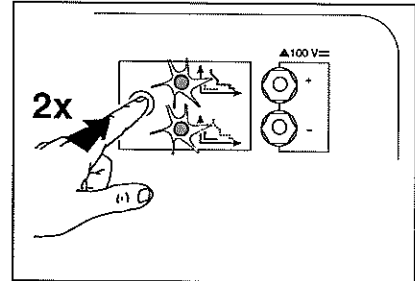


4D. STR22ME. / STR22ME.

- Test Long Retard / Court Retard.**
- Long time tripping test / short time tripping test.**

Les 2 leds "↑" et "↓" doivent être allumées.
 Attendre 20 minutes après chaque test (mémoire thermique).

Check "↑" and "↓" LEDs are on.
 Wait 20 minutes between tests (thermal memory).



- Test Long Retard.**
- Long time tripping test.**

X In =>	.....	5	6	7	8	9	10
All ratings							
	100mA / In	500	600	700	800	900	1000

courant à injecter (mA) / Current to be injected (mA).

- Test Court Retard.**
- Short time tripping test.**

	.....	7	8	9	10	11	12	13	14
Tous calibres									
All ratings	141mA / In	990	1131	1273	1414	1555	1697	1838	1980

courant à injecter (mA) / Current to be injected (mA).

- Test Instantané.**
- Instantaneous tripping test.**

La led "↑" doit être allumée.
 Check "↑" LED is on.

X In =>	.....	13	14	15
All ratings				
	100mA / In	1300	1400	1500

courant à injecter (mA) / Current to be injected (mA).

Schneider Electric SA

Merlin Gerin
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As standards, specifications and designs develop from time to time, always ask for confirmation of the information given in this publication.

Réalisation : MARRY JN

Appendix F: SACE Bergamo OCB Manual

INDOOR LOW OIL CONTENT
CIRCUIT-BREAKERS

SERIES R, types RM, RMc, RG

INSTRUCTIONS
FOR SERVICE AND MAINTENANCE



SACE S.P.A. COSTRUZIONI
ELETTROMECCANICHE - BERGAMO

HEAD OFFICE AND WORKS - BERGAMO - VIA BAIONI, 35 - TELEPHONE 238.444
MILAN - VIA ROSELLINI, 2 - TELEPHONE 68.82.551/2, 3
BRANCH OFFICES: R O M E - VIA PANAMA, 58 - TELEPHONE 848.831 - 850.447

INDOOR LOW OIL CONTENT
CIRCUIT-BREAKERS
SERIES R, types RM, RMc, RG

INSTRUCTIONS
FOR SERVICE AND MAINTENANCE

1. CONSTRUCTION

The series R circuit-breakers consist of three separate poles fixed to a steel sheet frame (2) which houses the tripping springs and supports the operating mechanism (1).

Each pole comprises a sturdy insulating cylinder (6) surmounted by an insulating lid (15) in which an oil filling plug (16) is provided; this plug serves also as safety vent. The upper terminal (17), directly connected to the fixed contact (10) projects from the top of the insulating lid (15). The fixed contact (10) comprises arc resisting alloy tipped elements (six for a RM pole and seven for a RG pole).

The lower terminal (18) projects from the middle of the insulating cylinder (6) and is connected to the inside foliated, patented, electrodynamic compensated fixed contact (8). The moving contact (7) arc resisting alloy tipped (29) is insulated from its earthed lower part by means of a rod made of epoxy resin and is operated, through a connecting rod and lever, by a shaft (34) projecting from the metal oil sump (3). The shaft operating levers of each pole are connected to the drive rod (32) which is operated by the main shaft (33) of the operating mechanism.

An oil shock-absorber (5) in each pole cushions the downstroke of moving contact (7). A device fitted under the foliated fixed contact (8) catches the metal chips which detach from the contact when strong currents are broken. Special gaskets (4, 14, 19, 27, 28) prevent oil leakage even with the high pressures which occur inside the poles when strong currents are broken.

The arc extinguishing chamber (9) is of the transversal and longitudinal blow-out type; several tests carried out in various service conditions have proved that the arc chamber dimensions are quite adequate.

1.1 TYPES

The series R circuit-breakers are suitable for indoor service only. The following types are available:

- type RM for normal conditions, with the cylinders (6) made of resin enamel
- types RMC and RG for moist, dusty, salty atmospheres, tropical climate, with the cylinders (6) made of resin paper (inside), glass fibre and epoxy resin covered with special insulating enamel (outside)

The operating mechanism is normally front mounted; on request, a side mounting mechanism is available (see TW 3151)

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The clearances have been designed in accordance with VDE specifications for breakers mounted behind steel sheet or wire net. The series R circuit-breakers, due to their remarkable compactness, are suitable particularly for the draw-out types, for mounting inside protected boards.

2. CHECKING ON ARRIVAL

It is advisable to check on arrival that the breaker has not been damaged during transit. All complaints are to be claimed within five days from the date of receipt.

1. STORAGE

Breaker if it is to be kept in store for only a few days, must be protected against moist, dust and chemical substances. If the storage room does not ensure sufficient protection, it is necessary to fill up each pole with filtered and dried transformer oil to avoid any internal damage and wrap the breaker up in canvas. The breaker must never be laid down on the cleases or insulating parts.

It is essential to keep the breaker, when not in service, in the off" position (with the springs released) to avoid useless loading of the springs and damage to personnel who might imprudently trip the opening or closing devices of the breaker.

2. SERVICE

2.1 - PRELIMINARY OPERATIONS

Before putting into service a breaker which has been kept in store for a certain time, the following operations, are to be performed :

- to clean the metal external parts by means of a clean dry duster
- to clean the insulating parts by means of another quite clean dry duster
- in the case where the poles have been filled with oil for protection purpose, it is necessary to empty and wash the poles following the instructions given at §5.3 "oil refilling and pole washing". It is not advisable to re-use the oil employed in a stored breaker unless it is filtered and dried before re-using.

4.2 - INSTALLATION

As a series R breaker is not very heavy, it can be lifted by hand, but if a crane or other lifting appliance is used, slings must be attached to the breaker base only, and not to any other part. Great care must be taken when hoisting to ensure that no strain is placed upon any operational part of the assembly.

The breaker must be installed on rigid, absolutely level and horizontal supports so that the base is not deformed when fixing bolts are tightened.

After fixing the base, the breaker frame must be earthed through the appropriate earthing screw.

4.3 - CONNECTIONS

Check that both upper (17) and lower (18) terminals are clean and not deformed by possible blows during transit or storage.

The connections must not press the terminals sideways and are to be dimensioned in accordance with the service current as well as the maximum short circuit current of the plant.

The insulating supports next to the breaker terminals are to be dimensioned according to the electrodynamic stresses arising from the short circuit currents of the plant.

4.3.1 - Copper connections

To make the copper connections it is necessary to :

- check that the contact surfaces of connections do not show any burr or deformation resulting from drilling or blows
- lap the contact surfaces
- ensure a good contact between connections and terminal surfaces, then tighten the bolts

N.B. - It is advisable but not necessary to tin the contact surfaces taking care to get an even plating

4.3.2 - Aluminium connections

To make the aluminium connections it is necessary to :

- check that the contact surfaces of connections do not show burr or deformation resulting from drilling or blows
- first file, then lap the contact surfaces
- coat the contact surfaces with grease quite free from acids

- ensure a good contact between connections and terminal surfaces, then tighten the bolts using a large diameter washer to distribute pressure over the entire contact area then a spring washer

4.4 - ELECTRIC CONTROL CONNECTIONS

If the breaker is equipped with type AEM (motor loaded closing springs) operating mechanism it is necessary to connect the incoming cables to the terminal board housed inside the operating mechanism, following the wiring diagram attached to the breaker.

If other breakers are installed inside the same switch board, the closing springs of all the breakers must be manually loaded by means of crank (22) before energizing the motors, to prevent the simultaneous starting of all the motors.

4.5 - OIL FILLING

After making all the connections, fill the poles with breaker in open position - with filtered and dried oil up to the mark of the oil level indicator (20). Oil must be poured slowly into each pole through the hole in the filling plug (16) which serves also as a safety vent. After oil has reached the right mark, wait a few minutes and, if the oil level has lowered, fill up to the mark. Should the oil exceed the level mark, the excess can be run off through plug (24).

The oil filling operation will be simplified if a galvanized iron, plastics or glass container - quite clean and dry - of the same capacity as a pole or graduated is available; this saves time and oil.

OIL CONTAINED IN THE 3 POLES OF A BREAKER

Type of breaker	Oil kg
RM - RMC 10 - 20 - 20p	4.7
RG 6 - 10 - 20 - 20p	7.6
RG 30	11

4.6 - SPECIFICATIONS FOR OIL

The oil for the series R breakers is the same as that used for transformers (specifications CEI, fascicule 74). All the containers for oil storage and filling must be quite clean, dry and, if possible, made of galvanized iron, plastics or glass.

Oil must be filtered and dried before re-using. Filtering can be carried out by means of a normal filter press to remove any impurity.

Drying should be made in a vacuum autoclave in which oil is to be heated to about 100 °C and not exceeding 110 °C. When bubbles are no longer seen breaking the surface, oil can be poured into clean and dry containers.

It must be kept in mind that even very slight moisture or impurity traces lower enormously the oil dielectric strength - which should be tested once a year at least - and that the discharge voltage must by no means be lower than 30 kV between the 10 mm diameter spheres of a 5 mm sphere gap.

4.7 - GLYCERINE OR OIL IN OVERLOAD RELEASES LAGGED BY DASH-POT

If a breaker is equipped with our types MF or PF overload releases lagged by dash-pot, 3 cubic centimeters of very pure glycerine or same viscosity oil are to be poured into the dash-pot cylinders, following the instructions 8 - 12 annexed to each release.

As the industrial glycerine usually contains some impurities, it may increase in viscosity, after a service period, to such an extent as to block the release element, preventing the release itself from continuing in its protective action.

4.8 - FINAL INSPECTION

After carrying out all the above operations, before closing the disconnecting switches and putting the breaker into service, it is necessary to :

- a) carry out some hand closing and opening operations to make sure that operating mechanism works satisfactorily

Important - "ALL TEST OPERATIONS CAN BE CARRIED OUT ONLY IF THE 3 POLES ARE FILLED WITH OIL".

The closing operations on a breaker equipped with type AE manually loaded spring operating mechanism are to be carried out as follows :

- Insert the detachable crank (22) on the spring loading shaft(21) after removing the plastic cap

- rotate the shaft clock-wise until it idles (one turn and a half is sufficient to load the springs); the crank can be moved also with reciprocating motion, (it idles anti-clockwise)
- the spring state is indicated by a coloured indicator (yellow: spring loaded; white: spring released) or by signal lamps (the connections thereof are shown in the wiring diagram annexed to the breaker)
- the closing operation is made by turning the hand grip (23) anticlockwise, while the opening operation is made by turning the same clockwise
- b) check that the releases trip the breaker satisfactorily
- c) adjust the trip setting of releases
- d) if the breaker is equipped with closing release, shunt trip and loading springs motor, it is necessary to carry out, besides the above operations, some electrical closing and opening operations to make sure that connections are right and that the closing mechanism operates satisfactorily
- if closing springs are released, the motor, when energized, loads the springs and stops automatically as soon as springs are fully loaded
- when the breaker closes, the springs are released and the motor then reloads them automatically, so that starting from breaker closed, the following cycle can be obtained: 0 - C - 0
- The same cycle is obtained also with AE type hand loaded closing mechanism if springs are reloaded when the breaker is closed
- check that the auxiliary voltage is the same as that indicated on motor, shunt trip and closing release data plates
- after making sure that the operating mechanism is in good working condition and that the poles are filled with oil at the right level, the breaker can be put into service, taking care to open the breaker, if closed, to close the disconnecting switches and finally to close the breaker

5. WORKING AND MAINTENANCE

5.1. - PERIODICAL INSPECTION

During normal service conditions the oil level and conservation are to be periodically inspected. If the breaker has been submitted to frequent opening and

closing operations on short-circuit at currents whose value is not exactly known, yet is thought to be not far from the breaking capacity, a careful inspection of contacts is advisable.

The breakers can undergo the following operations without replacing contacts and oil:

- 6 opening operations at the dataplate maximum breaking capacity, or,
- 500 opening operations at the rated current, or,
- 1000 opening operations at 50 % the rated current, or,
- 2000 opening operations at 25 % the rated current

5.2 - OIL LEVEL AND CONSERVATION CHECKING

As previously described, when the breaker is opened, oil must reach the level mark in each pole.

After the breaker has been put out of service, an oil sample is to be drawn out and viscosity as well as dielectric strength are to be tested; a blackening of the oil does not affect the breaker working provided that the dielectric strength checked by a spark gap test is not lower than the value stated at § 4.6. If it is, the oil must be replaced.

5.3 - OIL REFILLING AND POLE WASHING

Remove the red painted taps (24) and allow the oil to drain out of poles into a container placed under each pole.

The oil outlet plug (24) must not be replaced by any screw or other means. Before filling the poles with fresh oil, it is advisable to wash each pole by pouring some fresh oil through the hole (16) of the insulating lid (15) and allowing it flow immediately out from plug (24). This operation is to be repeated 3 or 4 times.

The oil which has been used for washing the poles cannot be re-used for filling the poles unless filtered and dried (see § 4.6)

After washing, plugs (24) are to be tightened and poles are to be filled as instructed above.

5.4 - INSPECTION OF FIXED CONTACTS

After the breaker is put out of service, without draining the oil out, the following operations are to be done on each pole

- a. on RM, RMC breakers unscrew the nuts of upper connection (17) on RG breakers unscrew the nuts (38) remove upper connection (17), unscrew the bolt under the upper connection (17) by means of the spanner supplied with the breaker

- b. take off washer (30), packing (28), insulating lid (15), and packing (14)
- c. unscrew the locking nut(13) by means of the spanner supplied with the breaker
- d. lift the upper conductor (11) which holds the fixed contact (10)
 - inspect the fixed contact elements (35); if there are some pittings it is necessary to file them without modifying the profile of elements and then to clean out fillings
 - if any element is considerably deteriorated it is better to replace it.

5.5 - REPLACING FIXED CONTACT ELEMENTS

- After the operations explained in § 5.4 are carried out, put the upper conductor (11) protected by aluminium or bakelite plates or by a canvas between the jaws of a bench vice.
- for breakers RM, RMC, RG 20, RG 30 hold the insulating contact container (37, 37a) and force it out by turning alternately left & right taking care to hold in the hand or in a rag the contact elements (35) and springs (36)
 - for breakers RG 6, RG 10, RG 20P screw the contact insulating container (37b) out of the contact holder, pull it out slowly and hold in the hand or in a rag the contact elements (35a) and springs (36a)
 - replace the deteriorated contact elements (35)
 - reassemble the pieces placing the leaf springs(36) with the longer part downwards, i.e. against the arcing plate. Both fixed contact elements (35) and relevant leaf springs (36) of breakers RM and RMC are not interchangeable with those of breakers RG (35a, 36a)

5.6 - INSPECTION OF MOVING CONTACTS

- An inspection of moving contact is not necessary unless a remarkable deterioration is observed on fixed contacts (35). If necessary the inspection of fixed contact is to be made as follows :
- a. make sure that the breaker is open
 - b. drain the oil out
 - c. remove the screw fixing the insulating cylinder (6) to oil sump (3)
 - d. lift the insulating cylinder (6) and lay it gently, on a clean board, card-board or rags, horizontally if possible.

so as not to damage the lower face.
If the tip(29) of moving contact(7) is badly deteriorated, it must be replaced

5.7 - REPLACING MOVING CONTACT TIP

- The arc resisting tips (29) are screwed and soldered on the top of the copper moving contacts (7). After operations described in § 14 are carried out, the following additional operations are to be carried out :
 - a. melt a little tin in a container and keep it melted
 - b. take the rod (32) connecting the shaft (33) off the centre pole lever pin, after removing the safety spring ring
 - c. rotate levers (34) clockwise by hand to the closed breaker position
 - d. remove pins connecting the lower part of moving contacts (7) to the rods inside the oil sumps
In carrying out operations c) and d) care must be taken not to break the insulating part of moving contact (7)
 - e. put the moving contact tip into the melted tin and keep it until it has reached the bath temperature
 - f. remove the tip (29) to be replaced, by means of bench vice
 - g. fit a new tip
 - h. clean with acid or solder paste the new tip(29) and put it into the melted tin
 - i. remove any surplus tin from the tip surface
 - 1. insert the insulating part of the moving contact (7) through the lower guide and shock absorber (5), connect the lower part of moving contact (7) to the rods inside the oil sumps
 - m. rotate manually the external levers (34) of the oil sumps (3) slowly to "breaker open" position
 - n. connect the rod (32) to lever (34) of the centre pole keeping it in its position by means of the safety spring ring
 - o. place the guide and shock absorber (5) in its seat inside the oil sump (3) making sure that gasket (4) is located in its seat
 - P. clean by means of a clean dry rag the lower face of cylinder (6) and locate it on the oil sump (3)

warning : Excessive direct heating (e.g. oxyacetylene flame) of the moving contact(7) end should not be used on any account as this might cause annealing of the copper rod, which seriously affects the satisfactory operation of the breaker

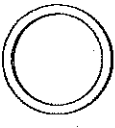

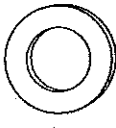
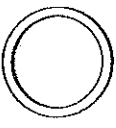
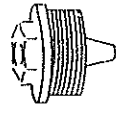


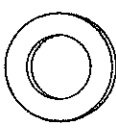
3.8 - IMPORTANT

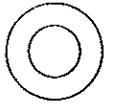


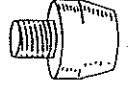
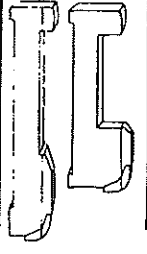
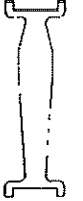
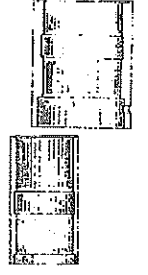

- a. If, after a long and severe service period, the arc chamber (9) is found even slightly damaged, it is advisable to send it to our Works in Bergamo for repair (*)
- b. It is essential to clean carefully the external parts of the breaker, particularly the insulating parts, twice a year at least.

SACE is not responsible for any damage or defect, if the instructions contained in this pamphlet are not fulfilled, particularly if the poles are not filled or incorrectly filled with oil.

*) - In case of great urgency, it is better to request the services of a Sace technical engineer

6. SPARE PARTS FOR SERIES R BREAKERS (SUPPLIED ON REQUEST)

figures and reference numbers	denomination	type of breaker	pieces for one breaker	number of drawing
4 4a 	Gasket for oil sump	RM, RMC RG	3 3	118200/46 119400/59
7 7a 7b 	Moving contact complete with arc tip	RM, RMC RG, 6, 10 20, 20P RG 30	3 3 3 3	118237/1 119402/1 120060/1
12 12a 	Valve	RM, RMC RG	3 3	118644/1 119341/1
14 14a 	Upper gasket	RM, RMC RG	3 3	118200/45 119400/58
16 	Oil filling & safety vent plug	RM, RMC RG	3	118221/1
19 	Gasket for oil level indicator	RM, RMC RG	3	118200/44
20 20a 	Oil level indicator	RM, RMC RG	3 3	118206/1 118206/2
25 	Gasket for oil filling and safety vent plug	RM, RMC RG	3	118647/1

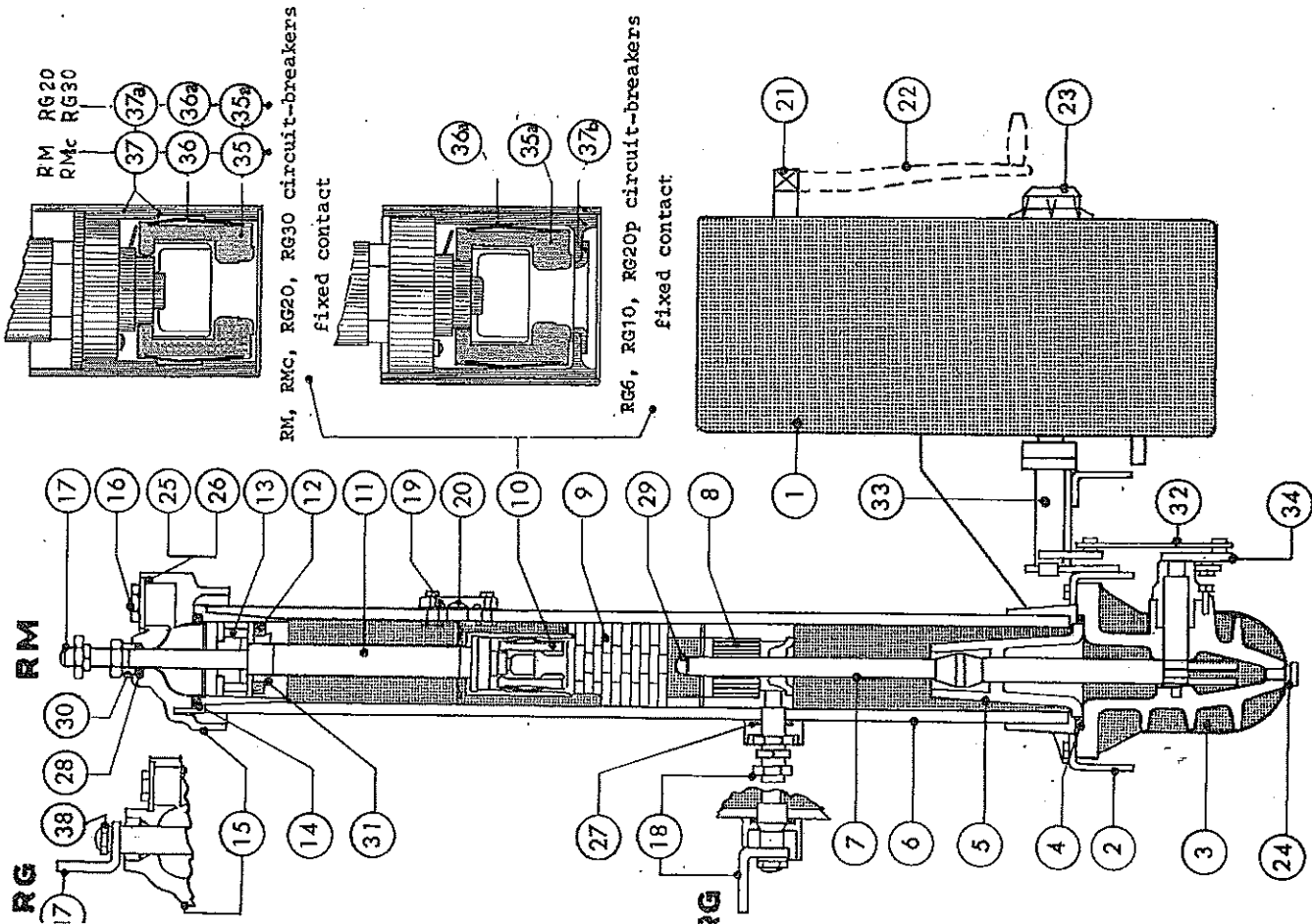
figures and reference number	denomination	type of breaker	pieces for one breaker	number of drawing
26 	Washer for oil filling and safety vent plug	RM, RMC RG	3	500078/17
27 27a 	Gasket for lower terminal	RM, RMC RG	3 3	118646/1 119344/1
28 28a 	Gasket for upper terminal	RM, RMC RG	3 3	118645/1 119340/1
29 29a 	Moving contact tip	RM, RMC RG	3 3	118239/1 119342/1
35 35a 	Fixed contact element	RM, RMC RG	18 21	118234/1 119352/1
36 36a 	Fixed contact springs	RM, RMC RG	18 21	118287/1 119387/1
37 37a 37b 	Fixed contact insulating container	RM, RMC RG20, 30 RG 6, 10, 20P	3 3 3	118232/1 119335/1 119330/1
39 39a 39b 39c 	Box containing a set of spare parts for 3 poles	RM10, 20, 20P RG 6, 10, 20P RG 20 RG30		

When requesting spare parts, please quote the reference number, denomination, type and serial number of the breaker, obtainable from the dataplate.

C A P T I O N

The spare parts listed hereunder have the same reference number if interchangeable, i.e. suitable for all types of series R breakers, while they are followed by letters a) b) or c) if not interchangeable (see pages 11 and 12).

- 1 - operating mechanism
- 2 - supporting frame
- 3 - oil sump
- 4 - gasket for oil sump
- 5 - guide end shock absorber
- 6 - insulating cylinder
- 7 - moving contact
- 8 - foliated fixed contact
- 9 - arc chamber
- 10 - fixed contact
- 11 - upper conductor
- 12 - valve
- 13 - locking nut
- 14 - upper gasket
- 15 - insulating lid
- 16 - oil filling and safety vent plug
- 17 - upper terminal
- 18 - lower terminal
- 19 - gasket for oil level indicator
- 20 - oil level indicator
- 21 - shaft for hand loading of closing springs
- 22 - detachable crank for the manual loading of closing springs
- 23 - grip for closing and opening the breaker manually
- 24 - taps for the oil outlet
- 25 - gasket for oil filling and safety vent plug
- 26 - washer for oil filling and safety vent plug
- 27 - gasket for lower terminal
- 28 - gasket for upper terminal
- 29 - moving contact tip
- 30 - washer for gasket (28)
- 31 - support for valve (12)
- 32 - connecting rod
- 33 - operating mechanism shaft
- 34 - lever
- 35 - fixed contact element
- 36 - Fixed contact spring
- 37 - fixed contact insulating container
- 38 - nut for fixing the upper terminal on type RG breakers



APPENDIX B
ESQUIMALT GRAVING DOCK – 2012 HIGH VOLTAGE MAINTENANCE REPORT
COORDINATION STUDY REVIEW - EATON CORPORATION AND EMERY
ELECTRIC

Coordination Study Comparisons

Relay settings versus coordination study

Main Substation									
Feeder ID	As Found	CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-1 - Phase	As Found	200:5	IEC-B	1.62x (324A pri.)	0.20				
	Coordination study	600:5	Off	0.54 (324A pri.)					
12.5MS-1 - Ground	As Found	600:5	V Inv.	0.5x	0.05				
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-2 - Phase - SEL501 X Winding	As Found	300:5	U4	3.9A	1.00	39A			
	Coordination study		U1	2.15		Off			
12.5MS-2 - Ground - SEL501 X Winding	As Found	300:5	U4	0.10	0.50	0.30			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-2 - Phase - SEL501 Y Winding	As Found	300:5	U4	3.9A	1.00	39A			
	Coordination study		U1	2.15		Off			
12.5MS-2 - Ground - SEL501 Y Winding	As Found	300:5	U4	0.10	0.50	0.30			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-2 - Phase - SEL351	As Found	300:5	U4	0.5A	6.00	40A			
	Coordination study		U5	4A	3.00	50A			
12.5MS-2 - Ground - SEL351	As Found	200:5	U4	0.1A	1.00	0.5A			
	Coordination study	300:5							
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-3 - Phase	As Found	150:5	E Inv.	1x	0.50	10x			
	Coordination study								
12.5MS-3 - Ground	As Found	150:5	D2	0.5x	0.10	1x			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-4 - Phase	As Found	300:5	V Inv.	0.8x	0.25	12x			
	Coordination study								
12.5MS-4 - Ground	As Found	300:5	D2	0.5x	0.10	1x			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-5 - Phase	As Found	75:5	V Inv.	2.4x	0.30	8x			
	Coordination study								
12.5MS-5 - Ground	As Found	75:5	D2	0.5x	0.30	1x			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-6 - Phase	As Found	25:5	V Inv.	1x	0.50	10x			
	Coordination study								
12.5MS-6 - Ground	As Found	25:5	D2	0.5x	0.10	1x			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-7 - Phase	As Found	40:5	V Inv.	1x	0.30	10x			
	Coordination study								
12.5MS-7 - Ground	As Found	40:5	D2	0.5x	0.10	1x			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
12.5MS-8 - Phase	As Found	75:5	V Inv.	1.6x	0.30	9x			
	Coordination study								
12.5MS-8 - Ground	As Found	75:5	D2	0.5x	0.10	1x			
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
2.4MS-20 - Phase	As Found	1200:5	V Inv.	5A	1.00	50A			
	Coordination study			4A					
2.4MS-20 - Ground	As Found		None						Ground fault protection implemented through FPE system
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
2.4MS-21 - Phase	As Found	300:5	E Inv.	220%	5.00	20x			
	Coordination study								
2.4MS-21 - Ground	As Found	300:5	DT	15%	1.00	1x			
	Coordination study			45x					
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
2.4MS-22 - Phase	As Found	75:5	E Inv.	2.01x	5.60	18.74x			Coordination settings taken from Turkan coordination report supplied by Emery
	Coordination study								
2.4MS-22 - Ground	As Found		None	None		1x			Coordination settings taken from Turkan coordination report supplied by Emery
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
2.4MS-23 - Phase	As Found	100:5	E Inv.	120%	8.00	12x			Coordination settings taken from Turkan coordination report supplied by Emery
	Coordination study								
2.4MS-23 - Ground	As Found		Off						Coordination settings taken from Turkan coordination report supplied by Emery
	Coordination study								
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments		
2.4MS-24 - Phase	As Found	150:5	V Inv.	4A	2.00	60A			
	Coordination study								
2.4MS-24 - Ground	As Found		None						Ground fault protection implemented through FPE system
	Coordination study								



Eaton Job # EVC12J0027

Relay settings versus coordination study

South Side Substation

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5SS-1 - Phase	As Found	150:5	V Inv.	6A	0.20	48A	
	Coordination study						
12.5SS-1 - Ground	As Found	150:5	V Inv.	0.5A	1.00	20A	Cannot locate settings in coordination study for this feeder
	Coordination study						

Tested by: Sean Gray



Eaton Job # EVC12J0027

Relay settings versus coordination study

South Crane Switchboard

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4SS-30T - Phase	As Found	50:5	E Inv.	2.38x	5.60	20x	Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						
2.4SS-30T - Ground	As Found	200:5		1x	2.5s		Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						
2.4SS-Spare - Phase	As Found	50:5	E Inv.	2.38x	5.60	20x	Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						
2.4SS-Spare - Ground	As Found	200:5		1x	2.5s		Coordination settings taken from Turkan coordination report supplied by Emery
	Emery test sheet settings						

Tested by: Lorne Cowley



Eaton Job # EVC12J0027

Relay settings versus coordination study

South Compressor Room

Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
2.4SC-BKR1 - Phase	As Found		V Inv.	3.75A	0.50	40A	Cannot locate settings in coordination study for this feeder
	Coordination study						
2.4SC-BKR1 - Ground	As Found		None				Cannot locate settings in coordination study for this feeder
	Coordination study						

Tested by: Lorne Cowley



Eaton Job # EVC12J0027

Relay settings versus coordination study

North Landing Warf Substation

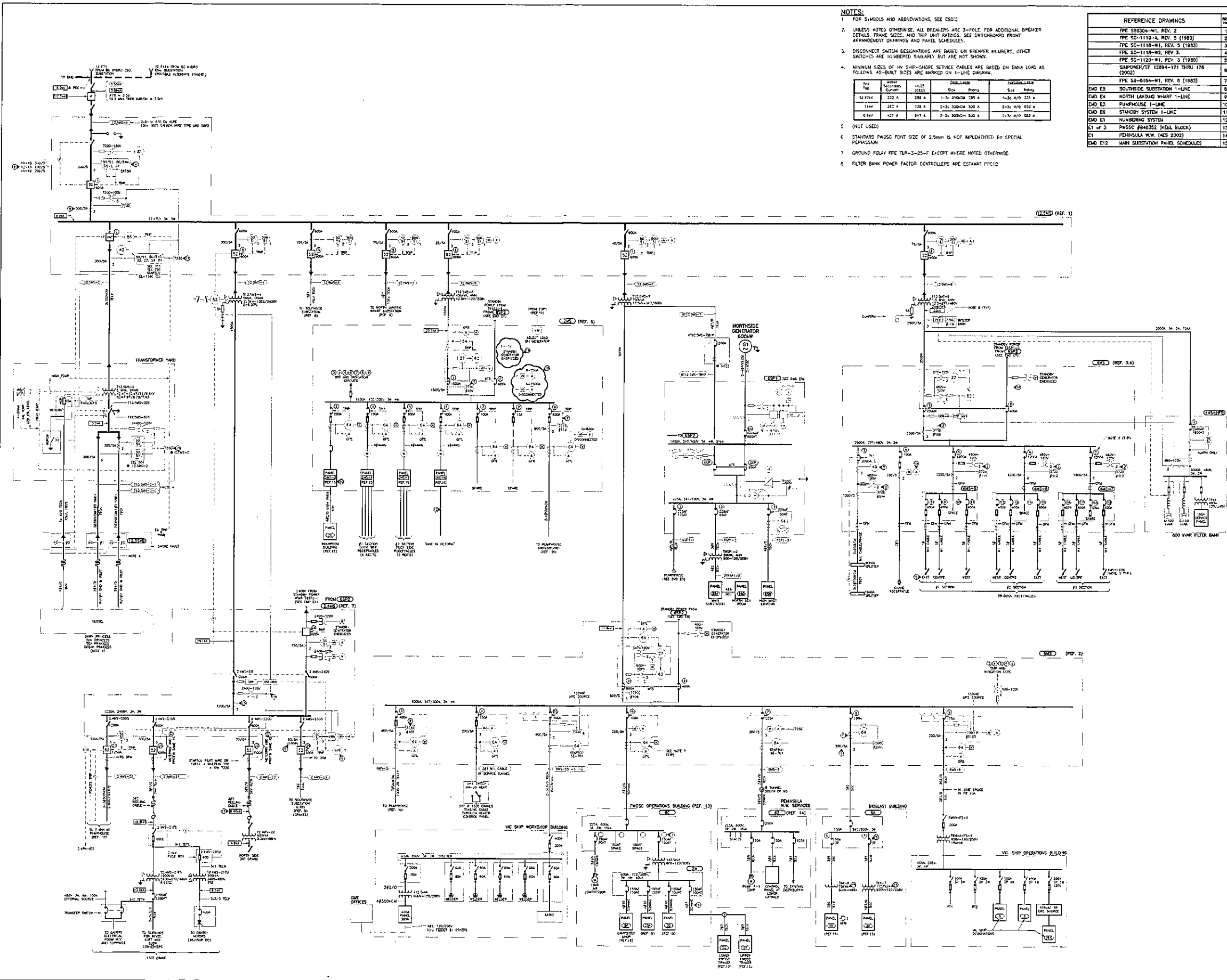
Feeder ID		CT Ratio	Curve	LTPU	TD	Inst	Comments
12.5NL-105 - Phase	As Found	75:5	V Inv.	6A (120)	0.50	80A (1600)	
	Coordination study					70A (1400)	
12.5NL-105 - Ground	As Found	75:5	V Inv.	1.5A (30)	0.50	12A (240)	
	Coordination study			2A (40)		10A (200)	

Tested by: Sean Gray

APPENDIX C

DRAWINGS

EMD E1	Electrical Equipment Numbering System – Rev. 6
EMD E2	Main Substation Single-Line Diagram – Rev. 12
EMD E3	Pumphouse Single-Line Diagram – Rev. 4
EMD E4	North Landing Wharf Substation Single Line Diagram – Rev. 3
EMD E5	South Side Substation Single Line Diagram – Rev. 7
EMD E6	Standby Power System Single-Line Diagram – Rev. 6
EMD E9001	Symbol Legend – Rev. 3
EMD E9002	Abbreviations – Rev. 1



- NOTES:**
- FOR SYMBOLS AND ABBREVIATIONS, SEE ESD/2
 - UNLESS NOTED OTHERWISE, ALL BREAKERS ARE 3-POLE. FOR ADDITIONAL BREAKER DETAILS, FRAME SIZES, AND TRIP UNIT RATINGS, SEE SWITCHBOARD FRONT ARRANGEMENT DRAWINGS AND PANEL SCHEDULES.
 - DISCONNECT SWITCH DESIGNATIONS ARE BASED ON BREAKER NUMBERS. OTHER SWITCHES ARE NUMBERED SIMILARLY BUT ARE NOT SHOWN.
 - MINIMUM SIZES OF HV SHIP-SHORE SERVICE CABLES ARE BASED ON DATA LOAD AS FOLLOWS. AS-BUILT SIZES ARE MARKED ON 1-LINE DIAGRAM.

TYPE	MINIMUM SIZE	MINIMUM SIZE	MINIMUM SIZE	MINIMUM SIZE
12.4KV	11KV	6KV	3.3KV	1.5KV
12.4KV	11KV	6KV	3.3KV	1.5KV
12.4KV	11KV	6KV	3.3KV	1.5KV
12.4KV	11KV	6KV	3.3KV	1.5KV
 - (NOT USED)
 - STANDARD PWSOC FOOT SIZE OF 25mm IS NOT IMPLEMENTED BY SPECIAL PERMISSION.
 - GROUND RELAY PFE TRIP-3-25-F EXCEPT WHERE NOTED OTHERWISE.
 - FILTER BANK POWER FACTOR CONTROLLERS ARE ESTIMAT PFC12

REFERENCE DRAWINGS

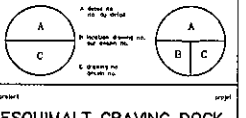
REF. NO.	DESCRIPTION
1	FPE S8303-W1, REV. 3
2	FPE SC-1118-A, REV. 5 (1983)
3	FPE SC-1118-W1, REV. 3 (1983)
4	FPE SC-1118-W2, REV. 3
5	FPE SC-1120-W1, REV. 3 (1983)
6	SIMPPOWER/TTI 12894-171 THRU 176 (2002)
7	FPE S8-8184-W1, REV. 8 (1983)
8	EMD E3 SOURSIDE SUBSTATION 1-LINE
9	EMD E4 NORTH LANDING WHARF 1-LINE
10	EMD E5 PUMPHOUSE 1-LINE
11	EMD E6 STANDBY SYSTEM 1-LINE
12	EMD E1 NUNBURGH SYSTEM
13	E1 of 3 PWSOC BREAKER (NEEL BLOCK)
14	E1 PENINSULA W.M. (AUG 2002)
15	EMD E12 MAIN SUBSTATION PANEL SCHEDULES

Public Works and
Government Services
Corporation

Portside Region

- TEMPORARY NOTES:**
- VERIFY BREAKER NUMBERS.
 - VERIFY PT SOURCE.
 - CONFIRM MAIN BREAKER.
 - NOT USED.
 - FIELD VERIFY.
 - NOT USED.
 - NOT USED.
 - NOT USED.
 - CONFIRM CT RATIO.
 - NOT USED.
 - CHANGE NAMEPLATE TO MISCELLANEOUS SERVICE PANEL.
 - CHANGE BREAKER NAMEPLATE.
 - PANEL BREAKERS ALL SPARES CABLES LEFT IN PLACE?
 - (NOT USED)
 - CONFIRM LOCATED BELOW ESP-HINT (NOT LABELED)
 - VOLTMETER AND AMMETER PROVIDED?
 - CONFIRM NAMEPLATE.
 - ASSIGN OR CONFIRM SCADA NUMBERS.
 - CONFIRM CIRCUIT CONNECTIONS.
 - CONFIRM FAULT LEVEL.

- 2012 HIGH VOLTAGE WORKMANSHIP RELATES
- RELEASER TRIPPER CONTACTS UNDER BELT/IN SWIFT BRIDGE SECTION SYSTEM
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000
- BY PFA, VERIFY AND TAG-3, ADDS TAGS TO 12.4KV TRIP CIRCUIT FOR ELITE 1000



**ESQUIMALT GRAVING DOCK
ESQUIMALT, B.C.
ELECTRICAL MASTER DRAWING**

**MAIN SUBSTATION
SINGLE-LINE DIAGRAM**

Author: M. K. ÇANÇAR | G. PETERSON

Drawn: P. PARANJAN

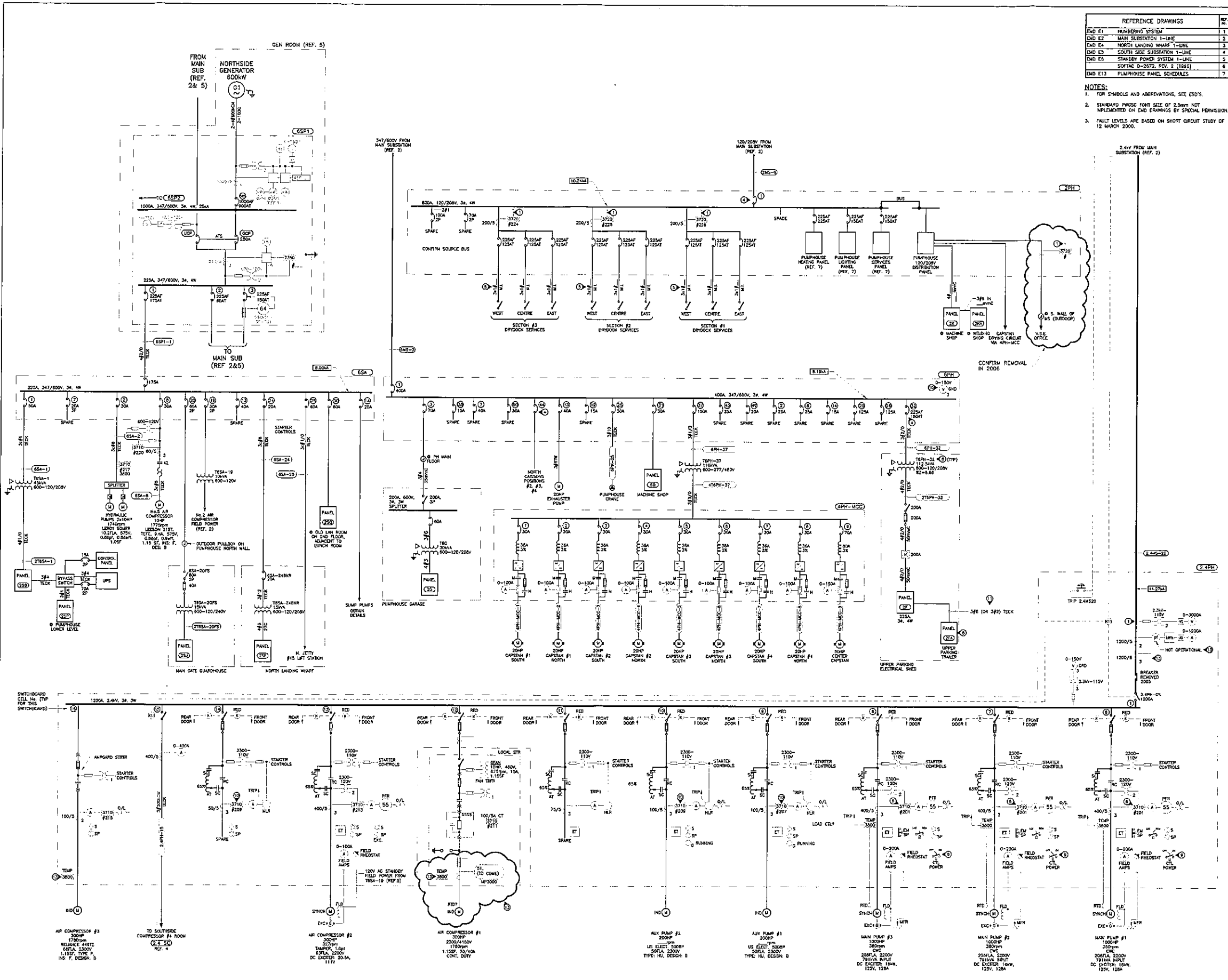
Checked: [Signature]

Scale: [Blank]

Project: [Blank]

Sheet: [Blank]

EMD E2 REV.12



REFERENCE DRAWINGS	
EMD E1	NUMBERING SYSTEM
EMD E2	MAIN SUBSTATION 1-LINE
EMD E4	NORTHSIDE GENERATOR 600KW
EMD E5	SOUTH SIDE SUBSTATION 1-LINE
EMD E6	STANDBY POWER SYSTEM 1-LINE
SOPAC D-2672, REV. 2 (1923)	
EMD E13	PUMPHOUSE PANEL SCHEDULES

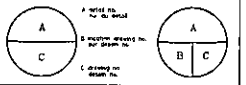
- NOTES:
- FOR SYMBOLS AND ABBREVIATIONS, SEE ESD'S.
 - STANDARD PWSIC FONT SIZE OF 2.5mm NOT IMPLEMENTED ON EMD DRAWINGS BY SPECIAL PERMISSION.
 - FAULT LEVELS ARE BASED ON SHORT CIRCUIT STUDY OF 12 MARCH 2000.

Public Work and
Government Services
Canada
Pacific Region



- TEMPORARY NOTES:
- VERIFY FT SOURCE AND PT PRIMARY CONNECTION POINT RELATIVE TO CT.
 - VERIFY FIELD SUPPLY IS FROM ESA.
 - NOT USED.
 - VERIFY BREAKER RATING.
 - VERIFY CABLE/CONDUCTOR SIZE.
 - VERIFY METER TYPE.
 - VERIFY CT RATIO.
 - CONFIRM NAMEPLATE.
 - FUTURE.
 - VERIFY LOCATION IN CIRCUIT.
 - VERIFY SIZE.
 - UPDATE PER AS-BUILT DRAWINGS.
 - FIELD VERIFY.

1	2013 HIGH VOLTAGE MAINTENANCE FED LEVELS	11 APR 2014
2	PROTECT STANDBY GENERATOR LOADS ELECTRICAL SWITCH IMPULSE DESIGN CHECK	15 FEB 2014
3	BY IFA: MODEL TRANSDUCER AND FAN DISCONNECT IN PUMPHOUSE JUNCTION BOXES	21 APR 2008
4	BY IFA: MODEL TRANSDUCER AND FAN DISCONNECT IN PUMPHOUSE JUNCTION BOXES	17 JUN 2002
5	BY IFA: MODEL TRANSDUCER AND FAN DISCONNECT IN PUMPHOUSE JUNCTION BOXES	17 JUN 2002
6	BY IFA: APPROVED IDEAL	2000

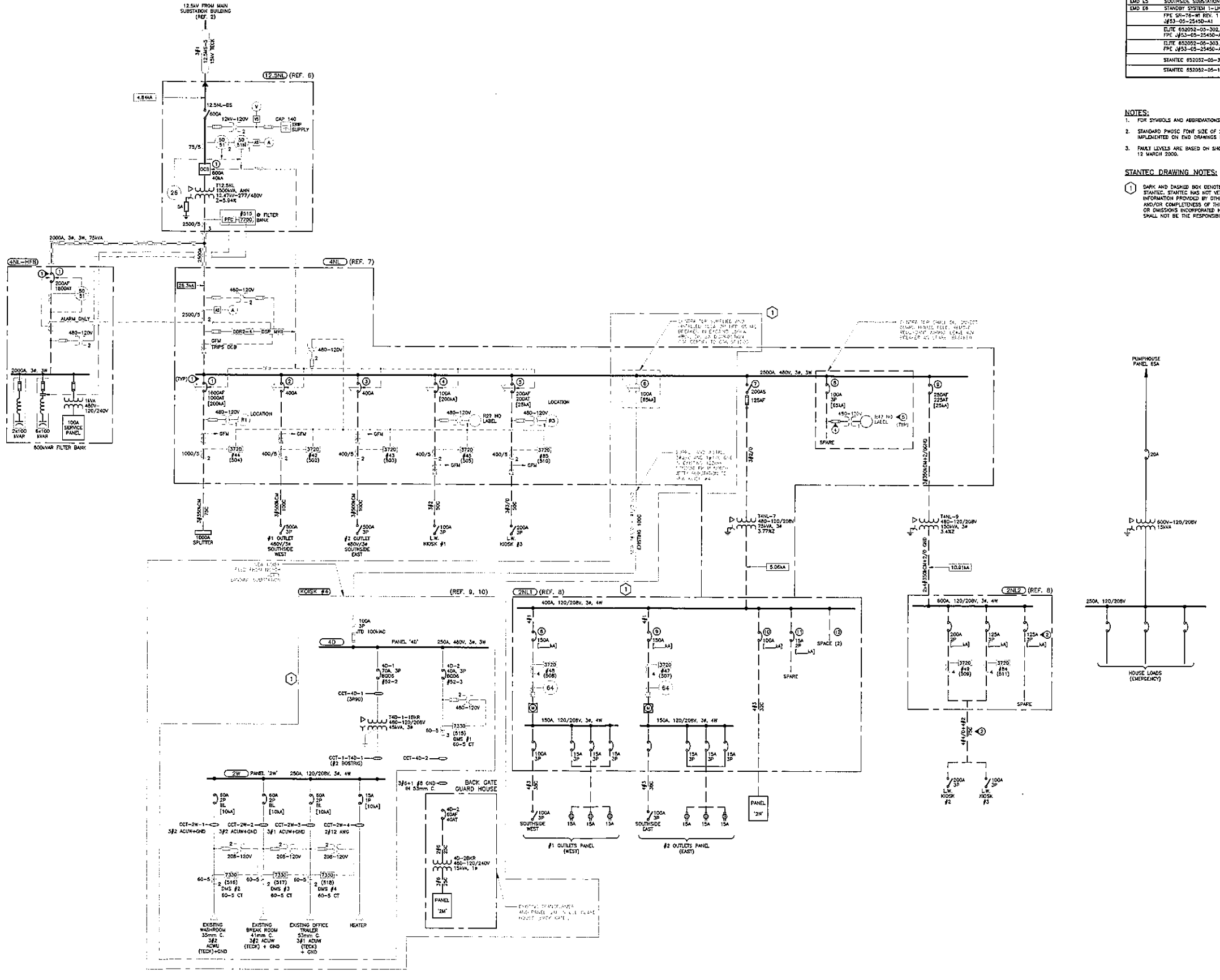


PROJECT: ESQUIMALT GRAVING DOCK
ESQUIMALT, B.C.
ELECTRICAL MASTER DRAWING

PUMPHOUSE
SINGLE-LINE DIAGRAM

DESIGNED BY: M. K. ÇANÇAR | G. PETERSON
CHECKED BY: P. PARANPAN
DATE: 11/11/2014
PROJECT: ESQUIMALT GRAVING DOCK
DRAWING NO: EMD E3
REV: 4

File: V:\LDC\Projects\ESG\Drawings\ESG\ESG-SLD-01-2014-10-20.dwg Date: 2014-10-20 10:00:00 AM User: pml/psw



REFERENCE DRAWINGS	NO.	
EMD E1	MANUERING SYSTEM	1
EMD E2	MAIN SUBSTATION 1-LINE	2
EMD E3	PUMPHOUSE 1-LINE	3
EMD E5	SOUTHSIDE SUBSTATION 1-LINE	4
EMD E8	STANDBY SYSTEM 1-LINE	5
PFE 55-75-W REV. 1 (1991)		6
ELFE 65202-02-302, REV. 2 (2003)		7
ELFE 65202-05-303, REV. 2 (2003)		8
PFE 6523-05-25450-A1		9
STANTEC 65202-05-3929		10
STANTEC 65202-05-1010		10

- NOTES:**
- FOR SYMBOLS AND ABBREVIATIONS, SEE ESD'S.
 - STANDARD FPMSC FUSE SIZE OF 2.5mm NOT IMPLEMENTED ON END DRAWINGS BY SPECIAL PERMISSION.
 - PANEL LEVELS ARE BASED ON SHORT CIRCUIT STUDY OF 12 MARCH 2000.

STANTEC DRAWING NOTES:

(1) DASH AND DASHED BOX DENOTES REVISIONS ADDED BY STANTEC. STANTEC HAS NOT VERIFIED PREVIOUS INFORMATION PROVIDED BY OTHERS. THE ACCURACY AND/OR COMPLETENESS OF THIS INFORMATION, ERRORS, OR OMISSIONS INCORPORATED HEREIN AS A RESULT SHALL NOT BE THE RESPONSIBILITY OF STANTEC.



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Victoria BC Canada
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Fax: 250.382-0514
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TEMPORARY NOTES:

- CHECK IF CONNECTED TO GROUND FAULT.
- FIELD VERIFY
- N/A
- VERIFY NO FUSE.
- ONLY 2 RELAYS ARE VISIBLE IN 4M CONTROL EQUIPMENT. CONTROL NUMBERS OF RELAYS AND THEIR DESIGNATION.

Record Drawing

This drawing has been prepared based on information provided by others. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result.

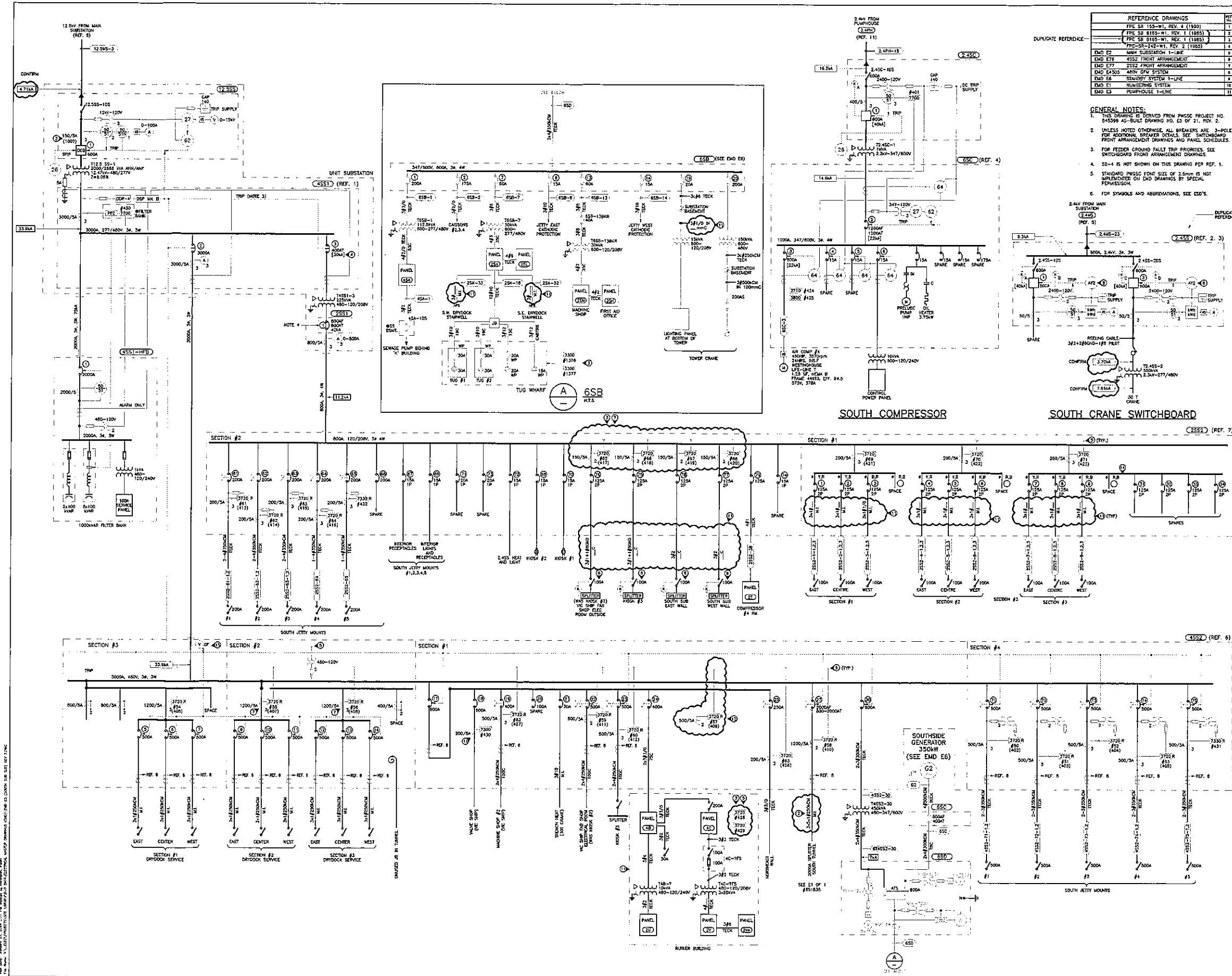
NO.	REVISION	DATE
1	FOR APPROVED ISSUE	10/20/2014
2	FOR APPROVED ISSUE	10/20/2014
3	FOR APPROVED ISSUE	10/20/2014
4	FOR APPROVED ISSUE	10/20/2014
5	FOR APPROVED ISSUE	10/20/2014
6	FOR APPROVED ISSUE	10/20/2014
7	FOR APPROVED ISSUE	10/20/2014
8	FOR APPROVED ISSUE	10/20/2014
9	FOR APPROVED ISSUE	10/20/2014
10	FOR APPROVED ISSUE	10/20/2014

project
ESQUIMALT GRAVING DOCK
ESQUIMALT, B.C.
ELECTRICAL MASTER DRAWING
ESQUIMALT, B.C.

drawing
NORTH LANDING
WHARF SUBSTATION
SINGLE LINE DIAGRAM

designed M. K. CANÇAR
date OCTOBER 2004
drawn M. EVANS / S. LEE / P. PARANPAN
date JANUARY 2014
approved _____
date _____
tender _____
PMSC Project Manager
project no. _____
no. of sheets _____

drawing no. **EMD E4**
no. of sheets **REV.3**



REF. NO.	DESCRIPTION	REV.
REF. 1	MANUFACTURER'S DRAWING NO. 12345	1
REF. 2	MANUFACTURER'S DRAWING NO. 67890	1
REF. 3	MANUFACTURER'S DRAWING NO. 11223	1
REF. 4	MANUFACTURER'S DRAWING NO. 44556	1
REF. 5	MANUFACTURER'S DRAWING NO. 77889	1
REF. 6	MANUFACTURER'S DRAWING NO. 10112	1
REF. 7	MANUFACTURER'S DRAWING NO. 13141	1
REF. 8	MANUFACTURER'S DRAWING NO. 16171	1
REF. 9	MANUFACTURER'S DRAWING NO. 19181	1
REF. 10	MANUFACTURER'S DRAWING NO. 22191	1
REF. 11	MANUFACTURER'S DRAWING NO. 25201	1

- GENERAL NOTES:**
- THIS DRAWING IS DERIVED FROM PROJECT NO. 845309 AS-BUILT DRAWING NO. 05 OF 21, REV. 2.
 - UNLESS NOTED OTHERWISE, ALL BREAKERS ARE 3-POLE. FOR ADDITIONAL BREAKER DETAILS, SEE SWITCHBOARD FRONT ARRANGEMENT DRAWINGS AND PANEL SCHEDULES.
 - FOR FEEDER GROUND FAULT TRIP PRIORITIES, SEE SWITCHBOARD FRONT ARRANGEMENT DRAWINGS.
 - SE-4 IS NOT SHOWN ON THIS DRAWING PER REF. 1.
 - STANDARD IWSOC FONT SIZE OF 2.5mm IS NOT IMPLEMENTED ON END DRAWINGS BY SPECIAL PERMISSION.
 - FOR SYMBOLS AND ABBREVIATIONS, SEE ESD'S.

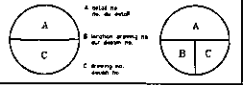
Public Works and
Government Services
Division of the
City of Vancouver

Pacific Region



- TEMPORARY NOTES:**
- VERIFY INTERNAL DISTRIBUTION.
 - VERIFY NO. OF PARALLEL CABLES.
 - VERIFY CT RATIO.
 - VERIFY I.C. RATING OF 32-4551-3.
 - VERIFY P.T. SOURCE.
 - INVESTIGATE IF SWITCH RATING IS ADEQUATE.
 - VERIFY 2 OR 3 CTS.
 - PAC 3431-1 PER ELITE-807
 - NOT USED.
 - NOT USED.
 - FIELD VERIFY.
 - CONFIRM METER NUMBERS AND IDENTIFY BREAKER.
 - FAULT LEVEL TO COME.
 - VERIFY IF SPARCS ARE CONNECTED TO SECTION #3 BUS OF THE MAIN BUS.
 - VERIFY CONNECTION.

NO.	DESCRIPTION	DATE
1	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
2	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
3	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
4	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
5	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
6	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
7	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
8	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
9	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019
10	2019 HIGH VOLTAGE MAINTENANCE	22 JAN 2019

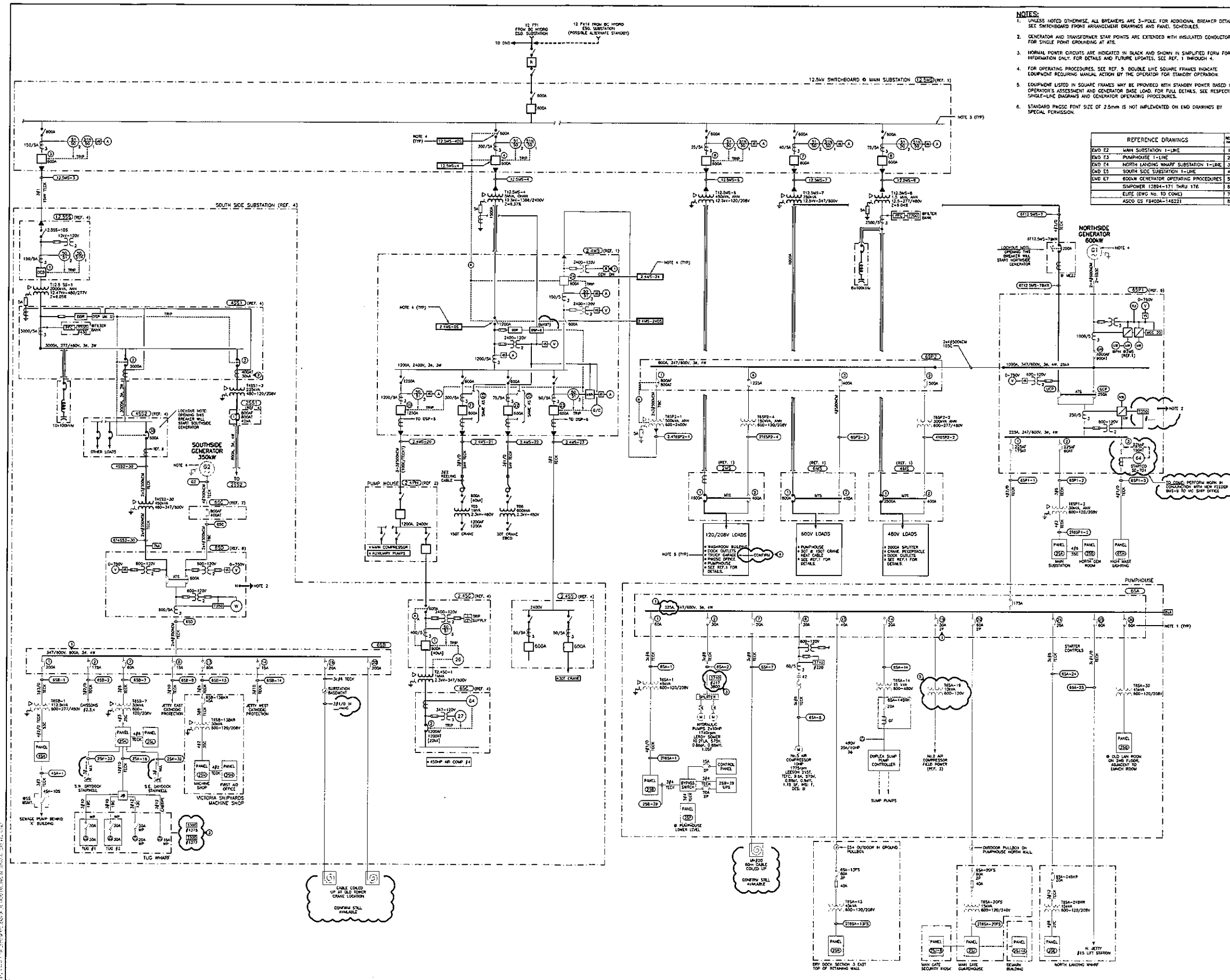


ESQUIMALT GRAVING DOCK
ESQUIMALT, B.C.

ELECTRICAL MASTER DRAWING

**SOUTH SIDE
SUBSTATION
SINGLE LINE DIAGRAM**

DESIGNED BY	M. K. ÇANÇAR | G. PETERSON
CHECKED BY	P. PARANPAN
DATE	
SCALE	
PROJECT NO.	
DRAWING NO.	EMD E5
REV.	REV.7



- NOTES:**
- UNLESS NOTED OTHERWISE, ALL BREAKERS ARE 3-POLE. FOR ADDITIONAL BREAKER DETAILS, SEE SWITCHBOARD FRONT ARRANGEMENT DRAWINGS AND PANEL SCHEDULES.
 - GENERATOR AND TRANSFORMER STAR POINTS ARE EXTENDED WITH INSULATED CONDUCTORS FOR SINGLE POINT GROUNDING AT ATS.
 - NORMAL POWER CIRCUITS ARE INDICATED IN BLACK AND SHOWN IN SIMPLIFIED FORM FOR INFORMATION ONLY. FOR DETAILS AND FUTURE UPDATES, SEE REF. 1 THROUGH 4.
 - FOR OPERATING PROCEDURES, SEE REF. 5. DOUBLE LINE SQUARE FRAMES INDICATE EQUIPMENT REQUIRING MANUAL ACTION BY THE OPERATOR FOR STANDBY OPERATION.
 - EQUIPMENT LISTED IN SQUARE FRAMES MAY BE PROVIDED WITH STANDBY POWER BASED ON OPERATOR'S ASSESSMENT AND GENERATOR BASE LOAD. FOR FULL DETAILS, SEE RESPECTIVE SINGLE-LINE DIAGRAMS AND GENERATOR OPERATING PROCEDURES.
 - STANDARD PWGSC FONT SIZE OF 2.5mm IS NOT IMPLEMENTED ON EMD DRAWINGS BY SPECIAL PERMISSION.

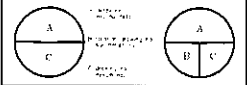
REF. NO.	DESCRIPTION
EMD E2	MAIN SUBSTATION 1-LINE
EMD E3	PUMPHOUSE 1-LINE
EMD E4	NORTH LANDING WHARF SUBSTATION 1-LINE
EMD E5	SOUTH SIDE SUBSTATION 1-LINE
EMD E7	600kW GENERATOR OPERATING PROCEDURES
5	SMPower 12284-171 THRU 176
7	ELITE (DWG. NO. TO COME)
8	ASCO CS F8400A-148221

GENIVAR
 Project: [illegible]

GENIVAR

- TEMPORARY NOTES:**
- FIELD VERIFY.
 - VERIFY I.C. RATING.
 - VERIFY METERING CIRCUITS.
 - (NOT USED)
 - VERIFY 1-PHASE TRANSFORMER WITH SECONDARY SWITCH.

- 1. BY W.A. JONES FOR 12SA-11, 12SA-12, 12SA-13, 12SA-14, 12SA-15, 12SA-16, 12SA-17, 12SA-18, 12SA-19, 12SA-20, 12SA-21, 12SA-22, 12SA-23, 12SA-24, 12SA-25, 12SA-26, 12SA-27, 12SA-28, 12SA-29, 12SA-30, 12SA-31, 12SA-32, 12SA-33, 12SA-34, 12SA-35, 12SA-36, 12SA-37, 12SA-38, 12SA-39, 12SA-40, 12SA-41, 12SA-42, 12SA-43, 12SA-44, 12SA-45, 12SA-46, 12SA-47, 12SA-48, 12SA-49, 12SA-50, 12SA-51, 12SA-52, 12SA-53, 12SA-54, 12SA-55, 12SA-56, 12SA-57, 12SA-58, 12SA-59, 12SA-60, 12SA-61, 12SA-62, 12SA-63, 12SA-64, 12SA-65, 12SA-66, 12SA-67, 12SA-68, 12SA-69, 12SA-70, 12SA-71, 12SA-72, 12SA-73, 12SA-74, 12SA-75, 12SA-76, 12SA-77, 12SA-78, 12SA-79, 12SA-80, 12SA-81, 12SA-82, 12SA-83, 12SA-84, 12SA-85, 12SA-86, 12SA-87, 12SA-88, 12SA-89, 12SA-90, 12SA-91, 12SA-92, 12SA-93, 12SA-94, 12SA-95, 12SA-96, 12SA-97, 12SA-98, 12SA-99, 12SA-100.



ESQUIMALT GRAVING DOCK
 ESQUIMALT, B.C.
 ELECTRICAL MASTER DRAWING

STANDBY POWER SYSTEM
 SINGLE-LINE
 DIAGRAM

M. K. ÇANÇAR
 J.O. / A.S. / P.P.

NOTES:
 1. STANDARD PHOSOR FONT SIZE OF 2.5mm NOT APPLIED TO END DRAWINGS BY SPECIAL PERMISSION. NORMAL SIZE OF 2mm USED.

LEGEND - SINGLE LINE & SCHEMATIC DIAGRAMS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	H.V. CABLE STRESS CONE TERMINATION - CABLE SIDE		PANEL
	INCOMING UTILITY CONNECTION		PANEL A
	ULTIMATE AVAILABLE FAULT LEVEL (RMS SYM)		PANEL A
	PRESENT AVAILABLE FAULT LEVEL (RMS SYM)		ANSI/IEEE STANDARD ELECTRICAL POWER SYSTEM DEVICE FUNCTION NUMBERS (NOTE 1): 1. MASTER ELEMENT 2. TIME-DELAY STARTING OR CLOSING RELAY 3. CHECKING OR INTERLOCKING RELAY 4. MASTER CONTACT 5. STOPPING DEVICE 6. SEPARATING CIRCUIT BREAKER 7. ANODE CIRCUIT BREAKER 8. CONTROL POWER DISCONNECTING DEVICE 9. REVERSING DEVICE 10. UNIT SEQUENCE SWITCH 11. RESERVED FOR FUTURE APPLICATION 12. OVERSPEED DEVICE 13. SYNCHRONOUS-OPERATED DEVICE 14. UNDERFIELD DEVICE 15. SPEED OR FREQUENCY WATCHING DEVICE 16. RESERVED FOR FUTURE APPLICATION 17. SHUNTING OR DISCHARGE SWITCH 18. ACCELERATING OR DECELERATING DEVICE 19. STARTING-TO-RUNNING TRANSITION CONTACTOR 20. ELECTRICALLY OPERATED VALVE 21. DISTANCE RELAY 22. EQUALIZER CIRCUIT BREAKER 23. REVERSE-PHASE CONTROL DEVICE 24. RESERVED FOR FUTURE APPLICATION 25. SYNCHRONIZING OR SYNCHRONIZATION-CHECK DEVICE 26. APPARATUS THERMAL DEVICE 27. UNDERVOLTAGE RELAY 28. FLAME DETECTOR 29. ISOLATING CONTACTOR 30. ANNUNCIATOR RELAY 31. SUPPLEMENTAL INDICATOR DEVICE 32. DISTRIBUTION POWER RELAY 33. POSITION SWITCH 34. MASTER SEQUENCE DEVICE 35. BREAKER-OPERATING OR SLIP-RING SHORT-CIRCUITING DEVICE 36. POLARITY OR POLARISING VOLTAGE DEVICE 37. UNDERCURRENT OR UNDERPOWER RELAY 38. BEARING PROTECTIVE DEVICE 39. MECHANICAL CONDITION MONITOR 40. FIELD RELAY 41. FIELD CIRCUIT BREAKER 42. RUNNING CIRCUIT BREAKER 43. MANUAL TRANSFER OR SELECTION DEVICE 44. UNIT SEQUENCE STARTING RELAY 45. ANTI-SIPHONIC CONDITION MONITOR 46. REVERSE-PHASE OR PHASE-BALANCE CURRENT RELAY 47. PHASE-SEQUENCE VOLTAGE RELAY 48. COMPLETE SEQUENCE RELAY 49. MACHINE OR TRANSFORMER THERMAL RELAY 50. INSTANTANEOUS OVERCURRENT OR RATE-OF-RISE RELAY 51. AC TIME OVERCURRENT RELAY 52. AC CIRCUIT BREAKER 53. BREAKER AUXILIARY SWITCH, OPEN WHEN THE BREAKER IS OPEN 54. BREAKER AUXILIARY SWITCH, CLOSED WHEN THE BREAKER IS OPEN 55. TRANSFER OR DC COIL/RELAY RELAY 56. RESERVED FOR FUTURE APPLICATION 57. POWER FACTOR RELAY 58. FIELD APPLICATION RELAY 59. SHORT-CIRCUITING OR GROUNDING DEVICE 60. RECTIFICATION FAILURE RELAY 61. OVERVOLTAGE RELAY 62. VOLTAGE OR CURRENT BALANCE RELAY 63. RESERVED FOR FUTURE APPLICATION 64. TIME-DELAY STOPPING ON OPENING RELAY 65. PRESSURE SWITCH 66. GROUND DETECTOR RELAY 67. GOVERNOR 68. NOTCHING OR JOGGING DEVICE 69. REMANENT CONTROL DEVICE 70. RHEOSTAT 71. LEVEL SWITCH 72. DC CIRCUIT BREAKER 73. LOAD-RESISTOR CONTACTOR 74. ALARM RELAY 75. POSITION CHANGING MECHANISM 76. DC OVERCURRENT RELAY 77. PULSE TRANSMITTER 78. PHASE-ANGLE MISMATCHING OR OUT-OF-STEP PROTECTIVE RELAY 79. AC RECLOSING RELAY 80. FLOW SWITCH 81. FREQUENCY RELAY 82. DC RECLOSING RELAY 83. AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY 84. OPERATING MECHANISM 85. CARBIDE OR PULVE-WIRE RECEIVER RELAY 86. LOCKOUT RELAY 87. DIFFERENTIAL PROTECTIVE RELAY 88. AUXILIARY MOTOR OR MOTOR GENERATOR 89. LINE SWITCH 90. REGULATING DEVICE 91. VOLTAGE DIRECTIONAL RELAY 92. VOLTAGE AND POWER DIRECTIONAL RELAY 93. FIELD-CHANGING CONTACTOR 94. TRIPPING OR TRIP-FREE RELAY 95-99. USED ONLY FOR SPECIFIC APPLICATIONS IN INDIVIDUAL INSTALLATIONS WHERE NONE OF THE ASSIGNED NUMBERED FUNCTIONS FROM 1 TO 94 ARE SUITABLE.
	BREAKER AUX CONTACTS		TRANSFORMER
	BREAKER KEY INTERLOCK (IF INDICATES KEY MARCH)		AUTO TRANSFORMER
	DRAWOUT CELL		REACTOR
	H.V. CIRCUIT BREAKER (DRAWOUT) LETTER DESIGNATIONS IF USED: DSB: DC CIRCUIT BREAKER; SFR: SF6; VAC: VACUUM; R: RECLOSED		REACTOR (ALTERNATE SYMBOL)
	POWER DISCONNECT SWITCH		FIELD WINDING
	LOAD BREAK SWITCH		POTENTIAL TRANSFORMER
	FUSED CIRCUIT (POLE MOUNTED)		CURRENT TRANSFORMER
	FUSED SWITCH		ZERO SEQUENCE CURRENT TRANSFORMER
	AUTOMATIC TRANSFER SWITCH		TEST LINK/SWITCH/BLOCK (1-LINE DIAGRAM)
	MANUAL TRANSFER SWITCH		TEST LINK (WIRING DIAGRAM)
	CONTROL FUSE		PRIMARY SYSTEM/H.V. BUS/CABLE
	INDICATING INSTRUMENT: V = VOLTMETER A = AMPHETER H = FREQUENCY METER W = WATTMETER SS = SYNCHROSCOPE		INTERMEDIATE SYSTEM/H.V./M.V. BUS/CABLE
	TRANSDUCER		SECONDARY SYSTEM EDV AND LOWER BUS/CABLE
	CONVERTER		BODY BUSDUCT
	INVERTER		CONTROL SCHEMATICS
	REDUCED VOLTAGE STARTER		METERING AND PROTECTION
	VARIABLE FREQUENCY DRIVE		ROOM/EQUIPMENT OUTLINES
	INTERLOCKING/RELOCKING/MAX. DEMAND INSTRUMENT: HMS = PULVATE DEMAND METER HMV = PULVATE JAMPING RELUCTIVE METER EM = ELAPSED TIME (FOR HOURS METRES) AM = AMPHETER DEMAND METER		MECHANICAL INTERLOCK
	DIGITAL POWER METER (NUMBER INDICATES MODEL, e.g. PAL 7330, 1000, 10000) #110 INDICATES ECHAN DESIGNATION		ELECTRICAL AND/OR MECHANICAL INTERLOCK
	DIGITAL METERING SYSTEM POWER METER (ALTERNATE)		CABLE LABELS
	UTILITY POWER METER		PANEL FRONT DEVICES: Illuminated pushbutton (green) Pilot light (red) Non-illuminated pushbutton (STOP) Mushroom head pushbutton 2-Position selector switch 3-Position selector switch Potentiometer Cut-out with closing button
	SLP RING		
	CAPACITOR		
	AC MOTOR (20 DESIGNATES HP)		
	AC MOTOR (GENERAL)		
	DC MOTOR (GENERAL)		
	AC GENERATOR SET		
	DC GENERATOR (OR EXCITER)		
	CONTACTOR MAIN CONTACTS		
	VACUUM CONTACTOR		
	THERMAL OVERLOAD DEVICE		

ESD 16010-1201

LEGEND - LAYOUT DRAWINGS

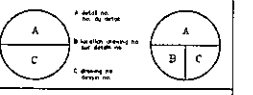
SYMBOL	DESCRIPTION
	FLUORESCENT LUMINAIRE
	CEILING MOUNTED LUMINAIRE
	WALL MOUNTED LUMINAIRE
	LUMINAIRE ON EMERGENCY/24HR CIRCUIT
	BOLLARD/POST TOP LUMINAIRE
	POLE MOUNTED LUMINAIRE
	DIRECTIONAL LUMINAIRE
	SINGLE POLE TOGGLE SWITCH, CHAINED AS SHOWN LETTERS, WHERE SHOWN, DENOTE SWITCHING
	DOUBLE POLE TOGGLE SWITCH, CHAINED AS SHOWN LETTERS, WHERE SHOWN, DENOTE SWITCHING
	SINGLE POLE TOGGLE SWITCH W/OVERTURN AS FOLLOWS: 2 - TWO POLE 3 - THREE WAY 4 - FOUR WAY NP - NOTCHER PROOF XP - EXPLOSION PROOF P - C/W PILOT LIGHT K - KEY OPERATED D - DOOR OPERATED M - MOTOR STARTER MC - MOTOR STARTER, 3-POSITION
	LOW VOLTAGE SWITCH
	DIMMER SWITCH
	3 WAY DIMMER SWITCH
	VARIABLE SPEED SWITCH
	PHOTO ELECTRIC CELL
	EMERGENCY LIGHT BATTERY UNIT, WATTAGE AS SHOWN
	EMERGENCY LIGHT BATTERY PACK, SELF CONTAINED UNIT
	DUPLEX RECEPTACLE
	SPLIT WIRED DUPLEX RECEPTACLE
	4-PLEX RECEPTACLE
	SINGLE RECEPTACLE
	CEILING MOUNTED JUNCTION BOX
	WALL MOUNTED JUNCTION BOX
	MECHANICAL EQUIPMENT CONNECTION
	SPECIAL PURPOSE RECEPTACLE
	SPECIAL PURPOSE OUTLET
	MANUAL MOTOR STARTER
	MAGNETIC MOTOR STARTER
	NON-FUSED DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
	COMBINATION MAGNETIC STARTER/DISCONNECT SWITCH
	INDOOR SERVICE POLE
	SINGLE PHASE MOTOR CONNECTION
	THREE PHASE MOTOR CONNECTION
	SURFACE MOUNTED POWER PANEL
	RECESSED/FLUSH MOUNTED POWER PANEL
	PANEL DESIGNATION
	DISTRIBUTION PANEL DESIGNATION
	LINE VOLTAGE THERMOSTAT
	LOW VOLTAGE THERMOSTAT
	ELECTRIC FLOOR HEATER
	ELECTRIC UNIT HEATER
	ELECTRIC BASEBOARD HEATER RELAY
	ELECTRIC BASEBOARD HEATER RELAY AND TRANSFORMER
	ELECTRIC BASEBOARD HEATER, WATTAGE AS SHOWN
	GROUND ROD
	GROUND ROD IN ACCESSIBLE BOX
	END-TO-END GROUND CONNECTION POINT
	X-CONNECTION (GROUNDING)
	T-CONNECTION (GROUNDING)
	GROUNDING END CONNECTION WITH CABLE LUG, CLAMP CONNECTOR OR OTHER MECHANICAL CONNECTOR BOLTED TO EQUIPMENT
	WELDED OR EXOTHERMIC END CONNECTION (GROUNDING)
	GROUNDING PLATE (CAST FLUSH IN CONCRETE)
	TELEPHONE OUTLET
	DATA OUTLET
	COMBINATION DATA/TEL OUTLET C/W 2 DATA & 1 TEL UNLESS OTHERWISE INDICATED
	INTERROOM
	MICROPHONE OUTLET
	CEILING MOUNTED HORN
	WALL MOUNTED HORN
	WIREWOUND 5400 C/W OUTLETS AS INDICATED
	CEILING MOUNTED FIRE ALARM/PAGING SPEAKER
	WALL MOUNTED FIRE ALARM/PAGING SPEAKER
	CLOCK C/W MASTER CLOCK WIRING AND 120V RECEPTACLE
	SURFACE MOUNTED COMMUNICATIONS PANEL
	RECESSED/FLUSH MOUNTED COMMUNICATIONS PANEL
	FIRE ALARM SMOKE DETECTOR
	FIRE ALARM DUCT SMOKE DETECTOR
	FIRE ALARM HEAT DETECTOR, RATE OF RISE
	FIRE ALARM PULL STATION
	FIRE ALARM MAGNETIC DOOR HOLDER
	FIRE ALARM CHIME
	FIRE ALARM STROBE
	END OF LINE RESISTOR
	HORN (FIRE ALARM SPEAKER)
	SMOKE ALARM
	FIRE ALARM ANNUNCIATOR
	FIRE ALARM CONTROL PANEL
	ZONE ADDRESSABLE MODULE
	ARRIER MODULE (INTRINSICALLY SAFE)
	FIRE ALARM ZONE ISOLATION MODULE
	SUPERVISORY SWITCH
	FLOW SWITCH
	PRESSURE SWITCH
	GATE VALVE
	CARD READER
	DOOR CONTACT
	ELECTRIC STRIKE
	ELECTROMAGNETIC LOCK
	POWER HINGE ELECTRIC LOCK
	REQUEST TO EXIT DEVICE
	PIR TYPE REQUEST TO EXIT DEVICE
	DOOR REFERENCE NO.
	FIRE MOTION DETECTOR
	ACTIVE BEAM MOTION DETECTOR
	GLASS BREAK DETECTOR
	DURESS BUTTON
	COMBINED STROBE AND SIREN
	STROBE
	ALARM HORN
	BUZZER
	INTRUSION ALARM KEYPAD
	INTERCOM STATION
	STEPPLAN CONDUIT/DUCT RUNS (SURFACE)
	STEPPLAN CONDUIT/DUCT RUNS (UNDERGROUND)
	STEPPLAN CONDUIT/DUCT RUNS (OVERHEAD)
	NEW DEVICES
	DEVICE WIRING (SURFACE)
	DEVICE WIRING (IN FLOOR/CONCEALED)
	EXISTING DEVICES
	FUTURE DEVICES
	MAIN CONDUIT ROUTE
	CONDUIT DOWN (AWAY FROM VIEWER)
	CONDUIT UP (TOWARDS VIEWER)
	CONDUIT HOME RUN
	CABLE TRAY DESIGNATOR (e.g. LADDER TYPE, 300mm WIDE)
	CABLE TRAY
	OPEN GRATE METAL PLATE
	SOLID METAL CHECKER PLATE

ESD 16010-1204(+)



TEMPORARY NOTES:
 Ⓚ SYMBOL IN REVIEW

1	BY THE ABOVE APPROVED FOR THE PROJECT	14 OCT 2006
2	BY THE ABOVE APPROVED FOR THE PROJECT	13 JUN 2006
3	BY THE ABOVE APPROVED FOR THE PROJECT	15 AUG 2006
4	BY THE ABOVE APPROVED FOR THE PROJECT	31 MAY 2006



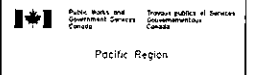
ESQUIMALT GRAVING DOCK
 ESQUIMALT, B.C.
 ELECTRICAL MASTER DRAWING

SYMBOL LEGEND

Drawn by	M. K. ÇANÇAR	Date	
Checked by	J. OSAGIE	Date	
Approved by		Date	
Scale			
Project No.		Revision No.	

Note: All dimensions are given in millimeters unless otherwise stated.
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NOTES:
 1. STANDARD PWGSC FONT SIZE OF 2.5mm NOT IMPLEMENTED ON EMD DRAWINGS BY SPECIAL PERMISSION. NOMINAL SIZE OF 3mm USED.



ABBREVIATIONS			
AIR CIRCUIT BREAKER	ACB	HAND	*H
ALARM	ALM	HARDWARE	*HW
ALTERNATING CURRENT	*AC	MAGNETIC FETTER BANK	*MFB
ANNUNCIATOR	ANN	HIGH VOLTAGE	*HV
APPROXIMATELY	*APPRX	HORIZONTAL	*HORIZ
ARRESTER	ARST	INCANDESCENT	*INCAN
AUTOMATIC	*AUT	INDICATE	*INDR
AUXILIARY	*AUX	INDICATOR, INDICATING	*IND
BOLDER	BLR	INDUCTION (MOTOR)	*IND
BRAKE	BRK	INFORMATION	*INFO
BREAKER	*BRKR	INTERLOCK	*INTLK
DC HYDRO	DC	LIGHT	*LT
BY-PASS	*BYP	LIGHTING	*LTD
CABINET	CAB	LIMIT SWITCH	*LS
CABLE LIST	*CL	LOCAL	*LOC
CAPACITOR	CAP	LOCK-OUT ATTACHMENT	*LOA
CIRCUIT	*CCT	LOW VOLTAGE	*LV
CIRCUIT BREAKER	CB	MANUAL	*MAN
CLOSED CIRCUIT TELEVISION	CCTV	MANUFACTURER	*MFR
COMMUNICATION(S)	*COMM	MATERIAL	*MTRL
COMPLETE WITH	*C/W	MEASUREMENT	*MTR
CONSOLE	*CONS	MISCELLANEOUS	*MISC
CONTACTOR	*CNT	MOTOR	*MOT
CONTROL	*CTRL	MOTOR CONTROL CENTRE	*MCC
CURRENT TRANSFORMER	CT	MOTOR FIELD RHEOSTAT	*MFR
DECREASE	*DECR	MOUNTED	*MNTD
DIA	*DIA	MOUNTING	*MNTG
DIGITAL METERING SYSTEM	*DMS	NETWORK	*NET
DIRECT CURRENT	*DC	NOT APPLICABLE	*N/A
DIRECT DIGITAL CONTROL	*DDC	OFF	*OFF
DISTRIBUTION	*DIST	OIL CIRCUIT BREAKER	*OCB
DOWN	*DN	ON	*ON
DRAINING	*DRAIN	ORIGINAL EQUIPMENT MANUFACTURER	*OEM
EACH	*EACH	OVERLOAD	*OVL
ELECTRICAL EQUIPMENT LIST	*EEL	PANMOUNT	*PMNT
ELECTRICAL MASTER DRAWING(S)	*EMD	PANEL	*PNL
ELECTRICAL STANDARD DRAWING(S)	*ESD	PHASE	*PH
EMERGENCY	*EMER	PHOTOELECTRIC CONTROL	*PEC
ELECTRICALLY OPERATED VALVE (e.g. SOLENOID VALVE)	*EVO	PILOT LIGHT/PILOT LAMP	*PLT
EXISTING	*EXIST	POINT OF COMMON COUPLING	*PCC
FEEDER	*FEED	POLARITY	*PLRT
FIELD	*FLD	POTENTIAL TRANSFORMER	*PT
FIRE ALARM	*FAL	POWER	*PWR
FLOAT SWITCH	*FLTS	POWER FACTOR RELAY (SS)	*PFR
FLOW SWITCH	*FLWS	PRESSURE SWITCH	*PS
FLOURESCENT	*FLU	PRIMARY	*PRI
FOOT CANDLE	*FC	PROGRAMMABLE LOGIC CONTROLLER	*PLC
TORNAW	*TORNAW	PUSH BUTTON	*PB
FULL LOAD AMPS	*FLA		
FUSE	*FU		
GALVANIZED	*GALV		
GENERATOR	*GEN		
GROUND	*GRD		
GROUND FAULT MONITORING SYSTEM	*GFMS		
		RECEPTACLE	*RECP
		RELAY	*REL
		REMOTE	*REM
		REVERSE	*REV
		ROOM	*RM
		SCHEMATIC	*SCHEM
		SECONDARY	*SEC
		SELECTOR	*SEL
		SH	*SH
		SOFT START	*SS
		SOLENOID VALVE	*SV
		SPEED/ACCELERATION	*S/AC
		SPEED SWITCH	*SSW
		STANDARD	*STD
		START	*STR
		STOP	*STR
		STOP	*STOP
		SUPPLIED WITH EQUIPMENT	*SWE
		SWITCH	*SW
		SWITCHBOARD	*SWSB
		SWITCHGEAR	*SWG
		SYNCHRONOUS/SYNCHRONIZING	*SYNCH
		TEST SWITCH	*TSW
		TEMPERATURE	*TEMP
		TEMPERATURE	*TEMP
		TERMINAL BLOCK	*TB
		TEST TERMINAL	*TT
		TERMINAL	*TT
		TRANSFORMER	*TRF
		TRANSFORMER	*TRF
		TRANSMITTER	*TRM
		TYPICAL	*TYP
		UP	*UP
		VERTICAL	*VERT
		WEATHERPROOF	*WP
		WINDING	*WDG
		ZERO SEQUENCE CT	*ZCT
		COLOURS	
		BLACK	*BLK
		BLUE	*BLU
		BROWN	*BRN
		GREEN	*GRN
		ORANGE	*ORG
		RED	*RED
		YELLOW	*YEL
		WHITE	*WHT
		SLATE	*SLT

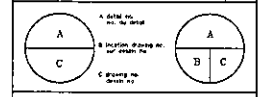
NOTES:
 1. UNLESS OTHERWISE NOTED, ABBREVIATIONS ARE IN ACCORDANCE WITH CSA Z85-1983
 2. ABBREVIATIONS IN BRACKETS ARE ALTERNATE CHOICES.
 3. ASTERISK (*) INDICATES ABBREVIATIONS NOT COVERED BY OR CONTRARY TO CSA Z85-1983.
 4. SINGLE LETTER ALTERNATE CHOICES ARE PRIMARILY INTENT FOR USE ON SINGLE LINE SCHEMATIC AND WIRING DIAGRAMS AS PART OF THE DEVICE SYMBOL.
 5. FOR INSTRUMENT DESIGNATIONS USED ON SINGLE LINE DIAGRAM, SEE REF. 1.

REFERENCE DRAWINGS	
EMD	SYMBOL LEGEND

ESD 18010-101

2011-11-15 10:15 AM - Drawn by: M. K. QANJAR, Checked by: J. OSAGIE, Approved by: M. K. QANJAR, Date: 2011-11-15 10:15 AM

BY	M. K. QANJAR	DATE	2011-11-15
CHECKED	J. OSAGIE	DATE	2011-11-15
APPROVED	M. K. QANJAR	DATE	2011-11-15



PROJECT
ESQUIMALT GRAVING DOCK
 ESQUIMALT, B.C.
 ELECTRICAL MASTER DRAWING

ABBREVIATIONS

DESIGNED BY	M. K. QANJAR
CHECKED BY	J. OSAGIE
APPROVED BY	M. K. QANJAR
DATE	2011-11-15

EMD E9002 REV.1

APPENDIX D
EGD LOCKOUT POLICY

**PUBLIC WORKS AND GOVERNMENT SERVICES
ESQUIMALT GRAVING DOCK**

Health Safety & Environmental Management System

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Subject: Lockout Policy & Procedures

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LOCKOUT POLICY, PROCEDURES & RECORDS

ESQUIMALT GRAVING DOCK



Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

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Risk Management	Jim Milne	18 July 2012	FINAL	01

**PUBLIC WORKS AND GOVERNMENT SERVICES
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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.

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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.**

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Note that there are numerous requirements within the Canadian Electrical Code, general requirements of PWGSC Departmental Policy 058, WORKSAFEBEC 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

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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.

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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 WORKSAFEBBC 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.

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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

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 DP058
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)

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.).

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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

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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

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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:

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- 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.

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- 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

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.

WORKSAFEBC 10.4

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.

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- 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):

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:

WORKSAFEBC
10.4
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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.

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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.

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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:

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- 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 1 of 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.

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- 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.

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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.

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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).

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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.

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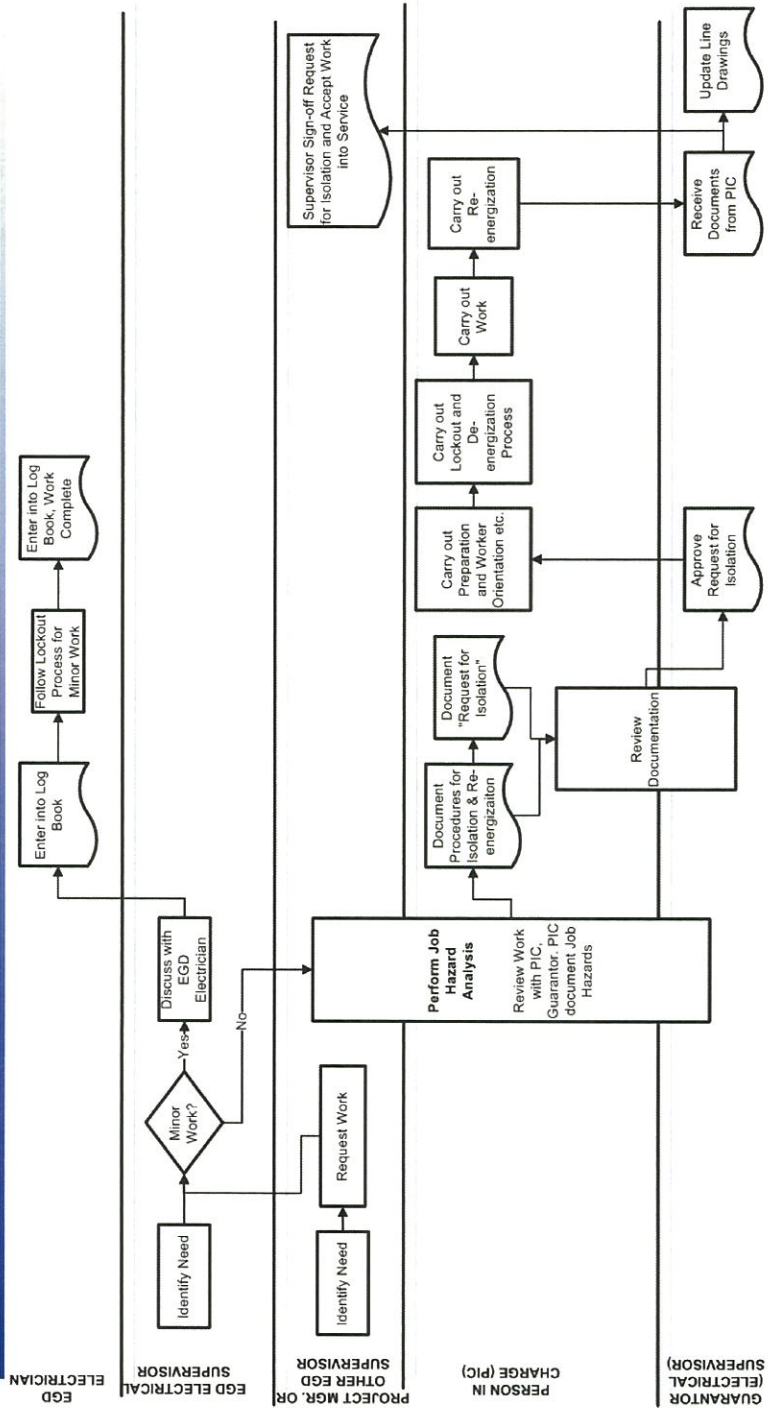
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ESQUIMALT GRAVING DOCK - LOCKOUT PROCESS



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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.

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- 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.

- 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.
- 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.
- 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.
- 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.
- 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!***
- Carry out the work for which de-energization and lockout is necessary.
- 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".
- 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.
- 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.
- 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.

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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 section 11). 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
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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.

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3. Have been informed of the potential hazards and provided with and follow appropriate **written** safe work procedures.

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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.
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.

WORKSAFEBC
19.10

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.

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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.
2. When working on H.V. systems, isolating devices used for safety protection guarantees must provide for *visual verification* of the isolation point.
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.
4. All H.V. work requires 2 or more Qualified Electricians authorized by the Guarantor, to be present while the work is being done.
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.
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.

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WORKSAFEBC
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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.

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- 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

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.

WORKSAFEBC
19.22

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.

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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

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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;

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(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	
	Metres	Feet
Phase to phase		
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.]

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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.

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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".

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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:

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- 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

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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.

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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.

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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.

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20.0 MISCELLANEOUS:

TREE PRUNING:

Tree Pruning and falling near energized conductors must conform to the requirements of WORKSAFEBBC regulations in WORKSAFEBBC 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

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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

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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

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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.

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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.

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ESQUIMALT GRAVING DOCK**

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APPENDIX 3- RECORD OF SAFETY DISCUSSION FORM

Contractors may use their own form. A larger version is available.



RECORD OF SAFETY DISCUSSION					
DATE:			TIME:		
LOCATION:					
DESCRIPTION OF JOBTASK:					
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 APPETACHE			COMMUNICATIONS		
OTHER WORKERS/ CONTRACTORS			CONFINED SPACE ENTRY		
COVER-UP REQUIREMENTS			UNDERGROUND UTILITIES		
TEST FOR POTENTIAL			WEATHER CONDITIONS		
INDUCTION HAZARDS			ENVIRONMENTAL CONCERNS		
FEEDBACK HAZARDS			CONDUCTIVE CONDITION		
GROUNDING/ EQUIPOTENTIAL			ADJACENT STRUCTURES		
ADEQUATE DRAWINGS ON SITE			HOUSEKEEPING		
QUALIFICATION # 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					

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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 <u>certain conditions</u> .
5 mA	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong <u>involuntary reactions</u> 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 <u>muscular contractions</u> . Individual cannot let go. <u>Death is possible</u> .
1000-4300 mA	Ventricular fibrillation (the rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. <u>Death is</u>

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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.

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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#death%20is%20most%20likely

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.

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APPENDIX 5 - SAMPLE LOCKOUT DOCUMENTS



Job Hazard Analysis (JHA)		
Job Name: Isolate Crane Functions for Wheel Change		
Frequency: Infrequent		
Analysis By: Joe Leggett	Reviewed By: Mike Ledson	Approved By: Joe Leggett
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 points
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

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**REQUEST FOR ELECTRICAL ISOLATION
DEMANDE DE COUPURE À LA SOURCE**

A. Building Name and Address - Nom et adresse de l'immeuble		Isolation Request No. N° de demande de coupure à la source	
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.)		EGD - 473	
E.G.D. YARD S. SIDE		Date and Time of Request - Date et heure de la demande	
Description of Installation or Equipment to be Isolated Description de l'installation ou de l'appareillage devant être coupé à la source		Date ▶ 0,2|0,3|15 Hour ▶ 09:00	
30 T CRANE GANTRY, MAIN HOIST & SLEW FUNCTIONS & CHOCK WHEELS		Isolation to Start On Coupure à la source devant débuter le	
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.)		Date ▶ 0,2|0,3|2,0 Hour ▶ 07:00	
SEE ATTACHED (2 PGS.)		Isolation to End On Coupure à la source devant se terminer le	
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.		Date ▶ 0,2|0,3|2,2 Hour ▶ 16:00	
Update of Line Drawings Required Upon Completion Nécessité de mettre à jour les schémas électriques une fois les travaux terminés <input type="checkbox"/> Yes Oui <input checked="" type="checkbox"/> No Non			
Requested by - Demandé par		Date	
Name of Person in Charge - Nom de la personne responsable	Signature	Y-A	M D-J Hour - Heures
MIKE LEDSON	<i>M Ledson</i>	0,2	0,3|1,0 08:00
Name of Guarantor - Nom du garant		Date	
Name of Guarantor - Nom du garant	Signature	Y-A	M D-J Hour - Heures
JOE LEZETC	<i>J. Lezetc</i>	0,2	0,3|1,5 09:00
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		Date	
Name of Person in Charge - Nom de la personne responsable	Signature	Y-A	M D-J Hour - Heures
MIKE LEDSON	<i>M. Ledson</i>	0,2	0,3|2,0 07:30
Line Drawings Updated as Required Les schémas électriques ont été mis à jour tel que demandé <input type="checkbox"/> Yes Oui <input checked="" type="checkbox"/> No Non			
Name of Person in Charge - Nom de la personne responsable		Date	
Name of Person in Charge - Nom de la personne responsable	Signature	Y-A	M D-J Hour - Heures
MIKE LEDSON			
Name of Manager in Charge of Worksite or Supervisor Nom du gestionnaire responsable du lieu de travail ou du superviseur		Date	
Name of Manager in Charge of Worksite or Supervisor	Signature	Y-A	M D-J Hour - Heures
WYATT WRIGHT	<i>W. Wright</i>	0,2	0,3|2,2 16:00

PWGC-TSPGC 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) ▶ Manager in Charge of Worksite or Supervisor
Copie 1 (Blanc) ▶ Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow) ▶ To be submitted to, and retained by the Guarantor (upon completion of the work)
Copie 2 (Jaune) ▶ À remettre au garant à la fin des travaux. Le garant doit garder cette copie.

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Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

SAMPLE

**PROCEDURES FOR ISOLATION
PROCÉDURES DE COUPEURE À LA SOURCE**

PROCÉDURES

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: **EGD xxx Pg. 1 of 2**
Date (YY-MM-DD): **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.P. M.R.
2	GANTRY DRIVE		FIELD POWER OFF	J.P. M.R.
3	MAIN HOIST		ARMATURE POWER OFF	J.P. M.R.
4	MAIN HOIST		FIELD POWER OFF	J.P. M.R.
5	SLEW DRIVE		ARMATURE POWER OFF	J.P. M.R.
6	SLEW DRIVE		FIELD POWER OFF	J.P. M.R.
7	GANTRY WHEELS		INSTALL CHOCKS (2 REQ'D)	J.P. M.R.
8	GANTRY WHEELS		REMOVE CHOCKS (2 REQ'D)	J.P. M.R.
9	SLEW DRIVE		FIELD POWER ON	J.P. M.R.
10	SLEW DRIVE		ARMATURE POWER ON	J.P. M.R.
11	MAIN HOIST		FIELD POWER ON	J.P. M.R.

Prepared by - Préparé par

Name - Nom: **MIKE LEDSON M Ledson** Time - Heure: **09:00** Date (YY-MM-DD): **02-03-13**

Checked by - Vérifié par

Name - Nom: **JOE LEZETC J. Lezetc** Time - Heure: **08:00** Date (YY-MM-DD): **02-02-14**

Issued by - Émis par

Name - Nom: **JOE LEZETC J. Lezetc** Time - Heure: **09:00** Date (YY-MM-DD): **02-03-15**

Performed by - Effectué par

Name - Nom: **M. Ledson & J. Lezetc** Time - Heure: **07:30** Date (YY-MM-DD): **02-03-20**

Operating diagram adjusted by - Schéma fonctionnel corrigé par

Name - Nom: _____ Time - Heure: _____ Date (YY-MM-DD): _____

PWGS-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

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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 électrique» 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
EGD xxx Pg. 2 of 2 Date (YY-MM-DD) 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.P. M.R.
13	GANTRY DRIVE		FIELD POWER ON	J.P. M.R.
14	GANTRY DRIVE		ARMATURE POWER ON	J.P. M.R.

Prepared by - Préparé par

Name - Nom MIKE LEDSON M. Ledson Time - Heure 09:00 Date (YY-MM-DD) 02-03-13

Checked by - Vérifié par

Name - Nom JOE LEZETC J. Lezetc Time - Heure 08:00 Date (YY-MM-DD) 02-03-14

Issued by - Émis par

Name - Nom JOE LEZETC J. Lezetc Time - Heure 09:00 Date (YY-MM-DD) 02-03-15

Performed by - Effectué par

Name - Nom M. Ledson J. Lezetc MIKE LEDSON & JOE LEZETC Time - Heure 07:30 Date (YY-MM-DD) 02-03-20

Operating diagram adjusted by - Schéma fonctionnel corrigé par

Name - Nom Time - Heure Date (YY-MM-DD)

PWGSC-TPSGC 12 (12/1997)

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Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow)
Copie 2 (Jaune)

Originator
Demandeur

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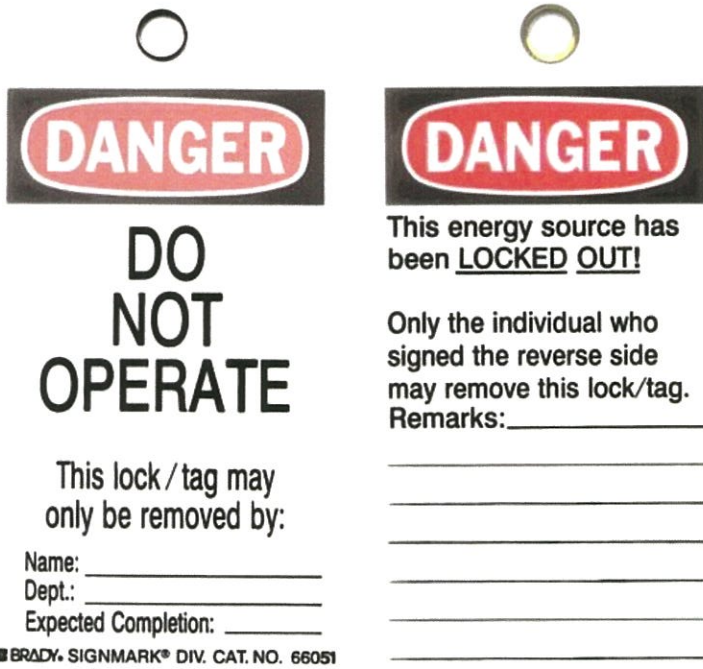
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APPENDIX 6 - TAGS ASSOCIATED WITH LOCKOUT

Note: Tags are examples only; to be modified for PWGSC.



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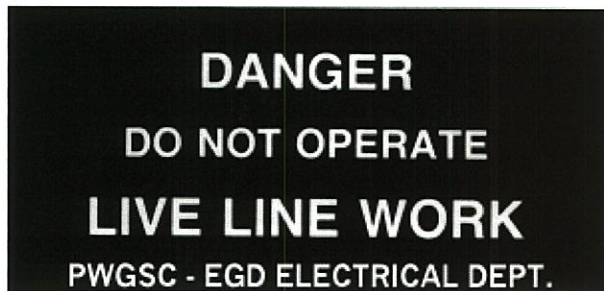
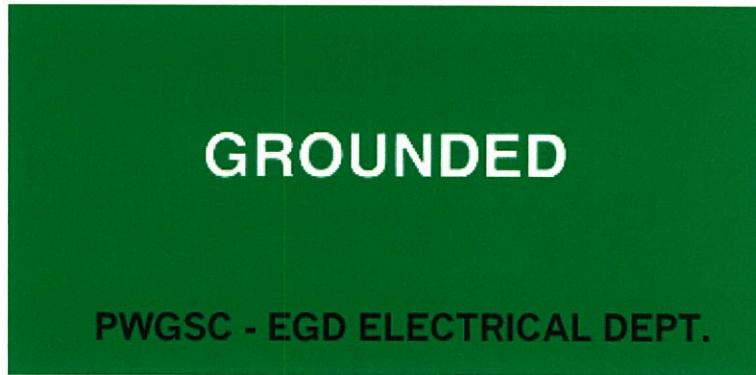
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APPENDIX 7 – RECORD OF ELECTRICAL WORK FOR MINOR PROJECTS (PWGSC-69)

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,

<i>Prepared For:</i>	<i>Approved By:</i>	<i>Date Issued:</i>	<i>Version:</i>	<i>Controlled Copy:</i>
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APPENDIX E
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

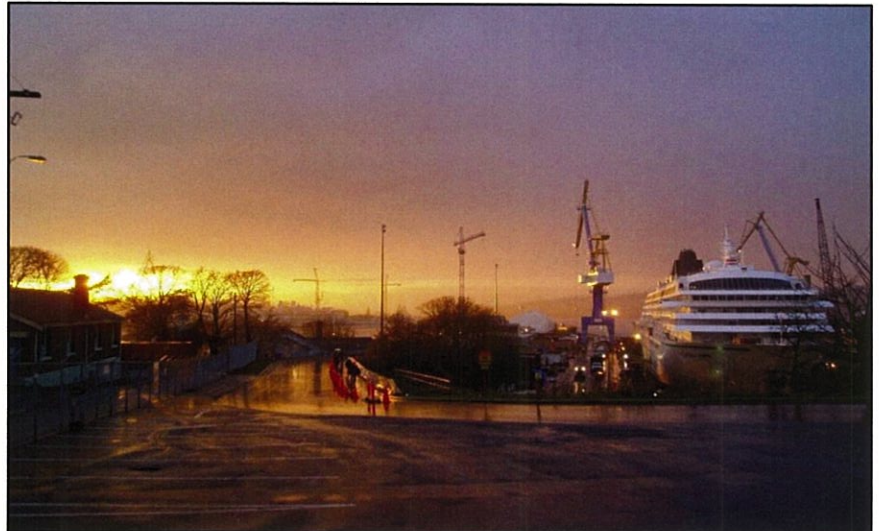


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Overview

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.

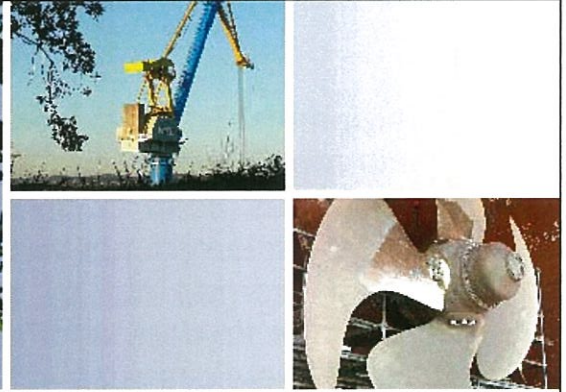
Industrial ship maintenance and repair operations have the potential to result in significant environmental issues and impacts. To help identify and manage these potential impacts, the EGD has implemented an **Environmental Management System (EMS)** certified under the internationally recognized standard **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 Director General Engineering Assets Strategy Sector	Jim Milne Director Esquimalt Graving Dock Engineering Assets Strategy Sector	David Latorki Operations Manager Esquimalt Graving Dock Engineering Assets Strategy Sector
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JULY 2009



Public Works
Gouvernement Services Canada

Travaux publics et Services
gouvernementaux Canada

ISO 14001
EMS-011
CGSB



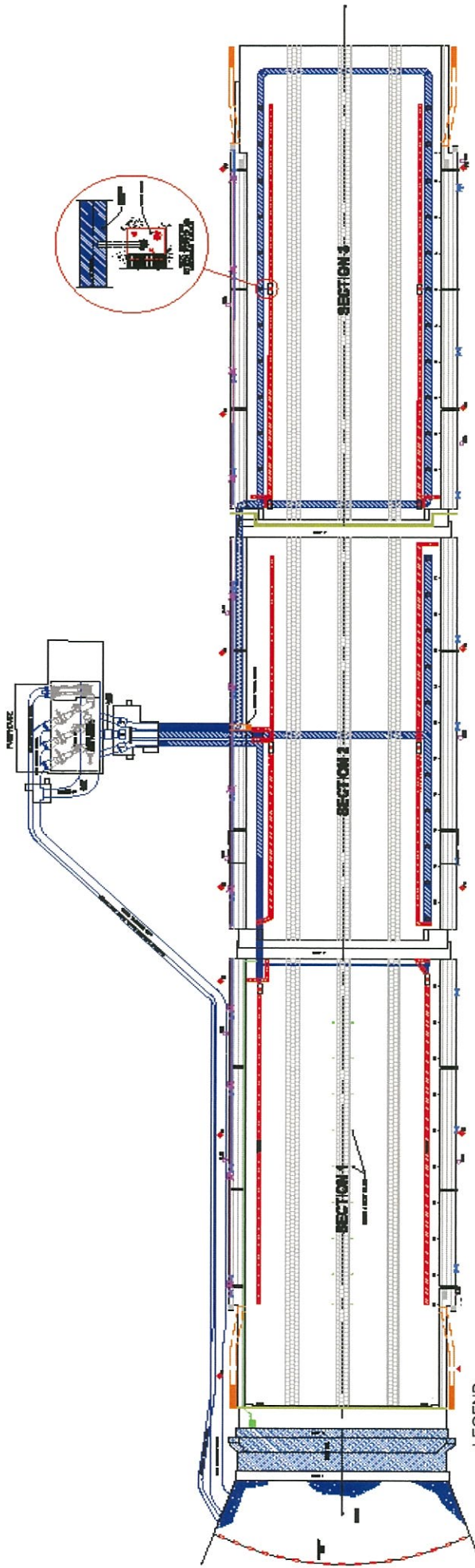
Canada

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	[Symbol]
STAIR	[Symbol]
FIRE ACCESS	[Symbol]
ELECTRICAL CONN.	[Symbol]
AIR CONNECTION	[Symbol]
WATER CONNECTION	[Symbol]
WATER PIPE	[Symbol]
TRENCH GRATE	[Symbol]
TUNNEL GRATE	[Symbol]
TUNNEL MANHOLE	[Symbol]
NET CAGE-	[Symbol]
MAIN TUNNEL ACCESS	[Symbol]
TRENCH DRAIN	[Symbol]
DE-WATERING TUNNEL	[Symbol]
SILL PUMP & PIPE	[Symbol]
MOON POOL	[Symbol]

ESQUIMALT GRAVING DOCK
1171' (357.1m) LONG
128' (41.2m) WIDE
49.5' (15m) 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.

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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.

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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.

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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



- 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

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Air Quality Alarm

The Esquimalt Graving Dock has an onsite PM₁₀ monitor in partnership with the Ministry of Environment.

If particulate matter levels in the air exceed 100µg/m³ 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.

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Keel/Bilge Blocks

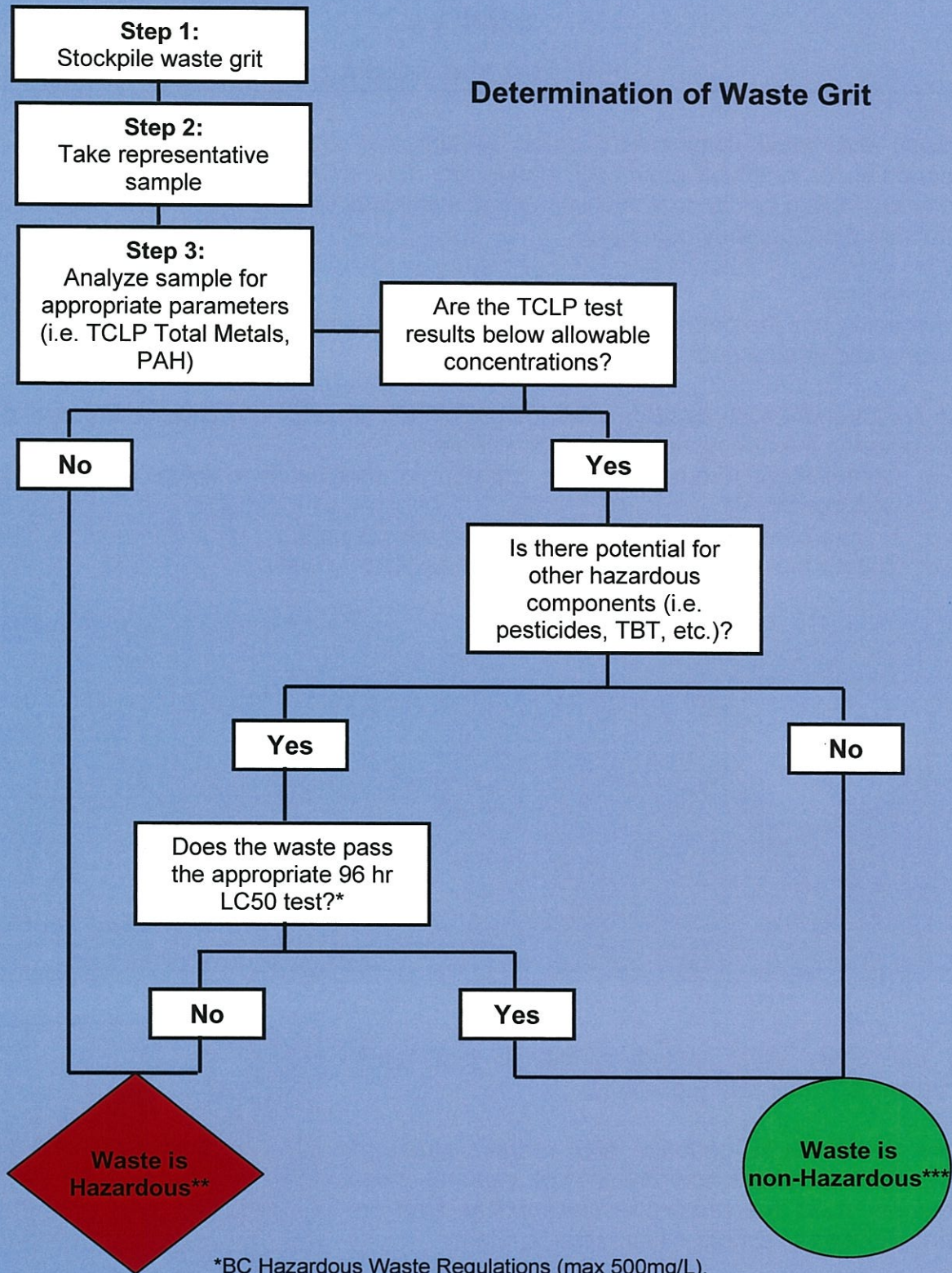
Keel and bilge blocks on dock bottom present a challenge for clean up of spent waste grit.

Excess blocks stored in dock bottom may be moved prior to sandblasting, or covered to prevent grit from collecting between the blocks.



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Determination of Waste Grit



*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.

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BMP #3

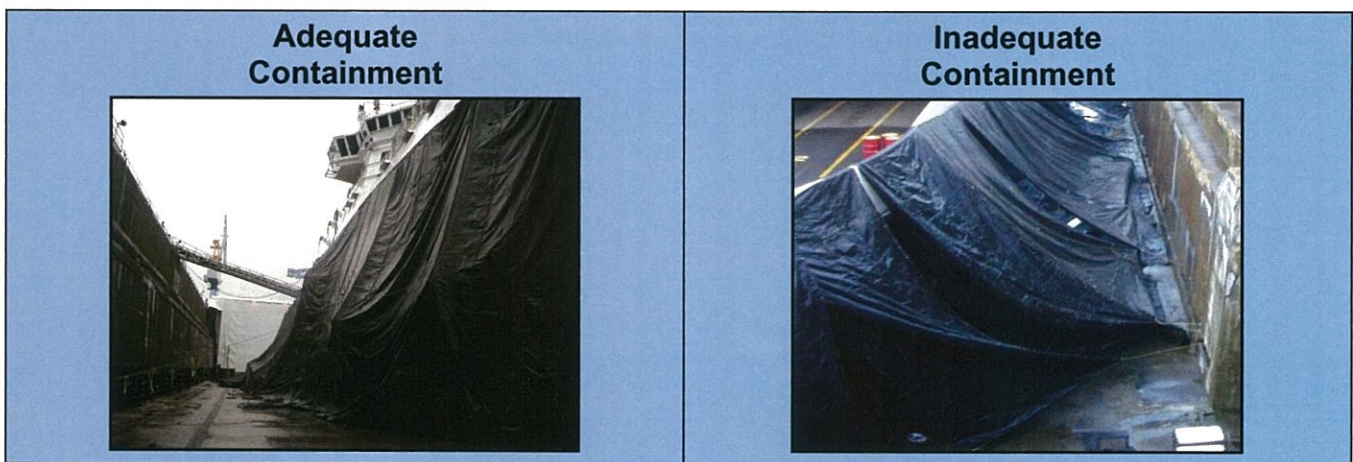
Painting and Coating

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.

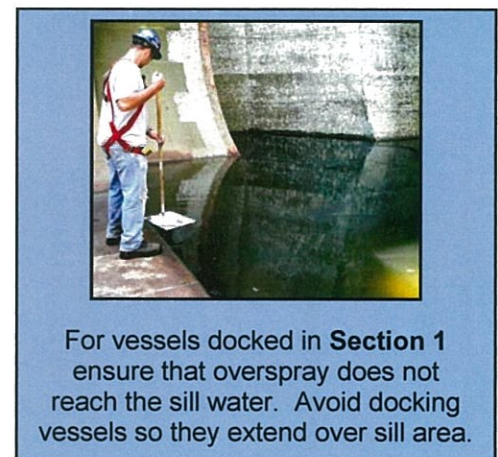
Paint Overspray

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.



- 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).



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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

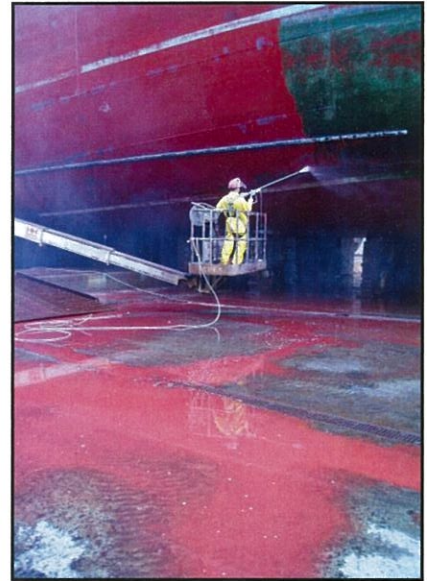
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BMP #4

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.

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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.

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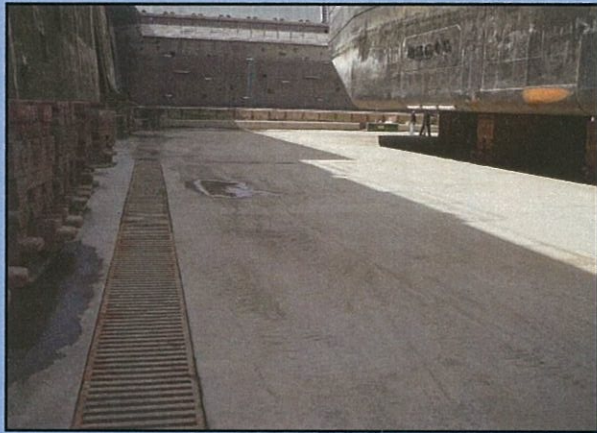
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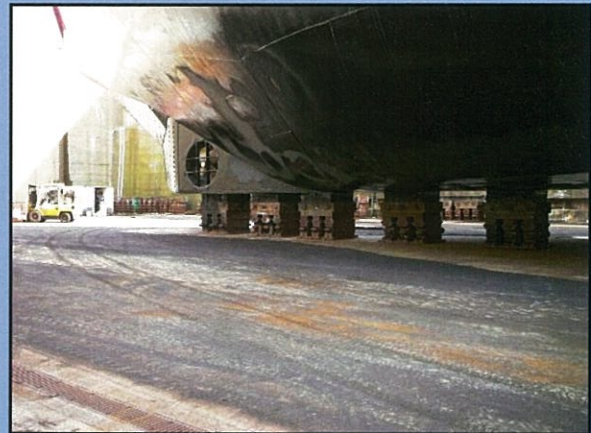
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Inspection and Cleanliness

- 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.

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Important Locations	Acceptable	Not Acceptable
Ramps		
Sills		
Keel Blocks		
Trench Drains		
Sump Wells		

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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

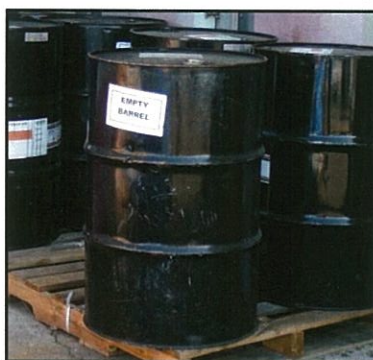


Materials must be:

- 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.

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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.



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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.



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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.



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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



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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.

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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.



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BMP #9

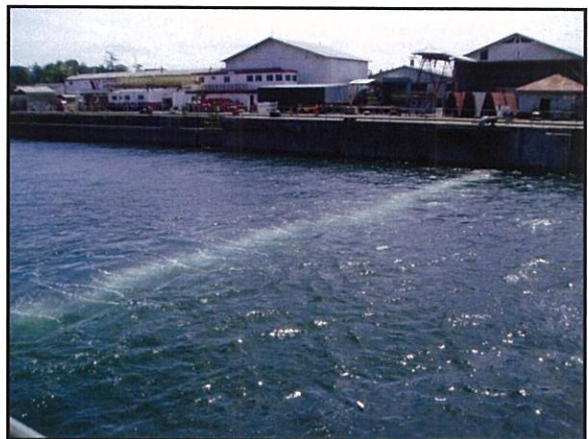
Fish and Wildlife Management

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

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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



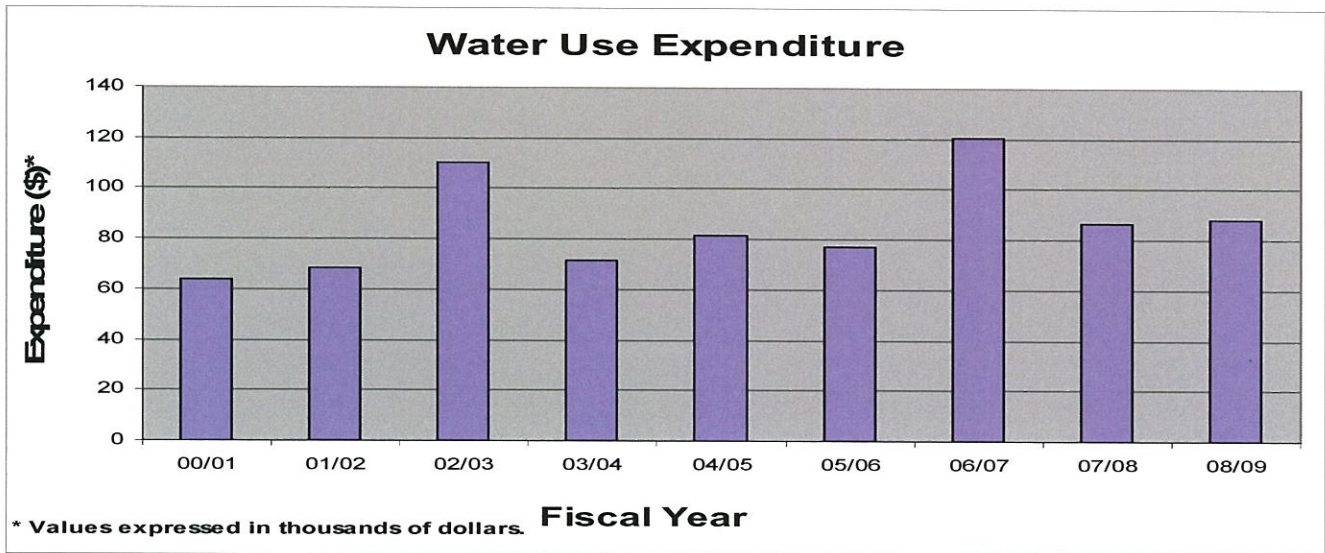
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BMP #10 Water Use


Water consumption and the quality of water are considerations of the environmental management system at the Esquimalt Graving Dock (EGD).

Water Consumption

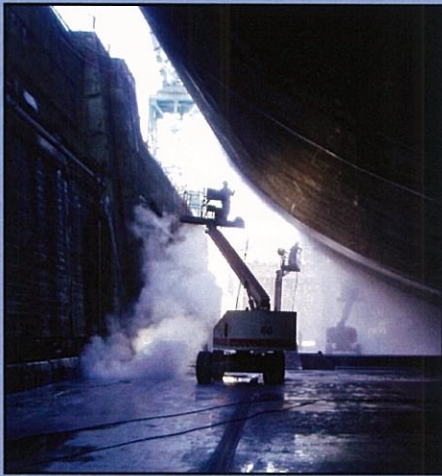
Large volumes of water are used during normal operations at the facility; because of this the EGD is considered a high volume user of fresh water in the Capital Region.



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

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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.



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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.

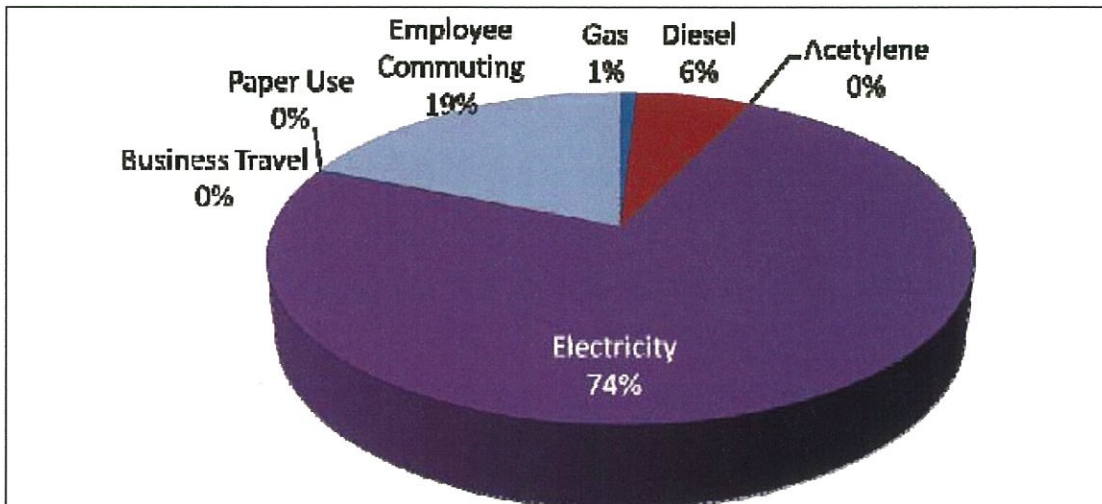
- Do not idle vehicles near building doorways or air intakes
- Vehicles must be turned off if idling for more than 3 minutes in a 60 minute period



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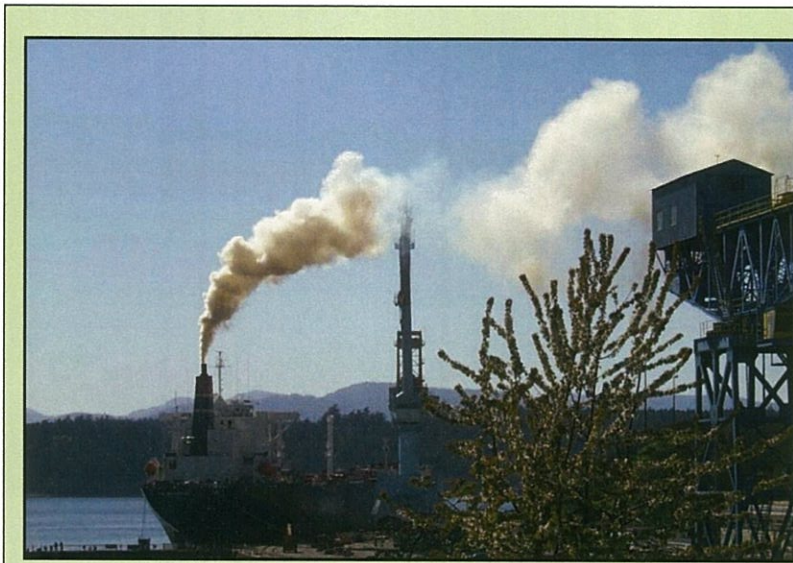
Greenhouse Gas Emissions:

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.

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BMP #12

Nuisance 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:

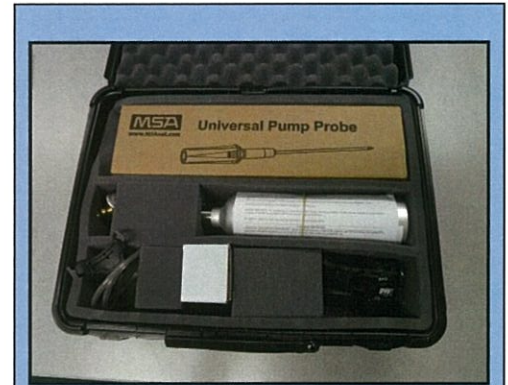
- a) the erection, alteration, repair, relocation, dismantling, demolition and removal of a building;
- b) structural maintenance, power-washing, painting, land clearing, earth moving, grading excavating, the laying of pipe and conduit, concrete placement, and the installation, or removal of construction 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.

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Odour

- Daily dock operations often create strong and unpleasant odours whether from the release of VOCs, H₂S, 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.



H₂S Meter

The EGD utilizes an H₂S 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.



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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.

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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

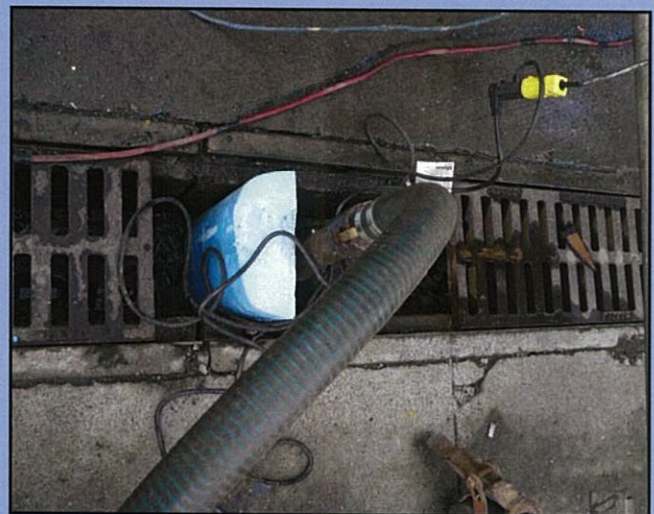
For access to the EGD spill response resources, contact EGD Management or Commissionaires.

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**

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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

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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.



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.

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.

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

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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.



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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.

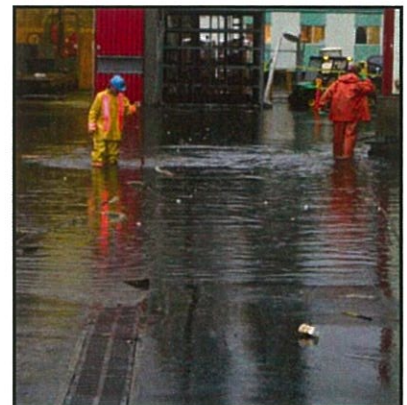
Materials Storage:

- 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.



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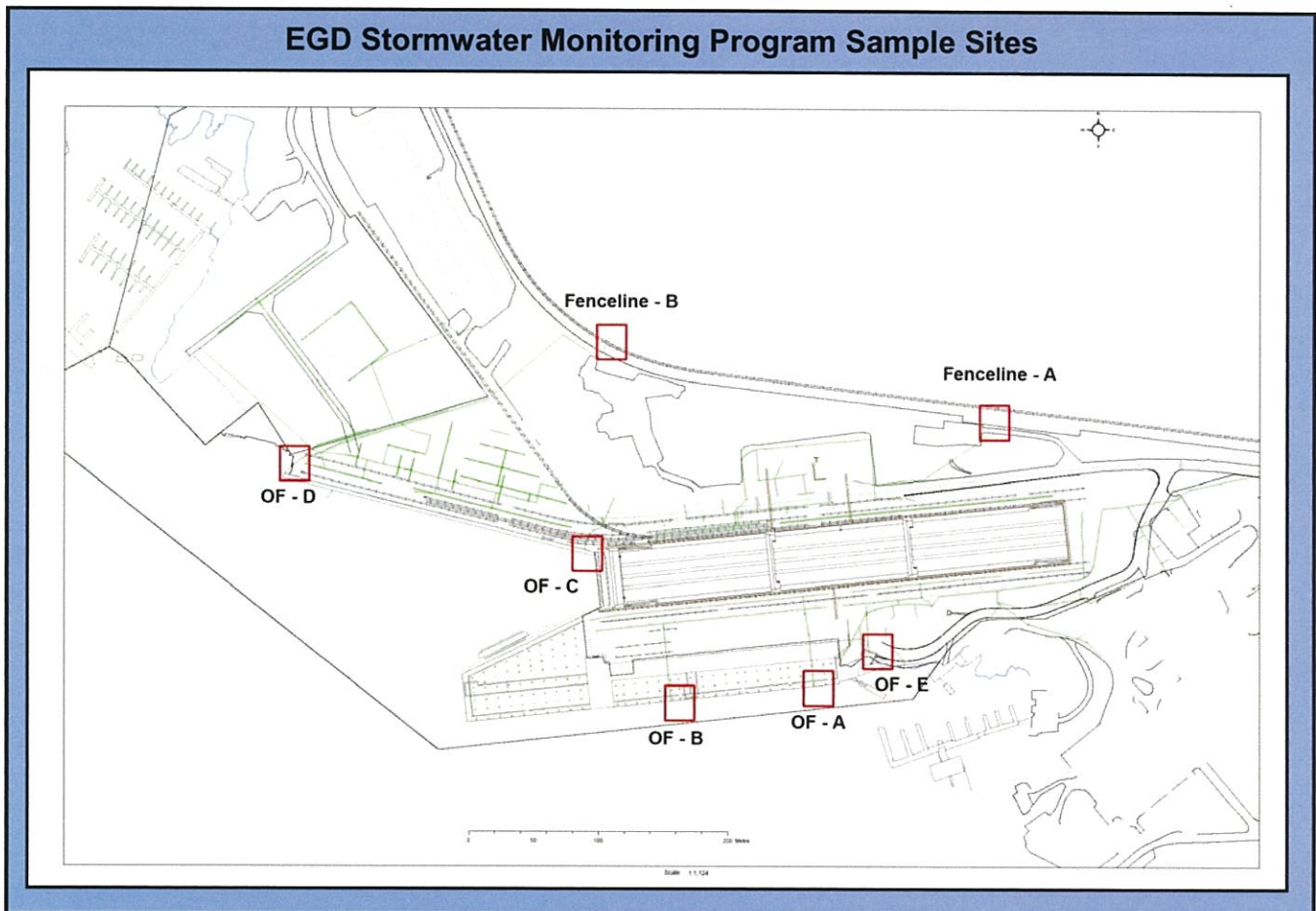
During heavy rain events in dock bottom:

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, tributyltin, LEPH/HEPH and microbiological parameters.



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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

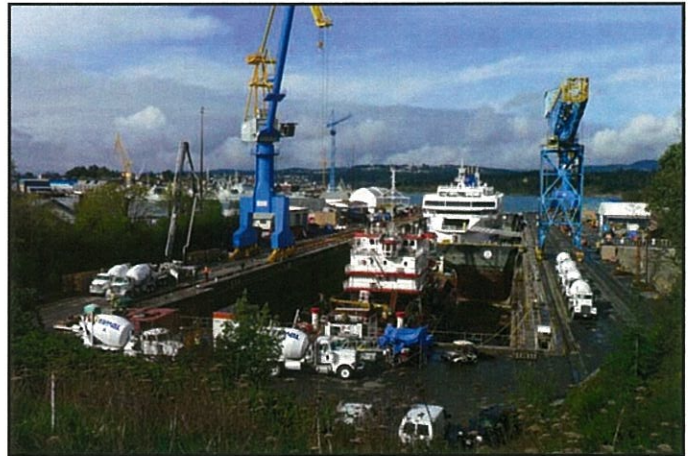
Maintenance and repair of the aging EGD infrastructure often results in waste generation and other environmental issues which need to be addressed.

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*****

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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.



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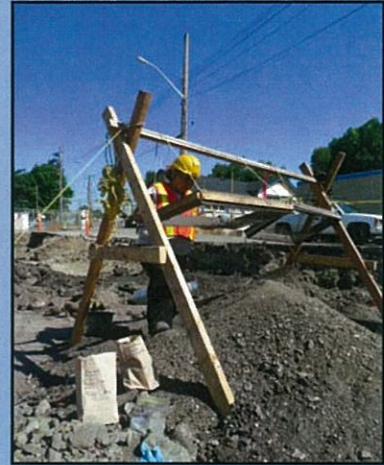
Archaeological Considerations

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.

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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.

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Requirements for Small Excavations (less than 10m³)

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.

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APPENDIX F
PRELIMINARY JOB HAZARD ANALYSIS



Preliminary JOB HAZARD ANALYSIS CHECK LIST

October 2014

APPENDIX F

Project Title: EGD High Voltage Switchgear Refurbishment

Project No. R.106116.123

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.



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Cond No.	Condition	Existing √	CODE	WORKS AFEBC Ref. #	Hazard/ Action Required
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

GENERAL



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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.



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		√	*	3.16 & 3.17	Contractor to provide <u>written</u> first aid assessment and written procedures for providing first aid to comply with first aid amendments effective 1 Feb/08
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?	√	*	3.10	To be covered at the pre-startup safety orientation meeting.
2.2	Workers instructed to report ALL injuries or near misses, hazardous conditions?	√	*	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.
2.3	Workers know where first aid is located and how to call for first aid? Communication between first aid attendant and ambulance service defined?	√	S	Part 3	Required. Provide certificate(s) to Project Manager before orientation session.
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	3.16	Provide location and type.
2.5	F.A. equipment on site where required? Must comply with "High" Hazard class 20 min or less travel to hospital.	√	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.
2.6	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	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.
2.7	Provide emergency transport to hospital as required by WORKSAFEBC and written procedures for transport	√	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 1/2 shift absence is permissible for unplanned absence until replacement attendant is in place.
2.8	Is the first aid attendant available to render prompt service?	√			

FIRST AID & INVESTIGATIONS



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		✓	S	3.20	General Contractor's first aid assessment and procedures to include sub-contractors.
2.9	Has the general contractor included all subs in determining the numbers or workers and first aid requirements	✓	S		
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.
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	

CHEMICAL/BIOLOGICAL - WHMIS



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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.



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		Follow MSD Sheet instructions.		S		Follow MSD Sheet instructions.
WORKING ALONE	3.26	Follow proper procedures in disposing of hazardous substances.	√	S		
	3.27	Other	TBD			
CONFINED SPACE		Note: Refer to WHMIS Implementation Plan checklist when doing inspections for hazardous substances	TBD	S		Create inspection checklist where required.
	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.
	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.



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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:				



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									All lockout points are labelled.
6.24	Are lockout points easily identifiable (eg. By number) to prevent lockout errors and identify the equipment it serves?	✓	S	19.13					Generally there should be no other users of panels while the project work is underway. Confirm.
6.25	Note that lockout of a panel door preventing access to other live breakers is unacceptable.	✓	S						Reminder item
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.
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.

FALL PROTECTION



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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.
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.

FIRE RELATED



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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.
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.

LADDERS/CAFFOLDS & TEMP WORK PLATFORMS



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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.



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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 10 th 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.



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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).	
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).	
PROTECTIVE EQUIPMENT						



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10.6	Wear Hearing Protection when required by WORKSAFEBEC regulations.	√	O	7.1-7.9	Hearing protection required when in high noise situations exceeding WORKSAFEBEC 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 <i>CSA Standard before each use</i> .
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.
11.1	Heat Stress Control Required? Followed?	√	S	7.27	To be determined by Contractor's Superintendent based on section 7 WORKSAFEBEC regulations (Jan/05), weather conditions, and worker proximity to heat sources and clothing worn.



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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 & LIFTING	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.
	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.
MOBILE EQUIPMENT & TRANSPORT OF WORKERS	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.



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	14.8	Do not leave delivery vehicles unattended for extended periods.	✓	*			Contractor to enforce.
	14.9	Do not hitch a ride on forklifts unless proper seats exist for this purpose.	✓	*			Contractor to ensure vehicles meet WORKSAFEBEC requirements.
	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 workers cannot be injured by unsecured items in the vehicle.
	14.11	Ensure tools/materials/ equipment are carried in separate designated area for that purpose.	✓	S	17.5		Ensure workers do not leave equipment parts unattended in an elevated condition or work under equipment unless properly secured.
	14.12	Equipment properly secured if elevated? No use of hydraulic or pneumatic lifts as blocks unless collapse not possible.	✓	S	16.37		Contractor to ensure loads are 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 workers have training & equipment if they will change tires.
	14.14	Workers have procedures, equipment and training for fire repairs?	✓	S	16.47-16.48		No blocking planned or required.
	15.1	Is there any blocking of roadways, or aisles during the project? If so install signs, barricades etc.	NA	S&O			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.
	15.2	Will gantry crane travel through the work area? Coordinate with the crane supervisor.	✓	*			The Engineer will ensure all supervisors and contractors on site are aware of the work and schedule.
	15.3	Is there operations activity near the project site? Ensure coordination and minimize impact.	✓	S&O			Provide controls if working near water.
	15.4	Control boat traffic and ensure flags and markers are in place.	✓	S&O			Define need and document special traffic control measures. Ensure traffic control plan prepared by a qualified person is in place meeting MoTH requirements and WORKSAFEBEC regulations.
	15.5	Is there a need to protect Public Roadways? Review WORKSAFEBEC PART 18.	✓	S&O	PART 18		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.
TRAFFIC CONTROL	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			



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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.
16.1	Written procedures developed?	√	S&O	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.

EVACUATION & RESCUE



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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	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 lifter assist wherever feasible or get assistance.	√	S			Contractor to train all workers in safe lifting practices and monitor for compliance.		



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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.				

ASBESTOS



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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	✓	0	6.12	
25.11	Monitoring carried out as req'd by PART5?	✓	0	6.12	
25.12	Monitoring during high risk activities carried out and provided to workers within 24 hrs?	✓	0	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	✓	0	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?	✓	0	6.13	Prepare area before starting work
25.15	Signs posted restricting entry?	✓	0	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	✓	0	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?	✓	0	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/	✓	0	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?	✓	0	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.	✓	0	6.26	Ensure exterior of waste containers, reusable equipment cleaned after work complete
25.21	Work area cleaned?	✓	0	6.27 6.28	Ensure work area is cleaned after each shift and at completion of work involving asbestos and dispose of containers promptly.



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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.
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.

MUSCULOSKELETAL INJURY



Public Works and
Government Services
Canada

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Services gouvernementaux
Canada

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Contractor's Superintendent: _____ **Date:** _____

Distribution:

EGD Operations Manager
EGD Supervisors
Engineer-of Record
Resident Engineer/Construction Coordinator
Project File



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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.



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Cond No.	Condition	Existing √	CODE	WORKS AFEBC Ref. #	Hazard/ Action Required
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	WORKSAFEB Orders, Inspections or "Notice to Workers" Posted? Notification of compliance posted?	√	S	Div. 10 183	Contractor to provide any WORKSAFEB 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 WORKSAFEB 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

GENERAL



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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.



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		3.16 & 3.17	*	✓			3.10		3.17 & 3.18	Part 3
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?		✓						Contractor to provide <u>written</u> 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?		✓				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?		✓					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		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		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		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.		

FIRST AID & INVESTIGATIONS



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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.
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	

CHEMICAL/BIOLOGICAL - WHMIS



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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.



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		Follow MSD Sheet instructions.		S		
WORKING ALONE	3.26	Follow proper procedures in disposing of hazardous substances.	√			
	3.27	Other	TBD			
CONFINED SPACE		Note: Refer to WHMIS Implementation Plan checklist when doing inspections for hazardous substances	TBD	S		
	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.
LOCK-OUT & ELECTRICAL	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.
	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.	



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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:				



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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.
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 WORKSAFEBEC are used. Note changes to WORKSAFEBEC 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.

FALL PROTECTION



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									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.
7.4	Inspection of fall arresting equipment before each use by a qualified person being done?	√	S	11.9-					Ensure workers use system
7.5	Fall Protection System used?	√	S	11.2(7)					Follow written fall protection plan.
7.6	Safety Belts used for fall restraint only? Otherwise use body harness.	√	S	11.4					
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.
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.

FIRE RELATED



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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.
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.

LADDERS/SCAFFOLDS &
TEMP WORK PLATFORMS



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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 from 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.



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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 10 th 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.



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PROTECTIVE EQUIPMENT	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).
	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).



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10.6	Wear Hearing Protection when required by WORKSAFEBEC regulations.	√	O	7.1-7.9	Hearing protection required when in high noise situations exceeding WORKSAFEBEC 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 <i>CSA Standard before each use</i> .
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.
11.1	Heat Stress Control Required? Followed?	√	S	7.27	To be determined by Contractor's Superintendent based on section 7 WORKSAFEBEC regulations (Jan/05), weather conditions, and worker proximity to heat sources and clothing worn.

HEAT
STRESS



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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	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.
	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.
MOBILE EQUIPMENT & TRANSPORT OF WORKERS	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 WORKSAFEBEC regulations if suspended platforms to be used.



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14.8	Do not leave delivery vehicles unattended for extended periods.	✓	*			Contractor to enforce.
14.9	Do not hitch a ride on forklifts unless proper seats exist for this purpose.	✓	*			Contractor to ensure vehicles meet WORKSAFEBC requirements.
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 workers cannot be injured by unsecured items in the vehicle.
14.11	Ensure tools/materials/ equipment are carried in separate designated area for that purpose.	✓	S	17.5		Ensure workers do not leave equipment parts unattended in an elevated condition or work under equipment unless properly secured.
14.12	Equipment properly secured if elevated? No use of hydraulic or pneumatic lifts as blocks unless collapse not possible.	✓	S	16.37		Contractor to ensure loads are 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 workers have training & equipment if they will change tires.
14.14	Workers have procedures, equipment and training for tire repairs?	✓	S	16.47-16.48		No blocking planned or required.
15.1	Is there any blocking of roadways, or aisles during the project? If so install signs, barricades etc.	NA	S&O			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.
15.2	Will gantry crane travel through the work area? Coordinate with the crane supervisor.	✓	*			The Engineer will ensure all supervisors and contractors on site are aware of the work and schedule.
15.3	Is there operations activity near the project site? Ensure coordination and minimize impact.	✓	S&O			Provide controls if working near water.
15.4	Control boat traffic and ensure flags and markers are in place.	✓	S&O			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.
15.5	Is there a need to protect Public Roadways? Review WORKSAFEBC PART 18.	✓	S&O	PART 18		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.
15.4	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			

TRAFFIC CONTROL



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EVACUATION & RESCUE	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.
	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.



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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.		
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.		



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	PART 6 6.2	O	√		
<p>25.0 Workers possibly exposed to potentially hazardous levels of asbestos? E.g.</p> <ul style="list-style-type: none"> - 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 					<p>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.</p>
25.2	5.53	O	√	Workplace exposure monitoring done and results provided to workers	
25.3	6.3	O	√	Contractor exposure control plan developed meeting WORKSAFEBC 5.54?	<p>Plan to include:</p> <ul style="list-style-type: none"> - 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	6.4 6.5	O	√	Qualified person prepare and keep current an inventory of all asbestos-containing materials; identify all such materials by signs, labels etc.	EGD has inventory of asbestos containing materials.
25.5	6.6	O	√	Qualified Risk assessment conducted by qualified person before any demolition, repair, etc work where asbestos-containing materials may be disturbed.	
25.6	6.7 6.8	O	√	Procedures documented providing task-specific work direction addressing both hazards & controls and eliminating or minimizing the air-borne release of asbestos fibres	WORKSAFEBC publication "Safe Work Procedures for Handling Asbestos" provides procedures acceptable to the Board.
25.8	6.9	O	√	No use of compressed air to clean up or remove asbestos-containing materials, dusts, fibres. Also no dry sweeping or dry mopping.	Use approved procedures for cleaning starters assuming asbestos dusts may be present.

ASBESTOS



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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	✓	0	6.12	
25.11	Monitoring carried out as req'd by PART5?	✓	0	6.12	
25.12	Monitoring during high risk activities carried out and provided to workers within 24 hrs?	✓	0	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 WORKSAFEBEC 6.15	✓	0	6.15 6.12(4)	If not, provide sampling as defined in WORKSAFEBEC 6.12 (4)
25.14	Work area boundary defined, all objects not required for the work removed, openings secured to prevent release of fibres?	✓	0	6.13	Prepare area before starting work
25.15	Signs posted restricting entry?	✓	0	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	✓	0	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?	✓	0	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/	✓	0	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?	✓	0	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.	✓	0	6.26	Ensure exterior of waste containers, reusable equipment cleaned after work complete
25.21	Work area cleaned?	✓	0	6.27 6.28	Ensure work area is cleaned after each shift and at completion of work involving asbestos and dispose of containers promptly.



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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.
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 G
HEALTH & SAFETY REQUIREMENTS



HEALTH AND SAFETY REQUIREMENTS

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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.



HEALTH AND SAFETY REQUIREMENTS

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- 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 WORKSAFEBBC 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

XYZ CONSTRUCTION

CONTRACTOR'S HEALTH & SAFETY PLAN – sample only

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

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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 practice 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 WORKSAFEBBC 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,

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- 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 1 First 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

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and all workers trained. Plans will be compatible with IOS emergency response for fire, bomb threat, earthquake and confined space rescue.

Accident/Incident/Injury/WORKSAFEB 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 WORKSAFEB as required by regulation and cooperate with any officer performing inspections or investigations. Any WORKSAFEB 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

SAMPLE ONLY