Public Works and Government Services Canada

Requisition No: EZ108-211544

DRAWINGS & SPECIFICATIONS
for

EGD HV Maintenance FY2020-2021

Project No.: R.112308.001
December 2020

APPROVED BY:

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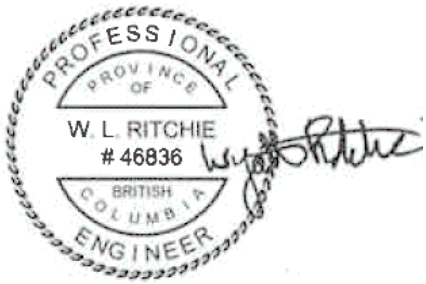
W-E-10 Electrical Crane Cable Feeders & Connection Details

END OF CONTENTS

CONSULTANTS – SEAL & SIGNATURE

Discipline	**Seal/Signature/Date**
Electrical (Prime)	 2020-12-17

END OF SECTION

1. General

1.1 CODES, BYLAWS, STANDARDS

.1 Comply with applicable local bylaws and all Esquimalt Graving Dock rules and regulations enforced at the location concerned.

.2 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

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

Contractor shall apply and obtain any work permits required by authorities having jurisdiction.

.4 CSA Z462 – Workplace Electrical Safety, Latest Edition

.5 CSA C22.1 – Canadian Electrical Code, Latest Edition

1.2 DESCRIPTION OF WORK

.1 Work under this contract covers the maintenance and testing of High Voltage power supply and distribution switchgear, North Substation equipment, and auxiliary equipment, which may include minor modifications and repairs, at the Esquimalt Graving Dock (EGD) at 825 Admirals Road, Victoria B.C. It also includes the replacement of crane HV junction boxes in the North and South service tunnels. Refer to Appendix B for drawing details of the electrical system configuration.

.2 In general, the work includes, but not limited to:

- Inspection, cleaning, testing, documentation of results, and re-calibration of High Voltage (HV) (greater than 600V) electrical equipment and switchgears, and some 600V, 480V, 208V, and main breakers as listed in Section 26 08 01.
- Testing of substation battery banks and chargers
- Testing of harmonic filter banks
- Testing the main switchgear line-up, including all relays, buses, LED indicating lights, metering including CTs and PTs, grounding switches and mechanical linkages, and other equipment within the switchgear
- Testing of the substation I-Gard Ground Fault Protection systems
- Testing of ground fault relays performing tripping on 12.5 kV and 2.4 kV breakers, including all relays outlined in Section 26 08 01
- Testing of 480V breakers specifically identified in Section 26 08 01
- Performance of high potential tests on HV cables identified within this specification
- Station grounding and lightning protection systems for continuity and general inspection for damage or buildup of rust or unwanted material
- Inspection of MCC personal grounding for grounding continuity and general inspection for damage or buildup of rust or unwanted material
- Inspection and possible cleaning of HV junction and pull boxes to determine their integrity and cleanliness

- 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 graphs, and updating single line diagrams within substation if required
- Thermal imaging of equipment before and after HV maintenance and logging results for ongoing maintenance record
- Testing of internal transformer fans
- Replacement of HV junction boxes

Refer to section 26 08 01 HV System Maintenance, Inspection, and Calibration for detailed work description. Refer to Appendix B for existing drawing details.

1.3 ALTERATIONS, ADDITIONS, OR REPAIRS TO EXISTING BUILDING

.1 Execute work with the 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.

1.4 CONTRACT METHOD

.1 Construct work under lump sum contract.

1.5 CONTRACT DOCUMENTS

.1 The Contract documents, drawings, and specifications are intended to complement each other, and to provide and include everything necessary for the completion of the work.

1.6 OTHER CONTRACTS

.1 Further contracts may be awarded while this contract is in progress.

.2 Cooperate with other Contractors on site in carrying out their respective works and carry out instructions from Departmental Representative.

1.7 DIVISION OF SPECIFICATIONS

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

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

1.8 TIME OF COMPLETION

.1 Commence work immediately upon official notification of acceptance of offer and complete the project within eight (8) weeks after contractor award.

.1 Complete all sitework per electrical shutdowns as described in Clause 1.9, hours of work and Clause 1.10, Work Schedule.

1.9 HOURS OF WORK

.1 Restrictive as follows:

.1 Electrical shut-downs will occur from 07:00 to 22:00 on each day. EGD Electrical Department will perform the isolation procedures starting at 07:00 and will be ready to have EGD isolation safety toolbox talk by 09:00. EGD Electrical Department will start the re-energization procedure at 20:00 to have the site power restored by 22:00.

.1 Contractors will not have access into work areas until EGD Electrical Department staff have completed their isolation procedures.

.2 Contractors must participate in the EGD isolation safety toolbox talk before beginning work.

.2 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.

1.10 WORK SCHEDULE

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

.2 Scheduled electrical shutdowns shall be:

.1 January 30 and 31, 2021

.2 February 6 and 7, 2021

.3 The Contractor shall confirm these dates with Departmental Representative two weeks prior to the start of work.

.4 HV Shore-to-Ship power work may be completed during regular weekday working hours. Work may only be performed with at least two-week’s notice and coordination with Departmental Representative.

.3 Prior to start of work, the contractor shall arrange a meeting with EGD Electrical to work arrange a lock-out sequence of work so that locked out equipment is coordinated with EGD staff and maintenance contractors.

.4 All effort shall be made by the contractor to complete the work in the following order:

.1 North Substation (NS), including all equipment and incoming/outgoing HV feeder cabling

.2 HV Ship-to-Shore Power Service

.3 Crane Electrical Equipment

Contractor shall make all effort to complete work in the NS substation during the first scheduled shutdown shown in 1.10.2.1.

.5 Provide to 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 Clause 1.9 Hours of Work and 1.10 Work Schedule. Identify the required duration and time of each shutdown in the work schedule. Notify the Departmental Representative of all proposed changes to the shutdown schedule at least 24 hours in advance of the shutdown.

.7 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 that cannot be completed during scheduled shutdowns may be scheduled with the EGD Electrical Department.

1.11 COST BREAKDOWN

.1 Before submitting the first progress claim, submit a breakdown of the contract lump sum price in detail as directed by the Departmental Representative. After approval, the cost breakdown will form the basis of progress payments.

1.12 DOCUMENTS REQUIRED

.1 Maintain one copy each of the following at the job site all of the following documents, as applicable to this job:

.1 Contract drawings.
.2 Contract specifications.
.3 Addenda to Contract documents.
.4 Copy of approved work schedule.
.5 Reviewed shop drawings.
.6 Change orders.
.7 Other modifications to Contract.
.8 Field test reports.
.9 Reviewed samples.
.10 Manufacturer’s installation and application instructions.
.11 One set of record drawings and specifications for "as-built" purposes.
.12 Contractor’s Health and Safety Plan and other Safety Related Documents.
.13 The latest adopted edition of the National Building Code of Canada.
.14 Current construction standards of workmanship listed in technical specifications.

.15 WHMIS documents.

.16 Site Instructions.

.17 Requests for Information (RFI).

.18 Contractor's Environmental Management Plan.

.19 Other documents as specified.

1.13 OWNER OCCUPANCY

.1 During the entire construction period, the owner will occupy adjacent areas for execution of normal operations.

1.14 CONTRACTOR'S USE OF SITE

.1 The Esquimalt Graving Dock shall be assumed to be fully operational for the duration of the contract except for specific areas covered under this contract.

.2 The Contractor will assume the role of Prime Contractor.

.3 The use of Contractor's work site is exclusive and complete for the execution of contract work.

.4 The Contractor shall:

.1 Assume responsibility for assigned premises for performance of the work.

.2 Coordinate all work activities on the Contractor's work site, including the work of other contractors engaged by Departmental Representative.

.3 Provide security of Contractor's work site and of all Contractor's and Subcontractor's equipment and material. Secure Contractor's work site at the end of each work day.

.4 Ensure the site is not unreasonably encumbered with material or equipment.

.5 Comply with all Esquimalt Graving Dock security restrictions,

.6 Do not enter any area of the Esquimalt Graving Dock property to which access is restricted by sign is a secured or restricted area and shall not be entered.

.7 Avoid obstructing access to PWGSC property outside of the Contractor's work site. Maintain overhead clearances, keep roadways and walkways clear, and maintain routes for emergency response vehicles.

.8 Work in minimum groups of two. Contractors shall at no time work alone. One apprentice performing work shall be accompanied at all times by one journeyman during the performance of work. At no time shall an apprentice perform work with another apprentice or without a journeyman present.

1.15 WORK BY OTHERS

.1 Co-operate with other Contractors on site in carrying out their respective works and carry out instructions from the Departmental Representative.

.2 Co-ordinate work with that of other Contractors. If any part of the Work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of work.

1.16 EXAMINATION

.1 Examine site and be familiar and conversant with existing conditions likely to affect work.

.2 At completion of operations the condition of existing equipment must be equal to or better than that which existed before work started.

.3 Protect existing equipment to prevent injury or damage.

.4 Departmental Representative to visually inspect equipment after maintenance is complete and prior to replacing covers, lids, or other sundry associated with the equipment.

1.17 QUALITY OF WORK

.1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.

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

1.18 APPROVAL OF PRODUCT DATA AND SAMPLES

.1 In accordance with Section 01 33 00 – Submittal Procedures, submit the requested product data, MSDS sheets and samples indicated in each of the technical Sections.

.2 Allow sufficient time for the following:

- .1 Review of product data.
- .2 Approval.
- .3 Review of re-submission.
- .4 Ordering of approved material and/or products - refer to technical Specifications.

1.19 SECURITY CLEARANCES

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

.2 Personnel will need to obtain security clearance at start of project and be provided with a security badge which is to be worn and visible at all times while on the site.

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

1.20 TESTING AND INSPECTIONS

.1 Requirements for particular inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative and paid for by the Contractor.

.2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's convenience.

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

.4 Contractor shall notify Departmental Representative in advance of planned testing.

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

.6 Provide Departmental Representative with 1 electronic copy of testing laboratory reports as soon as they are available.

1.21 CLEANING

.1 Conduct daily cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.

.2 Ensure cleanup of the work areas each day after completion of work.

.3 Vacuuming in electrical rooms shall be done using HEPA filter vacuums.

1.22 ENVIRONMENTAL PROTECTION

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

.2 Do not dispose of waste into water courses, storm or sanitary sewers.

.3 Ensure proper disposal procedures in accordance with all applicable regulations.

1.23 ADDITIONAL DRAWINGS

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

.2 Upon request, Departmental Representatives may furnish up to a maximum of 3 sets of Contract documents for use by the Contractor at no additional cost. Should more than 3 sets of documents be required, the Departmental Representative will provide them at additional cost.

1.24 SYSTEM OF MEASUREMENT

.1 The metric system of measurement (SI) will be employed on this Contract.

1.25 SUBMISSION OF TENDER

.1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents, is able to meet the security clearances discussed in part 1.19, and is fully conversant with all conditions.

1.26 COVID-19

.1 Contractor shall follow COVID-19 procedures in accordance with Canadian Construction Association COVID-19 Standardized Protocols. Furthermore, Contractor will address PPE and hygiene issues as per Worksafe BC regulations, and Provincial guidelines. Cost associated and required with COVID-19 Protocols to be included in the proposed fee.

END OF SECTION

1 General

1.1 RELATED SECTIONS

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

1.2 ADMINISTRATIVE

.1 Submit to Departmental Representatives with reasonable promptness and in orderly sequence listed submittals for review 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 due to such default will be allowed.

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

.3 Review submittals prior to submission. The review ensures 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 with the project will be returned without being examined and considered rejected.

.4 Notify Departmental Representative in writing at time of submission of any deviations from requirements of Contract Documents and state 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, with 1 electronic copy submitted to the Departmental Representative.

.2 Submit mark-ups of Appendix B drawings and any changed equipment settings. Mark-ups shall be in red ink on one set of clean white prints and coloured coordination graphs and shall be stamped, signed, and dated by the Contractor.

.3 Allow 10 business days for 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 Subcontractor
  - .2 Supplier
  - .3 Manufacturer

.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. The completion report format shall match that of Appendix A, complete with colour photographs. Include high quality scanned copies of marked-up drawings.

.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, a noted copy will be returned and resubmission, through the same procedure indicated above, must be performed before final payment is affected.

.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 or PWGSC representatives approve details inherent in submittals. The responsibility shall remain with the Contractor, 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 to verify settings and repairs.

.2 Photographs shall clearly show readings and settings where applicable to the photo.

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 GENERAL

PWGSC Update on Asbestos Use
Effective April 1, 2016, all Public Works and Government Services of Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit use of asbestos-containing materials.

COVID-19
All contractors shall follow Canadian Construction Association COVID-19 - Standardized Protocols for All Canadian Construction Sites, Provincial Regulations, and EGD site specific COVID-19 Procedures.

1.1 REFERENCES

.1 Government of Canada.

.1 Canada Labour Code - Part II (as amended)

.2 Canada Occupational Health and Safety Regulations (as amended)

.2 National Building Code of Canada (NBC): (as amended)

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

.3 The Canadian Electrical Code (as amended)

.4 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2018 Code of Practice for Access Scaffold.

.2 CSA S269.1-2016 Falsework for Construction Purposes.

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

.4 CSA Z1006-10 Management of Work in Confined Spaces.

.5 CSA Z462-18 Workplace Electrical Safety Standard

.5 National Fire Code of Canada 2015 (as amended)

.1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.

.6 American National Standards Institute (ANSI): (as amended)

.1 ANSI/ASSP A10.3-2013, Operations – Safety Requirements for Powder-Actuated

Fastening Systems.

.7 Province of British Columbia:

.1 Workers Compensation Act Part 3-Occupational Health and Safety. (as amended)

.8 NMS Section 00 00 01 Table of Contents for this project.

.9 Esquimalt Graving Dock (EGD) Contractors Safety Booklet (as amended)

1.2 RELATED SECTIONS

.1 Refer to the current NMS sections as indicated in Section 00 00 01 Table of Contents, including Appendices.

1.3 WORKERS' COMPENSATION BOARD COVERAGE

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

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

1.4 COMPLIANCE WITH REGULATIONS

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

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

1.5 SUBMITTALS

.1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 33 00.

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

.3 Submit the following:

.1 Organizations Health and Safety Plan.

.2 Site Specific Safety Plan or Health and Safety Plan (SSSP or HASP)

.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 (SDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS 2015) requirements.

.5 Emergency Response Plan and Emergency Evacuation Plan and Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Safety Plan or Health and Safety Plan (SSSP/HASP) and emergency response procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.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 Site Specific Safety Plan or Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:

.1 Be construed to imply approval by the Departmental Representative.

.2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

.1 Assume responsibility as the Prime Contractor for work under this contract.

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

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

.4 All contractor workers shall attend an EGD Safety Orientation prior to ant work starting.

.5 The contractor is responsible for reviewing the Esquimalt Graving Dock (EGD) Contractors Safety Handbook and ensuring that the Site Specific Safety Plan and/or Health and Safety Plan are harmonized with the EGD Contractors Safety Handbook.

1.7 HEALTH AND SAFETY COORDINATOR

.1 The contractor must assign a competent and qualified Health and Safety Coordinator who shall:

.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 Safety Plan (SSSP) or Health and Safety Plan (HASP)

.3 Be on site during execution of work.

.4 Have minimum two (2) years' site-related working experience

.5 Have working knowledge of the applicable occupational safety and health regulations.

1.8 GENERAL CONDITIONS

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

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

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

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

1.9 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 PWGSC and other Federal employees,

.2 EGD (federal) operational staff,

.3 Ship repair and other contractors,

.4 Work over and under water, Protection Against Drowning, Refer to COHS Section A Part X11-Safety Materials, Equipment, Devices and Clothing – Section 12.11 inclusive.

.5 Overhead cranes,

.6 Work at heights, **(2.4m on Federal Property)**

.7 Unpredictable weather conditions,

.8 Threat of tsunami and earthquake,

.9 Confined space and restricted access space,

.10 Work with hazardous substances, and

.11 Refer to PWGSC Preliminary Hazard Assessment Appendix E

1.10 UTILITY CLEARANCES

.1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work.

.2 The Contractor will not rely solely upon the Reference Drawings or other information provided for Utility locations.

1.11 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 (.1) above, the authorities having the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.12 WORK PERMITS

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

1.13 FILING OF NOTICE

.1 The General Contractor shall file Notice of Project with Provincial authorities prior to commencement of work. (All PWGSC construction projects require a Notice of Work)

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

1.14 SITE SPECIFIC HEALTH AND SAFETY PLAN

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

.2 Develop, implement, and enforce a Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP) 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.

.11 COVID 19 Protocols and Procedures (National, Provincial and EGD Site Specific)

.12 EGD Contractors Safety Handbook

.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. WHMIS 2015 SDS required for all products.

.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 site specific safety plan or health and/or safety 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 Site Specific Safety Plan (SSSP) and/or Health and Safety Plan (HASP) as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Site Specific Safety Plan and/or 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 Site Specific Safety Plan and/or Health and Safety Plan of responsibility for meeting all requirements of construction and Contract documents and legislated requirements.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an emergency response and emergency 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 and Other PWGSC staff as required. (reference: EGD Contractors Safety Handbook)

.5 A route map with written directions to the nearest hospital or medical clinic.

.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 and PWGSC site staff.

.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.

.6 Contractors must not rely solely upon 911 for emergency rescue in a confined space, working at heights, etc.

.7 At least once each year, emergency drills, must be held to ensure awareness and effectiveness of emergency exit routes and procedures, and a record of the drills must be kept

1.16 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Safety Data Sheets (SDS) 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 SDS and WHMIS 2015 documents as

per Section 01 33 00.

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

.3 The contractor shall ensure that the product is applied as per manufacturers recommendations.

.4 The contractor shall ensure that only pre-approved products are bought onto the site.

1.17 OFF SITE CONTINGENCY and EMERGENCY RESPONSE PLAN

.1 Prior to commencing Work involving handling of hazardous materials, develop off site Contingency and Emergency Response Plan.

2. Plan must provide immediate response to serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from Site.

3. Notification of fire departments [4.17 – Worksafe BC Regulations Part 4 Buildings, Structures, Equipment, and Site Conditions]

(1) An employer having at a workplace hazardous products covered by WHMIS, explosives, pesticides, radioactive material, consumer products or hazardous wastes in quantities which may endanger firefighters, must ensure the local fire department is notified of the nature and location of the hazardous materials or substances and methods to be used in their safe handling.

(2) Subsection (1) does not apply to a workplace

(a) where materials are kept on site for less than 15 days if the employer ensures an alternative effective means for notification of fire departments is in place in the event of fire or other emergency, or

(b) which is not within the service area of a fire department. [Amended by B.C. Reg. 30/2015, effective August 4, 2015.]

1.18. PERSONAL PROTECTIVE CLOTHING and EQUIPMENT

.1 Work shall be performed in compliance with Part 8 - Personal Protective Clothing and Equipment, and Part 5 – Chemical Agents and Biological Agents, (as applicable) Worksafe BC OHS Regulations (as amended)

1.19 ASBESTOS HAZARD

.1 Carry out any activities involving asbestos shall be in accordance with current applicable Federal and Provincial Regulations.

.2 Removal and handling of asbestos shall be in accordance with current applicable Provincial / Federal Regulations (as amended)

1.20 PCB REMOVALS

.1 Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.

.2 Remove, handle, transport and dispose of as indicated in Section 01 11 55 specification index.

1.21 REMOVAL OF LEAD-CONTAINING PAINT

.1 All paint containing TCLP lead concentrations above 5 ppm are classified as hazardous.

.2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with current applicable Provincial / Territorial Regulations.

.3 Work with lead-containing paint shall be completed as per Provincial and Federal regulations.

.4 Dry Scraping/Sanding of any materials containing lead is strictly prohibited.

.5 The use of Methylene Chloride based paint removal products is strictly prohibited.

1.22 SILICA

.1 Carry out work in accordance with Worksafe BC regulations.

1.23 ELECTRICAL SAFETY REQUIREMENTS (Reference: Worksafe BC OHS Regulation Part 19 – Electrical Safety)

.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 arc flash protection, 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.

.3 Develop, implement and enforce a communication plan with Departmental representative and EGD maintenance staff for all electrical work and lockout procedures.

1.24 ELECTRICAL LOCKOUT

.1 Electrical lockouts will be written and performed by on site PSPC EGD electrical department. Procedures will be pre-planned with contractors and will be reviewed during a safety toolbox talk with contractors after completion of lockouts and before going hands on.

1.25 OVERLOADING

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

1.26 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003) (as amended)

1.27 SCAFFOLDING

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

1.28 CONFINED SPACES

.1 Carry out work in compliance with current Worksafe BC Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space.

.2 Ground electrical vaults and High-Voltage pits covered under this contract shall be defined as confined spaces.

.3 Service tunnels covered under this contract shall be defined as confined spaces.

1.29 RESTRICTED ACCESS

.1 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry and emergency rescue plan in accordance with Worksafe BC regulations.

1.30 CONFINED SPACE AND RESTRICTED SPACE OUTSIDE OF DEFINED WORK SITE

.1 Carry out work in confined spaces in compliance with Worksafe BC Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space. Coordinate all confined space entry work with PWGSC Departmental Representative through the contractor's confined space entry permit system.

.2 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry and emergency rescue plan in accordance with Worksafe BC regulations. Coordinate all restricted access space entry work with the Departmental Representative prior to entry.

.3 The Contractor is required to provide a reasonable amount of time to the Departmental Representative for making arrangements for entry and/or access to Confined Space or Restricted Access spaces located outside the designated work site.

1.31 POWDER-ACTUATED DEVICES

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

1.32 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.

.3 Coordinate all hot work with Departmental Representative through the contractors' hot work permit system. Hot Work permits are a mandatory requirement for any hot work activities.

1.33 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. (as amended)

.3 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the Departmental Representative is required prior to any gas or diesel tank being brought onto the work site.

1.34 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.

1.35 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 immediately advise the Departmental Representative verbally and in writing.

1.36 BLASTING OPERATIONS

.1 All blasting operations shall be in accordance with Worksafe BC OHS Regulation Part 21 – Blasting Operations.

1.37 POSTED DOCUMENTS

.1 Post legible versions of the following documents on site:

.1 Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP)

.2 Sequence of work.

.3 Emergency procedures.

.4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.

.5 Notice of Project.

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

.7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.

.8 Workplace Hazardous Materials Information System (WHMIS 2015) documents.

.9 Material Safety Data Sheets (SDS).

.10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.11 All Hazardous Material and Substance Reports including Lab Analysis

.2 Post all Safety Data Sheets (SDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract

includes construction activities adjacent to occupied areas.

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

1.38 MEETINGS

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

1.39 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 noncompliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

2 PRODUCTS

.1 Not used.

3 EXECUTION

.1 Not used.

END OF SECTION

1 General

1.1 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls to execute work expeditiously.

.2 Remove from site all such work after use.

1.2 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating as required during shutdown work, including attendants, maintenance, and fuel.

1.3 TEMPORARY POWER AND LIGHT

.1 Provide and pay for portable generator and fuel during shutdown work for temporary lighting and operating power tools for any work taking place outside of substation areas, such as on cranes and HV Shore-to-Ship equipment.

.2 Lighting and 120V 15A general-use receptacles will be available within the substation work areas supplied by EGD stand-by generators. During maintenance of equipment that is integral to the generator systems and requires the generators to go offline, contractors will be required to supply their own portable generators to supply temporary lighting and power as required for their own use

1.4 TEMPORARY COMMUNICATION

.1 Contractor to provide a means of communication for all workers performing work on site (cellular phone, radio, etc).

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.

.3 Portable fire extinguishers are available on site, located near each exit door on every level of the substation work areas.

2 Products

.1 Not used

3 Execution

.1 Not used

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 01 11 55 – General Instructions

.2 Section 01 33 00 - Submittal Procedures

1.2 DESCRIPTION OF WORK

.1 Refer to Section 01 11 55 – General Instructions

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. The 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 Maintenance and Testing work shall be conducted in accordance with NETA MTS-2019, 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.

.1 It is not required that the contractor has a NETA accreditation. In lieu of an accreditation, the contractor may conduct the work according to NETA

MTS guidelines provided that a Professional Engineer seals all test results.

2 Areas and Equipment Covered by this Contract

2.1 EXISTING NORTH SUBSTATION (NS) BUILDING EQUIPMENT

.1 25/12 kV main switchgear section 12.5NS including all breakers, cables, and other equipment associated with the switchgear.

.2 4NS-1-01 2000A, 480V harmonic filter bank, including step contactors, capacitors, breakers, HFB cooling fan operation confirmation and thermostat settings, and reactors.

.3 4NS-1-M1, 3000AT/3000AF, 480V breaker

.4 5NS REG 1 and 5NS REG 2 3000A frame breaker

.5 Update existing single line diagram, including low Voltage single line diagram which currently has stickers on them and shows key-interlocks which are no longer there

.6 6NS-1-M1, 600V, 4000A breaker

.7 2NS-1-M1, 120/208V, 3000A breaker

.8 IGARD ground fault equipment for each transformer shown on the single line diagram

.9 Inspect the building lightning protection system for breaks or possible ground fault paths. Clean as required

.10 Measure grounding values at grounding grid substation ground test wells and clean test wells as required

.11 T25/12NS-3, 2250/3000kVA transformer, 25/12kV-347/600V

.12 T25/12NS-4, 1500/2000kVA transformer, 25/12kV-2.4kV

.13 T25/12NS-5, 750/1000kVA transformer, 25/12kV-120/208V

.14 T25/12NS-6, 1500/2000kVA transformer, 25/12kV-480V

.15 T12.5NS-9, 5000/6650kVA transformer, 12.47-12.47/6.6kV and grounding resistor switch located in transformer yard

.16 T25/12NS-11, 1000/1500kVA transformer c/w automatic off-load tap changer, 25/12kV-550V

.17 Manual 15kV and 27kV grounding breakers within the station

.18 In addition to all required tests shown in part 3.2, perform tests on all transformer fans and provide at least one spare fan for every size of transformer.

.19 All main cables from the 25/12kV switchgear

.20 Regulated power supply on line-tap changer

.21 Perform meter operational checks

.22 NS battery bank and battery charger. Inspection to include battery inspection, polarity check, cell impedance, torque settings, and cell Voltages before and after load testing.

.23 Provide a new oil spigot for oil sampling test purposes on R25/12 NS-11

.24 Visually review all four High Voltage junction boxes and cabling within on the ceiling and in the lowest level of the North Substation, including inspection for breaks in the boxes, debris within the boxes, and the removal and cleaning of all detritus inside the boxes

.25 See drawings within Appendix A.

2.2 HV SHORE POWER SERVICE

.1 One 5 MVA ONAN transformer with manual secondary switchgear, located at outdoor transformer yard adjacent to Main Substation building.

.2 One 12.5/11/6.6 kV neutral grounding resistor and associated earthing switch.

.3 One 12.5/11/6.6 kV service box with HV power receptacles and control plugs located in service vault north of the drydock.

.4 See drawing EMD E2 Main Substation Single-Line Diagram – Rev. A

2.3 150-TONNE CRANE

.1 2.4 kV substation consisting of a main switch, a fuse box for two branches, 150-tonne H.V. trailing cable, and two transformers.

.2 1200AF/1200AT 480V main breaker. Previous testing has required removing breaker from its position in the crane for testing, which required rigging. The contractor shall make allowance for this testing in their proposal.

.3 2.4 kV slip rings. After previous maintenance it was noted that some of the brush material had worn down. The contractor shall determine the minimum manufacturer's tolerances and allow for replacement of the brushes if required in their price. See page 39 of the attached report in Appendix B.

.4 Replace the existing single line diagram in the electrical room with an up to date electrical single line diagram. Coordinate with the EGD Project Management team for latest single line diagram.

.5 Install ground bus extensions for the 2.4kV grounding provisions.

.6 Replace the 2.4kV slip ring viewing cover gaskets.

.7 See drawing EMD E2 Main Substation Single-Line Diagram – Rev. A. Note that the drawings are for reference only. Cranes are fed from either the North or South Substations, which is to be confirmed by EGD staff prior to start of any work.

2.4 NORTH SIDE 30-TONNE CRANE

.1 2.4 kV unit substation consisting of a main switch, H.V. trailing cable, and a transformer.

.2 2.4 kV slip rings. The contractor shall determine the minimum manufacturer's tolerances and allow for replacement of the brushes if required in their price.

.3 See drawing EMD E2 Main Substation Single-Line Diagram – Rev. A. Note that the drawings are for reference only. Cranes are fed from either the North or South Substations, which is to be confirmed by EGD staff prior to start of any work.

.4 Previous maintenance has reported a possible loose connection underneath the crane ground bus. See page 51 of the attached report in Appendix B. The contractor shall investigate this cable and ensure that it is secure.

2.5 SOUTH SIDE 30-TONNE CRANE

.1 2.4 kV unit substation consisting of a main switch, H.V. trailing cable, and a transformer.

.2 2.4 kV slip rings. The contractor shall determine the minimum manufacturer's tolerances and allow for replacement of the brushes if required in their price.

.3 Other equipment clouded on drawing EMD E5 South Side Substation Single Line Diagram – Rev. A. Note that the drawings are for reference only. Cranes are fed

from either the North or South Substations, which is to be confirmed by EGD staff prior to start of any work.

2.6 HIGH VOLTAGE VAULT JUNCTION BOXES

.1 3 x 2.4kV crane junction boxes to be replaced. They are located in the north (two junction boxes) and south (one junction box) service tunnels. The contractor shall remove existing junction boxes and splices and refeed cable into new HV junction boxes. The junction boxes will be mounted as high as possible to allow for water level changes within the tunnel. The junction boxes shall be rated as follows, or equivalent:

.1 NEMA 4/IP66 water-tight silicon gasketted
.2 Stainless steel assembly
.3 Gland plates with continuous gaskets
.4 Deadbreak bushings
.5 Cable stand offs

Cable splices within the junction boxes are to be removed and replaced with new water resistant High Voltage cable splicing kits, including breakout boots for cable ends. Replace cable supports, including Kellums grips, as required.

The product HV4X6 by Adalet may be used as a minimum acceptable product. Similar products or equal may be considered after tender award and shall be submitted to the engineer as shop drawings for review and approval before installation.

Refer to drawing W-E-10 for existing details.

2.7 HIGH VOLTAGE VAULT INSPECTION

.1 Inspect and clean High Voltage service vaults between the Service Entrance Substation and the North Substation. This includes vaults 112HV, 115HV, 118HV, 146HV, 149HV, and 169HV. Refer to drawing 4100 in Appendix A.

2.8 HV CABLE JACKET REPAIR

.1 An HV 2.4kV cable within the service tunnels has damage on the outer jacket. The contractor shall provide and install a heat-shrink protective sleeve over the damaged section of cable. Coordinate with EGD electrical staff for exact location of repair within the service tunnel

2.9 GENERAL TO ALL AREAS

.1 Inspect all grounds on MCCs for personnel grounding

.2 Inspect portable grounding trucks

.3 Clean all internal HV equipment with portable HEPA filter vacuum

.4 Inspection and cleaning of all high voltage cable pits

.5 Review existing HV equipment O&M Manuals to determine regular maintenance schedule

.6 Submission of test reports and mark-ups of existing documentation, including single line diagrams and coordination study graphs.

.7 Work for all equipment shall include the following:

.1 Visual Inspection and Functional Testing of equipment.

.2 Thermographic/infra-red inspection of load-carrying components including switchgear, cable connections, circuit breakers, and transformers during high-load period. Coordination with the EGD Electrical Department must be done to ensure that the maximum possible loads are being supplied during thermographic/infra-red testing. Wherever possible, infra-red scanning shall occur prior to commencing maintenance work to identify hot spots that can be reviewed and addressed during hands on maintenance period.

.3 Electrical maintenance of equipment, including measurement, calibration, adjustments, lubrication, and replacement of worn parts.

.4 Preparation of a Maintenance Test plan for review by the Departmental Representative. The plan will outline all equipment to be tested, indicate the tests required, and describe whether the equipment is to be removed from service. The plan will also indicate the maintenance work to be done, estimated times each piece of equipment will be out of service, and provide a space for comments because of tests and maintenance.

.5 A Completion Report will be prepared and submitted to the Departmental Representative at the completion of the work. The report shall summarize the work done, recommend upgrades, and highlight any issues requiring further action.

3 Execution

3.1 GENERAL

.1 Complete the work as per schedule. See Section 01 11 55 – General Instructions.

.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 B for previously performed HV Maintenance report for similar scope of work, which includes current equipment 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 A. 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 MAINTENANCE

.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.

.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 IGARD ground fault protection system is operating in accordance with manufacturer's requirements.
.2 Provide written report.

.11 Crane Slew Slip Rings
.1 Inspect, clean, and check conductivity and insulation integrity of slew slip rings on rail mounted cranes.

.12 Thermal Imaging
.1 Provide thermal imaging on High Voltage cabling, terminations, breakers, slip rings, on cranes, and other major equipment within this Section, prior to maintenance and after maintenance is performed.

.13 Megger Testing
.1 Perform High Voltage insulation resistance (Megger) testing for all feeders, cables, bus bars, and insulators identified within this project.

3.3 MINOR MODIFICATION AND REPAIR WORK

.1 Compare 30T North Crane 500 kVA transformer core megger test results with original commissioning report and previous HV Maintenance report results. Report any discrepancies.

.2 Inspect the 5 MVA oil filled transformer's temperature gauge at the Ship to Shore equipment. Submit report on gauge's condition to Department Representative and supply, install, and commission replacement gauge and seal if directed to by the Department Representative.

.3 Inspect the Ship to Shore pit's ground and neutral boxes. Repair and make serviceable as required.

.4 Test and clean main 480V breaker and cubicle in 150-Tonne Gantry Crane space and provide report to Department Representative.

.5 Replace HV junction boxes as required in Part 2 of this specification.

.6 Repair the 2.4kV HV cable, location to be confirmed with EGD Electrical Staff.

.7 Review repairs completed as part of High Voltage Maintenance Esquimalt Graving Dock – Project R.098355.001, March 11, 2019, Prime Engineering for areas included in scope of this project. See Appendix B. Confirm all issues identified have been resolved. Report to Department Representative any outstanding issues.

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 1 high voltage hot sticks, 1 m long, extendable to 2 m, Pfisterer Part No. 364-169-170, or equal.

.2 Minimum of 2 3-phase grounding cable sets with 70 mm^2 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	Reference Drawings Bound with the Specification
Appendix B	High Voltage Maintenance Esquimalt Graving Dock – Project R.098355.001, March 11, 2019, Prime Engineering
Appendix C	EGD Lockout Policy, Procedures & Records
Appendix D	EGD Environmental Best Management Practices
Appendix E	Preliminary Hazard Assessment

APPENDIX A

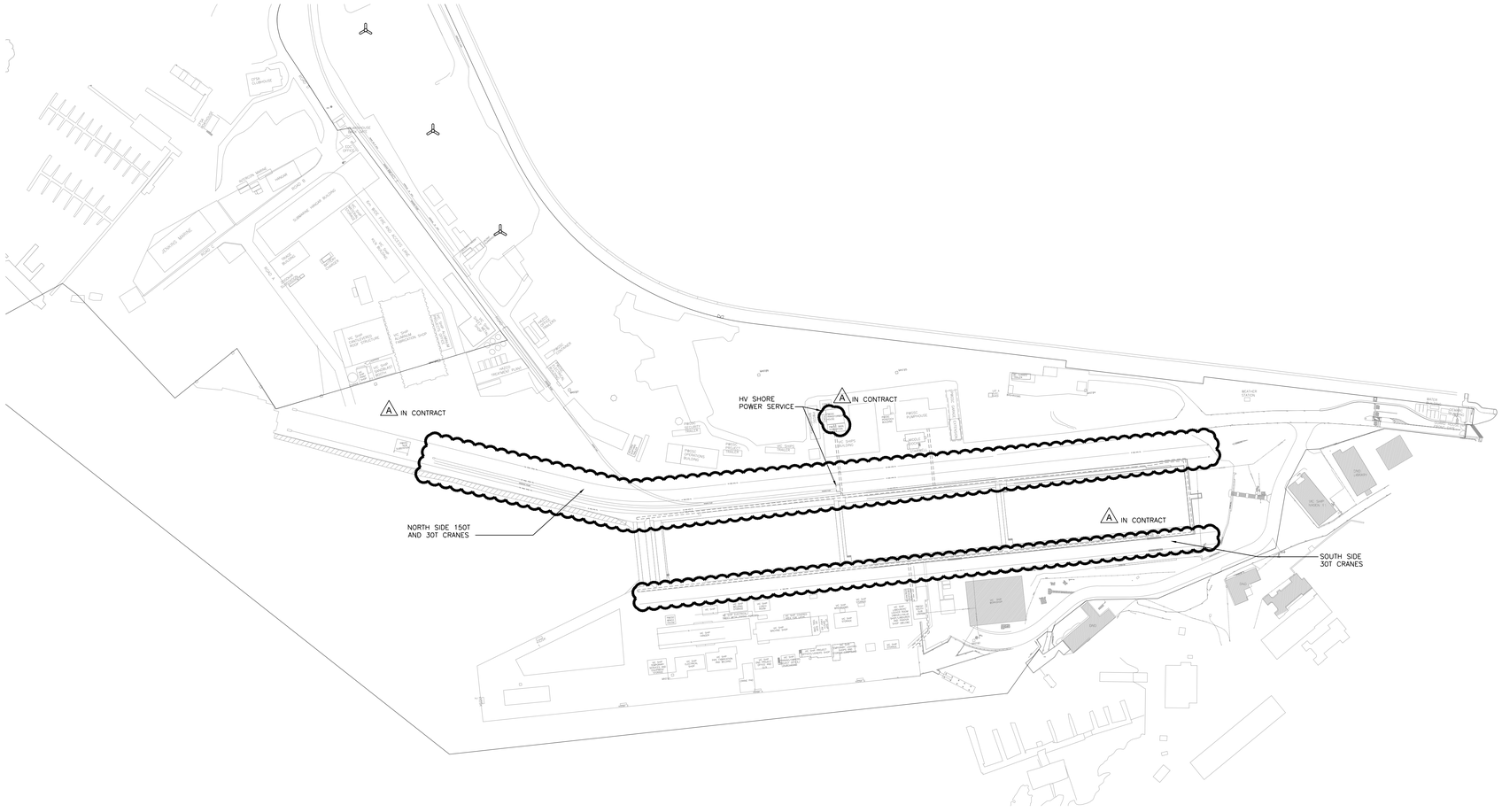
REFERENCE DRAWINGS BOUND WITH THE SPECIFICATION

DRAWINGS ARE PROVIDED FOR REFERENCE USE ONLY. REFER TO SPECIFICATIONS FOR SCOPE OF WORK AND TECHNICAL REQUIREMENTS.

DB-100	Site Key Plan
4010	Single Line Diagram High Voltage and Regulated Distributions
4011	Single Line Diagram Low Voltage Distribution
4011b	Single Line Diagram Low Voltage Distribution
4012	High Voltage Protection Diagram
4019	North Substation Ground Fault Detection Systems
4030	High Voltage Switchgear Details and Elevations
4031	High Voltage Switchgear Details and Elevations
4035	5NSREG-1 and 5NSREG-2 Switchboard Details
4036	Battery Bank and Charger Details
4100	NS Electrical Site Plan
4101	NS Site Section Details
4102	Main Floor Electrical Equipment
4104	Second Floor Electrical Equipment Layout
4105	NS Cable Pit
4412	North Substation and Main Substation Transformer Yard Grounding Details

EMD E2 Main Substation Single-Line Diagram
EMD E5 South Side Substation Single-Line Diagram

W-E-10 Electrical Crane Cable Feeders & Connection Details



Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Region de Pacifique

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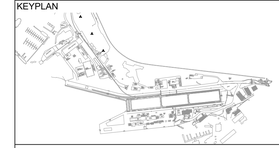
KEYPLAN



NOT FOR CONSTRUCTION

Revision/ Revision	Description/Description	Date/Date
A	HV MAINTENANCE SCOPE 2020/20201	
4	ISSUED FOR SITE WIDE 100% DD	13/03/31
3	ISSUED FOR WP-A & B 100% DD	13/01/24
2	RE-ISSUED FOR WP-C, D, F 100% DD	13/01/10
1	ISSUED FOR 100% DD	12/12/20
0	ISSUED FOR 50% DD	12/09/28

Client/client

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

825 ADMIRALS ROAD
VICTORIA, BC

Project title/Titre du projet

ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

ELECTRICAL SAFETY UPGRADE

Consultant Signature Box Only

Designed by/Concept par
G. PETERSON

Drawn by/Dessine par
P. PARANPAN

PWGSC Project Manager/Administrateur de Projets TPSGC
S. WINDL, F. VEILLETTE

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
-

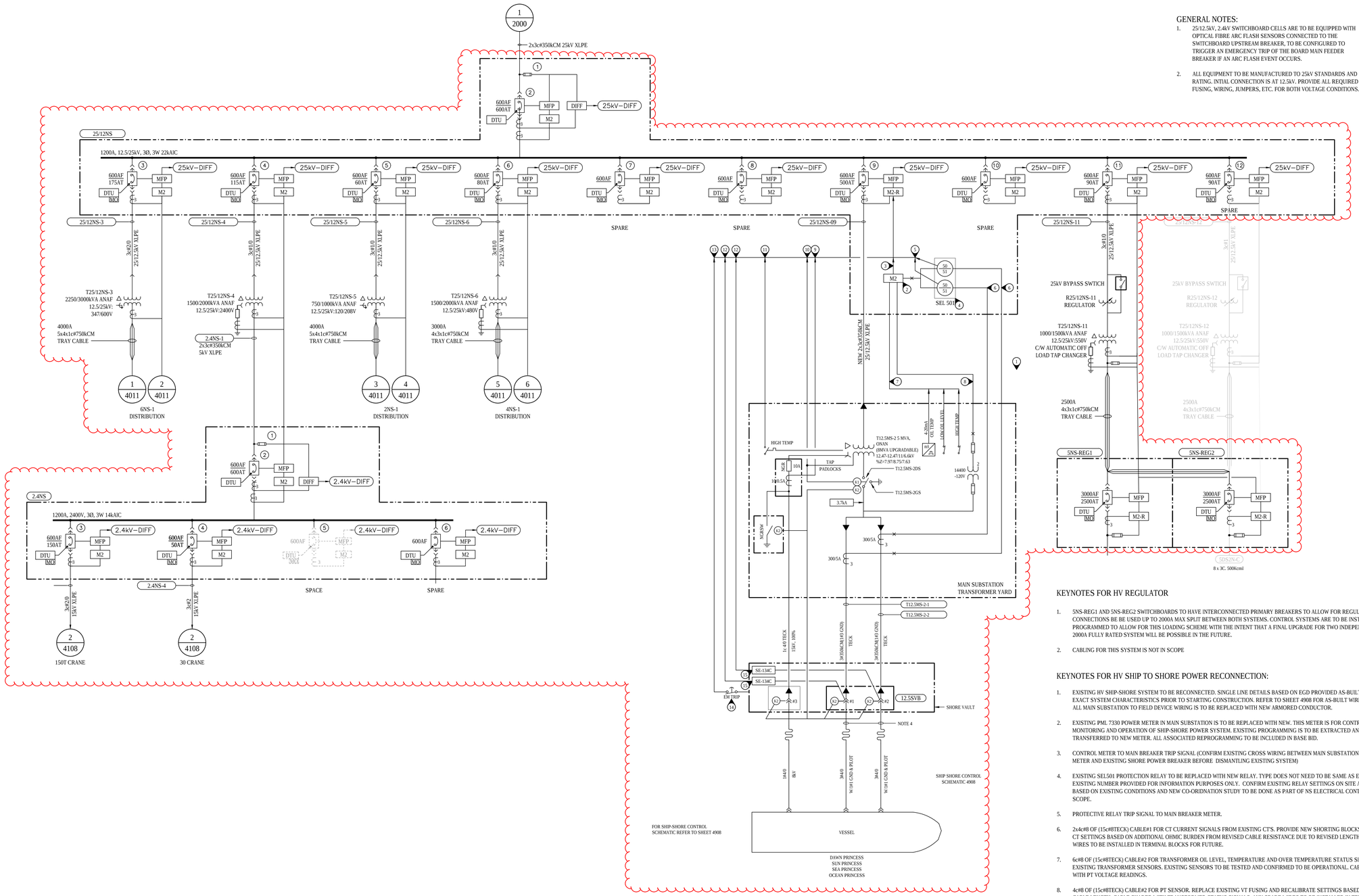
Drawing title/Titre du dessin

SITE KEY PLAN

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
101-15245-00	DB-100	4

Plot Date: November 27, 2020 4:41 PM - Plotted by: Rhoda Byrd
File Name: V:\PROJECTS\2012\101-15245-00 PWGSC CDD ESI\DRAWINGS\CURRENT\DB-100 SITE KEY PLANDWG

PWGSC – B1 – 1000X707



GENERAL NOTES:

1. 25/12.5kV, 2.4kV SWITCHBOARD CELLS ARE TO BE EQUIPPED WITH OPTICAL FIBRE ARC FLASH SENSORS CONNECTED TO THE SWITCHBOARD UPSTREAM BREAKER, TO BE CONFIGURED TO TRIGGER AN EMERGENCY TRIP OF THE BOARD MAIN FEEDER BREAKER IF AN ARC FLASH EVENT OCCURS.

2. ALL EQUIPMENT TO BE MANUFACTURED TO 25kV STANDARDS AND RATING. INTIAL CONNECTION IS AT 12.5kV. PROVIDE ALL REQUIRED FUSING, WIRING, JUMPERS, ETC. FOR BOTH VOLTAGE CONDITIONS.

KEYNOTES FOR HV REGULATOR

1. 5NS-REG1 AND 5NS-REG2 SWITCHBOARDS TO HAVE INTERCONNECTED PRIMARY BREAKERS TO ALLOW FOR REGULATOR CONNECTIONS BE BE USED UP TO 2000A MAX SPLIT BETWEEN BOTH SYSTEMS. CONTROL SYSTEMS ARE TO BE INSTALLED AND PROGRAMMED TO ALLOW FOR THIS LOADING SCHEME WITH THE INTENT THAT A FINAL UPGRADE FOR TWO INDEPENDENT, 2000A FULLY RATED SYSTEM WILL BE POSSIBLE IN THE FUTURE.

2. CABLING FOR THIS SYSTEM IS NOT IN SCOPE

KEYNOTES FOR HV SHIP TO SHORE POWER RECONNECTION:

1. EXISTING HV SHIP-SHORE SYSTEM TO BE RECONNECTED. SINGLE LINE DETAILS BASED ON EGD PROVIDED AS-BUILTS. CONFIRM EXACT SYSTEM CHARACTERISTICS PRIOR TO STARTING CONSTRUCTION. REFER TO SHEET 4908 FOR AS-BUILT WIRING DIAGRAMS. ALL MAIN SUBSTATION TO FIELD DEVICE WIRING IS TO BE REPLACED WITH NEW ARMORED CONDUCTOR.

2. EXISTING PML 7330 POWER METER IN MAIN SUBSTATION IS TO BE REPLACED WITH NEW. THIS METER IS FOR CONTROL, MONITORING AND OPERATION OF SHIP-SHORE POWER SYSTEM. EXISTING PROGRAMMING IS TO BE EXTRACTED AND TRANSFEIRRED TO NEW METER. ALL ASSOCIATED REPROGRAMMING TO BE INCLUDED IN BASE BID.

3. CONTROL METER TO MAIN BREAKER TRIP SIGNAL (CONFIRM EXISTING CROSS WIRING BETWEEN MAIN SUBSTATION BREAKER METER AND EXISTING SHORE POWER BREAKER BEFORE DISMANTLING EXISTING SYSTEM)

4. EXISTING SEL501 PROTECTION RELAY TO BE REPLACED WITH NEW RELAY. TYPE DOES NOT NEED TO BE SAME AS EXISTING. EXISTING NUMBER PROVIDED FOR INFORMATION PURPOSES ONLY. CONFIRM EXISTING RELAY SETTINGS ON SITE AND REVISE BASED ON EXISTING CONDITIONS AND NEW CO-ORIDNATION STUDY TO BE DONE AS PART OF NS ELECTRICAL CONTRACTOR SCOPE.

5. PROTECTIVE RELAY TRIP SIGNAL TO MAIN BREAKER METER.

6. 2x4c#8 OF (15c#8TECK) CABLE#1 FOR CT CURRENT SIGNALS FROM EXISTING CT'S. PROVIDE NEW SHORTING BLOCKS AND ADJUST CT SETTINGS BASED ON ADDITIONAL OHMIC BURDEN FROM REVISED CABLE RESISTANCE DUE TO REVISED LENGTHS. ANY SPARE WIRES TO BE INSTALLED IN TERMINAL BLOCKS FOR FUTURE.

7. 6c#8 OF (15c#8TECK) CABLE#2 FOR TRANSFORMER OIL LEVEL, TEMPERATURE AND OVER TEMPERATURE STATUS SIGNALS FROM EXISTING TRANSFORMER SENSORS. EXISTING SENSORS TO BE TESTED AND CONFIRMED TO BE OPERATIONAL. CABLE SHARED WITH PT VOLTAGE READINGS.

8. 4c#8 OF (15c#8TECK) CABLE#2 FOR PT SENSOR. REPLACE EXISTING VT FUSING AND RECALIBRATE SETTINGS BASED ON REVISED CABLE LENGTH. CABLE SHARED WITH TRANSFORMER STATUS SIGNALS. ANY SPARE WIRES TO BE INSTALLED IN TERMINAL BLOCKS FOR FUTURE.

9. 4c#8 OF (8c#8TECK) CABLE#1 FOR NGR CT SIGNALS TO BREAKER CONTROL METER. CABLE SHARED WITH THERMAL TRIP SIGNAL AND KEY INTERLOCK SIGNAL.

10. 2c#8 OF (15c#8TECK) CABLE#1 FOR KIRK KEY INTERLOCKING STATUS.

11. 2c#8 OF (15c#8TECK) CABLE#1 FOR THERMAL TRIP SIGNAL.

12. 6c#8 OF (50c#8 TECK) CABLE FOR SHIP-SHORE GROUND DETECTION RELAY - PLUG#1 TRIP SIGNALS BACK TO BREAKER AND CONTROL SYSTEM.

13. 6c#8 OF (50c#8 TECK) CABLE FOR SHIP-SHORE GROUND DETECTION RELAY - PLUG#2 TRIP SIGNALS BACK TO BREAKER AND CONTROL SYSTEM.

13. 2c#8 OF (50c#8 TECK) CABLE FOR REMOTE TRIP PUSHBUTTON

14. EXISTING SE-134C GROUND DETECTION RELAYS IN SHORE POWER VAULT. TO BE RECONNECTED INTO NEW CONTROL METER AND HV MAIN BREAKER.

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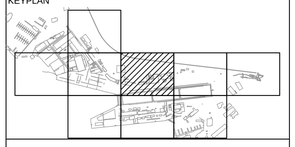

RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
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Revision/ Revision	Description/Description	Date/Date
7	RECORD DRAWINGS	2019/06/06
6	ISSUED FOR TENDER	2017/06/23
5	ISSUED FOR 100% REVIEW	2017/04/06
4	ISSUED FOR 99% REVIEW	2017/02/08
3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
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Drawn by/Dessine par
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PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

Drawing title/Titre du dessin

SINGLE LINE DIAGRAM HIGH VOLTAGE AND REGULATED DISTRIBUTIONS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4010	6

Plot Date: May 6, 2019 2:05 PM
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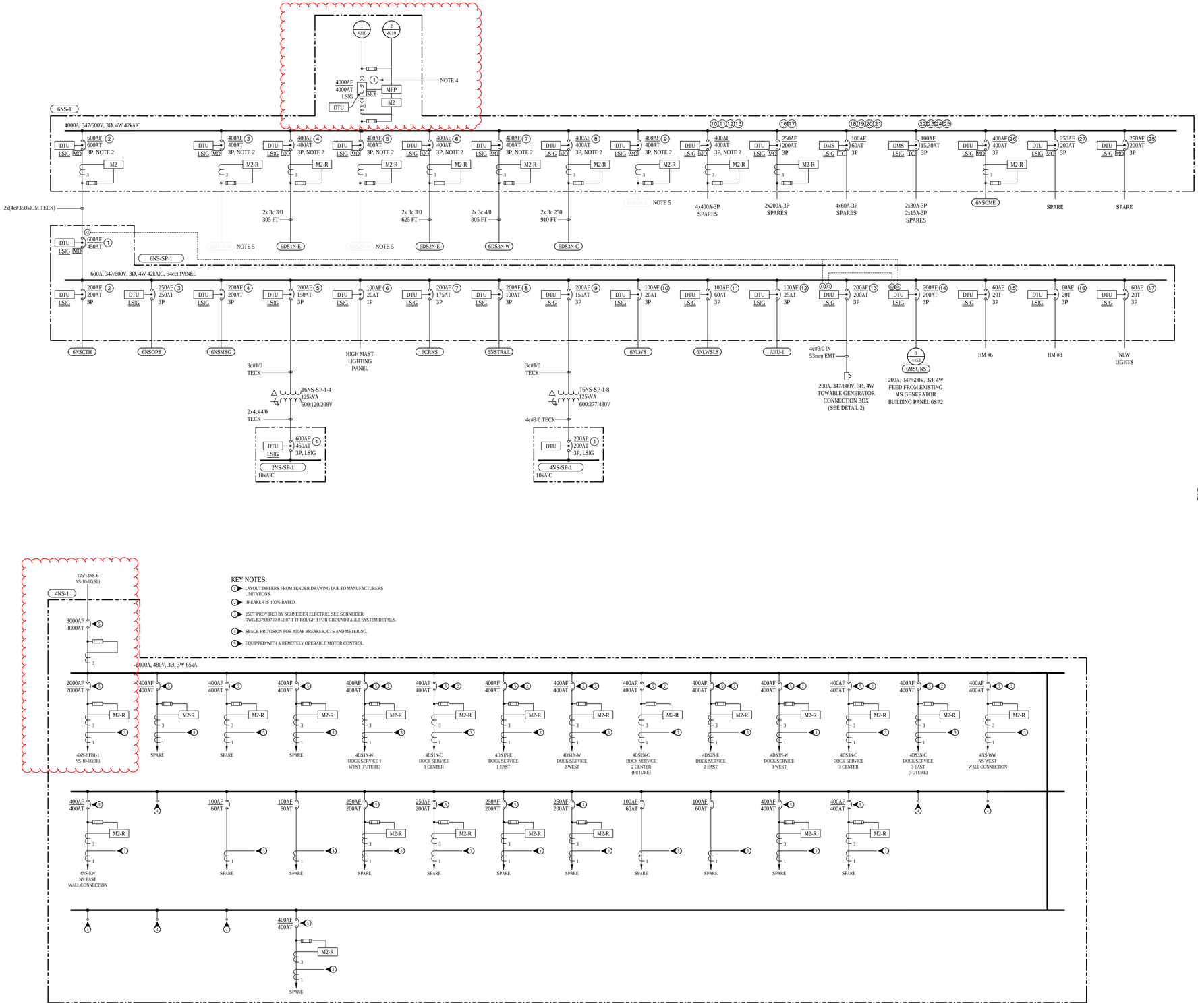
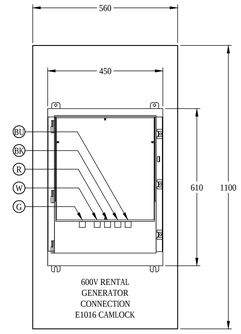
Plotted by: Chris LaChat

PWGSC – B1 – 1000X707





2 / 4011 600V 200A GENERATOR TEMPORARY CONNECTION

N.T.S.

KEY NOTES:

1. LAYOUT DIFFERS FROM TENDER DRAWING DUE TO MANUFACTURERS LIMITATIONS.
2. BREAKER IS 100% RATED.
3. ZSCT PROVIDED BY SCHNEIDER ELECTRIC. SEE SCHNEIDER DWG.E37939710-012-07 1 THROUGH 9 FOR GROUND FAULT SYSTEM DETAILS.
4. SPACE PROVISION FOR 400AF BREAKER, CTS AND METERING.
5. EQUIPPED WITH A REMOTELY OPERABLE MOTOR CONTROL.

GENERAL NOTES:

1. ALL SWITCHBOARD TO BE EQUIPPED WITH OPTICAL FIBRE ARC FLASH SENSORS CONNECTED TO THE SWITCHBOARD UPSTREAM BREAKER.
2. ALL LOW VOLTAGE BREAKERS HAVE 2 AUXILIARY CONTACTS. SHUNT TRIP AND ELECTRONIC TRIP. 480V BREAKERS TO HAVE 3 AUXILIARY CONTACTS: SHUNT TRIP, ELECTRONIC TRIP AND A SHUNT TRIP CONNECTED TO THE GROUND FAULT DETECTION SYSTEM.
3. UNLESS INDICATED OTHERWISE ALL LOW VOLTAGE BREAKERS SIZED MORE THAN 1200A; AND ALL BREAKERS AT GREATER THEN 1000V ARE EQUIPPED WITH REMOTE OPEN/CLOSE/RACK FUNCTIONS. REFER TO SINGLE LINE FOR ANY NON-STANDARD BREAKERS WITH THIS REQUIRED FUNCTIONALITY

NOTES:

1. EXISTING DRYDOCK LOAD. SPLICE AND EXTEND EXISTING MI CABLES IN SSS TUNNEL.
2. BREAKER TO BE 100% RATED.
3. SINGLE CONDUCTORS PER PHASE, INSTALLED TO MEET FREE AIR RATING FROM TABLE 1 CEC.
4. BREAKER IDENFITIER NUMBER. TO BE REVISED DURING PANEL CONSTRUCTION TO COUNT TOP TO BOTTOM, LEFT TO RIGHT ACROSS THE SWTICHBOARD. REVISED NUMBERS TO BE ADDED TO AS-BUITLS. (TYPICAL FOR ALL SWITCHBOARDS)
5. CABLING FOR THIS SYSTEM IS NOT IN SCOPE

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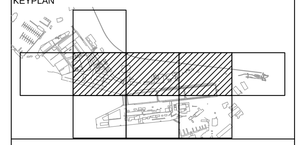

RECORD DRAWINGS

MARCH, 2019
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Revision/ Revision	Description/Description	Date/Date
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1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC ESQUIMALT GRAVING DOCK ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
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Drawn by/Dessine par
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Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

Drawing title/Titre du dessin

SINGLE LINE DIAGRAM LOW VOLTAGE DISTRIBUTION

Project No./No. du projet	Sheet/ Feuille No.	Revision no./ No.
R.080235.002	4011	6

Plot Date: May 6, 2019 2:48 PM
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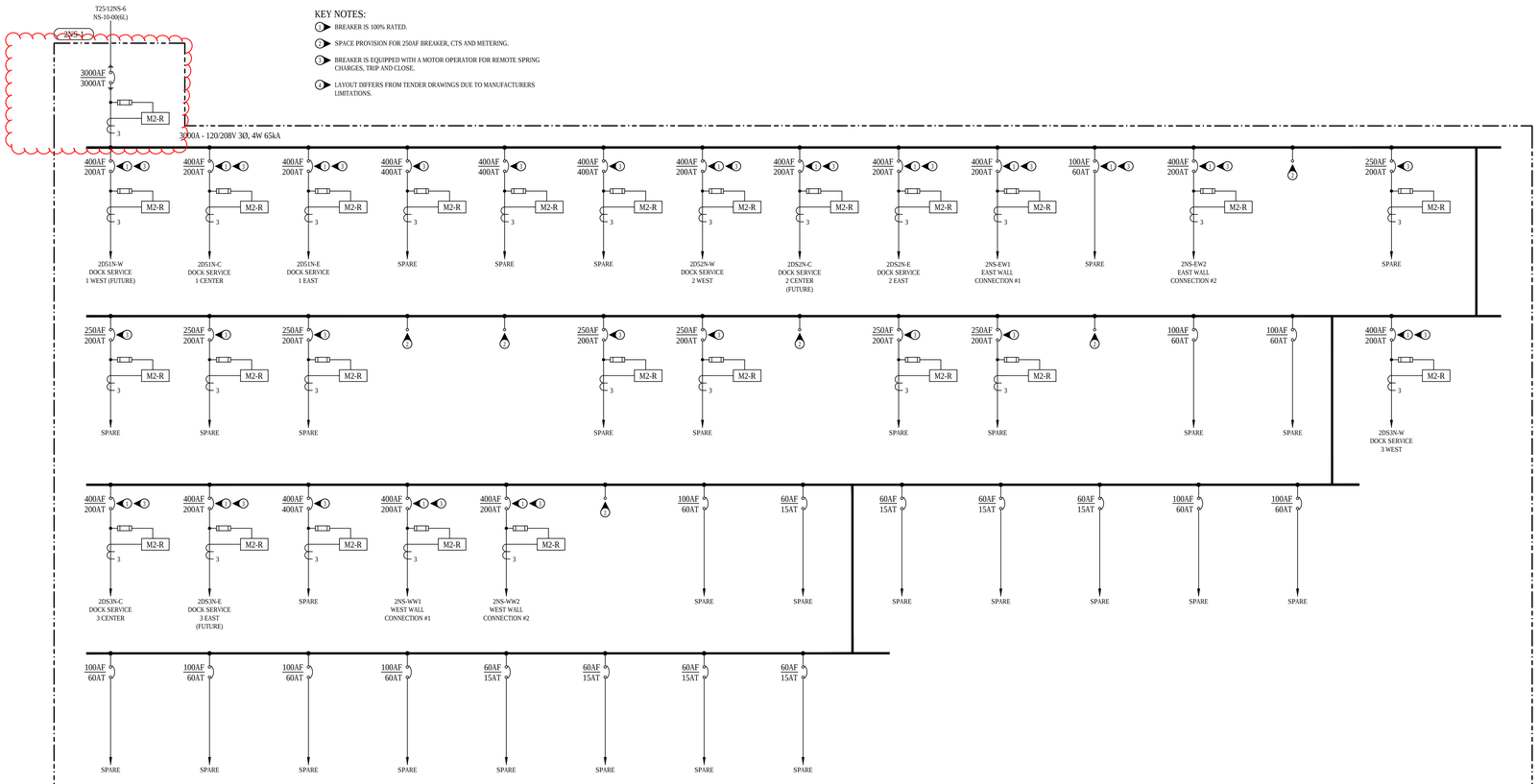
Plotted by: Gina LeGal



KEY NOTES:

1. BREAKER IS 100% RATED.
2. SPACE PROVISION FOR 250AF BREAKER, CTS AND METERING.
3. BREAKER IS EQUIPPED WITH A MOTOR OPERATOR FOR REMOTE SPRING CHARGES, TRIP AND CLOSE.
4. LAYOUT DIFFERS FROM TENDER DRAWINGS DUE TO MANUFACTURERS LIMITATIONS.

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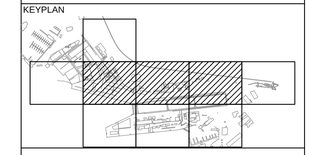

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MARCH, 2019
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Revision/ Revision	Description/Description	Date/Date
7	RECORD DRAWINGS	2019/03/06
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2	ISSUED FOR 33% REVIEW	16/08/15
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0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD
VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

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Jamie LeBlanc

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Preetipal Paul

Drawing title/Titre du dessin

SINGLE LINE DIAGRAM
LOW VOLTAGE DISTRIBUTION

Project No./No. du projet	Sheet/ Feuille	Revision no./ No. Revision
R.080235.002	4011b	6

Plot Date: May 6, 2019 2:48 PM — Plotted by: Chris LaChat
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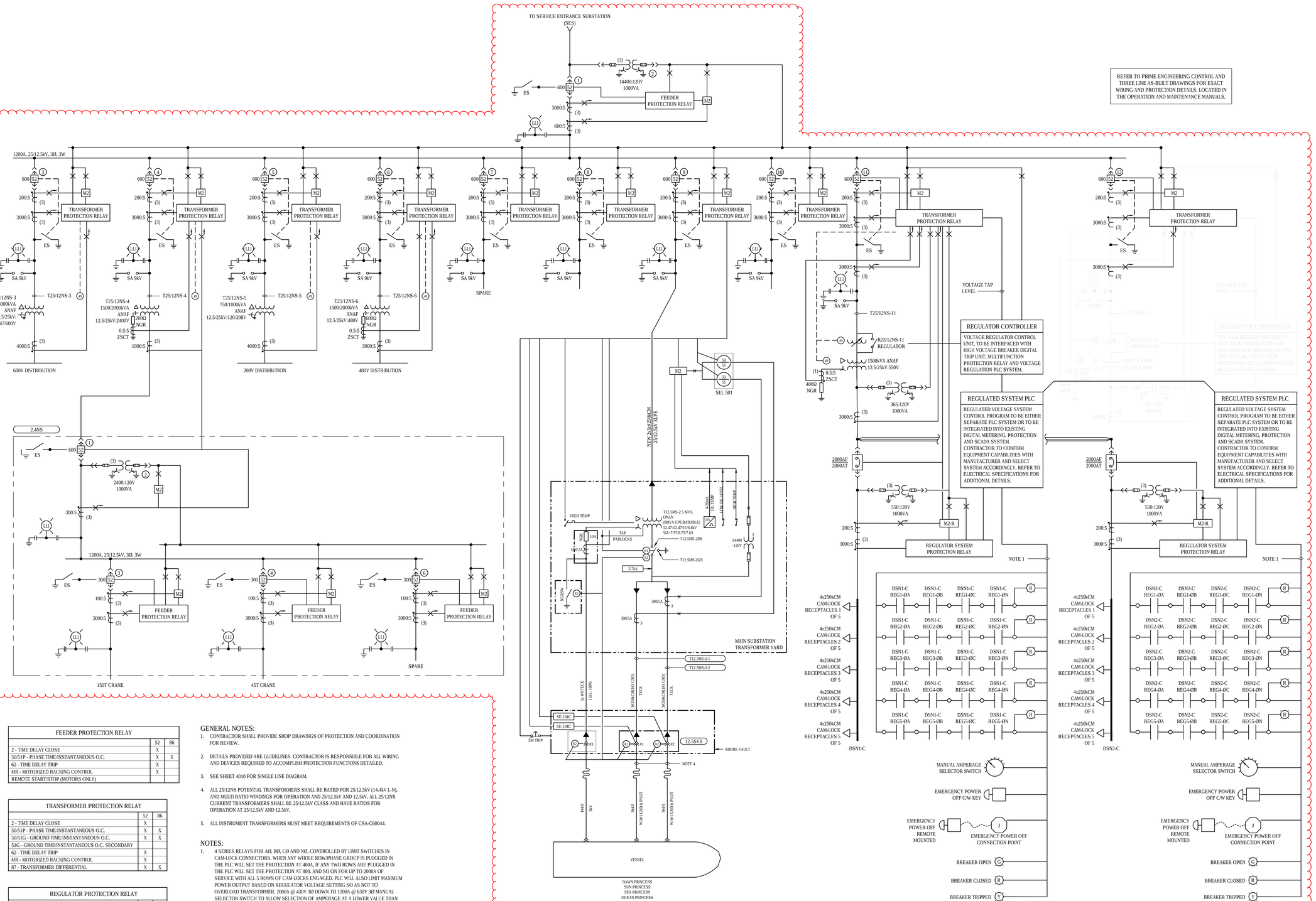

REFER TO PRIME ENGINEERING CONTROL AND THREE LINE AS-BUILT DRAWINGS FOR EXACT WIRING AND PROTECTION DETAILS. LOCATED IN THE OPERATION AND MAINTENANCE MANUALS.

FEEDER PROTECTION RELAY		
	52	86
2 - TIME DELAY CLOSE	X	
50/51P - PHASE TIME/INSTANTANEOUS O.C.	X	X
62 - TIME DELAY TRIP	X	
MR - MOTORIZED RACKING CONTROL	X	
REMOTE START/STOP (MOTORS ONLY)		

TRANSFORMER PROTECTION RELAY		
	52	86
2 - TIME DELAY CLOSE	X	
50/51P - PHASE TIME/INSTANTANEOUS O.C.	X	X
50/51G - GROUND TIME/INSTANTANEOUS O.C.	X	X
51G - GROUND TIME/INSTANTANEOUS O.C. SECONDARY		
62 - TIME DELAY TRIP	X	
MR - MOTORIZED RACKING CONTROL	X	
87 - TRANSFORMER DIFFERENTIAL	X	X

REGULATOR PROTECTION RELAY		
ADJUSTS BREAKER TRIP BASED ON REGULATOR VALUE	52	86
2 - TIME DELAY CLOSE	X	
50/51P - PHASE TIME/INSTANTANEOUS O.C.	X	X
50/51G - GROUND TIME/INSTANTANEOUS O.C.	X	X
51G - GROUND TIME/INSTANTANEOUS O.C. SECONDARY		
62 - TIME DELAY TRIP	X	
MR - MOTORIZED RACKING CONTROL	X	
87 - TRANSFORMER DIFFERENTIAL	X	X

LEGEND	
M1	DIGITAL METERING SYSTEM POWER METER TYPE 1
M2	DIGITAL METERING SYSTEM POWER METER TYPE 2
ES	EARTHING/SAFETY GROUNDING SWITCH
SA	SURGE ARRESTOR
LI.1	LIVE LINE INDICATOR
	VT TEST SWITCH
	CT SHORTING TYPE TEST SWITCH

GENERAL NOTES:

1. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS OF PROTECTION AND COORDINATION FOR REVIEW.
2. DETAILS PROVIDED ARE GUIDELINES. CONTRACTOR IS RESPONSIBLE FOR ALL WIRING AND DEVICES REQUIRED TO ACCOMPLISH PROTECTION FUNCTIONS DETAILED.
3. SEE SHEET 4010 FOR SINGLE LINE DIAGRAM.
4. ALL 25/12NS POTENTIAL TRANSFORMERS SHALL BE RATED FOR 25/12.5kV (14.4kV L-N), AND MULTI RATIO WINDINGS FOR OPERATION AND 25/12.5kV AND 12.5kV. ALL 25/12NS CURRENT TRANSFORMERS SHALL BE 25/12.5kV CLASS AND HAVE RATIOS FOR OPERATION AT 25/12.5kV AND 12.5kV.
5. ALL INSTRUMENT TRANSFORMERS MUST MEET REQUIREMENTS OF CSA-C60044.

NOTES:

1. 4 SERIES RELAYS FOR AØ, BØ, CØ AND NØ, CONTROLLED BY LIMIT SWITCHES IN CAM-LOCK CONNECTORS. WHEN ANY WHOLE ROW/PHASE GROUP IS PLUGGED IN THE PLC WILL SET THE PROTECTION AT 400A, IF ANY TWO ROWS ARE PLUGGED IN THE PLC WILL SET THE PROTECTION AT 800, AND SO ON FOR UP TO 2000A OF SERVICE WITH ALL 5 ROWS OF CAM-LOCKS ENGAGED. PLC WILL ALSO LIMIT MAXIMUM POWER OUTPUT BASED ON REGULATOR VOLTAGE SETTING SO AS NOT TO OVERLOAD TRANSFORMER. 2000A @ 430V 3Ø DOWN TO 1200A @ 630V 3Ø MANUAL SELECTOR SWITCH TO ALLOW SELECTION OF AMPERAGE AT A LOWER VALUE THAN THE ROW/PHASE WOULD AUTOMATICALLY SET TO, THIS WILL ALLOW FOR PARALLEL RUNS OF CABLE FOR LONG DISTANCES. PLC WILL NOT ALLOW MANUAL SELECTION OF AMPERAGE RATING TO BE HIGHER THAN THE ROW/PHASE GROUPS PLUGGED IN.

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, BASED UPON INFORMATION FURNISHED BY OTHERS AND HAVE BEEN UPDATED TO INCLUDE RELEVANT ADDENDUMS, CLARIFICATIONS, SITE INSTRUCTIONS, CHANGE ORDERS, AND CONTRACTOR SITE ADJUSTMENTS. AES ENGINEERING LTD. ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THESE RECORD DRAWINGS. THESE ARE NOT CERTIFIED AS-BUILT OR AS-CONSTRUCTED DRAWINGS.

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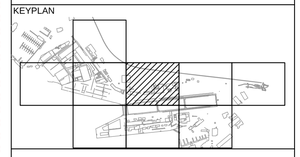

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MARCH, 2019
PREPARED BY:
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1	ISSUED FOR SCHEMATIC DESIGN	16/02/19
0		

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ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD
VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK

EGD-SSES
STANDBY POWER GENERATION SYSTEM

Consultant Signature Box Only

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Preetipal Paul

Drawing title/Titre du dessin

HIGH VOLTAGE PROTECTION DIAGRAM

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.057860.003	4012	5

Plot Date: May 6, 2019 2:21 PM
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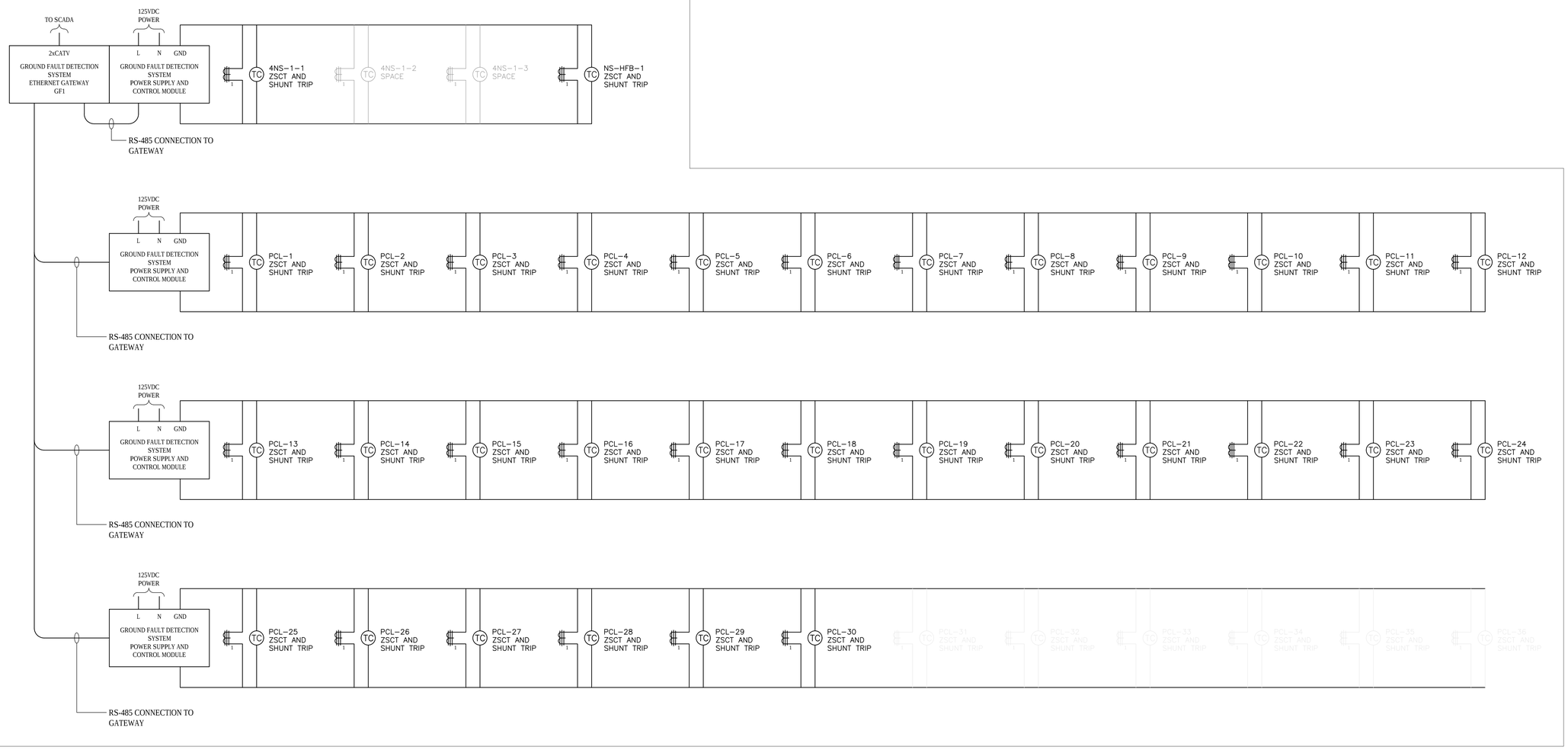
Plotted By: Greg LeCour
PWGSC - B1 - 1000X707

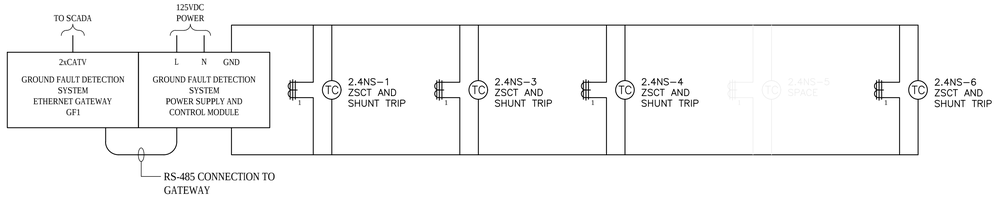
4NS-1



1 / 4019 4NS-1 GROUND FAULT DETECTION SYSTEM

SCALE 1:25

2.4NS



2 / 4019 2.4NS GROUND FAULT DETECTION SYSTEM

SCALE 1:25

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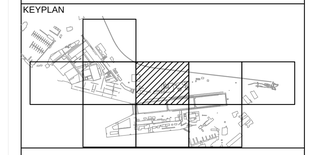

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3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

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ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC ESQUIMALT GRAVING DOCK ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

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Drawn by/Dessine par
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Drawing title/Titre du dessin

NORTH SUBSTATION GROUND FAULT DETECTION SYSTEMS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4019	6

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File Name: N:\PROJECTS\2016\16-125\DWG\DWG\16125_NS-SPD_SYSTEM.DWG

PWGSC – B1 – 1000X707

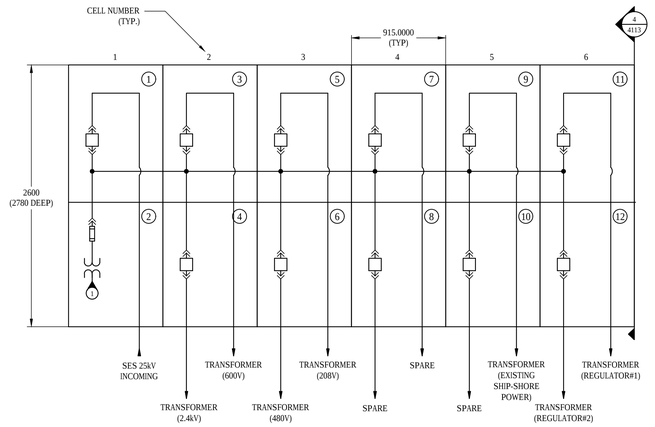
GENERAL NOTES:
1. REFER TO DRAWING 4010 FOR SINGLE LINE DIAGRAM.

KEYNOTES:
1. POTENTIAL TRANSFORMER PRIMARY TO MATCH 12.5kV AND 25kV AVAILABLE VOLTAGE. SECONDARY VOLTAGE (120VAC) IS COMMON TO ALL METERING IN RESPECTIVE CELLS. REFER TO SHEET 4012 FOR ADDITIONAL DETAILS.

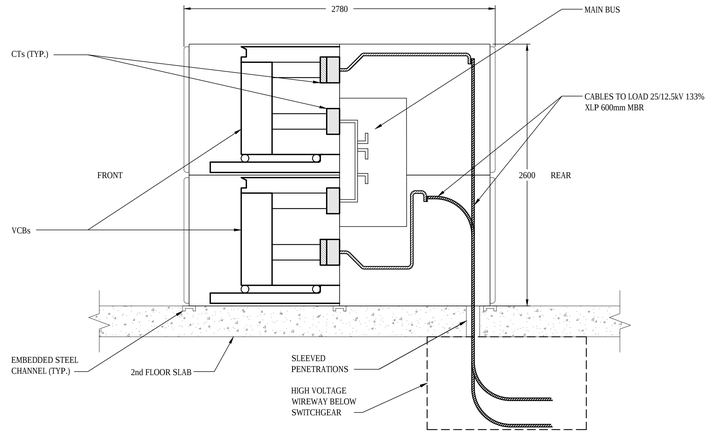
NS SWITCHGEAR SCHEDULE

VOLTAGE		CELL NO.		EQ	DESCRIPTION OF USE	RELAY	METER
RATED	USED						
25KV	12.5KV	1	1-TOP	VCB	INCOMING FEED FROM SES	MFP	M2
			2-BOT	VT	BUS VOLTAGE		
				CT	BUS LOAD		
		2	3-TOP	VCB	T25/12NS-3 600V STEP DOWN TRANSFORMER	MFP	M2
			4-BOT	VCB	T25/12NS-4 2.4kV STEP DOWN TRANSFORMER	MFP	M2
		3	5-TOP	VCB	T25/12NS-5 208V STEP DOWN TRANSFORMER	MFP	M2
			6-BOT	VCB	T25/12NS-6 480V STEP DOWN TRANSFORMER	MFP	M2
		4	7-TOP	VCB	SPARE	MFP	M2
			8-BOT	VCB	SPARE	MFP	M2
		5	9-TOP	VCB	T25/12NS-9 TRANSFORMER (EXISTING SHIP-SHORE POWER)	MFP	M2-R
			10-BOT	VCB	SPARE	MFP	M2
		6	11-TOP	VCB	T25/12NS-11 REGULATOR TRANSFORMER#1	MFP	M2
			12-BOT	VCB	T25/12NS-12 REGULATOR TRANSFORMER#2	MFP	M2

1 / 4030 SWITCHGEAR SCHEDULE
N.T.S.



2 / 4030 25/12.5kV METAL CLAD SWITCHGEAR ELEVATION
SCALE 1:25



3 / 4030 CUT SECTION ELEVATION
SCALE 1:25

0 500 1000 1500 2000mm
1:25

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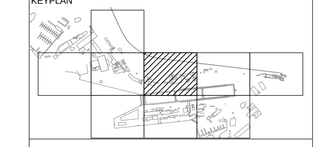


RECORD DRAWINGS
MARCH, 2019
PREPARED BY:
HOULE ELECTRIC VICTORIA
4240 GLANFORD AVE
VICTORIA, BC.
(250)544-0099

Revision/ Revision	Description/Description	Date/Date
7	RECORD DRAWINGS	2019/03/06
6	ISSUED FOR TENDER	2017/06/23
5	ISSUED FOR 100% REVIEW	2017/04/06
4	ISSUED FOR 99% REVIEW	2017/02/08
3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC ESQUIMALT GRAVING DOCK ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

Drawing title/Titre du dessin

HIGH VOLTAGE SWITCHGEAR DETAILS AND ELEVATIONS

Project No./No. du projet	Sheet/Feuille	Revision no./ Le Révision no.
R.080235.002	4030	6

Plot Date: March 6, 2019 8:58 AM
File Name: N:\PROJECTS\2017\15-129\DWGS\PWGSC\4030 ss ESQMT 25KV.DWG
Plotted by: Omar LaClair

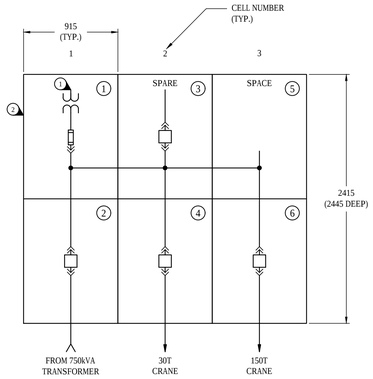
PWGSC – B1 – 1000X707

GENERAL NOTES:
1. REFER TO DRAWING 4010 FOR SINGLE LINE DIAGRAM.

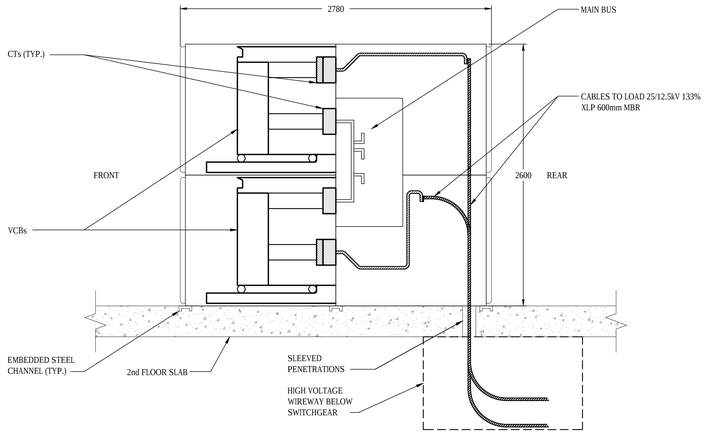
KEYNOTES:
1. POTENTIAL TRANSFORMER PRIMARY TO MATCH AVAILABLE VOLTAGE. SECONDARY VOLTAGE (120VAC) IS COMMON TO ALL METERING IN RESPECTIVE CELLS
2. 2.4NS GROUND FAULT DETECTION SYSTEM MODULE PANEL. REFER TO SHEET 4019 FOR SYSTEM DETAILS

NS SWITCHGEAR SCHEDULE							
VOLTAGE		CELL NO.		EQ	DESCRIPTION OF USE	RELAY	METER
RATED	USED						
5KV	2.4KV	1	1-TOP	VT CT	FUSED VTS, BUS LOAD, GROUND FAULT SYSTEM		
			2-BOT	VCB	FROM 2.4kV TRANSFORMER	MFP	M2
		2	3-TOP	VCB	SPARE	MFP	M2
			4-BOT	VCB	30 T CRANE	MFP	M2
		3	5-TOP	VCB	SPACE	MFP	M2
			6-BOT	VCB	150 T CRANE	MFP	M2

1 / 4031 SWITCHGEAR SCHEDULE
N.T.S.



2 / 4031 5kV METAL CLAD SWITCHGEAR ELEVATION
SCALE 1:25



3 / 4031 CUT SECTION ELEVATION
SCALE 1:25

0 500 1000 1500 2000mm
1:25

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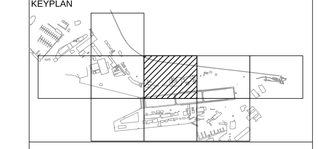

RECORD DRAWINGS
MARCH, 2019
PREPARED BY:
HOULE ELECTRIC VICTORIA
4240 GLANFORD AVE
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(250)544-0099

Revision/ Revision	Description/Description	Date/Date
7	RECORD DRAWINGS	2019/03/06
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3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD
VICTORIA, BC, V9A 2P1

Project title/Titre du projet
825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION
NORTH SUBSTATION
(RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

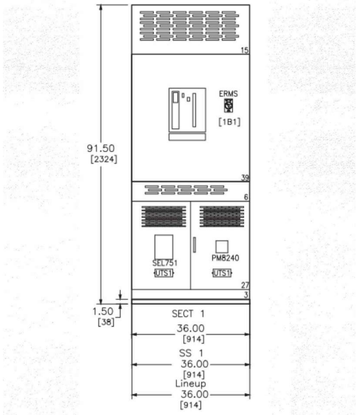
Drawing title/Titre du dessin

HIGH VOLTAGE SWITCHGEAR DETAILS AND ELEVATIONS

Project No./No. du projet	Sheet/Feuille	Revision no./ Le Révision no.
R.080235.002	4031	6

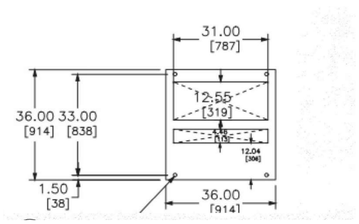
Plot Date: March 6, 2019 8:58 AM
File Name: N:\Projects\2017\16-139\Drawings\4031 HS SWGR 2.4KV.DWG
Plotted by: Gino LaClair

PWGSC – B1 – 1000X707



1/4035 2000A REGULATED SWITCHBOARD FRONT ELEVATION

SCALE 1:20



2/4035 2000A REGULATED SWITCHBOARD FOOTPRINT

SCALE 1:20

0 500 1000 1500 2000mm

1:25

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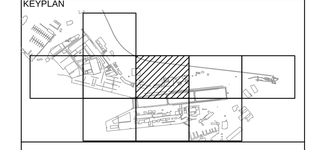

RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
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VICTORIA, BC.
(250)544-0099

Revision/ Revision	Description/Description	Date/Date
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2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC ESQUIMALT GRAVING DOCK ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

Drawing title/Titre du dessin

5NSREG-1 AND 5NSREG-2 SWITCHBOARD DETAILS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4035	6

Plot Date: May 6, 2019 2:40 PM — Plotted by: Gino LaDier
File Name: N:\PROJECTS\2016\16-120\DWG\DWG\16120_NS_ESPlan A3S-ESSN.DWG

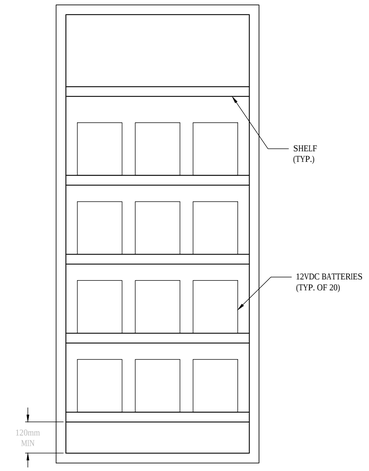
PWGSC – B1 – 1000X707

NORTH SUBSTATION BATTERY BANK PANEL

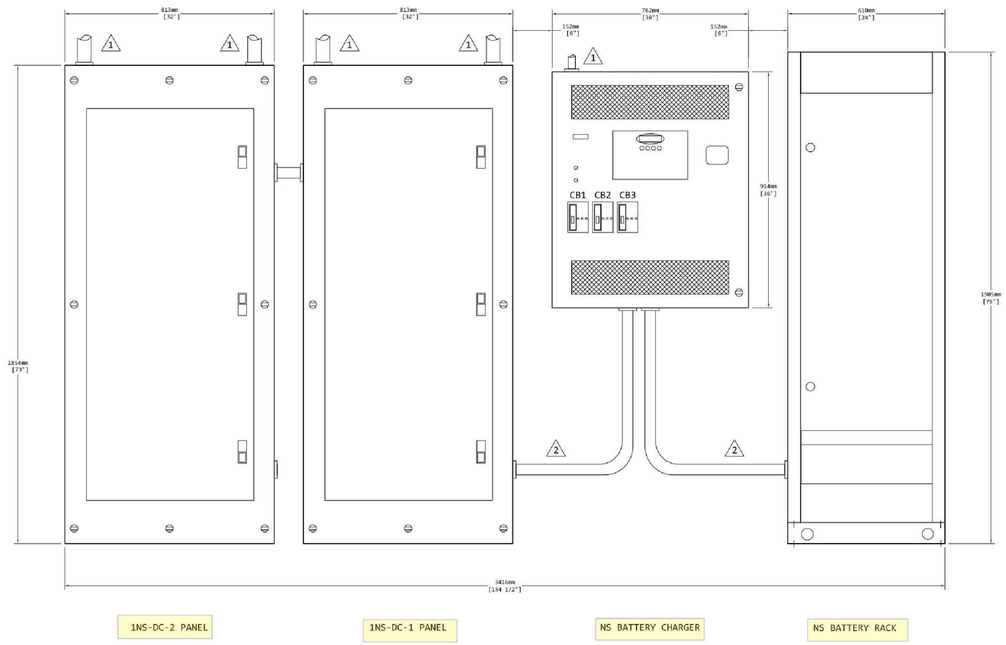
Voltage:	-	125VDC, 2W
Location:	-	NORTH SUBSTATION
Circuits:	-	72
Bus Size:	-	100A
Main Breaker:	-	30A

Description	Bkr	P	Cir	Cir	Bkr	P	Description
25/12NS Cell 1 - Upper	15	2	1	2	15	2	25/12NS Cell 1 - Lower
			3	4			
25/12NS Cell 2 - Upper	15	2	5	6	15	2	25/12NS Cell 2 - Lower
			7	8			
25/12NS Cell 3 - Upper	15	2	9	10	15	2	25/12NS Cell 3 - Lower
			11	12			
25/12NS Cell 4 - Upper	15	2	13	14	15	2	25/12NS Cell 4 - Lower
			15	16			
25/12NS Cell 5 - Upper	15	2	17	18	15	2	25/12NS Cell 5 - Lower
			19	20			
25/12NS Cell 6 - Upper	15	2	21	22	15	2	25/12NS Cell 6 - Lower
			23	24			
2.4NS Cell 1 - Upper	15	2	25	26	15	2	2.4NS Cell 1 - Lower
			27	28			
2.4NS Cell 2 - Upper	15	2	29	30	15	2	2.4NS Cell 2 - Lower
			31	32			
2.4NS Cell 3 - Upper	15	2	33	34	15	2	2.4NS Cell 3 - Lower
			35	36			
6NS-1 DEVICES	15	2	37	38	15	2	4NS-1 DEVICES
			39	40			
2NS-1 DEVICES	15	2	41	42	15	2	5NS-REG#1 DEVICES
			43	44			
NS 480V GROUND FAULT SYSTEM	15	2	45	46	15	2	5NS-REG#2 DEVICES
			47	48			
NS HFB CONTROLS	15	2	49	50	15	2	NS SCADA PANEL
			51	52			
SPARE	15	2	53	54	15	2	BATTERY CHARGER CABINET
			55	56			
SPARE	15	2	57	58	15	2	SPARE
			59	60			
SPARE	15	2	61	62	15	2	SPARE
			63	64			
SPARE	15	2	65	66	15	2	SPARE
			67	68			
SPARE	15	2	69	70	15	2	SPARE
			71	72			

1 / 4036 NORTH SUBSTATION
BATTERY BANK CHARGER PANEL SCHEDULE
N.T.S.



3 / 4036 NORTH SUBSTATION
BATTERY BANK (DOOR NOT SHOWN)
N.T.S.



2 / 4036 NORTH SUBSTATION DC PANEL,
BATTERY BANK AND CHARGER CABINET ELEVATION
N.T.S.

GENERAL NOTES:

1. ENCLOSURE DIMENSIONS ARE APPROXIMATE ONLY. FINAL ENCLOSURE SIZES TO BE PROVIDED IN SHOP DRAWINGS.
2. BATTERY CHARGER TO PROVIDE A MINIMUM OF 8 HOURS BACK-UP WITH SUFFICIENT CAPACITY TO TRIP ALL BREAKERS CONCURRENTLY.
3. DC DEVICES IN SWITCHGEAR SHALL BE WIRED FROM TERMINAL BLOCKS TO ENSURE DC TRIP CIRCUIT CANNOT BE COMPROMISED BY A METER OR OTHER DEVICE FAULT.
4. PROVIDE DEDICATED CIRCUIT BREAKERS FOR UPPER AND LOWER PORTIONS OF EACH SWITCHGEAR CELL AS INDICATED. SPARE BREAKERS SHALL BE PROVIDED PER PANEL SCHEDULE.
5. CONTRACTOR SHALL SUBMIT COMPLETE PANEL SCHEDULE INDICATING BREAKER ID'S.

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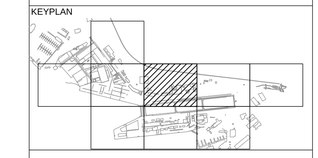

RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
HOULE ELECTRIC VICTORIA
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VICTORIA, BC.
(250)544-0099

7	RECORD DRAWINGS	2019/03/06
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2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		
Revision/ Revision	Description/Description	Date/Date

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD
VICTORIA, BC, V9A 2P1

Project title/Titre du projet
825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
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Drawn by/Dessine par
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Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

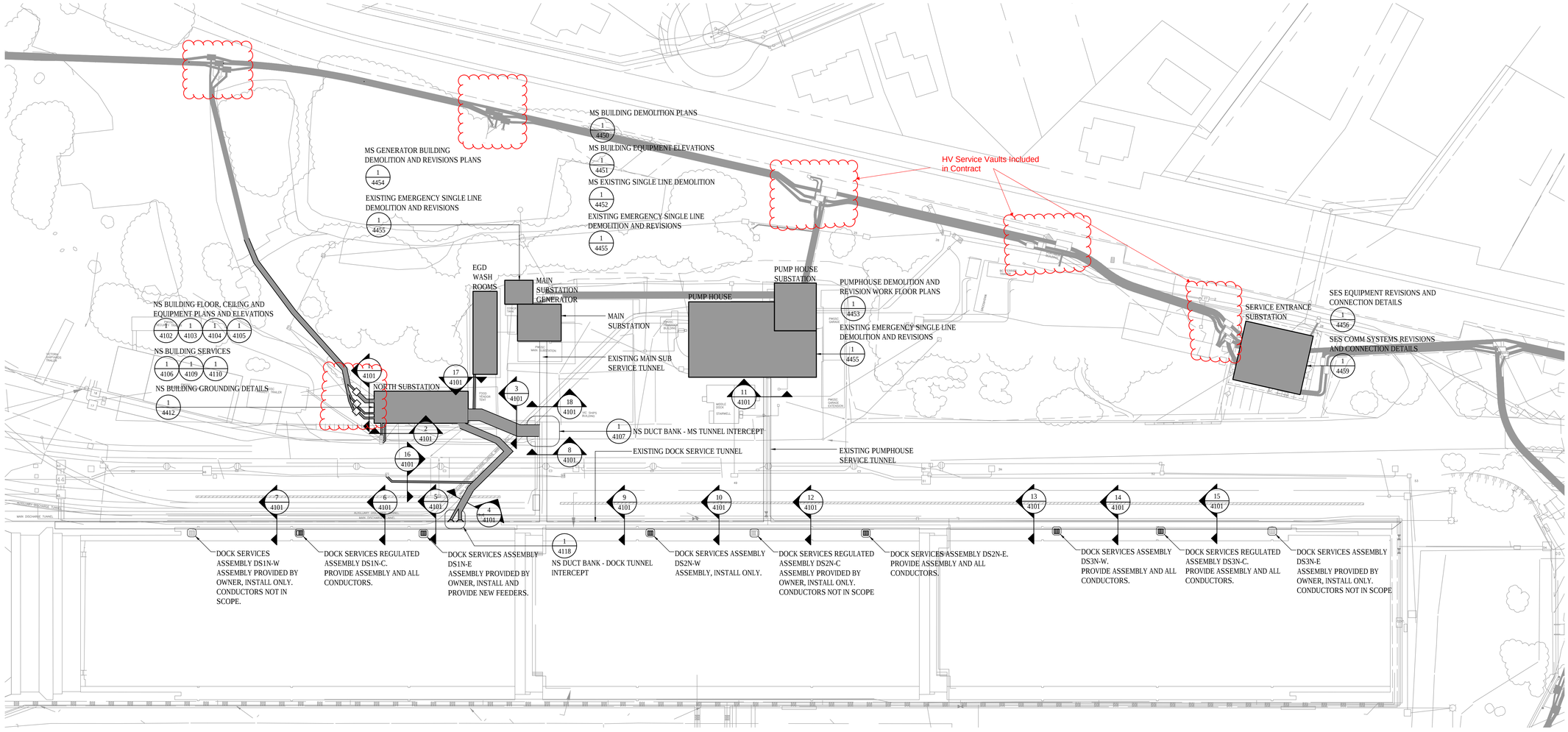
Drawing title/Titre du dessin

BATTERY BANK AND CHARGER DETAILS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4036	6

Plot Date: May 6, 2019 2:40 PM
File Name: N:\PROJECTS\2016\16-1329_DWG\DWG\DWG NS BATTERY BANK CHARGER DETAILING
Plotted by: Eric LeGer

PWGSC – B1 – 1000X707



GENERAL NOTES:

1. ALL SERVICE ASSEMBLIES TO BE CONNECTED TO THEIR RESPECTIVE LIGHTING AND HEATING CIRCUITS DS1N. DS2N, OR DS3N. EVEN IF ALL OTHER CONDUCTORS ARE NOT IN SCOPE.

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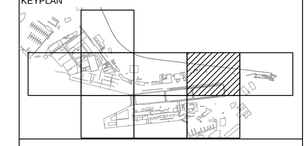

RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
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4240 GLANFORD AVE
VICTORIA, BC.
(250)544-0099

7	RECORD DRAWINGS	2019/03/06
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2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		
Revision/ Révision	Description/Description	Date/Date

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

Drawing title/Titre du dessin

NS ELECTRICAL SITE PLAN

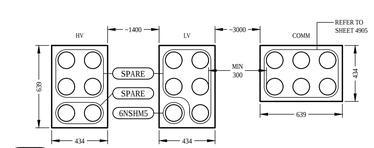
Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4100	6

Plot Date: March, 6, 2019 10:04 AM — Plotted by: Gino LaChar
File Name: N:\PROJECTS\2016\16-139\DWG\DRAWING\NS_SITEDWG

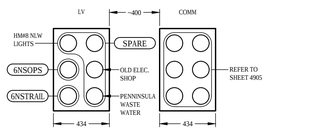
PWGSC – B1 – 1000X707

CABLE SCHEDULE NORTH SUBSTATION SERVICES				
SERVICE	TYPE	VOLTAGE	CONDUCTORS	ID
DS1N-W 600V, 400A SERVICE (FUTURE)	LV	600V	2x3c#3/0 TECK	6DS1N-W
DS1N-W 480V, 400A SERVICE (FUTURE)	LV	480V	2x3c#3/0 TECK	4DS1N-W
DS1N-W 208V, 200A SERVICE (FUTURE)	LV	120/208V	4c#350kCM TECK	2DS1N-W
DS1N-C REGULATED, 2000A SERVICE	LV	430V-630V	8x3c#500kCM TECK	5DS1N-C
DS1N-C 480V, 400A SERVICE	LV	480V	2x3c#3/0 TECK	4DS1N-C
DS1N-C 208V, 200A SERVICE	LV	120/208V	4c#350kCM TECK	2DS1N-C
DS1N-E 600V, 400A SERVICE	LV	600V	2x3c#3/0 TECK	6DS1N-E
DS1N-E 480V, 400A SERVICE	LV	480V	2x3c#3/0 TECK	4DS1N-E
DS1N-E 208V, 200A SERVICE	LV	120/208V	4c#350kCM TECK	2DS1N-E
DS2N-W 600V, 400A SERVICE (FUTURE)	LV	600V	2x3c#3/0 TECK	6DS2N-W
DS2N-W 480V, 400A SERVICE (FUTURE)	LV	480V	2x3c#3/0 TECK	4DS2N-W
DS2N-W 208V, 200A SERVICE (FUTURE)	LV	120/208V	4c#350kCM TECK	2DS2N-W
DS2N-C REGULATED, 2000A SERVICE (FUTURE)	LV	600V	8x3c#500kCM TECK	5DS2N-C
DS2N-C 480V, 400A SERVICE (FUTURE)	LV	480V	2x3c#3/0 TECK	4DS2N-C
DS2N-C 208V, 200A SERVICE (FUTURE)	LV	120/208V	4c#350kCM TECK	2DS2N-C
DS2N-E 600V, 400A SERVICE	LV	600V	2x3c#3/0 TECK	6DS2N-E
DS2N-E 480V, 400A SERVICE	LV	480V	2x3c#4/0 TECK	4DS2N-E
DS2N-E 208V, 200A SERVICE	LV	120/208V	2x4c#4/0 TECK	2DS2N-E
DS3N-W 600V, 400A SERVICE	LV	600V	2x3c#4/0 TECK	6DS3N-W
DS3N-W 480V, 400A SERVICE	LV	480V	2x3c#300kCM TECK	4DS3N-W
DS3N-W 208V, 200A SERVICE	LV	120/208V	2x4c#350kCM TECK	2DS3N-W
DS3N-C 600V, 400A SERVICE	LV	600V	2x3c#250kCM TECK	6DS3N-C
DS3N-C 480V, 400A SERVICE	LV	480V	2x3c#350kCM TECK	4DS3N-C
DS3N-C 208V, 200A SERVICE	LV	120/208V	2x4c#500kCM TECK	2DS3N-C
DS3N-E 600V, 400A SERVICE (FUTURE)	LV	600V	2x3c#250kCM TECK	6DS3N-E
DS3N-E 480V, 400A SERVICE (FUTURE)	LV	480V	2x3c#350kCM TECK	4DS3N-E
DS3N-E 208V, 200A SERVICE (FUTURE)	LV	120/208V	3x4c#500kCM TECK	2DS3N-E
NORTH TUNNEL LIGHTS CCT#1	LV	120V	3c#4 TECK	1NTL-1
NORTH TUNNEL LIGHTS CCT#2	LV	120V	3c#4 TECK	1NTL-2
NORTH TUNNEL LIGHTS CCT#2	LV	120V	2c#4 TECK	1NWSR
NORTH TUNNEL LIGHTS CCT#2	LV	120V	2c#4 TECK	1NESR
SECTION#1 DOCK SERVICE ASSEMBLY POWER	LV	120/208V	4c#4 TECK	1DS1N
SECTION#2 DOCK SERVICE ASSEMBLY POWER	LV	120/208V	4c#4 TECK	1DS2N
SECTION#3 DOCK SERVICE ASSEMBLY POWER	LV	120/208V	4c#4 TECK	1DS3N
CAISSON RECEPTACLES - NORTH SIDE	LV	600V	3c:250#kCM TECK	6CRNS
CME BUILDING SERVICE	LV	600V	2x4c#4/0 TECK	6NSCME
PWGSC OPS BUILDING SERVICE	LV	600V	3c#250kCM TECK	6NSOPS
PWGSC TRAILER SERVICE	LV	600V	4c#4/0 TECK	6NSTRAIL
CRANE TRENCH HEATING	LV	600V	4c#4/0 TECK	6NSCTH
480V CRANE PLUG	LV	480V	3c#2/0 TECK	4REC
NLWS 600V PANEL	LV	600V	3c#8TECK	6NLWS
NLWS 600V LIFT STATION	LV	600V	3c#1/0 TECK	6NLWSLS
SECTION#1 15A REC#1	LV	120V	2c#6 TECK	S1R1
SECTION#1 15A REC#2	LV	120V	2c#6 TECK	S1R2
SECTION#1 15A REC#3	LV	120V	2c#6 TECK	S1R3
SECTION#1 15A REC#4	LV	120V	2c#6 TECK	S1R4
SECTION#2 15A REC#1	LV	120V	2c#6 TECK	S2R1
SECTION#2 15A REC#2	LV	120V	2c#6 TECK	S2R2
SECTION#2 15A REC#3	LV	120V	2c#6 TECK	S2R3
SECTION#3 15A REC#1	LV	120V	2c#6 TECK	S3R1
SECTION#3 15A REC#2	LV	120V	2c#6 TECK	S3R2
HIGH MAST 6 CIRCUITS	LV	347V	4c#6 TECK	6NSHM5
600V NORTH SUB TO MAIN SUB GENERATOR	LV	600V	4c#4/0 TECK	6NSMSG
600V MAIN SUB GENERATOR TO NORTH SUB	LV	600V	4c#4/0 TECK	6MSGNS
DOCK TUNNEL WATER METER POWER	LV	120V	2c#10 TECK	1NSWMP
EGD WASHROOM SERVICE	LV	120/208V	4c#2/0TECK	2NSWR
NS-SES INTERCONNECT	HV	25kV	2x3c#350kCM 25kV XLPE	25NS-SES
HV SHORE POWER VAULT - SPARE	LV	120V	8c#8 TECK	HVSP-SPR
HV SHORE POWER VAULT - LTGS AND HEAT	LV	120V	8c#3 TECK	HVSP-POW
HV SHORE POWER VAULT - CONTROL	LV	120V	50c#8 TECK	HVSP-CON
HV SHORE POWER XFMR - CTS	LV	120V	15c#8 TECK	HVSP-CT
HV SHORE POWER XFRMR - PT & STATUS	LV	120V	15c#8 TECK	HVSP-PTS
HV SHORE POWER XFMR - ZSCT & KEY STATUS	LV	120V	8c#8 TECK	HVSP-ZSCT

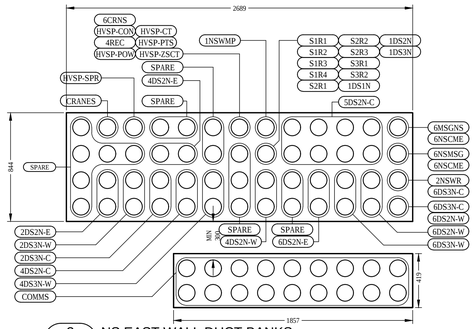
NOTE
NOT ALL CABLES WILL APPEAR IN EVERY SECTION.



1 4100 NS INCOMING SERVICES 1:20

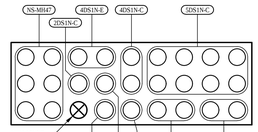


2 4100 NS MANHOLE RECONNECTION 1:20

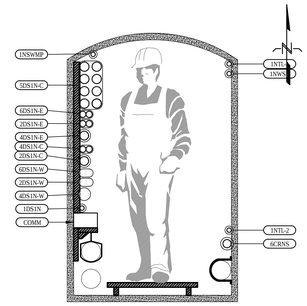


3 4100 NS EAST WALL DUCT BANKS 1:20

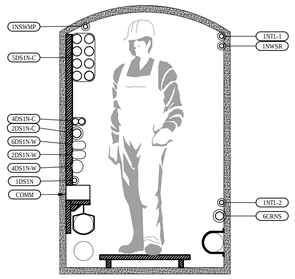
Note that for the purposes of this project, any references to cable 2.4MS-21 or 2.4MS-22 shall be considered as 2.4kV cables. The MS-21 and MS-22 labeling is outdated and no longer true



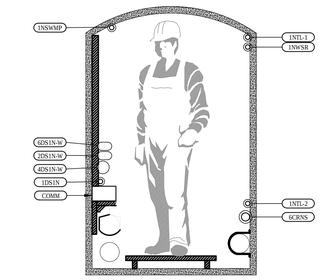
4 4100 NS SECTION#1 DUCT BANK 1:20



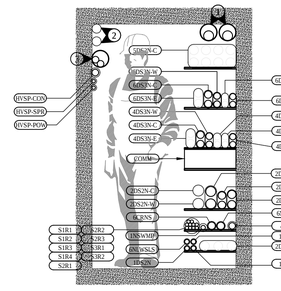
5 4100 DOCK TUNNEL SECTION 1:20



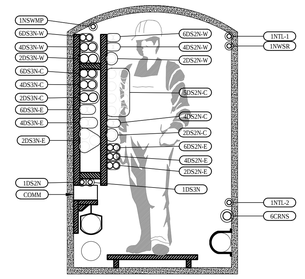
6 4100 DOCK TUNNEL SECTION 1:20



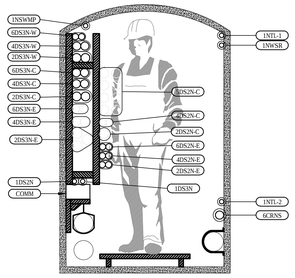
7 4100 DOCK TUNNEL SECTION 1:20



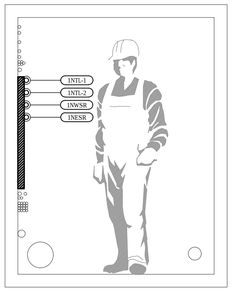
8 4100 MAIN SUB TUNNEL SECTION 1:20



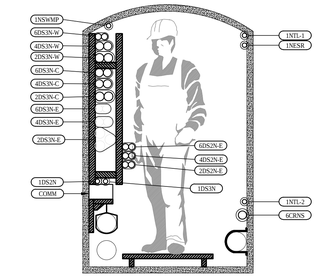
9 4100 DOCK TUNNEL SECTION 1:20



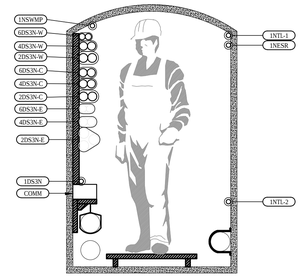
10 4100 DOCK TUNNEL SECTION 1:20



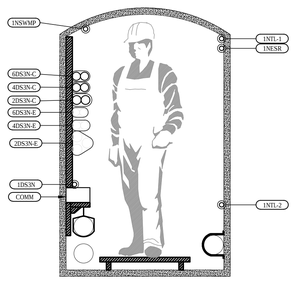
11 4100 PUMPHOUSE TUNNEL SECTION 1:20



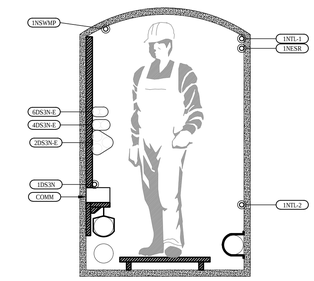
12 4100 DOCK TUNNEL SECTION 1:20



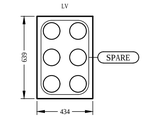
13 4100 DOCK TUNNEL SECTION 1:20



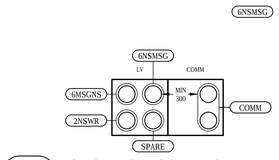
14 4100 DOCK TUNNEL SECTION 1:20



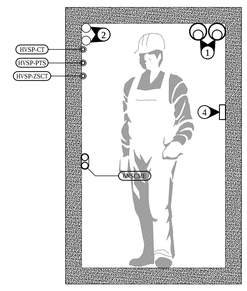
15 4100 DOCK TUNNEL SECTION 1:20



16 4100 NS TO MH47 DUCTBANK 1:20



17 4100 NS TO WASHROOM DUCTBANK 1:20



18 4100 MAIN SUB TUNNEL SECTION NORTH 1:20

0 400 800 1200 1600mm
1:20

GENERAL NOTES FOR WORK IN SERVICE TUNNELS:

1. EXISTING TUNNELS AND ALL WIRES, CABLES, BOXES, AND FITTINGS ARE CONTAMINATED WITH HEAVY METAL DUST. ALL WORK DONE IN TUNNELS WILL REQUIRE PROTECTIVE COVER ALLS, GLOVES, FILTER MASK. ALL REMOVED MATERIALS WILL REQUIRE DECONTAMINATION PRIOR TO DISPOSAL. INCLUDE COST FOR THE ADDED LABOR, MATERIALS, AND PROCEDURES IN BASE BID.
2. CONTRACTOR IS TO INCLUDE THE SALVAGE VALUE OF THE EXISTING CABLES AS A CREDIT IN BASE BID.

KEYNOTES

1. 2x129mm RIGID ALUMINUM CONDUIT FROM NS-MS TUNNEL DUCT BANK HV CONDUIT TO HV SHORT POWER TRANSFORMER IN MS TRANSFORMER YARD. PRIMARY CONDUCTORS TO BE ENCLOSED IN RIGID CONDUIT OR DUCT BANK ALONG ENTIRE RUN. PROVIDE PULL BOXES AS NEEDED. REFER TO SHEET 4010 FOR CONDUCTOR SIZES.
2. 2x3c15KV TECK CABLE SECONDARY CIRCUITS TO SHIP-SHORE VAULT
3. 5kV CRANE CONDUCTORS. REFER TO SHEET 4010 FOR SIZING AND 4108 FOR ROUTING DETAILS
4. CME FIRE ALARM CABLES.

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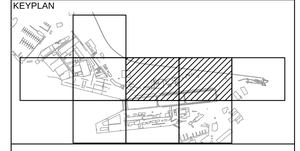
KEYPLAN



RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
HOULE ELECTRIC VICTORIA
4240 GLANFORD AVE
VICTORIA, BC.
(250)544-0099

Revision/ Revision	Description/Description	Date/Date
7	RECORD DRAWINGS	2019/03/06
6	ISSUED FOR TENDER	2017/06/23
5	ISSUED FOR 100% REVIEW	2017/04/06
4	ISSUED FOR 99% REVIEW	2017/02/08
3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet
825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

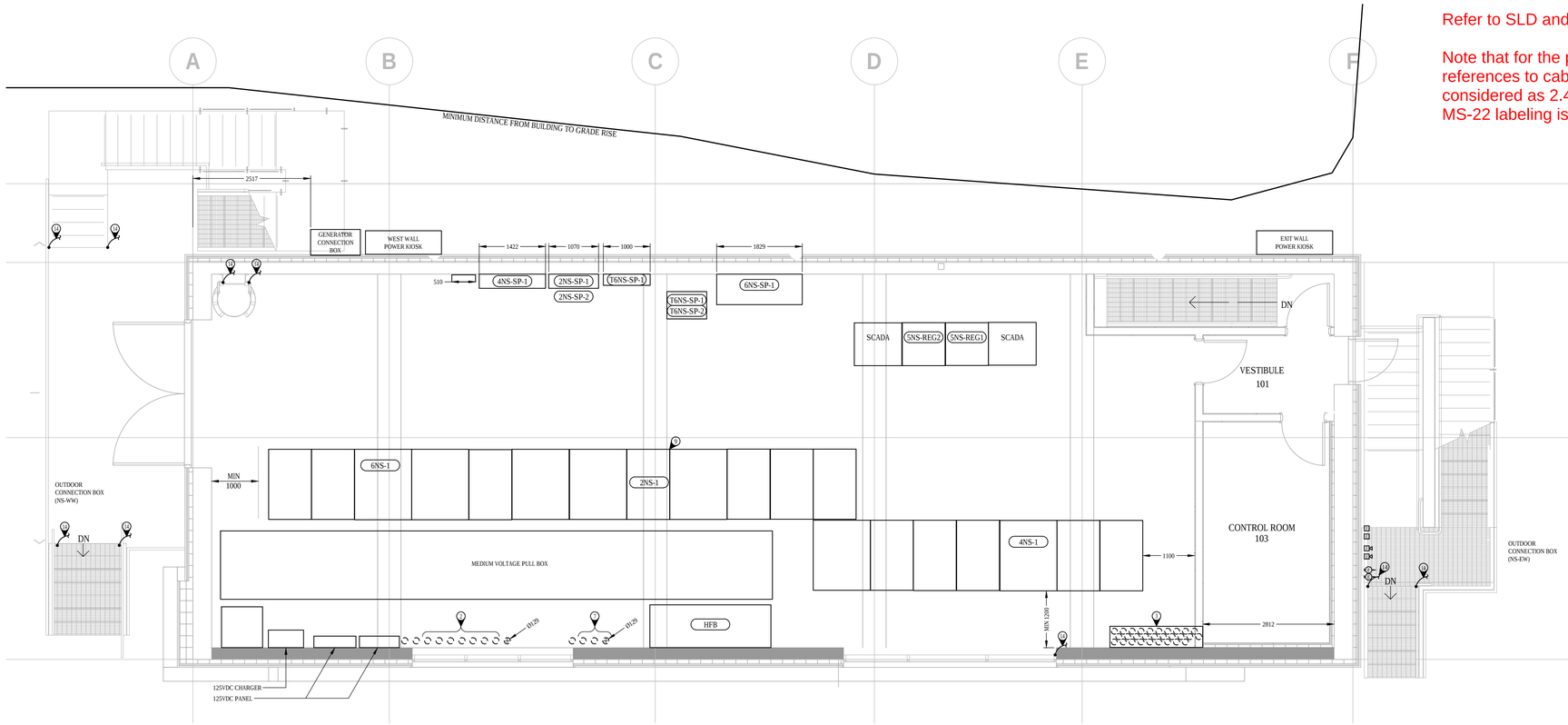
Drawing title/Titre du dessin

NS SITE SECTION DETAILS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4101	6

Plot Date: May 6, 2019 2:45 PM
File Name: K:\PROJECTS\2014\17-139\DWG\DRAWING\101 NS SITE SECTIONS.DWG
Plotted by: Gino LaChar

PWGSC – B1 – 1000X707



Refer to SLD and specifications for scope of work.

Note that for the purposes of this project, any references to cable 2.4MS-21 or 2.4MS-22 shall be considered as 2.4kV cables. The MS-21 and MS-22 labeling is outdated and no longer true

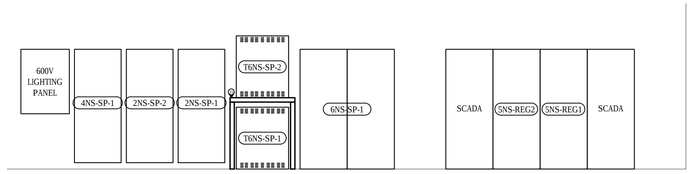
1 / 4102 MAIN FLOOR ELECTRICAL LAYOUT
SCALE 1:50

GENERAL PHASING NOTES AND PROPOSED SEQUENCE OF WORK:

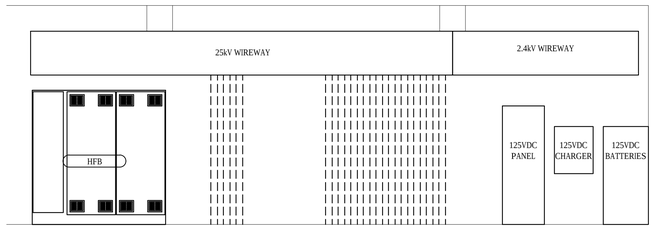
1. ALL OUTAGES ARE TO BE OF MINIMAL DISRUPTION TO THE DOCK OPERATIONS AND ARE TO BE DONE DURING OFF HOURS WHENEVER POSSIBLE.
2. WHEN TRANSITIONING FROM THE MS TO THE NS, ALL REQUIRED SUPPORTING WORKS OR INFRASTRUCTURE MUST BE COMPLETED, TESTED AND OPERATIONAL IN ADVANCE OF THE SWITCHOVER.
3. AS CONSTRUCTION PROGRESS POWER SHALL NOT BE INTERRUPTED TO EXISTING OPERATIONS.
4. ALL FLOOR PENETRATIONS BETWEEN FIRST FLOOR AND BASEMENT AND FIRST FLOOR AND SECOND FLOOR TO BE SUITABLY SEALED AND FIRESTOPPED AFTER ALL CONDUITS AND CONDUCTORS ARE INSTALLED.

KEY NOTES:

1. NORTH SUBSTATION WALL MOUNTED CONNECTION POINTS.
2. 129mm GRS HIGH VOLTAGE CONDUITS FROM PULLPIT TO CEILING MOUNTED CABLE RACEWAY.
3. 103mm GRS CONDUIT CONCEALED EXTRA THICK CONCRETE WALL FROM PULLPIT TO SECOND FLOOD TELECOM ROOM. PAINT WALL DIFFERENT COLOUR IN FRONT OF CONCEALED CONDUITS AND WRITE 'CONCEALED CONDUITS BEHIND WALL, DO NOT DRILL ANCHORS INTO THIS AREA'.
4. MINIMUM 1000M CLEARANCE IN FRONT OF ALL ELECTRICAL SWITCHBOARDS.
5. MINIMUM 2000M CLEARANCE IN FRONT OF ALL MAIN SWITCHBOARD BREAKERS TO ALLOW FOR CLEARANCE IF BREAKER IS IN DRAW-OUT POSITION.
6. 4NS-1 SIDE ACCESS MAIN SECTION. MINIMUM 1000M CLEARANCE.
7. 129M GRS HV CONDUITS FOR CRANE SERVICE CONDUCTORS.
8. 6NS-1 CABLE TRAY. REFER TO CEILING PLAN ON SHEET 4103 FOR ROUTING. EXACT CABLE TRAY ENTRY TO BE DETERMINED BY EQUIPMENT SUPPLIER.
9. 2NS-1 CABLE TRAY. REFER TO CEILING PLAN ON SHEET 4103 FOR ROUTING. EXACT CABLE TRAY ENTRY TO BE DETERMINED BY EQUIPMENT SUPPLIER.
10. 4NS-1 CABLE TRAY. REFER TO CEILING PLAN ON SHEET 4103 FOR ROUTING. EXACT CABLE TRAY ENTRY TO BE DETERMINED BY EQUIPMENT SUPPLIER.
11. 4NS-1 TO 4NS-HFB CABLE TRAY. REFER TO CEILING PLAN ON SHEET 4103 FOR ROUTING. EXACT CABLE TRAY ENTRY TO BE DETERMINED BY EQUIPMENT SUPPLIER AND CO-ORDINNATED WITH EXISTING HFB ENTRY CEILING.
12. 5NS-REG 1 CABLE TRAY. REFER TO CEILING PLAN ON SHEET 4103 FOR ROUTING. EXACT CABLE TRAY ENTRY TO BE DETERMINED BY EQUIPMENT SUPPLIER.
13. 5NS-REG 2 VERTICAL CABLE DROP FROM TRANSFORMER SECONDARY.
14. METAL STAIRWELLS AND SIDING TO BE SUITABLY GROUNDED TO NS STATION GROUND BUS VIA TWO SEPARATE GROUND CONDUCTORS CONNECTING TO THE METALLIC STRUCTURE IN QUESTION AT TO SEPARATE LOCATION. PROVIDE IRREVERSIBLE CRIMPS AND JUMPERS IF METALLIC STRUCTURE IS NOT CONTINUOUS.
15. TRANSFORMER SUPPORT FRAME SHOP DRAWING TO BE SUBMITTED WITH STAMPED APPROVAL OF SIESMIC ENGINEER REGISTERED IN THE PROVINCE OF BC, RATED TO STATIC AND SEISMIC LOADS.



2 / 4102 NORTH WALL EQUPMENT ELEVATION
SCALE 1:50



3 / 4102 SOUTH WALL EQUIPMENT ELEVATION
SCALE 1:50

0 1 2 3 4m
1:50

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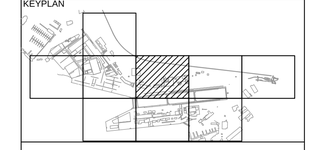
KEYPLAN



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ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet
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ESQUIMALT GRAVING DOCK
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REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

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PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

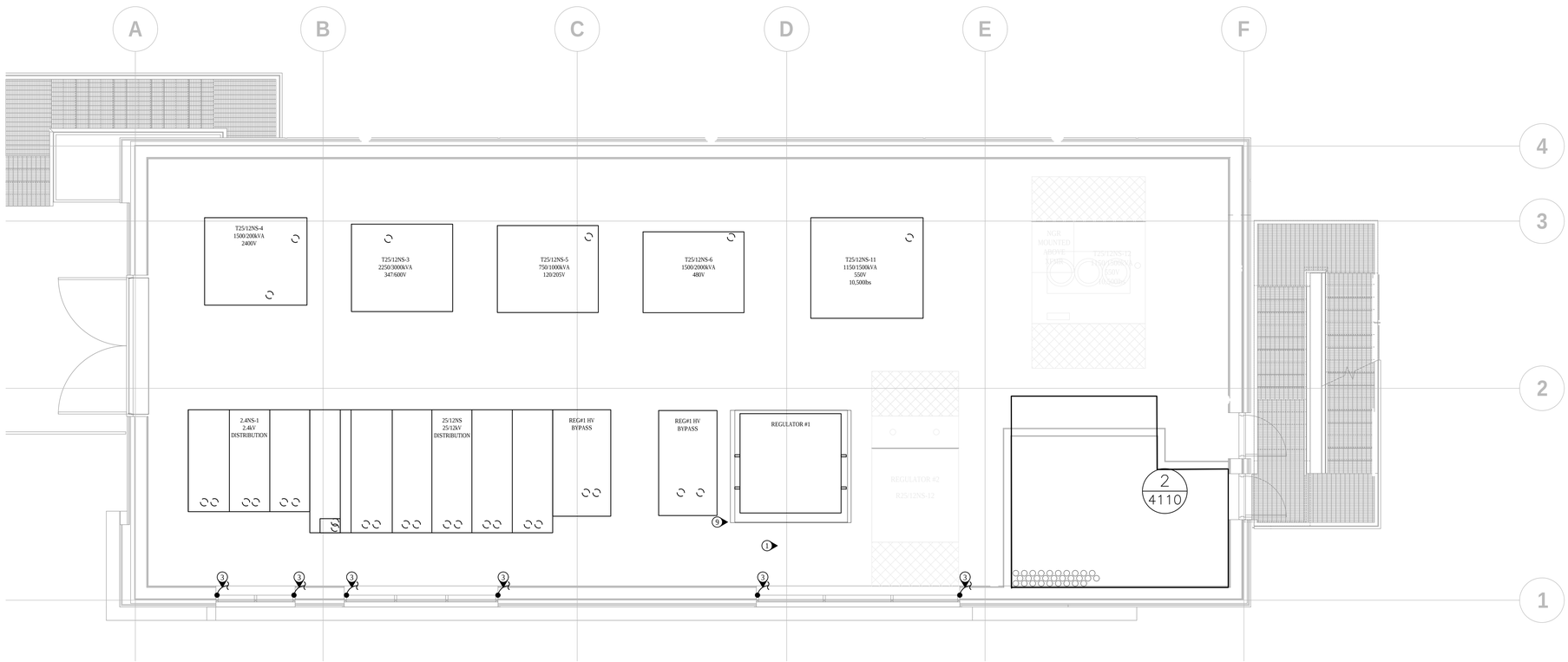
Drawing title/Titre du dessin

MAIN FLOOR ELECTRICAL EQUIPMENT

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4102	6

Plot Date: March 6, 2019 9:24 AM — Plotted By: Gino LaCroix
File Name: N:\PROJECTS\2016\16-129\DWGS\ARCH\4102 NS MAIN LEVEL.DWG

PWGSC – B1 – 1000X707



1 — SECOND FLOOR ELECTRICAL LAYOUT

SCALE 1:50

Refer to SLD and specifications for scope of work.

KEY NOTES:

1. MINIMUM 1000m CLEARANCE AT ACCESS DOORS OF ALL EQUIPMENT.
2. STRUCTURAL 'X' BRACE.
3. METAL STAIRWELLS AND SIDING TO BE SUITABLY GROUNDED TO NS STATION GROUND BUS VIA TWO SEPARATE GROUND CONDUCTORS CONNECTING TO THE METALLIC STRUCTURE IN QUESTION AT TO SEPARATE LOCATION. PROVIDE IRREVEISIBLE CRIMPS AND JUMPS IF METALLIC STRUCTURE IS NOT CONTINUOUS.

0 1 2 3 4m
1:50

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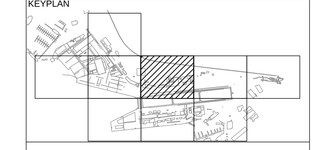
KEYPLAN



RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
HOULE ELECTRIC VICTORIA
4240 GLANFORD AVE
VICTORIA, BC.
(250)544-0099

Revision/ Revision	Description/Description	Date/Date
7	RECORD DRAWINGS	2019/03/06
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5	ISSUED FOR 100% REVIEW	2017/04/06
4	ISSUED FOR 99% REVIEW	2017/02/08
3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC ESQUIMALT GRAVING DOCK ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

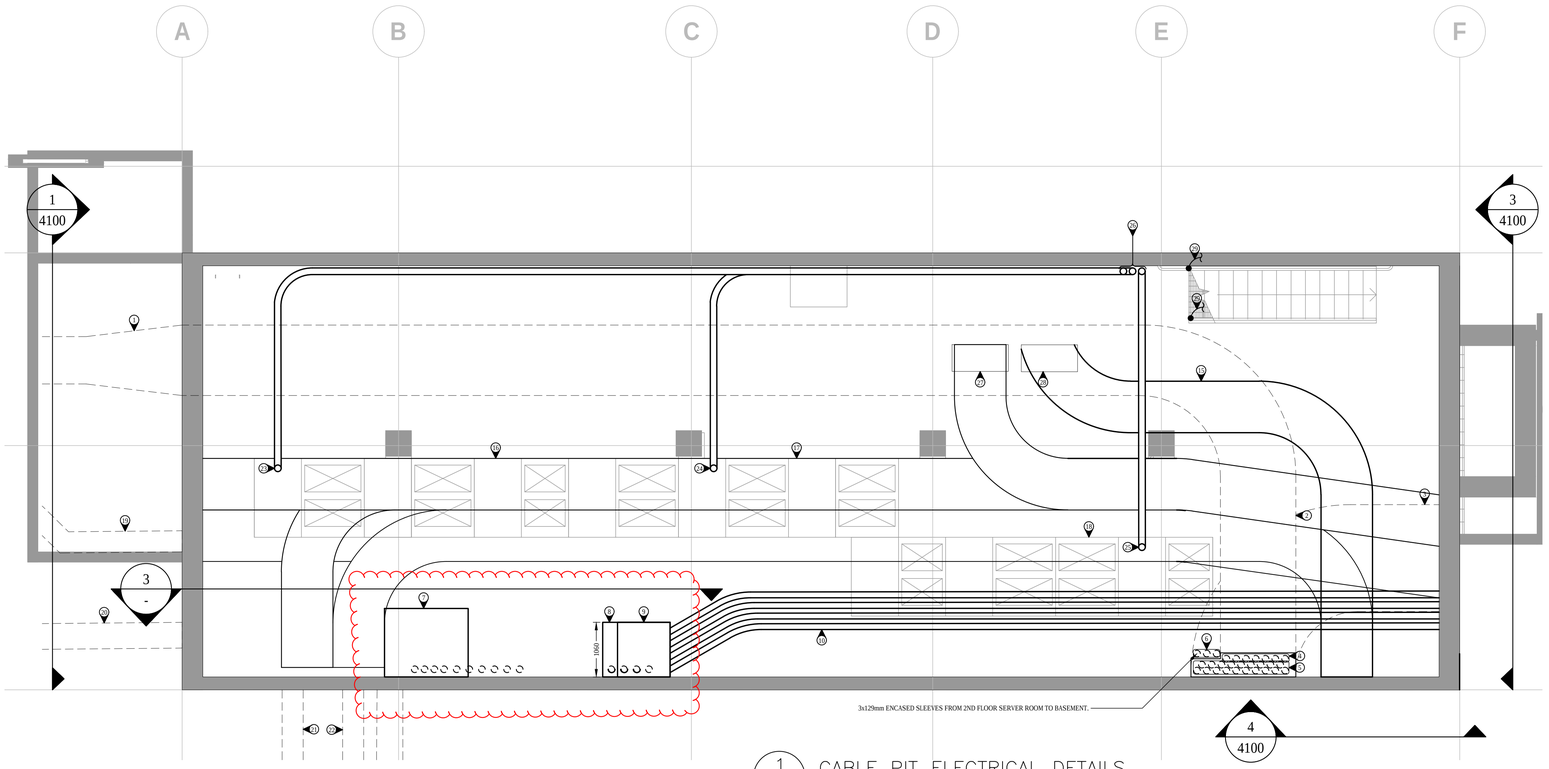
Drawing title/Titre du dessin

SECOND FLOOR ELECTRICAL EQUIPMENT LAYOUT

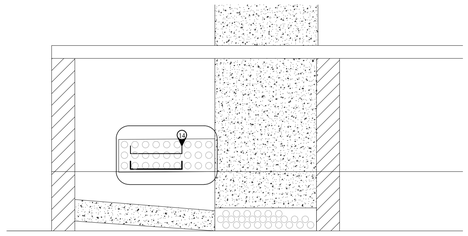
Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4104	6

Plot Date: May 6, 2019 2:41 PM — Plotted By: Gina LaCroix
File Name: N:\PROJECTS\2016\3_1+1-120\DWGS\DWG\16-120-NS SECOND LEVEL.DWG

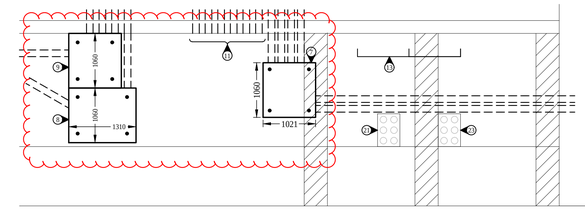
PWGSC – B1 – 1000X707



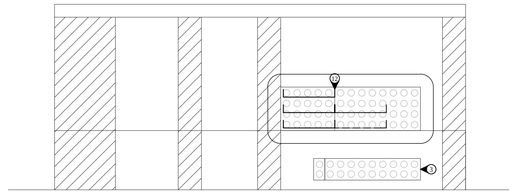
1 4105 CABLE PIT ELECTRICAL DETAILS
SCALE 1:50



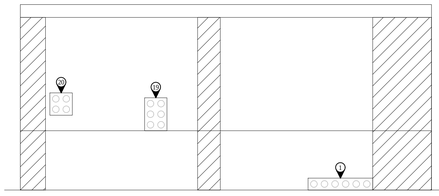
2 4105 CABLE PIT NE CORNER ELEVTAION
SCALE 1:50



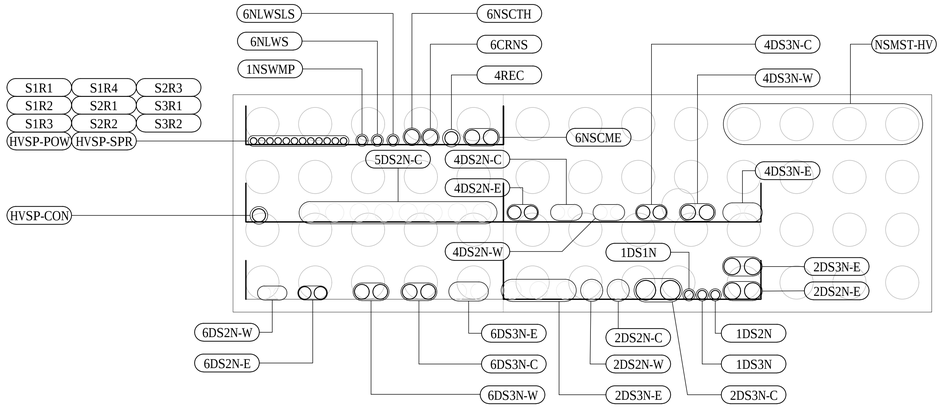
3 4105 CABLE PIT NW CORNER ELEVATION
SCALE 1:50



4 4105 CABLE PIT EAST WALL ELEVATION
SCALE 1:50



5 4105 CABLE PIT WEST WALL ELEVATION
SCALE 1:50



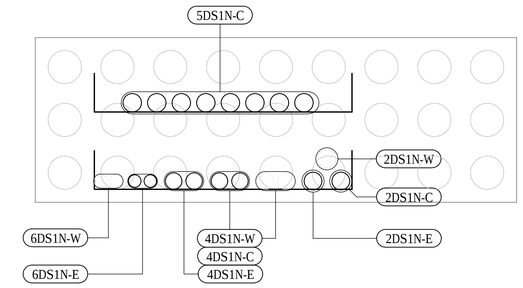
7 4105 E DUCT BANK—TRAY
SCALE 1:10

KEYNOTES:

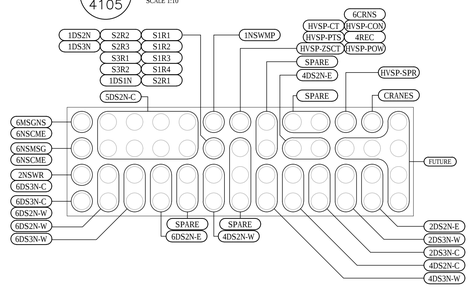
1. COMM. CONDUITS FROM NEW COMM. MANHOLE. 6x129mm RPVC. CONDUITS TO PASS ABOVE NEW SUBSTATION FOOTING AND BE INSTALLED IN CONCRETE FLOOR SLAB OF NORTH SUBSTATION BASEMENT. CONDUITS TO FLATTED INTO 1x6 DUCT BANK TO PASS UNDER SLAB. ENSURE MINIMUM 200mm CONCRETE COVER OVER CONDUITS UNDER FLOOR SLAB. REFER TO CIVIL AND STRUCTURAL SHEETS FOR ADDITIONAL DETAILS.
2. 1x6 COMM. CONDUITS TO PASS OVER 19x129 COMM. DUCT FROM NS-MS TUNNEL DUCT BANK. BOTH CONDUIT GROUPS TO RISE TOGETHER IN CONCRETE COLUMN FROM SUBSTATION BASEMENT TO SECOND FLOOR SERVER ROOM. CONDUITS TO BE COMPLETELY ENCASED WITH MINIMUM 50mm COVER FOR ENTIRE LENGTH OF RUN. REFER TO STRUCTURAL DETAILS FOR SUITABLE STRUCTURAL AND ANCHORING REQUIREMENTS.
3. COMM. CONDUITS FROM NEW NS-MS TUNNEL DUCT BANK AND WASHROOM DUCT BANK. 19x129mm RPVC. CONDUITS TO PASS ABOVE NEW SUBSTATION FOOTING AND BE INSTALLED IN CONCRETE FLOOR SLAB OF NORTH SUBSTATION BASEMENT. CONDUITS TO FLATTED INTO. ENSURE MINIMUM 200mm CONCRETE COVER OVER CONDUITS UNDER FLOOR SLAB. ELEVATIONS TO BE CO-ORDINATED WITH COMM. CONDUITS UNDER SLAB FROM NORTH SIDE COMM. MANHOLE.
4. 6x129mm CONDUITS FROM COMM. MANHOLE SHOWN INSIDE VERTICAL CONCRETE RACEWAY
5. 19x129mm CONDUITS FROM EAST SIDE DUCT BANKS SHOWN INSIDE VERTICAL CONCRETE RACEWAY
6. 3x129mm CONDUITS BETWEEN SECOND FLOOR COMM. ROOM AND NS BASEMENT SHOWN INSIDE VERTICAL CONCRETE RACEWAY. TO END IN NS BASEMENT CEILING, SUITABLE TERMINATED WITH BELLS ENDS AND VAPOR STOPPED.
7. INCOMING 25kV PULL BOX C/W WITH REMOVABLE FRONT PANEL. SIZED AS INDICATED ON DRAWING.
8. 2.4kV PULL BOX C/W WITH REMOVABLE FRONT PANEL. SIZED AS INDICATED ON DRAWING.
9. 25kV PULL BOX C/W WITH REMOVABLE FRONT PANEL. SIZED AS INDICATED ON DRAWING.
10. 4x129mm GRS CONDUITS FROM PULL BOXES TO HV DUCT BANK SECTIONS. MOUNTED TO BASEMENT CEILING AND CO-ORDINATED WITH LV CABLE TRAYS AND SERVICES.
11. CONDUIT STUBS BETWEEN 25kV WIRE WAY ON FIRST FLOOR CEILING TO BASEMENT CEILING. COMPLETE WITH BELL ENDS AND SUITABLY VAPOR STOPPED. CONDUITS ARE SPARE FOR FUTURE.
12. LV CABLE TRAYS COORDINATED WITH DUCT BANK SERVICES. 5 TRAYS, 1 FOR 5NS-REG1 FEEDERS, 1 FOR 6NS FEEDERS, 1 FOR 2NS FEEDERS, 1 FOR 4NS FEEDERS AND 1 FOR MIXED LV SERVICES.
13. LV CABLE TRAYS COORDINATED WITH DUCT BANK SERVICES. 2 TRAYS FOR MIXED LV SERVICES.
14. LV CABLE TRAYS COORDINATED WITH DUCT BANK SERVICES. 2 TRAYS, 1 FOR 5NS-REG2 FEEDERS, 1 FOR MIXED LV SERVICES.
15. TYPICAL FLOOR PENETRATION BELOW LV SWITCHBOARDS. REFER TO STRUCTURAL SHEETS FOR EXACT FLOOR PENETRATION DIMENSIONS. CONDUCTORS TO BE SUITABLE SPACED AND SUPPORTED DURING VERTICAL TRANSITIONS. ALL PENETRATIONS TO BE FIRE STOPPED AFTER CABLE INSTALLATIONS.
16. 6NS-1 SWITCHBOARD FOOTPRINT ON FIRST FLOOR.
17. 2NS-1 SWITCHBOARD FOOTPRINT ON FIRST FLOOR.
18. 4NS-1 SWITCHBOARD FOOTPRINT ON FIRST FLOOR.
19. INCOMING LV CONDUITS FROM NEW LV MANHOLE. 6x129mm RPVC C/W BELL ENDS.
20. INCOMING HV CONDUITS FROM NEW HV MANHOLE. 4x129mm RPVC C/W BELL ENDS.
21. NEW COMM. CONDUITS FROM NS TO EXISTING COMM. MANHOLE. 6x129mm RPVC C/W BELL ENDS
22. NEW LV CONDUITS FROM NS TO EXISTING LV MANHOLE. 6x129mm RPVC C/W BELL ENDS.
23. 1x129mm GRS CONDUITS FROM 6NS-1 TO SCADA CABINET MOUNTED TO BASEMENT CEILING.
24. 1x129mm GRS CONDUITS FROM 2NS-1 TO SCADA CABINET MOUNTED TO BASEMENT CEILING. CO-ORDINATED WITH 6NS-1 CONDUITS.
25. 1x129mm GRS CONDUITS FROM 4NS-1 TO SCADA CABINET MOUNTED TO BASEMENT CEILING.
26. CONDUIT STUB UP THROUGH SLAB TO NEW SCADA CONTROL CABINETS. SEAL EDGES AND SUITABLY FIRE AND VAPOR STOP PENETRATIONS.
27. 5NS-REG1 SWITCHBOARD FOOTPRINT ON FIRST FLOOR.
28. 5NS-REG2 SWITCHBOARD FOOTPRINT ON FIRST FLOOR.
29. METAL STAIRWELL TO BE SUITABLY GROUNDED TO NS STATION GROUND BUS VIA TWO SEPARATE GROUND CONDUCTORS CONNECTING TO THE METALLIC STRUCTURE IN QUESTION AT TO SEPARATE LOCATION. PROVIDE IRREVEISIBLE CRIMPS AND JUMPS IF METALLIC STRUCTURE IS NOT CONTINUOUS.

GENERAL NOTES DETAIL 1/4105:

1. CABLE TRAY LOCATIONS ARE PRELIMINARY, CONTRACTOR TO CONFIRM LAYOUT WITH MANUFACTURERS SWITCHGEAR AND SHOP DRAWINGS AND MAKE ADJUSTMENTS ACCORDINGLY. ENSURE ALL CLEARANCES AND ACCESS SPACING IS MAINTAINED. CABLE TRAY ADJUSTMENTS TO BE MADE TO MATCH EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER.
2. ALL FLOOR PENETRATIONS TO BE SUITABLY SEALED AND FIRE-STROPPED. SUITABLE FIRE STOPPING ASSEMBLIES ARE TO BE SUBMITTED FOR REVIEW AS PART OF PROJECT SHOP DRAWINGS.
3. ALL CONDUITS TO BE VAPOR STOPPED AFTER INSTALLATION OF ALL CONDUCTORS.



6 4105 NE DUCT BANK — TRAY DETAIL
SCALE 1:10



8 4105 EAST LAYOUT
SCALE 1:20

0 200 400 600 800mm 1:10
0 500 1000 1500 2000mm 1:25
0 1 2 3 4m 1:50

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, BASED UPON INFORMATION FURNISHED BY OTHERS AND HAVE BEEN UPDATED TO INCLUDE RELEVANT ADDENDUMS, CLARIFICATIONS, SITE INSTRUCTIONS, CHANGE ORDERS, AND CONTRACTOR SITE ADJUSTMENTS. AES ENGINEERING LTD. ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THESE RECORD DRAWINGS. THESE ARE NOT CERTIFIED AS-BUILT OR AS-CONSTRUCTED DRAWINGS.

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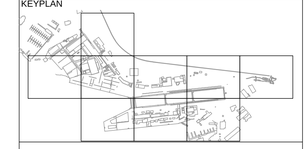
KEYPLAN



RECORD DRAWINGS

MARCH, 2019
PREPARED BY:
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4240 GLANFORD AVE
VICTORIA, BC.
(250)544-0099

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3	ISSUED FOR 66% REVIEW	2017/02/03
2	ISSUED FOR 33% REVIEW	16/08/15
1	ISSUED FOR DESIGN DEVELOPMENT	16/07/04
0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet
825 ADMIRALS ROAD VICTORIA BC
ESQUIMALT GRAVING DOCK
ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

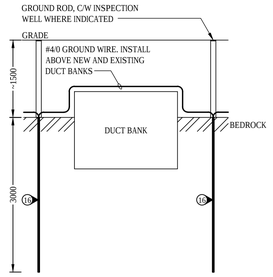
Drawing title/Titre du dessin

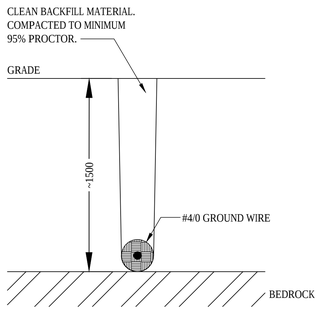
NS CABLE PIT

Project No./No. du projet	Sheet/ Feuille	Revision no./ La Révision no.
R.080235.002	4105	6

Plot Date: May 6, 2019 2:43 PM
File Name: N:\PROJECTS\2016\16-129\DWG\SHK\16129_NS BASEMENT LEVELING
Plotted by: Chris LaDair

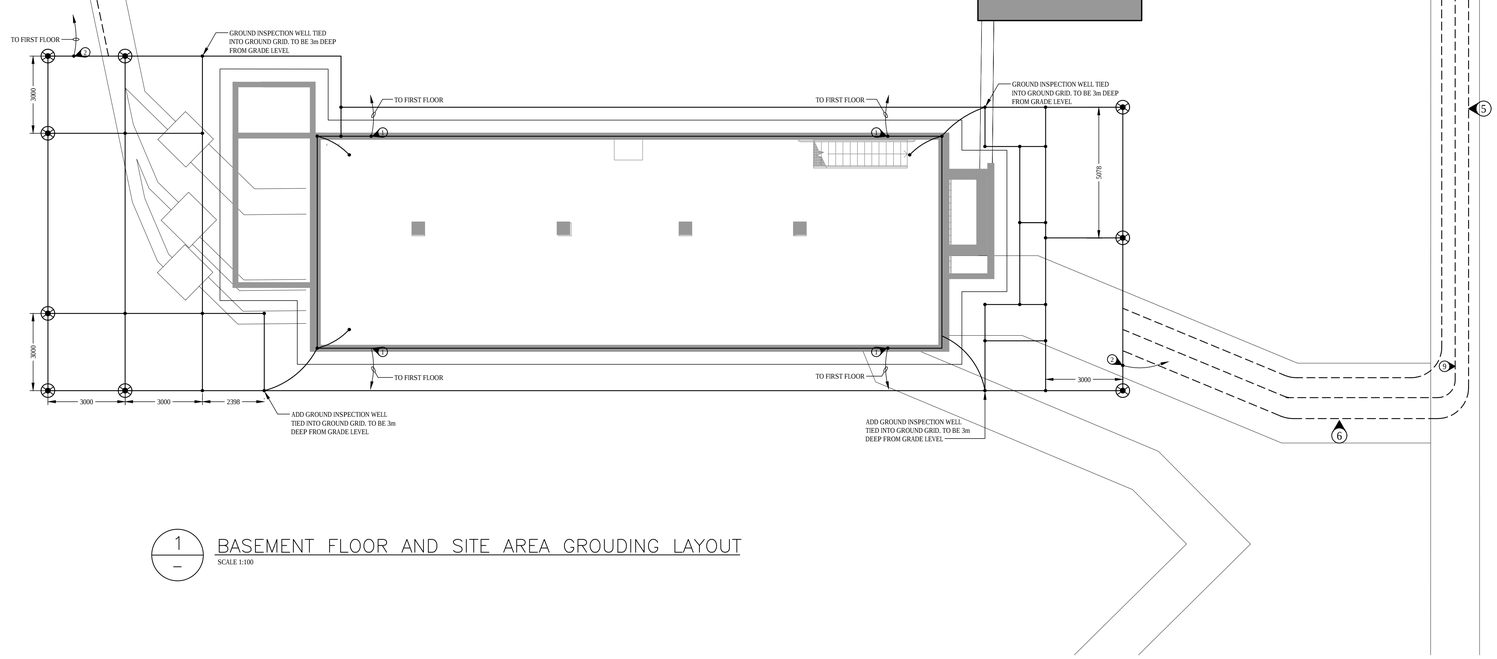
PWGSC – B1 – 1000X707



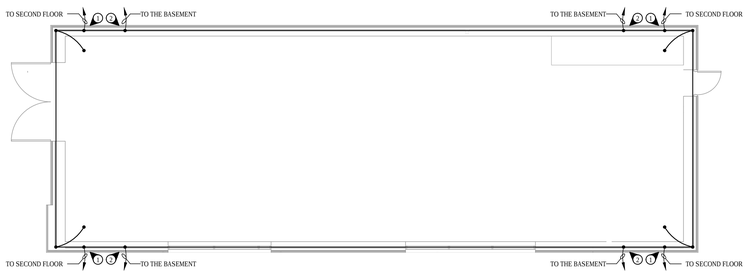


4 / 4412 GROUND WIRE OVER DUCT BANKS
NTS

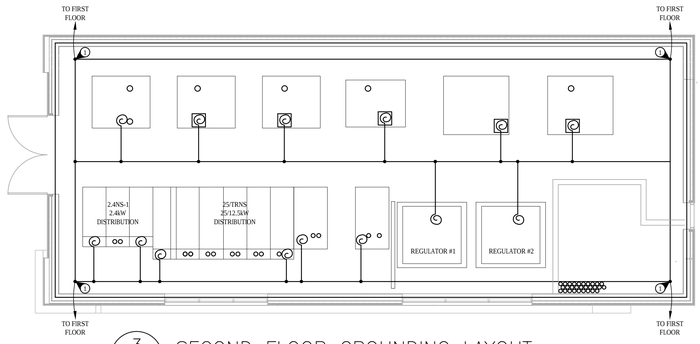
5 / 4412 GROUND GRID TRENCH DETAIL
NTS



1 / — BASEMENT FLOOR AND SITE AREA GROUDING LAYOUT
SCALE 1:100



2 / 4412 FIRST FLOOR GROUNDING LAYOUT
SCALE 1:100



3 / 4412 SECOND FLOOR GROUNDING LAYOUT
SCALE 1:100

0 2 4 6 8m
1:100

LEGEND	
⊙	GROUND ROD WITH ACCESS
⊗	GROUND ROD WITHOUT ACCESS
◉	GROUND ROD CONDUCTOR RISER TO 2ND FLOOR
●	COMPRESSION CONNECTOR
———	#4/0 GROUND CONDUCTOR

GENERAL NOTES:

1. GROUNDING SYSTEM SHALL BE INSTALLED PER CANADIAN ELECTRICAL CODE.
2. BUILDING UFER GROUND CONDUCTOR CONNECTED TO GROUND GRID.
3. STEP AND TOUCH GRID SHOWN IS ON UPPER FLOOR AND MAIN FLOOR LEVEL
4. FIRST AND SECOND FLOOR GROUND GRID TO RUN IN RISERS TO BASEMENT GROUND GRID FOR CONNECTION.

KEYNOTES:

1. EXISTING MAIN SUBSTATION TRANSFORMER YARD FENCING. REVIEW GROUNDING AND BONDING SYSTEM AND REPLACE ANY DAMAGED OR MISSING CLAMS OR CONDUCTORS.
2. EXISTING TRANSFORMER YARD GROUNDING GRID. ENSURE GRID IS NOT DAMAGED, OR THAT ANY DAMAGE IS REPAIRED DURING REMOVAL OF 2.4KV EQUIPMENT.
3. EXISTING GROUND GRID TO BE INTERCEPTED AND NEW GROUND CONDUCTORS TO BE INSTALLED RUNNING BACK TO NS GROUND SYSTEM
4. EXISTING FENCING TO BE CONNECTED TO NEW GROUND CONDUCTORS GOING TO NORTH SUBSTATION.
5. NEW GROUNDING CONDUCTORS TO BE #4/0 COPPER IN GREEN SHEATH, LABEL AS TRANSFORMER YARD GROUND CONDUCTORS EVER 5m FOR LENGTH OF TUNNEL RUN USING LAMACOIDS STRAPPED TO WIRE.
6. GROUND WIRES TO RUN VIA NEW NS-MAIN SUBSTATION TUNNEL INTO NORTH SUBSTATION BASEMENT.
7. TIE INTO GROUND GRID AT FOUR POINTS AT SHOWN.
8. NORTH SUBSTATION UP/DOWN GROUND RISER SYSTEM, 4 PER FLOOR AS SHOWN.
9. #4/0 COPPER GROUND GRID INTERCONNECT BETWEEN NEW NS GROUND GRID AND EXISTING MS GROUND GRID. ENSURE CONDUCTOR IS SUITABLY LABELED ALONG ENTIRE LENGTH.
10. CONNECT TO EXISTING MAIN SUBSTATION GROUND SYSTEM USING COMPRESSION TYPE CONNECTOR.
11. EXISTING 2x#4/0 INSULATED GROUND CONDUCTORS AT BOTTOM OF DUCT BANK TO SES AND PHS. CONFIRM CONTINUITY OF SYSTEM AND CONNECT INTO THESE GROUND CONDUCTORS TO TIE INTO SES AND PHS GROUND SYSTEMS.
12. REFER TO SHEET 4108 FOR EXISTING BUILDING LOCATIONS FOR CONTINUITY TESTING.
13. TIE INTO BUILDING REBAR AT 4 POINTS AS SHOWN
14. BUILDING REBAR IN SLABS, RISERS, COLUMNS AND WALLS TO BE ELECTRICALLY CONTINUOUS. FOR THE PURPOSES OF THIS CONTRACT THE USE OF METAL WIRE TIES TO BIND THE REBARS TOGETHER PRIOR TO A POUR IS SUFFICIENT TO GUARANTEE ELECTRICAL CONTINUITY. COPPER INTERCONNECTION CRIMPS ARE NOT REQUIRED.
15. #4/0 COPPER GROUND GRID. REFER TO DETAIL 5/- FOR TRENCH AND INSTALLATION INFORMATION.
16. 3m LONG COPPER GROUND ROD. TO BE INSTALLED ~1500mm BELOW GRADE AT EXISTING BEDROCK. GROUND RODS TO BE DRILLED INTO EXISTING BEDROCK FOR 3m AND PROPERLY GROUTED INTO BORE HOLE USING SUITABLE ROCK-COPPER GROUNDING COMPOUND. C/W ACCESS PORT WHERE INDICATED.

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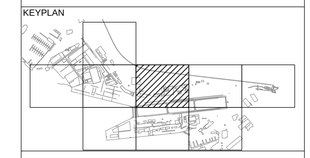
KEYPLAN



RECORD DRAWINGS

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PREPARED BY:
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4240 GLANFORD AVE
VICTORIA, BC.
(250)544-0099

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0		

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRALS ROAD VICTORIA, BC, V9A 2P1

Project title/Titre du projet

825 ADMIRALS ROAD VICTORIA BC ESQUIMALT GRAVING DOCK ELECTRICAL SAFETY UPGRADE

REPLACE MAIN SUBSTATION NORTH SUBSTATION (RMSNS)

Consultant Signature Box Only

Designed by/Concept par
I. BARNES

Drawn by/Dessine par
J. BIELING / S. SEYMOUR

PWGSC Project Manager/Administrateur de Projets TPSGC
Jamie LeBlanc

PWGSC, Regional Manager, Architectural and Engineering Services/ Gestionnaire régionale, Services d'architectural et de génie, TPSGC
Preetipal Paul

Drawing title/Titre du dessin

NORTH SUBSTATION AND MAIN SUBSTATION TRANSFORMER YARD GROUNDING DETAILS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.080235.002	4412	6

Plot Date: May 6, 2019 2:46 PM
File Name: N:\PROJECTS\2016\16-129\DWG\SHEETS\16-129_SHEET4412.DWG
Plotted by: Chris LaClair

PWGSC – B1 – 1000X707

NOTES:

1. FOR SYMBOLS AND ABBREVIATIONS, SEE ESD'S.
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.
3. DISCONNECT SWITCH DESIGNATIONS ARE BASED ON BREAKER NUMBERS, OTHER SWITCHES ARE NUMBERED SIMILARLY BUT ARE NOT SHOWN.
4. MINIMUM SIZES OF HV SHIP–SHORE SERVICE CABLES ARE BASED ON 5MVA LOAD AS FOLLOWS. AS–BUILT SIZES ARE MARKED ON 1–LINE DIAGRAM.

Trfr Tap	Rated Secondary Current	x1.25 (CEC)	Teck Cable		Portable Cable	
			Size	Rating	Size	Rating
12.47kV	232 A	289 A	1–3c 300kCM	295 A	1–3c 4/0	326 A
11kV	262 A	328 A	2–3c 300kCm	590 A	2–3c 4/0	652 A
6.6kV	437 A	547 A	2–3c 300kCm	590 A	2–3c 4/0	652 A

5. (NOT USED)
6. STANDARD PWGSC FONT SIZE OF 2.5mm IS NOT IMPLEMENTED BY SPECIAL PERMISSION.
7. GROUND RELAY FPE TLR–3–25–F EXCEPT WHERE NOTED OTHERWISE.
8. FILTER BANK POWER FACTOR CONTROLLERS ARE ESTAMAT PFC12.

REFERENCE DRAWINGS		REF. No.
	FPE SB8304–W1, REV. 2	1
	FPE SC–1119–A, REV. 5 (1980)	2
	FPE SC–1118–W1, REV. 5 (1983)	3
	FPE SC–1118–W2, REV 3.	4
	FPE SC–1120–W1, REV. 3 (1980)	5
	SIMPOWER/TTI 12894–171 THRU 176 (2002)	6
	FPE SB–6164–W1, REV. 6 (1983)	7
EMD E5	SOUTHSIDE SUBSTATION 1–LINE	8
EMD E4	NORTH LANDING WHARF 1–LINE	9
EMD E3	PUMPHOUSE 1–LINE	10
EMD E6	STANDBY SYSTEM 1–LINE	11
EMD E1	NUMBERING SYSTEM	12
E1 of 3	PWGSC #846352 (KEEL BLOCK)	13
E1	PENINSULA W.W. (AES 2002)	14
EMD E12	MAIN SUBSTATION PANEL SCHEDULES	15

Public Works and Government Services Canada / Travaux publics et Services Gouvernementaux Canada

Pacific Region

GENIVAR

4396 WEST SAANICH ROAD, SUITE 130
VICTORIA, BRITISH COLUMBIA, CANADA V8Z 3E9
TELEPHONE: (250) 386–6721
FAX: (250) 386–2844

TEMPORARY NOTES:

1. VERIFY BREAKER NUMBERS.
2. VERIFY PT SOURCE.
3. CONFIRM MAIN BREAKER.
4. NOT USED.
5. FIELD VERIFY.
6. NOT USED.
7. NOT USED.
8. CONFIRM CT RATIO.
9. NOT USED.
10. CHANGE NAMEPLATE TO MISCELLANEOUS SERVICE PANEL.
11. CHANGE BREAKER NAMEPLATE.
12. PANEL BREAKERS ALL SPARES. CABLES LEFT IN PLACE?
13. (NOT USED)
14. CONFIRM LOCATED BELOW DSP–MKII (NOT LABELED).
15. VOLTMETER AND AMMETER REMOVED?
16. CONFIRM NAMEPLATE.
17. ASSIGN OR CONFIRM SCADA NUMBERS.
18. CONFIRM CIRCUIT CONNECTIONS.
19. CONFIRM FAULT LEVEL.

revisions		date
13	EGD HIGH VOLTAGE MAINTENANCE	02 JAN 2019
12	2012 HIGH VOLTAGE MAINTENANCE REDLINES	01 JAN 2014
11	INCLUDED STANDBY GENERATOR LOADS ELECTRICAL SAFETY UPGRADE DESIGN CRITERIA	14 FEB 2011
10	BY RFA; 6M5–55 WAS 6M5–5; ADDED NORSW TO T12.5M5–2 PER ELITE E2, REV.10	7 JUNE 2008
9	BY RFA; ADDED CME SHOPS & OFFICES TO 6M5–5	26 FEB 2008
8	BY RFA; UPDATED 6M5 PER VIC SHIP OFFICE FEEDER AS–BUILTS.	19 DEC 2006
7	BY RFA; UPDATED FAULT LEVELS PER ELITE STUDY OF 6 OCT 2006	16 NOV 2006
6	BY PWGSC; ADDED AS BUILTS FOR VIC SHIP OFFICE BUILDING	15 MAY 2006
5	BY RFA; 6M5–9 FEEDER SIZE CHANGED TO MATCH NEW TRANSFORMER RATING OF 150kVA	17 MAR 2006
4	BY RFA; ADDED VIC. SHIP OFFICE BUILDING SERVICE TO 6M5	27 JAN 2006
3	BY RFA; GENERAL UPDATE FOR APPROVED EMD ISSUE, INCLUDING MACNA IV MARK–UPS FOR 2004 HV MAINTENANCE TENDER	15 AUG 2005
2	BY RFA; ADDED KEY INTERLOCK TO 2.4 MS–20; ISSUED FOR 2004 HV MAINTENANCE TENDER	7 OCT 2004
1	AS BUILT; (PWGSC #846354, RFA #237–20211) PER BREWS SUBMISSION OF 24 JUN 04; 3 PT'S ON LOAD SIDE OF 12.5M5–1 WAS 2	10 AUG 2004

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

ESQUIMALT GRAVING DOCK ESQUIMALT, B.C.

ELECTRICAL MASTER DRAWING

drawing / dessin

MAIN SUBSTATION SINGLE–LINE DIAGRAM

designed / conçu	M. K. ÇANÇAR | G. PETERSON	
drawn / dessiné	P. PARANPAN	
approved / approuvé		
tender / Soumission		
PWGSC Project Manager	Administrateur de projets TPSGC	
project no. / no. du projet	—	
drawing no. / no. du dessin	EMD E2	REV.A

Plot Date: January 02, 2019 - 1:24 PM Plotted by:Ritchie, Wyatt
File Name: V:_ELEC\MECHANAT\PROJECTS\SITE LIBRARY\ESQ DATA\ELECTRICAL MASTER DRAWINGS (DXG)\EMD E2 (MAIN SUB SLD) REV 12.DWG

REFERENCE DRAWINGS		REF. No.
	FPE SR 155–W1, REV. 4 (1990)	1
	FPE SB 6165–W1, REV. 1 (1985)	2
DUPLICATE REFERENCE →	FPE SB 6165–W1, REV. 1 (1985)	3
	FPE–SR–242–W1, REV. 2 (1985)	4
EMD E2	MAIN SUBSTATION 1–LINE	5
EMD E76	4SS2 FRONT ARRANGEMENT	6
EMD E77	2SS2 FRONT ARRANGEMENT	7
EMD E4305	480V GFM SYSTEM	8
EMD E6	STANDBY SYSTEM 1–LINE	9
EMD E1	NUMBERING SYSTEM	10
EMD E3	PUMPHOUSE 1–LINE	11

GENERAL NOTES:

1. THIS DRAWING IS DERIVED FROM PWGSC PROJECT NO. 845398 AS–BUILT DRAWING NO. ES OF 21, REV. 2.
2. UNLESS NOTED OTHERWISE, ALL BREAKERS ARE 3–POLE. FOR ADDITIONAL BREAKER DETAILS, SEE SWITCHBOARD FRONT ARRANGEMENT DRAWINGS AND PANEL SCHEDULES.
3. FOR FEEDER GROUND FAULT TRIP PRIORITIES, SEE SWITCHBOARD FRONT ARRANGEMENT DRAWINGS.
4. 52–4 IS NOT SHOWN ON THIS DRAWING PER REF. 1.
5. STANDARD PWGSC FONT SIZE OF 2.5mm IS NOT IMPLEMENTED ON EMD DRAWINGS BY SPECIAL PERMISSION.
6. FOR SYMBOLS AND ABBREVIATIONS, SEE ESD'S.

TEMPORARY NOTES:

1. VERIFY INTERNAL DISTRIBUTION.
2. VERIFY No. OF PARALLEL CABLES.
3. VERIFY CT RATIO.
4. VERIFY I.C. RATING OF 52–4SS1–3.
5. VERIFY P.T. SOURCE.
6. INVESTIGATE IF SWITCH RATING IS ADEQUATE.
7. VERIFY 2 OR 3 CT'S.
8. P&C 2A31–1 PER ELITE–307
9. NOT USED.
10. NOT USED.
11. FIELD VERIFY.
12. CONFIRM METER NUMBERS AND IDENTIFY BREAKER.
13. FAULT LEVEL TO COME.
14. VERIFY IF SPARES ARE CONNECTED TO SECTION #3 BUS OR THE MAIN BUS.
15. VERIFY CONNECTION

revisions		date
8	EQD HIGH VOLTAGE MAINTENANCE	02 JAN 2019
7	2012 HIGH VOLTAGE MAINTENANCE RED LINES	22 JAN 2014
6	INCLUDED STANDBY GENERATOR LOADS ELECTRICAL SAFETY UPGRADE DESIGN CRITERIA	14 FEB 2011
5	BY RFA: 112.5 SS–1 ANF RATING ADDED; BREAKER 4SS2–18 CT ADDED, 4SS2–23 KIOSK #3 SPLITTER WAS A RECEPTACLE	6 JULY 2007
4	BY RFA: UPDATED FAULT LEVELS PER ELITE STUDY OF 2 OCT 2006	16 NOV 2006
3	BY RFA: ADDED CABLE No'S; REMOVED LEGEND	15 AUG 2005
2	BY RFA: AS–BUILT PER FMI MARK–UPS (PWGSC #84635A, RFA# 237–20307).	27 MAY 2005
1	BY RFA: CABLE NUMBERS FOR JM4 & 5 UPDATED AS TENDERED (PWGS No. 846354); ISSUED FOR 2004 HV MAINTENANCE TENDER; 208V JETTY MOUNTS 1–5 FEEDER No.'S WERE 4SS2.	7 OCT 2004

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

ESQUIMALT GRAVING DOCK
ESQUIMALT, B.C.

ELECTRICAL MASTER DRAWING

drawing / dessin

SOUTH SIDE SUBSTATION SINGLE LINE DIAGRAM

designed / date	M. K. ÇANÇAR | G. PETERSON	concu
drawn / date	P. PARANPAN	dessine
approved / date		approuve
tender		Soummission
PWGSC Project Manager		Administrateur de projets TPSGC
project no.	—	no. du projet
drawing no.	EMD E5	no. du dessin REV.A

Public Works and Government Services Canada / Travaux publics et Services Gouvernementaux Canada

Pacific Region

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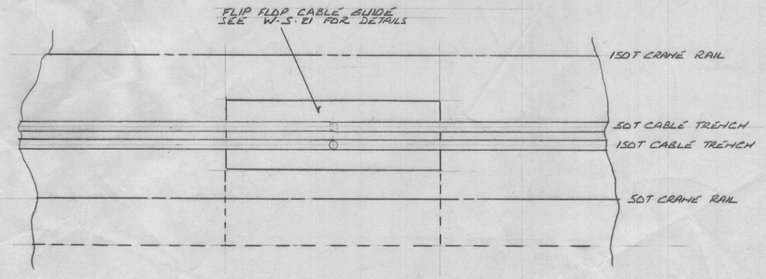
TELEPHONE: (250) 386–6721
FAX: (250) 386–2844

Plot Date: January 03, 2019 1:38 PM Plotted by:Rhoda, Wyatt
File Name: \\?\...\EQUIPMENT\PROJECTS\SITE LIBRARY\ESQ DATA\ELECTRICAL MASTER DRAWINGS (DWG)\EMD E5 (SOUTH SUB SLD) REV 7.DWG

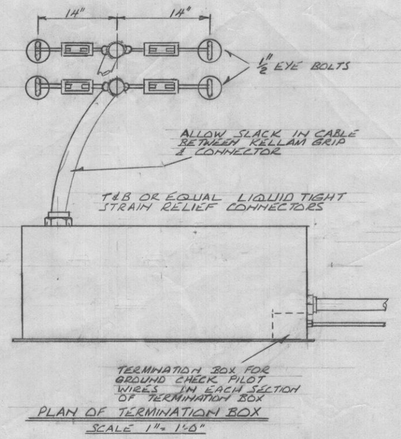
cut here
couper ici

international A1 594 x 841 mm

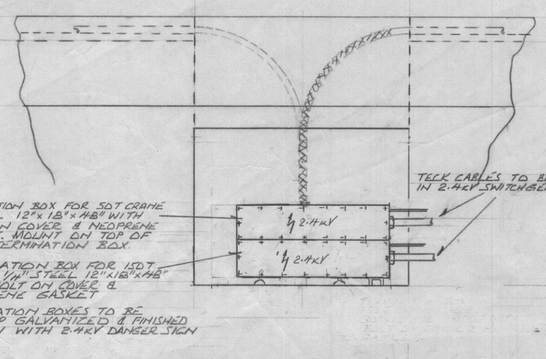
inches 0 1 2 3 4 5 6 7 8 pouces



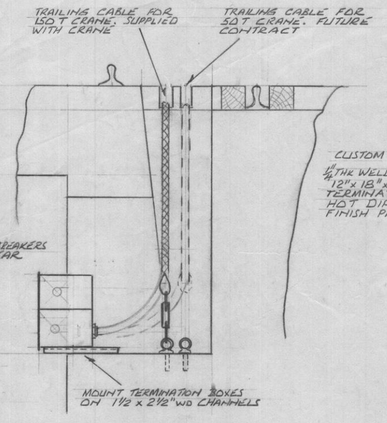
PLAN OF CABLE TERMINATION PIT
SCALE 1/8" = 1'-0"



PLAN OF TERMINATION BOX
SCALE 1" = 1'-0"

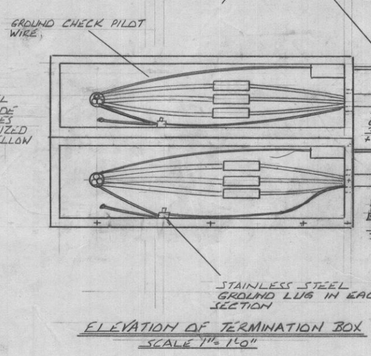


ELEVATION OF CABLE TERMINATION PIT FROM MAIN TUNNEL
SCALE 1/2" = 1'-0"

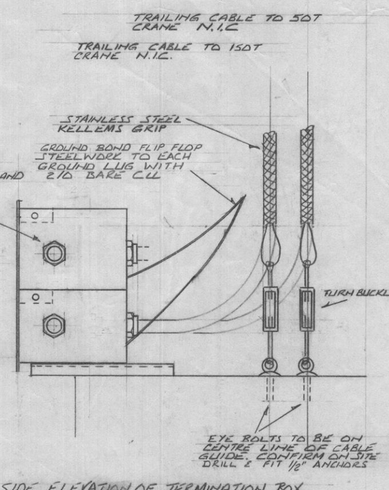


SECTION THRU CABLE TERMINATION PIT
SCALE 1/2" = 1'-0"

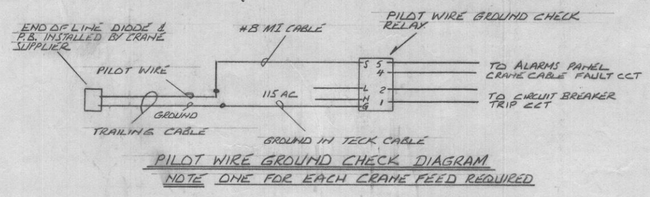
CUSTOM MADE 1/4" THK WELDED STEEL 12"W x 18"H x 48"L INSIDE TERMINATION BOXES HOT DIP GALVANIZED FINISH PAINTED YELLOW



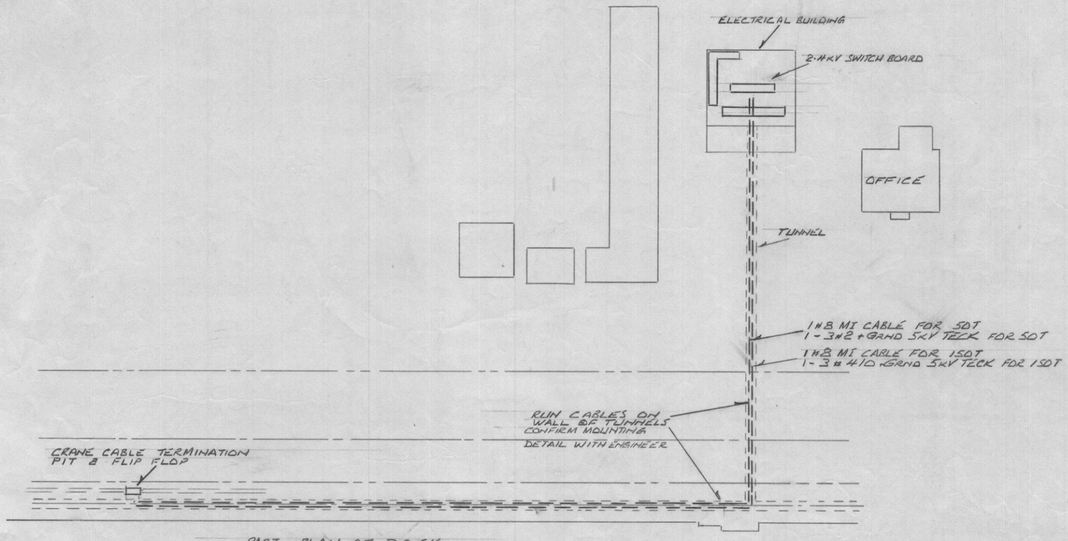
ELEVATION OF TERMINATION BOX
SCALE 1" = 1'-0"



SIDE ELEVATION OF TERMINATION BOX
SCALE 1" = 1'-0"



PILOT WIRE GROUND CHECK DIAGRAM
NOTE ONE FOR EACH CRANE FEED REQUIRED



PART PLAN OF DOCK
SCALE 1" = 30'

NOTES
1. SUPPLY & INSTALL FEEDERS & TERMINATION BOXES FOR 50T & 150T CRANES
2. SUPPLY & INSTALL RETAINING HARDWARE I.E. EYE BOLTS & TURNBUCKLES FOR BOTH CRANES
3. MAKE CONNECTION TO 150T CRANE TRAILING CABLE ONLY, INCLUDING SUPPLY OF KELLAM GRIP. TRAILING CABLE WILL BE SUPPLIED WITH CRANE
4. HIGH VOLTAGE CONNECTIONS AT SWITCHGEAR & IN TERMINATION BOXES BY QUALIFIED H.V. CABLE SPLICER ONLY

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. FREUNDLICH

centimetres 0 2 4 6 8 10 12 14 16 18 20 centimètres

DPW A1

Public Works Canada / Travaux publics Canada

office
bureau
PACIFIC REGION

consultant
expert-conseil
ROBERT FREUNDLICH
& ASSOCIATES LTD.
CONSULTING ENGINEERS
VICTORIA, B.C.

seal
sceau

designed by conçu par	B. D. WRIGHT	BDW
drawn by dessiné par	B. D. WRIGHT	BDW
approved by approuvé par	R. FREUNDLICH	date 17 JUN 80
	D. HARRIS	
scale échelle	AS NOTED	

A detail no. no. du détail
B sheet no. – where detail required no. de la feuille – où détail exigé
C sheet no. – where detailed no. de la feuille – où détaillé

revisions
révisions

1	FEB. 1983	'AS BUILT' - NO CHANGE

BC037066

project
projet
ESQUIMALT GRAVING DOCK
ESQUIMALT, B.C.
CRANE RAIL FOUNDATION
PHASE II

drawing
dessin
ELECTRICAL
CRANE CABLE FEEDERS & CONNECTION DETAILS

project No. du projet	sheet No. de la feuille
PR - 010214	W - E - 10

239-6

APPENDIX B

HIGH VOLTAGE MAINTENANCE, ESQUIMALT GRAVING DOCK – PROJECT R.098355.001, MARCH 11, 2019, PRIME ENGINEERING

Prime Engineering Ltd.
#1-717 Aldebury Street
Victoria, BC V9A 5T2
Phone: (250) 590-8912
Fax: (250) 590-8917
www.primeeng.ca

HIGH VOLTAGE MAINTENANCE, ESQUIMALT GRAVING DOCK

PROJECT No.: R.098355.001

Date: March 11, 2019

Contractor: Mega Power Installations Ltd

Owner: Public Works and Government Services Canada, Esquimalt Graving Dock

Prime Engineering Ltd.
#1-717 Aldebury Street
Victoria, BC V9A 5T2
Phone: (250) 590-8912
Fax: (250) 590-8917
www.primeeng.ca

ENGINEER . IMPLEMENT . MAINTAIN

CONTRACTOR	Megapower Installations	**DATE:**	2019-03-11			
OWNER	Public Works and Government Services Canada	**FROM:**	Keisan Goldsmith			
ADDRESS	3277 Whittier Ave Victoria, BC, V8Z 3R1 Canada	**Project #**	**8234**			
PHONE	(250) 475-2100	**PAGE**	2	**OF**	66	
EMAIL	jon@megapower.ca					
PROJECT	8234 – Esquimalt Graving Dock High Voltage Maintenance					
SUBJECT	High Voltage Maintenance Report					

Dear Sir,

Thank you for having Prime Engineering provide high voltage maintenance services for your facility. The testing and verifications have been completed and evaluated by following industry standards, manufacturers recommendations where available, latest revision of NETA MTS as applicable to evaluate test results, the latest revision of the Canadian Electrical Code (CEC) and CSA Z462 Workplace Electrical Safety Standard to identify any deficient items that require action for this facility to stay current with electrical industry safe working practices.

At **Prime Engineering**, we specialize in providing these services, and maintain records of your facility to allow year to year comparisons for determining life expectancy, using test equipment calibrated to international standards. You should schedule your next maintenance period two years from this report; we will remind you as well.

Contents

EXECUTIVE SUMMARY:

Prime engineering has performed maintenance and testing services at five locations at the Esquimalt Graving Dock. A summary of findings and recommendations for each location is included below:

NORTH LANDING WHARF SUBSTATION:

Notes:

- Ground fault detection system
    - The feeder cables for Kiosk #1 (fed from 4NL-4) are not ran through the zero sequence CT meant for detecting ground faults on this circuit. With this configuration, ground faults on this circuit will be undetected by the ground fault detection system.
    - The SPARE and PNL 2NL-10 ground fault modules did not operate as expected; no trips were observed when injecting above 80A through the corresponding zero sequence CT
- During IR scanning, Phase A CT on the load side of 4NL-4 was found to be at an elevated temperature relative to the other phases.

Recommendations:

- Re-route Kiosk #1 feeder cables through the designated zero sequence CT to ensure ground fault trips will be detected and tripped by the ground fault detection system
- Further investigation into inoperable ground fault modules to determine if zero sequence CTs or ground fault modules require replacement to restore ground fault monitoring system to proper operation.
- Monitor 4NL-4 phase CT thermal levels during heavy loading and consider replacement if levels are nearing the rated device values.

Krupp 150T CRANE

Notes:

- No posted single line or mimic bus on the 2.4kV equipment
- No arc flash hazard labels present
- T2.4MS-21FS nameplate has been modified
- No ground balls or good location to connect worker protection ground on the ground bus when opening any of the 2.4kV equipment doors.
- Winding temperature gauge for T2.4MS-21FU serves as visual indication only
- Cable penetrations in electrical room floor are open to the outside; possible entry point for birds.
- 2.4kV slip ring covers

- One cover gasket has deteriorated
- One cover has been sealed in place and can no longer be removed

Recommendations:

- Post an up to date single line in the electrical room
- Post up to date arc flash labels
- Install ground bus extensions for 2.4kV grounding provisions
- Seal cable penetrations to prevent birds from entering through
- Replace 2.4kV slip ring viewing cover gaskets

EBCO 30T CRANE

Notes:

- No posted single line or mimic bus on the 2.4kV equipment
- No arc flash hazard labels present

Recommendations:

- Post up to date single line diagram in the electrical room
- Post up to date arc flash labels
- Identify and label each device as per the single line designations

KONE 30T CRANE

Notes:

- Inaccuracies were noted in the equipment single line of record; the 2.4kV disconnect switch and earthing switch are not shown.
- No up to date posted single line in the electrical room

Recommendations:

- Post an up to date single line diagram in the electrical room
- Ensure record drawings are updated to include the 24KV disconnect and earthing switches
- Identify and label each device as per the single line designations

12.5KV SHIP-SHORE SYSTEM

Notes:

- T12.5NS-9 liquid level gauge was found with a large condensation buildup inside the site glass. Gauge is otherwise in good working order.
- Blackberry vines and other vegetation are growing inside the transformer yard

Recommendation:

- Replace the liquid level gauge site glass gasket
- Remove all vegetation from within the transformer yard

1 GENERAL REPORT:

The following items are general observations or considerations that this site could look at as area's for improvement, but are not imperative items as highlighted above

1. ***SHOCK AND ARC FLASH HAZARD LABELS:*** The Canadian Electrical Code Part I, Rule 2-306 requires that all new or modified switchgear installations be field marked (labeled) to warn persons of potential electric shock or arc flash hazards. In addition to that, CSA Z462, Workplace Electrical Safety standard, Clause 4.3.3.4 requires that: "Equipment shall be field marked with a label containing the **available incident energy or required level of PPE** and date of evaluation." Prime Engineering recommends that updated arc flash labels are applied at each location

    1.1. ***LIGHTNING ARRESTORS***: There were no lightning arrestors found on the north side 2.4kV crane feeder cables or 2.4kV crane electrical rooms. Prime Engineering is recommending that each set of cables has lightning arrestors installed on it.

2. ***GROUNDING BALLS*****:** None of the 2.4kV disconnect switches inside the cranes, nor the 12.5kV disconnect switch inside the NLW substation were found with grounding balls on the switchgear. Grounding balls provide a secure method of grounding out the switchgear, as approved by WorkSafe B.C. BC Hydro requires grounding balls as the means for grounding on all new switchgear, as part of their standards. Prime Engineering is recommending grounding balls be added to your switchgear on the next scheduled maintenance period, two years from the date of this report. The grounding balls can be installed in a future outage; one for each phase, and one for the ground, and one for the neutral when applicable. Please contact us for a proposal to complete this work.

2 WORK COMPLETED:

2.1. All the switchgear was cleaned and torqued by Mega Power Installations Ltd. staff, with the testing of the equipment by Prime Engineering Limited.

2.2. The upstream circuit breakers were opened and racked out for each location (switching by PWGSC) and a lock box was utilized for applying personal locks. Safety grounds were applied at each location as per WorkSafeBC lockout procedures. A WorkSafeBC approved tailboard was held, and the notes & signoff documents are kept in our working folder for future reference.

2.3. The primary isolating switch contacts were checked for potential hot spots with a low resistance tester, all contacts were found to be in good operating condition, as noted on the attached test sheets. Similar tests were performed on the high voltage fuses to look for fuses that might fail due to through faults weakening them. All fuses were found acceptable. Only two spare fuses were available in the 150T crane electrical room. The insulation resistance of the switches were checked with a 5000 VDC insulation resistance tester, across the open contacts, between phases, and each phase to ground.

2.4. The 2.4kV and 12.5kV transformers were then electrically tested for turns ratio's to verify that there are no internal turn to turn failures, the transformer windings were checked for insulation values high to low, high to ground, low to ground using a 5000 VDC insulation resistance tester for windings greater than 750 VAC, and at 1000 VDC for windings less than 750 VAC. The insulation resistance tester confirms the insulation values of the high and low windings, looking for moisture or brittle insulation. These tests found satisfactory results.

Thank you for using **Prime Engineering** Limited. If you have any questions or we can be of any further assistance please do not hesitate to call.

Sincerely,

Keisan Goldsmith, P.Eng
Field Service Engineer
prime engineering
ENGINEER . IMPLEMENT . MAINTAIN
717 Aldebury Street
Victoria BC V9A 5T2
p: (250) 590-8912 ext. 150
c: (250) 893-1854
f: (250) 590-8917
e: keisan.goldsmith@primeeng.ca
w: www.primeeng.ca

Attachments: Safety Forms, Test Sheets for the project:

ISOLATION SAFETY DISCUSSION

PERSON IN CHARGE OF SAFETY LOCKOUT/ISOLATION:

PRIME: Keisan Goldsmith CONTRACTOR: Jon Michiel CLIENT: Jesse Curtis

DATE AND TIME OF WORK COMMENCEMENT: 07:30 Feb 23, 2019

SITE REPESENTATIVE:

Name: Jesse Curtis Contact# 250 889 0187 Shift End Time: 22:00

Relief Number N/A

FIRST AID NAME: Clayton Laughren FIRST AID NUMBER: 250 893 8050

FIRST AID LOCATION: North Landing Wharf Substation

SPECIAL FIRST AID PROCEDURES:

-911 for emergencies

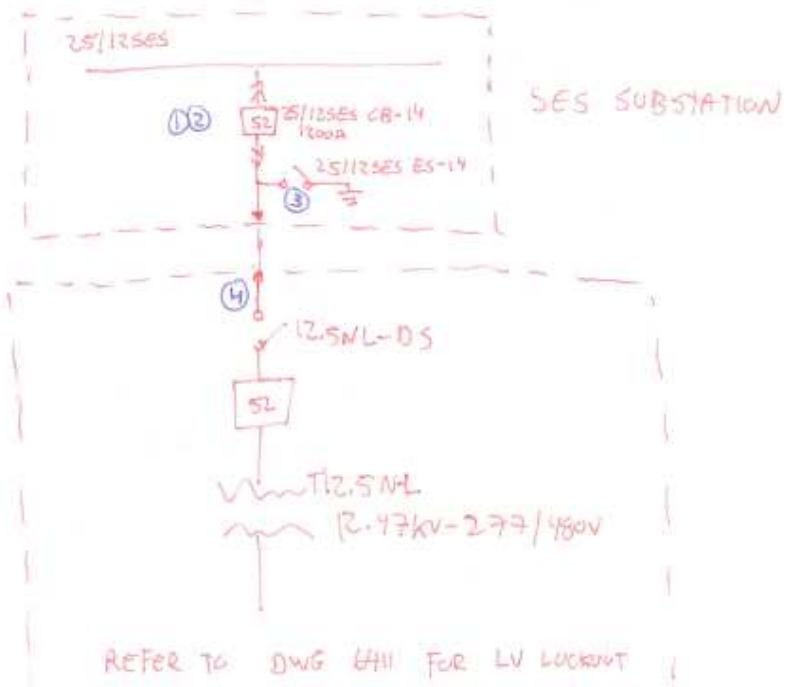
-VGH nearest hospital

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

SINGLE LINE DRAWING SHOWING POINTS OF ISOLATION/GROUNDING/LOCKOUT

North Landing Wharf Substation

SINGLE LINE DRAWING SHOWING POINTS OF ISOLATION/GROUNDING/LOCKOUT



IDENTIFY ALL ISOLATION POINTS AND WORKER PROTECTION GROUNDING/BLOCKING LOCATIONS ON THIS DRAWING

SITE SINGLE LINE DRAWING NAME/REVISION REFERENCED:

SWITCHING/ISOLATION/LOCKOUT SEQUENCE

	DESCRIPTION/ACTION	*POWER SOURCE TYPE	VERIFIED	COMPLETE
STEP #1:	OPEN AND RACK OUT 25/12SES-CB-14	E	KG	KG
STEP #2:	APPLY SAFETY LOCKS TO 25/12SES-CB-14	E	KG	KG
STEP #3:	CLOSE 25/12SES ES-14	E	KG	KG
STEP #4:	TEST FOR POTENTIAL & APPLY SAFETY GNDS	E	KG	KG
STEP #5:				
STEP #6:				
STEP #7:				
STEP #8:				
STEP #9:				
STEP #10:				
STEP #11:				
STEP #12:				

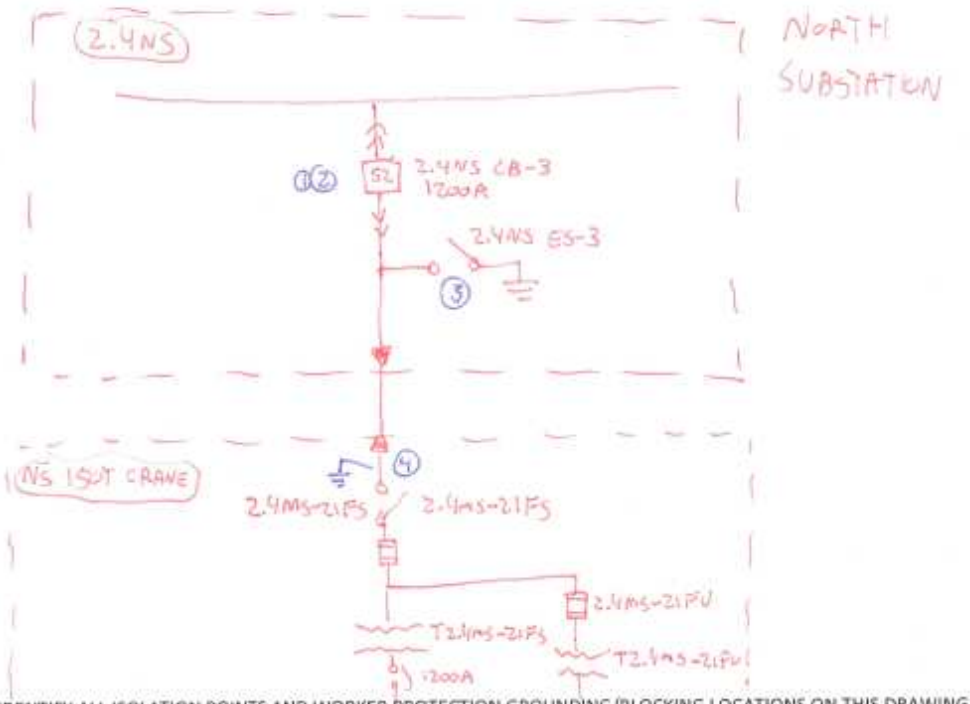
*POWER SOURCE TYPES: A=AIR, E=ELECTRICAL, G=GRAVITY, H=HYDRAULIC, M=MECHANICAL, O=OTHER, S=STEAM

1. CONFIRM THAT THAT ALL WORKERS ARE IN THE CLEAR AND THAT NO HAZARD WILL BE CREATED IF THE ISOLATION OR LOCKOUT IS NOT EFFECTIVE.
2. BY SIGNING BELOW THE INDIVIDUAL(S) WHO COMPLETED AND VERIFIED THE SWITCHING AND ISOLATION SEQUENCE STEPS HAVE ENSURED THE EFFECTIVENESS OF EACH ISOLATION/LOCKOUT POINT BY MEANS OF TESTING.

COMPLETED BY (NAME):	Jesse Curtis	VERIFIED BY (NAME):	Kieran Goldsmith

Krupp 150T Crane

SINGLE LINE DRAWING SHOWING POINTS OF ISOLATION/GROUNDING/LOCKOUT



IDENTIFY ALL ISOLATION POINTS AND WORKER PROTECTION GROUNDING/BLOCKING LOCATIONS ON THIS DRAWING

SITE SINGLE LINE DRAWING NAME/REVISION REFERENCED:

SWITCHING/ISOLATION/LOCKOUT SEQUENCE

	DESCRIPTION/ACTION	*POWER SOURCE TYPE	VERIFIED	COMPLETE
STEP #1:	OPEN, RACK OUT 2.4NS CB-3	E	✓	✓
STEP #2:	APPLY LOCKOUT TO 2.4NS CB-3	E	✓	✓
STEP #3:	CLOSE 2.4NS ES-3;	E	✓	✓
STEP #4:	TEST FOR POTENTIAL & APPLY SAFETY GNDS	E		
STEP #5:				
STEP #6:				
STEP #7:				
STEP #8:				
STEP #9:				
STEP #10:				
STEP #11:				
STEP #12:				

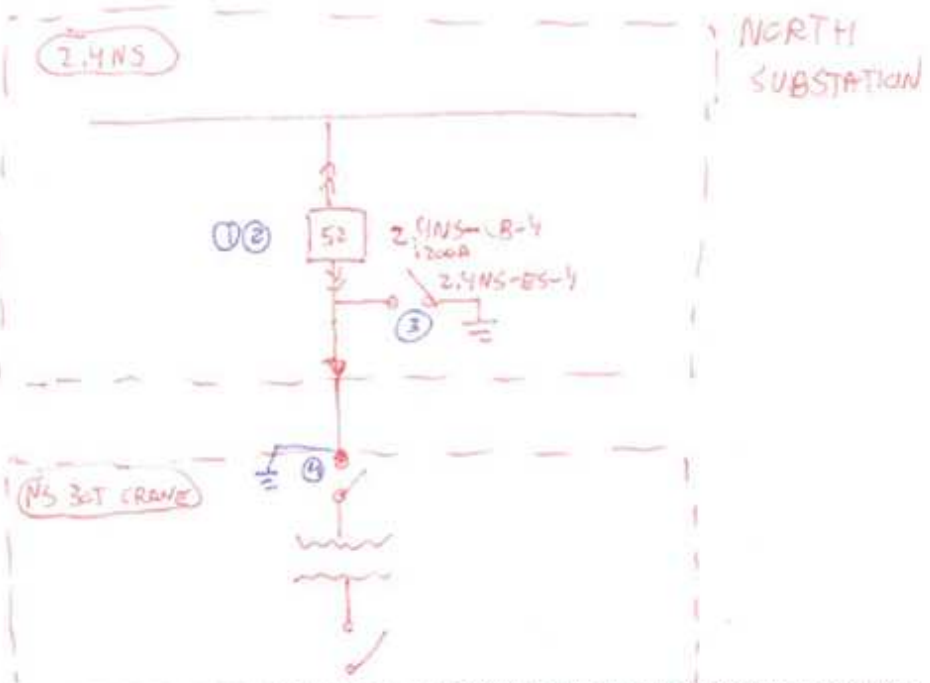
*POWER SOURCE TYPES: A=AIR, E=ELECTRICAL, G=GRAVITY, H=HYDRAULIC, M=MECHANICAL, O=OTHER, S=STEAM

1. CONFIRM THAT THAT ALL WORKERS ARE IN THE CLEAR AND THAT NO HAZARD WILL BE CREATED IF THE ISOLATION OR LOCKOUT IS NOT EFFECTIVE.
2. BY SIGNING BELOW THE INDIVIDUAL(S) WHO COMPLETED AND VERIFIED THE SWITCHING AND ISOLATION SEQUENCE STEPS HAVE ENSURED THE EFFECTIVENESS OF EACH ISOLATION/LOCKOUT POINT BY MEANS OF TESTING.

COMPLETED BY (NAME):	Jesse Curtis	VERIFIED BY (NAME):	Kevin Bjornson

Ebco 30T Crane

SINGLE LINE DRAWING SHOWING POINTS OF ISOLATION/GROUNDING/LOCKOUT



IDENTIFY ALL ISOLATION POINTS AND WORKER PROTECTION GROUNDING/BLOCKING LOCATIONS ON THIS DRAWING

SITE SINGLE LINE DRAWING NAME/REVISION REFERENCED:

SWITCHING/ISOLATION/LOCKOUT SEQUENCE

	DESCRIPTION/ACTION	*POWER SOURCE TYPE	VERIFIED	COMPLETE
STEP #1:	OPEN, RACK OUT 2.4NS-CB-4	E	✓	✓
STEP #2:	APPLY LOCKOUT TO 2.4NS-CB-4	E	✓	✓
STEP #3:	CLOSE 2.4NS-ES-4	E	✓	✓
STEP #4:	TEST FOR POTENTIAL & APPLY SAFETY GNDS	E	✓	✓
STEP #5:				
STEP #6:				
STEP #7:				
STEP #8:				
STEP #9:				
STEP #10:				
STEP #11:				
STEP #12:				

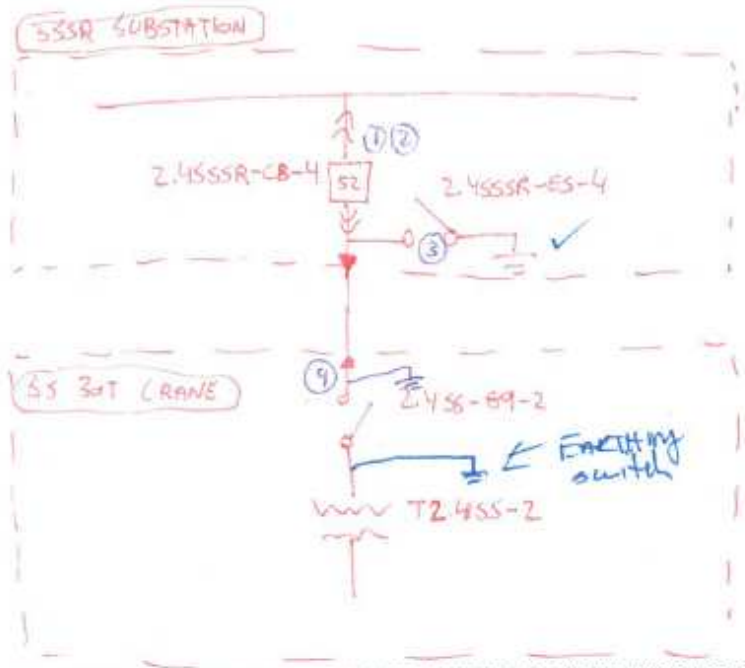
*POWER SOURCE TYPES: A=AIR, E=ELECTRICAL, G=GRAVITY, H=HYDRAULIC, M=MECHANICAL, O=OTHER, S=STEAM

1. CONFIRM THAT THAT ALL WORKERS ARE IN THE CLEAR AND THAT NO HAZARD WILL BE CREATED IF THE ISOLATION OR LOCKOUT IS NOT EFFECTIVE.
2. BY SIGNING BELOW THE INDIVIDUAL(S) WHO COMPLETED AND VERIFIED THE SWITCHING AND ISOLATION SEQUENCE STEPS HAVE ENSURED THE EFFECTIVENESS OF EACH ISOLATION/LOCKOUT POINT BY MEANS OF TESTING.

COMPLETED BY (NAME):	Jesse Curtis	VERIFIED BY (NAME):	Paul Douillard

Kone 30T Crane

SINGLE LINE DRAWING SHOWING POINTS OF ISOLATION/GROUNDING/LOCKOUT



IDENTIFY ALL ISOLATION POINTS AND WORKER PROTECTION GROUNDING/BLOCKING LOCATIONS ON THIS DRAWING

SITE SINGLE LINE DRAWING NAME/REVISION REFERENCED: SSSR-10-01-50

SWITCHING/ISOLATION/LOCKOUT SEQUENCE

	DESCRIPTION/ACTION	*POWER SOURCE TYPE	VERIFIED	COMPLETE
STEP #1:	OPEN & RACK OUT 2.4SSSR-CB-4	E	✓	✓
STEP #2:	APPLY SAFETY LOCKS TO 2.4SSSR-CB-4	E	✓	✓
STEP #3:	CLOSE 2.4SSSR-ES-4	E	✓	✓
STEP #4:	TEST FOR POTENTIAL & APPLY SAFETY GNDS	M	✓	✓
STEP #5:				
STEP #6:				
STEP #7:				
STEP #8:				
STEP #9:				
STEP #10:				
STEP #11:				
STEP #12:				

*POWER SOURCE TYPES: A=AIR, E=ELECTRICAL, G=GRAVITY, H=HYDRAULIC, M=MECHANICAL, O=OTHER, S=STEAM

1. CONFIRM THAT THAT ALL WORKERS ARE IN THE CLEAR AND THAT NO HAZARD WILL BE CREATED IF THE ISOLATION OR LOCKOUT IS NOT EFFECTIVE.
2. BY SIGNING BELOW THE INDIVIDUAL(S) WHO COMPLETED AND VERIFIED THE SWITCHING AND ISOLATION SEQUENCE STEPS HAVE ENSURED THE EFFECTIVENESS OF EACH ISOLATION/LOCKOUT POINT BY MEANS OF TESTING.

COMPLETED BY (NAME):	Jesse Curtis	VERIFIED BY (NAME):	Ryan Olson

WORK SCOPE (include any component of work necessary to be reversed prior to re-Energization):

High voltage maintenance services including cleaning, torqueing, testing, and inspecting HV electrical equipment

HAZARDS IDENTIFIED:

-Airborne particles
-Pinch points
-Test voltages

HAZARD CONTROLS:

-Task specific PPE
-Communications between all parties prior to, and while testing with test voltages

Personal Present on site (to be signed only after you have fully checked the lock-out/isolation procedure and agree to is effectiveness, placement, and controls):

NAME	COMPANY	CONTACT NUMBER
Paul Douillard	Prime Engineering	250 893 8991
Kevin Bjornson	Prime Engineering	250 893 9089
Tyler Ney	Prime Engineering	250 893 6950
Clayton Laughren	Prime Engineering	250 893 8050
Keith Cardiff	Prime Engineering	250 893 4274
Neil McKerricher	Prime Engineering	250 893 6272
Ryan Olson	Prime Engineering	250 893 5900
Josh Blandford	Megapower Installations	250 880 0289
Robert Seifried	Megapower Installations	250 883 0816
Mitchell Smith	Megapower Installations	250 889 9628
Jon Michiel	Megapower Installations	250 883 2399
Keisan Goldsmith	Prime Engineering	250 893 1854

Safety Discussion Check Sheet PRIOR TO ISOLATION					
ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
PERSON IN CHARGE:	X		ARC FLASH HAZARDS:	X	
QUALIFICATIONS OF PERSONNEL:	X		LIMITS OF APPROACH:	X	
EMERGENCY RESPONSE:	X		TEST FOR POTENTIAL:	X	
PUBLIC SAFETY:	X		INDUCTION HAZARDS:	X	
COMMUNICATION AND NOTIFICATION:	X		CONTROL CIRCUITS LIVE:	X	
ENVIRONMENTAL CONCERNS:	X		FEEDBACK HAZARDS:	X	
WEATHER CONDITIONS:	X		TEST VOLTAGE HAZARDS:	X	
DRAWING ACCURACY:	X		SAFETY GROUNDING REQUIRED:	X	
LENGTH OF OUTAGE:	X		UNDERGROUND UTILITIES:		X
LIGHTING AND POWER AVAILABLE:	X		LOCATION OF GROUNDING:	X	
BLACK OUT PROCEDURES:	X		PAD LOCKS AND TAGS REQUIRED:	X	
OTHER SYSTEMS AFFECTED:	X		CLIMBING HAZARDS:	X	
OTHER CONTRACTORS:	X		FALL PROTECTION:		X
ADJACENT STRUCTURES:	X		CONFINED SPACE ENTRY:		X
EXISTING PHASE ROTATION:	X		RIGGING AND LIFTING:	X	
OPERATION OF TRANSFER SYSTEM:	X		HOUSEKEEPING:	X	
GENERATORS START UP:	X		OTHER:	X	
PERSONAL PROTECTIVE EQUIPMENT:	X				

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

PRIOR TO RE-ENERGIZING EQUIPMENT					
ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
NOTIFICATION TO SITE:	X		TRANSFER OF OVERRIDES:		X
LOCATION OF PERSONNEL:	X		REMOVAL OF LOCKS/TAGS:	X	
OTHER CONTRACTORS:	X		PPE FOR RE-ENERGIZATION:	X	
POSITION OF BREAKER(S)/SWITCH(ES):	X		REMOVAL OF SAFETY GROUNDS:	X	
CT WIRING AND SHORTING BLOCKS:	X		EQUIPMENT READY TO START:	X	
TOOLS ACCOUNTED FOR:	X		PHASE ROTATION CORRECT:	X	
COVERS ON	X		GENERATOR/TRANSFER SWITCH OK:	X	
ANY COMPONENT DIS-ASSEMBLED HAS BEEN RE-ASSEMBLED	X				

DATE AND TIME OF COMPLETION: Feb 23, 2019, 17:50

PRIOR TO ENERGIZATION SHEET COMPLETED BY: KG

SITE ENERGIZATION AUTHORIZED BY: Jesse Curtis (EGD)

SITE ENERGIZED BY: Jesse Curtis (EGD)

3 NORTH LANDING WHARF SUBSTATION TEST SHEETS

3.1 12.5NL-DS HIGH VOLTAGE DISCONNECT SWITCH TEST AND INSPECTION

CIRCUIT ID:	12.5NL-DS	FEEDS TO:	T12.5NL XFMR
MANUFACTURER:	Federal Pioneer	MFG. DATE:	1981?
TYPE:	NAL	SERIAL #:	46914-LF3
STYLE:	Indoor	VOLTAGE RATING:	15KV
B.I.L.:	95KV	CURRENT RATING:	600
INTERRUPTING CAPACITY:	40kA	MOM RATING:	40kA

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	PASS	INTERLOCK KEY NUMBER: C2172T
MOTOR OPERATOR:	NA	
LIMIT SWITCHES:	NA	
INSULATORS:	PASS	
CONTROL:	NA	
CONNECTIONS TORQUED:	PASS	
BLADE ALIGNMENT:	PASS	LUBRICATED: YES ☒ NO ☐
BLADE OPERATING ARMS:	PASS	LUBRICATED: YES ☒ NO ☐
WARNING SIGNS:	PASS	
BUS AND INSULATION:	PASS	
OPERATION COUNTER:	NA	
BONDING:	FAIL	
ANCHORAGE:	PASS	
CLEARANCES:	PASS	
INDICATION/ CONTROL DEVICES:	NA	
CLEANLINESS:	PASS	

CONTACT TESTING

LINE A	LINE B	LINE C
20.4µΩ	19.8µΩ	18.6µΩ

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	5000VDC	1.309TΩ	1.261TΩ	1.219TΩ
LINE TO GROUND:	5000VDC	56.1GΩ	59.3GΩ	66.4GΩ
ACROSS CONTACTS:	5000VDC	56.1GΩ	59.3GΩ	66.4GΩ

EQUIPMENT ID

PE-D-2, PE-M-2, PE-T-2

GENERAL COMMENTS

Insulation resistance taken with switch open due to upstream safety grounds.

Switch frame not bonded to ground.

PRIME ENGINEERING – REVISION #4.0

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

3.2 12.5NL MCB HIGH VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	12.5NL MCB	FEEDS TO:	12.5NL XFMR	MANUFACTURER:	Sace Bergamo
MFG DATE:	1980	TYPE:	RM17.5-35	INTERRUPTING CAPACITY:	12.5kA
SERIAL #:	1907760	STYLE:	Oil CB	CONTROL VOLTAGE:	120VAC
INTERLOCK KEY #:	C2172T	RATED CURRENT:	630A	OPERATION COUNTER:	NA
B.I.L.:	NL			RATED VOLTAGE:	17.5KV

VISUAL INSPECTIONS

SF6 GAS PRESSURE – CORR. TO 20°C	RATED =	NA	A=	NA	B=	NA	C=	NA

	PASS/FAIL/N/A	NOTES
OPERATION OF INTERLOCKS:	PASS	
CONDITION OF BREAKER CELLS:	PASS	
RACKING MECHANISM OF RAILS:	NA	
SIGNS OF OVERHEATING:	PASS	
CONDITION OF FINGERS AND CLUSTERS:	PASS	
OPERATION OF SHUTTERS:	NA	
GROUND CONNECTIONS:	PASS	
LUBRICATION OF MECHANISM:	NA	
CONNECTIONS TORQUED:	PASS	
SPRINGS / PUFFERS / DAMPERS:	PASS	
AUXILIARY CONTACTS:	PASS	HIGHEST RESISTANCE:

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	115.9μΩ	145.3μΩ	113.1μΩ
CONTACT OPENING TIME:	NA	NA	NA
CONTACT CLOSING TIME:	NA	NA	NA
WEAR INDICATORS:	NA	NA	NA

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	5000VDC	1.309TΩ	1.261TΩ	1.219TΩ
LINE TO GROUND:	5000VDC	56.1GΩ	59.3GΩ	66.4GΩ
ACROSS CONTACTS:	5000VDC	56.1GΩ	59.3GΩ	66.4GΩ
WITHSTAND TEST:	NA	NA	NA	NA

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	√			NA	120VAC	NA
OPENING COIL:	√			NA	120VAC	NA
TRIPPING COIL:	NA			NA	NA	NA
MOTOR CHARGING:	√			NA	120VAC	NA

EQUIPMENT ID

PE-D-2, PE-M-2, PE-T-2

GENERAL COMMENTS

Oil levels checked - OK

PRIME ENGINEERING – REVISION #4.0

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

3.3 12.5NL-PR-1 (P) OVERCURRENT RELAY TEST			
CIRCUIT ID:	12.5NL-1 W1 Primary	FEEDS TO:	Transformer
MANUFACTURER:	SEL	MFG. DATE:	Not visible
STYLE:	Electronic	SERIAL #:	3153240172
MODEL #:	07871X1A0X0XA5850000	CURVE NAME P/N:	C3
TAP RANGE P/N:	0.5-15	INST. RANGE P/N:	0.5-96
CT RATIO:	75:5		

VISUAL INSPECTION		
	PASS/FAIL/N/A	COMMENTS
UNIT CLEANED:	P	
CONNECTIONS TIGHTENED	P	
CONTACTS BURNISHED:	NA	
MECHANICAL OPERATION:	P	
SHORTING HARDWARE:	P	

RELAY SETTINGS			
	PICKUP	TIME DIAL	INSTANTANEOUS
PHASE:	6.0	1.0	96
NEUTRAL:	3.33	1.0	64

RELAY REST RESULTS – LINE & GROUND/NEUTRAL							
PHASE:		PICKUP	3X TAP	5X TAP	INST.	TARGET	PASS/FAIL
TEST AMPS:		6	18	30	NT	PASS	P
LINE A	RESULTS:	5.99	10.02	3.376	-	PASS	P
LINE B	RESULTS:	5.99	10.02	3.376	-	PASS	P
LINE C	RESULTS:	5.99	10.02	3.376	-	PASS	P
NEUTRAL:							
TEST AMPS:		3.33	9.99	16.65	NT	OK	P
RESULTS:		3.33	10.04	10.04	-		P

EQUIPMENT ID
RTS-4

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

3.4 12.5NL-PR-1 (S) OVERCURRENT RELAY TEST			
CIRCUIT ID:	12.5NL-1 W1 Primary	FEEDS TO:	Transformer
MANUFACTURER:	SEL	MFG. DATE:	Not visible
STYLE:	Electronic	SERIAL #:	3153240172
MODEL #:	07871X1A0X0XA5850000	CURVE NAME P/N:	C3
TAP RANGE P/N:	0.5-15	INST. RANGE P/N:	0.5-96
CT RATIO:	2500:5		

VISUAL INSPECTION		
	PASS/FAIL/N/A	COMMENTS
UNIT CLEANED:	P	
CONNECTIONS TIGHTENED	P	
CONTACTS BURNISHED:	NA	
MECHANICAL OPERATION:	P	
SHORTING HARDWARE:	P	

RELAY SETTINGS			
	PICKUP	TIME DIAL	INSTANTANEOUS
PHASE:	4.6	1.0	20
NEUTRAL:	OFF	NA	NA

RELAY REST RESULTS – LINE & GROUND/NEUTRAL							
PHASE:		PICKUP	3X TAP	5X TAP	INST.	TARGET	PASS/FAIL
TEST AMPS:		4.6	9.2	13.8	20	OK	P
LINE A	RESULTS:	4.59	26.65	10.03	117.5ms	OK	P
LINE B	RESULTS:	4.59	26.65	10.03	117.5ms	OK	P
LINE C	RESULTS:	4.59	26.65	10.03	117.5ms	OK	P
NEUTRAL:							
TEST AMPS:		NA	NA	NA	NA	NA	NA
TEST DURATION:		NA	NA	NA	NA	NA	NA
MAX DEVIATION:		NA	NA	NA	NA	NA	NA
MIN DEVIATION:		NA	NA	NA	NA	NA	NA
RESULTS:		NA	NA	NA	NA	NA	NA

EQUIPMENT ID
RTS-4

GENERAL COMMENTS
W1 Primary Injection Metering @ 40A Primary: A = 40.03A, B = 40.07A, C = 40.03A
W2 Primary Injection Metering @ 50A Primary: A = 49.55A, B = 50.15A, C = 50.02A

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

3.5 T12.5NL TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T12.5NL	PHASES:	3
FEEDS TO:	4NL	HIGH SIDE VOLTAGE:	12.5KV
SERIAL #:	S8391.01	HIGH SIDE B.I.L.:	NL
TYPE:	ANN	LOW SIDE VOLTAGE:	480/277V
SIZE:	1725KVA	LOW SIDE B.I.L.:	NL
PERCENT IMPEDANCE:	5.94%	MANUFACTURER:	Federal Pioneer
TEMPERATURE RISE:	135°C	MFG. DATE:	1981
CONFIGURATION:	Δ/Y	APARATUS TEMPERATURE:	50°C
TAP POSITION AS FOUND:	C-D	AMBIENT TEMPERATURE:	15°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	FAIL
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	NA
VISUAL CORE INSPECTION:	PASS	TEMPERATURE SENSING DEVICE:	PASS
OVERALL CONNECTION TIGHTNESS:	PASS	GROUND RESISTOR:	NA
SIGNS OF OVERLOADING:	PASS	SECONDARY VOLTAGE CHECK:	NA
OVERALL CLEARANCES	PASS	SIESMICALLY RESTRAINED:	PASS

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	A-B	B-C	C-D	D-E	E-F
HIGH SIDE VOLTAGE:	13125V	12812.5V	12500V	12187.5V	11875V
CALCULATED RATIO:	47.381:1	46.254:1	45.12:1	43.998:1	42.870:1
H1-H2-X0-X1	NA	NA	45.184:1	NA	NA
EXCITING CURRENT – mA	NA	NA	5mA	NA	NA
H1-H3-X0-X3	NA	NA	45.167:1	NA	NA
EXCITING CURRENT – mA	NA	NA	5mA	NA	NA
H2-H3-X0-X2	NA	NA	45.169:1	NA	NA
EXCITING CURRENT – mA	NA	NA	4mA	NA	NA

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5000VDC	500VDC	500VDC	500VDC
PI/DAR:	5.40/1.42	NA	NA	6.17/178
INSULATION VALUE:	7.06TΩ	NA	NA	830GΩ
TEMPERATURE CORRECTED:	7.06TΩ	NA	NA	830GΩ

WINDING RESISTANCE

H	1	H	2	0.70Ω	H	1	H	3	0.71Ω	H	2	H	3	0.71Ω
X	0	X	1	485µΩ	X	0	X	2	496µΩ	X	0	X	3	495µΩ

EQUIPMENT ID

PE-D-2, PE-M-2, PE-T-2

GENERAL COMMENTS

No lightning arrestors.

Temperature sensor trips at 150°C.

PRIME ENGINEERING – REVISION #4.0

3.6 4NL-1 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	WCL	CIRCUIT ID:	4NL-1	PROTECTION:	TM
MFG DATE:	NL	FEEDS TO:	1000A Splitter		
SERIAL #:	178C792G02	AMPACITY:	1600A		
TYPE:	AB-PC	FAULT BRACING:	65kA		
STYLE:	178C792G02	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	95 µΩ	86 µΩ	78 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	55 GΩ	78 GΩ	44 GΩ
PHASE TO GROUND:	1000 VDC	26 GΩ	31 GΩ	35 GΩ
ACROSS CONTACTS:	1000 VDC	135 GΩ	167 GΩ	124 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	95 µΩ	86 µΩ	78 µΩ

BREAKER OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	MINIMUM PICKUP VOLTS
CLOSING COIL:	N/A	N/A	-
TRIPPING COIL:	PASS	125VDC	-
AUX. CONTACTS	-	-	-

EQUIPMENT ID

PE-M-12, PE-D-12, Raptor PTS

GENERAL COMMENTS

Primary injection test results:

Trip time 0.307s @ 3000A
Trip time 0.621s @ 2000A
Trip time 0.621s @ 1300A

No trip below 1200A

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

3.7 T4NL-7 TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T4 NL-7	PHASES:	3
FEEDS TO:	2NL-1	HIGH SIDE VOLTAGE:	480V
SERIAL #:	ST.55610	HIGH SIDE B.I.L.:	NL
TYPE:	ANN	LOW SIDE VOLTAGE:	120/208V
SIZE:	75KVA	LOW SIDE B.I.L.:	NL
PERCENT IMPEDANCE:	3.77%	MANUFACTURER:	Federal Pioneer
TEMPERATURE RISE:	115°C	MFG. DATE:	1981
CONFIGURATION:	Δ/Y	APARATUS TEMPERATURE:	50°C
TAP POSITION AS FOUND:	1-4	AMBIENT TEMPERATURE:	15°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	NA
INSULATOR CONDITION:	NA	COOLING AND FILTERS:	NA
VISUAL CORE INSPECTION:	PASS	TEMPERATURE SENSING DEVICE:	PASS
OVERALL CONNECTION TIGHTNESS:	PASS	GROUND RESISTOR:	NA
SIGNS OF OVERLOADING:	PASS	SECONDARY VOLTAGE CHECK:	NA
OVERALL CLEARANCES	PASS	SIESMICALLY RESTRAINED:	PASS

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	A-B	B-C	C-D	D-E	E-F
HIGH SIDE VOLTAGE:	-	-	-	-	-
CALCULATED RATIO:	-	-	-	-	-
H 1 H 2 X 0 X 1	-	-	-	-	-
EXCITING CURRENT – mA	-	-	-	-	-
H H X X	-	-	-	-	-
EXCITING CURRENT – mA	-	-	-	-	-
H H X X	-	-	-	-	-
EXCITING CURRENT – mA	-	-	-	-	-

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	-	-	-	-
PI/DAR:	-	-	-	-
INSULATION VALUE:	-	-	-	-
TEMPERATURE CORRECTED:	-	-	-	-

WINDING RESISTANCE

H	-	H	-	-	H	-	H	-	-	H	-	H	-	-
X	-	X	-	-	X	-	X	-	-	X	-	X	-	-

EQUIPMENT ID

GENERAL COMMENTS

Equipment was cleaned and torqued. Visual inspection of condition only.

PRIME ENGINEERING – REVISION #4.0

3.8 4NL GF DETECTION GENERAL TESTING

DEVICE	TEST	CONDITION
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip 1000A Splitter	Breaker Trips 90A
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip West 480V	Breaker Trips 84A
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip East 480V	Breaker Trips 86A
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip KIOSK 1	GFR Trips 88A Cables do not pass through zero sequence CT, GF system bypassed, no breaker trip on ground fault
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip Kisok 4	Breaker Trips 88A
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip Spare	No Trip
NLW GF System FPE DSP-MKII	Inject 80A, Observe Trip Panel 2NL-10	No Trip

EQUIPMENT ID

RTS-4

GENERAL COMMENTS

Possible zero sequence CT or ground fault module failure on 2NL-10/SPARE modules

PRIME ENGINEERING – REVISION #4.1

3.9 4NL-HFB Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Merlin Gerin	CIRCUIT ID:	4NL-HFB	PROTECTION:	STR 58U
MFG DATE:	NL	FEEDS TO:	4NL-HFB		
SERIAL #:	3GJH0388710	AMPACITY:	2000A		
TYPE:	Masterpact	FAULT BRACING:	65kA		
STYLE:	MC20H1	VOLTAGE RATING:	635V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	-	-	-

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.42 TΩ	3.81 TΩ	2.55 TΩ
PHASE TO GROUND:	1000 VDC	985 GΩ	999 GΩ	1.03 TΩ
ACROSS CONTACTS:	1000 VDC	3.84 TΩ	>4 TΩ	>4 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	65.5 µΩ	63.3 µΩ	83.8 µΩ

BREAKER OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	MINIMUM PICKUP VOLTS
CLOSING COIL:	PASS	120VAC	-
TRIPPING COIL:	PASS	120VAC	-
AUX. CONTACTS	-	-	-

EQUIPMENT ID

PE-M-12, PE-D-12

GENERAL COMMENTS

3.10 4NL-HFB GENERAL TESTING

DEVICE	TEST	CONDITION
4NL-HFB	480V 800KVAR	SER. NO. 8028
	Megger Common Bus Bar @1000VDC	A-G= 5.95GΩ B-G= 6.04GΩ C-G= 6.29GΩ A-B= 8.6GΩ B-C=8.87GΩ C-A=10.23GΩ
Joslyn Clark Contactor 200A 600V	Megger Open Contacts @1000VDC	Step 1 A= 26.74GΩ B=26.51GΩ C=25.59 Step 2 A=32.61GΩ B=33.99GΩ C=34.11GΩ Step 3 A=52.7GΩ B=55.6GΩ C=55.1GΩ Step 4 A=47.5GΩ B=56.8GΩ C=59.7GΩ Step 5 A=51.7GΩ B=61.4GΩ C=48.6GΩ
BEI KY303XF-1 328uH Class H1 Reactor	Megger @1000VDC	Fixed Step 1 A-G=23.72GΩ B-G=24.18GΩ C-G=25.69GΩ Fixed Step 2 A-G=18.54GΩ B-G=18.97GΩ C-G=19.77GΩ Step 1 A-G=33.5GΩ B-G=37.44GΩ C-G=37.39GΩ Step 2 A-G=31.68GΩ B-G=57.9GΩ C-G=57.9GΩ Step 3 A-G=25.64GΩ B-G=34.08GΩ C-G=29.49GΩ Step 4 A-G=38.42GΩ B-G=44.5GΩ C-G=44.8GΩ Step 5 A-G=30.1GΩ B-G=37.25GΩ C-G=37.47GΩ Step 6 A-G=36.56GΩ B-G=36.56GΩ C-G=41.8GΩ
BEI KY303XF-1 328uH Class H1 Reactor	Ductor	Fixed Step 1 A=1.046mΩ B=1.046mΩ C=1.039mΩ Fixed Step 2 A=1.102mΩ B=1.057mΩ C=1.033mΩ Step 1 A=1.039mΩ B=1.053mΩ C=1.047mΩ Step 2 A=1.053mΩ B=1.039mΩ C=1.032mΩ Step 3 A=1.042mΩ B=1.054mΩ C=1.044mΩ Step 4 A=1.096mΩ B=1.124mΩ C=1.058mΩ Step 5 A=1.516mΩ B=1.093mΩ C=1.038mΩ Step 6 A=1.039mΩ B=1.032mΩ C=1.052mΩ
Power Survey PSP0025H338 25KVAR 600VAC Capacitor	Measuring Capacitance	Cells Tested GOOD

EQUIPMENT ID

PE-M-5 PE-D-5

GENERAL COMMENTS

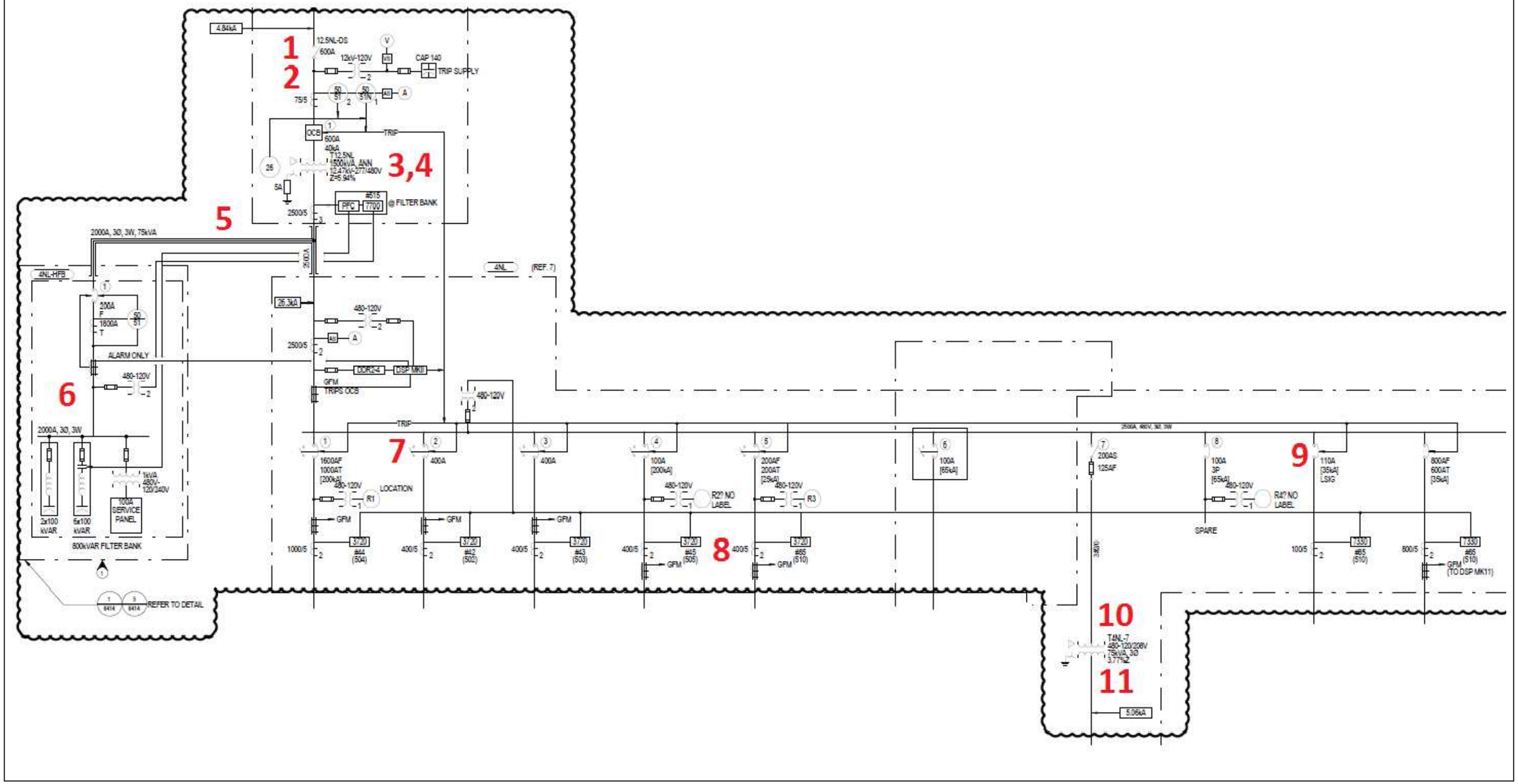
-Step #1 B Phase JKS-200 Fuse blown Replaced with spare from step #6
-Step #5 High deviation on Reactor A phase winding resistance
-Step #6 Contactor removed

PRIME ENGINEERING – REVISION #4.1

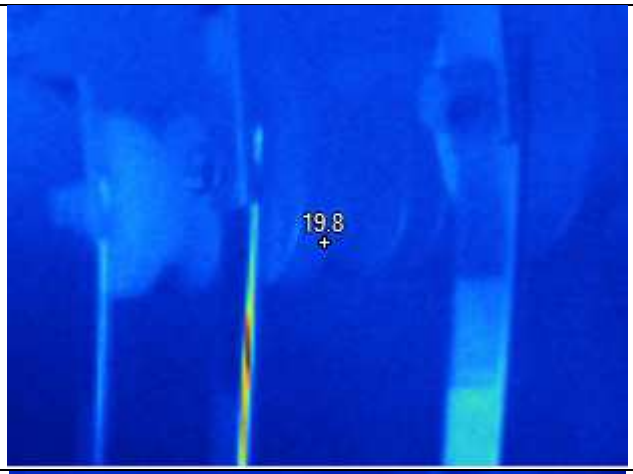
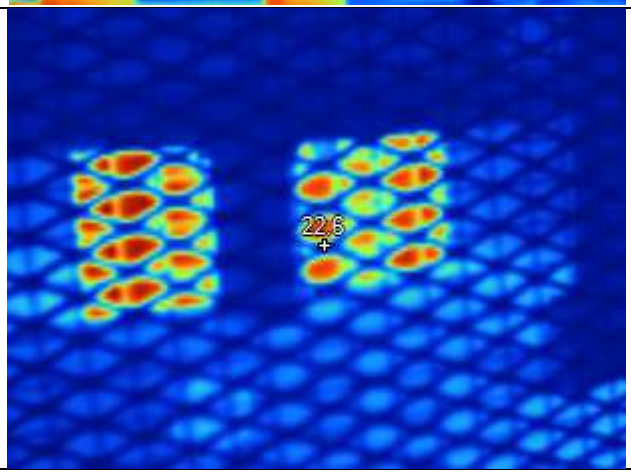
SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

3.11 North Landing Warf Substation Infrared Scanning Results

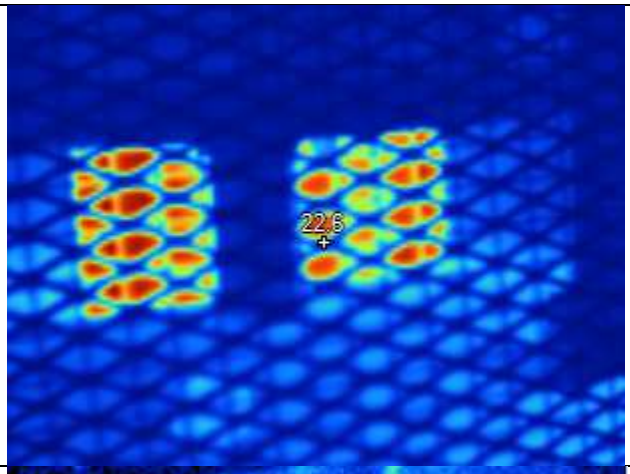
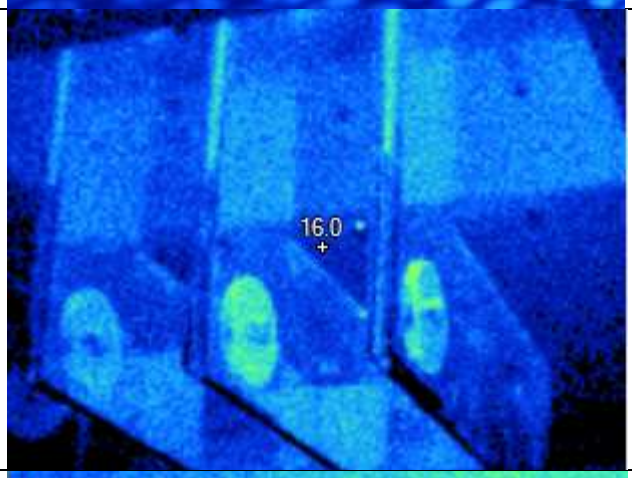
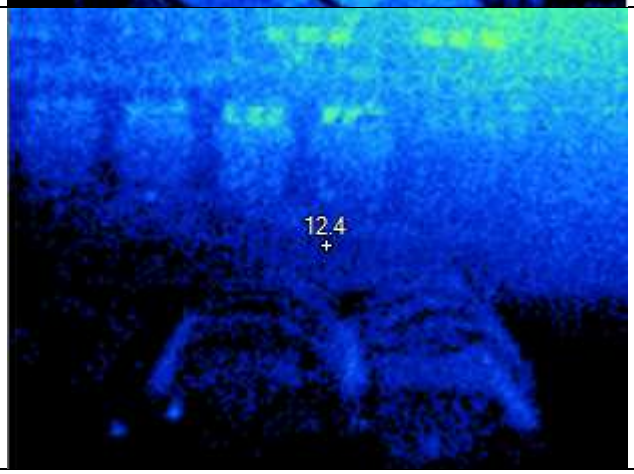
REFERENCE DRAWING	EXISTING NORTH LANDING WHARF SUBSTATION SINGLE LINE DIAGRAM – 6411 REV.A

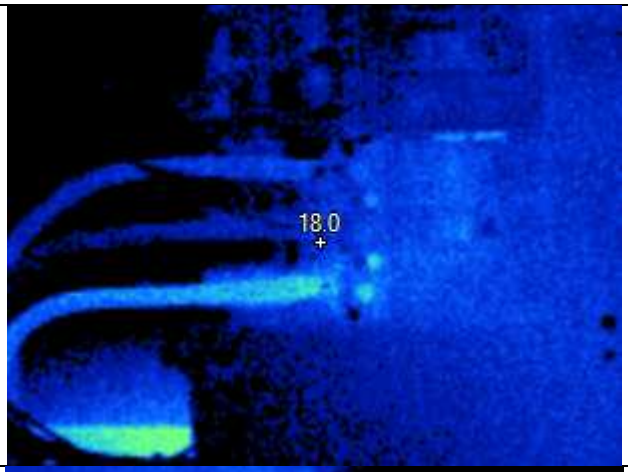
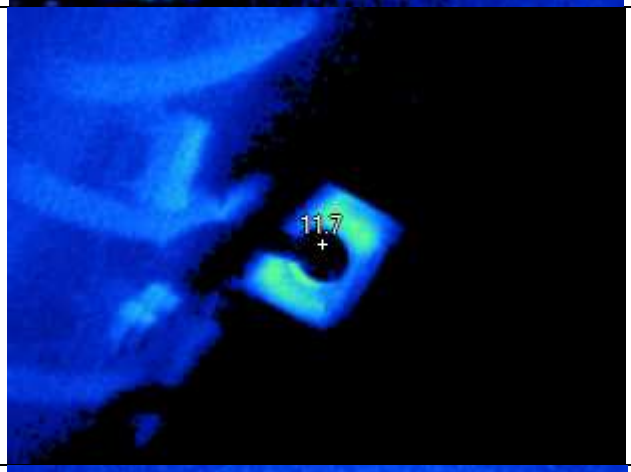
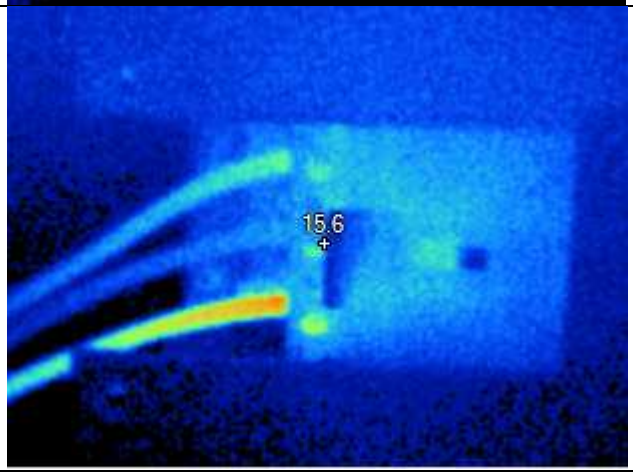


SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

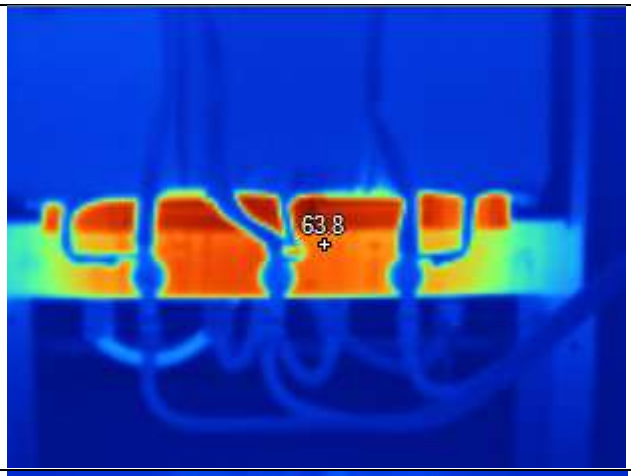
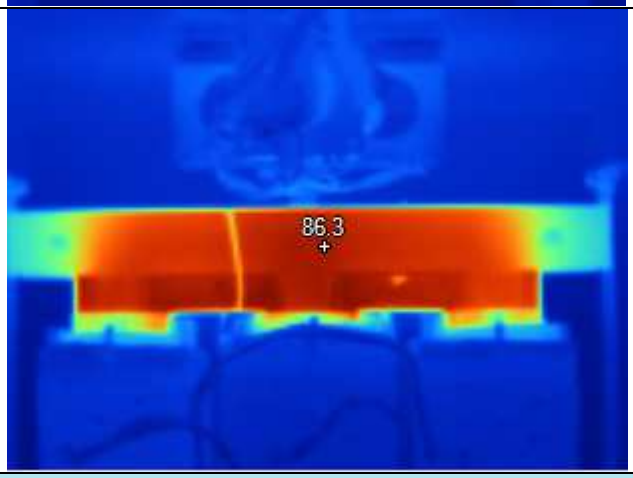
POINT	DESCRIPTION	MAX TEMP	PICTURE
1	12.5NL-DS	19.8°C	
2	12.5NL-CB	25.2 °C	
3	T12.5NL	81.0°C	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
4	T12.5NL	71.0°C	
5	2000A HFB BUS DUCT	18.3°C	
6	4NL-HFB capacitor/reactor section	15.3°C	

POINT	DESCRIPTION	MAX TEMP	PICTURE
7	4NL-2 cable connections	20.5°C	
8	4NL-4 phase CT	18.3°C	
9	4NL-9 cable connections	19.3°C	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
10	T4NL-7	82.2°C	
11	T4NL-7	90.4°C	

GENERAL COMMENTS
Pictures of equipment at or below ambient temperature were not included in this report.

4 KRUPP 150T CRANE TESTSHEETS

4.1 2.4MS-21FS MEDIUM VOLTAGE LOAD BREAK SWITCH TEST AND INSPECTION			
MANUFACTURER:	WESTINGHOUSE	MFG. DATE:	~1986
CIRCUIT ID:	2.4MS-21FS	FEEDS TO:	T24MS-21FS/2.4MS FU
TYPE:	AWP-2	SERIAL NUMBER:	3417A09H01
STYLE:	3416A42G	CLOSING RATING:	40kA
CURRENT RATING:	600A	INTERRUPTING CAPACITY:	600A
MOM. RATING:	40kA	VOLTAGE:	5.5kV
B.I.L.:	60kV	CONTROL VOLTAGE:	n/a

INSPECTIONS		
	PASS/FAIL/N/A	NOTES
OVERALL CONDITION:	Pass	
SCREEN AND WINDOWS:	Pass	
INSULATION BARRIERS:	Pass	
CLEARANCES:	Pass	
BLADE OPERATING ARMS & ALIGNMENT:	Pass	
WARNING SIGNS:	Fair	One small sign on front
BUS AND INSULATION:	Pass	
CONTROL WIRING:	n/a	
MOTOR OPERATOR:	n/a	
KEY INTERLOCK:	Pass	Manufacturer Yale
KEY NUMBER:	Pass	21654

FUSE AND CABLE DATA			
FUSE TYPE:	RBA-400	CABLE TYPE:	-
FUSE MFG:	Westinghouse	CABLE SIZE:	-
AMPACITY:	400E	STRESS CONE:	-
VOLTAGE:	8.25kV	CONDITION:	-
INTERRUPTING CAPACITY:	29400A		

CONTACT, FUSE AND INSULATION TESTING			
CONTACT & FUSE	LINE A	LINE B	LINE C
FUSE RESISTANCE mΩ:	0.393	0.308	0.419
CONTACT RESISTANCE mΩ:	0.0329	0.0271	0.017

	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE :	5000VDC	>100GΩ	>100GΩ	>100GΩ
LINE TO GROUND:	5000VDC	>100GΩ	>100GΩ	>100GΩ
ACROSS CONTACTS:	5000VDC	>100GΩ	>100GΩ	>100GΩ

EQUIPMENT ID
PE-M-7/ PE-D-7

GENERAL COMMENTS
1. **Ductor readings from line side bus to transformer terminals A: 0.71mΩ B: 0.63mΩ C: 0.59mΩ**
2. **Only two replacement fuse links available**
3. **No grounding balls or good access point for connections to ground bus**

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

4.2 2T2.4MS-21FS TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T2.4MS-21FS	PHASES:	3
FEEDS TO:	Hoise/Luff/Slew Converters	HIGH SIDE VOLTAGE:	2400
SERIAL #:	80TSA441	HIGH SIDE B.I.L.:	30kV
TYPE:	ANN	LOW SIDE VOLTAGE:	480/277
SIZE:	1000KVA	LOW SIDE B.I.L.:	10kV
PERCENT IMPEDANCE:	5.7	MANUFACTURER:	Westinghouse
TEMPERATURE RISE:	150°C	MFG. DATE:	~1987
CONFIGURATION:	Delya Wye	APARATUS TEMPERATURE:	18°C
TAP POSITION AS FOUND:	3-6	AMBIENT TEMPERATURE:	18°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	Fair	LIGHTNING ARRESTERS:	See comments
INSULATOR CONDITION:	Pass	COOLING AND FILTERS:	Pass
VISUAL CORE INSPECTION:	Pass	TEMPERATURE SENSING DEVICE:	n/a
OVERALL CONNECTION TIGHTNESS:	Pass	GROUND RESISTOR:	n/a
SIGNS OF OVERLOADING:	Pass	SECONDARY VOLTAGE CHECK:	n/a
OVERALL CLEARANCES	Pass	SIESMICALLY RESTRAINED:	Pass

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	2520	2460	2400V	2340	2280
CALCULATED RATIO:	9.097	8.88	8.66	8.45	8.23
H1 H3 X1 X0	--	--	8.6945:1	--	--
EXCITING CURRENT – mA	--	--	43mA	--	--
H2 H1 X2 X0	--	--	8.6962:1	--	--
EXCITING CURRENT – mA	--	--	35mA	--	--
H3 H2 X3 X0	--	--	8.697:1	--	--
EXCITING CURRENT – mA	--	--	50mA	--	--

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	2500VDC	500VDC	--	500VDC
PI/DAR:	2.67/1.32	1.88/1.05	--	--
INSULATION VALUE:	656GΩ	1.853GΩ	--	290.8GΩ

WINDING RESISTANCE

H	1	H	3	55.6mΩ	H	2	H	1	55.9mΩ	H	3	H	2	55.4mΩ
X	1	X	0	1.05mΩ	X	2	X	0	0.99mΩ	X	3	X	0	0.95mΩ

EQUIPMENT ID

PE-M-7/ PE-TTR-7/ PE-D-7

GENERAL COMMENTS

1.X0 to neutral bus: 0.114mΩ **2.X1 to outgoing A phase: 0.1044mΩ** **3.X2 to outgoing B phase: 0.1123mΩ**

4.X3 to outgoing C phase: 0.118mΩ **5.No lightning arrestors** **6.No temperature sensing device**

7. No screens on filters cable penetrations in floor open to outside. Possible point of entry for birds.

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

4.3 T2.4MS-21FU TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T2.4MS-21FU	PHASES:	3
FEEDS TO:	AFE Inverter	HIGH SIDE VOLTAGE:	2400
SERIAL #:	B43826	HIGH SIDE B.I.L.:	30kV
TYPE:	ANN	LOW SIDE VOLTAGE:	480
SIZE:	300kVA	LOW SIDE B.I.L.:	No data
PERCENT IMPEDANCE:	3.0	MANUFACTURER:	REX
TEMPERATURE RISE:	150°C	MFG. DATE:	No data
CONFIGURATION:	Delta Delta	APARATUS TEMPERATURE:	20°C
TAP POSITION AS FOUND:	1-2	AMBIENT TEMPERATURE:	20°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	Pass	LIGHTNING ARRESTERS:	Fail
INSULATOR CONDITION:	Pass	COOLING AND FILTERS:	Pass
VISUAL CORE INSPECTION:	Pass	TEMPERATURE SENSING DEVICE:	Pass
OVERALL CONNECTION TIGHTNESS:	Pass	GROUND RESISTOR:	n/a
SIGNS OF OVERLOADING:	Pass	SECONDARY VOLTAGE CHECK:	n/a
OVERALL CLEARANCES	Pass	SIESMICALLY RESTRAINED:	Pass

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	2520	2-3	3-4	4-5	5-6
CALCULATED RATIO:	5.25	--	--	--	--
H 1 H 2 X 1 X 2	5.255:1	--	--	--	--
EXCITING CURRENT – mA	14mA	--	--	--	--
H 2 H 3 X 2 X 3	5.2601:1	--	--	--	--
EXCITING CURRENT – mA	19mA	--	--	--	--
H 3 H 1 X 3 X 1	5.2496:1	--	--	--	--
EXCITING CURRENT – mA	18mA	--	--	--	--

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	2500VDC	5000VDC	--	500VDC
PI/DAR:	2.67/1.73	n/a/1.41	--	--
INSULATION VALUE:	2.703TΩ	>2.00TΩ	--	--
TEMPERATURE CORRECTED:	--	--	--	--

WINDING RESISTANCE

H	1	H	2	77.42mΩ	H	2	H	3	77.06mΩ	H	3	H	1	77.19mΩ
X	1	X	2	3.04mΩ	X	2	X	3	3.03mΩ	X	3	X	1	3.02mΩ

EQUIPMENT ID

PE-M-7/ PE-D-7/ PE-TTR-7

GENERAL COMMENTS

Low voltage winding PI not applicable. >2.0TΩ

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD		LOCATION:		NLWS, CRANES
CLIENT:	MEGAPOWER INST.		DATE:		FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM			JOB:	8234

4.4 150T 480V Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Westinghouse	CIRCUIT ID:	480V MAIN	PROTECTION:	THERMAL MAG
MFG DATE:	NL	FEEDS TO:	150T CRANE		
SERIAL #:	229P214H05	AMPACITY:	1200A		
TYPE:	NCG31200F	FAULT BRACING:	NL		
STYLE:	2612D87G05	VOLTAGE RATING:	600VAC		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	91.2 µΩ	73.6 µΩ	79.0 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	12.2 GΩ	8.15 GΩ	13.4 GΩ
PHASE TO GROUND:	1000 VDC	56.3 GΩ	46.5 GΩ	49.5 GΩ
ACROSS CONTACTS:	1000 VDC	475 GΩ	190 GΩ	97.1 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	91.2 µΩ	73.6 µΩ	79.0 µΩ

BREAKER OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	MINIMUM PICKUP VOLTS
CLOSING COIL:	N/A	N/A	-
TRIPPING COIL:	N/A	N/A	-
AUX. CONTACTS	-	-	-

EQUIPMENT ID

PE-M-12, PE-D-12, Raptor PTS

GENERAL COMMENTS

PRIMARY INJECTION TRIP TIMING RESULTS:

Phase o/c trip
2000A trip @ 273s ** PU Dialed down to 4x for testing
2400a trip @194s ** PU dialed down to 4x for testing

Gf trip
290A @ 0.315

4.5 KRUPP 150T CRANE GENERAL TESTING

DEVICE	TEST	CONDITION
2.4MS-21FU (A)	Fuse resistance	3.8249mΩ
2.4MS-21FU (B)	Fuse resistance	3.8347mΩ
2.4MS-21FU (C)	Fuse resistance	3.8511mΩ
2.4MS-21FU	Fuse information	Manufacturer: Electric Power Equipment
		Type: current limiting
		Rated current: 100 amp
		Interrupting capacity: 350MVA
2.4MS-21FU	Key information	Manufacturer: Yale
		Number: 21654
	Fuse resistance	4.026mΩ
	Fuse resistance	3.975mΩ
	Fuse resistance	3.955mΩ

EQUIPMENT ID

PE-D-7

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

4.6 2.4KV CRANE CABLE TEST	
CIRCUIT ID:	2.4NS-3
FEEDS TO:	2.4MS-21FU/T24MS-21FU
MANUFACTURER:	ROME CABLE
MFG. DATE:	NO DATA
INSULATION TYPE:	RW 90 XLPE
CONDUCTOR TYPE:	COPPER
NUMBER OF RUNS PER PHASE:	ONE
SIZE:	#1 AWG
VOLTAGE RATING:	5000V
TEMPERATURE RATING:	90°C

VISUAL INSPECTION		
		NOTES
TERMINATIONS:	Pass	
CONNECTIONS TORQUED:	Pass	
GROUNDING CONNECTIONS:	Pass	
POINT TO POINT TEST:	Pass	
NEUTRAL 100% RATED:	n/a	
CABLE LENGTHS EQUAL:	Pass	
APPROXIMATE CABLE LENGTH:	15m	

INSULATION TESTING				
	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	2.5kV DC	17.54GΩ	7.02GΩ	13.23GΩ
LINE TO GROUND:	2.5kV DC	6.07GΩ	5.53GΩ	5.61GΩ
OVERPOTENTIAL TEST:	n/a	n/a	n/a	n/a

EQUIPMENT ID
PE-M-7

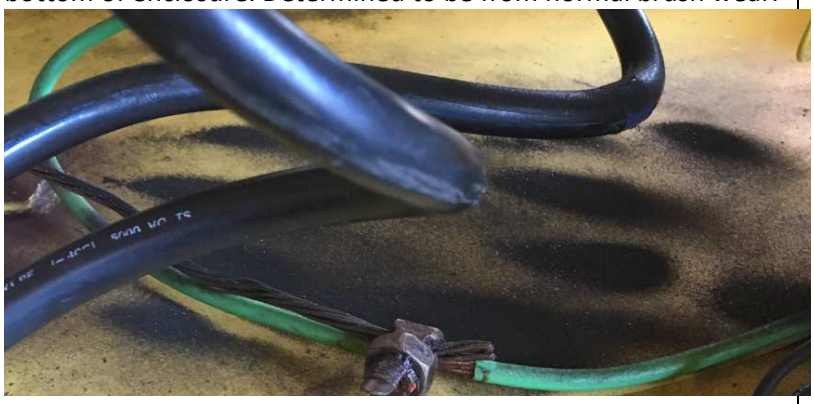
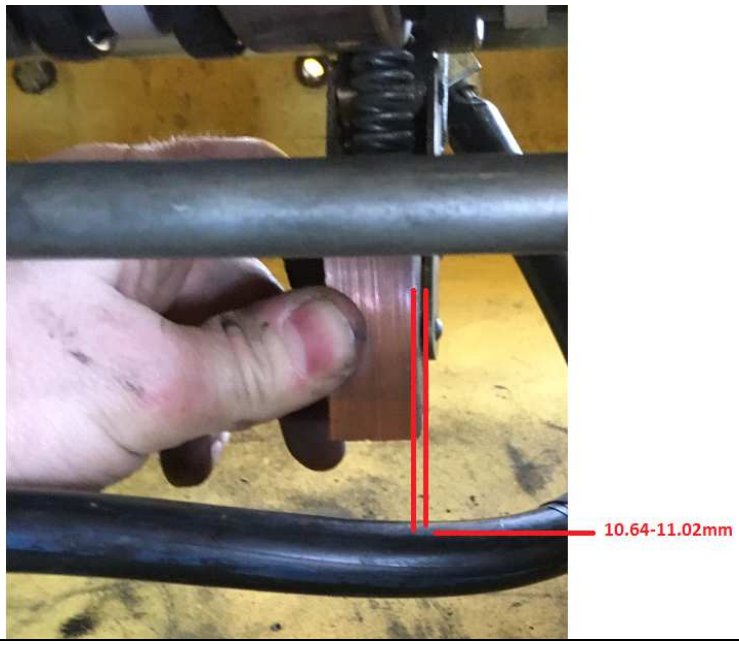
GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

4.7 2.4NS-3 CABLE TEST				
CIRCUIT ID:	2.4NS-3			
FEEDS TO:	150T Crane			
MANUFACTURER:	Nexan			
MFG. DATE:	NL			
INSULATION TYPE:	XLPE			
CONDUCTOR TYPE:	CU			
NUMBER OF RUNS PER PHASE:	1			
SIZE:	2/0			
VOLTAGE RATING:	25kV			
TEMPERATURE RATING:	90°C			
VISUAL INSPECTION				
	PASS/FAIL/N/A	NOTES		
TERMINATIONS:	PASS	Termination in splice box accumulating moisture		
CONNECTIONS TORQUED:	PASS			
GROUNDING CONNECTIONS:	PASS			
POINT TO POINT TEST:	PASS			
NEUTRAL 100% RATED:	N/A			
CABLE LENGTHS EQUAL:	PASS			
APPROXIMATE CABLE LENGTH:	150’			
INSULATION TESTING				
	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	2.5KV DC	1.23GΩ	867MΩ	30.3GΩ
LINE TO GROUND:	2.5KV DC	1.23GΩ	867MΩ	30.3GΩ
OVERPOTENTIAL TEST:	n/a	n/a	n/a	n/a
EQUIPMENT ID				
PE-D-12, PE-M-12				
GENERAL COMMENTS				
Low insulation resistance values obtained determined to be a result of moisture accumulation in the 2.4kV				
Crane junction box where 2.4NS-4 and the 30T crane trailing cable are spliced together. This splice was redone				
And re-tested by others				
PRIME ENGINEERING – REVISION #4.1				

4.8 2.4KV SLIP RINGS GENERAL TESTING

DEVICE	TEST	CONDITION
150T crane 2.4kV slip rings	Visual inspection	Noticeable buildup of carbon/graphite material on within bottom of enclosure. Determined to be from normal brush wear. 
150T crane 2.4kV slip rings	Visual inspection	Brush wear appears to be even between all six brushes inspected. There are no sever scores or other abnormal defects noted. Brush pressure, although not measured with a spring scale, appears to be sufficient (not excess and not to light).
150T crane 2.4kV slip rings	Visual inspection	Approximate remaining brush material varies between 10.64 mm and 11.02mm when measuring from locations shown below. Recommended that manufactures tolerances for minimum brush gear be reviewed to determine replacement intervals. 

150T crane 2.4kV slip rings	Visual inspection	Slip rings appear to be in good condition. No uneven wear or other defects noticed after visiual inspection of each phase and ground. Supports and insulators appear to be in good condition and have sufficient electrical resistance between each phase and ground. 
150T crane 2.4kV slip rings	Contact resistance	Contact resistance measurements were performed between the incoming 2.4kV cable connections and the slip rings. Good electrical connections currently exist and are similar between each phase. The ground connection is higher however this is due to the fact that the slip ring and brush assembly are much smaller than the corresponding phases. Phase A: 1.4258 mΩ Phase B: 1.1036 mΩ Phase C: 1.8541 mΩ Ground: 6.11 mΩ
150T crane 2.4kV slip rings	Ground loop check	The ground loop check was verified by momentarily lifting the connection between the slip ring assembly and the end of line diode. This was verified to activate the appropriate relay in the North Substation. The ground loop was then restored and the relay reset.

EQUIPMENT ID

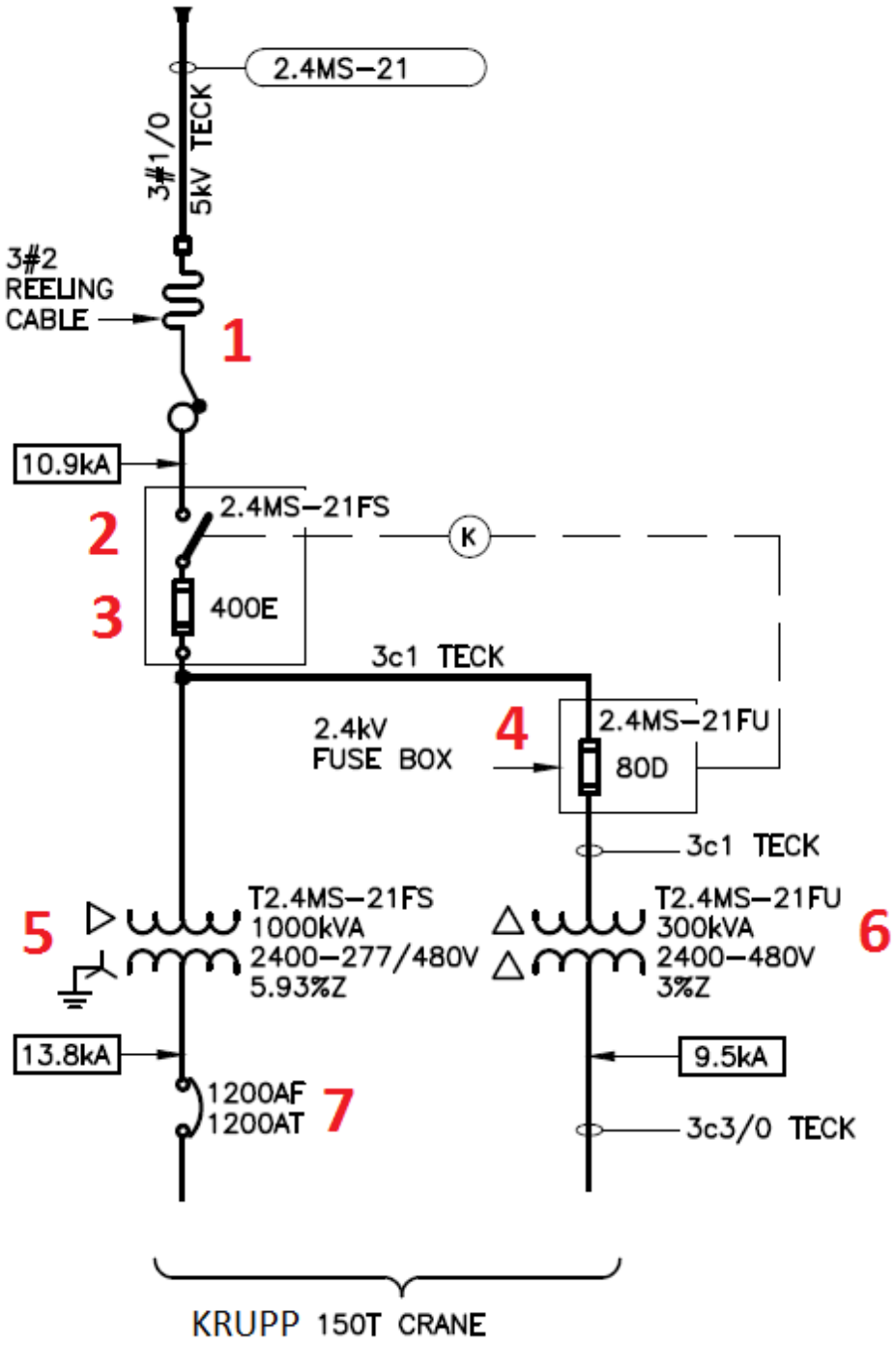
PE-D-7

GENERAL COMMENTS

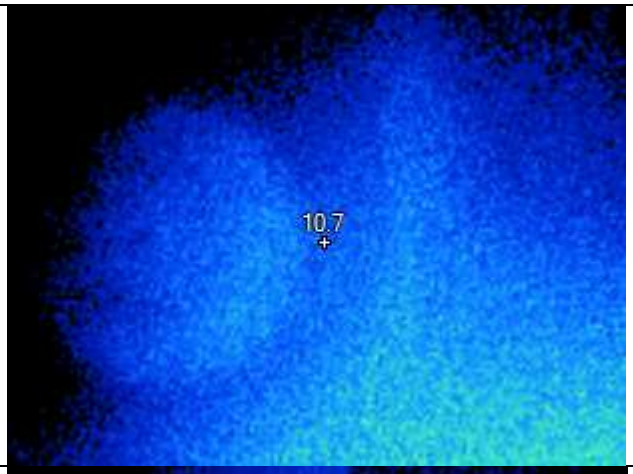
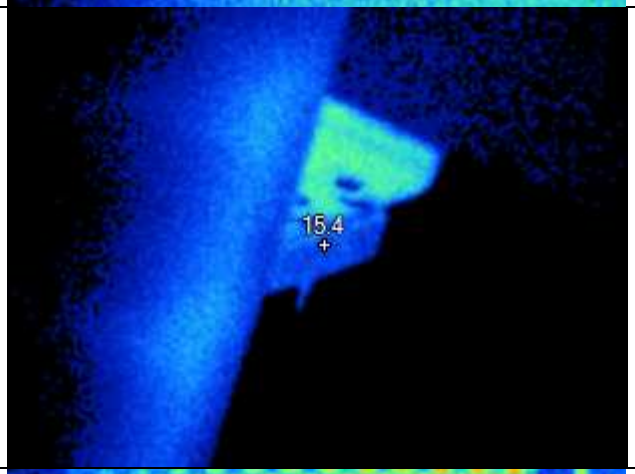
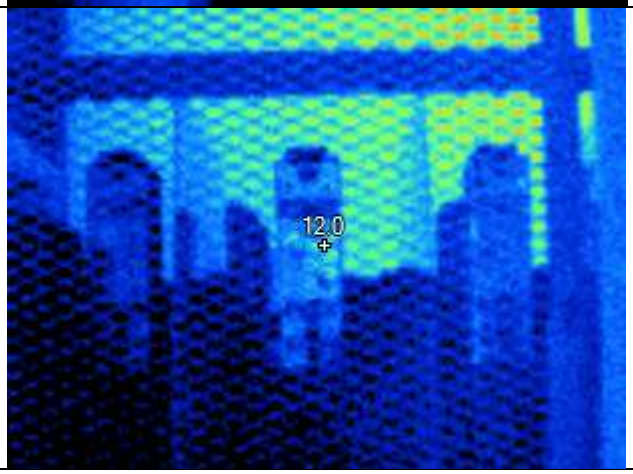
Viewing window/access gasket has deteriorated and should be replaced on one cover. The other viewing window/access cover has been sealed with clear silicone thus prevents access to the equipment from this point. It is recommended that this window be removed and a rubber gasket installed to provide better access to slip rings and brushes for inspection and replacement.

4.9 Krupp 150T Crane Infrared Scanning Results

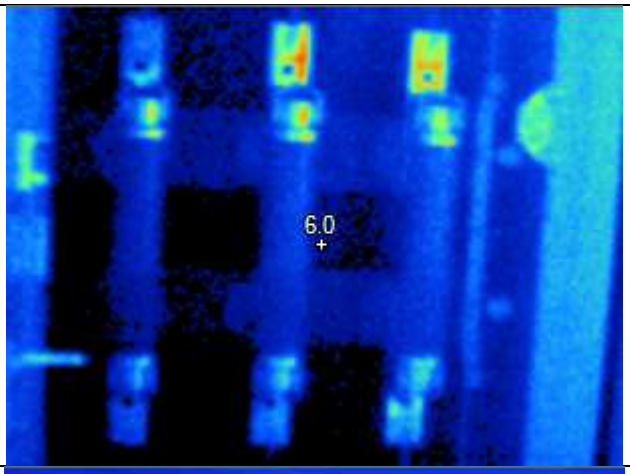
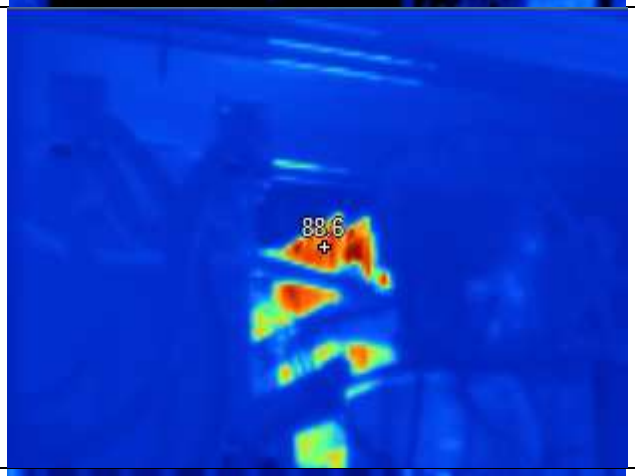
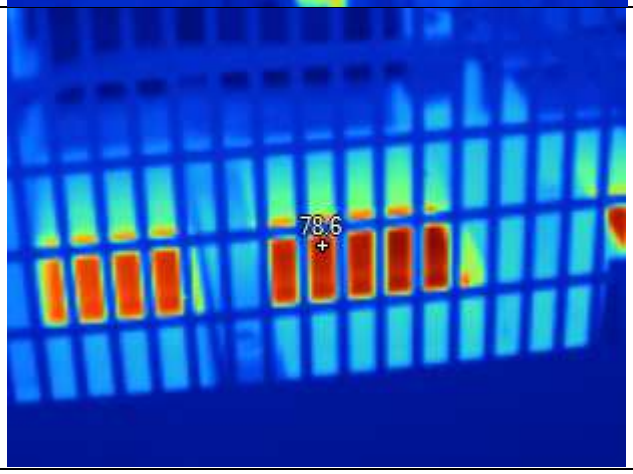
REFERENCE DRAWING	MAIN SUB SINGLE-LINE DIAGRAM EMD-E2 REV.A



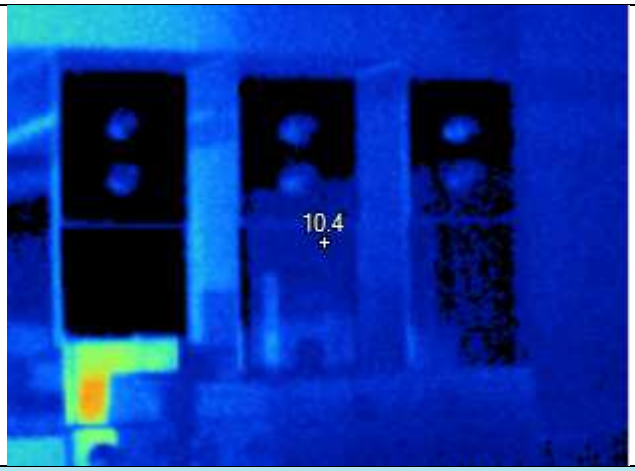
SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
1	2.4kV Slip Rings	**12.0°C**	
2	2.4MS-21FS	**17.8°C**	
3	400E 2.4KV FUSES	**12.0°C**	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
4	2.4MS-21FU	14.3°C	
5	T2.4MS-21FS	108.3°C	
6	T2.4MS-21FU	84°C	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
7	1200 480V Breaker	17.6°C	

GENERAL COMMENTS

5 EBCO 30T CRANE TESTSHEETS

5.1 2.4MS-89-22 MEDIUM VOLTAGE LOAD BREAK SWITCH TEST AND INSPECTION

MANUFACTURER:	WESTINGHOUSE	MFG. DATE:	1985
CIRCUIT ID:	2.4MS-89-22	FEEDS TO:	EBCO 30T CRANE
TYPE:	LOADBREAK	SERIAL NUMBER:	3417A09401
STYLE:	AWP-2	CLOSING RATING:	40KA
CURRENT RATING:	600A	INTERRUPTING CAPACITY:	600A
MOM. RATING:	40KA	VOLTAGE:	4.8KV
B.I.L.:	60KV	CONTROL VOLTAGE:	N/A

INSPECTIONS

	PASS/FAIL/N/A	NOTES
OVERALL CONDITION:	PASS	
SCREEN AND WINDOWS:	PASS	
INSULATION BARRIERS:	PASS	
CLEARANCES:	PASS	
BLADE OPERATING ARMS & ALIGNMENT:	PASS	
WARNING SIGNS:	PASS	
BUS AND INSULATION:	PASS	
CONTROL WIRING:	N/A	
MOTOR OPERATOR:	N/A	
KEY INTERLOCK:	N/A	
KEY NUMBER:	N/A	

FUSE AND CABLE DATA

FUSE TYPE:	BBA	CABLE TYPE:	-
FUSE MFG:	WESTINGHOUSE	CABLE SIZE:	-
AMPACITY:	200A	STRESS CONE:	-
VOLTAGE:	8.25KV	CONDITION:	-
INTERRUPTING CAPACITY:	8.25KV		

CONTACT, FUSE AND INSULATION TESTING

CONTACT & FUSE	LINE A	LINE B	LINE C
FUSE RESISTANCE mΩ:	0.650	0.504	0.494
CONTACT RESISTANCE mΩ:	0.0553	.0391	.032

	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE :	5000VDC	2.012 GΩ	1.346 GΩ	2.107 GΩ
LINE TO GROUND:	5000VDC	2.012 GΩ	1.346 GΩ	2.107 GΩ
ACROSS CONTACTS:	5000VDC	365 GΩ	295 GΩ	628 GΩ
OVERPOTENTIAL TEST mA	-	-	-	-

EQUIPMENT ID

PE-M-13, PE-D-13

GENERAL COMMENTS

CABLES ON LOAD SIDE OF SWITCH INCLUDED IN INSULATION RESISTANCE MEASUREMENTS

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

5.2 T2.4MS-22 TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T2.4MS-22	PHASES:	3
FEEDS TO:	30T Crane	HIGH SIDE VOLTAGE:	2400V
SERIAL #:	M15D3017A-1	HIGH SIDE B.I.L.:	20KV
TYPE:	ANN	LOW SIDE VOLTAGE:	480/277
SIZE:	500KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	5.06	MANUFACTURER:	PIONEER
TEMPERATURE RISE:	150°C	MFG. DATE:	2010
CONFIGURATION:	DELTA-WYE	APARATUS TEMPERATURE:	40°C
TAP POSITION AS FOUND:	3-4	AMBIENT TEMPERATURE:	10°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	N/A
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	PASS
VISUAL CORE INSPECTION:	PASS	TEMPERATURE SENSING DEVICE:	N/A
OVERALL CONNECTION TIGHTNESS:	PASS	GROUND RESISTOR:	N/A
SIGNS OF OVERLOADING:	PASS	SECONDARY VOLTAGE CHECK:	N/A
OVERALL CLEARANCES	PASS	SIESMICALLY RESTRAINED:	PASS

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	-	-	2400	-	-
CALCULATED RATIO:	-	-	8.6642	-	-
H3 H1 X0 X1	-	-	8.6691	-	-
EXCITING CURRENT – mA	-	-	11	-	-
H1 H2 X0 X2	-	-	8.6655	-	-
EXCITING CURRENT – mA	-	-	12	-	-
H2 H3 X0 X3	-	-	8.6807	-	-
EXCITING CURRENT – mA	-	-	15	-	-

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	2500VDC	500	500	-
PI/DAR:	2.18/1.29	6.01/1.55	4.45/1.59	-
INSULATION VALUE:	246.7GΩ	257.1 GΩ	264.4	-
TEMPERATURE CORRECTED:	-	-	-	-

WINDING RESISTANCE

H	1	H	2	110.9mΩ	H	2	H	3	109.9mΩ	H	1	H	3	109.3mΩ
X	0	X	1	1.73mΩ	X	0	X	2	1.74mΩ	X	0	X	3	1.71mΩ

EQUIPMENT ID

PE-M-13, PE-D-13, PE-T-13

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.1

5.3 EBCO 30T 2.4kV SLIP RINGS - GENERAL TESTING

DEVICE	TEST	CONDITION
A PHASE BRUSHES	CONTACT RESISTANCE	2.14 mΩ
B PHASE BRUSHES	CONTACT RESISTANCE	2.29 mΩ
C PHASE BRUSHES	CONTACT RESISTANCE	2.08 mΩ
GROUND BRUSHES	CONTACT RESISTANCE	3.68 mΩ
A	BRUSH MEASUREMENT	12.53mm
B	BRUSH MEASUREMENT	13.01mm
C	BRUSH MEASUREMENT	12.89mm
G	BRUSH MEASUREMENT	12.69mm

EQUIPMENT ID

PE-D-11

GENERAL COMMENTS

Refer to 2.4NS-4 cable test results for insulation resistance values

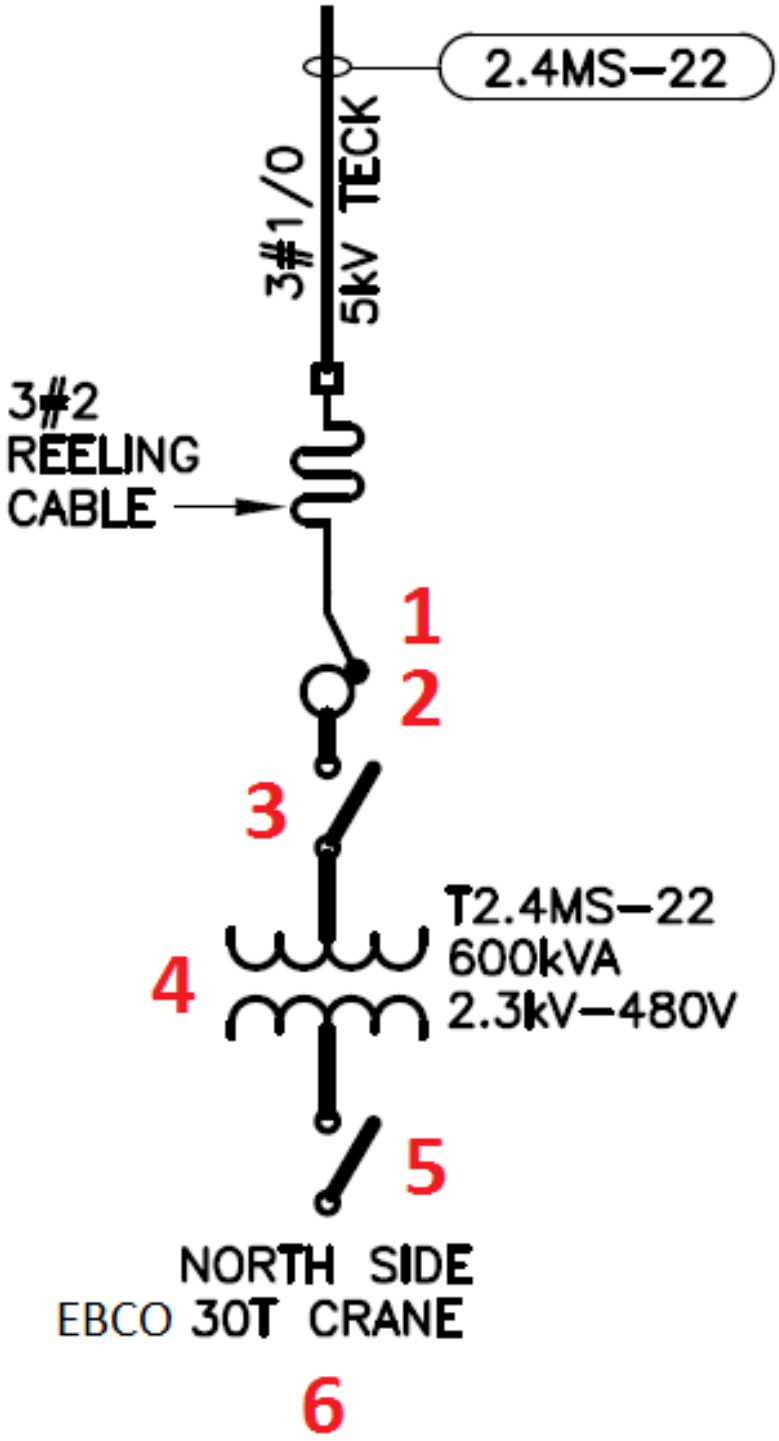
PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

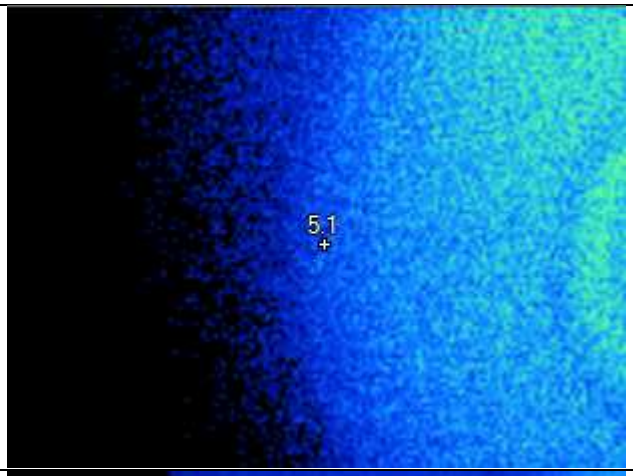
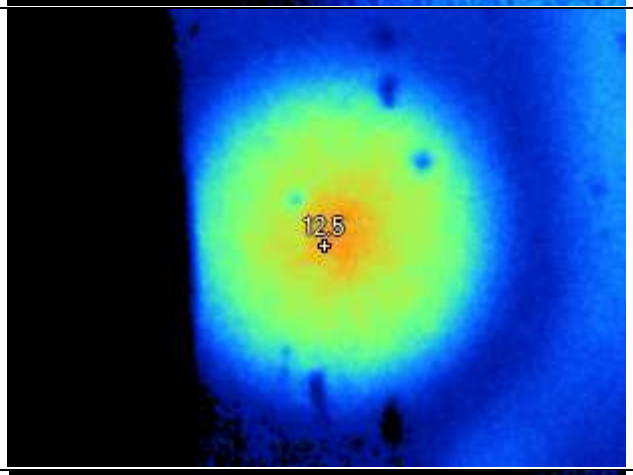
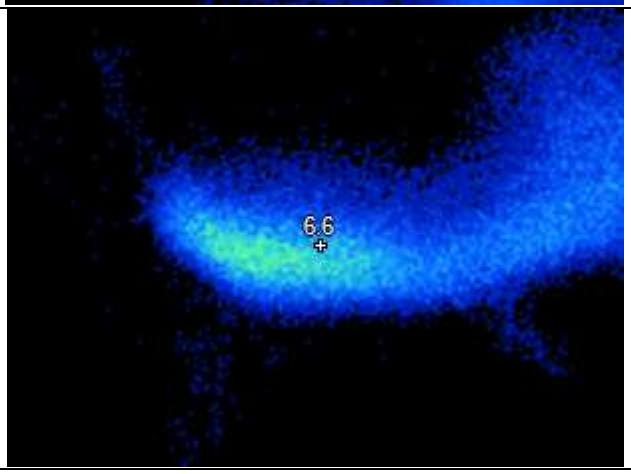
5.4 2.4NS-4 CABLE TEST				
CIRCUIT ID:	2.4NS-4			
FEEDS TO:	30T Crane			
MANUFACTURER:	Nexan			
MFG. DATE:	2017			
INSULATION TYPE:	XLPE			
CONDUCTOR TYPE:	CU			
NUMBER OF RUNS PER PHASE:	1			
SIZE:	#2 AWG			
VOLTAGE RATING:	32kV RMS			
TEMPERATURE RATING:	90°C			
VISUAL INSPECTION				
	PASS/FAIL/N/A	NOTES		
TERMINATIONS:	PASS	Termination in splice box accumulating moisture		
CONNECTIONS TORQUED:	PASS			
GROUNDING CONNECTIONS:	PASS			
POINT TO POINT TEST:	PASS			
NEUTRAL 100% RATED:	N/A			
CABLE LENGTHS EQUAL:	PASS			
APPROXIMATE CABLE LENGTH:	150’			
INSULATION TESTING				
	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	2.5KV DC	8.05 GΩ	9.43 GΩ	8.01 GΩ
LINE TO GROUND:	2.5KV DC	8.05 GΩ	9.43 GΩ	8.01 GΩ
OVERPOTENTIAL TEST:	n/a	n/a	n/a	n/a
EQUIPMENT ID				
PE-M-12				
GENERAL COMMENTS				
Low insulation resistance values obtained determined to be a result of moisture accumulation in the 2.4kV				
Crane junction box where 2.4NS-4 and the Ebco 30T crane trailing cable are spliced together. This splice was redone and re-tested by others				
Correct operation of SE-107 ground check trip verified by lifting the pilot wire connection				
PRIME ENGINEERING – REVISION #4.1				

5.5 EBCO 30T Crane Infrared Scanning Results

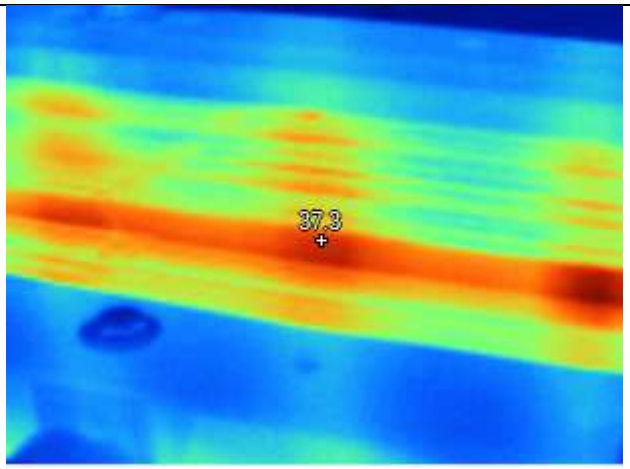
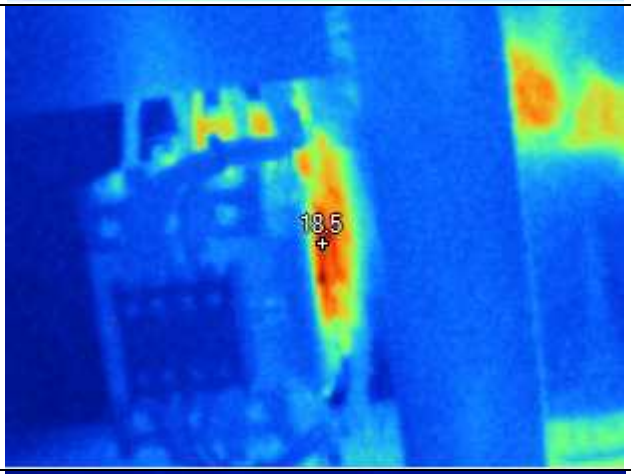
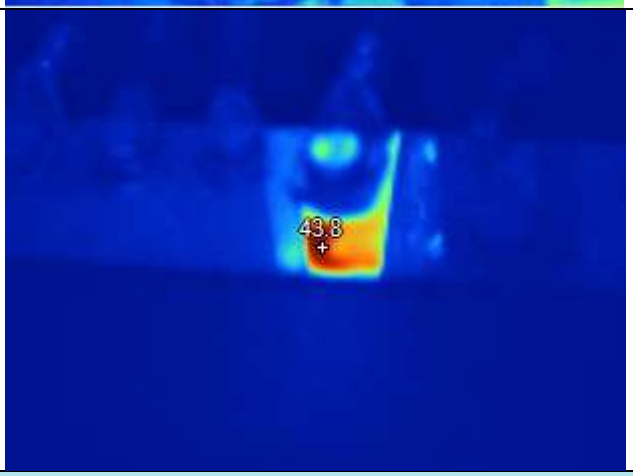
REFERENCE DRAWING	MAIN SUB SINGLE-LINE DIAGRAM EMD-E2 REV.A



SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
1	2.4kV Slip Rings (No Load)	6.4**°C**	
2	2.4kV Slip Rings (With Load)	12.5**°C**	
3	2.4kV Disconnect	7.4°C	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
4	T2.4MS-22	41.5°C	
5	480V Breaker	20.5°C	
6	Conductors Underneath Ground Bus	45.0°C	

GENERAL COMMENTS
Possible loose connection underneath ground bus

6 KONE 30T CRANE TESTSHEETS

6.1 2.4SS-89-2 MEDIUM VOLTAGE LOAD BREAK SWITCH TEST AND INSPECTION			
MANUFACTURER:	AREVA	MFG. DATE:	2010
CIRCUIT ID:	2.4SS-89-2	FEEDS TO:	T2.4SS-2
TYPE:	L-TRI	SERIAL NUMBER:	NL
STYLE:	5/175/600/210/UH-KS-A	CLOSING RATING:	45KA
CURRENT RATING:	600A	INTERRUPTING CAPACITY:	600A
MOM. RATING:	45KA	VOLTAGE:	14KV
B.I.L.:	95KV	CONTROL VOLTAGE:	N/A

INSPECTIONS		
	PASS/FAIL/N/A	NOTES
OVERALL CONDITION:	PASS	
SCREEN AND WINDOWS:	PASS	
INSULATION BARRIERS:	PASS	
CLEARANCES:	PASS	
BLADE OPERATING ARMS & ALIGNMENT:	PASS	
WARNING SIGNS:	PASS	
BUS AND INSULATION:	PASS	
CONTROL WIRING:	N/A	
MOTOR OPERATOR:	N/A	
KEY INTERLOCK:	PASS	
KEY NUMBER:	PASS	C 455396-K1

FUSE AND CABLE DATA			
FUSE TYPE:	NL	CABLE TYPE:	-
FUSE MFG:	SIBA	CABLE SIZE:	-
AMPACITY:	200A	STRESS CONE:	-
VOLTAGE:	7KV	CONDITION:	-
INTERRUPTING CAPACITY:	50KA		

CONTACT, FUSE AND INSULATION TESTING			
CONTACT & FUSE	LINE A	LINE B	LINE C
FUSE RESISTANCE mΩ:	1.75	1.773	1.783
CONTACT RESISTANCE mΩ:			

	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE :	2500VDC	>10TΩ	>10TΩ	>10TΩ
LINE TO GROUND:	2500VDC	-	-	-
ACROSS CONTACTS:	2500VDC	-	-	-
OVERPOTENTIAL TEST mA	-	-	-	-

EQUIPMENT ID
PE-M-11, PE-D-11

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

6.2 T2.4SS-2 TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T2.4SS-2	PHASES:	3
FEEDS TO:	KONE 30T Crane	HIGH SIDE VOLTAGE:	2400
SERIAL #:	41004-585	HIGH SIDE B.I.L.:	30KV
TYPE:	ANN	LOW SIDE VOLTAGE:	480/277
SIZE:	550 KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	5.95	MANUFACTURER:	BEAVER
TEMPERATURE RISE:	115 °C	MFG. DATE:	DATE CODE C10
CONFIGURATION:	DELTA-WYE	APARATUS TEMPERATURE:	50°C
TAP POSITION AS FOUND:	4-5	AMBIENT TEMPERATURE:	20°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	N/A
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	PASS
VISUAL CORE INSPECTION:	PASS	TEMPERATURE SENSING DEVICE:	PASS
OVERALL CONNECTION TIGHTNESS:	PASS	GROUND RESISTOR:	N/A
SIGNS OF OVERLOADING:	PASS	SECONDARY VOLTAGE CHECK:	N/A
OVERALL CLEARANCES	PASS	SIESMICALLY RESTRAINED:	PASS

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	1-2	2-3	3-4	4-5	5-6
HIGH SIDE VOLTAGE:	-	-	-	2340V	-
CALCULATED RATIO:	-	-	-	8.447	-
H2 H1 X0 X1	-	-	-	8.4504	-
EXCITING CURRENT – mA	-	-	-	31	-
H2 H3 X0 X2	-	-	-	8.4319	-
EXCITING CURRENT – mA	-	-	-	24	-
H3 H1 X0 X3	-	-	-	8.4341	-
EXCITING CURRENT – mA	-	-	-	28	-

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5000 VDC	1000 VDC	1000 VDC	-
PI/DAR:	13.3 / 1.9	3.34 / 1.19	5.79 / 1.09	-
INSULATION VALUE:	806 GΩ	152.4 GΩ	180.7 GΩ	-
TEMPERATURE CORRECTED:	-	-	-	-

WINDING RESISTANCE

H	1	H	2	80.06mΩ	H	2	H	3	80.51mΩ	H	3	H	1	79.99mΩ
X	0	X	2	1.182mΩ	X	0	X	3	1.182mΩ	X	0	X	1	1.438mΩ

EQUIPMENT ID

GENERAL COMMENTS

TRANSFORMER CORE BONDED TO GROUND INTERNALLY

PRIME ENGINEERING – REVISION #4.1

6.3 Kone 30T 2.4kV SLIP RINGS - GENERAL TESTING

DEVICE	TEST	CONDITION
A PHASE BRUSHES	CONTACT RESISTANCE	5.33 mΩ
B PHASE BRUSHES	CONTACT RESISTANCE	1.60 mΩ
C PHASE BRUSHES	CONTACT RESISTANCE	1.21 mΩ
GROUND BRUSHES	CONTACT RESISTANCE	3.51 mΩ
A	BRUSH MEASUREMENT	24.66mm
B	BRUSH MEASUREMENT	24.70mm
C	BRUSH MEASUREMENT	25.81mm
G	BRUSH MEASUREMENT	24.94mm

EQUIPMENT ID

PE-D-11

GENERAL COMMENTS

Refer to 2.4NS-3 cable test results for insulation resistance values

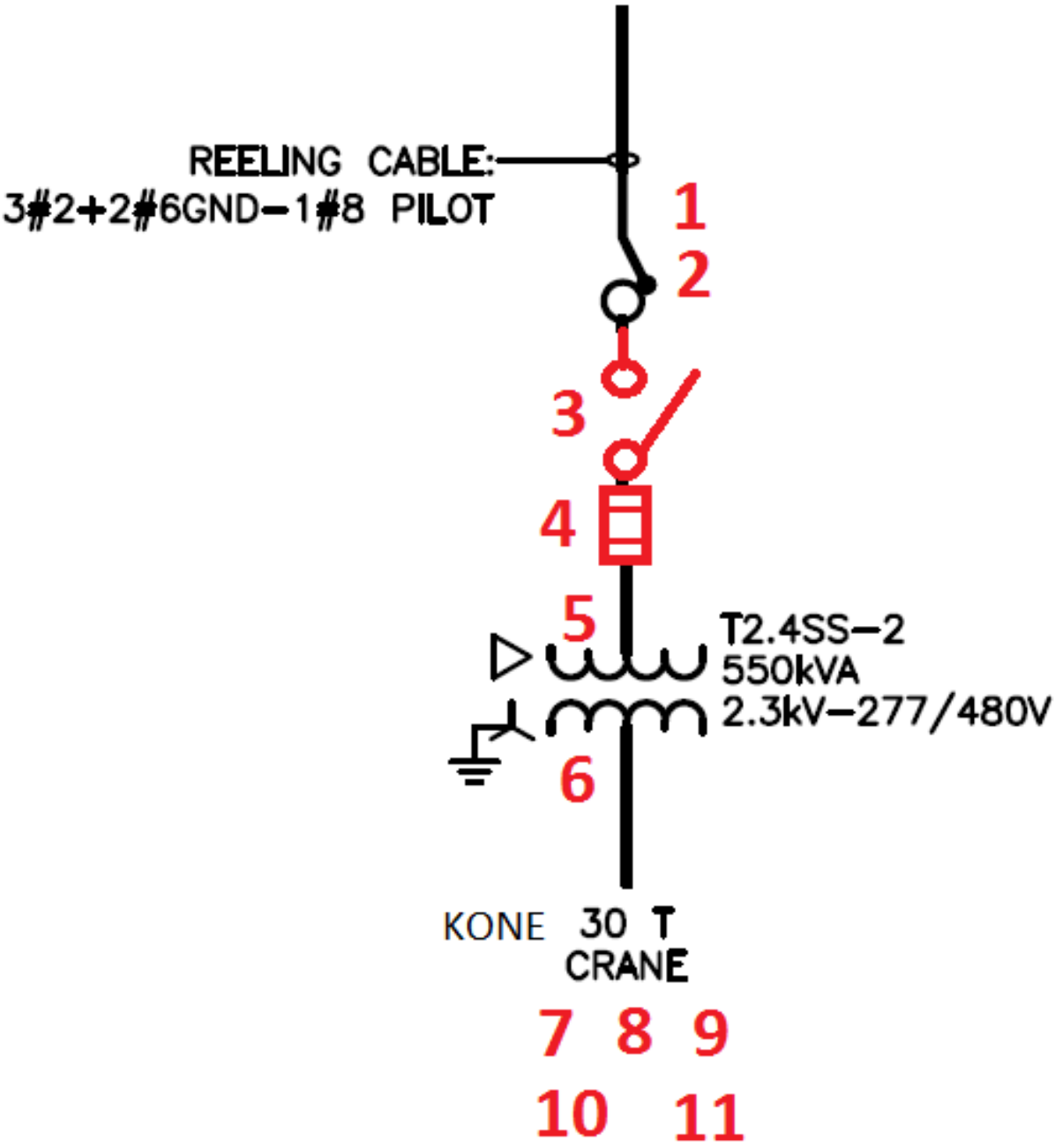
PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

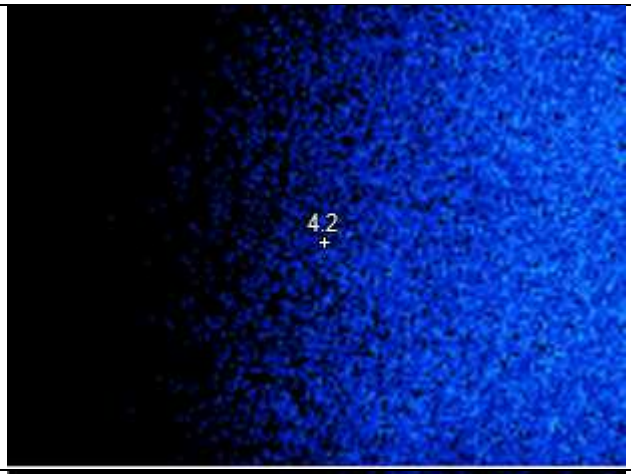
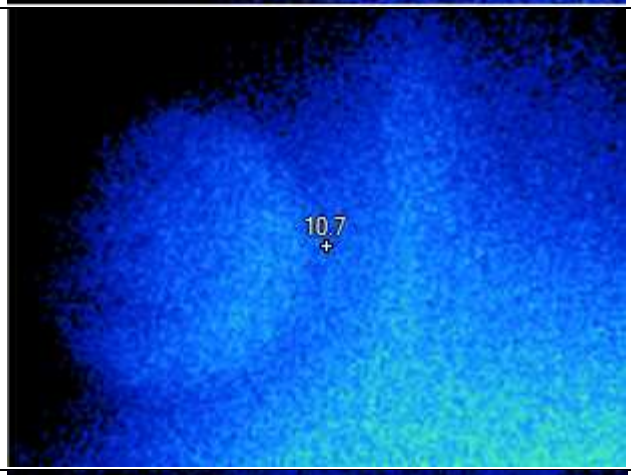
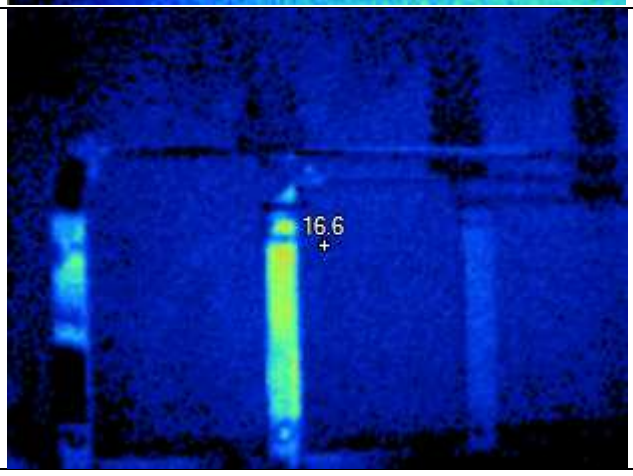
6.4 2.4SSSR-4 CABLE TEST				
CIRCUIT ID:	2.4SSSR-4			
FEEDS TO:	Kone 30T Crane			
MANUFACTURER:	NL			
MFG. DATE:	NL			
INSULATION TYPE:	XLPE			
CONDUCTOR TYPE:	CU			
NUMBER OF RUNS PER PHASE:	1			
SIZE:	2/0			
VOLTAGE RATING:	5kV			
TEMPERATURE RATING:	90°C			
VISUAL INSPECTION				
	PASS/FAIL/N/A	NOTES		
TERMINATIONS:	PASS			
CONNECTIONS TORQUED:	PASS			
GROUNDING CONNECTIONS:	PASS			
POINT TO POINT TEST:	PASS			
NEUTRAL 100% RATED:	N/A			
CABLE LENGTHS EQUAL:	PASS			
APPROXIMATE CABLE LENGTH:	150’			
INSULATION TESTING				
	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	2.5KV DC	103.5GΩ	88.6GΩ	92.2GΩ
LINE TO GROUND:	2.5KV DC	103.5GΩ	88.6GΩ	92.2GΩ
OVERPOTENTIAL TEST:	n/a	n/a	n/a	n/a
EQUIPMENT ID				
PE-M-12				
GENERAL COMMENTS				
Test performed with all conductors not under test grounded				
PRIME ENGINEERING – REVISION #4.1				

6.5 Kone 30T Crane Infrared Scanning Results

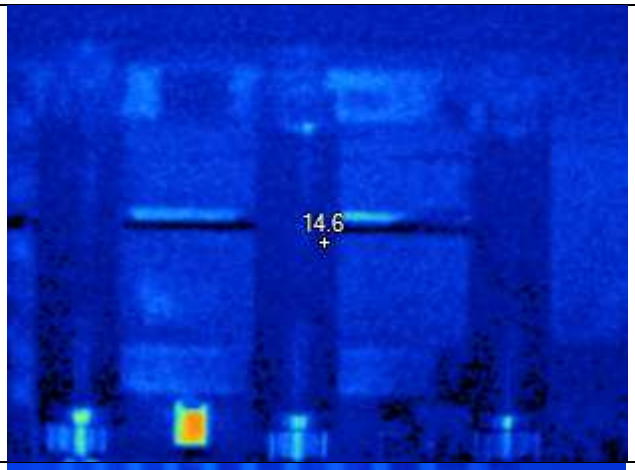
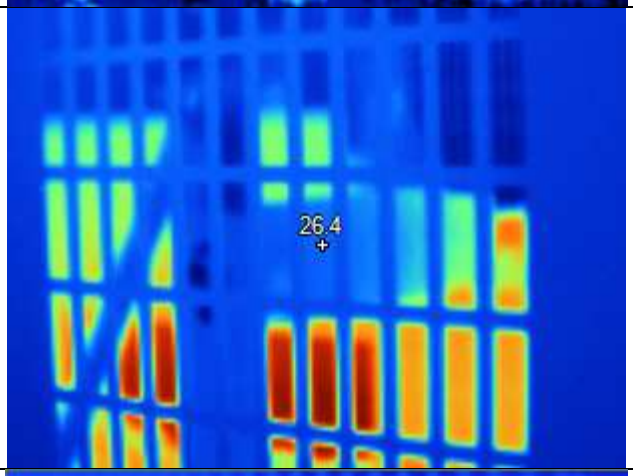
REFERENCE DRAWING	South Side Sub Single Line Diagram E5_Rev.A



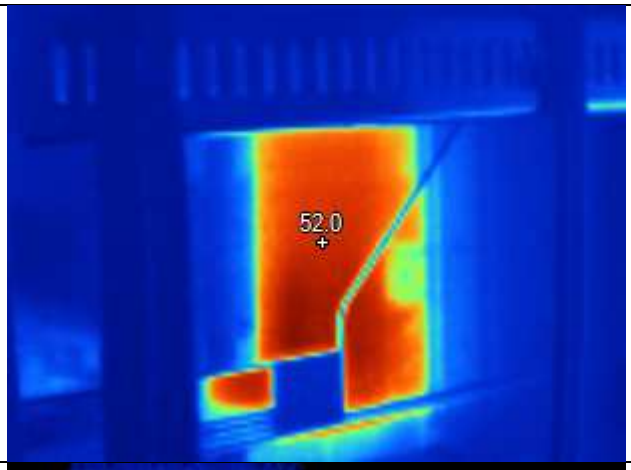
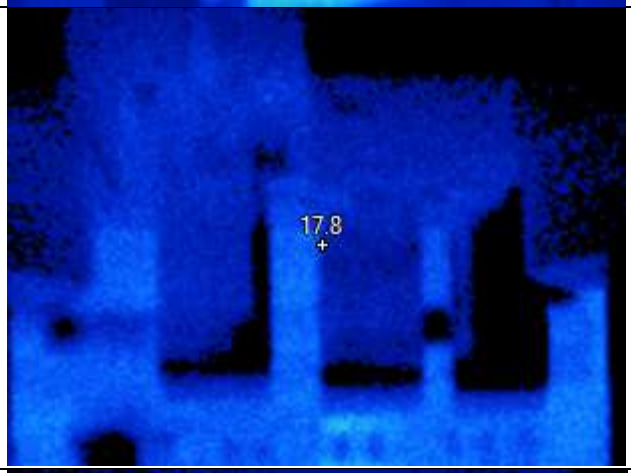
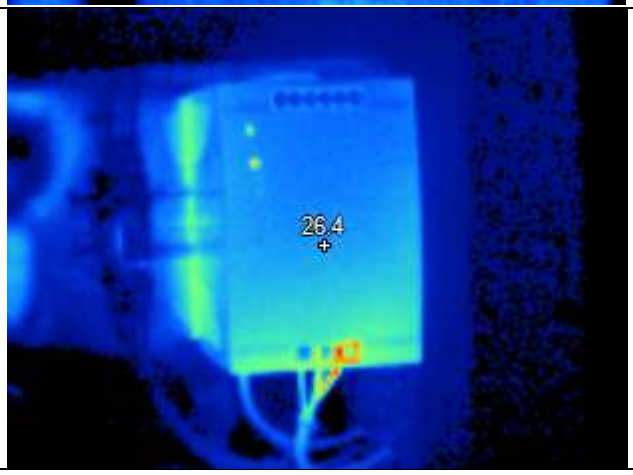
SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
1	2.4kV Slip Rings (No Load)	4.2**°C**	
2	2.4kV Slip Rings (With Load)	10.1**°C**	
3	2.4kV Disconnect	16.6^{0}C	

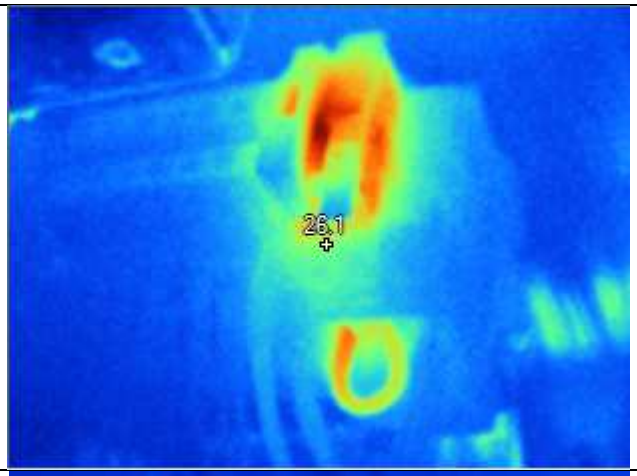
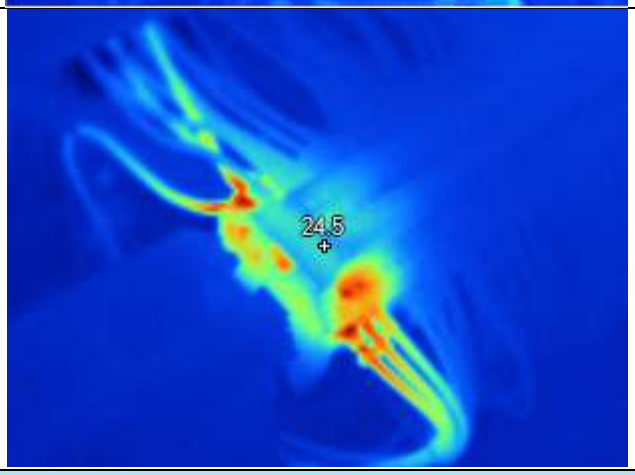
SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
4	2.4kV Fuses	14.6°C	
5	T2.4SS-2 Primary	58.0°C	
6	T2.4SS-2 Secondary	52.9°C	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
7	Gantry VFD	55.5°C	
8	Bus Connections	17.0°C	
9	48V Power Supply – Door # 0-E51	39.2°C	

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

POINT	DESCRIPTION	MAX TEMP	PICTURE
10	Terminal Block Connections in Cabinet R-E1	32.1°C	
11	Terminal block connections in T-E2/R2	50.3°C	

GENERAL COMMENTS
Possible loose connections on terminal blocks inside cabinets R-E1 and T-E2/R2
Reference drawing does not show the 2.4kV load break switch or fuses. These have been added in red for clarity

7 12.5KV SHIP-SHORE SYSTEM TESTSHEETS

7.1 T12.5NS-9 TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T12.5NS-9	PHASES:	3
FEEDS TO:	12.5SVB	HIGH SIDE VOLTAGE:	12470
SERIAL #:	PID-0263	HIGH SIDE B.I.L.:	95KV
TYPE:	ONAN	LOW SIDE VOLTAGE:	6600Y/3811 11000Y/6351 12470Y/7200
SIZE:	5000/6650	LOW SIDE B.I.L.:	95KV
PERCENT IMPEDANCE:	7.63 @ 6600, 7.97 @ 12470, 8.75 @ 11000	MANUFACTURER:	ALSTROM
TEMPERATURE RISE:	65°C	MFG. DATE:	04/03
CONFIGURATION:	DELTA WYE	APARATUS TEMPERATURE:	5°C
TAP POSITION AS FOUND:	SW1: 12470, SW2: 1, TAP C	AMBIENT TEMPERATURE:	5°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	N/A
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	N/A
VISUAL CORE INSPECTION:	N/A	TEMPERATURE SENSING DEVICE:	
OVERALL CONNECTION TIGHTNESS:	PASS	GROUND RESISTOR:	
SIGNS OF OVERLOADING:	PASS	SECONDARY VOLTAGE CHECK:	N/A
OVERALL CLEARANCES	QUESTIONABLE	SIESMICALLY RESTRAINED:	PASS

TRANSFORMER TURNS RATIO HV TO LV @ 12470y/7200

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	13094	12782	12470	12158	11847
CALCULATED RATIO @:	1.8186	1.7753	1.7319	1.6886	1.6454
H 1 H 2 X 0 X 2	1.8164	1.7756	1.7307	1.6857	1.6450
EXCITING CURRENT – mA	2mA	2mA	2mA	3mA	3mA
H 3 H 2 X 0 X 3	1.8165	1.7756	1.7307	1.6858	1.6450
EXCITING CURRENT – mA	3mA	3mA	3mA	4mA	4mA
H 3 H 1 X 0 X 1	1.8164	1.7756	1.7307	1.6858	1.6449
EXCITING CURRENT – mA	3mA	3mA	3mA	3mA	3mA

TRANSFORMER TURNS RATIO HV TO LV @ 11000Y/6351

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	13094	12782	12470	12158	11847
CALCULATED RATIO @:	2.0617	2.0126	1.9634	1.9143	1.8654
H 1 H 2 X 0 X 2	2.0509	2.0048	1.9541	1.9033	1.8572
EXCITING CURRENT – mA	2mA	2mA	3mA	3mA	3mA
H 3 H 2 X 0 X 3	2.0508	2.0048	1.9540	1.9034	1.8527
EXCITING CURRENT – mA	3mA	3mA	3mA	4mA	4mA
H 3 H 1 X 0 X 1	2.0509	2.0047	1.9541	1.9033	1.8573
EXCITING CURRENT – mA	3mA	3mA	3mA	3mA	3mA

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

TRANSFORMER TURNS RATIO HV TO LV @ 6600Y/3811					
TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	13094	12782	12470	12158	11847
CALCULATED RATIO @:	3.4358	3.3539	3.2721	3.1902	3.1086
H 1 H 2 X 0 X 2	3.4232	3.3462	32.2617	3.1771	3.1001
EXCITING CURRENT – mA	2mA	2mA	3mA	3mA	3mA
H 3 H 2 X 0 X 1	3.4233	3.3463	3.2618	3.1770	3.1001
EXCITING CURRENT – mA	3mA	3mA	3mA	4mA	4mA
H 3 H 1 X 0 X 1	3.4233	3.3436	3.2618	3.1771	3.1001
EXCITING CURRENT – mA	3mA	3mA	3mA	3mA	3mA

INSULATION RESISTANCE				
	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5000VDC	5000VDC	5000VDC	N/A
PI/DAR:	1.63/1.42	2.53/1.17	1.52/1.18	N/A
INSULATION VALUE:	3.438GΩ	2.451GΩ	3.213GΩ	N/A
TEMPERATURE CORRECTED:	3.438GΩ	2.451GΩ	3.213GΩ	N/A

WINDING RESISTANCE														
H	1	H	2	169.1mΩ	H	2	H	3	167.1mΩ	H	1	H	3	168.2mΩ
X	0	X	1	59.2mΩ	X	0	X	2	58.5mΩ	X	0	X	3	58.8mΩ

EQUIPMENT ID

GENERAL COMMENTS
-VEGETATION GROWING INSIDE FENCED AREA ENCROUCHING ON TRANSFORMER
-LIQUID LEVEL GUAGE ACCUMULATING MOISTURE BEHIND THE GLASS COVER
PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

7.2 T12.5NS-9 MEDIUM VOLTAGE LOAD BREAK SWITCH TEST AND INSPECTION

MANUFACTURER:	ALSTOM	MFG. DATE:	2004
CIRCUIT ID:	T12.5NS-9	FEEDS TO:	12.5SVB
TYPE:	L-TRI5/17.5	SERIAL NUMBER:	10-02-04
STYLE:	Loadbreak	CLOSING RATING:	600A
CURRENT RATING:	600	INTERRUPTING CAPACITY:	28KA 2s
MOM. RATING:	45kA	VOLTAGE:	17.5KV
B.I.L.:	95	CONTROL VOLTAGE:	N/A

INSPECTIONS

	PASS/FAIL/N/A	NOTES
OVERALL CONDITION:	Pass	
SCREEN AND WINDOWS:	Pass	
INSULATION BARRIERS:	N/A	
CLEARANCES:	Pass	
BLADE OPERATING ARMS & ALIGNMENT:	Pass	
WARNING SIGNS:	Pass	
BUS AND INSULATION:	Pass	
CONTROL WIRING:	N/A	
MOTOR OPERATOR:	N/A	
KEY INTERLOCK:	Pass	
KEY NUMBER:	K1-C243759-L19	
OPERATION COUNTER:	N/A	

FUSE AND CABLE DATA

FUSE TYPE:	N/A	CABLE TYPE:	TECK
FUSE MFG:	N/A	CABLE SIZE:	350MCM
AMPACITY:	N/A	STRESS CONE:	NO
VOLTAGE:	N/A	CONDITION:	PASS
INTERRUPTING CAPACITY:	N/A		

CONTACT, FUSE AND INSULATION TESTING

CONTACT & FUSE	LINE A	LINE B	LINE C
FUSE RESISTANCE mΩ:	N/A	N/A	N/A
CONTACT RESISTANCE mΩ:	42.3μΩ	41.6μΩ	42.6μΩ

	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	500VDC	226.4GΩ	350.8GΩ	366.6GΩ
LINE TO GROUND:	5000VDC	59.1GΩ	168.0GΩ	275.8GΩ
ACROSS CONTACTS:	5000VDC	230.7GΩ	478GΩ	195.9GΩ
OVERPOTENTIAL TEST mA	N/A	N/A	N/A	N/A

EQUIPMENT ID

GENERAL COMMENTS

UNABLE TO PERFORM LINE TO LINE INSULATION RESISTANCE TEST DUE TO TRANSFORMER CONNECTION

EARTHING SWITCH CONTACT RESISTANCE: A=1.0897mΩ B=1.0137mΩ C=1.1723mΩ

PRIME ENGINEERING – REVISION #4.1

7.3 T12.5NS-NGRSW ISOLATION SWITCH TEST AND INSPECTION

CIRCUIT ID:	NGRSW	FEEDS TO:	T12.5NS-NGR

ISOLATION SWITCH

MANUFACTURER:	FPE
MFG. DATE:	NL
TYPE:	INDOOR
SERIAL #:	NL
STYLE:	ISOLATIONSWITCH
VOLTAGE:	15kV
B.I.L.:	95kV
CURRENT:	600A
INTERRUPTING CAPACITY:	N/A

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
INTERLOCK:	Pass	KEY NUMBER: K2
OVERALL CONDITION:	Pass	
SCREEN AND WINDOW:	Pass	
INSULATION BARRIERS:	N/A	
CONTROL:	N/A	
CONNECTIONS TORQUED:	Pass	
BLADE ALIGNMENT:	Pass	LUBRICATED: YES ☒ NO ☐
BLADE OPERATING ARMS:	Pass	LUBRICATED: YES ☒ NO ☐
WARNING SIGNS:	Pass	
BUS AND INSULATION:	N/A	
OPERATION COUNTER:	N/A	

CONTACT AND FUSE TESTING

ISOLATION SWITCH mΩ:	0.1553mΩ

INSULATION TESTING

SWITCH	VOLTAGE	
LINE TO GROUND:	5000VDC	1.182GΩ
ACROSS CONTACTS:	5000VDC	1.182GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

CABLE BETWEEN SWITCH AND RESISTOR INSULATION RESISTANCE TO GROUND: 1.410GΩ

7.4 SHIP-SHORE SYSTEM GENERAL TESTING

IPC Resistors – NGR7200-10-8732
Current rating: 10A
Voltage Rating: 15kV
Serial Number: 19002

DEVICE	TEST	CONDITION
NGR	1mA Ductor test	Nameplate: 720Ω Actual: 702.8Ω
NGR	500VDC Insulation resistance test to ground	4.52MΩ
12.5NS Transformer to NGR Cable	5000VDC Insulation resistance test to ground	616MΩ
12.5NS NGR to Ship-to-Shore Kiosk Cable	5000VDC Insulation resistance test to ground	538MΩ
12.5NS NGR to Isolation Switch Cable	5000VDC Insulation resistance test to ground	1.182GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.1

SITE:	EGD	LOCATION:	NLWS, CRANES
CLIENT:	MEGAPOWER INST.	DATE:	FEB 23, 2019
TECHNICIAN:	KG KB CL PD RO KC TN NM	JOB:	8234

7.5 T12.5NS-9-1/2 CABLE VLF TEST

MANUFACTURER:	NL	MFG. DATE:	NL
CIRCUIT ID:	T12.5NS-9-1/2	FEEDS TO:	12.5SVB
CABLE TYPE/INSULATION:	TR - XLPE	CONDUCTOR SIZE:	2x 350MCM
TEMPERATURE RATING::	90°C	HUMIDITY - %	60%
LENGTH:	150’	MAXIMUM TEST VOLTAGE:	22 KV RMS
AUTHORIZED BY:	K. GOLDSMITH	SHIELD TYPE:	TAPE SHIELD

VISUAL INSPECTION

	PASS/FAIL/N/A		PASS/FAIL/N/A
CABLE TERMINATIONS:	PASS	SHIELD GROUNDING:	See Note
STRESS CONES:	PASS	SHIELD CONTINUITY:	Pass
CABLE SUPPORT:	PASS		

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	370 GΩ	LINE A-B WITH C GROUNDED:	1.34 TΩ
LINE B TO GROUND:	323 GΩ	LINE B-C WITH A GROUNDED:	1.12 TΩ
LINE C TO GROUND:	390 GΩ	LINE C-A WITH B GROUNDED:	0.87 TΩ

TEST SETUP

TYPE OF HV TEST:	VLF	VOLTAGE:	22 KV RMS
WAVEFORM:	Sine	PLANNED TEST DURATION:	15 Minutes
FREQUENCY:	0.1 Hz	CURRENT LIMIT:	-

MEASUREMENTS/RESULTS

PHASE	VOLTAGE	CURRENT	LOAD CAP.	LOAD RES.	FREQUENCY
A	22.0 KV	641µA	32.9 nF	>20 GΩ	0.1 Hz
B	22.0 KV	646µA	33.2 nF	14 GΩ	0.1 Hz
C	22.0 KV	644µA	33.1 nF	14 GΩ	0.1 Hz

TEST RESULT

ACCEPTABLE:	PASS	UNACCEPTABLE:	

EQUIPMENT ID

PE-M-15 PE-VLF-1

GENERAL COMMENTS

-TAPE SHIELD TO BE BONDED AT SOURCE SIDE ONLY

APPENDIX C

EGD LOCKOUT POLICY, PROCEDURES, & RECORDS

LOCKOUT POLICY, PROCEDURES & RECORDS

ESQUIMALT GRAVING DOCK

Canada

Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

Prepared For:	*Approved By:*	*Date Issued:*	*Version:*	*Controlled Copy:*
Risk Management	Jim Milne	18 July 2012	FINAL	01

LIST OF CURRENT AMENDMENTS

AMENDMENT ***NUMBER***	***DATE***	***SECTION***	PAGE ***NO.***	***SUBJECT***
001	6 Jan/10	All		Reviewed and updated. Removed use of Re-energization form; PPE modifications; remove Treasury Board requirements; Mods to reflect BC Safety Authority requirements regarding qualifications.
002	16 May/12	All		Reviewed & Updated. Applicable regulations updated.
003	16 May/12	6	15	Added sequence of operations to allow for orderly startup
004	16 May/12	6	17	Added note re non-electrical isolation; requirement for contractors to provide list of qualified workers.
005	16 May/12	10	24	Add WorkSafeBC19.24 reference re informing workers of H.V.
006	16 May/12	10	25-27	Added Authorization by Owner: WorkSafeBC 19.29 New limits of approach for H.V. by WorkSafeBC Feb 2011
007	16 May/12	10		Added reference to Assurance in writing: WorkSafeBC 19.25

NOTE: Copies of this manual identified as “UNCONTROLLED” may not be the latest release. CONTROLLED copies are numbered and kept by the following individuals:
Copy 1 – Guarantor
Copy 2 – EGD Best Practices Coordinator
Copy 3 – PWGSC Operations Manager at EGD

Every Manual Holder is required to update their manual immediately when amendments are issued and to record the changes on their amendment sheet in the front of their book. Personnel are requested not to make additional copies of this manual as important revisions will not be made available to any manual not issued by the EGD Health & Safety Department.

To initiate a revision contact the PWGSC Operations Manager at EGD.

Table of Contents

Safe Work Policy# EGD- 001	***Applicable Regulations:*** • ***WorkSafeBC B.C. OH&S*** ➢ ***Part 10 - De-energization & Lockout.*** ➢ ***Part 19 – Electrical Safety*** • ***PWGSC Departmental Policy 058 (containing reference to numerous regulations)*** • ***Canada Labour Code Part VIII Electrical Safety*** • ***Treasury Board of Canada Policy, Part VIII, 2008:04:01*** • ***Canadian Electrical Code*** • BC Hydro *Safety Practice Regulations*, issued March 2011, with revisions from BC Hydro Safety Practices Committee up to May 31, 2011 • *National Electrical Safety Code*, ANSI/IEEE C2 - 2007 • ***DND BCEO Local Operating Orders***

1.0 BACKGROUND AND APPLICATION:

The intent of this policy is to create a standard policy and procedures that will apply to all work for PWGSC/ Esquimalt Graving Dock (EGD) that requires isolation/lockout.

This policy will apply to the following personnel and/or contractors:

1. PWGSC Employees at all times
2. Any Contractor working for PWGSC on PWGSC/EGD contracts.

The procedures and requirements of this policy are intended primarily to ensure compliance with WORKSAFEBC regulations. Exceptions arise from the need to also comply with PWGSC Departmental Policy 058 and all Departments with the Canada Labour Code/ Treasury Board Policy. These exceptions are identified in sidebars in the document. Most sections are required in order to meet WORKSAFEBC Regulations PARTS 10 and 19 and some specific references are also noted. **NOTE that sections with references to regulations are not intended to provide the regulation wording verbatim.**

Note that there are numerous requirements within the Canadian Electrical Code, general requirements of PWGSC Departmental Policy 058, WORKSAFEBC regulations etc regarding design criteria for electrical installations and regular operating requirements that also have an impact on safety. It is not the intent of this policy to deal with those requirements. Workers and supervisors must familiarize themselves with applicable regulations/directives.

It is expected that Ship Repair Contractors (e.g. Jenkins Marine, Victoria Shipyards etc.) will establish their own lockout policy and ensure it meets all applicable regulations.

2.0 PURPOSE:

The purpose of a lockout policy is to prevent an energy-isolating device (such as a switch, circuit breaker, disconnect, or valve) from accidentally or inadvertently being operated while workers are performing maintenance or other work on machinery or equipment.

The purpose of this policy/procedure is to ensure the safety of workers by making sure machinery or equipment won't start and injure a worker. The EGD PWGSC Supervisors, PWGSC Project Managers, will ensure that every Contractor has a copy of this policy prior to engaging in work requiring lockout. In the case of Contract Workers on maintenance or construction activities, the Contractor's Superintendent will be responsible for ensuring Worker training has occurred and providing documentation thereof to the Project Manager. PWGSC Supervisors will ensure that persons performing work that requires lockout, are trained in and adhere to this policy. It is expected this document will be used as part of any lockout training/orientation package.

Serious injury (see Appendix 1) may result if lockout rules are not followed in every detail. If there are details of the policy or rules not understood, workers are encouraged to discuss them with their Supervisor.

3.0 DEFINITIONS:

ABBREVIATIONS

EGD EA: EGD Electrical Authority. Currently the PWGSC Electrical Supervisor.

DND BCEO: Department of National Defense Base Construction Engineering & Operations. Note that only Monroe Head is fed directly by B.C. Hydro. Power to EGD is supplied by DND BCEO. EGD Electrical personnel do not deal directly with B.C. Hydro.

EGD: Esquimalt Graving Dock

PIC: Person in Charge of actually carrying out or supervision of the work.

AERIAL MANLIFT:
Includes all types of equipment such as boom mounted buckets, cages, or baskets and truck mounted ladders. These are designed to place personnel, their equipment and tools, aloft in a position to work on Elevated Structures and equipment. Note: Buckets shall not in themselves, be considered an insulating device.

ALIVE or LIVE:
Means capable of delivering power or containing stored energy or being energized.

AUTHORIZED PERSONS:
Persons confirmed by supervision as being thoroughly familiar with the process or operation are authorized persons to operate valves, breakers etc.

For specific equipment in specific circumstances (i.e. Main Power Disconnect on site service power pole, main electrical vault disconnect etc.), those persons authorized by the Guarantor may operate electrical disconnect devices after they have been properly instructed and are considered thoroughly capable.

See also definition of Electrical Worker and Qualified Person/Qualified Electrician.

CLEARANCE:
An assurance that a specific Line or specified Electrical Apparatus is isolated and it is safe to apply Safety Grounds and go to work.

DEAD:
Incapable of delivering power and not containing stored energy.

DE-ENERGIZED:
Means the normal sources of energy have been interrupted by disconnection apparatus.

DIFFERENT OPERATING AUTHORITY:
D.N.D. Base Construction Engineering Operations and EGD EA (EGD Electrical Authority) are recognized as the different Operating Authorities for the purposes of these procedures described herein.

ELECTRICAL APPARATUS:
Means all electrical machines, equipment, fuses, switches, disconnects, bus bars, electrical conductors, cables, transformers, capacitors, etc, together forming an electrical system.

ELECTRICAL WORKER:
means a Qualified person who meets the requirements of the B.C. Electrical Safety Act for installing, altering or maintaining electrical equipment.

WORKSAFE BC 19.1

GUARANTOR:
means a representative of the EGD Director or designated representative, responsible for the electrical equipment, the electrical installation or power system and authorized by PWGSC as the exclusive authority to establish conditions for isolation, provide a guarantee of isolation and approve a "REQUEST FOR ELECTRICAL ISOLATION" and to authorize live line work. The Guarantor is like a "gatekeeper" who will ensure a number of critical activities have taken place prior to authorizing the work to proceed.

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The Guarantor is a Field Service Representative (FSR) as defined by B.C. Safety Authority, with a Class A certificate who holds the Operating Permit for EGD. The Guarantor may assign a Qualified Electrician to act as alternate Guarantor subject to conditions as outlined under "Qualified Electrician".

The Guarantor must be authorized in writing by his/her employer to perform the role of Guarantor. Note that all original copies of log-books, guarantees of isolation and other associated documentation will be kept on site at EGD with the Guarantor. The Guarantor will ensure that persons with knowledge are involved in defining procedures when ***non-electrical isolation*** is required as part of the lockout process.

Note that WORKSAFEBC refers to the Guarantor as the "Person in Charge" per paragraph 19.19

The Guarantor will also:

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1. Ensure that a log of minor electrical repair and renovation projects is established and maintained and necessary inspections are carried out by local Electrical Inspection Authorities.
2. Ensure that a permit is obtained from local electrical authorities when necessary, and work is subsequently inspected as required. See Departmental Policy DP058 Appendix 7 located in Section 6 of the Lockout Manual for equipment/installations requiring inspection certificates.
3. Inform all occupants who will be affected that the isolation is taking place.
4. Inform anyone that may be affected, of any unscheduled interruptions.
5. Maintain a log of switching details, safety protection guarantees and operational events
6. Authorize the commencement of work.
7. Ensure only workers authorized by the owner receive a safety protection guarantee and are permitted to do work on the system.
8. Ensure there is effective communication between the Guarantor, Person in Charge, others on site (as required) and the workers doing the work.
9. Ensure that other groups of workers, contractors, etc. that may be affected are informed of the Lockout Plan about to be implemented and that no other work that could interfere is authorized to commence during the isolation.

10. If work is taking place near live electrical equipment, determine when a Safety Watcher should be used.
11. Ensure that all operating procedures, schematics and related documents are updated promptly on completion of the work.
12. Ensure required signage is in place at each approach to High Voltage electrical equipment.
13. Provide alternate Switching Routing or Isolating Procedures required to restore or maintain Emergency Electrical Service when existing Standard Operating Procedures do not exist covering such unforeseen emergencies.

QUALIFIED PERSON/ QUALIFIED ELECTRICIAN

DP058

Means, with respect to a specified duty, an individual who, because of knowledge, training and experience, is qualified to safely and properly perform the duty. A Qualified Electrician is a qualified person who is also licensed to perform electrical work in the Province of B.C. The operating permit holder (Guarantor) has the authority to assign the work to certified and qualified electrical workers. "Qualified", has been defined as a person who is familiar with the equipment being installed or altered, is aware of required safety procedures and the hazards involved. So the FSR should assign the work to one with training and experience. Qualified Journeymen Electricians will have a Trade Qualification (TQ) and/or Interprovincial Ticket.

The Qualified Electrical Worker can be assigned to work involving any voltage provided the Guarantor has selected the Worker based on specific competency parameters, knowledge, experience to be able to complete the work safely.[1]

PERSON IN CHARGE (PIC)

DP058

Relative to this policy, means a Qualified Person in charge of carrying out Isolation, appointed by management, to ensure the safe and proper conduct of an operation, or the work of employees to implement isolation (e.g. Electrician, Electrical Foreman, etc.).

The Person in Charge will:

1. Secure the input of persons qualified to carry out mechanical isolations as required to ensure the overall safe conduct of the operation.
2. Prepare the Request for Electrical Isolation and Procedures for Isolation forms (see sample in Appendix 4) in consultation with the Guarantor. The Person In Charge must be authorized in writing by his/her employer to receive a Guarantee of Isolation.

PWGSC ELECTRICAL SUPERVISOR at EGD:

An individual charged with supervising EGD Electricians or coordinating the procurement of Electrical Contract Resources to carry out electrical work at the EGD site. Relevant records regarding electrical

[1] BC Safety Authority, Ted Gilbert 8 Sept 2009

work (Requests for Isolation, Procedures, Line diagrams, etc.) will be stored in his/her office. Also, the Electrical Supervisor will coordinate reviews/revisions to this policy and act as the Guarantor.

BEST PRACTICES COORDINATOR:
The Coordinator is an individual at EGD who is responsible (among other things) for the maintenance of Health & Safety Policies. Requests for changes to this document will be initiated through the PWGSC Electrical Supervisor who will bring them to the Best Practices Coordinator for documentation and subsequent approval by the PWGSC Electrical Supervisor and the EGD Director.

MANAGER IN CHARGE OF WORKSITE OR OPERATIONS SUPERVISOR
Regarding box "E" on the "REQUEST FOR ELECTRICAL ISOLATION" (PWGSC-13), this individual is usually the Supervisor accepting the COMPLETED WORK back into service. However, this can also be the Guarantor accepting the work as properly completed in the event of work completed on an off shift or weekend.

ISOLATED:
Means the normal source of electrical energy has been disconnected by opening all associated switches and securing them in this condition. For other energy sources (e.g. mechanical, hydraulic, pneumatic etc.) it means use of an energy-isolating device and locks to secure the points and prevent accidental energy release.

LIVE TESTING:
Means the Line or Electrical Apparatus is under the Direct Control of the Person In Charge who may authorize him/herself or others to conduct Live Testing. "Do Not Operate - Testing" tags are to be affixed to the appropriate switches or isolating devices for the duration of the tests.

SAFETY WATCHER:

Where a Worker is working on/near live equipment and because of the nature of the work, the condition or location of the workplace, it is necessary the work be observed, the Person in Charge shall appoint a Safety Watcher. His/her duties are:

1. Warn workers of the hazard and
2. Ensure all safety precautions/procedures are complied with.

The Safety Watcher shall be:

1. A Qualified Person informed of the duties and of the hazards involved.
2. Trained and instructed in emergency procedures
3. Authorized to immediately stop work he/she considers to be dangerous or not being properly conducted; and

4. Free of other duties that might interfere with the Safety Watcher duties.
5. Identified to all parties as the official Safety Watcher and included in a pre-project safety review of the work with all Workers.

SCISSORS:
A clamp-like device that allows multiple locks to be attached to a single isolation point.
The Electrical Supervisor will issue scissors as required.

TAILBOARD DISCUSSION:
Any job involving two or more workers must be planned in detail before any work commences. To work safely a "Tailboard Discussion" must be held. All employees involved in a job must have a clear understanding of their role and procedures. Tailboard discussions must be held prior to work and again if there is a change in plans. The tailboard meetings shall be recorded, and kept with the Request for Isolation, Procedures and other documents related to the job for future reference.

4.0 LOCKOUT DEFINED AND WHEN REQUIRED:

What is Lockout?

WORKSAFEBC 10.1

Lockout is the use of a lock or locks to render machinery or equipment inoperable or to isolate an energy source, in accordance with a written procedure. The equipment cannot be operated or energized without the consent of the person(s) who rendered it inoperable.

Energy sources can be: Electrical, Mechanical, Hydraulic, Pneumatic, Chemical, Thermal or can be Potential Energy. The objective of lockout is to achieve a "zero energy state".

When is Lockout Required?

Lockout is required under the following circumstances.

WORKSAFEBC 10.2, 10.3

1. If the machinery or equipment could unexpectedly activate, or
2. If the unexpected release of an energy source could cause injury.

When is Lockout not required?

If there is no hazard to workers, no lockout is required. The application of a lock is not required if:

WORKSAFEBC 10.11

a. The energy-isolating device is under the *exclusive and immediate control* of the worker *at all times* while working on the equipment and has been de-energized.

b. The tool, machine or equipment which receives power through a readily disconnected supply such as an electrical cord or quick release air or hydraulic line, is disconnected from its power supply and it's connection point is kept under the immediate control of the worker at all times while the work is being done.

5.0 PERSONAL SAFETY LOCKS AND PERSONAL PROTECTIVE EQUIPMENT:

Personal Safety Locks

WORKSAFEBC 10.4

Every worker who is required to lock out machinery or equipment will be issued personal safety lock(s) by their supervisor, in the quantity required to comply with lock out requirements. This lock(s) ensures the safety of the individual worker. Workers are **FORBIDDEN** from removing locks belonging to other workers. Workers are **FORBIDDEN** from giving their key(s) for personal lock(s) to anyone.

Your key is your life insurance!

Only individually keyed locks of substantial construction are acceptable (no locks with one master key and no multiple keys). ***No combination locks*** are permitted. All locks issued to workers will be recorded in a lock registry with the name of the worker owning the lock opposite the lock's serial number. When using Personal Safety Locks, each worker will attach a tag identifying the lock owner, his/her company and date/time applied to each lock. Alternatively, locks can be permanently identified with the owner's name. Contractors are expected to supply sufficient locks for all of their workers to carry out the required procedure.
If used in conjunction with a Live Test, mark the tag as a Testing Tag.

If multiple workers must apply locks to an isolation point, scissor adapters will be provided or possibly a Group Lockout procedure (see section 10) will be used to reduce lock requirements. EVERY Worker must apply their Personal Safety Lock. ***DO NOT work under someone else's lock!*** You will not be adequately protected!

A TAG applied to the energy-isolating device will NOT be considered adequate protection without personal lock(s) also being applied.

Locks are not to be used for any other purpose than Lockout!

1. When a lock or key is damaged or the lock identification is not readable, it must be returned to the Electrical Supervisor's Office for repair or replacement. If a lock or key is lost, notify the Electrical Supervisor immediately.
2. Contractors are required to supply their own safety locks and to apply and remove these locks. These locks must meet WorkSafeBC requirements.

3. Lock-out by attaching your personal lock(s) securely to each disconnect switch and isolation valves. Isolation valves are to be closed, locked and tagged. When in doubt as to how a device is to be locked out, ask the Person in Charge, or Supervisor. The lock(s) must make the equipment inoperative and be attached to the shut off device or a scissor clamp, but never directly to another lock and never to the last hole on a scissor clamp.

Personal Protective Equipment (PPE):

WORKSAFEBC 10.4 DP058

All PPE and tools shall be CSA approved and used only for the intended purpose. It is the responsibility of the Supervisor (or the Contractor's Superintendent for contract workers), to ensure that adequate supplies are on hand **BEFORE** commencing the work and that workers have received training and instruction in the proper use, fit and care of equipment and tools. This will include applicable items from the list in Appendix 2B:

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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.

6.0 PRIOR TO ISOLATION:

Before implementing a lockout the following must take place:

Prepare a Job Hazard Analysis

The Person in Charge or the Contractor's Superintendent will assist in finalization of a **Job Hazard Analysis** for discussion with the Guarantor. This will involve a discussion of the work to be performed and a tour with knowledgeable persons to become familiar with the equipment or installation. The purpose of this is to identify hazards and additional precautionary measures to prevent accidents. The appropriate requirements will be included in the isolation procedure.

For jobs that are repetitive, the Job Hazard Analysis should be kept on file in the PWGSC Electrical Supervisor's office for use as a starting point for the next time the job is performed. However, be sure to work through the analysis again. **Do not assume** that nothing has changed in the interim! Discuss with the PWGSC Electrical Supervisor to ensure single line diagrams are up to date and conduct a review of Maintenance Management System (MMS) records for relevant information on the equipment involved in the job.

For Demolition work, ensure all services are accurately located and disconnected as part of the procedures as required by the owner of the applicable utility.

When excavating, ensure underground utility services are accurately located and excavation/drilling work is undertaken in conformance with the requirements of the owner of the service and applicable regulations. Do not use pointed tools to probe for gas/electrical services.

Confined Space Entry & Manholes

If work requires the entry into manholes or other CONFINED SPACES, ensure that PWGSC procedures regarding entry to Confined Spaces are followed. Confined Spaces present special hazards and it is imperative that all workers be trained in Confined Space Entry prior to entering and that provisions for emergency rescue etc have been addressed.

Protection From Ship's Power:

The Person In Charge and the Guarantor will establish proper contact with ship's officials when planning work in order to determine if any hazard exists to either workers covered by the planned isolation or ship's personnel and the necessary steps to eliminate the risk. Ships in port and their service needs are subject to change. Therefore it is important to review the situation at the time of lockout to be sure all contingencies are covered.

Prepare a Lockout Procedure

The Person in Charge will prepare the **PROCEDURES FOR ISOLATION** form (PWGSC-12) for work requiring more than one operation. This details all steps to be taken in performing the **lockout and re-energizing** after the work is completed. This procedure shall include the following:

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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 1of 2 etc.)

- Ensure an effective means of communication between the Person in Charge and the Workers is built into the procedure as required.
- Be sure to consider Interlocks.
- If working in/near Battery Rooms consider risks of ignition of flammable gases and ensure ventilation systems are working.
- Ensure access to every electrical switch, control device or meter is maintained free of obstruction. Lockout of a panel door preventing access to other live breakers is unacceptable as part of a lockout procedure.
- Ensure that no flammable materials are stored or placed close to electrical equipment.

- Note lockout of Control Circuits is not sufficient for total isolation.
- Ensure lockout points are uniquely identified to prevent errors.

Prepare written Emergency Procedures for critical tasks.

Prepare a REQUEST FOR ELECTRICAL ISOLATION and Obtain Approval

The Person in Charge will complete a "**REQUEST FOR ELECTRICAL ISOLATION** form **(PWGSC-13)** and present it along with the PROCEDURES FOR ISOLATION (PWGSC-12) for approval by the Guarantor prior to work commencing. The Guarantor will ensure, prior to providing approval, that there is no other work being undertaken that will interfere or conflict during the requested time for isolation and that the Single Line Drawings have been reviewed. Ensure the Guarantor is given sufficient time to authorize the isolation. See Appendix 5 for a SAMPLE document.

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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

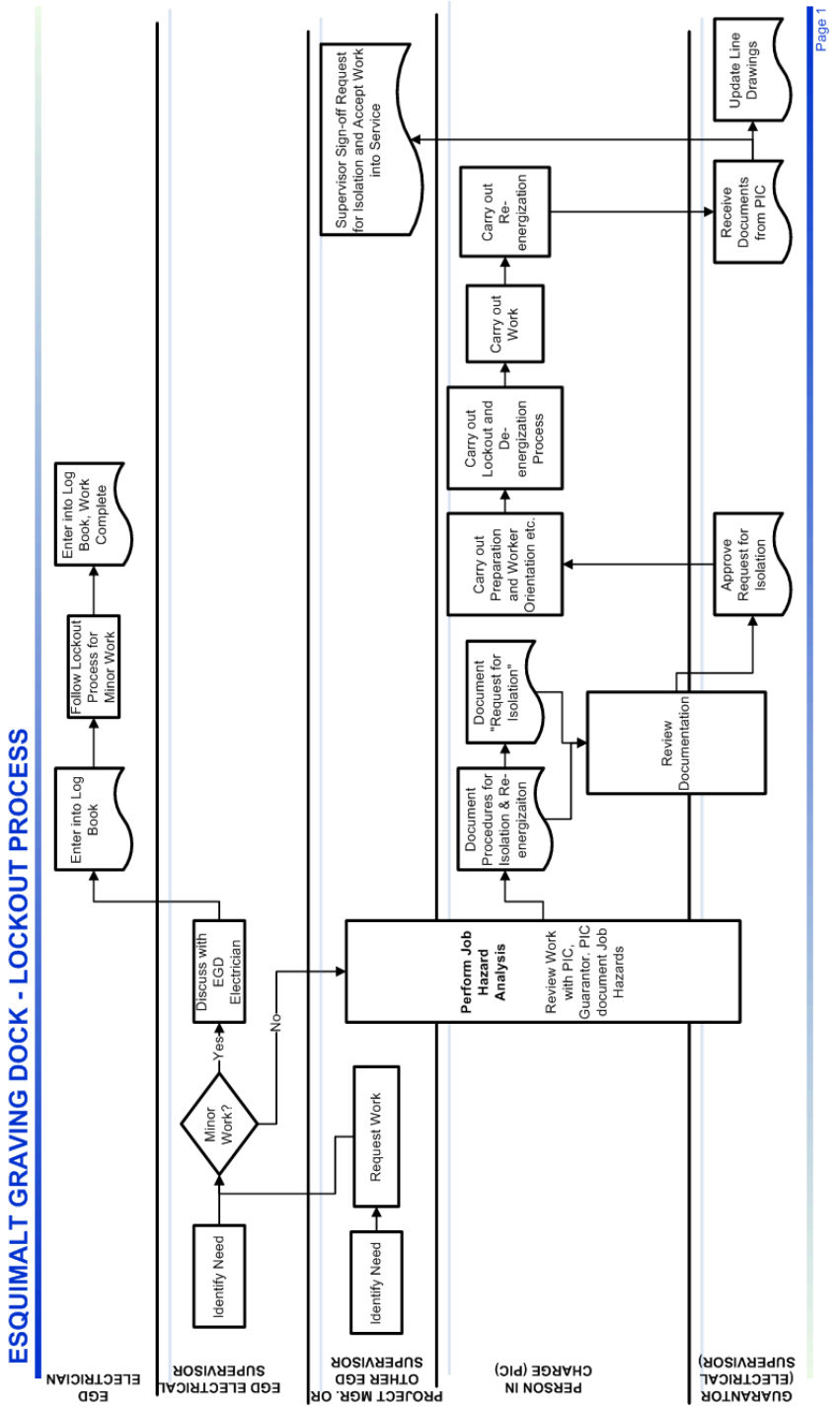
The following procedure applies. See Appendix 4 for Sample Forms. PWGSC will perform the isolation and review the details with the Contractor's Superintendent. A Group Lockout will be performed permitting all affected workers to apply their personal lock to the lock box (see section 11).

1. The EGD Project Manager will request the work to proceed verbally and follow up with an e-mail to the Electrical Supervisor detailing the project name and number and work activity to be performed and Contractor's Superintendent name.
2. The PWGSC Person In Charge will document the isolation procedures and review them with the Guarantor and the Contractor's Superintendent.
3. The Person in Charge on the REQUEST FOR ELECTRICAL ISOLATION form (PWGSC-13) is the Qualified Person in charge of doing the isolation. The Person in Charge completes boxes A, C & D and the detailed Procedures for Isolation form (PWGSC-12), in consultation with the Guarantor and the Contractor's Superintendent.
4. The Contractor will provide a written list of all Workers and those persons Qualified to work within the Limits of Approach to the Guarantor along with their qualifications. If additional persons will work on the power system after the work begins the names and qualification must be provided to the Guarantor before they are authorized to work on the system. (WorkSafeBC 19.29)

EGD Basic Lockout Process Flowchart:

See next page. A larger version of this chart is available.

Note that isolation and lockout for non-electrical work is also carried out by the Electrical Dept.


ESQUIMALT GRAVING DOCK - LOCKOUT PROCESS
Page 1
EGD ELECTRICIAN
EGD ELECTRICAL SUPERVISOR
PROJECT MGR. OR OTHER EGD SUPERVISOR
PERSON IN CHARGE (PIC)
GUARANTOR (ELECTRICAL SUPERVISOR)
Identify Need
Minor Work?
Yes
No
Discuss with EGD Electrician
Request Work
Identify Need
Enter into Log Book
Follow Lockout Process for Minor Work
Enter into Log Book, Work Complete
Perform Job Hazard Analysis
Review Work with PIC, Guarantor, PIC document Job Hazards
Document Procedures for Isolation & Re-energization
Document "Request for Isolation"
Review Documentation
Carry out Preparation and Worker Orientation etc.
Carry out Lockout and De-energization Process
Carry out Work
Carry out Re-energization
Supervisor Sign-off Request for Isolation and Accept Work into Service
Approve Request for Isolation
Receive Documents from PIC
Update Line Drawings

7.0 LOCKOUT STEPS FOR MINOR LOW VOLTAGE JOBS:

For minor low voltage (</=750V) jobs involving 3 or fewer steps (generally one isolation point) and one worker the following procedures apply:

1. The requirement for written procedures will be replaced by an entry in the Minor Maintenance Log controlled by the Guarantor or worker's Supervisor.
2. The Qualified Person will discuss the work with the Guarantor/Supervisor who will complete the "Record of Electrical Work for Minor Projects" (PWGSC 69) or an equivalent form – See Appendix 6. The Guarantor/Supervisor must be satisfied that the worker has the proper safety equipment and procedures to carry out the work.
3. All of the steps under Basic Lockout Steps in section 8.0 must still be followed ***except*** the on-site documentation requirements (Detailed Procedures, Request For Isolation, Request for Re-Energization described in section 6 above).
4. When finished, the worker will record the completion in the Record of Electrical Work for Minor Projects log.

8.0 BASIC LOCKOUT STEPS (L.V. & H.V.):

The following apply to all types of lockout situations except as noted. See also the additional requirements specific to Low Voltage (policy section 9.0) or to High Voltage (policy section 10.0)

BE SURE - ASSUME NOTHING!

1. ***Identify the machinery or equipment*** that needs to be locked out to ensure worker safety. Be sure to consider interlocks to multiple sources.
2. ***Shut off the machinery or equipment***. The Person in Charge or Contractor's Superintendent will
   a. Make sure that all moving parts have come to a complete stop
   b. Ensure that the act of shutting off equipment will not cause a hazard to other workers prior to shutting it off.
   c. Ensure potential energy is blocked and any pneumatic, hydraulic or other pressure has been bled or rendered safe.

3. The Person in Charge or Contractor's Superintendent will identify and ***de-energize the main energy-isolating device*** (feeder) for each energy source. Wear eye protection, and standing to the side of the panel (in case of explosion), turn off the breaker or activate the isolating equipment.
4. **Visually verify** disconnecting means for possible defects and ensure blades are open; or if blades are not visible remove and insulate conductors or remove fuses with an insulated Fuse Puller.
5. **Check with a tester** on a known voltage and then test on the load side to be sure the circuit is de-energized. Only a Qualified Electrician shall use the Potential Tester.
6. In the case of air or hydraulic systems ensure the system has been bled and all potential energy is either blocked or eliminated.

7. Person in Charge will apply his/her personal lock(s) with ID tag. Record the isolation and initial the Procedures for Isolation (PWGSC-12) form next to each operation.

NOTE:
Initials of TWO (2) Qualified Persons are required next to each step of the Procedure for High Voltage work or Group Lockout.

8. Doors of electrical disconnect switches must be closed before installing any locks and the locks are to be applied in such a manner that the doors are locked closed.
9. ***Each worker applies a personal lock*** with ID tag (identifying worker, his/her company and date/time applied) to the energy-isolating device for each energy source, and observes that all parts and attachments are secured against inadvertent movement.
10. Ensure that all ***workers are in the clear*** and that no hazard will be created if the testing of the lockout fails. Ensure no one can inadvertently energize the equipment while testing or work is underway.
11. ***TEST the lockout*** to make sure it's effective and to verify that each energy source has been effectively locked out. Attempt to start the de-energized piece of equipment. Repeat for each piece of equipment.
12. Lockout will be tested after each energy-isolating device is locked out or after a group of devices is locked out. ***Treat all equipment as LIVE until locked out and tested!***
13. Carry out the work for which de-energization and lockout is necessary.
14. Upon completion of the work and being ready to re-energize, the Person in Charge of Isolation will ensure that all ***workers are in the clear and that all guards have been re-installed***. Remove grounding chains, where applied. Place warning signs close to the equipment to be re-energized stating " Danger, Energized Equipment".

WORKSAFEBC 19.11

15. All workers will ***remove their locks*** at the end of each shift with the Person in Charge of Isolation being the last to do so. In the event work has not been completed and will be continued the next shift/day, see the Continuity of Lockout provision, Section 11.
16. Person in Charge of Isolation ***Re-energize*** the machinery or equipment again standing to the side of the panel. To prevent loading the disconnect, be sure the Control Station is in the OFF position when re-energizing the disconnect.
17. Complete the "REQUEST FOR ELECTRICAL ISOLATION" form and provide to the Guarantor to be filed for 1 year in the office of the PWGSC Operations Manager.

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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 section11). For minor L.V. jobs, see section 7.0 above.

WORKSAFEBC 19.1

The steps in section 8.0 must be followed whenever lockout is required in addition to L.V. requirements noted below. Supervisors must ensure every worker knows these steps and follows them. The steps to be followed ***must be in writing*** and ***must be posted*** in the area where lockout is taking place. The procedure will be the result of completing the steps under Section 6.0 (Prior To Isolation).

WORKSAFEBC Lockout Pamphlet & 10.4 DP058

If work is to be done by a Contractor, the Person In Charge of isolation is responsible for documenting and posting the detailed Procedures for Isolation (PWGSC-12), including the procedures for re-energization and approved Request for Electrical Isolation Form (PWGSC-13). The Guarantor will identify and confirm all sources of power to equipment and assess the impact of equipment isolation on other systems and/or equipment.

The Guarantor may also be involved in actually supervising or carrying out the work.

Be sure to check steps in the lockout process against the single line diagram(s) in Manual Section 3.

Capacitors:

If disconnecting a capacitor that could be dangerous to Workers allow at least 5 minutes before short-circuiting or applying a safety ground. Ensure procedures prevent any Worker from contacting the terminals before grounds are applied and ensure a Safety Watcher is present if the Person In Charge considers it necessary.

Working on/near Low Voltage Energized Equipment:

Work shall not be carried out on live equipment or installations. However, sometimes machinery or equipment has to be energized for a specific task (e.g. fine adjustments or troubleshooting).

Work on energized equipment must be performed ONLY by workers who:

1. Are qualified to do the work
2. Have been authorized by their supervisor to perform the work.

3. Have been informed of the potential hazards and provided with and follow appropriate ***written*** safe work procedures.

WORKSAFEBC 19.5

The procedures will require:

1. The use of appropriate electrical protective equipment including rubber gloves and cover up, approved eye protection, and other necessary line tools.

WORKSAFEBC 19.10

2. If practicable, uncontrolled liquid is not permitted close to any worker working on the equipment.
3. Where practicable, prohibit the use of metal ladders, metal scaffolds, metal work platforms and wooden ladders with wire reinforced side rails.

Suitable physical barriers or covers must be provided to cover any un-insulated, live, energized parts if a worker unfamiliar with the hazards is working within 1m (3.3ft.) of the parts.

WORKSAFEBC 19.12

Where it is absolutely necessary to have power on and operate equipment while repairs or adjustments are made, a responsible person MUST BE AT THE CONTROLS AND IN DIRECT AND PERSONAL COMMUNICATION with the Person in Charge at all times.

Working on ***energized*** parts of lighting circuits operating at over 250V to ground is prohibited without first obtaining written permission of the WORKSAFEBC.

WORKSAFEBC 19.10

***LIVE TESTS*:**

A separate Guarantee of Isolation is required to conduct live tests.

No Guarantee of Isolation shall be issued for live tests unless:

1. Any other Guarantee of Isolation respecting the subject equipment has been terminated, and all workers working under the guarantee informed of its termination.
2. Steps are taken to ensure the health and safety of anyone conducting the live test
3. The person(s) conducting the live test have informed anyone that could be affected by the test of the potential hazard.

10.0 LOCKOUT ON HIGH VOLTAGE EQUIPMENT (>750V)

De-energizing High Voltage Equipment:

High Voltage means a potential difference (voltage) of more than 750V between conductors or between conductors and ground. **Follow the basic lockout procedures in section 8.0 and also the following:**

WORKSAFEBC 19.1

1. At EGD, H.V. electrical equipment must be completely isolated, *grounded*, and locked out before starting work on it. To ensure nothing is overlooked, Electrical Personnel should use Checklists (see Appendix for example) and ensure workers sign acknowledging agreement to proceed with isolation or re-energization. Note this DOES NOT REPLACE properly completed and approved forms PWGSC-12 and 13.

WORKSAFEBC 19.16

2. When working on H.V. systems, isolating devices used for safety protection guarantees must provide for *visual verification* of the isolation point.

WORKSAFEBC 19.21

3. ***In addition*** to applying personal locks as required by this policy, a distinctive "DANGER - DO NOT OPERATE" tag must be securely placed on each isolating device used for a safety protection guarantee. See sample in Appendix.

WORKSAFEBC 19.16(2)

4. All H.V. work requires 2 or more Qualified Electricians authorized by the Guarantor, to be present while the work is being done.

WORKSAFEBC 19.18

5. Barriers or distinctive identification must be used to differentiate de-energized from energized equipment at the work location when lack of identification could result in undue risk to workers.
6. Outer clothing of non-flammable material with long sleeves fastened at the wrists shall be worn

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7. No person shall work on electrical equipment unless the Worker uses such protective and insulated clothing and equipment as necessary.

Grounding of H.V. Equipment and Conductors:

Safety grounding shall be applied for hand contact work on isolated lines or apparatus either existing or under construction, wherever a hazard of energizing may occur from any source, including the following:

b) Faulty apparatus, conductors or adjacent lines.
c) Accidental energizing from a power source.
d) Accidental backfeed.
e) Contact with crossed or fallen live conductors.
f) Lightning strikes.

f) Electromagnetic or electrostatic sources (eg. Wind, dust storms, adjacent lines, static capacitors, etc.).

Grounding will be built into the Procedures for Isolation as appropriate.

Note: **In the following procedure, a second Qualified Person will always accompany the Person In Charge**. Both individuals must be Qualified Electricians and be authorized by the Guarantor

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.

WORKSAFEBC 19.22

2. Ensure that there is no possibility of back feed, and that approved procedures to discharge equipment have been taken.
3. Temporary grounding devices, when required by the Canadian Electrical Code or CSA, will be installed between the location where the work is being carried out and all possible sources of supply. Grounding and blocking of equipment must be carried out as close as practicable to the worksite.
4. Grounding devices shall be connected to the low resistance ground (i.e.. ground grid) *before* being brought into contact with any isolated conductors. Remove from conductors first, and then from the ground connection when removing.
5. When isolating H.V. electrical equipment, use a grounding stick to allow discharge of capacitance in the conductors and H.V. cables before grounding.
6. Grounding and blocking may be removed for the purpose of conducting tests.
7. See also Canada Labour Code Part VIII “Safety Grounding” (Section 7 of Lockout Manual) for additional details regarding requirements for grounding equipment.
8. Connect a “Grounded” tag (green) to the equipment to indicate it has been grounded out.
9. Contractors must supply their own tested grounding devices and not use EGD grounding equipment.

Work on/near Energized High Voltage Equipment or Electrical Parts:

Informing workers about high voltage electrical equipment and conductors (WorkSafeBC19.24):

Before a person starts work close to high voltage electrical equipment or conductors that are exposed or that might become exposed during work at a workplace, the person must be informed of

(a) the existence, location and voltage of the high voltage electrical equipment and conductors, and

(b) the work arrangements and procedures to be followed to ensure compliance with this Part.

Authorization by Owner: WorkSafeBC 19.29

Qualified workers and workers under their direct supervision may work within the minimum distances to energized high voltage electrical equipment and conductors, as specified below when authorized by the owner of the power system and using work procedures acceptable to the Board.

Contractors will provide a written list of all Workers and those persons Qualified to work within the Limits of Approach to the Guarantor along with their qualifications. If additional persons will work on the power system after the work begins the names and qualification must be provided to the Guarantor before they are authorized to work on the system.

Work on or near ***energized*** High Voltage Equipment or Electrical Parts at EGD is NOT permitted.

If testing is to be done on energized H.V. Equipment or Electrical Parts ensure that the following limits of approach are adhered to by Workers and Qualified Electricians under the direction of a PIC authorized by the Guarantor:

Limits of Approach:

The following are combined limits per WorkSafeBC Regulations Part 19 and those of CLC and reflect the most stringent.

Voltage Range of Phase to Phase	**Limit of Approach for Qualified Electrician only**	**General Limit of Approach for any Worker [2]**
Over 736 to 20,000 [3]	0.9 Meters	3 Meters

1. Ensure, through barricades and supervision, that unqualified personnel and any equipment, material, or work they could come in contact with (including inadvertent movement) are kept at least three (3) metres from the live parts.
2. Limits of approach apply to workers, a tool, a machine, material or equipment at the workplace.
3. At EGD the maximum nominal voltage encountered is 7,200V to ground or 12500V AC line to line.

Note that a separate Request for Isolation is required for the live test and the requirements listed under LIVE TESTS in section 8 also apply for High Voltage.

Where Workers are working on or near electrical equipment that is live or could become live, the PIC will ensure the equipment is guarded and warning signs attached or if guarding is not practicable, take measures to protect Workers by insulating either the equipment or the Worker from the other. See also

[2] CLC Lower limit is 736 and WorkSafeBC Upper Limit is 75000V Phase to Phase
[3] Lower limit CLC and Upper limit WorkSafeBC

CLC Occupational Health & Safety PART VIII Electrical Safety 8.4 to 8.7 re working near energized equipment (Section 7 of the EGD Lockout manual).

Assurance in writing: WorkSafeBC 19.25

(1) If the minimum distance of 3 metres cannot be maintained because of the circumstances of work or the inadvertent movement of persons or equipment, an assurance in writing on a form acceptable to the Board and signed by a representative of the owner of the power system, must be obtained.

(2) The assurance must state that while the work is being done the electrical equipment and conductors will be displaced or rerouted from the work area, if practicable.

(3) If compliance with subsection (2) is not practicable the assurance must state that the electrical equipment will be isolated and grounded, but if isolation and grounding is not practicable the assurance must state that the electrical equipment will be visually identified and guarded.

(4) The safeguards specified in the assurance must be in place before work commences and effectively maintained while work is taking place.

(5) If guarding is used,

(a) neither equipment nor unqualified persons may touch the guarding, and

(b) a safety watcher must be designated, or range limiting or field detection devices acceptable to the Board must be used.

(6) The assurance must be available for inspection at the workplace, as close as practicable to the area of work, and must be known to all persons with access to the area.

[Amended by B.C. Reg. 312/2010, effective February 1, 2011.]

Minimum clearance distance when passing under exposed electrical equipment and conductors (WorkSafeBC 19.24.2):

1) This section applies in the circumstances where a person working at a workplace is moving or is involved in moving equipment under exposed electrical equipment or conductors and is not performing any work other than work related to moving the equipment.

(2) Unless otherwise permitted by this Part, in the circumstances set out in subsection (1), if exposed electrical equipment or conductors have a voltage within a range set out in Column 1 of Table 19-1B, the following must maintain at least the clearance distance from the exposed electrical equipment and conductors that is set out in Column 2 opposite that range of voltage:

(a) a person moving or involved in moving the equipment under the exposed electrical equipment or conductor;

(b) the equipment that a person referred to in paragraph (a) is moving;

(c) the load carried by the equipment referred to in paragraph (b).

Table 19-1B

Column 1 Voltage	Column 2 Minimum clearance distance for passing under exposed electrical equipment or conductors	
Phase to phase	Metres	Feet
Over 750 V to 75 kV	2	6.5
Over 75 kV to 250 kV	3	10
Over 250 kV to 550 kV	4	13

[Enacted by B.C. Reg. 312/2010, effective February 1, 2011.]

Assurance not practicable: WorkSafeBC 19.26

(1) If exposed high voltage electrical equipment and conductors cannot be isolated, rerouted or guarded, work must not be done within the 3 metre limit of approach until the following precautions are taken:

(a) the area within which equipment or materials are to be moved must be barricaded and supervised to restrict entry only to those workers necessarily engaged in the work;

(b) a safety watcher must be designated;

(c) a positive means must be provided for the safety watcher to give a clear, understandable stop signal to workers in the area, and the watcher must give the stop signal by no other means.

(2) While equipment is in motion in an area in proximity to energized electrical equipment or conductors, no person other than the equipment operator may touch any part of the equipment or the material being moved by it.

(3) No person may move a load or any rigging line from its position of natural suspension if it is in proximity to an energized electrical conductor or equipment.

[Amended by B.C. Reg. 312/2010, effective February 1, 2011.]

[Amended by B.C. Reg. 188/2011, effective February 1, 2012.]

11.0 GROUP LOCKOUT PROCEDURES:

In some cases the number of points to be isolated and the numbers of workers required to lockout may be large enough that a "lock-box" or "key-box" approach would be beneficial. If a group lockout is required, the following procedure will be followed. **Note**: In the following procedure, a second Qualified Person will always accompany the Person In Charge and both persons must be authorized by the Guarantor.

WORKSAFEBC 10.9

The following outlines the variations required for a Group Lockout.

BE SURE - ASSUME NOTHING!

1. **The steps under Section 6 "Prior to Isolation" also apply to a Group Lockout**. Prepare the required Procedures and approval forms.
2. **FOLLOW THE PROCEDURES DEFINED IN SECTIONS 8, 9 AND 10 ABOVE FOR THE APPROPRIATE LOW OR HIGH VOLTAGE SITUATION**.
3. The approved REQUEST FOR ELECTRICAL ISOLATION and PROCEDURES FOR ISOLATION (including Re-energization procedures) will be conspicuously posted at the place where the system is in use and the "lock-box" is kept. The Lockout Policy will be readily available through the Electrical Supervisor, or Contractor's Superintendent.
4. Lockout will be tested after each energy-isolating device is locked out or after a group of devices is locked out. The 2 qualified persons will initial the PROCEDURES FOR ISOLATION (PWGSC-12) to verify the isolation of each point and post the sheet along with the approved REQUEST FOR ELECTRICAL ISOLATION near the lock box.
5. The keys for the locks applied in step 4 will then be placed into a "lock-box" and the 2 qualified individuals will apply their personal locks with ID Tags, to the lock box. ***Each worker will apply a personal lock*** with ID tag, to the "lock-box" only after ensuring his/her work area is listed as isolated on the Lockout Procedure form.
6. Workers working under the Group Lockout will check the Lockout Procedure form prior to starting work each day to ensure their specific work area has been locked out.
7. Complete the necessary work.
8. The Person in Charge of Isolation is responsible for having the detailed "PROCEDURES FOR ELECTRICAL ISOLATION" approved by the Guarantor prior to re-energization. Follow the procedures for re-energization as on the PROCEDURES FOR ISOLATION (PWGSC-12) form and both Qualified Persons initial completion of each step. When ready to re-energize, the 2 qualified persons will ensure that all ***workers are in the clear, all guards have been re-installed and the machinery or equipment is safe to operate.*** Place warning signs close to the equipment to be re-energized stating " Danger, Energized Equipment".

WORKSAFEBC 19.17

9. All workers will ***remove their locks*** at the end of each shift with the Person in Charge or the Contractor's Superintendent being the last to do so. In the event work has not been completed and will be continued the next shift/day, follow the "Continuity of Lockout" provisions below.

12.0 CONTINUITY OF LOCKOUT:

In some cases lockout must be maintained between shift changes. To maintain lockout continuity and ensure no one is at risk between the time one shift removes their locks and the next applies theirs, the Person in Charge or Contractor's Superintendent will apply his/her lock(s) to all points requiring isolation before locks are removed and leave his/her lock(s) in place until the next shift has established their lockout as per the agreed process. Complete and attach information tags to the lockout points or the lock-box (for group lockout).

NOTE:
In some cases, the same workers will continue work the next day and there is no need to activate the equipment in the meantime. Under these circumstances it is acceptable to leave all locks in place provided it is ***part of the documented lockout procedure*** and all workers are aware of the practice.

13.0 EMERGENCY LOCK REMOVAL:

Only the Guarantor, or failing that, the Person in Charge may order the removal of a worker's lock. This task may not be delegated to anyone else. Lock removal may take place ONLY IF he or she ensures **ALL** of the following are done:

WORKSAFEBC 10.8

a) The Guarantor/Person in Charge must:
   - Make every attempt to ensure that the employee whose lock(s) are to be removed is not on the premises
   - Enter an explanation in the Lock-Out Log Book stating what steps have been taken to contact the owner of the Personal Lock.
   - Refer to any available documentation including logbooks, to determine if work has been completed upon the device or system to which the lock was applied.
   - Contact personnel who performed repairs on the device or system to which the lock was applied.

   These steps are taken to assure that it is safe to proceed to remove the lock and place the device or system into service. **AND**

b) The Guarantor/Person in Charge has made sure the machinery or equipment can be operated safely before removing the lock.

c) The Guarantor/Person in Charge will then obtain the duplicate key for the lock from the Duplicate Key Locker located in the Electrical Supervisor's Office. The Guarantor/Person in

Charge will open the Duplicate Key Locker, remove the required key and log this event in the Lockout Log Book's Chapter on "Lock-Out Events". When the lock has been opened the Guarantor/Person in Charge will return the key to the Key Locker. **AND**

d) The Guarantor/Person in Charge must also notify the worker whose lock is removed at the start of his/her next shift that the worker's personal lock was removed and return the lock. Only the person to whom the lock was issued may reinstall it.

14.0 REQUIRED CLOTHING/ PROPER ATTIRE:

Those required to work on electrical equipment and installations shall wear:

DP 058

- Protective Headwear Class E (formerly Class B) rated meeting CSA Z94.1- 92 (R2003) Industrial Protective Headwear
- Electrical shock resistant protective footwear meeting CSA Z195-M-92 Protective Footwear - Grade 1 indicated by a green triangle showing
- Safety glasses or other eye protection meeting CSA Z94.3-00 specifically designed for the work to be done.
- Rubber insulating gloves/mitts etc. are required to meet CSA standard Z259.4-M
- When working on/near High Voltage outer clothing with full length sleeves fastened at wrists and fabricated from a non-flammable material or other material meeting ASTM D120-95 *'Standard Specification for Rubber Insulating Gloves*' . Treasury Board standard 8.4

The following is required before entering a workplace where machinery or energized electrical equipment is in operation:

- secure/cover/remove loose clothing
- secure/cover long hair
- dangling accessories, rings or other jewellery that could become entangled in machinery or contact energized electrical equipment must be removed

15.0 NEW CONSTRUCTION (BY LICENSED ELECTRICAL CONTRACTORS):

When new electrical construction involves modifications or additions to the existing EGD Building Electrical Services or to EGD Primary/Secondary Electrical System, the Electrical Contractor shall obtain a Province of British Columbia Safety Engineering Services Electrical Permit to cover the work.

When the installation is ready for the electrical connection and/or energization, the Electrical contractor shall apply to the Provincial Electrical Safety Branch for Electrical Inspection of the work.

The Electrical Inspector may choose to look at the installation and/or will sign the Authorization Form accepting the installation on the basis of the Electrical Contractors Certification.

The Electrical Contractor will submit a copy of the signed Provincial Inspection Authorization Form to the PWGSC Electrical Supervisor. The Provincial Inspection Authority may forward the signed Inspection Form directly to the EGD EA.

No electrical connections will be made to the EGD Electrical System unless the Electrical Inspector signs the Provincial Electrical Inspection Authorization Form and the PWGSC Electrical Supervisor receives a signed copy of the Inspection Form.

Prior to the energization of any new electrical construction, the PWGSC Electrical Supervisor reserves the right to cause an inspection of any electrical work installed at EGD to ensure that the electrical installation complies with EGD safety requirements. Authorization for connection to EGD Electrical System shall only be granted when all Electrical Standards and Safety Requirements have been complied with.

16.0 PLANNED & EMERGENCY POWER OUTAGES:

PLANNED OUTAGES: Requests for planned power outages will be directed to and obtained from only the PWGSC Electrical Supervisor.

EMERGENCY POWER OUTAGES:
During silent hours, the Commissionaire will initiate the Emergency Call Out List as required.

17.0 EGD SITE GENERAL H.V. RULES

EGD NORMAL POWER SUPPLY:
The EGD normal power supply is the responsibility of the PWGSC Electrical Supervisor who is the Operating Authority of the electrical system as described in this manual.

IDENTIFICATION OF THE ELECTRICAL FACILITY:
Name or number shall identify all EGD High Voltage Lines, Power Poles, Transformers, Switch Gear, Apparatus and Switching Stations and workers shall use this identification when referring to them.

All Lines, Electrical Apparatus, or Transformers, whether newly constructed or out of service for any reason, which may be operated or energized by conventional means or by back feed shall be treated as Live.

No electrical work, including switching or tree trimming or arborist work, shall be done on any Line or Electrical Apparatus without prior arrangement and approval of the PWGSC Electrical Supervisor /Guarantor who will issue a Switching order and/or a Guarantee of Isolation to initiate the work.

When a Line or Electrical Apparatus is de- energized for hand contact work by disconnecting means of an oil or air circuit breaker, associated disconnecting switches shall be opened and visual separation of disconnecting contacts shall be observed prior to Clearance being issued.
(Note: The racking-out of draw-out CIRCUIT BREAKER type switchgear shall constitute the opening of disconnect switches.) Apply a Lockout to this equipment.

No one shall start work on the strength of a promise that the Line or Electrical Apparatus will be Dead or made inoperative at a certain time.

18.0 PROTECTION OF EQUIPMENT:

In the event equipment must be rendered inoperative and protected from use (e.g. while waiting for parts), the equipment must be ***Locked Out and a Tag Attached*** indicating who locked it out and the reason for doing so. It will not be acceptable to only tag the equipment.

If a Supervisor is to install a protection lock, he must be satisfied that the lockout is effective before the trades person's lock is removed and his is installed.

Although, at times, only equipment damage could result if the tag was removed and equipment activation attempted, EGD Management have decided it is best to always require a lock and accompanying tag. This requirement will ensure removing the tag and starting equipment will injure no one. Also, it reinforces the mindset that tags alone are not acceptable for lockout under any circumstance.

19.0 TESTING OF CLOTHING AND EQUIPMENT:

Every article of insulated protective clothing, insulated equipment and insulated devices/tools shall be so designed, constructed, and maintained as to be safe, adequate and reliable under all conditions of intended use.
Unless certified by a recognized testing agency prior to initial use, a qualified person shall test each article.

Test annually by an approved method and clearly mark to show date of test.

Any article that fails a test shall be immediately removed from service, so marked, tagged or disabled as to prevent its use until repaired and the test has been passed.

Tests of insulating gloves & mitts shall follow CSA standard Z259.4-M1979

Users shall inspect clothing, equipment, devices and tools prior to use to ensure they are safe for intended use.

20.0 MISCELLANEOUS:

TREE PRUNING:
Tree Pruning and falling near energized conductors must conform to the requirements of WORKSAFEBC regulations in WORKSAFEBC regulations - section 19.

NO SMOKING:

NO SMOKING is permitted in any EGD Buildings or Electrical Substations. Besides reducing fire hazards, workers can better detect burning conductors or other apparatus if no cigarette smoke is present.

21.0 MONITORING/REVIEW:

The EGD Guarantor shall initiate a review of this policy annually or earlier should circumstances indicate such a review is required (e.g. changes to Regulations or incident involving lockout failure).

The EGD Health & Safety Committee shall undertake a quarterly review and report to the EGD Director to ensure:

DP058 (6)

- Log Books are established and in use.
- Procedures have been developed and Requests For Isolation used as required.
- Appropriate signage is in place identifying cabinets/equipment, live H.V. equipment, etc.

See checklist available for Committee use.

Reviewed By:_____ Date: _____
Joe Lezetc, EGD Electrical Supervisor and Guarantor

Approved By:_____ Date: _____
Jim Milne, EGD Director

APPENDIX 1- LIST OF AUTHORIZED PERSONS

GUARANTOR/PERSON IN CHARGE:

The Guarantor/Person In charge at EGD is Joe Lezetc.

ALTERNATE PERSON IN CHARGE

Besides the Person In Charge, the following personnel are recognized by PWGSC as competent, trained and familiar with the PWGSC Primary Power Distribution and the PWGSC De-energization and Lockout Policy Manual and are authorized to issue or receive a Guarantee of Isolation (Clearances) as defined in the PWGSC De-energization and Lockout Policy Manual.

The following individuals are qualified and authorized as Alternate Person In Charge**:**

- Acting Electrical Supervisor
-
-

QUALIFIED ELECTRICAL WORKERS:

Class "A" License:

- Joe Lezetc
-

Journeyman Electricians:

- Remainder of Electrical Staff
-
-
-
-

The following is a summary of PWGSC and DND BCEO personnel who may be involved in the EGD Electrical Distribution System, when required. Also included are various telephone numbers that may be relevant to the system operation.

The following personnel are approved for receiving a Guarantee of Isolation when required from either of the two Operating Authorities (DND BCEO and PWGSC).

- EGD Electrical Supervisor
- Contractor Resources retained by PWGSC specifically for this purpose
-

DND BCEO PERSONNEL

Power Outages and Electrical Emergencies (24-hour) CFB Fire Hall Watch Room 7 days/week 250-363-2224. .

Electrical Business Mgr. – 250-213-5271 (cell) 250-363-2917 (land)

The following PWGSC personnel may be involved during Electrical Distribution interruptions and during an emergency. Personnel would be telephoned in the following descending order:

- Joe Lezetc 250-213-2545 (cell) Office -250-363-3991
- Mark Cammiade 778-977-6262 (cell)
- EGD Electricians 250-363-3984 (office) 250-508-9364 (cell)
-

The following personnel are recognized by PWGSC as competent, trained and familiar with the EGD Primary Power Distribution and the EGD De-energization and Lockout Policy Manual and are authorized to issue or receive a Guarantee of Isolation (Clearances) as defined in the EGD De-energization and Lockout Policy Manual.

- Joe Lezetc
- Acting Electrical Supervisor
-
-

The PWGSC individuals listed above are authorized by PWGSC Management to fulfill the roles to which they are assigned.

Approved By:_____ Date: _____
Jim Milne, Director EGD

APPENDIX 2A- HIGH VOLTAGE LOCKOUT CHECKLIST & SIGN-OFF

Note: This checklist is used with a detailed procedure document & does not replace it.

Qualified Person In Charge (as designated by the Guarantor): _____.
Date: _____.
Location: _____.
Isolation Points: _____.

_____

The Person In Charge is required to:

1. Ensure procedures are documented and authorization received from Guarantor. _____.
2. Explain written procedures to everyone involved prior to commencing work, including use of mimic or single line drawings.
3. Ensure all Equipment is checked prior to use. _____.

- Hotsticks, including test date within last year
- Mats, including test date within last year
- Gloves, roll tested prior to each use
- Grounds, inspected for mechanical integrity
- Proximity Meters
- Required numbers of locks, scissors, lockbox, tags present, ready for use.

4. Explain the safe Limits of Approach (minimum .9 meters).
5. Disconnect power from all sources as per procedures and initial procedures along with second Qualified Electrician and visually ensure isolation.
6. Wear gloves and use proximity detector to test for residual voltage on all points to be grounded.
7. Wear gloves and ground isolated points of work and determine it is safe to begin work in conjunction with second Qualified Electrician.
8. **Have all workers involved sign that it is safe to begin.**

_____ _____ _____

_____ _____ _____

9. After all work is complete, wear gloves and remove grounds in conjunction with second Qualified Electrician
10. Ensure all tools, nuts, bolts etc. are removed, enclosures closed and warning signs placed close to the equipment to be re-energized stating " Danger, Energized Equipment".
11. **Have all workers sign that it is safe to reenergize prior to completing re-energization.**

_____ _____ _____

_____ _____ _____

APPENDIX 2B- CHECKLIST OF EQUIPMENT FOR LOCKOUT

The Supervisor will ensure appropriate items are available before commencing lockout.

- Personal Locks in quantity to permit all points to be locked out.
- Lock Identification Tags for each lock
- Information Tags
- Scissors for the application of multiple locks at a lockout point
- Lock/Key Boxes for group lockout and/or multiple lockout point work.
- Valve lockout covers
- Valve locking devices
- Circuit Breaker switch lockout devices
- Devices for locking cord plug ends
- Blanks or Blinds engineered and fabricated for blocking flow of material at specific points
- Blocking device (specially made) to control potential energy in specific situations
- Cables/chains for securing valve stem wheels against rotation
- Insulating Blankets, live line tools etc. appropriate for High Voltage work.
- Arc Flash Face Masks
- Arc Flash Protective Coveralls
- Hotsticks, including test date within last year
- Mats, including test date within last year
- Insulating Rubber Gloves, roll tested prior to each use
- CSA approved grounding devices/chains, inspected for integrity
- Proximity Meters, Electrical Testing Equipment meeting the requirements of WorkSafeBC Reg. 19.8
- "PROCEDURES FOR ISOLATION" Form (PWGSC-12); Document all steps, including mechanical and Re-energization procedures.
- Clear Plastic covers for holding lockout procedures and other forms at the worksite.
- CSA approved UV Safety Eye Glasses, CSA approved Safety Footwear, Hearing Protection and protective Headwear appropriate to the work to be carried out.

The Supervisor will also ensure that:

- Adequate supplies are on hand and that workers have received training and instruction in the proper use, fit and care of equipment and tools, **BEFORE** commencing the work.
- All tools and equipment are stored, maintained, inspected and tested by a Qualified Person.
- All tools/equipment failing testing are removed from service and tagged until repaired or removed from the workplace.

APPENDIX 3- RECORD OF SAFETY DISCUSSION FORM

Contractors may use their own form. A larger version is available.

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

RECORD OF SAFETY DISCUSSION					
DATE:			TIME:		
LOCATION:					
DESCRIPTION OF JOB/TASK					
PERMIT NUMBER:					
LOG OF PERSONNEL AT WORK SITE					

POINTS CONSIDERED/ DISCUSSED					
	DISCUSSED	N/A		DISCUSSED	N/A
DETAILED PROCEDURES/PERMITS			FIRST AID		
PERSONAL PROTECTIVE EQUIPMENT			CLIMBING HAZARDS		
LIMITS OF APPROACH			COMMUNICATIONS		
OTHER WORKERS/CONTRACTORS			CONFINED SPACE ENTRY		
COVER-UP REQUIREMENTS			UNDERGROUND UTILITIES		
TEST FOR POTENTIAL			WEATHER CONDITIONS		
INDUCTION HAZARDS			ENVIRONMENTAL CONCERNS		
FEEDBACK HAZARDS			CONDUCTOR CONDITION		
GROUNDING/EQUIPOTENTIAL			ADJACENT STRUCTURES		
ADEQUATE DRAWINGS ON SITE			HOUSEKEEPING		
QUALIFICATIONS OF PERSONNEL			FALL PROTECTION		
RIGGING SAFE WORKING LOAD			VEHICLE STABILITY		
PUBLIC SAFETY			TRAFFIC CONTROL		
INSPECTION OF TOOLS & EQUIPMENT			HELICOPTER PROCEDURES		
OTHER CONCERNS DISCUSSED					
DESCRIPTION OF UNEXPECTED HAZARDS					

APPENDIX 4- EFFECTS OF ELECTRICAL CONTACT

The following are effects at various current levels provided by OSHA.

How Electrical Current Affects the Human Body

Three primary factors affect the severity of the shock a person receives when he or she is a part of an electrical circuit:

- Amount of current flowing through the body (measured in amperes).
- Path of the current through the body.
- Length of time the body is in the circuit.

Other factors that may affect the severity of the shock are:

- The voltage of the current.
- The presence of moisture in the environment.
- The phase of the heart cycle when the shock occurs.
- The general health of the person prior to the shock.

Effects can range from a barely perceptible tingle to severe burns and immediate cardiac arrest. Although it is not known the exact injuries that result from any given amperage, the following table demonstrates this general relationship for a 60-cycle, hand-to-foot shock of one second's duration:

Current level (in milliamperes)	Probable effect on human body
1 mA	Perception level. Slight tingling sensation. Still dangerous under certain conditions.
5 mA	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range may lead to injuries.
6-30 mA	Painful shock, muscular control is lost. This is called the freezing current or "let-go" range.
50-150 mA	Extreme pain, respiratory arrest, severe muscular contractions. Individual cannot let go. Death is possible.
1000-4300 mA	Ventricular fibrillation (the rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is

	most likely.
10,000 mA	Cardiac arrest, severe burns and probable death.

Wet conditions are common during low-voltage electrocutions. Under dry conditions, human skin is very resistant. Wet skin dramatically drops the body's resistance.

Dry Conditions: Current = Volts/Ohms = 120/100,000 = 1mA
a barely perceptible level of current

Wet conditions: Current = Volts/Ohms = 120/1,000 = 120mA
sufficient current to cause ventricular fibrillation

If the extensor muscles are excited by the shock, the person may be thrown away from the circuit. Often, this can result in a fall from elevation that kills a victim even when electrocution does not.

When muscular contraction caused by stimulation does not allow the victim to free himself from the circuit, even relatively low voltages can be extremely dangerous, because the degree of injury increases with the length of time the body is in the circuit. LOW VOLTAGE DOES NOT IMPLY LOW HAZARD!

100mA for 3 seconds = 900mA for .03 seconds
in causing fibrillation

Note that a difference of less than 100 milliamperes exists between a current that is barely perceptible and one that can kill.

High voltage electrical energy greatly reduces the body's resistance by quickly breaking down human skin. Once the skin is punctured, the lowered resistance results in massive current flow.

Ohm's law is used to demonstrate the action.
At 1,000 volts, Current = Volts/Ohms = 1,000/500 = 2 Amps
which can cause cardiac standstill and serious damage to internal organs.

http://www.osha.gov/SLTC/etools/construction/electrical_incidents/eleccurrent.html - death%20is%20most%20likely

http://www.osha.gov/SLTC/etools/construction/electrical_incidents/eleccurrent.html#certain%20conditions

ARC FLASH:

When High Voltage, or High Current switchgear fails during operation, maintenance, or repair, the resulting arc flash and blast can produce temperatures in excess of 35,000°. The resulting heat can instantly ignite clothing, burn skin, and causes the metal and air in the switchgear to expand rapidly. This rapid expansion causes a high-pressure explosion of molten metal and hot gases.

Arc Flash events were responsible for over 2000 burn-unit hospitalizations and 700 deaths in North America last year. The majority of all hospitalizations due to electrical accidents each year are due to arc flash burns, and not electrocution. Many of these events occur during routine events as racking a breaker into its cell, or closing a load break switch onto a live bus.

The harm caused by these accidents can be greatly reduced by proper adjustment of the electrical protection system on a site, and the use of NFPA 70E compliant, flash rated, personal protective equipment. The national Fire Protection Association 70E is the adopted American standard for Electrical Worker Safety.

Above provided courtesy Elite Engineering Ltd.

APPENDIX 5 - SAMPLE LOCKOUT DOCUMENTS

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

Job Hazard Analysis (JHA)		
Job Name: Isolate Crane Functions for Wheel Change **Frequency**: Infrequent		
Analysis By: **Joe Legate**	**Reviewed By**: **Mike Ledson**	**Approved By**: **Joe Legate**
Date: 13/03/02	**Date**: 13/03/02	**Date**: 13/03/02
SEQUENCE OF STEPS	**POTENTIAL HAZARDS**	**NEW PROCEDURE/ PREVENTIVE MEASURES**
1. Gantry Drive Disconnect Power off	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
2. Apply locks and test	Lockout fails and drive reenergized	Ensure all workers stay at a distance
3. Main Hoist Disconnect power off	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
4. Apply locks and test	Lockout fails and hoist reenergized	Ensure all workers stay at a distance
5. Slew Drive Disconnect power off	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
6. Apply locks and test	Lockout fails and drive reenergized	Ensure all workers stay at a distance
7. Place all keys in lock box and all workers apply locks		
8. Chock wheels		
9. Relieve weight with hydraulic jacks	Jack failure and crane drops	Remove/replace one wheel at a time; do not place any body part near pinch pints
10. Remove wheel and replace	Potential for back injury and/or pinched fingers and abrasions	Get assistance; use hydraulic lift; check rigging; wear gloves
RE-ENERGIZATION		
12. Remove locks from lock box		
13. Remove locks from Slew Drive disconnect		
14. Slew Drive Disconnect power on	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
15. Remove locks from Main Hoist disconnect		
16 Main Hoist power on	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker
17. Remove locks from Main Hoist disconnect		
18. Gantry Drive Power on	Possible explosion, arc flash. Electrocution	Wear eye protection; stand to side and look away when throwing breaker

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

REQUEST FOR ELECTRICAL ISOLATION
DEMANDE DE COUPURE À LA SOURCE

A. Building Name and Address - Nom et adresse de l'immeuble

Specific Location of Installation or Equipment to be Isolated (indicate floor, wing, room no., cabinet no., etc.)
Endroit précis de l'installation ou de l'appareillage devant être coupé à la source (indiquer l'étage, l'aile, le nº de la pièce, le nº du panneau, etc.)
E.G.D. YARD S. SIDE

Description of Installation or Equipment to be Isolated
Description de l'installation ou de l'appareillage devant être coupé à la source
30 T CRANE GANTRY, MAIN HOIST & SLEW FUNCTIONS & CHOCK WHEELS

Isolation Request No.
Nº de demande de coupure à la source
EGD - 473

Date and Time of Request - Date et heure de la demande
Date (Y-A M D-J): 02 03 15 Hour Heure (HH:MM): 09:00

Isolation to Start On
Coupure à la source devant débuter le
Date (Y-A M D-J): 02 03 20 Hour Heure (HH:MM): 07:00

Isolation to End On
Coupure à la source devant se terminer le
Date (Y-A M D-J): 02 03 22 Hour Heure (HH:MM): 16:00

Procedures for Isolation - Procédures de coupure à la source
(NOTE: When procedures involve more than one operation a Procedures for Isolation Form must be completed and attached.)
(NOTA : Lorsqu'un procédé comporte plus d'une opération, vous devez remplir le formulaire «Procédures de coupure à la source» et l'annexer au présent formulaire.)
SEE ATTACHED (2 PGS.)

Voltage Tension ▶ 480

When high voltage equipment is to be isolated a Procedures for Isolation Form must be completed and attached.
Pour la coupure à la source d'appareillages haute tension, le formulaire «Procédures de coupure à la source» doit être rempli et joint.

Update of Line Drawings Required Upon Completion
Nécessité de mettre à jour les schémas électriques une fois les travaux terminés ▶ ☐ Yes Oui ☒ No Non

Requested by - Demandé par

Name of Person in Charge - Nom de la personne responsable	Signature	Date (Y-A M D-J)	Hour - Heure (HH:MM)
MIKE LEDSON	M Ledson	02 03 10	08:00

B. Request Approved - Demande autorisée

Name of Guarantor - Nom du garant	Signature	Date (Y-A M D-J)	Hour - Heure (HH:MM)
JOE LEZETC	J. Lezetc	02 03 15	09:00

C. Isolation Confirmed - TO BE COMPLETED PRIOR TO COMMENCEMENT OF WORK
Coupure à la source confirmée - À REMPLIR AVANT DE COMMENCER LES TRAVAUX

Isolation has been tested and it is determined safe for workers to perform the work.
Le procédé de coupure à la source a été mis à l'essai et les travaux peuvent être exécutés en sécurité

Name of Person in Charge - Nom de la personne responsable	Signature	Date (Y-A M D-J)	Hour - Heure (HH:MM)
MIKE LEDSON	M. Ledson	02 03 20	07:30

D. Completion of Requested Isolation Time and Completion of Work Confirmed
Achèvement de la période demandée pour la coupure à la source et confirmation de l'exécution des travaux

Line Drawings Updated as Required
Les schémas électriques ont été mis à jour tel que demandé ▶ ☐ Yes Oui ☒ No Non

Name of Person in Charge - Nom de la personne responsable	Signature	Date (Y-A M D-J)	Hour - Heure (HH:MM)
MIKE LEDSON			

E. Approval of Completion of Work and Confirmation that Equipment or Installation has been Re-energized
Approbation d'achèvement des travaux et confirmation de la remise sous tension de l'appareil ou de l'installation

Name of Manager in Charge of Worksite or Supervisor / Nom du gestionnaire responsable du lieu de travail ou du superviseur	Signature	Date (Y-A M D-J)	Hour - Heure (HH:MM)
WYATT WRIGHT	W. Wright	02 03 22	16:00

PWGSC-TPSGC 13 (12/1997)

THIS RECORD MUST BE KEPT FOR ONE YEAR FOLLOWING COMPLETION OF WORK
À CONSERVER PENDANT UN AN APRÈS LA FIN DES TRAVAUX

Copy 1 (White) / Copie 1 (Blanc) ▶ Manager in Charge of Worksite or Supervisor / Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow) / Copie 2 (Jaune) ▶ To be submitted to, and retained by the Guarantor (upon completion of the work) / À remettre au garant à la fin des travaux. Le garant doit garder cette copie.

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada — SAMPLE

PROCEDURES FOR ISOLATION
PROCÉDURES DE COUPURE À LA SOURCE

PROCEDURES

This form must be completed when high voltage equipment or installations are to be isolated.

This form must be completed and attached to all Request for Electrical Isolation forms when more than one operation is required in the isolation process.

These procedures must indicate the correct sequence to be followed in the isolation process and the correct procedures to follow to re-energize.

This sequence must be followed without deviation.

See reverse for additional instructions.

PROCÉDURES

Vous devez remplir ce formulaire lorsque vous avez à couper à la source un appareil ou des installations à haute tension.

Vous devez remplir ce formulaire et l'annexer à toutes les «demandes de coupure à la source électricité» lorsque le procédé d'isolation comporte plus d'une opération.

Ces procédures doivent indiquer la séquence exacte des étapes du procédé de coupure à la source et la marche à suivre normale pour la remise sous tension.

Vous devez sans faute suivre cette séquence.

Voir les renseignements complémentaires au verso.

These operating procedures shall be carried out in conjunction with Request for Isolation No.
La procédure est liée à la demande de n° de coupure à la source ▶

Request for Isolation No. - Demande de n° de coupure à la source	Date (YY-MM-DD)
EGD xxx Pg. 1 of 2	02-03-15

Purpose of order / Objet de la commande ▶ ISOLATE CRANE FUNCTIONS FOR WHEEL CHANGE.

Sequence no. / N° séquentiel	Equipment affected / Appareillage concerné	Tag no. installed on Equipment / N° d'étiquette installée	Functions to be performed and specific safety measures required / Fonctions à remplir et mesures de sécurité spéciales requises	Initials / Initiales
1	GANTRY DRIVE		ARMATURE POWER OFF	J.L. M.L.
2	GANTRY DRIVE		FIELD POWER OFF	J.L. M.L.
3	MAIN HOIST		ARMATURE POWER OFF	J.L. M.L.
4	MAIN HOIST		FIELD POWER OFF	J.L. M.L.
5	SLEW DRIVE		ARMATURE POWER OFF	J.L. M.L.
6	SLEW DRIVE		FIELD POWER OFF	J.L. M.L.
7	GANTRY WHEELS		INSTALL CHOCKS (2 REQ'D)	J.L. M.L.
8	GANTRY WHEELS		REMOVE CHOCKS (2 REQ'D)	J.L. M.L.
9	SLEW DRIVE		FIELD POWER ON	J.L. M.L.
10	SLEW DRIVE		ARMATURE POWER ON	J.L. M.L.
11	MAIN HOIST		FIELD POWER ON	J.L. M.L.

Prepared by - Préparé par

Name - Nom	Time - Heure	Date (YY-MM-DD)
MIKE LEDSON M. Ledson	09:00	02-03-13

Checked by - Vérifié par

Name - Nom	Time - Heure	Date (YY-MM-DD)
JOE LEZETC J. Lezetc	08:00	02-03-14

Issued by - Émis par

Name - Nom	Time - Heure	Date (YY-MM-DD)
JOE LEZETC J. Lezetc	09:00	02-03-15

Performed by - Effectué par

Name - Nom	Time - Heure	Date (YY-MM-DD)
M. Ledson J. Lezetc MIKE LEDSON & JOE LEZETC	07:30	02-03-20

Operating diagram adjusted by - Schéma fonctionnel corrigé par

Name - Nom	Time - Heure	Date (YY-MM-DD)

PWGSC-TPSGC 12 (12/1997)

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Copy 2 (Yellow) / Copie 2 (Jaune) ▶ Originator / Demandeur

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SAMPLE

PROCEDURES FOR ISOLATION
PROCÉDURES DE COUPURE À LA SOURCE

PROCEDURES

This form must be completed when high voltage equipment or installations are to be isolated.

This form must be completed and attached to all Request for Electrical Isolation forms when more than one operation is required in the isolation process.

These procedures must indicate the correct sequence to be followed in the isolation process and the correct procedures to follow to re-energize.

This sequence must be followed without deviation.

See reverse for additional instructions.

PROCÉDURES

Vous devez remplir ce formulaire lorsque vous avez à couper à la source un appareil ou des installations à haute tension.

Vous devez remplir ce formulaire et l'annexer à toutes les «demandes de coupure à la source électricité» lorsque le procédé d'isolation comporte plus d'une opération.

Ces procédures doivent indiquer la séquence exacte des étapes du procédé de coupure à la source et la marche à suivre normale pour la remise sous tension.

Vous devez sans faute suivre cette séquence.

Voir les renseignements complémentaires au verso.

These operating procedures shall be carried out in conjunction with Request for Isolation No.
La procédure est liée à la demande de n° de coupure à la source

Request for Isolation No. - Demande de n° de coupure à la source	Date (YY-MM-DD)
EGD xxx Pg. 2 of 2	02-03-15

Purpose of order / Objet de la commande

Sequence no. / N° séquentiel	Equipment affected / Appareillage concerné	Tag no. installed on Equipment / N° d'étiquette installée	Functions to be performed and specific safety measures required / Fonctions à remplir et mesures de sécurité spéciales requises	Initials / Initiales
12	MAIN HOIST		ARMATURE POWER ON	J.L. M.L.
13	GANTRY DRIVE		FIELD POWER ON	J.L. M.L.
14	GANTRY DRIVE		ARMATURE POWER ON	J.L. M.L.

Prepared by - Préparé par

Name - Nom	Time - Heure	Date (YY-MM-DD)
MIKE LEDSON M. Ledson	09:00	02-03-13

Checked by - Vérifié par

Name - Nom	Time - Heure	Date (YY-MM-DD)
JOE LEZETC J. Lezetc	08:00	02-03-14

Issued by - Émis par

Name - Nom	Time - Heure	Date (YY-MM-DD)
JOE LEZETC J. Lezetc	09:00	02-03-15

Performed by - Effectué par

Name - Nom	Time - Heure	Date (YY-MM-DD)
M. Ledson J. Lezetc MIKE LEDSON & JOE LEZETC	07:30	02-03-20

Operating diagram adjusted by - Schéma fonctionnel corrigé par

Name - Nom	Time - Heure	Date (YY-MM-DD)

PWGSC-TPSGC 12 (12/1997)

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Copy 2 (Yellow) / Copie 2 (Jaune) ▶ Originator / Demandeur

APPENDIX 6 - TAGS ASSOCIATED WITH LOCKOUT

Note: Tags are examples only; to be modified for PWGSC.


DANGER
DO NOT OPERATE
TESTING
PWGSC - EGD ELECTRICAL DEPT.


GROUNDED
PWGSC - EGD ELECTRICAL DEPT.


DANGER
DO NOT OPERATE
LIVE LINE WORK
PWGSC - EGD ELECTRICAL DEPT.

APPENDIX 7 – RECORD OF ELECTRICAL WORK FOR MINOR PROJECTS (PWGSC-69)

See separate LOGBOOK in EGD Electrical Shop for record of Minor Projects. These are projects requiring inspection by an Electrical Inspector at a later date. Major Projects or those where work will be closed in, must be inspected immediately. Record equivalent information to that on form PWGSC 69.

MANUAL SECTION 2: EMERGENCY CALL OUT LIST

See Section 2 in the Lockout Manual for the Call-out List and related information

MANUAL SECTION 3: EGD ELECTRICAL SINGLE LINE DRAWINGS

See Section 3 of the Lockout Manual for list of Single Line Drawings located in the Electrical Shop.

MANUAL SECTION 4: STANDARD OPERATING PROCEDURES FOR ISOLATION/ RE-ENERGIZATION

See Section 4 of the Lockout Manual for list of Standard Operating Procedures

MANUAL SECTION 5: COMPLETED LOCKOUT FORMS

See Section 5 of the Lockout Manual for completed forms.

MANUAL SECTION 6: PWGSC DEPARTMENTAL POLICY 058

MANUAL SECTION 7: OTHER REFERENCES

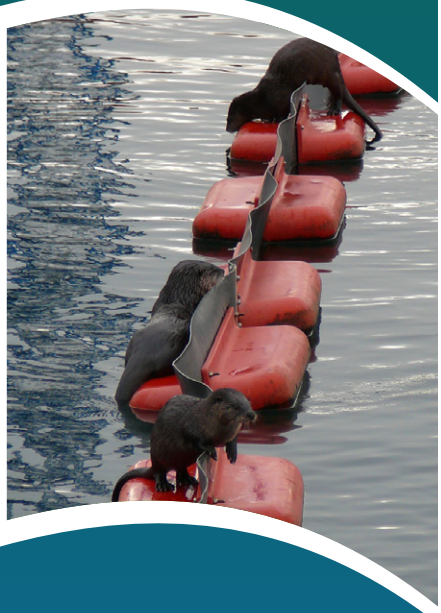
Treasury Board Of Canada Policy Part Viii, Canada Labour Code COHS Regulations Part Viii,

APPENDIX D

EGD ENVIRONMENTAL BEST MANAGEMENT PRACTICES

EGD
Esquimalt Graving Dock

Environmental Best Management Practices



Prepared by:
Public Services and Procurement Canada
Environmental Services

October 2016
Version: 05

INDEX

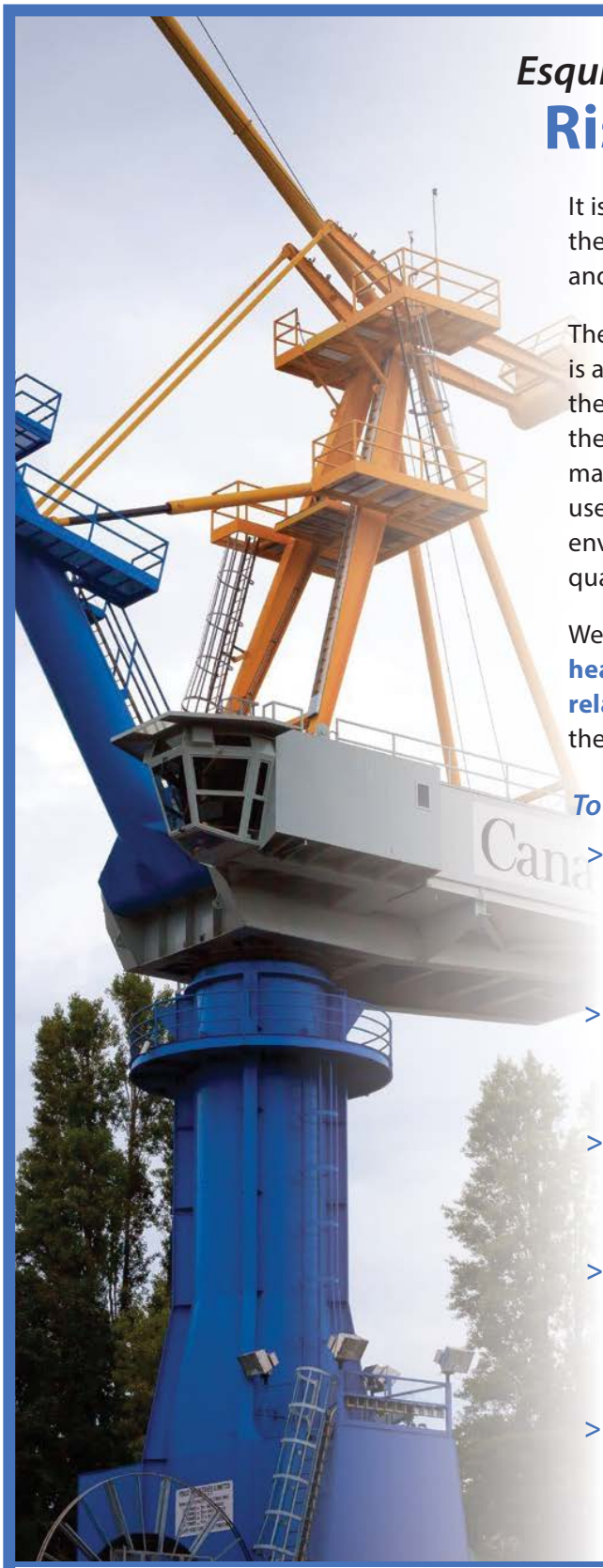
OVERVIEW

The **Esquimalt Graving Dock** (*EGD*) is a federal government owned and 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 shipyard repair contractors that rent the required sections of the drydock, lease upland work space from the government, and pay a fee for services such as cranes, compressed air, water, sewer and power.

The EGD is committed to managing the actual and potential health and safety, environmental, security, financial and public relations risks, while ensuring quality operations and services. In order to identify and manage these risks, the EGD has implemented an **Environmental Management System** (*EMS*) and a Risk Management Framework (*in conformance with the internationally recognized standards ISO 14001 and ISO 31000*). The EMS provides the framework for identifying environmental impacts, and ensures adequate controls are in place to effectively manage them.

This manual contains a series of **Environmental Best Management Practices** (*EBMPs*) developed to reduce impact to the environment related to common activities and operations at the Esquimalt Graving Dock. The manual contains guidance and recommendations 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 EGD to abide by all applicable regulatory requirements and industry standards. All users of the facility are expected to follow the EBMPs.

For additional information contact the EGD Environmental Services Department.



Esquimalt Graving Dock

Risk Management 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 acknowledges that risk management is an integral part of attaining this goal. We recognize that risk is the effect of uncertainty on our operations and is inherent within the ship repair industry. Our objective is to identify, monitor and manage risk in order to prevent the harm of our employees, site users, contractors, neighbours, other stakeholders, the environment and our facility, while ensuring and maintaining quality operations and services.

We are committed to managing the actual and potential **health & safety, environmental, security, financial and public relation risks** pertaining to strategies, policies and practices at the Esquimalt Graving Dock.

To meet our commitment we will:

> *Implement systems and processes to consistently identify, measure, mitigate, minimize and report on risks, while continuing to uphold and adapt the established Environmental Management System and other relevant Management Frameworks.*

> *Meet or exceed applicable federal, provincial and municipal legislation and regulations, departmental policies, industry standards, practices and other requirements.*

> *Communicate openly with our employees to ensure they are aware of and understand our Risk Management Framework, the nature of our operations and their roles and responsibilities in managing risk.*

> *Monitor and review our Risk Management Framework to ensure we are meeting our goals. Ongoing oversight of the effectiveness of our Risk Management Framework is the responsibility of the Esquimalt Graving Dock Risk Management Team.*

> *Provide the necessary resources to effectively implement our Risk Management Framework, while continuing to improve our programs, procedures and operations.*

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Jim Milne
Director
Esquimalt Graving Dock
Engineering Assets
Strategy Sector

David Latoski
Operations Manager
Esquimalt Graving Dock
Engineering Assets
Strategy Sector

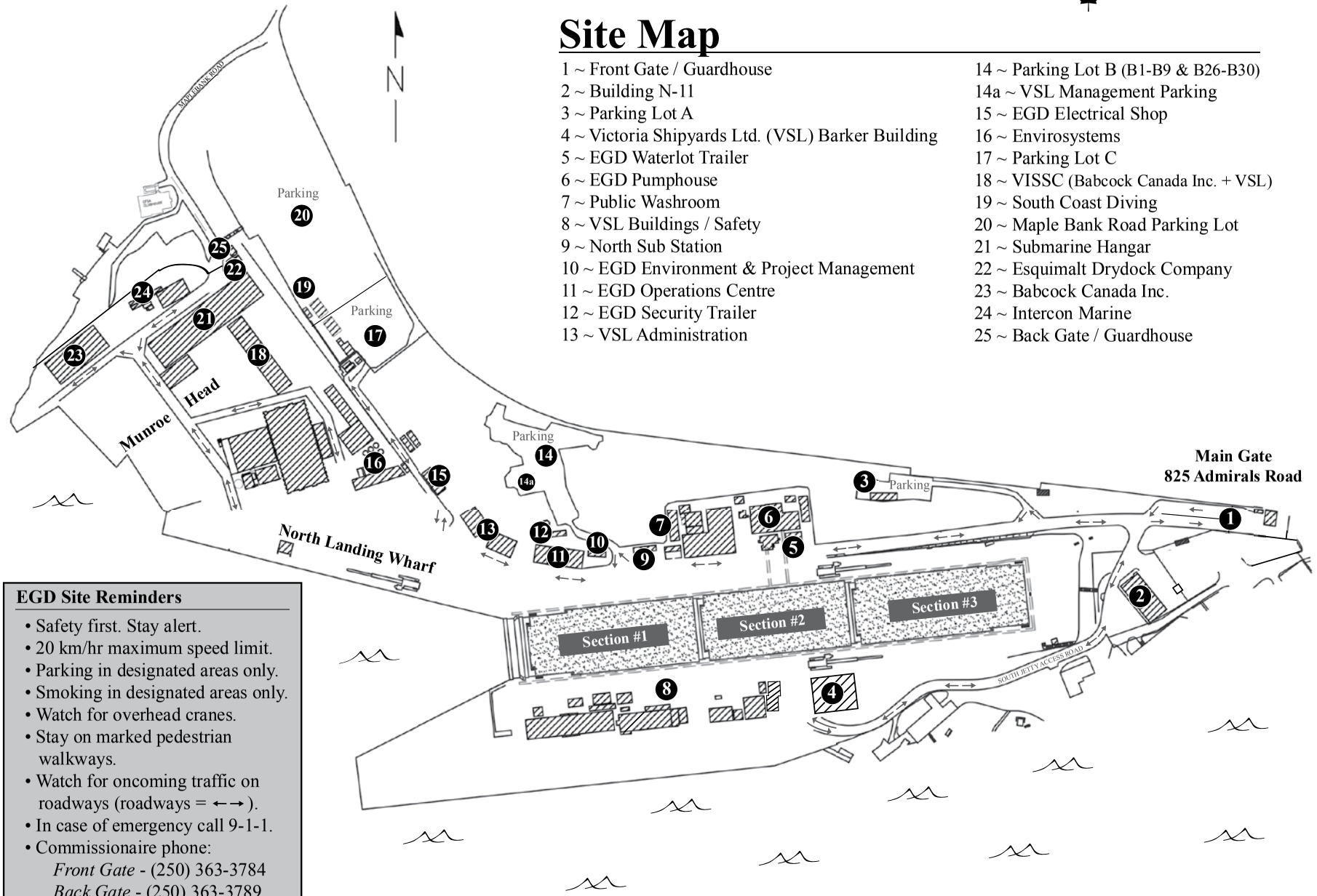
Canada

August 2015

EGD
Esquimalt Graving Dock

Site Map

1 ~ Front Gate / Guardhouse
2 ~ Building N-11
3 ~ Parking Lot A
4 ~ Victoria Shipyards Ltd. (VSL) Barker Building
5 ~ EGD Waterlot Trailer
6 ~ EGD Pumphouse
7 ~ Public Washroom
8 ~ VSL Buildings / Safety
9 ~ North Sub Station
10 ~ EGD Environment & Project Management
11 ~ EGD Operations Centre
12 ~ EGD Security Trailer
13 ~ VSL Administration
14 ~ Parking Lot B (B1-B9 & B26-B30)
14a ~ VSL Management Parking
15 ~ EGD Electrical Shop
16 ~ Envirosystems
17 ~ Parking Lot C
18 ~ VISSC (Babcock Canada Inc. + VSL)
19 ~ South Coast Diving
20 ~ Maple Bank Road Parking Lot
21 ~ Submarine Hangar
22 ~ Esquimalt Drydock Company
23 ~ Babcock Canada Inc.
24 ~ Intercon Marine
25 ~ Back Gate / Guardhouse



EGD Site Reminders

- Safety first. Stay alert.
- 20 km/hr maximum speed limit.
- Parking in designated areas only.
- Smoking in designated areas only.
- Watch for overhead cranes.
- Stay on marked pedestrian walkways.
- Watch for oncoming traffic on roadways (roadways = ←→).
- In case of emergency call 9-1-1.
- Commissionaire phone:
  Front Gate - (250) 363-3784
  Back Gate - (250) 363-3789

Environmental Best Management Practices

EBMP #1: Pressure Washing (High and Ultra High)

One of the first activities to occur on a drydocked vessel is pressure washing of the hull to remove salts, marine growth and residual paint, prior to surface preparation or painting. This typically involves pressure washing the underwater hull and/or super structure with water at 2,000 – 3,500 psi. This activity produces large volumes of paint contaminated wastewater (*e.g. washwater*). Ship repair contractors may also use an Ultra High Pressure (*UHP)* washing process (*from 40,000 – 55,000 psi*) to completely remove all paints, often eliminating the need for further surface preparation (*e.g. sandblasting*) prior to painting. UHP generates even larger volumes of wastewater and slurry solids. All wastewater created from pressure washing and UHP requires management (*i.e. assessment, collection, handling, treatment and disposal*).

Management of Wastewater on the Graving Dock Floor

- Ensure all wastes and wastewater discharges, resulting from hull and anchor chain washing, as well as dock bottom clean-up activities, are collected and disposed of properly.
- Close all sump well valves in the drydock floor collection system prior to and during pressure washing operations.
- Manage pumps to ensure they are handling the volume of washwater sufficiently.
- Manage washwater storage containers to ensure they are not overfilled.
- Divert contaminated wastewater, that falls outside of the drydock floor collection system, away from the tunnel drains.
- Direct non-contaminated water (*e.g. ballast water, cooling water, dock wall/moon pool leakage water*) away from contaminants on the drydock floor.
- Collect and dispose of stormwater that comes into contact with contaminants.
- Do not use detergents or additives in washwater.

Opening Sump Well Valves

Sump well valves in the drydock floor can be opened to manage rainwater under the following conditions ONLY:

- Dock floor has been pre-cleaned, prior to the completion of the work period.
- A filter cloth has been installed to reduce the migration of debris.

All wastewater containing paint contaminants must be directed to the collection trench drains and sump wells on the drydock floor, collected, and sent for proper treatment.

Antifoulant contaminated washwater entering the collection system (trench drains and sump wells) on the drydock floor.

The sill diversion pump removes clean seawater from the pool at the front of Section 1 (moon pool) and discharges into the tunnel drains through a hard pipe on the graving dock wall.

Sediment from the harbour often settles on dock bottom after dewatering. If this becomes contaminated with paint, etc., it must be disposed of.

The hull of a cruise ship being ultra high pressure washed.

Section 1 Considerations:
Caisson and Dock Wall Leakage & Drydock Floor Sediment

Managing Caisson and Dock Wall Leakage:

- Divert caisson leakage water away from pressure washing areas.
- Water leakage from the caisson can be diverted by using a sump pump connected to the PVC diversion pipe installed on the north wall of the drydock Section 1.
- Divert water leakage from the graving dock walls, during high tide, directly into the drainage tunnel.

Managing Entrained Sediment:

Harbour sediment may accumulate in the corners, trenches, keel blocks and sumps of the drydock Section 1 during normal docking procedure. Users of the section will need to consider management of this sediment and are responsible for removal and proper disposal if it becomes contaminated from their operations and activities on dock floor (*e.g. pressure washing wastewater, sandblast grit, paint chips, paint overspray, and other contaminants*).

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 UHP waste.
- Remove all water, sludge and debris, generated from UHP washing, from the drydock.
- Ensure the washwater and sludge is disposed of at an appropriately permitted facility.
- Disposal certificates may be requested, by EGD Management, to ensure washwater is being properly managed.

Management of Pressure Wastewater in Upland Areas/Dockside

- Perform pressure washing of small vessels and parts, in designated areas only, where wastewater management can be effectively achieved.
- Approval for pressure washing in upland areas (*including the use of a stormwater trench for water collection*) is required from EGD Management
- Wash vessel parts in a suitable contained area (*e.g. enclosed skip*).
- Completely block all drains in the area where pressure washing will occur (*e.g. cover nearby trench drains with filter cloth, place a foam bung in the trench drain to prevent migration of wash water should an incident occur*).
- Ensure sufficient equipment (*e.g. pumps, totes, tanks, foam blocks and sandbags*) is available for the timely collection, control and removal of washwater.
- Contaminated washwater requires proper treatment for disposal. Label containers.

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 high density styrofoam blocks used as a drain blocker on the NLW.

Large tank dockside with an attendant.

EBMP #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.

The dust emissions generated from abrasive blasting operations can contain harmful environmental pollutants and have the potential to negatively effect employees, facility users, neighbours, equipment and infrastructure if it is not properly managed. Fugitive dust may also impact the local marine environment by entering the Esquimalt Harbour directly, or via stormwater runoff, and through direct deposit to uplands soil.

Waste grit may be highly contaminated with antifouling paint and other metals, which also poses a risk to the environment if not handled and disposed of properly.

Dust Control

- Establish dust suppression controls in advance of starting any work.
- Do not abrasive blast during conditions that render containment ineffective *(e.g. during windy conditions)*.
- No abrasive blasting of vessels shall be performed while vessels are docked alongside the North Landing Wharf or South Jetty.
- Minimize dust emissions by ensuring blast nozzles are angled perpendicular to the vessel and aimed slightly downward during blasting.
- Properly manage (*contained, covered and secure*) all sandblast product and wastes during transport.

ADEQUATE containment.

Hoarding (*Physical Containment*)

- 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 and reach the dock floor or walls.
- Ensure containment is properly installed (*connected and overlapped*) so there are no gaps.
- Used tarps with tears and holes should be replaced, repaired or doubled with additional layers.

INADEQUATE containment.

Water Use (*Fugitive Dust Suppression*)

- Where physical containment techniques are not sufficient to prevent fugitive dust emissions, water may be used to mitigate dust.
- Users may requisition use of Dust Suppression Units (*e.g. Dust Boss*) from the EGD. The units are highly effective at mitigating dust.
- Monitor areas where dust escapes physical containment and adjust dust suppression unit water spray accordingly.
- Do not allow water from the dust suppression units to enter other sections of the dock, especially in the case where another user occupies it.
- Do not allow water from the dust suppression units to come in contact with contaminants on the drydock floor or other work areas. Adjust water spray and relocate contaminants to mitigate impacts.
- Fire nozzle "water curtains" may only be used to control dust emissions when approved by EGD Management in advance. The dust suppression units generates a more effective water mist and uses significantly less fresh water during operation.

Waste Grit Management

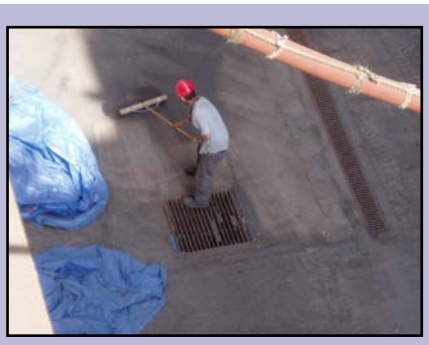
- Cover trench drains and tunnel grates in work areas with filter cloth. Replace the cloth as required.
- Manage waste grit by sweeping it into central areas, away from trenches, tunnel grates and dock floor traffic.
- Remove waste grit from work areas as soon as possible.
- Store all waste grit in appropriate containers to prevent leakage.
- Cover all skips, storage bins, tanks, and hoppers to prevent dust emissions and spills.
- Characterize and dispose of waste grit in accordance with applicable provincial regulations.

Dust suppression unit in operation.

Store all waste grit away from drains, to prevent contaminates migrating into the marine environment.

INADEQUATE waste grit storage.

ADEQUATE waste grit storage.



Clean up waste grit to prevent it from being washed into the drainage system by clean water (e.g. cooling water discharge, stormwater, dust suppression unit spray).

Store waste grit in appropriate containers.

Remove waste grit from work areas as soon as possible to prevent migration of contaminates throughout the drydock floor.

Keel / Bilge Blocks

Keel and bilge blocks on dock bottom present a challenge for the clean up of spent waste grit.

Waste grit must be removed from areas around excess blocks stored in the dock bottom. To prevent grit from collecting between the blocks, they can be relocated or covered prior to sandblasting.

Power washing at the base of the blocks can be effective in removing contaminants.

EBMP #3: Painting and Coating

Ship repair and maintenance often requires the painting and coating of vessel surfaces to protect them from corrosion or to inhibit the growth of marine life. The industrial nature of marine paints and solvents, in particular antifouling paints, may result in negative impacts to the environment and surrounding infrastructure, if not properly managed.

Spray Painting

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 use keel blocks, dock floor or dock walls to test paint sprayers.
- Do not spray paint during conditions that render containment ineffective (*e.g. 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 (*e.g. during painting of anchor chains, or grates*).
- Manage overspray on the drydock floor to prevent safety hazards (*e.g. slippage*).
- When spray painting materials inside the stabilizer pockets, ensure the area is sealed and that the walls and floors are covered.
- For vessels docked in Section 1, ensure that overspray does not reach the caisson sill/moon pool water. Avoid docking vessels so they extend over sill area.

Spray Painting

ADEQUATE containment.

INADEQUATE containment.

INADEQUATE containment. Ensure tarps are in place to prevent overspray impacting the surrounding work area.

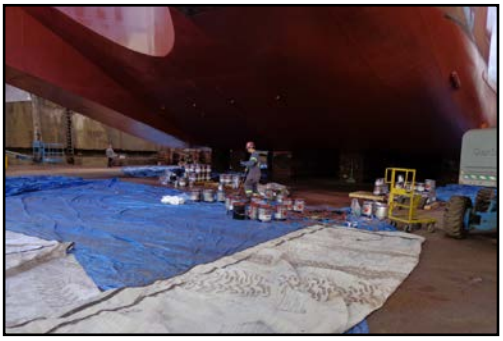
ADEQUATE containment on stablizer pocket doors.

Paint overspray due to INADEQUATE containment stablizer pocket doors.

Manual Painting

Painting by hand (*roller, brush*) can be conducted without shrouding the work area; however, the potential remains for product to migrate into the environment. Work spaces and product handling must be managed with care, similar to dockside painting.

- Containment should be large enough to adequately cover the work area and provide a barrier between the work and the environment (*e.g. dock floor, ocean and soil*).
- Ensure containment is secured so there are no gaps.
- Product container lids are to be secured.



ADEQUATE containment.

Painting Dockside

- Do not spray paint vessels docked alongside the wharves or jetties *(e.g. North Landing Wharf)*.
- 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 from going into the marine environment.
- Waste generated from painting and other activities such as grinding, hand tooling and welding, must be prevented from entering the marine environment.

While painting vessels docked alongside the wharves or jetties, do not spray paint. Take sufficient measures to prevent paint from entering the marine environment.

Environmental Best Management Practices

Empty paint cans must be properly stored on dock bottom and dock side.

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.
- Ensure empty paint containers being dried for disposal are protected from rain.
- Do not dispose of used paint containers that still contain wet paint.

IMPORTANT!

In rare situations (*e.g. 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 EGD Management 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.

Environmental Best Management Practices

EBMP #4: Dry Dock Floor Management and Clean Up

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 (*e.g. ballast water, cooling water, caisson sill water*).

Hazardous Materials Managementt

- Store hazardous materials (*e.g. 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.

Collect and properly dispose of all contaminated water.

Sediment Management

- Segregate any marine sediment, that may enter the dock during vessel transfer, from the waste generated during vessel repair. This is 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.

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 remove from dock bottom as soon as possible.

Residual paint in the cans may drip out of the skip and enter the marine environment through the drain systems.

Leaving garbage around the work site attracts wildlife such as seagulls, racoons and rats.

When cleaning dock bottom, skips of waste sandblast grit may leak contaminated water and should be removed as soon as possible.

All hazardous materials must be stored in appropriate containment and away from tunnel drain system.

Inspection and Cleanliness

- Prior to flooding, the drydock must be cleaned to meet the Esquimalt Graving Dock (*EGD*) *Standard of Cleanliness (see below),* 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.

ADEQUATE:
Example of a dock floor that would pass inspection.

INADEQUATE:
Example of a dock floor that would not pass inspection.

EGD Standards 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 or paint chips,
    - cutting and grinding wastes,
    - oil and grease,
    - food and drink containers,
    - ear plugs,
    - dust masks,
    - rope,
    - cigarette butts, 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.

AREAS IN NEED OF *SPECIAL ATTENTION*

ACCEPTABLE		NOT ACCEPTABLE
	**RAMPS**	
	**SILLS**	
	**KEEL BLOCKS**	
	**TRENCH DRAINS**	
	**SUMP WELLS**	

Environmental Best Management Practices

EBMP #5: Hazardous Materials Handling and Storage

A variety of hazardous materials are used, stored and transported by Users at the Esquimalt Graving Dock (*EGD*). If not handled appropriately, these materials have the potential to negatively impact worker health and safety, infrastructure and the environment. Hazardous materials commonly used at the EGD include: antifoulant paint, fuels and oils, antifreeze.

Storage

Users must have designated storage areas suitable for the materials they use on site. Where applicable, 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 (*covered, lids secured, valves closed*).
- Have placards and proper ventilation.
- Have controlled access.
- Be located away from pathways to the marine environment.
- Be located on impervious surfaces (*e.g. concrete*).

Handling

All hazardous materials must be:

- Labelled appropriately with the owner name, product name, first aid information, and PPE requirements.
- Secured appropriately during transport.
- Transported by equipment that can sufficiently handle its weight and size.
- Transported in containers that are stable and not in need of repair (*e.g. totes with broken feet, excessive rust, faulty valves*).

ADEQUATE storage.

ADEQUATE storage.

INADEQUATE storage.

Any container holding hazardous materials must be clearly and properly labelled.

Areas to Avoid Storing Hazardous Materials

Trench Storm Drains
Any containers placed directly over top or beside a trench drain have the potential to spill to the drain leading directly to the ocean.

Storm Drains
Any containers placed directly over top or beside a storm drain have the potential to spill to the drain leading directly to the ocean.

Alongside Wharves and Jetties
Any containers placed alongside the edge of the wharves and jetties at the EGD have the potential to spill directly to the ocean, as there are no berms or secondary containment available.

Dock Floor Trench Drains
If a tote or drum is placed directly over or beside a trench drain, hazardous materials have the potential to flow down the drain and into the marine environment. Although the drains are designed for rapid containment and recovery, there is no guarantee that workers will be present to close drain valves during an incident.

Dock Floor Sump Wells
When the sump well valve is open the sump drains directly into the marine environment. Any containers placed on top of or adjacent to the sump well have the potential to enter the ocean if a spill were to occur.

Dock Floor Tunnel Grate Drains
Tunnel grate drains lead directly to the marine environment. Any containers placed directly over top of or beside a tunnel grate have the potential to impact the marine environment, should a spill occur.

Environmental Best Management Practices

Safety Data Sheet *(formerly Material Data Safety Sheet)*

A Safety Data Sheet (SDS) is a document that contains information on the potential hazards (*health, fire, reactivity and environmental*) and how to work safely with the product. SDSs also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material. SDSs must be available (*electronically or hardcopy*) for all products stored on site and be readily available to all employees.

Storage Tanks and Totes

Storage tanks and totes are used for a variety of materials at the EGD, including: washwater, fuel products, bilge water, waste oil/fuel and other waste liquids. Storage tanks and totes may be considered portable/mobile, temporary or permanent. The regulatory requirements for proper use of these tanks vary and is dependent on a variety of factors.

Federal Regulation for Fuel Storage Tanks

The EGD is a Federal facility; therefore, storage tanks onsite need to comply with the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations. Users may be required to register their tanks with Environment Canada. **Contact EGD Environmental Services for information.**

There are four different fuel tanks at the Esquimalt Graving Dock.

National Fire Code

The National Fire Code outlines the requirements for containment, labelling and location of flammable liquid storage.

Environmental Best Management Practices

EBMP #6: Waste Management and Recycling

Operations at the Esquimalt Graving Dock (*EGD*) generate a variety of waste streams including hazardous waste, controlled waste, biological waste, international waste, 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, mercury, PCB containing equipment 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 should 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 (*e.g. 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 (*e.g. absorbents, rags, etc.*).
- Do not dilute or mix hazardous waste, other hazardous or non-hazardous wastes.
- Cover waste containers to prevent exposure to weather (*e.g. rain*).

All hazardous waste must be carefully stored and disposed of.

Asbestos

All asbestos containers and asbestos-containing materials must be identified by signage and labelling in accordance with applicable legislation.

Companies that engage in asbestos related work at the EGD must be qualified to do so.

Clearly label all hazardous waste containers.

- Labels should include: type of waste, generator/company name, and contact information.

Controlled Waste

Controlled waste such as animal feces, sewage, contaminated grit, stormwater catch basin waste, creosote wood and dead animals can be disposed of at the **Capital Regional District (*CRD*) Hartland Landfill.**

Controlled waste disposal at requires a permit.

For more information about Controlled Waste disposal contact the CRD Hotline at (250) 360-3030.

Large scale food waste bin.

An example of a Waste Management Area at the EGD.

Food Waste

During normal activity at the EGD, food waste is collected in conveniently located and accessible receptacles onsite and disposed of at the landfill. During larger projects, however, alternative measures are taken to account for the increase in generated wastes.

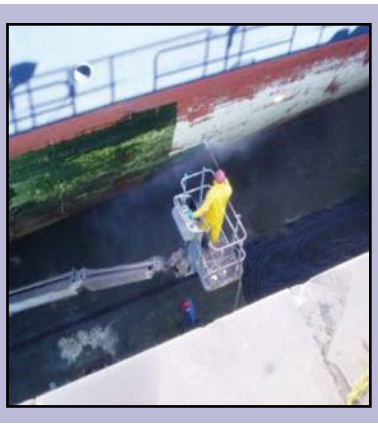
General Refuse

General refuse should be separated into categories to enable easy disposal. Users are responsible for properly disposing of refuse and recyclable materials. There are many containers throughout the site for disposal of common refuse materials (*e.g. steel, wood, glass, cardboard etc.*).

Biological Waste

Marine life removed from vessel hulls and sea chests may contain paint contaminants. This waste may be considered a controlled or hazardous waste and would need to be handled and disposed of accordingly.

Biological waste should be stored out of the sun, covered and removed from the facility quickly to prevent any odours from emanating.



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 or disposed of appropriately.
- 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 species to local areas. Foreign dunnage must be identified, stored, and disposed of at an approved facility without delay.

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.

EBMP #7:
Fuelling and Oil Transfer

The transfer of fuel and oil is a common activity at the Esquimalt Graving Dock (*EGD*). Transfer may be from ship to shore (*e.g. removal of waste fuel/oil*), from shore to ship (*e.g. refuelling a vessel from a truck)* or land based.

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:
    - the ***EGD Oil Transfer Checklist*** must be complete;
    - an emergency plan must be in place and readily available;
    - adequate spill response equipment must be available; and
    - personnel must be aware of spill response procedures.
- 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 (*e.g. storm drains, trench drains, edge of the dock*) without effective mitigation measures in place.

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, gasoline, lube oil and refined products.

Berthed Vessels

- ALL berthed vessels receiving fuel from a truck or a barge require a containment boom.
- Transfers of fuel and oil to and from ALL berthed vessels 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*.

Vessels in Drydock

- ALL fuel and oil transfers occurring in the drydock require spill kits to be placed nearby and are not to be completed next to drainage pathways to the marine environment (*e.g. trench drains, sump wells, tunnel grate drains*).

On Land Transfers

- ALL fuel and oil transfers occurring on land require spill kits to be placed nearby and are not to be completed next to drainage pathways to the marine environment (*e.g. storm drains, edge of dock*).

Containment Boom Requisition

The Esquimalt Graving Dock has containment boom and deployment equipment available for requisition. To arrange for booking or rental, contact the EGD Operations Manager.

An orange inshore containment boom fully surrounds the vessel while being fuelled.

The hydraulic powered deployment reel with inshore containment boom available for requisition.

EXAMPLE SCENARIO REQUIREMENTS

Scenario 1: FUELLING A BERTHED VESSEL

- Completed and signed ***EGD Oil Transfer Checklist*** submitted to EGD Pumphouse.
- Containment boom deployed and effectively secured at both ends.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

EXAMPLE SCENARIO REQUIREMENTS (*Continued*)

Scenario 2: BULK OIL TRANSFER FROM A BERTHED VESSEL

- Completed and signed ***EGD Oil Transfer Checklist*** submitted to EGD Pumphouse.
- Containment boom deployed and adequately secured at both ends.
- Receiving containers located away from pathways to the harbour (*e.g. storm drains, edge of dock*).
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 3: FUELLING A VESSEL OR BULK OIL TRANSFER IN THE DRYDOCK

- Pumphouse operation on site prepared to shut down auxiliary pumps in case of an emergency.
- Receiving containers located away from pathways to the harbour (*e.g. trench drains, sump wells, tunnel grate drains*).
- Receiving containers in secondary containment and in good condition.
- 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 (*e.g. storm drains, edge of dock)*.
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Environmental Best Management Practices

EBMP #8: Invasive Species

Invasive species are a significant threat to the marine ecosystems of British Columbia. The Esquimalt Harbour is known to have 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. Ship repair contractors are encouraged to report unusual species observed during hull cleaning activities.

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.

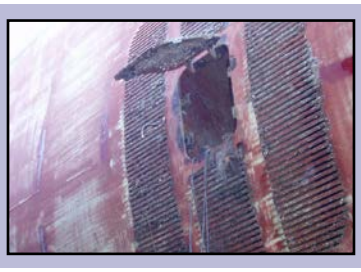
Sea chests

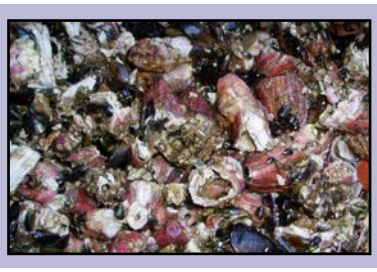
- All biological material removed from sea chests must be contained, covered and disposed of appropriately.
- Material must be stored away from direct sunlight/heat and disposed of as soon as possible, to avoid nuisance odour pollution.

Marine growth removed from vessel hulls must not be allowed to enter the harbour through the drydock drainage system.

INADEQUATE containment: Biological waste on drydock floor near drains.

INADEQUATE containment: Biological growth mixed with paint waste on drydock floor.





Sea chests, such as this one from a cruise ship docked at the EGD, often contain a significant amount of marine life.

If not managed appropriately, this marine life has the potential to negatively impact the local ecosystem of the harbour.

EBMP #9: Fish and Wildlife Management

The daily operations and activities of the Esquimalt Graving Dock (*EGD*) have the potential to negatively impact wildlife that frequents the property. The *EGD Wildlife Management Plan* has been developed to assist EGD employees and Users to properly manage interaction with fish and wildlife that are common to the facility.

Fish

Fish and other marine life have the potential to become stranded in the drydock during normal vessel docking/undocking operations. This may include, but is not limited to: salmon and other fish species, seals and octopus.

- The bubble curtain must be employed during vessel transfer into and out of the drydock.
- EGD employees must monitor the drydock for stranded fish and/or other marine life during dewatering and report cases to EGD Environmental Services.
- 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 drydock.

Report all cases of fish and marine life interaction with the drydock to EGD Environmental Services.

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 during migration 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, Canada goose and a variety of other common waterfowl, nesting and songbirds and pollinators *(e.g. bats, native bees)*.

Bubble curtain employed during vessel transfer.

Stranded marine life must be carefully returned back to the Harbour.

Fisheries Act - Destruction of Fish

The EGD has received authorization for the destruction of fish associated with normal operation of the drydock from the Department of Fisheries and Oceans (*DFO*).

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.

Environmental Best Management Practices

- ALL wildlife must be left alone. Do not approach or handle newborn or juvenile wildlife.
- Injured or orphaned wildlife must not be handled without proper experience and equipment.
- Dispose of dead wildlife appropriately.
- Report observations of injured or deceased animals to EGD Environmental Services.
- Prior approval from EGD Environmental Services is required for the relocation or removal of nesting wildlife; a Migratory Bird Damage or Danger Permit is required to remove nests and retrieve eggs of migratory birds (*e.g. seagulls*).
- Never mistreat, remove or destroy any areas that could provide habitat for wildlife without prior approval and receipt of appropriate permits from the relevant authority.

Contact EGD Environmental Services for wildlife related information, incidents and interactions.
Contact the Front Gate Commissionaires for afterhours assistance.

A variety of wildlife is known to occupy areas of the Esquimalt Graving Dock property.

Incidents with wildlife are managed on a case by case basis.
Direction and/or assistance must be taken from the appropriate authority when required.

EBMP #10: Water Use

The Esquimalt Graving Dock (*EGD*) is considered a major consumer of fresh water. Water is provided to the facility by the Capital Regional District (*CRD*) distribution system, on a fee for use basis. Inefficient use of water may result in a negative economic and environmental impact. Water consumption and the quality of water are both considerations of the environmental management systems at the 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 CRD. Users must be conscious of activities that consume high volumes of water and work to mitigate any water waste.

In order to reduce the amount of water consumed onsite:

- Mitigate dust in problem areas using high efficiency Dust Suppression Units, when physical containment techniques are not sufficient to prevent fugitive dust emissions.
- Use fire nozzle water curtains only when all other attempts to contain particulate emissions from sandblasting have failed. Water curtain use must be approved by EGD Management in advance.
- Avoid use of freshwater to clean work areas, where possible.
- Maintain fittings in buildings and on equipment to prevent leakages.

Water Consuming Activities

Activities associated with vessel surface preparation and dust control use significant amounts of water.

Conventional pressure washing and ultra high pressure (UHP) washing use large amounts of water at high pressure to scour paint and biological material from the hulls of ships.

Dust Suppression Units

Dust Suppression Units are used to mitigate the escape of dust from sandblasting operations in the drydock.

Water Quality

The water distribution system at the EGD was originally designed as a fire suppression system; therefore, the water in certain areas of the system may not be considered potable.

- Potable water is not available throughout the facility (*this includes intake to vessels moored alongside or in the drydock*).
- Users of the facility are responsible for ensuring that the water they use meets the guidelines for the purpose intended.
- Users must use backflow prevention when accessing the water distribution system.

The EGD maintains the fresh 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 on an annual basis.

Metered Water Use at the Esquimalt Graving Dock

- Users of the facility must ensure that water is accessed from a metered line when connecting to the water distribution system.
- Portable meters are to be used when required.
- The EGD Pumphouse must be contacted for proper access to the water distribution system.

EBMP #11: Energy Conservation

The Esquimalt Graving Dock (*EGD*), as an industrial facility, is a major consumer of energy. Inefficient energy use may result in negative economic and environmental impacts. Economic impacts are associated with inefficient electrical usage (e.g. cost), while environmental impacts include those associated with the consumption of fuel (*e.g. air emissions*).

Energy consumption also 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 operating the cranes or printing a report. It is important to minimize energy consumption wherever possible to reduce the release of harmful greenhouse gases and conserve energy.

Electrical Consumption

There are a number of opportunities to increase the efficiency of electrical usage at the EGD:

- Turn off lights and equipment when not in use (*e.g. flood lights, office buildings*).
- Install energy efficient devices in buildings (*e.g. sensor switches, efficient light bulbs*).
- Use energy efficient equipment whenever possible and consider energy efficient options when purchasing new equipment.
- Stagger equipment start-up to decrease load on electrical system.

Environmental Best Management Practices

Fuel Consumption and Emissions

Opportunities to decrease the amount of fuel consumed by day to day activities include:

- Using energy efficient vehicles.
- Using alternative fuels where possible (*e.g. Biofuels*).
- Using alternative energy sources where possible (*e.g. LED, solar, rechargeable*).
- Avoid idling vehicles (*e.g. delivery vehicles*).
- Use shore power where possible.
- Encourage staff to try alternative means for commuting to work (*e.g. carpool, public transit, cycling*).

Be aware of the potential impacts of emmissions on neighours near the EGD.

Idling Vehicles

- 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.

Idling vehicles produce unnecessary air emissions and noise.

Shore Power

For vessels moored alongside at the North Landing Wharf and in the drydock it is important that they utilize shore power when possible. With shore power, the auxiliary generator can be turned off, thereby saving fuel and preventing the release of harmful air pollutants.

Did You Know?

Shore Power may be accessed at the EGD:

- 208V and 480V available on the North Landing Wharf and drydock.

EBMP #12:
Nuisance Pollution (Noise/Odour/Light)

The daily operations of the Esquimalt Graving Dock (*EGD*) Users have the potential to negatively impact neighbouring residents and businesses, as well as the immediate work area. Nuisance pollution is often created by noise, odour and light.

Noise

- Noise pollution can be generated and recognized in decibel levels, pitch, oscillation and duration.
- 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.
- Sound carries. Operational noise, vehicle noise and loud voices can be heard in nearby areas. Site Users must be aware of the potential impacts of all activities taking place at EGD and be respectful of neighbours.
- Schedule noisy activities for daytime hours 0700 hrs to 2300 hrs on weekdays, weekends and holidays. Through worker education and good practice the generation of high-level intermittent or non-continuous noises can be minimized.
- Personal vehicles, including motorcycles, can disturb neighbouring residents. Your vigilance is appreciated especially during quiet hours. Warning signs are posted at parking areas to remind personnel to be respectful of neighbours when arriving and departing the EGD.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Nuisances Noise Contro*l.

The EGD is located in close proximity to residential areas.

Personal vehicles with loud engines can disturb neighbouring residents.

Warning signs in parking areas act as a reminder to minimize noise at EGD.

Responses to nuisance pollution complaints will be taken on a concern-by-concern basis.

To submit a nuisance complaint contact the Esquimalt Graving Dock Information Line at (250) 363-0227.

Environmental Best Management Practices

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 residents. Biological material removed from bilges, sea chests and hulls must be contained, covered and disposed of appropriately. Be proactive in planning for timely transport and proper disposal of material; a permit may be required for disposal.
- Material must be stored away from direct sunlight/heat and disposed of in a timely manner, to avoid nuisance odour pollution.
- Odour mitigating measures may be required, if odours are negatively affecting neighbouring properties or onsite personnel.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Odour and Disturbances*.

ADEQUATE containment of odorous waste.

INADEQUATE containment of odorous waste.

Light

- Night time dock operations require spotlights to provide a safe work environment. Be aware that strong spotlights can be a significant intrusion for residential neighbours.
- Only utilize spotlights when absolutely necessary. This will help prevent disturbing the neighbours, as well as to ensure a more energy efficient work environment.
- Changing the direction of stationary and portable lights in the workplace may reduce the effect they have on the neighbours.
- Turn off any unnecessary lights.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Odour and Disturbances.*

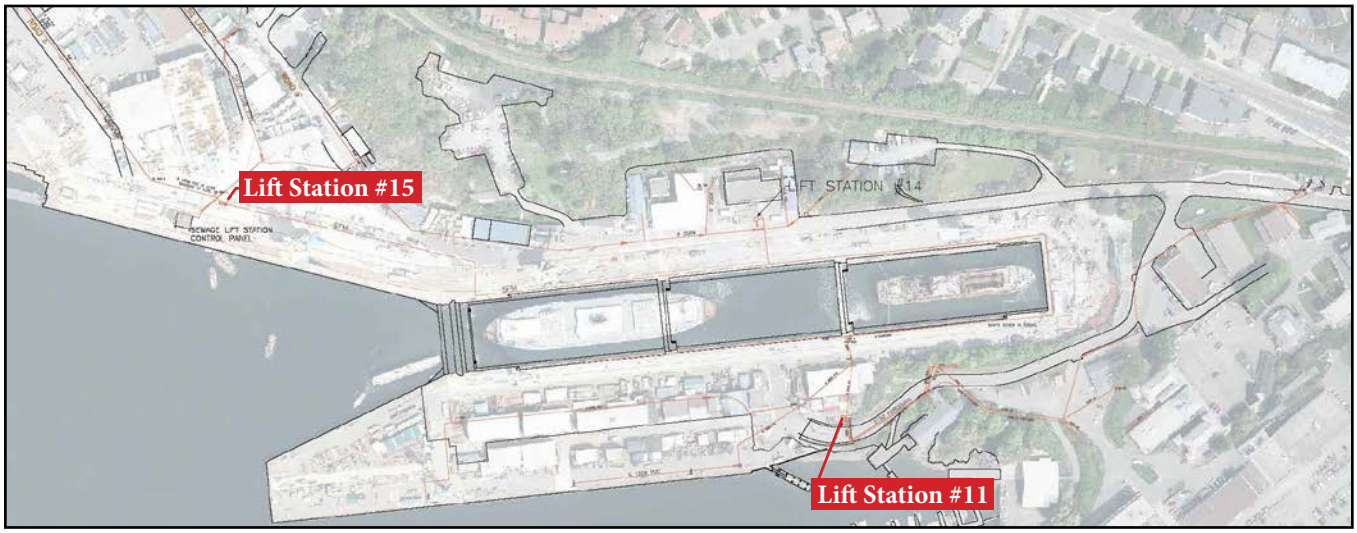
Only utilize spotlights when necessary.

Changing the direction of spotlights can reduce light impact on neighbours.

EBMP #13:
Sanitary Waste Management and Sewer Use

The Esquimalt Graving Dock (*EGD*) is authorized by the Capital Regional District (*CRD*) as a ship and boat waste disposal facility. The authorization allows for the proper discharge of sanitary waste, grey water and superchlorinated water at designated locations at the EGD, and stipulates the requirements that must be met prior to discharge.

Discharge to the sanitary sewer at any location other than at LS#15, LS#11 or at vessel connections located in the services tunnels of the drydock is prohibited.



Lift Station #11.

Lift Station Maintenance.

The EGD is authorized to discharge to the sanitary sewer at:

- Lift Station #15 (*LS#15*),
- Lift Station #11 (*LS#11*), and
- Vessel connections in the drydock.

Permitted wastes include:

- Sanitary waste, *
- Grey water, and
- Treated superchlorinated water.**

Sanitary Waste: *must contain <50,000 ppm total solids.*

***Superchlorinated Water:** must not be discharged to the sanitary sewer unless it has been de-chlorinated to less than 5 ppm chlorine.*

Prohibited wastes include:

- Bilge and ballast water,
- Wastewater sludge, and
- Fuel and oil, paint, paint thinner, solvents, and products containing toxic chemicals.

Other Wastes

Other wastes may be considered for discharge to the sanitary sewer on a case-by-case basis; approval *must be* requested from EGD Management prior to discharge.

Discharge to the sanitary sewer at locations other than those authorized may be considered on a case-by-case basis; approval *must be* requested from EGD Management prior to discharge.

Waste Discharge Notification

Envirosystems Inc. will, as a standard operating procedure, notify the EGD Pumphouse prior to large volume discharges to the sewer system (*e.g. any "batch discharge" in excess of 20,000 litres*). Coordination of discharge may be required depending on usage of the sanitary sewer system at the time.

Envirosystems Inc. will contact the Pumphouse on a regular work day if Envirosystems Inc. is planning to discharge large volumes during times other than Monday to Friday, day shift (*0730 hrs to 1600 hrs*) or on statutory holidays.

Envirosystems Inc. must contact EGD Management if there is a change in normal discharge operations (*e.g. increase in daily volume*).

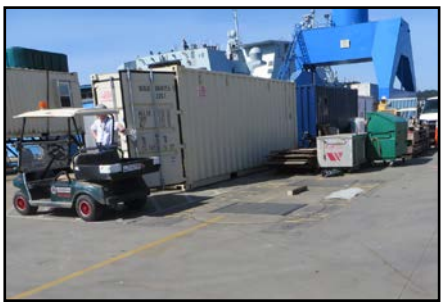
Access to the Sanitary Sewer

- Users must notify the Pumphouse before conducting any discharges to the sanitary sewer. Typical methods of discharge include: large (*direct connection and discharge from a vessel*), and small (*portable discharges from totes and tanks*).
- 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.
- Users must ensure a sample collection point is accessible at the point of discharge.
- Users must request approval from EGD Management to connect directly to the sanitary sewer for regular domestic waste (*e.g. washrooms, sinks, toilets*). Any other waste is prohibited from being discharged of through these lines.

Lift Station Maintenance

- Commissionaires will contact the Pumphouse on radio Channel 4 when DND sewer maintenance personnel enter the facility.
- Pumphouse staff will supervise DND personnel work on the lift stations where required.

AUTHORIZED Sanitary Sewer Discharge point, Lift Station #11.



AUTHORIZED Sanitary Sewer Discharge point, Lift Station #15.

UNAUTHORIZED Sanitary Sewer Discharge point (i.e. storm drain).

UNAUTHORIZED Sanitary Sewer Discharge point (i.e. trench drains).

UNAUTHORIZED Sanitary Sewer Discharge point (i.e. sewer manhole).

EBMP #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 still 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 spill response equipment and materials appropriate to the work they are performing.
- 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.
- Containment boom, deployment reels and boat.
- Pneumatic skimmer with drum and brush recovery modules, deployment and retrieval services.
- Staff trained to deal with land and water based spills.

For spills beyond the capability of the facility to manage, contact *Emergency Management* (EM*BC*). Additional resources will be coordinated for response to land and water based spills.

ALL Spills at the Facility
MUST BE REPORTED to EGD Management.
Details are to be provided in an *Incident or Spill Report*.

Spill response training at EGD.

Spill response training at EGD.

Spill response equipment: Skimmer.

Spill response equipment: Spill Kit.

Environmental Best Management Practices

Assess the situation.

Stop product flow.

Secure the area.

Steps to Spill Response

Assess the Situation

- Never rush in. Warn others in the immediate area.
- Stay upwind of the spill and avoid low lying areas.
- Quickly and accurately gather details that may need to be communicated to spill response personnel and the authorities including:
    - What equipment or work activity is involved?
    - What hazards are associated with the spilled product?
    - How large is the spill?
    - Is the situation under control or is it escalating?
    - What areas are or could be affected?
    - Proposed strategy to contain/control the spill.
    - Notify others in the area of the spill.

Stop Product Flow

- Act quickly to stop product flow, ONLY IF SAFE TO DO SO.
- Activate emergency shutdowns (*if applicable*).
- Close delivery truck manifold valves, etc. (*if applicable*).

Secure the Area

- Clear the area of public and untrained personnel.
- Ensure those onsite are wearing appropriate PPE.
- If spill is indoors, ensure the building is evacuated.
- Isolate large spills in all directions.
- Limit or prevent access to the site.
- Enforce safety procedures.

Contain the Spill

- Approach the spill from an upwind direction and avoid low lying areas.
- Use appropriate PPE (*e.g. gloves, eye protection, respirator*).
- Follow safe work procedures.
- Block drains, culverts, and ditches to prevent entry into waterways, sewers or confined areas.
- Contain spill with absorbent materials (*from spill kits*), earth, sand, or other non-combustible materials.

Notify the Authorities

- Contact your Supervisor immediately.
- Report the spill to EGD Management.
- For spills greater than 100L on land, or any spill of any size that enters the marine environment, contact: Emergency Management (*EMBC*) Reporting Line: 1-800-663-3456.
- Additional reporting requirements may be required depending on the spilled material.

Recovery and Clean Up

- Use appropriate materials to recover spilled product (*e.g. loose absorbent, pads, booms, socks*).
- Place waste in labelled 6mm plastic bags or leak proof containers.
- Store waste in secure, dry, well-ventilated location, away from heat and ignition sources.
- Consult with authorities before removing waste from site.
- Arrange for waste disposal at an approved facility by a qualified contractor.

Investigation & Reporting

- Investigate the spill or incident and complete and submit required reports to the authority having jurisdiction.

Contain the spill.

Environmental Emergency Contacts (24 Hours):

EGD Commissionaires
250-363-3784

Emergency Management (*BC*) Reporting Line
1-800-663-3456

DND QHM
250-363-2160
or
VHF Channel 10

Recovery and clean up.

EBMP #15:
In-Water Hull Cleaning and Maintenance

The cleaning, maintenance and repair of the underwater hull and associated appendages 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.
- In-water hull cleaning of 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 work. This applies to in-water hull cleaning to remove organic growth only, NOT to coating removal.

In-water Maintenance

- In-water maintenance may be considered on a case by case basis and must be approved by EGD Management prior to the commencement of work. In-water maintenance may include but is not limited to:
    - Cleaning of anodes, inlets, props, and transducers for operational and inspection purposes only.

All vessels approved for in-water hull cleaning or maintenance must have a containment boom in place prior to work starting.

Additional requirements may be required on a case by case basis depending on the scope of work involved.

NOTE: Cleaning of the above water hull while berthed alongside the dock is PROHIBITED.

Did You Know?

Antifouling paints and their residues contain heavy metals, such as copper, which 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.

Environmental Best Management Practices

EBMP #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. Good housekeeping programs will identify and assign responsibilities for shift clean up, day-to-day cleanup, proper waste disposal, removal of unused material, and regular inspection.

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 potentially contaminated water could enter the stormwater system.
- Ensure trench and storm drains within designated leased areas are kept clean and free of debris.
- Sweep and/or clean active working areas on a regular basis.

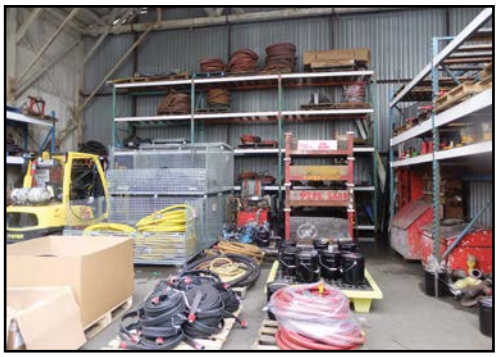
Storage

- Do not store materials or equipment outside of leased areas.
- Regularly inspect lease areas for unidentified or improperly stored materials.
- Ensure all stored products and wastes are clearly labelled and identifiable.
- Place a drip pan underneath vehicles and equipment when performing maintenance. Promptly transfer used fluids to the proper waste or recycling drums.
- Ensure all containers (*e.g. drums, totes, pails*) are in good condition and have a clean exterior at all times. Ensure containers are not left open; secure lids or cover containers when not in use.

INADEQUATE: Keep work areas neat & orderly.

INADEQUATE:
Keep trench and storm drains free of debris.

INADEQUATE:
Ensure storage containers are not left open.



ADEQUATE: Keep work spaces organized and clear of debris to prevent accidents.

EBMP #17: Stormwater Management

Stormwater has been identified as one of the primary pathways of contaminant loading to the local harbour associated with Esquimalt Graving Dock (*EGD*) operations. Common contaminants found in stormwater samples include metals, extractable petroleum hydrocarbons (*LEPH/HEPH)*, and total suspended solids (*TSS*). Five upland stormwater catchment areas terminate into the Esquimalt Harbour from the EGD property. The drydock floor tunnel drainage system leads directly to the Esquimalt Harbour. Any material entering the tunnel drainage system, either through tunnel grate drains or open sump well valves, will end up in the harbour. Deleterious materials must not be allowed to enter the storm or tunnel drain system.

Uplands Stormwater Management

- Store hazardous materials away from storm drains and trenches on the dock floor and in upland areas.
- Ensure totes, drums, pails and skips containing hazardous materials are protected from the weather (*e.g. lids secure, tarps in place*).
- Place filter cloth over storm and trench drains when working with deleterious substances that are in close proximity to, and that could pose a hazard to the marine environment.
- Divert and contain stormwater runoff containing contaminants and sediment with proper materials and filtration, prior to entering the drains (*e.g. use filter cloth, hay bales, sand bags*).
- During heavy stormwater events, ensure storm drains and trenches are kept clear of debris to prevent flooding.
- Conduct regular inspections of storm and trench drains in lease areas to ensure they are kept clear of debris.
- 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.

Prevent deleterious substances entering marine environment by placing filter cloth in the trench drains.

Sand bags used on dock bottom to divert and filter excess water.

Do not allow trench drains to build up with debris. This helps to prevent flooding during heavy stormwater events.

Drydock Floor Stormwater Management

- Stormwater has the potential to mix with washwater and other contaminants on the drydock floor during normal operations. Users of the drydock must plan in advance for stormwater management during their work period.
- To reduce the amount of washwater requiring treatment, stop power washing operations until stormwater can be controlled.
- To prevent contamination of stormwater with washwater, waste sandblast grit and other hazardous materials and wastes, cleanup work areas as soon as possible.
- Sump well valves may be opened to allow stormwater to drain into the tunnel drains when the trench drains, sump wells and dock floor area is clear of contaminants and debris. In the case where washwater collection is completed, but the trench drains, sump wells and dock floor have not been cleaned, a filter cloth may be secured over an open sump well valve to allow stormwater flow. This procedure prevents contaminants and debris from entering the drainage system. This method requires dedicated personnel management of the process and regular filter cloth replacement. Do not poke holes in the filter cloth.
- Tunnel grate drains on the drydock floor in Section 2 and 3 may be uncovered enough to allow stormwater to flow into the drains. Ensure the area is clear of contaminants and debris.
- Sump well valves must be closed in sumps containing visibly contaminated material. Sump wells must be pumped out and cleaned prior to opening the valves.
- Ensure there is capacity in the trench drain/sump well collection system to manage expected stormwater volume. This will allow for continued collection and will prevent flooding of the dock floor.
- Prior to flooding and dewatering of the drydock, ensure all sump well valves are open.

Uplands storm drain with filter cloth. Avoid storing hazardous materials near storm drains, which are directly linked to the marine environment.

Filter cloth secured over sump well valve to allow stormwater flow.

EBMP #18:
Property and Infrastructure Maintenance, Modifications and Construction

Significant environmental issues and potential impacts are known to be related to the management of Esquimalt Graving Dock (*EGD*) property and infrastructure. Any new property and infrastructure construction or modification projects at the EGD must consider environmental issues in project planning and implementation. Common environmental aspects that require consideration and management when planning and implementing projects include: dust emissions, hazardous materials and wastes, storm water runoff, noise, and prevention and response to accidental spills and releases. Requirements for the operational aspects are identified in specific sections of the EGD EBMPs.

Infrastructure Maintenance & Repair

Maintenance and repair of existing facility property and infrastructure often results in waste generation and other environmental aspect considerations to be addressed.

Minor Concrete Work

- Contain dust emissions from cutting and drilling.
- Prevent concrete slurry runoff from entering storm drains.
- Prevent debris from mixing concrete from entering storm drains or the marine environment.
- Prevent concrete slurry runoff from entering the trench and tunnel drains and the "moonpool" on the drydock floor.

Use of Preserved Wood

- Avoid use of creosote preserved wood products where possible.
- Follow applicable guideline for use of preserved wood products.
- Creosote wood waste may be considered a hazardous, restricted or controlled waste, and must be handled and disposed of accordingly.

Demolition/Renovation

- Ensure structures are assessed for the presence of hazardous materials prior to demolition or renovation (*e.g. asbestos, lead based paint, PCB and mercury containing ballasts, mould*).
- Hazardous materials and waste must be handled and disposed of according to applicable regulatory requirements.
- Halocarbon containing equipment must be managed in accordance with the Federal Halocarbon Regulations.

Land Use Application

The EGD Land Use Application (*EGD LUA*) contains sections specific to potential environmental aspects related to the project. These sections must be completed with all relevant information.

EGD Management will respond with additional environmental protection and mitigation measures if required.

Infrastructure Modification & Construction

All modification and construction projects at the EGD must be assessed for environmental impacts, and plans put in place to mitigate the identified impacts. Projects managed by the EGD will be completed in accordance with the national project management system and site specific requirements.

For projects managed by Users:

- Any 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 a property or infrastructure project, the EGD Land Use Application must be completed in full and submitted to EGD Management for review.

Green Space and Vegetation

The EGD property includes areas of vegetation that provides many benefits, including important habitat for wildlife and sensitive native plant species, and act as a buffer between the industrial operations of the facility and the neighbouring residential area.

All projects which have the potential to impact green space, vegetation and wildlife habitat must be reviewed and approved by EGD Management.

Tree and Vegetation Compensation Policy

To facilitate the EGD wildlife management plan and reduce the likelihood of habitat loss at the facility, property and infrastructure projects that require the removal of vegetation must provide compensation in the form of appropriate vegetation replacement. Additional supplies are also required when compensation vegetation is purchased to ensure that new plantings will be successful (*e.g. soil, mulch, tree protection, and water bags*). Consult with EGD Management prior to work to determine what compensation is required.

Soil Management

The EGD has undergone significant capital and operation and maintenance projects in recent years. Extensive investigations into the soil conditions (*e.g. contamination and structure*), utility mapping and identification of archaeological conditions have taken place. The industrial history of the facility has resulted in known 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 Excavation

Planning Excavation

1. Consult with EGD Management prior to excavation to identify:

- Project area and excavation boundaries.
- Known utilities, structures, and historical information regarding the proposed excavation area.
- Known contaminated soil locations and the nature and level of contaminants potentially in the soils to be excavated.
- Archaeologically significant areas, requirements for mitigation of archaeological impacts, and dealing with unanticipated archaeological finds.

2. Prepare a plan for soil management: stockpiling and sampling of soils to be excavated. Key issues to be considered include:

- Turnaround times for sample results may take up to 2 weeks.
- Parameters to be sampled may vary depending on the area of excavation. Common parameters include total metals, leachable metals, PAHs, and hydrocarbons (*LEPH, HEPH*).
- EGD Management must approve stockpile areas.
- Soils which exceed the CCME Industrial Levels or BC CSR Industrial Levels: must be disposed of off site at an approved disposal facility.
- Soils which are below industrial standards: may remain on site if geotechnically suitable, if there is an identified use for the soil, and when approved by EGD Management.

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 the risks. This includes adequate Personal Protective Equipment (PPE) and hygiene practices (e.g. no smoking, wear gloves).

ADEQUATE soil stockpile management. Soils placed on poly and covered.

INADEQUATE stockpile of contaminated soil. Soil should be covered to prevent exposure to elements, runoff and people.

Conducting Excavation

- Ensure appropriate PPE and hygienic precautions are in place to prevent exposure to contaminants in the soils.
- Monitor all excavations for visible soil contamination or archaeologically significant material.
- Ensure soil is stockpiled, sampled and analyzed in accordance with the Environmental Management Act and Contaminated Sites Regulation, and BC Ministry of Environment Technical Guidance Document 1, Site Characterization BC Government Technical Guidance on Contaminated Sites (*January 2009*).
- Ensure soils suspected of contamination are stockpiled on an impervious surface (*e.g. 6 mil PVC or plastic poly liner*) and adequately covered to prevent exposure to wind, storm water runoff or people. Stockpiles must not exceed 50m^3 in size.
- Imported fill material used for surfacing, backfilling or any other use must meet CCME Residential/Parkland (*RL/PL)* Land Usage Soil Quality Guidelines. Fill material information must be provided to and approved by EGD Management before being used on site.

After Excavation

- Ensure all soil is disposed of at a facility that is permitted to accept that material.
- Obtain all disposal records, including: waste manifests, weigh bills and disposal certificates from the receiver.
- Report the volume, analysis results, excavation details and dimensions and disposal records to EGD Management.
- Provide all as-builts and project drawings to EGD Management in the format compatible with the EGD drawing standards.

Archaeological Considerations

The EGD property and surrounding area has a rich First Nations history. There are 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 scope of the project a detailed Archaeological Impact Assessment may be required.
- All Users, including contractors and employees working on excavation projects, must be made aware of the potential for archaeological chance finds. In the case where suspect archaeological material is discovered during excavation, work must stop in that area and EGD Management must be notified immediately.

Archaeological Overview Assessment

An Archaeological Overview Assessment was conducted for the EGD which outlines the archaeologically sensitive areas on the property and identifies areas of high archaeological potential.

Archaeological significant materials found during excavation projects at the facility include shell midden, artifacts, faunal and human remains.

Many archaeologically sensitive areas exist on the EGD Property.

First Nations archaeologists examine materials unearthed during excavations at EGD.

APPENDIX E

PRELIMINARY HAZARD ASSESSMENT FORM

PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	R.112308.001
Location:	Esquimalt Graving Dock
Date:	October 16th, 2020
Name of Departmental Representative:	Rowan Seth Leonard
Name of Client:	PSPC
Name of Client Project Co-ordinator	

Site Specific Orientation Provided at Project Location **Yes** **X** **No** ☐

Notice of Project Required **Yes** **X** **No** ☐

NOTE:
PWGSC requires "**A Notice of Project"** for all construction work related activities.

NOTE:
OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
Examples: Chemical, Biological, Natural, Physical, and Ergonomic Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	**PWGSC, OGD's, or tenants**		**General Public or other contractors**		Note: When thinking about this pre-construction hazard assessment, remember a **hazard** is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the **risk** is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
	Yes	**No**	**Yes**	**No**	
Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc)	**X**		**X**		No natural gas services on site
Slip Hazards or Unsound Footing	**X**		**X**		
Working at Heights	**X**		**X**		
Working Over or Around Water	**X**		**X**		
Heavy overhead lifting operations, mobile cranes etc.	**X**		**X**		

Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.	X		X		
Fire and Explosion Hazards	X		X		
High Noise Levels	X		X		
Excavations	X		X		Active construction sites.
Blasting	X		X		Possible blasting on site during time of project
Construction Equipment	X		X		
Pedestrian Traffic (site personnel, tenants, visitors, public)	X		X		
Multiple Employer Worksite	X		X		

Electrical Hazards					**Comments**
Contact With Overhead Wires	X		X		
Live Electrical Systems or Equipment	X		X		
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions	X		X		Dockside altars/ledges/walkways are slippery
Earthquake	X		X		
Tsunami	X		X		
Avalanche		X		X	
Forest Fires		X		X	
Fire and Explosion Hazards	X		X		
Working in Isolation		X		X	
Working Alone		X		X	Working alone not allowed on project.
Violence in the Workplace	X		X		
High Noise Levels	X		X		
Inclement weather	X		X		
High Pressure Systems	X		X		
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces	X		X		Electrical vaults/pits are confined spaces. Service tunnels are confined spaces.
Suspended / Mobile Work Platforms	X		X		
Other:	X		X		Overhead cranes within EGD
Biological Hazards					
Mould Proliferations		X		X	
Accumulation of Bird or Bat Guano		X		X	
Bacteria / Legionella in Cooling Towers / Process Water		X		X	
Rodent / Insect Infestation		X		X	
Poisonous Plants		X		X	

Sharp or Potentially Infectious Objects in Wastes	X		X		Multiple employer workplace
Wildlife	X		X		Resident deer population
Chemical Hazards					
Asbestos Materials on Site		X		X	None known in project work areas
Designated Substance Present		X		X	
Chemicals Used in work	X		X		Active ship repair facility
Lead in paint	X		X		Paint on steel and concrete surfaces may contain lead
Mercury in Thermostats or Switches		X		X	
Application of Chemicals or Pesticides		X		X	
PCB Liquids in Electrical Equipment		X		X	
Radioactive Materials in Equipment		X		X	
Other:					
Contaminated Sites Hazards					
Hazardous Waste	X		X		Suspected contaminated soils
Hydrocarbons	X		X		Suspected contaminated soils
Metals	X		X		Suspected contaminated soils
Other:	X		X		Suspected contaminated soils

Security Hazards					**Comments**
Risk of Assault	X		X		Multiple employer workplace
Other:	X		X		Unauthorized entry to site
Other Hazards					

Other Compliance and Permit Requirements[1]	**YES**	**NO**	**Notes / Comments[2]**
Is a Building Permit required?			**N/A**
Is a Electrical permit required?	**X**		
Is a Plumbing Permit required?			**N/A**
Is a Sewage Permit required?			**N/A**
Is a Dumping Permit required?			**N/A**
Is a Hot Work Permit required?			**N/A**
Is a Permit to Work required?			**N/A**
Is a Confined Space Entry Permit required?	**X**		
Is a Confined Space Entry Log required?	**X**		
Discharge Approval for treated water required?			**N/A**

Notes:

(1) Does not relieve Service Provider from complying with all applicable federal, provincial, and municipal laws and regulations.

(2) TBD means To Be Determined by Service Provider.

Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		**Date Signed**	
RETURN EXECUTED DOCUMENT TO PWGSC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			