Public Works and Government Services Canada

Requisition No: EZ108-201858

DRAWINGS & SPECIFICATIONS
for

High Voltage Maintenance FY19/20, Esquimalt Graving Dock

Project No.: R.106345.001
December 2019

APPROVED BY:

Mehrabadi, Behzad Digitally signed by: Mehrabadi, Behzad DN: CN = Mehrabadi, Behzad C = CA O = GC OU = PWGSC-TPSGC Date: 2020.01.10 12:11:03 -08'00'	2020-01-10
Regional Manager	Date
	2020-01-10
Construction Safety Coordinator	Date

TENDER:

	2020-01-09
Project Manager	Date

Real Property Services Branch, Professional and Technical Services, Pacific Region
Room 219 - 800 Burrard Street, Vancouver, B.C., V6Z 0B9

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PROFESSIONAL
PROVINCE OF
W. L. RITCHIE
46836
BRITISH COLUMBIA
ENGINEER

2019-12-20

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, 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. 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 main breakers as listed
- Testing of substation battery packs and chargers
- Testing of HV Automatic Transfer Switch
- 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 I-Gard Ground Fault Protection systems at each substation
- 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 HV System Maintenance, Inspection, and Calibration
- Testing of 480V breakers specifically identified in Section 26 08 01 HV System Maintenance, Inspection, and Calibration
- 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
- 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

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

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 February 29 and March 1, 2020

.2 March 7 and 8 2020

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

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

.1 SES Substation, including all equipment and incoming/outgoing HV feeder cabling

.2 SSSR Substation

.3 PHS Substation

Contractor shall make all effort to complete work in the SES substation and SSSR Substation during the first weekend, with priority on the SES substation.

.4 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.

.5 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.

.6 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 shall 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 as per Section 118 of the Workers Compensation Act

.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.

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 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 FAMILIARIZATION WITH SITE

.1 Before submitting tender, visit site areas indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.

1.26 SUBMISSION OF TENDER

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

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, noted copy will be returned and resubmission of corrected submissions, through 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.

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

PWGSC Update on Asbestos Use
Effective April 1, 2016, all Public Works and Government Services Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit the use of asbestos-containing materials. Further information can be found at:
http://www.tpsgc-pwgsc.gc.ca/comm/vedette-features/2016-04-19-00-eng.html

1 General

1.1 REFERENCES

.1 Government of Canada:

.1 Canada Labour Code - Part II

.2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):

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

.3 Canadian Standards Association (CSA) as amended:

.1 CAN/CSA Z797-18 Code of Practice for Access Scaffold

.2 CSA S269.1-16 Falsework and Formwork

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

.4 CSA Z1006-16 – Management of Work In Confined Space

.5 CSA22.2 – Canadian Electrical Code, Part I, Latest Edition

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

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

.5 American National Standards Institute (ANSI):

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

.6 Province of British Columbia:

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

.2 Occupational Health and Safety Regulation

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

1.2 RELATED SECTIONS

.1 Refer to the current NMS Sections indicated in Section 00 10 10 Table of Contents, including:
  .1 01 11 55 General Instructions
  .2 01 33 00 Submittal Procedures
  .3 01 51 00 Temporary Utilities
  .4 26 08 01 HV System Maintenance, Inspection, and Calibration

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 Submittal Procedures.

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

.3 Submit the following:
  .1 Site Specific Safety Plan.

  .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.

  .3 Copies of incident and accident reports.

.4 Complete set of Material Safety Data Sheets (MSDS) and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.

.5 Copy of Contractors' Construction Safety Manual.

.6 Emergency Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Safety Plan and Emergency Procedures, and provide comments to the Contractor within 5 days 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, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:

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

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

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

1.6 RESPONSIBILITY

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

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

.3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with the Site Specific Safety Plan.

.4 All contractor workers must attend an EGD Safety Orientation prior to any work starting.

.5 The contractor is responsible for reviewing the EGD Contractors Safety Handbook and ensuring that the Site Specific Safety Plan and the EGD Contractors Safety Handbook are harmonized.

1.7 HEALTH AND SAFETY COORDINATOR

.1 The contractor shall appoint a 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.

.3 Be on site during execution of work.

1.8 GENERAL CONDITIONS

.1 Provide safety barricades and lights 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 sites.

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

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

1.9 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.

1.10 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, and

.9 Confined space and restricted access space.

.10 Work with hazardous substances.

.11 See Preliminary Hazard Assessment Appendix E

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 permits related to project before start of work.

1.13 FILING OF NOTICE

.1 The Prime Contractor shall submit a Notice of Project to the Provincial authorities.

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

1.14 SITE SPECIFIC SAFETY PLAN

.1 Conduct a site-specific hazard assessment based on a 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 the Site Specific Safety Plan based on hazard assessment, including, but not limited to, the following:

   .1 Primary requirements:

      .1 Contractor's safety policy.

      .2 Identification of applicable compliance obligations.

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

      .4 General safety rules for project.

      .5 Job-specific safe work, procedures.

      .6 Inspection policy and procedures.

      .7 Incident reporting and investigation policy and procedures

      .8 Occupational Health and Safety Committee/Representative procedures.

      .9 Occupational Health and Safety meetings.

      .10 Occupational Health and Safety communication and record keeping procedures.

      .11 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.

   .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 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 as required, and re-submit to the Departmental Representative for review.

.5 Departmental Representative's review: the review of the contractors' Site Specific Safety Plan by PWGSC shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

.1 Designated personnel from own company.

.2 Regulatory agencies applicable to work and as per legislated regulations.

.3 Local emergency resources.

.4 Departmental Representative and other PWGSC staff as required.

(Reference: See EGD Contractors Safety Handbook)

.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 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.

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

1.16 HAZARDOUS PRODUCTS

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

.2 Where use of hazardous and toxic products cannot be avoided:

.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.

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

.3 Provide adequate means of ventilation in accordance with NMS Sections as indicated in Section 00 01 10

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 B.C. OHS Regulations.

1.19 ASBESTOS HAZARD

.1 Modifications to spray- or trowel-applied asbestos surfaces can be hazardous to health.

.2 Removal and handling of asbestos will be performed as per Worksafe B.C. Regulations Part 6 Substance Specific Requirements Asbestos and all applicable regulations.

1.20 PCB REMOVALS

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

.2 When applicable, remove, handle, transport and dispose of as indicated in Section 00 01 10.

1.21 REMOVAL OF LEAD-CONTAINING PAINTS

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

.2 Carry out demolition and any other activities involving lead-containing paints in accordance with Worksafe B.C. Regulations Part 6 Substance Specific Requirements Lead and all applicable regulations.

1.22 SILICA

.1 Carry out work in accordance with Worksafe BC regulations

1.23 ELECTRICAL SAFETY REQUIREMENTS

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

 .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.

 .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

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

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

.3 All electrical isolation procedures will be prepared and performed by EGD electrical staff and will be reviewed with contractors in detail during a safety tailboard meeting prior to the application of contractor’s personal locks and commencement of work

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

.5 All contractors must have their own personal locks and tags that contain their name and contact information that will be applied to the EGD electrical staff’s lockout procedures.

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).

1.27 SCAFFOLDING

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

1.28 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with Worksafe B.C. Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space.

.1 In-ground electrical vaults and high-voltage pits covered under this contract are defined as CONFINED SPACE.

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 B.C. regulations.

1.30 CONFINED SPACE AND RESTRICTED SPACE OUTSIDE OF DEFINED WORK SITE

.1 Carry out work in confined spaces in compliance with Worksafe B.C. 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 B.C. 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 only after receipt of written permission from the Departmental Representative.

1.32 FIRE SAFETY AND HOT WORK

.1 Coordinate all hot work with Departmental Representative through the contractors’ hot work permit system.

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

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

1.33 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.

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 advise the Departmental Representative verbally and in writing.

1.36 POSTED DOCUMENTS

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

 .1 Site Specific Safety Plan.

 .2 Sequence of work.

 .3 Emergency procedures.

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

 .5 Notice of Project.

 .6 Floor plans or site plans.

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

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

.9 Material Safety Data Sheets (MSDS).

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

.11 Electrical installation permit for project work.

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

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

1.37 MEETINGS

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

.2 All personnel employed by the contractor and its subcontractors shall attend the EGD Safety Orientation presentation prior to starting work at the EGD Work Site.

1.38 CORRECTION OF NON-COMPLIANCE

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

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

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

END OF SECTION

1 General

1.1 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls to execute work expeditiously.

.2 Remove from site all such work after use.

.3 Lighting and 120V 15A general-use receptacles will be available within the substation work areas supplied by EGD stand-by generators. During maintenance of the ATS's, contractors will be required to supply their own portable generators to supply temporary lighting and power for their own 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.

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, Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems. It is expected that the Contractor will have access to a copy of this document.

2 Areas and Equipment Covered by this Contract

The following is a list of equipment that shall be tested under the scope of the project, divided into three areas of testing. A fourth section identifies general maintenance to be performed in all areas of work.

2.1 SERVICE ENTRANCE SUBSTATION (SES)

.1 See SES single line diagram in Appendix B:
- SES-10-00 – Service Entrance Substation MV Single Line Diagram, Rev 5
- SES-10-01 – Service entrance Substation LV Single Line Diagram, Rev 5
- SES-11-01 – Service Entrance Substation MV Protection Single Line Diagram (1 of 5), Rev 5
- SES-11-02 – Service Entrance Substation MV Protection Single Line Diagram (2 of 5), Rev 5
- SES-11-03 – Service Entrance Substation MV Protection Single Line Diagram (3 of 5), Rev 5
- SES-11-04 – Service Entrance Substation MV Protection Single Line Diagram (4 of 5), Rev 5
- SES-11-05 – Service Entrance Substation MV Protection Single Line Diagram (5 of 5), Rev 5

.2 T6-SES-SP-12-1
.1 3MVA/4MVA, 600V - 25/12.5kV KNFN Transformer for Generator

.3 1 MW Load Bank and controller
.1 600V, 3W, 1100A, fed from 6SES-SP-0

.4 6SES-1
.1 1600A, 600V breaker, fed from T25/12SES-1

.5 T25/12SES-1
.1 750/1000kVA ANN/ANF 25/12.5kV – 600/347V transformer

.6 SES Battery Bank and Battery Charger
.1 Fed from SES DC Charger 2SES-SP-1

.7 Automatic Transfer Switch
.1 Fed from 6SES-1/Generator

.8 SES Switchgear Lineup
.1 1200A, 25kV, two buses and bus-tie
.2 Switchgear equipment includes all relays, buses, LEDs, PM8000 metering, including PTs and CTs, earthing switches and mechanical linkage, all internal cables and cable components such as surge

arrestors, and all other equipment within the switchgear not specifically listed

.3 Confirm that all equipment within the switchgear is rated for 25kV

.9 All High Voltage cabling incoming or outgoing from the SES. All cables shall be confirmed to be 25kV rated, and include:

.1 Main High Voltage cable incoming from the Department of National Defence. Cable routes from the SES to the EGD property line at manhole 101HV

.2 All outgoing HV feeder cables from the SES

.10 Substation grounding system

.11 Lightning protection system

.12 Inspection and cleaning of the cable pulling vaults underneath the switchgear equipment

2.2 PUMP HOUSE SUBSTATION (PHS)

.1 See PHS single line diagram in Appendix B

- PHS-10-00 – Pumphouse Substation MV Single Line Diagram (1 of 3), Rev 5
- PHS-10-01 – Pumphouse Substation MV Single Line Diagram (2 of 3), Rev 5
- PHS-10-02 – Pumphouse Substation MV Single Line Diagram (3 of 3), Rev 5
- PHS-10-03 – Pumphouse Substation LV Single Line Diagram, Rev 5
- PHS-11-00 – 25/12 PHS Protection Single Line Diagram, Rev 5
- PHS-11-01 – 2.4PHS Protection Single Line Diagram, Rev 5
- PHS-11-03 – 2.4PHS – MCC1 Protection Single Line Diagram (1 of 2), Rev 5
- PHS-11-04 – 2.4PHS – MCC1 Protection Single Line Diagram (2 of 2), Rev 5
- PHS-11-05 – 2.4PHS – MCC2 Protection Single Line Diagram (1 of 2), Rev 5
- PHS-11-06 – 2.4PHS – MCC2 Protection Single Line Diagram (2 of 2), Rev 5

.2 PHS 2400V Compressor #1 and #3

.1 Work includes electrical motor testing only. Mechanical testing is not part of the scope of this work

.3 Main Pumps #1, #2, and #3. 1000hp, 208FLA, 2.2kV
 .1 Equipment includes motor starters, disconnect equipment, vacuum contactors, starting resistors, surge arresters, autotransformers, and any other electrical equipment associated with the pump

.4 Main PHS Switchgear Lineup

 .1 1200A, 25kV, 3 phase bus
 .2 Switchgear equipment includes all relays, buses, LEDs, PM8000 metering, including PTs and CTs, earthing switches and mechanical linkage, all internal cables and cable components such as surge arrestors, and all other equipment within the switchgear not specifically listed
 .3 Confirm that all equipment within the switchgear is rated for 25kV

.5 Auxiliary Pumps #1 and #2. 200hp, 50FLA, 2.3kV

.6 MCC1 and MCC2, 2.4kV switchgear

.7 T25/12PHS-1
 .1 5000/6667kVA, 25/12.5kV – 2400/1386V including transformer temperature control unit

.8 T25/12PHS-2
 .1 750/1000kVA, 25/12.5kV – 347/600V including transformer temperature control unit

.9 T6PHS-1
 .1 500/667kVA, 2400/1386V – 600V

.10 PHS Battery Bank and Battery Charger
 .1 Fed from PHS DC Charger 2PHS-SP-A

.11 6PHS-1 Main Breaker
 .1 1200A, 600V. Fed from T25/12PHS-2

.12 Automatic Transfer Switch
 .1 Fed from 6PHS-1/Generator

.13 Neutral Ground Resistors
.14 Lightning Arrestors

.15 Substation grounding system

.16 Check spare cells in MCC1 and MCC2, including all relays, contactors, and other components.

2.3 SOUTH SIDE SUBSTATION (SSS)

.1 See SSS single line diagram in Appendix B
- SSSR-10-00 – 25/12SSSR Single Line Diagram, Rev 5
- SSSR-10-01 – 2.4SSSR Single Line Diagram, Rev 5
- SSSR-10-02 – 4SSSR-1 and 4SSSR-2 Single Line Diagram, Rev 5
- SSSR-10-03 – 6SSSR-1 Single Line Diagram, Rev 53
- SSSR-11-00 – 25/12SSSR HV Protection Single Line Diagram (1 of 3), Rev 5
- SSSR-11-01 – 25/12SSSR HV Protection Single Line Diagram (2 of 3), Rev 5
- SSSR-11-02 – 25/12SSSR HV Protection Single Line Diagram (3 of 3), Rev 5
- SSSR-11-03 – 2.4SSSR HV Protection Single Line Diagram, Rev 5
- SSSR-13-00 – T25/12SSSR-10 Tap Changer Interlocking Diagram

.2 6SSSR-1-21 Air Compressor 4 Circuit Breaker
.1 1200A, 600V

.3 4SSSR-1-01 Circuit Breaker
.1 4000A, 480V

.4 4SSSR-2-05 Circuit Breaker
.1 1200A, 480V

.5 SSS 1000kVAR 10-step Power Factor Correction and Harmonic Filter Bank
.1 Maintenance will include inspection of the intermittent contactor, which is reported to be not functioning at full capacity
.1 EGD Electrical Department has noted that step #8 specifically is making noises.

.6 4SSSR-REG-01 and 4SSSR-REG-02
.1 2000A splitter, Sec 2/3 Center
.2 3000A bus, 600V

.7 4SSSR-REG-03
.1 This piece of equipment is optional and shall be discussed with EGD staff before maintenance is performed on it

.8 i-Gard Ground Fault protection systems for both 480V and regulated supplies

.9 SSSR Battery Bank and Battery Charger
.1 Fed from SSSR DC Charger 2SSSR-SP-1

.10 Main SSS Switchgear Lineup
.1 1200A, 25kV, 3 phase bus
.2 Switchgear equipment includes all relays, buses, LEDs, PM8000 metering, including PTs and CTs, earthing switches and mechanical linkage, all internal cables and cable components such as surge arrestors, and all other equipment within the switchgear not specifically listed
.3 Confirm that all equipment within the switchgear is rated for 25Kv

.11 2.4SSSR
.1 1200A, 2400V 3phase switchgear

.12 Neutral grounding resistors

.13 Station grounding system

.14 25/12SSSR-Reg
.1 3 x 432kVA, 25kV/14.4kV, 32 x 5/8% taps

.15 25/12SSSR-Reg-BP

.16 T25/12SSSR-1
.1 3000/4000kVA ANAF, 25/12.5kV – 480V transformer including transformer temperature control unit

.17 T25/12SSSR-2
.1 750/1000kVA ANAF, 25/12.5kV – 2.4/1.386kV transformer including transformer temperature control unit

.18 T25/12SSSR-7
.1 2250/3000kVA ANAF, 25/12.5kV – 600/347V transformer including transformer temperature control unit

.19 T25/12SSSR-8
.1 750/1000kVA ANAF, 25/12.5kV – 208/120V transformer including transformer temperature control unit

.20 T25/12SSSR-10
.1 3000/4000kVA ANN/AFF, 25/12.5kV – 515/297V transformer including transformer temperature control unit

.21 Offload Tap Changer
.1 Secondary Voltages include:
- 515V – 421.4V
- 539.5V – 441.4V
- 566.5V – 463.5V
- 596.3V – 487.9V

- 629.4V – 515.0V

2.4 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 Allow for infra-red scanning at maximum possible loads to detect-hot spots. Coordinate this work with EGD Electrical Department.

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

.8 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.

.6 Protective Relay testing in accordance with the requirements outlined herein. Refer to the Attached Appendix A, Public Works & Government Services Canada – Existing Electrical Equipment Settings, indicating the type of existing equipment. Include as-modified mark-ups of coordination curves wherever as-found device settings are modified or differ from as-left settings of Appendix A.

.7 Mark-up drawings contained in Appendix B, including as-found and/or as-modified data on all circuit components included in the work, and investigate and mark-up of items identified on the drawings. Submit marked-up drawings to Departmental Representative with Completion Report.

3 Execution

3.1 GENERAL

.1 Complete the work as per schedule.

.2 Arrange for equipment shutdowns with Departmental Representative.

.3 Do not undertake extra work such as equipment repairs without prior approval of the Departmental Representative.

.4 Verify the electrical system configuration and component device ratings are as per the attached Single-Line Diagrams (SLDs) in Appendix B. Mark up the SLDs with any noted changes and deliver to the Departmental Representative at the completion of the work.

.5 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.
  .3 Contractor shall perform oil sample analysis for all liquid-filled transformers and provide to EGD for future baseline reference

.7 Transformer, Dry Type
  .1 Perform Visual and Mechanical Inspections per NETA Clause 7.2.1.2.1.
  .2 Perform Electrical Tests per NETA Clause 7.2.1.2.2.

.8 Neutral Grounding Resistor, Dry Type
  .1 Perform visual and mechanical inspections and cleaning.
  .2 Perform resistance measurements using low-resistance ohmmeter.

.9 Direct Current System
  .1 Perform Visual and Mechanical Inspections per NETA Clause 7.18.1.3.1 and 7.18.2.1.1.
  .2 Perform Electrical Tests per NETA Clause 7.18.1.3.

.10 Ground Fault Relay System
  .1 Test, calibrate, and verify the control wiring for 480V FPE DSP MKII and 150-tonne crane gantry FPE DSP Mark II ground fault relays as listed.
  .2 Provide written report.

3.3 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, 1m long extendable to 2m, Pfisterer Part No. 364-169-170 or equal.

.2 Minimum of 2 x 3-phase grounding cable sets with 70 mm^2 cable, 1.5m phase lengths, 3m ground length, complete with 3 hot stick-applied and 1 hand-applied ground clamp, Pfisterer Part No. 368-620-070 or equal.

.2 All equipment used during the performance of the work shall be CSA certified.

.1 Submit calibration reports for all testing equipment to be used a minimum of one week prior to the start of work.

END OF SECTION

APPENDICES

APPENDIX A

Public Works & Government Services Canada – Existing Electrical Equipment Settings

APPENDIX A

Public Works & Government Services Canada – Existing Electrical Equipment

Settings

prime engineering

ENGINEER . IMPLEMENT . MAINTAIN

Esquimalt Graving Dock
4517.81 – Station Service Transformer and Low Voltage Switchboard Site Acceptance Testing Report

Client:	EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
2.0	Kevin Bjornson	Eric Sleigh. P.Eng.	November 28, 2016	For Internal Review

November 28, 2016

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

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

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DATE: 2016-11-27 **PROJECT #** 4517.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **Service Entrance Substation (SES) Station Service Transformer/Low Voltage Switchboard Commissioning Report**

Ms. Wallace,

This report documents the site acceptance testing for the Esquimalt Graving Dock station service transformer and low voltage switchboard. The testing and verification has been completed to the requirements of the specifications in accordance with the Canadian Electrical Code (CEC) and the National Electrical Testing Association (NETA).

GENERAL NOTES:

- The purpose of this report is to permit initial energization of T25/12SES-1 and 6SES-1 switchboard.
- This report is in addition to ***"4517.81_25/12SES SAT Report_20161108_Rev 2.0"*** submitted November 17 2016 to permit energization 25/12SES medium voltage switchgear. Because complete construction of the medium voltage cabling (25/12SES-14), station service transformer (T25/12SES-1) and low voltage switchboard (6SES-1) was not complete prior to November 20th 2016, this equipment was not included in any previous reports.

REPORT

Prime Engineering Ltd. has substantially completed commissioning of this new installation for equipment outlined under general notes. As per Section 36 of the Canadian Electrical Code, Part I, with the exception of ***"Items Requiring Attention Prior to Energization"*** we hereby confirm that this installation meets the following requirements:

1. The equipment in this substation is in compliance with applicable CSA standards as required by CEC Rule 2-024 & BCSA Bulletin # B-E3 0710193
2. The operation of high voltage switches or disconnecting means is in accordance with CEC Rules 36-212, 36-214

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

3. The station service transformer is adequately protected in accordance with CEC Rule 26-252, where one of the following must be met:

    a. The transformer has primary protection and secondary protection not set at more than the following percentages of transformer rating (for transformers with percent impedance not more than 7.5%):

Primary Side (Over 750V)		Secondary Side (750V or Less)
Circuit Breaker	Fuses	Circuit Breaker or Fuse
600%	300%	250%

4. Switches, Fuses, and Breakers are adequately rated
5. Insulation testing of the transformer and cabling has been completed at 5000VDC for equipment rated over 750VAC, and 1000VDC for equipment rated 750VAC and less.
6. The entire LV switchboard has been assembled and torqued as per the manufacturer's recommendations.

If there are any questions or concerns regarding the content of this report, please feel free to contact myself as outlined below.

Sincerely,

Kevin Bjornson
Field Service Manager
prime engineering
ENGINEER . IMPLEMENT . MAINTAIN
#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-9089
f: (250) 590-8917
e: kevin.bjornson@primeeng.ca
www.primeeng.ca

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

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ADDITIONAL/SUPPORTING DOCUMENTATION			
Item #	**DWG/DOC#/NAME**	**REV.#**	**COMMENTS**
1	4517.81_2512SES SAT Report_20161108	2.0	Previously Submitted
2	4517.81_25_12SES-PR-14	4.0	T25/12SES-1 Protection Relay
3	4517.81_6SES-1CT Test Results	4.0	Vangaurd Test Reports for 25/12SES CT's
4	4517.81_6SES-1 SPE-1000 Report	-	SPE-1000 Testing/Inspection for 25/12SES modifications
5	4517.81_SES Commissioning Test Equipment Calibration Certificates	-	Test Equipment Calibration Certificates for 25/12SES Testing

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

25/12SES-14 MEDIUM VOLTAGE CABLE TEST

MANUFACTURER:	PRYSMIAN	MFG. DATE:	2016
CIRCUIT ID:	25/12SES-14	FEEDS TO:	T25/12SES-1
CABLE TYPE/INSULATION:	TRXPLE	CONDUCTOR SIZE:	1/0 AWG
TEMPERATURE RATING::	90C	HUMIDITY/TEMPURATURE:	85%/14ºC
LENGTH:	60m	MAXIMUM TEST VOLTAGE:	31 KVAC RMS AT 0.1 HZ
AUTHORIZED BY:	ERIK CHAMBERS (HOULE)	CABLE VOLTAGE RATING:	28KV

VISUAL INSPECTION

	PASS/FAIL/N/A		PASS/FAIL/N/A
CABLE TERMINATIONS:	PASS	SHIELD GROUNDING:	SEE COMMENTS
STRESS CONES:	PASS	SHIELD CONTINUITY:	PASS
CABLE SUPPORT:	PASS		

INSULATION RESISTANCE AT 15 KVDC

LINE A TO GROUND:	116.1GΩ	LINE A-B WITH C GROUNDED:	116.1GΩ
LINE B TO GROUND:	138.8GΩ	LINE B-C WITH A GROUNDED:	138.8GΩ
LINE C TO GROUND:	155.5GΩ	LINE C-A WITH B GROUNDED:	155.5GΩ

TIME WITHSTAND TEST

TIME IN MINUTES	TEST KVAC AT 0.1 HZ	LINE A nF	LINE A uA	LINE B nF	LINE B uA	LINE C nF	LINE C uA
1	31	5.9	112	6.0	116	6.1	119
2	31	5.9	115	5.9	116	6.1	118
3	31	5.9	115	6.0	116	6.1	119
4	31	5.9	115	6.0	116	6.1	119
5	31	5.9	115	6.0	116	6.1	119
6	31	5.9	115	6.0	116	6.1	119
7	31	5.9	115	6.0	116	6.1	119
8	31	5.9	115	6.0	116	6.1	119
9	31	5.9	115	6.0	116	6.1	119
10	31	5.9	115	6.0	116	6.1	119
11	31	5.9	115	6.0	116	6.1	118
12	31	5.9	115	6.0	116	6.1	118
13	31	5.9	115	6.0	116	6.1	118
14	31	5.9	115	6.0	116	6.1	118
15	31	5.9	115	6.0	116	6.1	118

AC INSULATION RESISTANCE AT 0.1 HZ 30 MIN READING:	LINE A	LINE B	LINE C
	17GΩ	17GΩ	17GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-10

GENERAL COMMENTS

- TEST PERFORMED WITH ALL CABLES NOT UNDERTEST CONNECTED TO GROUND
- AT TIME OF TESTING CONCENTRIC NEUTRALS WERE NOT CONNECTED TO GROUND. THIS MUST BE COMPLETE PRIOR TO ENERGIZATION. TEMPPORARY GROUNDS WERE APPLIED TO THE CONCENTRIC NEUTRALS FOR TESTING.

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SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

T25/12SES-1 TRANSFORMERS, DRY TYPE, AIR-COOLED, LARGE

Reference: NETA ATS-2013 Section: 7.2.1.2

CIRCUIT ID:	T25/12SES-1	PHASES:	3 PHASE
FEEDS TO:	6SES-1	HIGH SIDE VOLTAGE:	25000/12500
SERIAL #:	1210038332	HIGH SIDE B.I.L.:	125KV/95KV
TYPE:	ANN/ANF	LOW SIDE VOLTAGE:	600/347
SIZE:	750KVA/1000KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	5.11	MANUFACTURER:	JINPAN INTERNATIONAL
TEMPERATURE RISE:	115°C	MFG. DATE:	2016
CONFIGURATION:	DAB	APARATUS TEMPERATURE:	20°C
TAP POSITION AS FOUND/ LEFT:	C/C	AMBIENT TEMPERATURE:	20°C

TEST AND/OR INSPECTION	ACCEPTABLE RESULTS	RESULT
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify that resilient mounts are free and that any shipping brackets have been removed	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Verify control and alarm settings on temperature indicators	Shall operate within manufacturer's recommendations for specified settings	PASS
Verify that the cooling fans operate and the fans have overcurrent protection	Pass/Fail	PASS
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Perform specific inspections and mechanical tests as recommended by the manufacturer	Pass/Fail	PASS
Verify that as-left tap connections are as specified	Pass/Fail	PASS
Verify the presence of surge arresters	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute winding to winding and each winding to ground	Insulation-resistance values should be above manufacturers limits or if absent greater than table 100.5	PASS
Perform power factor tests on all windings in accordance with test equipment manufacturer's data	CHL on power transformers shall be 2% or less and 5% or less for distribution	PASS

SITE:	Esquimalt Graving Dock		LOCATION:		SES
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Perform turns ratio tests on all tap positions	Turns-ratio test results shall not deviate more than one-half percent from either adjacent coils or calculated ratio	PASS
Perform an excitation current test	For a three-legged core transformer the typical current readings are two high and one low	PASS
Perform winding resistance test on all windings	Temp corrected winding resistance values shall compare to within 1% of previous results	PASS
If the core strap is insulated and removable, measure the insulation resistance at 500VDC	Shall not be less than 1MΩ at 500VDC	PASS
Verify correct secondary voltage, phase to phase and phase to neutral after energization but before loading	Shall be in agreement with nameplate data	SEE COMMENTS
Neutral Grounding Resistor ratings and nameplate information match shop drawings and design requirements	Pass/Fail	N/A

GENERAL COMMENTS
SECONDARY VOLTAGE VERIFICATIONS TO BE PERFORMED AFTER INITIAL ENERGIZATION
POWER FACTOR TEST RESULTS INCLUDED IN THIS REPORT ARE FROM FACTORY TESTING

SITE:	Esquimalt Graving Dock	LOCATION:		SES	
CLIENT:	EECOL	DATE:		November 2016	
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81	

T25/12SES-1 TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T25/12SES-1	PHASES:	3 PHASE
FEEDS TO:	6SES-1	HIGH SIDE VOLTAGE:	25000/12500
SERIAL #:	1210038332	HIGH SIDE B.I.L.:	125KV/95KV
TYPE:	ANN/ANF	LOW SIDE VOLTAGE:	600/347
SIZE:	750KVA/1000KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	5.11	MANUFACTURER:	JINPAN INTERNATIONAL
TEMPERATURE RISE:	115°C	MFG. DATE:	2016
CONFIGURATION:	DAB	APARATUS TEMPERATURE:	20°C
TAP POSITION AS FOUND/LEFT:	C/C	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	SIGNS OF OVERLOADING:	N/A

TRANSFORMER TURNS RATIO HV TO LV

HV VOLTAGE WINDING VOLTAGE CONFIGURATION: 25000V

TAP POSITION	A(3-4)	B(2-4)	C(2-5)	D(1-5)	E(1-6)
VOLTAGE	26250	25625	25000	24375	23750
CALCULATED RATIO:	75.648	73.847	72.046	70.245	68.444
H 1 H 3 X 1 X 0	75.826	74.068	72.221	70.384	68.633
EXCITING CURRENT – mA	≤1mA	≤1mA	≤1mA	≤1mA	≤1mA
H 2 H 1 X 2 X 0	75.766	74.005	72.223	70.287	68.634
EXCITING CURRENT – mA	≤1mA	≤1mA	≤1mA	≤1mA	≤1mA
H 3 H 2 X 3 X 0	75.857	74.013	72.188	70.296	68.634
EXCITING CURRENT – mA	≤1mA	≤1mA	≤1mA	≤1mA	≤1mA

HV VOLTAGE WINDING VOLTAGE CONFIGURATION: 12500V

TAP POSITION	A(3-4)	B(2-4)	C(2-5)	D(1-5)	E(1-6)
VOLTAGE	13125	12813	12500	12188	11875
CALCULATED RATIO:	37.824	36.925	36.023	35.124	34.222
H 1 H 3 X 1 X 0	37.891	36.966	36.031	35.129	34.262
EXCITING CURRENT – mA	7mA	8mA	9mA	10mA	11mA
H 2 H 1 X 2 X 0	37.897	36.972	36.011	35.127	34.223
EXCITING CURRENT – mA	7mA	8mA	9mA	10mA	11mA
H 3 H 2 X 3 X 0	37.887	36.979	36.018	35.151	34.270
EXCITING CURRENT – mA	7mA	8mA	9mA	10mA	11mA

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

INSULATION RESISTANCE – (PERFORMED ON 12.5 KV CONFIGURATION)

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE – GND
TEST VOLTAGE:	5000VDC	1000VDC	1000VDC	500VDC
PI/DAR:	2.74/1.29	3.57/1.48	2.80/1.40	1.44/0.96
INSULATION VALUE:	827 GΩ	1.847 TΩ	858 GΩ	15.25 GΩ
TEMPERATURE CORRECTED:	N/A	N/A	N/A	N/A

WINDING RESISTANCE – (PERFORMED ON 12.5KV CONFIGURATION)

WINDINGS PARALLEL CONNECTED WITH TAP SET IN "C" (2-5) POSITION

HIGH VOLTAGE WINDING

H1	H2	1754.3mΩ	H2	H3	1751.6mΩ	H3	H1	1750.0mΩ

LOW VOLTAGE WINDING

X1	X0	1.33mΩ	X2	X0	1.32mΩ	X3	X0	1.322mΩ

NEUTRAL GROUNDING RESISTOR

MANUFACTURER	N/A	SERIAL NUMBER:	N/A
VOLTAGE V L/N:	N/A	CURRENT RATING:	N/A
N-G RATED OHMS:	N/A	DUTY RATING:	N/A
ENCLOSURE RATING:	N/A	CT RATIO:	N/A

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
RESISTOR BANK CONDITION:	N/A	CT POLARITY AND SECONDARY CONNECTIONS:	N/A
INSULATOR CONDITION:	N/A	NGR MONITOR AND CONNECTIONS	N/A
GROUNDING AS PER DESIGN:	N/A	CT POLARITY AND CONNECTIONS:	N/A
NEUTRAL CONNECTION:	N/A	OVERALL CONNECTION TIGHTNESS:	N/A
NEUTRAL CABLE VOLTAGE RATING:	N/A	FILTERS AND COOLING:	N/A
CLEANLINESS:	N/A	CLEANLINESS:	N/A

ELECTRICAL TESTS

INSULATION RESISTANCE	TEST VOLTAGE	MEGA OHMS	RESISTANCE TEST	TEST CURRENT	OHMS
NGR:	1000VDC	N/A	N-G	1A	N/A
NEUTRAL CABLE:	1000VDC	N/A	G-GROUND BUS	10A	N/A

TEST EQUIPMENT ID

PE-M-10, PE-T-10, PE-D-10

GENERAL COMMENTS

Report Source **Dry Type Transformer**

Session Test Date 12/05/2016 8:52:27 AM

Nameplate

Company	Prime Engineering	**Serial Number**	*
Location	EGD	**Special ID**	4517.81
Division	FAT	**Circuit Designation**	T25/12SES-1
Manufacturer	JINPAN INTERNATIONAL	**Class**	ANN/ANF
Year Manufactured	2016	**Type**	DryTypeTransformer
Mfr Location	USA	**Winding Insulation**	Cast Coil
Coolant	Select Coolant	**Weight**	3600.00 KG
Tank Type	Select Tank Type	**BIL**	125 kV
Dry Tank Type	NA	**VA Rating**	750/1000
kV	25.00 or 12.50-0.600/0.347	**Insulation Material**	Epoxy Mica

Overall Tests – Performed on 12.5kV High Voltage Configuration

#	Insulation	Test kV	mA	Watts	% Pf Meas.	Cap. Pf	Tip UP	IR Man.
1	CH+CHL	10.000	3.373	0.184	0.544	894.613	*	
2	CH	10.000	0.942	0.090	0.955	249.814	*	
3	CHL(UST)	10.000	2.430	0.096	0.397	644.573	*	
4	CHL	0	2.431	0.094	0.385	644.799	*	
5	CL+CHL	0.300	6.640	0.273	0.411	1761.320	*	
6	CL	0.300	4.209	0.172	0.409	1116.540	*	
7	CHL(UST)	0.300	2.431	0.101	0.413	644.917	*	
8	CHL	0	2.431	0.101	0.415	644.780	*	

Excitation Tests – Performed on 12.5kV High Voltage Configuration

	Manufacturer	Type	Position Found	Position Left	Oil Volume
DETC	JST	OFF LOAD	A	A	NA

			H1 H2			H2 H3			H3 H1			
DETC	**LTC**	**Test kV**	**mA**	**Watts**	**X**	**mA**	**Watts**	**X**	**mA**	**Watts**	**X**	**Method:** Manual
A		3	52.029	391.911	L	89.949	664.697	L	85.108	629.757	L	

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

6SES-1 LOW VOLTAGE SWITCHBOARD TEST AND INSPECTION			
MANUFACTURER:	Schneider	MFG. DATE:	Date code: 16-34
CIRCUIT ID:	6SES-1	FEEDS TO:	Distribution
TYPE:	OF9	PROTECTION:	Micrologic 6.0A
SERIAL #:	37100374-047	FAULT BRACING:	22KAIC
AMPACITY:	1000A	VOLTAGE RATING:	600V

MAIN BREAKER INSPECTION				
MAIN BREAKER SETTINGS		PICKUP	TIME DELAY	I^2T ON/OFF
LONG TIME:		0.63(1008A)	0.5	OFF
SHORT TIME:		4.0(4032A)	0.1	OFF
INSTANTANEOUS:		6(9600A)	NA	NA
GROUND FAULT:		D(800A)	0.4	OFF
BREAKER RESISTANCES:		LINE A	LINE B	LINE C
FUSE :		NA	NA	NA
CONTACTS:		103 mΩ	110 mΩ	106 mΩ
INSULATION RESISTANCE AT 1000 VDC	LINE TO LINE:	102.9 GΩ	47.5 GΩ	94.0 GΩ
	LINE TO GROUND:	72.4 GΩ	40.3 GGΩ	36.19 GΩ
	ACROSS CONTACTS:	2.012 TΩ	3.281 TΩ	2.635 TΩ

SECONDARY BREAKER – SWITCH INSPECTION					
ID	TYPE	FRAME SIZE	TRIP SIZE	SETTINGS	FUNCTIONAL TEST
6SES-1-3	JJ	250A	225A	VERIFIED	PASS
6SES-1-4	JJ	250A	150A	VERIFIED	PASS
6SES-1-5	LJ	400A	300A	VERIFIED	PASS
6SES-1-6	LJ	400A	300A	VERIFIED	PASS
6SES-1-7	JJ	250A	150A	VERIFIED	PASS
6SES-1-8	JJ	250A	150A	VERIFIED	PASS
6SES-1-9	JJ	250A	150A	VERIFIED	PASS
REFER TO PROJECT POWER SYSTEM STUDY FOR FEEDER TRIP UNIT SETTINGS					

METER VERIFIED:	PASS	CONTROL WIRING VERIFIED:	PASS

EQUIPMENT ID
PE-D-10, PE-M-10, PE-BTK-3, PE-BTK-5

GENERAL COMMENTS
TIP UNIT TESTING PERFORMED WITH MANUFACTURES TEST DEVICES. RESULTS ARE A PASS/FAIL TEST. ALL TRIP UNITS PASSED APPLICABLE TESTING.
FOR MICROLOGIC 6.2 AND 6.3 TRIP UNITS, FRONT PANEL SELF TEST ALSO PERFORMED
CIRCUIT BREAKER AND PANELBOARD RATINGS SUITABLE FOR THE APPLICATION
NEUTRAL GROUNDED AT ONE LOCATION IN SWITCHBOARD. NEUTRAL CT INSTALLATION VERIFIED.

SITE:	EGD	SUBSTATION:	SERVICE ENTRANCE SUBSTATION (SES)
LOCATION:	VICTORIA	SWITCHBOARD/PNL:	25/12SES
CLIENT:	EECOL	DATE:	2016.11.09
TECHNICIAN:	JS KB	JOB NUMBER:	4517.81

TRANSFORMER PROTECTION RELAY

MANUFACTURER:	SEL	WINDING 1 CT RATIO :	10
CIRCUIT ID:	25/12SES-PR-14	NEUTRAL CT RATIO:	10
PART NUMBER:	0787EX1ACA1A75850330	VOLTAGE SENSING PT RATIO:	60
SERIAL NUMBER:	3161791295	WINDING 2 CT RATIO:	320
MANUFACTURED DATE:	2016	PROTECTED WINDING L-L VOLTS (kV) :	208
FIRMARE REVISION:	R209	PT TRANSFORMER CONNECTION:	WYE
CONTROL VOLTAGE (POWER SUPPLY):	125VDC	WINDING 1 L-L VOLTS (kV):	12.5
CONTROL VOLTAGE (DIGITAL INPUTS):	125VDC	WINDING 2 L-L VOLTS (kV):	0.6
IP ADDRESS:	10.1.16.21	TRANSFORMER MVA CAPACITY:	1
FRONT PANEL BAUD RATE/PASSWORD:	19200	SYSTEM PHASE ROTATION	ABC

METER CHECK

TEST SET OUTPUT	UNIT	MAGNITUDE	ANGLE	RELAY INPUT	UNIT	EXPECTED	RESULT
I1	AMPS	4.62	0	IAW1	AMPS	46.2	46.2
I2	AMPS	4.62	240	IBW1	AMPS	46.2	46.2
I3	AMPS	4.62	120	ICW1	AMPS	46.2	46.2
L1	VOLTS	120	0	VA	VOLTS	7200	7206
L2	VOLTS	120	240	VB	VOLTS	7200	7208
L3	VOLTS	120	120	VC	VOLTS	7200	7200
I4	AMPS	3.01	-210	IAW2	AMPS	963.2	963.1
I5	AMPS	3.01	-330	IBW2	AMPS	963.2	962.8
I6	AMPS	3.01	-90	ICW2	AMPS	963.2	962.7
					KVA	997.92	999
					KW	997.92	999
					KVAR	0	2
					PF	1	1
					IOP PU	0	0
					IRT PU	2	2

DIFFERENTIAL SETTINGS

TAP1	TAP2	U87P	O87P	W1CTC	W2CTC	SLP1%	SLP2%
4.62	3.01	10	0.2	0	1	18	50

2ND HARMONIC BLOCKING %	4TH HARMONIC BLOCKING %	5TH HARMONIC BLOCKING %	HARMONIC RESTRAINT (Y/N)	HARMONIC BLOCK (Y/N)
15	15	35	N	Y

DIFFENTIAL TEST RESULTS

WINDNG 1		UNRESTRAINED PICKUP	RESTRAINED PICKUP	WINDNG 2		UNRESTRAINED PICKUP	RESTRAINED PICKUP
TEST AMPS:		9.24	0.924	TEST AMPS:		10.42664	1.042664
MAX DEVIATION:		9.702	0.9702	MAX DEVIATION:		10.947972	1.0947972
MIN DEVIATION:		8.778	0.8778	MIN DEVIATION:		9.905308	0.9905308
LINE A	RESULTS:	9.25	0.93	LINE A	RESULTS:	10.43	1.03
LINE B	RESULTS:	9.26	0.93	LINE B	RESULTS:	10.43	1.03
LINE C	RESULTS:	9.24	0.93	LINE C	RESULTS:	10.43	1.03
DIFF TIMING:	RESULTS:	33.7 ms	47.4 ms	DIFF TIMING:	RESULTS:	33.4 ms	43.8 ms
TEST NOTE:			87U SETTING REDUCED TO 2 FROM 10 FOR TEST				

SLOPE 1 INITIAL CURRENT SIGNALS			SLOPE 1 EXPECTED CURRENT SIGNALS			SLOPE 1 RESULTS	
RELAY INPUT	MAGNITUDE	ANGLE	RELAY INPUT	MAGNITUDE	ANGLE	MAGNITUDES	IRT MEASURED
IAW1	9.691733333	0	IAW1	9.691733333	0	9.692	0.64
IBW1	9.691733333	-120	IBW1	9.691733333	-120	9.692	IOP MEASURED
ICW1	9.691733333	120	ICW1	9.691733333	120	9.692	3.55
IAW2	6.314311111	-210	IAW2	4.387911111	-210	4.384	SLOPE %
IBW2	6.314311111	-330	IBW2	4.387911111	-330	4.384	18.02816901
ICW2	6.314311111	-90	ICW2	4.387911111	-90	4.384	

2ND HARMONIC BLOCKING

RELAY INPUT	MAGNITUDE	ANGLE	FREQUENCY	INCREASE	EXPECTED VALUES	RESULT	BLOCK %
IAW1	5	0	60		5	5	15.28
IAW1	0	0	120HZ	X	0.75	0.764	

4TH HARMONIC BLOCKING

RELAY INPUT	MAGNITUDE	ANGLE	FREQUENCY	INCREASE	EXPECTED VALUES	RESULT	BLOCK %
IAW1	5	0	60		5	5	15.28
IAW1	0	0	240HZ	X	0.75	0.764	

5TH HARMONIC BLOCKING

RELAY INPUT	MAGNITUDE	ANGLE	FREQUENCY	INCREASE	EXPECTED VALUES	RESULT	BLOCK %
IAW1	5	0	60		5	5	35.08
IAW1	0	0	300HZ	X	1.75	1.754	

OVERCURRENT SETTINGS

TYPE	CURVE TYPE	PICKUP	TIME DIAL	EM RESET (Y/N)	DEFINITE TIME PICKUP	DEFINITE TIME DELAY
PHASE (WINDING 1):	U4	5	2.5	N	96	0.05
PHASE (WINDING 2):	U4	3.2	2.6	N	12.5	0.11
RESIDUAL GROUND (WINDING 1):	C3	3	0.7	N	NA	NA
RESIDUAL GROUND (WINDING 2):	U4	NA	NA	N	2.5	0.4
NEUTRAL:	NA	NA	NA	N	NA	NA

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SITE:	EGD	SUBSTATION:	SERVICE ENTRANCE SUBSTATION (SES)
LOCATION:	VICTORIA	SWITCHBOARD/PNL:	25/12SES
CLIENT:	EECOL	DATE:	2016.11.09
TECHNICIAN:	JS KB	JOB NUMBER:	4517.81

OVERCURRENT TEST RESULTS – PHASE/RESIDUAL GROUND/NEUTRAL

PHASE (WINDNG 1)		PICKUP	3X TAP	5X TAP	INSTANTANEOUS	TARGET	PASS/FAIL
TEST AMPS:		5	15	25	105.6		
TEST DURATION:			1.85	0.675	0.05		
MAX DEVIATION:		5.25	1.9425	0.70875	0.0525		
MIN DEVIATION:		4.75	1.7575	0.64125	0.0475		
LINE A	RESULTS:	5	1.845	0.673	NT	PASS	PASS
LINE B	RESULTS:	5	1.845	0.673	NT	PASS	PASS
LINE C	RESULTS:	5	1.845	0.673	NT	PASS	PASS
PHASE (WINDING 2)		PICKUP	3X TAP	5X TAP	INSTANTANEOUS	TARGET	PASS/FAIL
TEST AMPS:		3.2	9.6	16	13.75		
TEST DURATION:			1.924	0.702	0.11		
MAX DEVIATION:		3.36	2.0202	0.7371	0.121		
MIN DEVIATION:		3.04	1.8278	0.6669	0.1045		
LINE A	RESULTS:	3.2	1.92	0.695	0.113	PASS	PASS
LINE B	RESULTS:	3.2	1.92	0.695	0.113	PASS	PASS
LINE C	RESULTS:	3.2	1.92	0.695	0.113	PASS	PASS
RESIDUAL GROUND (WINDING 1)		PICKUP	3X TAP	5X TAP	INSTANTANEOUS	TARGET	PASS/FAIL
TEST AMPS:		3	9	15	NA		
TEST DURATION:			7	2.3331	NA		
MAX DEVIATION:		3.15	7.35	2.449755	NA		
MIN DEVIATION:		2.85	6.65	2.216445	NA		
RESIDUAL GROUND:	RESULTS:	3	7.01	2.333	NA	PASS	PASS
RESIDUAL GROUND (WINDING 2)		PICKUP	3X TAP	5X TAP	INSTANTANEOUS	TARGET	PASS/FAIL
TEST AMPS:		NA	NA	NA	2.75		
TEST DURATION:			NA	NA	0.4		
MAX DEVIATION:		NA	NA	NA	0.44		
MIN DEVIATION:		NA	NA	NA	0.38		
RESIDUAL GROUND:	RESULTS:	NA	NA	NA	0.4312	PASS	PASS
NEUTRAL		PICKUP	3X TAP	5X TAP	INSTANTANEOUS	TARGET	PASS/FAIL
TEST AMPS:		NA	NA	NA	NA		
TEST DURATION:			NA	NA	NA		
MAX DEVIATION:		NA	NA	NA	NA		
MIN DEVIATION:		NA	NA	NA	NA		
NEUTRAL:	RESULTS:	NA	NA	NA	NA	PASS	PASS

POWER QUALITY TEST RESULTS – VOLTAGE

UNDERVOLTAGE		PICKUP LEVEL 1	PICKUP LEVEL 2	.8 x PICKUP 1	.8 x PICKUP 2	TARGET	PASS/FAIL
TEST VOLTS:		108	60	86.4	48		
TEST DURATION:				2	0.1		
MAX DEVIATION:		113.4	63	2.1	0.12		
MIN DEVIATION:		102.6	57	1.9	0.095		
UNDERVOLTAGE:	RESULTS:	107.9	59.94	2.015	0.1168	PASS	PASS

BREAKER FAIL TEST RESULT

BREAKER FAIL TEST RESULT		PHASE A	PHASE B	PHASE C		TARGET	PASS/FAIL
TEST AMPS:		0.15	0.15	0.15			
TEST DURATION:		0.5	0.5	0.5			
MAX DEVIATION:		0.6	0.6	0.6			
MIN DEVIATION:		0.475	0.475	0.475			
BREAKER FAIL:	PU RESULTS:	0.15	0.15	0.15		PASS	PASS
BREAKER FAIL:	TIMING RESULTS:	0.538	0.535	0.529		PASS	PASS
TEST NOTE:		BF PICK UP TEST PERFORMED VIA R_TRIG IN401. 3 PASE TEST, BASED ON POSITIVE SEQUENCE CURRENT > 0.02 X INOM					

ADDITIONAL TESTS AND INSPECTIONS

DESCRIPTION	RESULT	DESCRIPTION	RESULT
TRIP LED 1 LOGIC	PASS	VERIFY ALL DIGITAL INPUTS/OUPUTS (JUMPER/PULSE)	PASS
TRIP LED 2 LOGIC	PASS	TIME DELAY TRIP OPERATION	PASS
TRIP LED 3 LOGIC	PASS	TIME DELAY CLOSE OPERATION	PASS
TRIP LED 4 LOGIC	PASS	LOCK PUSHBUTTON OPERATION	PASS
TRIP LED 5 LOGIC	PASS	TRIP LOCKOUT/BLOCK CLOSE OPERATION	PASS
TRIP LED 6 LOGIC	PASS	EARTHING SWITCH CLOSE BLOCK (ES CLOSED/UNKOWN STATUS)	PASS
PB1A LED LOGIC	NA	EARTHING SWITCH TRIP (ES CLOSED/UNKOWN)	PASS
PB1B LED LOGIC	NA	RELAY TROUBLE ALARM TO POWER METER	PASS
PB2A LED LOGIC	PASS	PROGRAMABLE DISPLAY POINTS	PASS
PB2B LED LOGIC	PASS	CHECK CONNECTIONS FOR TIGHTNESS	PASS
PB3A LED LOGIC	PASS	FRAME GROUNDING	PASS
PB3B LED LOGIC	PASS	CLEAR SEQUENTIAL EVENT RECORDER	PASS
PB4A LED LOGIC	NA	CLEAR HISTORY	PASS
PB4B LED LOGIC	PASS	DOWNLOAD SETTINGS (AS LEFT) AND COMPARE TO STUDY(S)	PASS

EQUIPMENT ID

PE-RTS-4

GENERAL COMMENTS

ACCEPTABLE FOR SERVICE

ESQUIMALT GRAVING DOCK SERVICE ENTRANCE SUBSTATION MV SWITCHGEAR
25/12SES Protection Relay Settings Report
EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Details**	**Prepared By:**	**Reviewed By:**	**Date**
2.0	For External Review	Kevin Bjornson	Eric Sleigh	April 21, 2016
4.0	Issued for Construction	Kevin Bjornson		October 13, 2016
5.0	As Built	Kevin Bjornson	Keisan Goldsmith	June 27, 2017

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Definitions

Abbreviation	Definition
EGD	Esquimalt Graving Dock
PWGSC	Public Works and Government Services Canada
DND	Department of National Defense
BCH	British Columbia Hydro
WSP	WSP Consulting Engineers
AES	Applied Engineering Solutions
PENG	Prime Engineering
SES	Service Entrance Substation
POI	Point of Interconnection
12F71	BCH designation for distribution line connecting to DND/EGD
25/12SES-PR-XX	Protection relay located in medium voltage equipment 25/12SES and numbered xx
25/12SES-XX	Circuit breaker located in medium voltage equipment 25/12SES and numbered xx
21	Distance Relay
25	Synchronizing or synchronism-check device
32	Directional power relay
47	Phase-Sequence Voltage Relay
50	Instantaneous Overcurrent
50AF	Current supervised arc flash detection
50BF	Current supervised breaker fail detection
51	AC time overcurrent relay
52	Circuit Breaker
86	Lockout Relay
87	Differential Relay
87B	Bus differential relay
87L	Line current differential relay
87T	Transformer differential relay

1 Scope

The scope of this document covers the protection requirements for 25/12SES "Service Entrance Substation". The following is a list of notes, assumptions and future clarifications required.

1. Equipment located within 25/12SES has be designed/rated for 25kV (L-L) /14.4kV (L-N) operating voltage, however will be configured for an initial operating voltage of 12.5kV (L-L)/7.2kV (L-N).
2. All protection settings are based on an initial system operating voltage of 12.5kV (L-L)/7.2kV (L-N). Attempts to obtain power system data on both future high capacity 25kV feeders from BCH were performed to no avail. Prior to any future conversions to 25kV the contents in this document and any protection settings implemented must be reviewed and altered as necessary.
3. 25/12SES will initially be supplied via existing service from DND BCH Feeder 12F71. Protection setting changes to the existing recloser will be required to achieve proper site co-ordination prior to energization.
4. Three by 600V, 725kW future diesel generators proposed to connect to 25/12SES at the 12.5kV or 25kV level thru one 4MVA step up transformer will not be implemented during this project. Protection settings, control schemes, co-ordination studies and arc flash hazarad analysis will need to be reviewed and updated prior to the generators being utilized for emergency distribution to 25/12SES.
5. It is recommended that this document or equivalent information be produced to BCH so project details and additional loading are taken into account on DND BCH Feeder 12F71. BCH will also need to be notified of recloser setting alterations as described in the submitted document For more information refer to *EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0*
6. Distribution line parameters are subject to confirmation from BCH. Additional cable impedances are estimated based on Tender drawings using ETAP typical values.
7. Future BCH-1 and BCH-2 high capacity feeders will not be implemented during this project.
8. Future SEL-411L protection relays for BCH-1 and BCH-2 will only be programmed with basic power system data as part of this project. Until correct utility parameters are known for the future systems, detailed protection settings for these devices will not be included in this report. Section 3 will be reserved for these protection relays.
9. Key interlocking requirements for incoming sources to 25/12SES have been outlined on drawing *4517.12_SES-13-00_5.0.*
10. Any feeder or incoming source that is reserved for future provisions will have overcurrent settings reduced to the minimum values.
11. Any synchronism check elements for future EGD-SESS project generation or future high capacity BCH feeder installations will need to be confirmed via high voltage phasing or other approved methods prior to synchronization attempts between any two sources.

2 DND 12F71 Service Entrance Protection (25/12SES-PR-01) SEL-751

2.1 Distribution Line Parameters

Distribution line lengths are estimate and subject to review. These parameter are not utilized for any protective functions.

SECTION 1-BCH SUBSTATION TO DND		
Field Description	Value	Unit
Length	2.0	km
Conductor size	500 (ASCR)	kCMIL
Positive-sequence resistance – R1	0.2326	Ω
Positive-sequence reactance – X1	0.7236	Ω
Zero-sequence resistance – R0	0.7953	Ω
Zero-sequence reactance – X0	2.3451	Ω
SECTION 2-NADEN TO BCH MH 101HV		
Field Description	Value	Unit
Length	.119	km
Conductor size	500 (ASCR	kCMIL
Positive-sequence resistance – R1	0.0138	Ω
Positive-sequence reactance – X1	0.0431	Ω
Zero-sequence resistance – R0	0.0473	Ω
Zero-sequence reactance – X0	0.1395	Ω
SECTION 3-MH 101HV TO MH 107H		
Field Description	Value	Unit
Length	0.04	km
Conductor size	2x4/0	kCMIL
Positive-sequence resistance – R1	0.008	Ω
Positive-sequence reactance – X1	0.0051	Ω
Zero-sequence resistance – R0	0.0082	Ω
Zero-sequence reactance – X0	0.0677	Ω
SECTION-4 MH 107H TO 25/12SES CB-1		
Field Description	Value	Unit
Length	.250	km
Conductor size	2x4/0	kCMIL
Positive-sequence resistance – R1	0.0503	Ω
Positive-sequence reactance – X1	0.0321	Ω
Zero-sequence resistance – R0	0.0567	Ω
Zero-sequence reactance – X0	0.5217	Ω
OVERALL		
Field Description	Value	Unit
Length	2.41	km
Positive-sequence resistance – R1	0.305	Ω
Positive-sequence reactance – X1	0.804	Ω
Positive-sequence impedance – Z1	0.86	Ω
Positive-sequence line angle	69.23	o
Zero-sequence resistance – R0	0.908	Ω
Zero-sequence reactance – X0	3.074	Ω
Zero-sequence impedance – Z1	3.205	Ω
Zero-sequence line angle	73.54	o

2.2 Configuration Settings

GROUP 1 – MAIN		
UNIT ID LINE 1 (16 Characters)	RID	25/12-PR-01
UNIT ID LINE 2 (16 Characters)	TID	EGD-SES
PHASE CT RATIO (1–5000)	CTR	120
NEUTRAL CT RATIO (1–5000)	CTRN	120
PHASE PT RATIO (1.00–10000.00)	PTR	60
SYNCV PT RATIO (1.00–10000.00)	PTRS	60
XFMR CONNECTION (WYE, DELTA)	DELTA_Y	WYE
SYNCH. CHANNEL CONNECTION	VSCONN	VS
SINGLE V INPUT (Y, N)	SINGLEV	N
LINE VOLTAGE (OFF, 20.00–440.00 V)	VNOM	208
GROUP 1 – LINE PARAMETERS/FAULT LOCATOR		
POS SQ LN Z MAG (0.10–510.00 ohm sec)	Z1MAG	1.72
POS SQ LN Z ANG (5.00–90.00 deg)	Z1ANG	69.23
ZERO SQ LN Z MAG (0.10–510.00 ohm sec)	Z0MAG	6.41
ZERO SQ LN Z ANG (5.00–90.00 deg)	Z0ANG	73.54
LINE LENGTH (0.10–999.00 unitless)	LL	2.41
FLT LOC ENABLE (Y, N)	EFLOC	Y

*Line impedance and angle and distance settings are subject to change/review. These settings may be utilized for fault location on the incoming distribution line and for directional current supervision. There are no directional elements enabled in this relay as EGD is an incoming radial feed only with no requirements presented to Prime Engineering to implement protection settings to prevent fault contributions or power flow back onto the utility system.

2.3 25-Synchronism Check

With future generation to be in excess of 1500kVA, and potentially operating in closed transition with DND 12F71 the following synchronizing guidelines in order to permit closing breaker 25/12SES CB-1 will be implemented to limit system disturbances for both BCH and EGD.

Aggregate Rating of Generators (kVA)	Frequency Difference (HZ)	Voltage Difference (%)	Phase Angle Difference (Degrees)
>1500	0.1	3	10

DND 12F71 will not be permitted to be paralleled to future BCH-1 or BCH-2 via key interlocking, only to a dead BUS-1 or live BUS-1 when all synchronism check parameters are met. Because the parallel connection will only be made to a “slipping” or “rotating” diesel generator source, setting TCLOSED=50 will be implemented to compensate for breaker closing time.

To ensure that the voltage difference between the reference voltage VA from 25/12PT-1 and the synchronizing input voltage VS from 25/12PT-B1 are within an acceptable voltage difference threshold, math variable (MV01) has been implemented to block closing of 25/12SES CB-1 if the percent difference exceeds 3%.

25/12SES CB-1 will be permitted to close on a dead BUS-1 whenever the VS channel under voltage pickup is true, effectively bypassing the synchronism check function/requirements.

GROUP 1 – SYNCHRONISM CHECK		
SYNCH CHECK (Y, N)	E25	Y
VS WINDOW HIGH (0.00–300.00 V)	25VHI	218.00
VS WINDOW LOW (0.00–300.00 V)	25VLO	190.00
V RATIO COR FAC (0.50–2.00)	25RCF	1.00
MAX SLIP FREQUENCY (0.05–0.50 Hz)	25SF	.10
MAX ANGLE 1 (0–80 deg)	25ANG1	10
MAX ANGLE 2 (0–80 deg)	25ANG2	25
SYNCPH PHASE	SYNCPH	330
BRKR CLOSE TIME (OFF, 1–1000 ms)	TCLOSD	50
BLK SYNCH CHECK (SELOGIC)	BSYNCH	52A
LOGIC 1		
SELogic ENABLES	EMV	1
MATH VARIABLES	MV01	(VAB_MAG/VS_MAG) * 100
SV_INPUT	SV07	(25A1 AND (MV01 < 103.00 AND MV01 > 97.00)) OR (59VP AND 27S1T)
SV_TIMER PICKUP (SECONDS)	SV07PU	0.00
SV_TIMER DROPOUT (SECONDS)	SV07DO	0.00
OUT103 FAIL-SAFE	OUT103FS	N
SELLOGIC	OUT103	LT01 OR NOT LT02 OR NOT SV07 # BLOCK CLOSE
GROUP 1 – UNDERVOLTAGE ELEMENTS		
UVS LEVEL 1 (OFF, 2.00–300.00 V)	27S1P	8.00
UVS DELAY 1 (0.00–120.00 s)	27S1D	0.00

2.4 Power Quality Protection

Requirements laid out in *BC Hydro 35 kV and Below Interconnection Requirements for Power Generators, May 2010* were used to determine abnormal conditions for BCH distribution feeders. As such the following power quality protection settings shall conform to the table below. DND 12F71 will be considered to operate within these voltage/frequency ranges and any deviation outside the "Normal Operation" will be deemed undesirable to both BCH and EGD.

2.4.1 27/59 Over/Under Voltage Protection

GROUP 1 – UNDER/OVER VOLTAGE ELEMENTS			
		SETTING VALUE	REFRENCE.
UV TRIP1 LEVEL (OFF, 2.00–300.00 V)	27P1P	108.00 Vsec	≤90%
UV TRIP1 DELAY (0.00–120.00 s)	27P1D	1.95 s	2.0 s
UV TRIP2 LEVEL (OFF, 2.00–300.00 V)	27P2P	60.00 Vsec	≤50%
UV TRIP2 DELAY (0.00–120.00 s)	27P2D	0.11 s	0.16 s
PP UV TRIP1 LEVEL (OFF, 2.00–300.00 V	27PP1P	OFF	N/A
PP UV TRIP2 LEVEL (OFF, 2.00–300.00 V	27PP2P	OFF	N/A
OV TRIP1 LEVEL (OFF, 2.00–300.00 V)	59P1P	127.20 Vsec	≥106%
OV TRIP1 DELAY (0.00–120.00 s)	59P1D	0.95 s	1.0 s
OV TRIP2 LEVEL (OFF, 2.00–300.00 V)	59P2P	144.00 Vsec	≥120%
OV TRIP2 DELAY (0.00–120.00 s)	59P2D	0.11 s	0.16 s

2.4.2 81O/U Over/Under Frequency Protection

GROUP 1 – FREQUENCY			
		SETTING VALUE	REFRENCE.
FREQ1 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D1TP	59.40 Hz	-
FREQ1 TRIP DELAY (0.00–240.00 s)	81D1TD	180.00 s	3 minutes
81D1 TRQCTRL (SELOGIC)	81D1TC	1	-
FREQ2 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D2TP	58.40 Hz	-
FREQ2 TRIP DELAY (0.00–240.00 s)	81D2TD	30.00 s	30 seconds
81D2 TRQCTRL (SELOGIC)	81D2TC	1	-
FREQ3 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D3TP	57.80 Hz	-
FREQ3 TRIP DELAY (0.00–240.00 s)	81D3TD	7.50 s	7.5 seconds
81D3 TRQCTRL (SELOGIC)	81D3TC	1	-
FREQ4 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D4TP	56.40 Hz	-
FREQ4 TRIP DELAY (0.00–240.00 s)	81D4TD	0.00 s	Instantaneous
81D4 TRQCTRL (SELOGIC)	81D4TC	1	-

FREQ5 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D5TP	61.60 Hz	-
FREQ5 TRIP DELAY (0.00–240.00 s)	81D5TD	30.00 s	30 seconds
81D5 TRQCTRL (SELOGIC)	81D5TC	1	-
FREQ6 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D6TP	61.70 Hz	-
FREQ6 TRIP DELAY (0.00–240.00 s)	81D6TD	0.0 s	Instantaneous
81D6 TRQCTRL (SELOGIC)	81D6TC	1	-

2.5 47-Negative Sequence Overvoltage

The negative-sequence voltage type (47) is recommended to detect phase unbalance and phase reversal in the supply or source circuits. Ideal operating sensitivities are about 0.05 PU negative sequence voltage or less. With one such relay connected thru VT's to the secondary supply bus, sufficient negative sequence voltage is generally available for an open phase in the source or upstream system. Also when the phases are reversed 1 PU positive sequence voltage becomes 1 PU negative sequence voltage, so the negative sequence overvoltage protection will certainly respond to phase reversals.

A 2.0 second delay will be implemented to allow for any momentary transient conditions or voltage imbalances.

GROUP 1 – OVER VOLTAGE ELEMENTS			
		SETTING VALUE	REFRENCE.
NSQ OV TRIP1 LVL (OFF, 2.00–300.00 V)	59Q1P	12.0 Vsec	.10 PU V1
NSQ OV TRIP1 DLY (0.00–120.00 s)	59Q1D	2.0 SEC	2.0 SEC
NSQ OV TRIP2 LVL (OFF, 2.00–300.00 V)	59Q2P	OFF	OFF

2.6 51- Overcurrent Protection Phase/Ground

Non directional phase and ground overcurrent settings have been implemented to sufficiently coordinate with BC Hydro Feeder protection for DND 12F71, maintaining or exceeding the .4sec clearing time between devices. Of note, some adjustments will be required to the existing relcoser to achieve proper coordination with BCH and allow for maximum transformer inrush. Being that this recloser and

DND 12F71 service entrance protection relay are in series, both devices have been set to match overcurrent characteristics. For more information refer to *EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0*

GROUP 1 – OVERCURRENT ELEMENTS/TIME OVERCURRENT ELEMENTS		
TOC TRIP LVL (OFF, 0.25–24.00 A)	51P1P	3.8
TOC CURVE SEL (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5)	51P1C	C3
TOC TIME DIAL (0.50–15.00)	51P1TD	0.4
EM RESET DELAY (Y, N)	51P1RS	N
CONST TIME ADDER (0.00–1.00 s)	51P1CT	0.00
MIN RESPONSE TIM (0.00–1.00 s)	51P1MR	0.00
TOC TRQ CONTROL (SELOGIC)	51P1TC	1
TOC TRIP LVL (OFF, 0.25–24.00 A)	51P2P	OFF
OC TRIP LVL (OFF, 0.25-100.00A)	51G1P	35
OC TIME DELAY (0.00-400)	51G1D	0.14
OC RESIDUAL TORQUE CONTROL	50G1TC	1
TOC TRIP LVL (OFF, 0.25–24.00 A)	51G1P	1.5
TOC CURVE SEL (U1, U2, U3, U4, U5, C1, C2, C3, C4, C5)	51G1C	C3
TOC TIME DIAL (0.50–15.00)	51G1TD	1
EM RESET DELAY (Y, N)	51G1RS	N
CONST TIME ADDER (0.00–1.00 s)	51G1CT	0.00
MIN RESPONSE TIM (0.00–1.00 s)	51G1MR	0.00
TOC TRQ CONTROL (SELOGIC)	51G1TC	1
TOC TRIP LVL (OFF, 0.25–24.00 A)	51G2P	OFF

2.7 50AF-Arc Flash Detection

The SEL-751 offers advanced arc-flash protection capability aimed at minimizing the hazards associated with high energy arc (faults) in metal enclosed and metal-clad switchgear. The system supports four fiber-optic light sensors capable of detecting the high energy arc-flash events and tripping the breaker within milliseconds of the fault. Light sensors are supervised with and instantaneous overcurrent element offering enhanced security against false trips.

This protection system can support two different type of fiber optic light sensor. The first type is the omni-directional point sensor optimized for installation in individual switchgear compartments. This sensor will be utilized in the feeder outgoing cable sections outlined in Section 6. The second sensor is the clear-jacketed fiber loop sensor optimized for protection of long, distributed resources, such as switchgear bus compartments. For the purpose of the 25/12SES-PR-01, the clear jacketed fiber loop sensor will be employed.

Due to the overall length of 25/12SES, two different loop sensors will be installed to cover both BUS-1 and BUS-2 on either side of the bus tie breaker 25/12SES CB-5. BUS-1 loop sensor will only consist of a small “black jacketed” section to extend the open loop sensor to the rear of Section #15 control compartment before being ran to the tie breaker Section #6. BUS-2 loop sensor will consist of a longer length of “black jacketed” section that will extend and overlap slightly with BUS-1 sensor in the tie breaker Section #6 before exposing the loop sensor that will extend to the end of Section #1 detection arc flash events on BUS-2.

Since the fast overcurrent detectors do not reject harmonics and therefore have a natural tendency to “overreach” under high harmonic load conditions the 50PAFP/50NAFP current settings should be set close to 2 times the expected maximum load level. The phase current pickup value will be set at two times 90% of the phase time overcurrent pickup setting. The neutral element measured by the IN input will be set at two time 90% of the ground time overcurrent setting.

GLOBAL - ARC FLASH PROTECTION		
AF PH OC TRP LVL (OFF, 0.50–100.00 A)	50PAFP	6.84
AF N OC TRP LVL (OFF, 0.50–100.00 A)	50NAFP	2.70
SELECT ARC-FLASH OUPUT SLOT	AOUTSLOT	301_4
SENSOR 1 TYPE (NONE, POINT, FIBER)	AFSENS1	FIBER
TOL 1 PICKUP (3.0–20.0% {POINT}, 0.6–4.0%	TOL1P	0.6
SENSOR 2 TYPE (NONE, POINT, FIBER)	AFSENS2	FIBER
TOL 2 PICKUP (3.0–20.0% {POINT}, 0.6–4.0%	TOL2P	0.6
SENSOR 3 TYPE (NONE, POINT, FIBER)	AFSENS3	NONE
SENSOR 4 TYPE (NONE, POINT, FIBER)	AFSENS4	NONE

2.8 50BF-25/12SES CB-1 Breaker Fail Detection

Breaker fail logic will be implemented to trip 86B1 (BUS-1 lockout relay described in Section 5). If a trip is issued, the breaker fail delay will begin if any of the phase currents remain greater than the current detector setting. If any of the phase current remains greater than the current threshold after the breaker fail delay, breaker fail will be asserted from 25/12SES-PR-01 to trip 86B1.

GLOBAL - BREAKER FAIL		
52A INTERLOCK (Y, N)	52ABF	N
CURRENT DETECTOR (0.10–10.00 A)	50BFP	0.1
BK FAILURE DELAY (0.00–2.00 s)	BFD	0.5
AUX TIMER DELAY (OFF, 0.00–2.00 s)	ATD	OFF
BK FAIL INITIATE (SELOGIC)	BFI	R_TRIG TRIP OR R_TRIG IN401

2.9 52PB-Trip/Close Pushbuttons (Time Delayed)

Along with the “pistol grip” style breaker control switch to operate 25/12SES CB-1, programmable pushbuttons located on the SEL-751 front panel will be implemented to allow the operator to retreat to a safe location prior to circuit breaker operation. Typical initiating times after the pushbuttons have been programmed as 15 seconds, but can be adjusted as desired.

3 BCH-1 and BCH-2 Future High Capacity Feeders (25/12SES-PR-03A, 25/12SES-PR-03B, 25/12SES-PR-04A and 25/12SES-PR-04B,)

This section is reserved for future protection relays settings for 25/12SES-PR-03A, 25/12SES-PR-03B, 25/12SES-PR-04A and 25/12SES-PR-04B.

Note: Only power system parameters, breaker fail and basic control functions have been implemented in this protection relay. Synchronism check has been incorporated for testing purposes only for EGD-SESS project and is subject to review and further testing for future feeder connections. Protection and control schemes for this relay to be completed by others during BCH high capacity feeder implementation projects.

4 Future Standby Diesel Transformer Protection (25/12SES-PR-02A) SEL-787.

Three 600V, 725kW future diesel generators are proposed to connect to 25/12SES at the 12.5kV level thru one 4MVA step up transformer. Connection to 25/12SES will occur thru circuit breaker 25/12SES CB-2 and be monitored by protection relay 25/12SES-PR-02A. Because this future generator source will be used in a transfer system scheme in conjunction with the utility feed DND 12F71 thru 25/12SES CB-1, and the SEL 787 does not perform synchronism check, an additional protection relay has been installed (25/12SES-PR-02B Basler ES-25) to provide dead bus and synchronism check functions.

4.1 Configuration Settings

GROUP 1 – SET 1-IDENTIFIER		
UNIT ID LINE 1 (16 Characters)	RID	25/12-PR-02A
UNIT ID LINE 2 (16 Characters)	TID	EGD-SES
GROUP 1-SET 1-CONFIGURATION		
WDG1 CT CONN (DELTA, WYE)	W1CT	WYE
WDG2 CT CONN (DELTA, WYE)	W2CT	WYE
WDG1 PHASE CTR	CTR1	120
WDG2 PHASE CTR	CTR2	800
MAX XFMR CAP (OFF, 0.2–5000.0 MVA)	MVA	4.0
DEFINE CT COMP (Y, N)	ICOM	Y
WDG1 CT COMP (0–12)	W1CTC	12
WDG2 CT COMP (0–12)	W2CTC	1
WDG1 L-L VOLTS (0.20–1000.00 kV)	VWDG1	12.5
WDG2 L-L VOLTS (0.20–1000.00 kV)	VWDG2	.6
NEUT 1 CT RATIO	NTR1	10000
PHASE PT RATIO (1.00–10000.00)	PTR	60
NOMINAL VOLTAGE (0.20–1000.00 kV)	VNOM	12.5
PT CONNECTION (DELTA, WYE)	DELTA_Y	WYE
VOLT-CURR WDG (1, 2)	VIWDG	1
SINGLE V INPUT(Y,N)	SINGLEV	N

4.2 Future Standby Transformer Nameplate (XXXXX) "Circuit Designation to be confirmed"

XXXXX NAMEPLATE	
Manufacturer	EATON COOPER POWER SERIES
Size (MVA)	3.0/3.9 MVA (85˚C) KNAN/KNAF
Rated High Voltage Winding (KV)	12470Y/7200 x 24940/14400
Rated Low Voltage Winding (KV)	600
Impedance (%)	6.0%
Taps	+/- 5.0% (On High Voltage Winding)
Connection:	Dy1

4.3 Differential Protection

GROUP 1 – SET 1-IDENTIFIER		
XFMR DIFF ENABLE (Y, N)	E87	Y
WDG1 CURR TAP	TAP1	1.54
WDG2 CURR TAP	TAP2	4.81
OPERATE CURR LVL	O87P	0.50
DIFF CURR AL LVL	87AP	0.25
DIFF CURR AL DLY	87AD	5.0
RESTRAINT SLOPE1 (5–90 %)	SLP1	18
RESTRAINT SLOPE2 (5–90 %%)	SLP2	50
RES SLOPE1 LIMIT (1.0–20.0 TAP)	IRS1	6.0
UNRES CURR LVL (1.0–20.0 TAP)	U87P	10.0
2ND HARM BLOCK (OFF, 5–100 %)	PCT2	15
4TH HARM BLOCK (OFF, 5–100 %)	PCT4	15
5TH HARM BLOCK (OFF, 5–100 %)	PCT5	35
5TH HARM AL LVL (OFF, 0.02–3.20 TAP)	TH5P	OFF
HARMONIC RESTRNT (Y, N)	HRSTR	Y
HARMONIC BLOCK (Y, N)	HBLK	N

The SEL 787 relay offers dual slope percentage differential protection. The dual slope feature accommodates for CT saturation, CT errors and errors due to tap changing.

Differential zones will protect both transformer windings against internal faults but also employ selectivity to not falsely operate for thru fault conditions. This will allow faults within main power transformer, main power cabling, and some of the various medium voltage switchgear/low voltage switchboard to be detected quickly and cleared.

4.3.1 Winding WnCTC (CT connection compensation)

This transformer is an Yd1 connected step up unit (600V DELTA to 25/12.5kV WYE) with the polarity of X1 connected to the non-polarity point of X3, implying a DAC type Delta connection. In this instance the WYE connected secondary windings lead the Delta connected primary windings by 30 electrical degrees.

Current transformer secondary wiring connections to the new SEL 787 relay will utilize WYE configurations. The SEL 787 relay uses an internal CT connection matrix compensation to account for phase shifts in the transformer winding and CT connections. Below is an explanation for the connection compensation constants that will be utilized.

W1CTC = 12 (Reference Winding)

W2CTC = 1 (To apply one 30° phase shift in a counter clockwise direction. Establishes a 180° displacement from the reference winding used for the differential calculation).

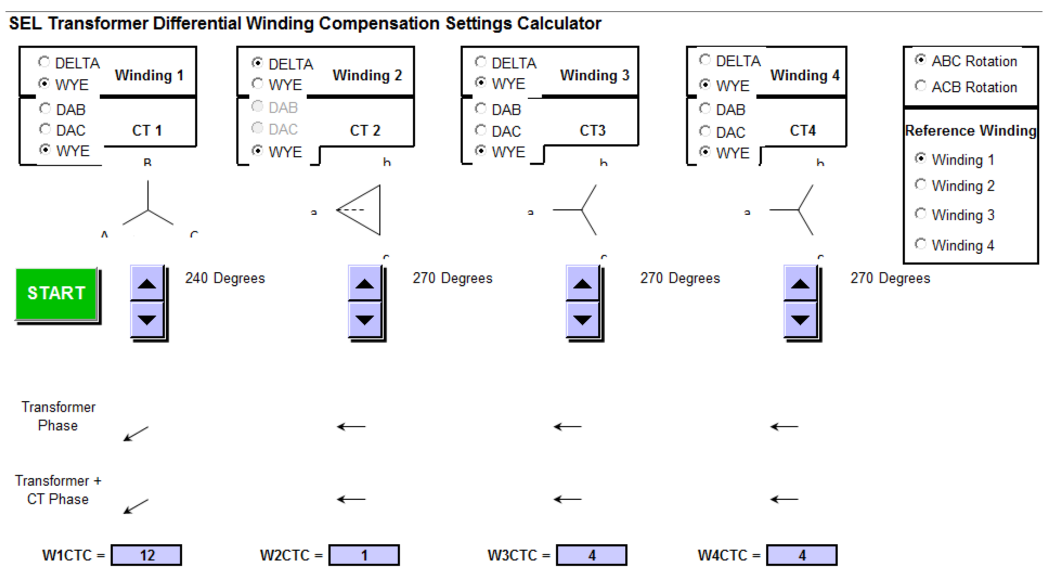

Figure 1 - SEL Transformer Differential Winding Compensation Settings Calculator T25/12SES-1

4.3.2 Current Tap

The relay uses a standard equation to set TAP*n*, based on settings entered for the particular winding. (*n* denotes the winding number.)

$$\text{TAPn} = \frac{\text{MVA} \bullet 1000}{\sqrt{3} \bullet \text{VWDGn} \bullet \text{CTRn}} \bullet \text{C}$$

where:

C = 1 if W*n*CT setting = Y (wye-connected CTs)
C = √3 if W*n*CT setting = D (delta-connected CTs)
MVA = maximum power transformer capacity setting (must be the same for all TAP*n* calculations)
VWDG*n* = winding line-to-line voltage setting, in kV
CTR*n* = current transformer ratio setting

TAP1 = 4*1000/(1.732*12.5*120)*1.00 = 1.54
TAP2 = 4*1000/(1.732*.6*800)*1.00 = 4.81

4.3.3 Restrained Element Operating Pickup

Set the restrained element operating pickup at a minimum for increased sensitivity but high enough to avoid operation because of steady-state CT error and transformer excitation current:

O87P Min ≥ (0.1*INOM)/TAP MIN
O87P≥ (0.1*5)/1.54 = 0.32 Set 087P = .5

4.3.4 Unrestrained Element Current Pickup

Set the unrestrained element high enough so as not to react to large inrush currents. Because there is no harmonic blocking associate with this element, set magnitude to clear inrush which is expected to be 10 times transformer FLA.

U87P=10

4.3.5 Slope 1 and Slope 2 Settings

The slope setting in differential protection is used to accommodate for:

- Power Transformer Tap Changer
- Magnetizing Current
- Relay Error
- CT Error
- Current Mismatch from actual interposing CT

This transformer has an “Off-Load Tap Changer” which may vary the outgoing voltage by +/- 5.0%. Total voltage deviation in per unit: a = .05 or 5%

Estimated CT error: e= .1 or 10%

Using these two values and assuming the worst case scenario for a through-current situation using the measured maximum positive value of the input currents, the maximum measured negative value of the output currents as well as being offset by the maximum tap changer variation the following can be calculated:

(2*e+a+e*a)/(1+a)*100 = 25.5%

Note that the restraint current is defined as the sum of the winding currents, which equals 2.0 per unit for through-current conditions. Therefore the differential current as a percentage of the restraint current (also known as slope) is

Slope = (25.5/2) = 12.75%

In addition the following factors need to be considered:

Estimated excitation current for these transformers: 3%

Maximum Relay error: 5%.

Total error: 12.75%+3%+5%= 20.75%

Using only one slope, a conservative slope setting, SLP1 would be 20.75 percent. This would represent a fixed percentage differential application and is a good average setting to cover the entire current range.

A two-slope or variable-percentage differential application, improves sensitivity in the region where CT error is small and increases security in the high-current region where CT error is great. Both slopes must be defined as well as the slope 1 limit or crossover point, IRS1. With lower thru faults or normal loading conditions, if assumed CT error is 1 percent slope 1 could be set at 16%: The slope 1 setting will be set slighting higher to avoid nuisance tripping to 18%. IRS1 will be set to 6.0 per unit of TAP as recommended by SEL.

SLP2 setting should be in the 25-70% range to avoid problems with CT saturation at high currents. Slope 2 will be set to 50%.

4.3.6 Harmonic Restraint

Second, Fourth and Fifth Harmonic blocking will be employed to block false differential trips during transformer inrush or over-excitation situations. Recommended and default settings of 15% and 35% will be applied respectively.

4.3.7 Transformer Auxiliary Protection:

Transformer auxiliary protection not incorporated in the SEL 787 will be winding or oil temperature triggered from the Electronic Temperature Monitor (ETM). This device will also perform transformer cooling for those units equipped with fans. Configuration of the ETM and wiring and testing to trip the transformer protection relay is to be performed by others under the EGD SESS-Generator project.

4.4 51- Overcurrent Protection Phase/Ground

Refer to *EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0* for overcurrent protection settings

4.5 Power Quality Protection

Because the future diesel generators will act as a source to the entire EGD facility, power quality protection has been incorporated within 25/12SES-PR-02A with a similar philosophy as that described for 25/12SES-PR-01 in Section 2.4. However, only four levels of frequency protection are available in the SEL 787 protection relay and because the diesel generators are not as stable as the utility grid, time delays have been added to the low and high end frequency settings to prevent nuisance tripping during large load applications and removal (i.e. main dewatering pump starting and stopping).

4.5.1 27/59 Over/Under Voltage Protection

GROUP 1 – UNDER/OVER VOLTAGE ELEMENTS			
		SETTING VALUE	REFRENCE.
UV TRIP1 LEVEL (OFF, 2.00–300.00 V)	27P1P	108.00 Vsec	≤90%
UV TRIP1 DELAY (0.00–120.00 s)	27P1D	1.95 s	2.0 s
UV TRIP2 LEVEL (OFF, 2.00–300.00 V)	27P2P	60.00 Vsec	≤50%
UV TRIP2 DELAY (0.00–120.00 s)	27P2D	0.11 s	0.16 s
OV TRIP1 LEVEL (OFF, 2.00–300.00 V)	59P1P	127.20 Vsec	≥106%
OV TRIP1 DELAY (0.00–120.00 s)	59P1D	0.95 s	1.0 s
OV TRIP2 LEVEL (OFF, 2.00–300.00 V)	59P2P	144.00 Vsec	≥120%
OV TRIP2 DELAY (0.00–120.00 s)	59P2D	0.11 s	0.16 s

*Under voltage elements supervised in trip logic by breaker status. (Enabled only when breaker is closed)

4.5.2 81O/U Over/Under Frequency Protection

GROUP 1 – FREQUENCY			
		SETTING VALUE	REFRENCE.
FREQ1 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D1TP	58.40 Hz	-
FREQ1 TRIP DELAY (0.00–240.00 s)	81D1TD	30.00 s	30 seconds
FREQ2 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D2TP	56.40 Hz	-
FREQ2 TRIP DELAY (0.00–240.00 s)	81D2TD	1.00 s	1.0 Seconds
FREQ3 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D3TP	61.60 Hz	-
FREQ3 TRIP DELAY (0.00–240.00 s)	81D3TD	30.00 s	30 seconds
FREQ4 TRIP LEVEL (OFF, 15.00–70.00 Hz)	81D4TP	61.70 Hz	-
FREQ4 TRIP DELAY (0.00–240.00 s)	81D4TD	1.00 s	1.0 Seconds

*Under frequency elements supervised in trip logic by breaker status. (Enabled only when breaker is closed)

4.6 47-Negative Sequence Overvoltage

Similarly to protection relay 25/12SES-PR-01 (Section 2.5) the negative-sequence voltage type (47) will be utilized to detect an open phase or unbalance as well as protection against phase reversals. The SEL 787 minimum setting is 12.5 volts secondary and will be set to this value corresponding to .10 PU negative sequence voltage.

GROUP 1 – OVER VOLTAGE ELEMENTS			
		SETTING VALUE	REFRENCE.
NSQ OV TRIP1 LVL (OFF, 12.50–300.00 V)	59Q1P	12.5 Vsec	.05 PU V1
NSQ OV TRIP1 DLY (0.00–120.00 s)	59Q1D	2.0 SEC	2.0 SEC
NSQ OV TRIP2 LVL (OFF, 2.00–300.00 V)	59Q2P	OFF	OFF

4.7 50BF-25/12SES CB-2A Breaker Fail Detection

Breaker fail logic will be implemented to trip 86B1 (Refer 86-Lockout Relays described in Section 5.6). If a trip is issued, the breaker fail delay will begin if sum of the positive-sequence and negative-sequence currents exceed 0.02*INOM (0.02*5.00). If the current remains greater than the current threshold after the breaker fail delay, breaker fail will be asserted to trip 86B1.

GLOBAL - BREAKER FAIL		
52ABF INTERLOCK (Y, N)	52ABF	N
BK FAILURE DELAY (0.00–2.00 s)	BFD1	0.5
BK FAIL INITIATE (SELOGIC)	BFI1	R_TRIG TRIP1 OR R_TRIG IN401
BK FAILURE DELAY (0.00–2.00 s)	BFD2	0.5
BK FAIL INITIATE (SELOGIC)	BFI2	R_TRIG TRIP2 OR R_TRIG IN401

4.8 25/12SES CB-2A Breaker Tripping

Upon detection of an abnormal condition 25/12SES-PR-02A contains provisions to trip the following circuit breakers:

LOCKOUT RELAY TRIPS					
		25/12SES-PR-02A	52-G1*	52-G2*	52-G3*
TRIP 1 EQUATION	TR1	X	X	X	X
TRIP 2 EQUATION	TR2	X	X	X	X

*Circuit designations to be confirmed under EGD-SESS project. Connections and trip verifications from this protection relay to these circuit breakers to be confirmed by others.

4.9 25/12SES –PR-02B - Synchronism Check

Synchronism check to supervise closure of 25/12SES CB-2 will be incorporated utilizing a Basler ES-25 protection relay as the SEL 787 relay does not offer this functionality. This relay offers true synch-check protection by monitoring the phase displacement (adjustable from 1-20 degrees) voltage difference (adjustable from 5-30%) and slip frequency (fixed at 0.5 Hz) between the two sources and will also be equipped with a dead bus feature which will allow closure of 25/12SES CB-2 if the sensed BUS-1 voltage is less than 8% (fixed) of the nominal input.

25/12SES-PR-02B Synchronism Check Settings		
	RANGE	SETTING
PHASE DISPLACEMENT DIAL	1-20 DEGREES	3 DEGREES
VOLTAGE DIFFERENTIAL DIAL	5-30%	10%
SLIP FREQUENCY	FIXED	0.5
DEADBUS CLOSURE	FIXED	8% OF NOMINAL INPUT

*Because the Basler ES-25 permits dead source dead bus closures, to prevent the circuit breaker from closing for dead source/dead bus, generator undervoltage block close logic implemented in 25/12SES-PR-02A.

5 Bus Protection (25/12SES-PR-05A and 25/12SES-PR-05B) SEL-487E

5.1 Configuration Settings

GROUP 1 – SET 1 – RELAY CONFIGURATION		
ENABLE CURRENT TERMINALS (S,T,U,W,X OR OFF)	ECTTERM	S,T,U,W,X*
ENABLE VOLTAGE TERMINALS (V,Z OR OFF)	EPTTERM	V,Z
INCLUDE TERMINALS IN DIFFERENTIAL ELEMENT (S,T,U,W,X OR OFF)	E87	S,T,U,W,X*
ENABLE NUMBER OF RESTRICTED EARTH FAULT ELEMENTS	EREF	N
ENABLE DEFINITE TIME O/C ELEMENTS FOR TERMINALS (S,T,U,W,X OR OFF)	E50	T
ENABLE THE FOLLOWING NUMBER OF INVERSE TIME O/C ELEMENTS	E51	2
ENABLE CURRENT UNBALANCE ELEMENTS FOR TERMINALS (S,T,U,W,X OR OFF)	E46	N
ENABLE THE FOLLOWING NUMBER OF OVERVOLTAGE ELEMENTS (N, 1-5)	E59	N
ENABLE THE FOLLOWING NUMBER OF UNDERVOLTAGE ELEMENTS (N, 1-5)	E27	N
ENABLE THE FOLLOWING NUMBER OF OVER/UNDER FREQUENCY ELEMENTS (N, 1-6)	E81	N
ENABLE VOLTZ PER HERTZ PROTECTION (N,Y)	E24	N
ENABLE SYNCHRONISM CHECK FOR THE FOLLOWING TERMINALS	E25	X
ENABLE BREAKER FAILURE FOR THE FOLLOWING TERMINALS (S,T,U,W,X OR OFF)	EBFL	X
BREAKER FAILURE SCHEME	BF_SCHM	Y
ENABLE ACTIVE,REACTIVE AND APPARENT POWER CALCS FOR TERMIALS (S,T,U,W,X OR OFF)	EPCAL	OFF
SELECT NUMBER OF DEMAND METERING ELEMENTS REQUIRED (N,1-10)	EDEM	N
GROUP 1 – SET 1 – CURRENT TRANSFORMER DATA		
CTRS CURRENT TRANSFORMER RATIO FOR TERMINAL S	CTRS	120*
CTCONS CURRENT TRANSFORMER CONNECTION FOR TERMINA S	CTCONS	Y*
CTRT CURRENT TRANSFORMER RATIO FOR TERMINAL T	CTRT	120
CTCONT CURRENT TRANSFORMER CONNECTION FOR TERMINA T	CTCONT	Y
CTRU CURRENT TRANSFORMER RATIO FOR TERMINAL U	CTRU	120
CTCONU CURRENT TRANSFORMER CONNECTION FOR TERMINA U	CTCONU	Y
CTRW CURRENT TRANSFORMER RATIO FOR TERMINAL W	CTRW	10*
CTCONW CURRENT TRANSFORMER CONNECTION FOR TERMINA W	CTCONW	Y*
CTRX CURRENT TRANSFORMER RATIO FOR TERMINAL X	CTRX	120
CTCONX CURRENT TRANSFORMER CONNECTION FOR TERMINA X	CTCONX	Y
GROUP 1 – SET 1 – POTENTIAL TRANSFORMER DATA/VOLTAGE REFERENCE TERMINAL SELECTION		
POTENTIAL TRANSFORMER RATIOF FOR TERMINAL V	PTRV	60
PTENTIAL TRANSFORMER CONNECTION FOR TERMINAL V	PTCONV	Y
POTENTIAL TRANSFORMER COMPENSATION ANGLE FOR TERMINAL V (DEGREES)	PTCOMPV	0.00
POTENTIAL TRANSFOMER NOMINAL L-L VOLTAGE FOR TERMINAL V (V,sec)	VNOMV	208
POTENTIAL TRANSFORMER RATIOF FOR TERMINAL Z	PTRZ	60
PTENTIAL TRANSFORMER CONNECTION FOR TERMINAL Z	PTCONZ	Y
POTENTIAL TRANSFORMER COMPENSATION ANGLE FOR TERMINAL Z (DEGREES)	PTCOMPZ	0.00
POTENTIAL TRANSFOMER NOMINAL L-L VOLTAGE FOR TERMINAL Z (V,sec)	VNOMZ	208
SELECT VOLTAGE REFERENCE FOR TERMINAL S (OFF,V,Z)	VREFS	V
SELECT VOLTAGE REFERENCE FOR TERMINAL T (OFF,V,Z)	VREFT	V
SELECT VOLTAGE REFERENCE FOR TERMINAL U (OFF,V,Z)	VREFU	V
SELECT VOLTAGE REFERENCE FOR TERMINAL W (OFF,V,Z)	VREFW	V
SELECT VOLTAGE REFERENCE FOR TERMINAL X (OFF,V,Z)	VREFX	V

*Terminals S and W turned off in 25/12PR-05B

5.2 87B-Bus Differential Protection

Terminal current transformer windings will be enabled in the bus differential protection as follows.

BUS-1 (25/12SES-PR-05A)	
SEL Winding Identification	Description
TERMINAL S	Current summation of DND BCH 12F71 (25/12CT-1-P) and future Standby Generators (25/12CT-2-P)
TERMINAL T	Current summation of both future BCH-1 parallel incoming cables (25/12CT-3A-P) and (25/12CT-3B-P)
TERMINAL U	Current summation of BUS-1 feeders (25/12CT-11-P thru 25/12CT-13-P and 25/12CT-15-P thru 25/12CT-19-P)
TERMINAL W	Primary current of transformer T25/12SES-1 (25/12CT-14-P)
TERMINAL X	BUS-2 side of 25/12SES-5 (25/12CT-5A-P)

BUS-2 (25/12SES-PR-05A)	
SEL Winding Identification	Description
TERMINAL S	Not used
TERMINAL T	Current summation of both future BCH-2 parallel incoming cables (25/12CT-4A-P) and (25/12CT-4B-P)
TERMINAL U	Current summation of BUS-2 feeders (25/12CT-6-P thru 25/12CT-10-P)
TERMINAL W	Not used
TERMINAL X	BUS-1 side of 25/12SES CB-5 (25/12CT-5B-P)

5.2.1 Terminal *m* Current TAP Setting

Current “TAP” settings, are used to convert each individual winding magnitude to a per unit (PU) value. The SEL 487E automatically calculates these values based on maximum MVA of the protected zone or device, winding voltage, CT ratio, and CT connection settings. For the purpose of determining the TAP values for the initial configuration of 25/12SES, the maximum capacity of DND 12F71 (10MVA) and operating voltage of 12.5kV were used.

$$\text{TAP} = \frac{\text{MVA} \bullet 1000}{\sqrt{3} \bullet \text{VTERM} \bullet \text{CTR}} \bullet \text{C}$$

where:

MVA = Transformer maximum MVA (MVA)

VTERM = Terminal line-to-line voltage of the winding (kV)

CTR = CT ratio

C = 1 if CTCON = Y (wye- or star-connected CTs)

C = $\sqrt{3}$ if CTCON = D (delta-connected CTs)

5.2.2 Restrained Element Operating Current Pickup

Program this set point for the operating current pickup at a minimum for increased sensitivity but high enough to avoid operation because of steady-state CT error. To ensure proper relay operation the following equation must be satisfied.

$$O87P_{MIN} \geq (0.1 \cdot I_{NOM}) / TAP_{MIN} \quad = (0.1*5)/3.85=0.13$$

Because 0.13 corresponds to the minimum recommended setting for the retrained element operating current pickup, a setting of 0.2 will be used.

5.2.3 Restrained Slope Percentage Setting SLP1, SLP2

The SEL-487E protection relay is designed to be used in transformer differential applications. This type of protection application introduces two main current sensing errors that are not applicable to bus protection applications. These errors include:

1. Voltage ratio variation of the power transformer
2. Transformer Load Tap Changers (LTC's)
3. Transformer excitation currents
4. CT ratio differences

Because the current transformers used in these bus differential schemes are of the same manufacture, ratio and C rating, the expected characteristics during thru fault conditions are expected to be similar. However that being said, CT errors of 10% and relay error of 5% will be considered, yielding a slope of 15% for the Slope setting.

During external faults, the SEL 487E changes to high –security mode and switches from Slope 1 to Slope 2 to avoid relay miss-operation resulting from CT saturation. In contrast to small CT errors for load current, CT errors during external faults can be quite large. During CT saturation, current resulting from CT errors appears as differential current and can cause relay miss-operation.

To avoid relay miss-operation, set Slope 2 as high as possible. Normally, a high Slope 2 setting causes slow tripping for evolving faults (external-to-internal faults). However because the differential element in the SEL-487E required less than 1.5 cycles to return to normal mode for an evolving fault, a Slope 2 setting as high as 90 percent is acceptable. This setting will remain at the default value for Slope 2 of 75%.

5.2.4 Other Differential Settings

Settings for incremental operate and restraint current thresholds used in the differential logic to differentiate between internal and external faults will remain at the recommended default values of 1.2 per unit. Harmonic blocking or Harmonic restraint must be enabled as an inherent function of the SEL-487E and is used to detect transformer inrush scenarios on the primary winding when used in a transformer differential protection applications. However, because this differential zone does not extend across a transformer, the second, fourth and fifth harmonic percentage of fundamental settings will be turned off.

Negative-sequence percentage differential element will remain active at the recommended default settings as this function assists in detecting evolving internal faults for heavy loading conditions because negative sequence currents are unaffected by load in a balanced system.

GROUP 1 – SET 1 – DIFFERENTIAL ELEMENT CONFIGURATION DATA		
INCLUDE TERMINAL S IN THE DIFFERENTIAL ELEMENT FOR THE FOLLOWING CONDITIONS	E87TS	1*
INCLUDE TERMINAL T IN THE DIFFERENTIAL ELEMENT FOR THE FOLLOWING CONDITIONS	E87TT	1
INCLUDE TERMINAL U IN THE DIFFERENTIAL ELEMENT FOR THE FOLLOWING CONDITIONS	E87TU	1
INCLUDE TERMINAL W IN THE DIFFERENTIAL ELEMENT FOR THE FOLLOWINGCONDITIONS	E87TW	1*
INCLUDE TERMINAL X IN THE DIFFERENTIAL ELEMENT FOR THE FOLLOWING CONDITIONS	E87TX	1
INTERNAL CT CONNECTION MATRIC COMPENSATION ENABLES (Y,N)	ICOM	Y
TSCTC TERMINAL S CT CONNECTION COMPENSATION	TSCTC	12*
TTCTC TERMINAL T CT CONNECTION COMPENSATION	TTCTC	12
TUCTC TERMINAL U CT CONNECTION COMPENSATION	TUCTC	12
TWCTC TERMINAL W CT CONNECTION COMPENSATION	TWCTC	12*
TXCTC TERMINAL X CT CONNECTION COMPENSATION	TXCTC	12
ENTER TRANSFORMER MAXIMUM MVA RATING (MVA)	MVA	10
TERMINAL S NOMINAL LINE-TO-LINE VOLTAGE (kV)	VTERMS	12.5*
TERMINAL S CURRENT TAP (A,sec)	TAPS	3.85*
TERMINAL T NOMINAL LINE-TO-LINE VOLTAGE (kV)	VTERMT	12.5
TERMINAL T CURRENT TAP (A,sec)	TAPT	3.85
TERMINAL U NOMINAL LINE-TO-LINE VOLTAGE (kV)	VTERMU	12.5
TERMINAL U CURRENT TAP (A,sec)	TAPU	3.85
TERMINAL W NOMINAL LINE-TO-LINE VOLTAGE (kV)	VTERMW	12.5*
TERMINAL W CURRENT TAP (A,sec)	TAPW	46.19*
TERMINAL X NOMINAL LINE-TO-LINE VOLTAGE (kV)	VTERMX	12.5
TERMINAL X CURRENT TAP (A,sec)	TAPX	3.85
DIFFERENTIAL ELEMENT OPERATING CURRENT PIKUP (p.u)	O87P	0.2
SLOPE 1 SETTING (%)	SLP1	15
SLOPE 2 SETTING (%)	SLP2	75.00
UNRESTRAINED ELEMENT CURRENT PICKUP (p.u.)	U87P	8
INCREMENTAL OPERATE CURRENT PICKUP (p.u.)	DIOPR	1.20
INCREMENTAL RESTRAINT CURRENT PICKUP (p.u.)	DIRPR	1.20
ENABLE HARMONIC BLOCKING DIFFERENTIAL ELEMENT	E87HB	N
ENABLE HARMONIC RESTRAING ELEMENT	E87HR	Y
SECOND, FOURTH AND FIFTH HARMONIC PERCENTANGE (% OF FUNDAMENTAL)	PCT2-5	OFF
ENABLE WAVE-SHAPE BLOCKING DIFFERENTIAL ELEMENT	E87T_WS	N
NEGATIVE SEQUENCE DIFFERENTIAL ELEMENT OPERATING CURRENT PICKUP (p.u.)	87QP	0.30
NEGATIVE SEQUENCE DIFFERENTIAL SLOPE (%)	SLPQ1	25
NEGATIVE SEQUENCE DIFFERENTIAL ELEMENT DELAY (cyc)	87QD	10.00

*Terminals S and W turned off in 25/12PR-05B

5.3 25-Synchronism Check

Because of the numerous future incoming sources that will eventually be available, synchronism check will be enabled to ensure future closing operations of circuit breaker 25/12SES CB-5 may not occur when the corresponding phases of BUS-1 and BUS-1 are excessively out of phase, magnitude or frequency.

GROUP 1 – SET 1 – RELAY CONFIGURATION		
ENABLE SYNCHRONISM CHECK (OFF, S,T,U,W,X)	E25	X
GROUP 1 – SET 1 – SYNCHRONISM CHECK-SYNCHRONISM CHECK (25) REFERENCE		
SYNCHRONISM CHECK (25) REFERENCE (VAV, VBV, VCV, VAZ,VBZ,VCZ)	SYNCP	VAV
SYNCHRONISM-CHECK VOLTAGE SCHEME (Y, Y1, Y2)	25_SCHM	Y2
VOLTAGE WIDNOW HIGH THRESHOLD (20.0-200V,sec)	25VL	127.0
VOLTAGE WIDNOW LOW THRESHOLD (5.0-200V,sec)	25VH	108.5
SYNCHRONISM VOLTAGE DIFFERENCE CHECK (5.0-200V)	25VDIF	5.0
GROUP 1 – SET 1 – SYNCHRONISM CHECK-BREAKER X SYNCHRONISM CHECK (25)		
SYNCHRONISM SOURCE (VAV, VBV, VCV, VAZ,VBZ,VCZ)	SYNCS	VAZ
SYNCHRONISM SOURCE X RATIO FACTOR	KSXM	1.00
SYNCHRONISM SOURCE X ANGLE SHIFT (deg)	KSXA	0.00
ALTERNATIVE SYNCHRONISM SOURCE X ENABLE EQUATION (SELOGIC)	ALTSX	NA
MAXIMUM SLIP FREQUENCY –BKX (HZ)	25SFBKX	0.050
MAXIMUM ANGLE DIFFERENCE 1 –BKX(deg)	ANG1BX	5.0
MAXIMUM ANGLE DIFFERENCE 1 –BKX(deg)	ANG2BX	10.0
BREAKER X CLOSE TIME (cyc)*	TCLSBKX	6.00
BLOCK SYNCHRONISM CHECK-BKX EQUATION (SELOGIC)	BSYNBKX	52CLX

*Breaker closing time to be confirmed during factory acceptance testing

In addition to synchronism check when both busses are energized, logical equations have been implemented to allow closing from a “live” bus to a “dead” bus or if both BUS-1 and BUS-2 are “dead”.

5.4 50/51- Overcurrent Protection Phase/Ground

Due to the current transformer configuration required to perform independent line current differential protection across each parallel cable run for future BCH-1 and BCH-2 as per the tender package, 25/12SES-PR-05A and 25/12SES-PR-05B will provide overcurrent protection for 25/12SES bus bars via current summations from 25/12CT-3A-P and 25/12CT-3B-P for BCH-1 and 25/12CT-4A-P and 25/12CT-4B-P for BCH-2. 25/12SES-PR-05A will trip 25/12SES-3 for overcurrent conditions from or towards BCH-1 and 25/12SES-PR-05B will trip 25/12SES-4 for overcurrent conditions from or towards BCH-2.

Until such time that applicable utility parameters are known for the two future BCH feeders, non-directional phase and ground overcurrent settings will be set to their minimum values.

5.5 50BF-25/12SES CB-5 Breaker Fail Detection

Breaker fail detection for BUS-1 to BUS-2 tie breaker 25/12SES CB-5 will be performed by both 25/12-PR-05A and 25/12-PR-05B. If either protection relay detects a bus fault within the protected zone and current is still detected on winding X of the 487E indicating current flow across 25/12SES CB-5 after an attempted trip, 25/12SES CB-5 breaker fail initiation will be sent to the opposing bus protection relay to trip and lockout all breakers connected to that bus.

Detection of local lockout relay operation or breaker fail initiation from the opposing bus protection relay will also initiate 25/12SES CB-5 breaker fail detection within 25/12-PR-05A and 25/12-PR-05B respectively via digital input 107. This condition will be considered external to the SEL 487E and will not require current supervision for breaker fail operation.

GROUP 1 – SET 1 –WINDING X-BREAKER X FAILURE LOGIC		
ENABLING CONDITION(S) FOR EXTERNAL BREAKER FAILURE (SELOGIC)	EXBFX	TXFMR OR IN107
EXTERNAL BREAKER FAILURE INITIATE PICKUP DELAY (cyc)	EBFPUX	6.00
FAULT CURRENT PICKUP (A,sec)	50FPUX	0.50
BREAKER FAILURE INITIATE PICKUP DELAY (cyc)	BFPUX	6.00
RETRIP DLEAY (cyc)	RTPUX	3.00
BREAKER FAIL INITIATE CONDITION (cyc)	BFIX	TRIPX
ALTERNATE BREAKER FAIL INITIATE CONDITION(S) (SELOGIC)	ATBFIX	NA
ENABLING CONDITION(S) FOR NEUTRAL BREAKER FAILURE (SELOGIC)	ENINBFX	NA
NEUTRAL CURRENT PICKUP (A,sec)	INFPUX	0.50
BREAKER FAILURE INITIATE SEAL-IN	EBFISX	N
BREAKER FAILURE INITIATE DROUPOUT DELAY(cyc)	BFIDOX	1.500

5.6 86- Lockout Relays

Each bus protection zone will incorporate one SEL-RS86 manual reset lockout relay. Designations will be:

- 86B1 for BUS-1
- 86B2 for BUS-2

Each lockout relay will operate upon any of the following conditions.

i. Bus differential trip
ii. 25/12SES CB-5 Breaker fail from opposite bus protection
iii. Breaker fail from bus source breaker
iv. Breaker fail from feeder breaker

Lockout relays when activated, will trip and lockout all associated breakers connected to that particular bus and the BUS-1 to BUS-2 tie breaker 25/12SES CB-5. No breaker connected to that particular bus will be permitted to be reclosed until the tripped lockout relay is manually reset by operating personal.

LOCKOUT RELAY TRIPS		
	86B1	86B2
TRIP BREAKER 25/12SES CB-1	X	
TRIP BREAKER 25/12SES CB-2	X	
TRIP BREAKER 25/12SES CB-3	X	
TRIP BREAKER 25/12SES CB-4		X
TRIP BREAKER 25/12SES CB-5	X	X
TRIP BREAKERS 25/12SES CB-11 THRU 25/12SES CB-19	X	
TRIP BREAKERS 25/12SES CB-6 THRU 25/12SES CB-10		X

6 Feeder Protection SEL-751A (and SEL-787 as Applicable)

6.1 Configuration Settings

Refer to Section 7.1 for 25/12SES-PR-14 configuration settings (transformer protection).

GROUP 1 – MAIN		
UNIT ID LINE 1 (16 Characters)	RID	25/12SES-PR-XX*
UNIT ID LINE 2 (16 Characters)	TID	EGD-SES
PHASE CT RATIO (1–5000)	CTR	120*
NEUTRAL CT RATIO (1–5000)	CTRN	120*
PHASE PT RATIO (1.00–10000.00)	PTR	60
SYNCV PT RATIO (1.00–10000.00)	PTRS	60
XFMR CONNECTION (WYE, DELTA)	DELTA_Y	WYE
SINGLE V INPUT (Y, N)	SINGLEV	N
LINE VOLTAGE (OFF, 20.00–440.00 V)	VNOM	208

*May vary for each feeder.

6.2 27-Undervoltage

Upon a loss of utility, all 25/12SES feeder circuit breakers will open. Transformer start up sequencing will be required, as the combined cold load pickup will be too high to start without causing nuisance tripping of either 25/12SES CB-1, the pole top recloser or BC Hyrdo's DND 12F71 breaker.

As outlined in *"EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0"* PWGSC will need to create a new or append an existing switching procedure to restore site conditions following a loss of utility.

GROUP 1 – UNDER/OVER VOLTAGE ELEMENTS			
		SETTING VALUE	REFRENCE.
UV TRIP1 LEVEL (OFF, 2.00–300.00 V)	27P1P	108.00 Vsec	≤90%
UV TRIP1 DELAY (0.00–120.00 s)	27P1D	1.95 s	2.0 s
UV TRIP2 LEVEL (OFF, 2.00–300.00 V)	27P2P	60.00 Vsec	≤50%
UV TRIP2 DELAY (0.00–120.00 s)	27P2D	0.11 s	0.16 s

6.3 51- Overcurrent Protection Phase/Ground

Non directional phase and ground overcurrent settings will be implemented to sufficiently coordinate each feeder with the upstream protection for DND 12F71 protection relay 25/12SES-PR-01 and to adequately protect equipment fed downstream. Because each feeder protection relay will contain unique overcurrent settings, those time overcurrent curves and settings are not identified in this report. For more information on overcurrent settings refer to *"EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0"*

6.4 50AF-Arc Flash Detection

Feeder protection relays will utilize the omni-directional point sensor optimized for installation in individual switchgear compartments. Together with current supervision, light from any potential arc flash in the feeder outgoing cable compartments will be utilized to quickly isolate any detected faults.

Since the fast overcurrent detectors do not reject harmonics and therefore have a natural tendency to "overreach" under high harmonic load conditions the 50PAFP/50NAFP current settings should be set at 2 times the expected maximum load level. The phase current pickup values will be set at two times 90% of the phase time overcurrent pickup settings. The neutral elements measured by the IN input will be set at two times 90% of the ground time overcurrent settings. These values will change feeder to feeder thus will not be included in this report.

25/12SES-PR-08 and 25/12SES-PR-14 protection relays are SEL-787's designed for transformer applications and do not have the capability to accept fiber optic sensors designed to sense the light emitted from an arc flash event. Thus, point sensors installed in the cable outgoing compartments for these loads (HVSP DRY DOCK and T25/12SES-1) will be ran to 25/12SES-PR-07 and 25/12SES-PR-13 SEL-751A's. These SEL-751A's will trip directly circuit breakers 25/12SES CB-8 and 25/12SES CB-14 respectively if a light flash is present in the outgoing cable sections. The disadvantage with this scheme is the arc flash trip to circuit breakers 25/12SES CB-8 and 25/12SES CB-14 will not be able to be supervised by current, thus precautions when opening the rear upper cable compartments of sections 2 and 12 will need to be taken to ensure inadvertent light sources such as flash lights do not cause nuisance tripping.

- 25/12SES-PR-07 sends arc flash trip via digital output 302 to 25/12SES CB-8
- 25/12SES-PR-12 sends arc flash trip via digital output 302 to 25/12SES CB-14

GLOBAL - ARC FLASH PROTECTION		
AF PH OC TRP LVL (OFF, 0.50–100.00 A)	50PAFP	FEEDER DEPENDANT
AF N OC TRP LVL (OFF, 0.50–100.00 A)	50NAFP	FEEDER DEPENDANT
SELECT ARC-FLASH OUPUT SLOT	AOUTSLOT	101_2
SENSOR 1 TYPE (NONE, POINT, FIBER)	AFSENS1	POINT
TOL 1 PICKUP (3.0–20.0% {POINT}, 0.6–4.0%	TOL1P	3.0
SENSOR 2 TYPE (NONE, POINT, FIBER)	AFSENS2	POINT*
TOL 2 PICKUP (3.0–20.0% {POINT}, 0.6–4.0%	TOL2P	3.0*

*Applicable to 25/12SES-PR-07 and 25/12SES-PR-13 protection relays only. Used for arc flash trip to 25/12SES CB-8 & 25/12SES CB-14 respectively. All other feeder protection relays will have these settings disabled or OFF.

6.5 50BF-25/12SES CB-6 thru 25/12SES CB-19 Breaker Fail Detection

Breaker fail logic will be implemented to trip either 86B1 or 86B2 depending on which bus that particular feeder circuit breaker is connected to. (Refer 86-Lockout Relays described in Section 5.6). If a trip is issued, the breaker fail delay will begin if sum of the positive-sequence and negative-sequence currents exceed 0.02*INOM (0.02*5.00). If the current remains greater than the current threshold after the breaker fail delay, breaker fail will be asserted from respective feeder protection relay to trip the appropriate bus lockout relay.

GLOBAL - BREAKER FAIL		
52A INTERLOCK (Y, N)	52ABF	N
BF FAILURE DELAY (0.00–2.00 s)	BFD*	0.5
BF FAIL INITIATE (SELOGIC)	BFI*	R_TRIG TRIP OR R_TRIG IN401

*For transformer protection relays SEL-787's, select breaker 1.

6.6 52PB-Trip/Close Pushbuttons (Time Delayed)

Along with the "pistol grip" style breaker control switch to operate each feeder breaker, programmable pushbuttons located on the SEL-751A and SEL-787 front panels will be implemented to allow the operator to retreat to a safe location prior to circuit breaker operation. Typical initiating times after the pushbuttons have been programmed for 15 seconds, but can be adjusted as desired.

6.7 86-Feeder Lockout/Block Close

All SEL-751A and SEL-787 protection relays will trip and lockout the respective breakers they protect. The lockout function may be reset via a programmed latching bit that may only be restored by pressing the "Target Reset" pushbutton local to the initiating relay. Electrical faults causing the lockout function to initiate in each respective feeder relay are as follows.

FEEDER LOCKOUT INITIATIONS	
	86
50P – Phase Instantaneous Overcurrent (Primary)	X
50G – Ground Instantaneous Overcurrent (Primary)	X
50P – Phase Instantaneous Overcurrent (Secondary)*	X
50G – Ground Instantaneous Overcurrent (Secondary)*	X
50AF (P/N) – Arc Flash Phase/Neutral	X
87-Transformer Differential*	X

*Protective function applies to 25/12SES-PR-08 & 25/12SES-PR-14 only.

7 Transformer Protection (25/12SES-PR-14) SEL-787

This section covers transformer differential protection applied to cover T25/12SES-1 only. Future settings to protect HVSP Dry Dock transformers fed from 25/12SES CB-8 are not included in this document as transformer details are not yet known.

7.1 Configuration Settings

GROUP 1 – SET 1-IDENTIFIER		
UNIT ID LINE 1 (16 Characters)	RID	25/12-PR-14
UNIT ID LINE 2 (16 Characters)	TID	EGD-SES
GROUP 1-SET 1-CONFIGURATION		
WDG1 CT CONN (DELTA, WYE)	W1CT	WYE
WDG2 CT CONN (DELTA, WYE)	W2CT	WYE
WDG1 PHASE CTR	CTR1	10
WDG2 PHASE CTR	CTR2	320
MAX XFMR CAP (OFF, 0.2–5000.0 MVA)	MVA	1.0
DEFINE CT COMP (Y, N)	ICOM	Y
WDG1 CT COMP (0–12)	W1CTC	0
WDG2 CT COMP (0–12)	W2CTC	1
WDG1 L-L VOLTS (0.20–1000.00 kV)	VWDG1	12.5
WDG2 L-L VOLTS (0.20–1000.00 kV)	VWDG2	.6
NEUT 1 CT RATIO	NTR1	10
PHASE PT RATIO (1.00–10000.00)	PTR	60
NOMINAL VOLTAGE (0.20–1000.00 kV)	VNOM	12.5
PT CONNECTION (DELTA, WYE)	DELTA_Y	WYE
VOLT-CURR WDG (1, 2)	VIWDG	1
SINGLE V INPUT(Y,N)	SINGLEV	N

7.2 T25/12SES-1 Nameplate

T25/12SES-1 NAMEPLATE	
Manufacturer	JINPAN INTERNATIONAL USA LTD.
Size (MVA)	.75/1.0 MVA (185˚C) ANN/ANF
Rated High Voltage Winding (KV)	12.5/25.0
Rated Low Voltage Winding (KV)	.6-.347
Impedance (%)	5.0%
Taps	+/- 5.0% (On High Voltage Winding)
Connection:	Dy1

7.3 Differential Protection

GROUP 1 – SET 1-IDENTIFIER		
XFMR DIFF ENABLE (Y, N)	E87	Y
WDG1 CURR TAP	TAP1	4.62
WDG2 CURR TAP	TAP2	3.01
OPERATE CURR LVL	O87P	0.20
DIFF CURR AL LVL	87AP	0.15
DIFF CURR AL DLY	87AD	5.0
RESTRAINT SLOPE1 (5–90 %)	SLP1	18
RESTRAINT SLOPE2 (5–90 %%)	SLP2	50
RES SLOPE1 LIMIT (1.0–20.0 TAP)	IRS1	6.0
UNRES CURR LVL (1.0–20.0 TAP)	U87P	10.0
2ND HARM BLOCK (OFF, 5–100 %)	PCT2	15
4TH HARM BLOCK (OFF, 5–100 %)	PCT4	15
5TH HARM BLOCK (OFF, 5–100 %)	PCT5	35
5TH HARM AL LVL (OFF, 0.02–3.20 TAP)	TH5P	OFF
HARMONIC RESTRNT (Y, N)	HRSTR	Y
HARMONIC BLOCK (Y, N)	HBLK	N

The SEL 787 relay offers dual slope percentage differential protection. The dual slope feature accommodates for CT saturation, CT errors and errors due to tap changing.

Differential zones will protect both transformer windings against internal faults but also employ selectivity to not falsely operate for thru fault conditions. This will allow faults within main power transformer, main power cabling, and some of the various medium voltage switchgear/low voltage switchboard to be detected quickly and cleared.

7.3.1 Winding WnCTC (CT connection compensation)

T25/12SES-1 transformer is a Dy1 connected unit with the polarity of H1 connected to the non-polarity point of H2, implying a DAB type delta connection. In this instance the Delta connected primary windings lead the WYE connected secondary windings.

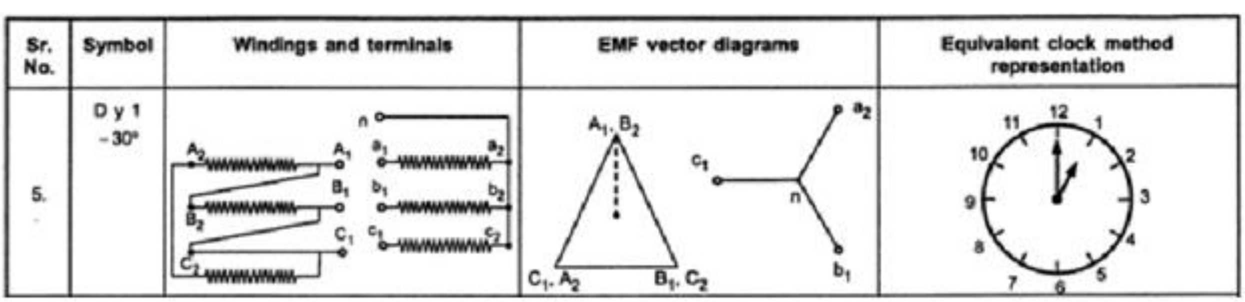

Figure 2- T25/12SES-1 Winding Configuration

Current transformer secondary wiring connections to the new SEL 787 relay will utilize WYE configurations. The SEL 787 relay uses an internal CT connection matrix compensation to account for phase shifts in the transformer winding and CT connections. Below is an explanation for the connection compensation constants that will be utilized.

W1CTC = 0 (Reference Winding)

W2CTC = 1 (To apply one 30° phase shift in a counter clockwise direction. Establishes a 180° displacement from the reference winding used for the differential calculation).

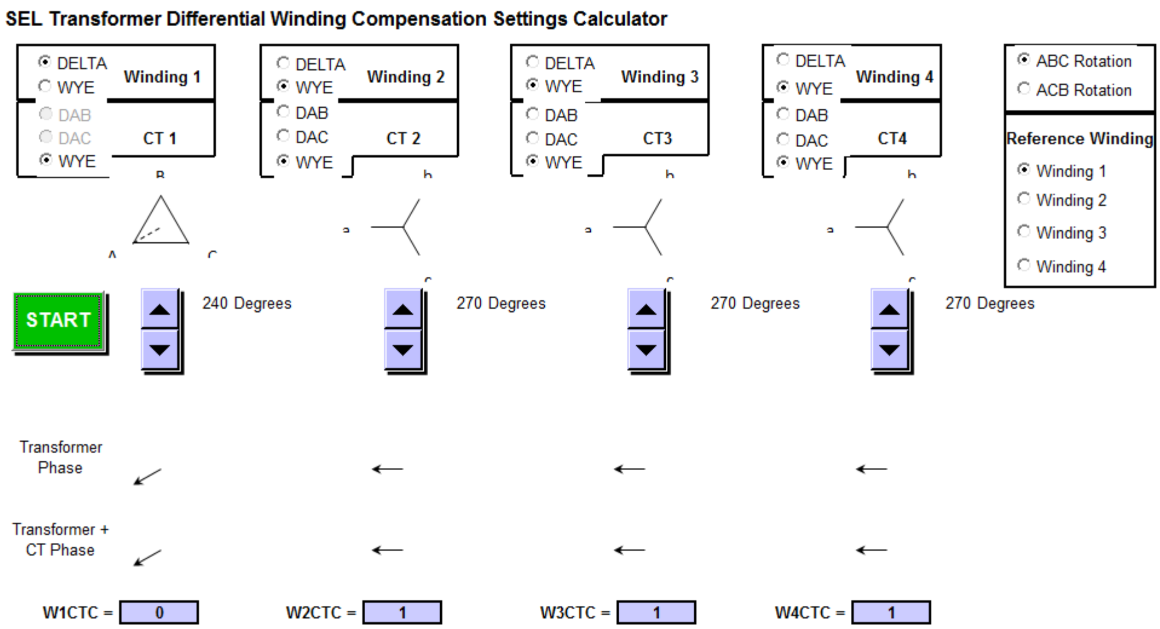

Figure 3 - SEL Transformer Differential Winding Compensation Settings Calculator T25/12SES-1

7.3.2 Current Tap

The relay uses a standard equation to set TAP*n*, based on settings entered for the particular winding. (*n* denotes the winding number.)

$$TAPn = \frac{MVA \bullet 1000}{\sqrt{3} \bullet VWDGn \bullet CTRn} \bullet C$$

where:

C = 1 if W*n*CT setting = Y (wye-connected CTs)
C = √3 if W*n*CT setting = D (delta-connected CTs)
MVA = maximum power transformer capacity setting (must be the same for all TAP*n* calculations)
VWDG*n* = winding line-to-line voltage setting, in kV
CTR*n* = current transformer ratio setting

TAP1 = 1*1000/(1.732*12.5*10)*1.732 = 4.62
TAP2 = 1*1000/(1.732*.6*320)*1.732 = 3.01

7.3.3 Restrained Element Operating Pickup

Set the restrained element operating pickup at a minimum for increased sensitivity but high enough to avoid operation because of steady-state CT error and transformer excitation current:

O87P Min ≥ (0.1*INOM)/TAP MIN
O87P≥ (0.1*5)/3.00 = 0.166 Set 087P = .2

7.3.4 Unrestrained Element Current Pickup

Set the unrestrained element high enough so as not to react to large inrush currents. Because there is no harmonic blocking associate with this element, set magnitude to clear inrush which is expected to be 10 times transformer FLA.

U87P> 10*TAP1
U87P> 10*4.62*10 = (462A primary)

7.3.5 Slope 1 and Slope 2 Settings

The slope setting in differential protection is used to accommodate for:

- Power Transformer Tap Changer
- Magnetizing Current
- Relay Error
- CT Error
- Current Mismatch from actual interposing CT

All transformers will have Off-Load Tap Changers which may vary the outgoing voltage by +/- 5.0%. Total voltage deviation in per unit: a = .05 or 5%

Estimated CT error: e= .1 or 10%

Using these two values and assuming the worst case scenario for a through-current situation using the measured maximum positive value of the input currents, the maximum measured negative value of the output currents as well as being offset by the maximum tap changer variation the following can be calculated:

(2*e+a+e*a)/(1+a)*100 = 25.5%

Note that the restraint current is defined as the sum of the winding currents, which equals 2.0 per unit for through-current conditions. Therefore the differential current as a percentage of the restraint current (also known as slope) is

Slope = (25.5/2) = 12.75%

In addition the following factors need to be considered:

Estimated excitation current for these transformers: 3%

Maximum Relay error: 5%.

Total error: 12.75%+3%+5%= 20.75%

Using only one slope, a conservative slope setting, SLP1 would be 20.75 percent. This would represent a fixed percentage differential application and is a good average setting to cover the entire current range.

A two-slope or variable-percentage differential application, improves sensitivity in the region where CT error is small and increases security in the high-current region where CT error is great. Both slopes must be defined as well as the slope 1 limit or crossover point, IRS1. With lower thru faults or normal loading conditions, if assumed CT error is 1 percent slope 1 could be set at 16%: The slope 1 setting will be set slighting higher to avoid nuisance tripping to 18%. IRS1 will be set to 6.0 per unit of TAP as recommended by SEL.

SLP2 setting should be in the 25-70% range to avoid problems with CT saturation at high currents. Slope 2 will be set to 50%.

7.3.6 Harmonic Restraint

Second, Fourth and Fifth Harmonic blocking will be employed to block false differential trips during transformer inrush or over-excitation situations. Recommended and default settings of 15% and 35% will be applied respectively.

7.3.7 Transformer Auxiliary Protection:

Transformer auxiliary protection not incorporated in the SEL 787 will be winding temperature triggered from the Electronic Temperature Monitor (ETM). This device will also perform transformer cooling for those units equipped with fans.

- 49 – Winding Temperature

8 Circuit Breaker Control

All circuit breakers located in 25/12SES will have the ability to be controlled by the following means:

- Directly and instantaneously from the control switch located on the switchgear.
- Via time delayed pushbuttons on the protection relay, allowing the operator to get to a safe distance prior to circuit breaker operation as mentioned previously in this document.
- Via the SCADA system initiated thru the 7650 or PM8240 power meters for the respective breaker/load.

PARALLEL SET ... 25/12SES SECTION 15

prime engineering

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SITE:	EGD	LOCATION:	SES / PB34
CLIENT:	EECOL	DATE:	NOVEMBER 20 2016
TECHNICIAN:	K.BJORNSON / J.SIM	JOB:	4517.81

MEDIUM VOLTAGE CABLE TEST

MANUFACTURER:	PRYSMIAN CABLE	MFG. DATE:	2016
CIRCUIT ID:	BCH 12F71	FEEDS TO:	PB34 TO SES (GROUNDED)
CABLE TYPE/INSULATION:	VOLTALENE/TRXLPE ~~[illegible]~~	CONDUCTOR SIZE:	4/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY - ~~%~~ TEMPERATURE	87% / 11°C
LENGTH:	286 METERS	MAXIMUM TEST VOLTAGE:	31 KVAC RMS AT 0.1 HZ
AUTHORIZED BY:	DAVE HIGGINS (HOLE)	CABLE VOLTAGE RATING:	28KV / 100% INSULATION

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5 KVDC

LINE A TO GROUND:	704 GΩ	LINE A-B WITH C GROUNDED:	704 GΩ
LINE B TO GROUND:	964 GΩ	LINE B-C WITH A GROUNDED:	964 GΩ
LINE C TO GROUND:	935 GΩ	LINE C-A WITH B GROUNDED:	935 GΩ

TIME WITHSTAND TEST

TIME IN MINUTES	TEST KVAC AT 0.1 HZ	LINE A nF	LINE A mA	LINE B nF	LINE B mA	LINE C nF	LINE C mA
1	31	53.3	1.04	~~[illegible]~~ 53.3	1.04	53.3	1.04
2	31	53.3	1.04	53.3	1.04	53.3	1.04
~~4~~ 3	31	53.3	1.04	53.3	1.04	53.3	1.04
~~6~~ 4	31	53.3	1.04	53.3	1.04	53.3	1.04
~~8~~ 5	31	53.3	1.04	53.3	1.04	53.3	1.04
~~10~~ 6	31	53.3	1.04	53.3	1.04	53.3	1.04
~~12~~ 7	31	53.3	1.04	53.3	1.04	53.3	1.04
~~14~~ 8	31	53.3	1.04	53.3	1.04	53.3	1.04
~~16~~ 9	31	53.3	1.04	53.3	1.04	53.3	1.04
~~18~~ 10	31	53.3	1.04	53.3	1.04	53.3	1.04
~~20~~ 11	31	53.3	1.04	53.3	1.04	53.3	1.04
~~22~~ 12	31	53.3	1.04	53.3	1.04	53.3	1.04
~~24~~ 13	31	53.3	1.04	53.3	1.04	53.3	1.04
~~26~~ 14	31	53.3	1.04	53.3	1.04	53.3	1.04
~~28~~ 15	31	53.3	1.04	53.3	1.04	53.3	1.04
~~30~~							

AC INSULATION RESISTANCE AT 0.1 HZ ~~30~~ 15 MIN READING:	LINE A	LINE B	LINE C
	17 GΩ	17 GΩ	17 GΩ

EQUIPMENT ID

PE-ULF-1 / PE-M-10

GENERAL COMMENTS

- TEST PERFORMED WITH ALL CABLES NOT UNDER TEST CONNECTED TO GROUND

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- CONCENTRIC NEUTRALS CONNECTED TO GROUND AT SES DURING TEST.
- DEAD BREAK ELBOWS @ PB34 / COLD SHRINK TERMINATIONS @ SES

KEVIN BJORNSON: [signature] GRANT PETERSON (WSP) [signature] NOV 20, 2016

PARALLEL SET FROM [illegible] NOW CONNECTED TO
25/12SES SECTION 15 (LINE SIDE OF 25/12SES CB-1)

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SITE:	EGD	LOCATION:	SES / PB34
CLIENT:	EECOL	DATE:	NOVEMBER 20, 2016
TECHNICIAN:	K. BJORNSON / S. SIU	JOB:	4517.81

MEDIUM VOLTAGE CABLE TEST

MANUFACTURER:	PRYSMIAN CABLE	MFG. DATE:	2016
CIRCUIT ID:	BCH 12F71	FEEDS TO:	PB34 TO 25/12SES
CABLE TYPE/INSULATION:	VOLTALENE / TRXLPE	CONDUCTOR SIZE:	4/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY - ~~%~~ TEMPERATURE	87% / 11°C
LENGTH:	286 METERS	MAXIMUM TEST VOLTAGE:	31 KVAC RMS AT 0.1 HZ
AUTHORIZED BY:	DAVE HIGGINS (HOULE)	CABLE VOLTAGE RATING:	28kV / 100% INSULATION

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5 KVDC

LINE A TO GROUND:	707.6 GΩ	LINE A-B WITH C GROUNDED:	707.6 GΩ
LINE B TO GROUND:	708.1 GΩ	LINE B-C WITH A GROUNDED:	708.1 GΩ
LINE C TO GROUND:	1.049 TΩ	LINE C-A WITH B GROUNDED:	1.049 TΩ

TIME WITHSTAND TEST

TIME IN MINUTES	TEST KVAC AT 0.1 HZ	LINE A nF	LINE A mA	LINE B nF	LINE B mA	LINE C nF	LINE C mA
1	31	53.6	1.04	~~[illegible]~~ 52.9	1.03	53.8	1.05
2	31	53.6	1.04	52.9	1.03	53.8	1.05
~~4~~ 3	31	53.6	1.04	52.9	1.03	53.8	1.05
~~6~~ 4	31	53.6	1.04	52.9	1.03	53.8	1.05
~~8~~ 5	31	53.6	1.04	52.9	1.03	53.8	1.05
~~10~~ 6	31	53.6	1.04	52.9	1.03	53.8	1.05
~~12~~ 7	31	53.6	1.04	52.9	1.03	53.8	1.05
~~14~~ 8	31	53.6	1.04	52.9	1.03	53.8	1.05
~~16~~ 9	31	53.6	1.04	52.9	1.03	53.8	1.05
~~18~~ 10	31	53.6	1.04	52.9	1.03	53.8	1.05
~~20~~ 11	31	53.6	1.04	52.9	1.03	53.8	1.05
~~22~~ 12	31	53.6	1.04	52.9	1.03	53.8	1.05
~~24~~ 13	31	53.6	1.04	52.9	1.03	53.8	1.05
~~26~~ 14	31	53.6	1.04	52.9	1.03	53.8	1.05
~~28~~ 15	31	53.6	1.04	52.9	1.03	53.8	1.05
~~30~~							

AC INSULATION RESISTANCE	LINE A	LINE B	LINE C
AT 0.1 HZ ~~30~~ 15 MIN READING:	17 GΩ	17 GΩ	17 GΩ

EQUIPMENT ID

PE-VLF-1 / PE-M-10

GENERAL COMMENTS

▷ TEST PERFORMED WITH ALL CABLES NOT UNDER TEST CONNECTED TO GROUND)

PRIME ENGINEERING – REVISION #4.0

▷ CONCENTRIC NEUTRALS CONNECTED TO GROUND AT SES DURING TEST.

▷ DEAD BREAK ELBOWS @ PB34 / COLD SHRINK TERMINATIONS @ SES.

KEVIN BJORNSON [signature]

GRANT PETERSON (WSP) [signature]

Nov. 20 2016

ENGINEER . IMPLEMENT . MAINTAIN

Esquimalt Graving Dock
4517.81 – 25/12SES-11 Feeder Cable Test Report

Client:

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
2.0	Jordan Siu		March 27, 2017	For External Review
2.1	Kevin Bjornson		March 28, 2017	Corrected Cable AWG Size

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

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

DATE: 2017-03-27

PROJECT # 4517.81

Attention: Erik Chambers
Houle Electric
300A - 2261 Keating Cross Road
Saanichton, BC V8M 2A5

Project: **Esquimalt Graving Dock**
Reference: **25/12SES-11 MV Feeder Cables**

Dear Erik:

This report documents the site acceptance testing for the Esquimalt Graving Dock 25/12SES-11 medium voltage feeder cables. Very low frequency withstand testing (VLF) has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA) and IEEE Standard 400.2-2013 with installation verifications completed as per project specifications.

ITEMS REQUIRING ATTENTION PRIOR TO ENERGIZATION:

- Concentric neutrals on cables must be tied to ground
- Cable lugs must be attached to the switchgear and torques to spec
- Final installation verification during site wide outage Sunday April 2nd 2017

GENERAL REPORT:

- Cable system 25/12SES-11 has been tested and deemed fit for service upon completion and inspection of the items requiring attention prior to energization.

Sincerely,

Jordan Siu
Field Technician
prime engineering
ENGINEER . IMPLEMENT . MAINTAIN
#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
f: (250) 590-8917
c: (250) 893-3528
e: jordan.siu@primeeng.ca
www.primeeng.ca

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SITE:	Esquimalt Graving Dock	LOCATION:		SES Substation
CLIENT:	Houle Electric	DATE:		March 2017
TECHNICIAN:	JS		JOB:	4517.81

MEDIUM VOLTAGE CABLE TEST			
MANUFACTURER:	PRYSMIAN	MFG. DATE:	2016
CIRCUIT ID:	25/12SES-11	FEEDS TO:	Main Substation
CABLE TYPE/INSULATION:	TRXPLE	CONDUCTOR SIZE:	4/0 AWG
TEMPERATURE RATING::	90^{o}C	HUMIDITY/TEMPURATURE:	85%/14^{o}C
LENGTH:	60 M	MAXIMUM TEST VOLTAGE:	31 KVAC RMS AT 0.1 HZ
AUTHORIZED BY:	ERIK CHAMBERS (HOULE)	CABLE VOLTAGE RATING:	28KV

VISUAL INSPECTION			
	PASS/FAIL/N/A		PASS/FAIL/N/A
CABLE TERMINATIONS:	PASS	SHIELD GROUNDING:	See Comments
STRESS CONES:	PASS	SHIELD CONTINUITY:	PASS
CABLE SUPPORT:	PASS		

INSULATION RESISTANCE AT 5KVDC			
LINE A TO GROUND:	1.125TΩ	LINE A-B WITH C GROUNDED:	1.125TΩ
LINE B TO GROUND:	1.547TΩ	LINE B-C WITH A GROUNDED:	1.547TΩ
LINE C TO GROUND:	997GΩ	LINE C-A WITH B GROUNDED:	997GΩ

TIME WITHSTAND TEST							
TIME IN MINUTES	TEST KVAC AT 0.1 HZ	LINE A nF	LINE A uA	LINE B nF	LINE B uA	LINE C nF	LINE C uA
1	31	49.5	963	49.3	960	49.4	961
2	31	49.5	963	49.3	960	49.4	961
4	31	49.5	963	49.3	960	49.4	961
6	31	49.5	963	49.3	960	49.4	961
8	31	49.5	963	49.3	960	49.4	961
10	31	49.5	963	49.3	960	49.4	961
12	31	49.5	963	49.3	960	49.4	961
14	31	49.5	963	49.3	960	49.4	961
16	31	49.5	963	49.3	960	49.4	961
18	31	49.5	963	49.3	960	49.4	961
20	31	49.5	964	49.3	960	49.4	961
22	31	49.5	964	49.3	960	49.4	961
24	31	49.5	964	49.3	960	49.4	961
26	31	49.5	964	49.3	960	49.4	961
30	31	49.5	964	49.3	960	49.4	961

AC INSULATION RESISTANCE AT 0.1 HZ 30 MIN READING:	LINE A	LINE B	LINE C
	3.15GΩ	3.18GΩ	3.3GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-10, PE-D-10

GENERAL COMMENTS

- TEST PERFORMED WITH ALL CABLES NOT UNDERTEST CONNECTED TO GROUND
- AT TIME OF TESTING CONCENTRIC NEUTRALS WERE NOT CONNECTED TO GROUND. THIS MUST BE COMPLETE PRIOR TO ENERGIZATION. TEMPORARY GROUNDS WERE APPLIED TO THE CONCENTRIC NEUTRALS FOR TESTING.

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

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Esquimalt Graving Dock

4517.81 – 25/12SES Site Acceptance Testing Report

Client:

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
1.0	Jordan Siu	Kevin Bjornson	November 15, 2016	For Internal Review
1.1	Kevin Bjornson	Eric Sleigh	November 16, 2016	For Internal Review
1.2	Kevin Bjornson	Keith Cardiff	November 16, 2016	Ground Grid Calculations Only
2.0	Kevin Bjornson	Eric Sleigh	November 16, 2016	For External Review

November 16, 2016

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

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

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DATE: **PROJECT #** 4517.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **Service Entrance Substation (SES) Interim Commissioning Report**

Madam,

This report documents the factory acceptance testing for the Esquimalt Graving Dock 25/12SES medium voltage switchgear. The testing and verification has been completed to the requirements of the specifications in accordance with the Canadian Electrical Code (CEC) and the National Electrical Testing Association (NETA).

GENERAL NOTES:

- The purpose of this report is to permit initial energization of 25/12SES switchgear for commissioning purposes during a site wide outage on November 20 2016.
- Temporary settings have been implemented in protection relay 25/12SES-PR-01 to maximize clearing times between this device and the upstream main recloser during commissioning. Final in service settings will be implemented and tested at a later date
- Temporary arc flash and shock hazard labels will be installed on SES equipment during the time temporary protection settings are in place
- At the time of this report, no medium voltage cables to T25/12SES-1 were installed and construction activities were in progress on the low voltage equipment. As a result this report only covers the medium voltage equipment. Should all equipment be completely constructed and commissioned prior to November 18th 2016, this equipment will be included in the final report and permitted to be energized on November 20, 2016.
- Power system SCADA commissioning will be completed at a later date. For initial energization the only functional device that will be monitored via the SES operator's workstation will be 25/12SES-MET-01, which is required to determine overall EGD electrical consumption.
- Ongoing control verifications and protection relay testing not required for initial energization are in progress
- Utility metering instrument transformers were not provided in a timely matter to be implemented in the SES switchgear. Potential transformer connection provisions have been removed and bus bar jumpers installed in place of the current transformers.

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- In addition to performing ground grid calculations for the final installation asphalt covering layer, calculations have also been performed for a road base covering layer, as applicable to the area future generator area directly west of the SES still under construction. As indicated below, the road base on the surface must be a minimum of 0.1m thick and have a minimum wet resistivity of 1350Ωm in order for these calculations to apply and the installation meet the requirements of section 36-304 of the Canadian Electrical Code. If this requirement is not met, any exposed conductors such as rebar, grounding counterpoise, or other bonded metal objects may pose a touch potential risk to workers working in this area.

ITEMS REQUIRING ATTENTION PRIOR TO ENERGIZATION:

- Portions of the railing on the exterior of the substation were not bonded to the main grounding electrode. These must be bonded as per 36-308 2 (e) (iii).
- Note rebar and concrete connected to the SES building footing are extending outward and uncovered at this time for the future standby generator project.
- Currently there is only one bonding conductor to the center section of 25/12SES. It is highly recommended that additional conductors been installed at each end of the switchgear.
- Medium voltage cabling from the Service Entrance Substation to PB34 will need to have the terminations completed and be tested and signed off by a PWGSC representative prior to energization. Due to the nature of the installation requirements, this work will need to be completed during the proposed outage on November 20th, 2016. These results will be merged with the final report and re-submitted at a later date.

REPORT

Prime Engineering Ltd. has substantially completed commissioning of this new installation. As per Section 36 of the Canadian Electrical Code, Part I, with the exception of ***"Items Requiring Attention Prior to Energization"*** we hereby confirm that this installation meets the following requirements:

1. The equipment in this substation is in compliance with applicable CSA standards as required by CEC Rule 2-024 & BCSA Bulletin # B-E3 0710193
2. The operation of high voltage switches or disconnecting means is in accordance with CEC Rules 36-212, 36-214
3. Live component spacing is adequate as per CEC Rules 36-108, 36-110, 36-212, Tables 30, 31, 32, 33, 34, 35. Reductions in electrical clearances have been adequately guarded against by appropriate insulating means.
4. Interlocks are in accordance with CEC Rules 36-208, 36-214

5. The station service transformer is adequately protected in accordance with CEC Rule 26-252, where one of the following must be met:

    a. The transformer has primary protection and secondary protection not set at more than the following percentages of transformer rating (for transformers with percent impedance not more than 7.5%):

Primary Side (Over 750V)		Secondary Side (750V or Less)
Circuit Breaker	Fuses	Circuit Breaker or Fuse
600%	300%	250%

6. Switches, Fuses, and Breakers are adequately rated per CEC Rules 36-202, 36-204
7. Insulation testing of the transformer and cabling has been completed at 5000VDC for equipment rated over 750VAC, and 1000VDC for equipment rated 750VAC and less.
8. The entire MV switchboard has been assembled and torqued as per the manufacturer's recommendations.
9. The High Voltage Station Ground Resistance: CEC Rule 36-304 states that "after completion of construction, the resistance of the station ground electrode at each station shall be measured and changes shall be made if necessary to verify and ensure that the maximum permissible resistance of Subrule (1) is not exceeded". A table of Ground grid measurement & calculations is included in the table below.

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

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Ground Grid Calculations per IEEE Standard 80, CEC Rule 36-304 – Asphalt Cover		
Date:	November 15, 2016	
Project Name:	Esquimalt Graving Dock - SES	
Client:	Houle Electric Ltd.	
Site Location:	Esquimalt, BC	
Field Measurements		
Covering Medium Type:	Asphalt	
Covering Medium Depth:	0.1	Meters
Covering Medium Resistivity:	10,000	Ω-meters
Top Soil Resistivity:	59.8	Ω-meters
Top Soil Depth:	1.5	Meters
Bottom Soil Resistivity:	48.0	Ω-meters
Ground Grid Resistance:	0.89	Ω
Fault Duty Information		
Fault Level at Site for L-G fault[1]	3,900	Symmetrical Amperes
Fault Duration	0.5	Seconds
IEEE 80 Acceptable Levels		
Tolerable Ground Potential Rise:	5000	Volts
Tolerable Touch Voltage:	1868.7	Volts
Tolerable Step Voltage:	6982.7	Volts
Software Mathematical Calculations[2]		
Calculated Ground Potential Rise:	2403.3	Volts
Calculated Maximum Touch Voltage:	395.2	Volts
Calculated Maximum Step Voltage:	360.8	Volts

[1] Based on BC Hydro present fault level, not the ultimate fault level
[2] Calculations assume a bolted connection to the system neutral, and fault current split between the system neutral and installed ground grid

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

Ground Grid Calculations per IEEE Standard 80, CEC Rule 36-304 – Road Base Cover		
Date:	November 16, 2016	
Project Name:	Esquimalt Graving Dock - SES	
Client:	Houle Electric Ltd.	
Site Location:	Esquimalt, BC	
Field Measurements		
Covering Medium Type:	Road Base	
Covering Medium Depth:	0.1	Meters
Covering Medium Resistivity:	1,350	Ω-meters
Top Soil Resistivity:	59.8	Ω-meters
Top Soil Depth:	1.5	Meters
Bottom Soil Resistivity:	48.0	Ω-meters
Ground Grid Resistance:	0.89	Ω
Fault Duty Information		
Fault Level at Site for L-G fault[3]	3,900	Symmetrical Amperes
Fault Duration	0.5	Seconds
IEEE 80 Acceptable Levels		
Tolerable Ground Potential Rise:	5000	Volts
Tolerable Touch Voltage:	398.1	Volts
Tolerable Step Voltage:	1100.3	Volts
Software Mathematical Calculations[4]		
Calculated Ground Potential Rise:	2403.3	Volts
Calculated Maximum Touch Voltage:	395.2	Volts
Calculated Maximum Step Voltage:	360.8	Volts

The results in these tables have been reviewed by and sealed by a professional engineer registered in BC, as required by the CEC.

PROFESSIONAL
PROVINCE OF
W. B. K. CARDIFF
36995
BRITISH COLUMBIA
ENGINEER

Nov 15/16

[3] Based on BC Hydro present fault level, not the ultimate fault level
[4] Calculations assume a bolted connection to the system neutral, and fault current split between the system neutral and installed ground grid

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

If there are any questions or concerns regarding the content of this report, please feel free to contact myself as outlined below.

Sincerely,

Kevin Bjornson
Field Service Manager
prime engineering
ENGINEER . IMPLEMENT . MAINTAIN
#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-9089
f: (250) 590-8917
e: kevin.bjornson@primeeng.ca
www.primeeng.ca

Additional/Supporting Documentation			
Item #	**DWG/DOC#/NAME**	**REV.#**	**COMMENTS**
1	4517.81_25_12SES-PR-01	4.0	DND 12F71 Protection Relay
2	4517.81_25_12SES-PR-05A	4.0	BUS-1 Protection Relay
3	4517.81_25_12SES-PR-05B	4.0	BUS-2 Protection Relay
4	4517.81_25_12SES-PR-14	4.0	T25/12SES-1 Protection Relay
5	4517.81_25_12SES CT Test Results	4.0	Vangaurd Test Reports for 25/12SES CT's
6	4517.81_25_12SES SPE-1000 Report	-	SPE-1000 Testing/Inspection for 25/12SES modifications
7	4517.81_SES Commissioning Test Equipment Calibration Certificates	-	Test Equipment Calibration Certificates for 25/12SES Testing

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.1 New Installation Commissioning Checklist

	PASS	FAIL	N/A	CEC AND WORKSAFE REQUIREMENTS, NOTES
COMPLIANCE WITH APPICABLE STANDARDS CEC RULES: 2-024, 36-108, 36-110, 36-212, TABLES: 30, 31, 21, 33, 34, 35, BCSA BULLETIN No. B-E3 07101993				
SWITCHGEAR - CSA C22.2 NO. 31:	X			
FIELD INSPECTION – CSA SPE1000:	X			FIELD INSPECTIONOF CUSTOM CABINET
LIQUID FILLED TRANSFORMER STANDARDS:			X	EQUIPMENT MUST BEAR LABEL INDICATING COMPLIANCE WITH ONE OR MORE OF THE FOLLOWING: CSA C2.1, C88, C227.4, cUL
DRY TYPE TRANSFORMER STANDARDS:	X			EQUIPMENT MUST BEAR LABEL INDICATING COMPLIANCE WITH ONE OF THE FOLLOWING: CSA C9, cUL
ADEQUATE ELECTRICAL CLEARANCE:	X			25KV P-P = 9.0” (229mm), P-G = 8.0” (204mm) 12.5KV: P-P = 6.0” (153mm), P-G = 5.0” (127mm)
HEATER CONNECTED AND OPERATIONAL:			X	OUTDOOR EQUIPMENT REQUIRES WORKING MOISTURE CONTROL DEVICE
HV SWITCH OR DISCONNECT MEANS CEC RULES: 36-212, 36,214, TABLES: 35				
AT ENTRANCE OF BUILDING OR CAN BE TRIPPED FROM WITHIN BUILDING:			X	ISOLATION MEANS MUST BE PRESENT AND ACCESSIBLE
CONTACTS VISIBLE OPEN AND CLOSED:	X			
BREAKER INTERLOCKED TO ISOLATION SWITCH:			X	
POSITIVE POSITION INDICATORS PRESENT:	X			
INTERLOCKS CEC RULES: 36-208, 36-214, TABLES: 35				
FUSE COMPARTMENT CANNOT BE OPENED UNLESS SWITCH IS OFF:			X	
UTILITY METERING SECTION INTERLOCKED TO PRIMARY SWITCH:	X			**MULTIPLE FUTURE SOURCES. REFER TO DRAWING SES-13-00 FOR INTERLOCKING SCHEME.**
GROUND FAULT SYSTEM, GROUNDING, AND BONDING CEC RULES: 36-304, 14-102, TABLES: 52				
FALL OF POTENTIAL RESISTANCE:	X			
ALL GROUNDING/BONDING COMPLETE:	X			
OPERATION OF GROUND FAULT SYSTEM:	X			GF PROTECTION SET @ MAX 1200A OR 3000A FOR 1sec FOR LV SYSTEM RATED >1000A @ P-N > 150V OR >2000A @ P-N <150V
TRANSFORMER PROTECTION CEC RULES: 26-252				
PRIMARY FUSES ARE SIZED TO NEXT NOMINAL FUSE SIZE AT 150% FLA:			X	
XFMR HAS FUSED LB SWITCH, NO MAIN SEC. BREAKER, THERMAL OVERLOAD **OR**			X	VERIFY THERMAL OVERLOAD PROTECTION

XFMR HAS FUSED L SWITCH, MAIN SEC BREAKER **OR**			X	
XFMR HAS MAIN PRI. BREAKER WITH APPROPRIATE 50/51 PROTECTION:	X			**THERMAL OVERLOAD PROTECTION IS ALSO IMPLEMENTED**
SWITCH, FUSE AND BREAKER RATINGS CEC RULES: 36-202, 36-204, 14-012				
ADEQUATE INTERRUPTING CAPACITY:	X			HV EQUIPMENT MUST MEET UTILITY REQUIREMENTS
SUITABLE FOR THE APPLICATION:	X			WITH REFERENCE TO APPLICABLE CEC RULES FOR TRANSFORMERS, CAPACITORS, MOTORS, AND OTHER EQUIPMENT
EQUIPMENT COORDINATION				
EQUIPMENT SET PER COORDINATION STUDY, BOTH PHASE AND GROUND OC:	X			**TERMPORARY SETTINGS WILL BE INITIALLY IMPLEMENTED**
SETTINGS OK FOR ARC FLASH:	X			LOW INSTANTANEOUS SETTINGS ON LOW VOLTAGE EQUIPMENT GENERALLY RESULT IN A LOWER ARC FLASH HAZARD
OTHER ITEMS				
ARC FLASH LABELS PRESENT:	X			EQUIPMENT MUST BE LABELED. GENERIC LABELS ARE ACCEPTABLE
GROUNDING BALLS IN UTILITY INCOMING/METERING SECTION:	X			LINE AND LOAD SIDE OF CURRENT TRANSFORMERS, IF APPLICABLE
UTILITY NEUTRAL BUS	X			MUST BE SEPARATE FROM UTILITY GROUND BUS AND BONDED TO GROUND BUS IN INCOMING SECTION WITH REMOVEABLE LINK
GROUNDING BALLS AND BUS EASILY ACCESSIBLE FOR MAINTENANCE:	X			
LIGHTNING ARRESTERS CONNECTED AND SIZED CORRECTLY:	X			
3 SPARE FUSES ON SITE:			X	
TRANSFORMER SEISMICALLY RESTRAINED:	X			
CABLE PHASING CORRECT – HV AND LV:			X	**TBD DURING NOV. 20 2016 OUTAGE**
NOTES AND COMMENTS AND RECOMMENDATIONS				
Where electrical clearances have been reduced below CEC values, sufficient insulting means have been implemented				
Arc flash labels to be posted for temporary settings initially and changed out for permanent labels at a later date.				

SITE:	Esquimalt Graving Dock		LOCATION:	SES	
CLIENT:	EECOL		DATE:	November 2016	
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81	

1.2 Switchgear and Switchboard Assemblies

Reference: NETA ATS-2013 Section: 7.1

CIRCUIT ID:	**25/12SES**	PHASES:	**3**
SERIAL #:	**37100374-001**	WIRES:	**3**
TYPE:	**Metal Clad**	VOLTAGE:	**27kV**
MANUFACTURER:	**Square D**	B.I.L.:	**125kV**
MFG. DATE:	**04/2016**	POWER FREQUENCY:	**60HZ**
POWER FUSE SIZE:	**N/A**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40kA**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify that the fuse and circuit breaker sizes and types correspond to the drawings and coordination study.	Pass/Fail	**Pass**
Verify that the current and voltage transformer ratios correspond to drawings.	Pass/Fail	**Pass**
Verify that the wiring connections are tight and that the wiring is secure to prevent damage during routine operation of moving parts.	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Inspect insulators for evidence of physical damage or contaminated surfaces.	Pass/Fail	**Pass**
Verify correct barrier and shutter installation and operation.	Pass/Fail	**Pass**
Exercise all active components	Pass/Fail	**Pass**
Inspect mechanical indicating devices for correct operation.	Pass/Fail	**Pass**
Verify that filters are in place and vents are clear.	Pass/Fail	**Pass**
Perform visual and mechanical inspection of instrument transformers.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric	**Pass**

recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.	withstand test, the test specimen is considered to have passed the test.	
Perform electrical tests on instrument transformers	Pass/Fail	**Pass**
Determine accuracy of all meters and calibrate watthour meters	Pass/Fail	**Pass**
Control Power Transformers 1. Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be in accordance with Table 100.1 unless otherwise specified by the manufacturer. 2. Perform a turns-ratio test on all tap positions. 3. Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices. 4. Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected. 5. Verify correct function of control transfer relays located in the switchgear with multiple control power sources.	1. Turns-ratio test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. 2. Secondary wiring shall be in accordance with design drawings and specifications. 3. Secondary voltage shall be in accordance with design specifications. 4. Control transfer relays shall perform as designed	**Pass**
Voltage Transformers 1. Perform secondary wiring integrity test. Verify correct potential at all devices. 2. Verify secondary voltages by energizing the primary winding with system voltage.	1. Secondary wiring shall be in accordance with design drawings and specifications. 2. Secondary voltage shall be in accordance with design specifications	**Pass**
Perform current-injection tests on the entire current circuit in each section of switchgear. 1. Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 ampere flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.	1. Current-injection tests shall prove current wiring is in accordance with design specifications.	**Pass**

GENERAL COMMENTS

Equipment is acceptable for service

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.3 25/12SES (BUS-1 & BUS-2) Medium Voltage Switchboard Test and Inspection

MANUFACTURER:	**Square D**	MFG. DATE:	**04/2016**
EQUIPMENT ID:	**25/12SES**	NUMBER OF PHASES/WIRES	**3/3**
TYPE:	**Metal Enclosed**	PROTECTION:	**Digital Relay**
SERIAL #:	**37100374-001**	FAULT BRACING:	**40kA**
AMPACITY:	**1200A**	VOLTAGE RATING:	**27kV**

CONNECTION TIGHTNESS

Note: All Circuit Breakers Listed Under "Connection" To Be Connected And Closed For Following Tests

Connection	A Phase	B phase	C Phase	% Deviation	PASS/FAIL
CB-19 Load – CB-10 Load	**717.8µΩ**	**700.5µΩ**	**711.4µΩ**	**2.4%**	**PASS**
CB-19 Load – CB-9 Load	**718.2µΩ**	**691.4µΩ**	**706.4µΩ**	**3.7%**	**PASS**
CB-19 Load – CB-8 Load	**698.6µΩ**	**693.2µΩ**	**770.4µΩ**	**10.0%**	**PASS**
CB-19 Load – CB-7 Load	**715.7µΩ**	**676.5µΩ**	**700.3µΩ**	**5.5%**	**PASS**
CB-19 Load – CB-6 Load	**681.1µΩ**	**678.3µΩ**	**704.8µΩ**	**3.8%**	**PASS**
CB-19 Load – CB-11 Load	**445.3µΩ**	**429.5µΩ**	**425.6µΩ**	**4.4%**	**PASS**
CB-19 Load – CB-12 Load	**441.2µΩ**	**426.8µΩ**	**422.9µΩ**	**4.1%**	**PASS**
CB-19 Load – CB-13 Load	**446.8µΩ**	**426.5µΩ**	**422.6µΩ**	**5.4%**	**PASS**
CB-19 Load – CB-14 Load	**998.5µΩ**	**976.5µΩ**	**965.6µΩ**	**3.3%**	**PASS**
CB-19 Load – CB-15 Load	**418.4µΩ**	**414.3µΩ**	**399.9µΩ**	**4.4%**	**PASS**
CB-19 Load – CB-16 Load	**424.7µΩ**	**407.2µΩ**	**410.2µΩ**	**4.1%**	**PASS**
CB-19 Load – CB-17 Load	**520.4µΩ**	**502.0µΩ**	**488.2µΩ**	**6.2%**	**PASS**
CB-19 Load – CB-18 Load	**401.3µΩ**	**395.3µΩ**	**392.9µΩ**	**2.1%**	**PASS**
CB-19 Load – CB-1 Line	**459.2µΩ**	**442.8µΩ**	**434.4µΩ**	**5.4%**	**PASS**
CB-19 Load – CB-2 Line	**442.7µΩ**	**427.3µΩ**	**413.9µΩ**	**6.5%**	**PASS**
CB-19 Load – CB-3 Line	**428.3µΩ**	**501.2µΩ**	**499.6µΩ**	**14.6%**	**PASS**
CB-19 Load – CB-4 Line	**567.6µΩ**	**605.4µΩ**	**621.5µΩ**	**8.7%**	**PASS**

INSULATION RESISTANCE

TIME:___10min____ VOLTAGE:__5kVDC____ (ALL BREAKERS CONNECTED AND CLOSED, POTENTIAL TRANSFORMERS DISCONNECTED)

Phase	Result	Acceptable	Phase	Result	PASS/FAIL
A-GND	**96.8 MΩ / 0.98 PI / 1.01 DAR**	**PASS**	A-B	**219.5 MΩ**	**Pass**
B-GND	**110.5 MΩ / 0.98 PI / 1.01 DAR**	**PASS**	B-C	**221.7 MΩ**	**Pass**
C-GND	**101.2 MΩ / 0.97 PI / 1.01 DAR**	**PASS**	A-C	**209.2 MΩ**	**Pass**

DIELECTRIC WITHSTAND TEST

Time: 1min VOLTAGE 60kVDC (ALL BREAKERS CONNECTED AND CLOSED. POTENTIAL TRANSFORMER DISCONNECTED)
ENVIRONMENTAL CONDITIONS: INDOORS, DRY 20°C 57% Humidity

Phase	Result	PASS/FAIL
A-GND	**1 mA**	**PASS**
B-GND	**1 mA**	**PASS**
C-GND	**1 mA**	**PASS**

TEST EQUIPMENT ID

PE-HP-01, PE-D-10, PE-M-10

GENERAL COMMENTS

Dielectric withstand voltage test performed on entire switchgear lineup, each phase-to-ground with phases not under test grounded, performed in accordance with manufacturer's published data for 25kV rated equipment.

Interlock numbers for disconnected feeder permissive to enter utility metering instrument transformer cubicle Bus-1 "K6"22047 Bus-2 "K7"22048

1.4 25/12PT-1 Instrument Transformer Test

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**2016**
CIRCUIT ID:	**BCH 12F71**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**
PRIMARY FUSE AMPACITY:	**0.5 A**	**0.5 A**	**0.5 A**
PRIMARY FUSE RESISTANCE:	**5.63 Ω**	**5.49 Ω**	**5.64 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:	**54525440**		**54525383**		**54525384**	
	RATIO	EXCITING	RATIO		RATIO	EXCITING
H1-H2:X1-X3	**59.95:1**	**1 mA**	**59.89:1**	H1-H2:X1-X3	**59.95:1**	**1 mA**
H1-H2:X2-X3	**119.91:1**	**1 mA**	**119.80:1**	H1-H2:X2-X3	**119.91:1**	**1 mA**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**1.859 nA**	**1.385 nA**	**1.290 nA**
X-GND INSULTATION RESISTANCE:	**325.5 GΩ**	**550 GΩ**	**381.2 GΩ**
H-GND INSULATION RESISTANCE:	**2.677 TΩ**	**3.592 TΩ**	**3.857 TΩ**
POLARIZATION INDEX:	**7.64**	**3.74**	**1.65**
DIELECTRIC ABSORPTION RATIO:	**0.62**	**1.34**	**1.36**
X+H-GND:	**529 GΩ**	**731 GΩ**	**768 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.5 25/12SES CB-1 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-1**	PHASES:	**3**
SERIAL #:	**1790659**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**BUS-1**	OPERATION COUNTER:	**86**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.6 25/12SES CB-1 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-1**	FEEDS TO:	**BUS-1**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790659**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**K1-62389 & K2-62486**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**86**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	New Installation	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20 µΩ**	**20 µΩ**	**19 µΩ**
CONTACT OPENING TIME:	**27.8 ms**	**27.5 ms**	**27.5 ms**
CONTACT CLOSING TIME:	**50.5 ms**	**50.8 ms**	**50.1 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**6.71 TΩ**	**>10 TΩ**	**7.52TΩ**
LINE TO GROUND:	**5KVDC**	**5.41 TΩ**	**4.48 TΩ**	**4.24 TΩ**
ACROSS CONTACTS:	**5KVDC**	**2.34 TΩ**	**2.24 TΩ**	**2.76 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**181.3**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**179.7**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.6**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.7 25/12SA-1 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-1**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

1.8 25/12SA-1 Surge Arrestor Test and Inspection

CIRCUIT ID:	**25/12SA-1**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**√**			**A: 132.8GΩ B: 129.7GΩ C: 127.4GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT:	**√**			**A: >.5Ω B: >.5Ω mΩ C: >.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10,

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.9 25/12PT-2 Instrument Transformer Test

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**2016**
CIRCUIT ID:	**STANDBY GENERATOR VTs**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**
PRIMARY FUSE AMPACITY:	**0.5 A**	**0.5 A**	**0.5 A**
PRIMARY FUSE RESISTANCE:	**5.48 Ω**	**6.09 Ω**	**6.44 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:	**54525331**		**54525297**		**54525298**	
	RATIO	EXCITING	RATIO		RATIO	EXCITING
H1-H2:X1-X3	**59.82:1**	**1 mA**	**59.87:1**	H1-H2:X1-X3	**59.82:1**	**1 mA**
H1-H2:X2-X3	**119.77:1**	**1 mA**	**119.74:1**	H1-H2:X2-X3	**119.77:1**	**1 mA**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**0.855 nA**	**1.660 nA**	**1.336 nA**
X-GND INSULTATION RESISTANCE:	**338.3 GΩ**	**657.0 GΩ**	**263.6 GΩ**
H-GND INSULATION RESISTANCE:	**5.81 TΩ**	**3.00 TΩ**	**3.72 TΩ**
POLARIZATION INDEX:	**1.23**	**3.25**	**3.14**
DIELECTRIC ABSORPTION RATIO:	**1.25**	**1.41**	**1.48**
X+H-GND:	**310.1 GΩ**	**309.4 GΩ**	**303.1 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

1.10 25/12SES CB-2 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-2**	PHASES:	**3**
SERIAL #:	**1790644**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**BUS-1**	OPERATION COUNTER:	**86**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

1.11 25/12SES CB-2 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-2**	FEEDS TO:	**BUS-1**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790644**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**K3-62549**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**86**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 µΩ**	**19 µΩ**	**18 µΩ**
CONTACT OPENING TIME:	**26.9 ms**	**27.1 ms**	**27.4 ms**
CONTACT CLOSING TIME:	**50.9 ms**	**50.4 ms**	**50.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**3.87 TΩ**
LINE TO GROUND:	**5KVDC**	**1.24 TΩ**	**1.95 TΩ**	**1.30 TΩ**
ACROSS CONTACTS:	**5KVDC**	**2.98 TΩ**	**4.39 TΩ**	**4.33 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**181.6**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**184.2**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**11.1**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.12 25/12SA-3 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-3**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections 4. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**PASS**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.13 25/12SA-3 Surge Arrester Test and Inspection

CIRCUIT ID:	**25/12SA-3**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**√**			**A: 204GΩ B: 168.4GΩ C: 208.3GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**√**			**A: >.5Ω B: >.5Ω mΩ C: >.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10,

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.14 25/12PT-3 Instrument Transformer Test

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**2016**
CIRCUIT ID:	**BCH-1 12F111**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**
PRIMARY FUSE AMPACITY:	**0.5 A**	**0.5 A**	**0.5 A**
PRIMARY FUSE RESISTANCE:	**6.16 Ω**	**5.91 Ω**	**5.54 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:	**54525356**		**54525355**		**54525357**	
	RATIO	EXCITING	RATIO	EXCITING	RATIO	EXCITING
H1-H2:X1-X3	**59.93:1**	**1 mA**	**59.91:1**	**1 mA**	**59.89:1**	**1 mA**
H1-H2:X2-X3	**119.88:1**	**1 mA**	**119.84:1**	**1 mA**	**119.80:1**	**1 mA**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**2.206 nA**	**2.293 nA**	**2.102 nA**
X-GND INSULTATION RESISTANCE:	**187.4 GΩ**	**284.1 GΩ**	**218.7 GΩ**
H-GND INSULATION RESISTANCE:	**2.225 TΩ**	**2.169 TΩ**	**2.367 TΩ**
POLARIZATION INDEX:	**2.67**	**2.66**	**3.04**
DIELECTRIC ABSORPTION RATIO:	**1.44**	**1.40**	**1.47**
X+H-GND:	**271.0 GΩ**	**332.7 GΩ**	**239.5 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

1.15 25/12SES CB-3 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-3**	PHASES:	**3**
SERIAL #:	**1790643**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**BUS-1**	OPERATION COUNTER:	**79**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.16 25/12SES CB-3 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-3**	FEEDS TO:	**BUS-1**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790643**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**K1-62389**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**79**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 μΩ**	**17 μΩ**	**18 μΩ**
CONTACT OPENING TIME:	**27.4 ms**	**27.0 ms**	**27.0 ms**
CONTACT CLOSING TIME:	**49.4 ms**	**49.7 ms**	**49.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**4.51 TΩ**	**8.87 TΩ**	**4.91 TΩ**
LINE TO GROUND:	**5KVDC**	**1.26 TΩ**	**1.57 TΩ**	**2.21 TΩ**
ACROSS CONTACTS:	**5KVDC**	**2.53 TΩ**	**3.02 TΩ**	**3.61 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**180.7**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**186.4**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**12.2**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.17 25/12SA-4 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-4**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 5. Low-resistance ohmmeter 6. Calibrated torque wrench	5. Investigate connection values that deviate more than 50% from similar connections 6. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.18 25/12SA-4 Surge Arrester Test and Inspection

CIRCUIT ID:	**25/12SA-4**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5kVDC	**√**			**A: 132GΩ B: 134GΩ C: 89.2GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**√**			**A: >.5Ω B: >.5Ω mΩ C: >.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10,

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.19 25/12PT-4 Instrument Transformer Test

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**2016**
CIRCUIT ID:	**BCH-2 12F112**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**
PRIMARY FUSE AMPACITY:	**0.5 A**	**0.5 A**	**0.5 A**
PRIMARY FUSE RESISTANCE:	**5.56 Ω**	**6.62 Ω**	**6.09 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:	**54525363**		**54525439**		**54525364**	
	RATIO	EXCITING	RATIO		RATIO	EXCITING
H1-H2:X1-X3	**59.877:1**	**1 mA**	**59.906:1**	H1-H2:X1-X3	**59.877:1**	**1 mA**
H1-H2:X2-X3	**119.77:1**	**1 mA**	**119.82:1**	H1-H2:X2-X3	**119.77:1**	**1 mA**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**1.442 nA**	**1.991 nA**	**3.621 nA**
X-GND INSULTATION RESISTANCE:	**321.1 GΩ**	**219.3 GΩ**	**197.6 GΩ**
H-GND INSULATION RESISTANCE:	**3.448 TΩ**	**2.499 TΩ**	**1.374 TΩ**
POLARIZATION INDEX:	**2.53**	**3.07**	**1.61**
DIELECTRIC ABSORPTION RATIO:	**1.28**	**1.50**	**1.41**
X+H-GND:	**422 GΩ**	**269.9 GΩ**	**307.4 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.20 25/12SES CB-4 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-4**	PHASES:	**3**
SERIAL #:	**1790651**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**BUS-2**	OPERATION COUNTER:	**81**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.21 25/12SES CB-4 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-4**	FEEDS TO:	**BUS-2**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790651**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**K2-62486**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**81**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**19 µΩ**	**21 µΩ**	**19 µΩ**
CONTACT OPENING TIME:	**27.5 ms**	**27.3 ms**	**27.1 ms**
CONTACT CLOSING TIME:	**49.1 ms**	**49.7 ms**	**49.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**5.40 TΩ**	**>10 TΩ**	**5.44 TΩ**
LINE TO GROUND:	**5KVDC**	**0.80 TΩ**	**1.31 TΩ**	**2.22 TΩ**
ACROSS CONTACTS:	**5KVDC**	**3.70 TΩ**	**5.70 TΩ**	**6.75 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**182.3**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**182.5**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.7**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.22 25/12SES CB-5 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-5**	PHASES:	**3**
SERIAL #:	**1790658**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**BUS-1/BUS-2**	OPERATION COUNTER:	**120**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.23 25/12SES CB-5 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-5**	FEEDS TO:	**BUS-1/BUS-2**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790651**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**K4-22097 & K5-RC15241**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**120**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**22 µΩ**	**21 µΩ**	**21 µΩ**
CONTACT OPENING TIME:	**27.6 ms**	**27.3 ms**	**27.4ms**
CONTACT CLOSING TIME:	**49.4 ms**	**49.4 ms**	**49.4 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**8.41 TΩ**	**9.37 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**1.83 TΩ**	**1.77 TΩ**	**1.82 TΩ**
ACROSS CONTACTS:	**5KVDC**	**5.44 TΩ**	**5.68 TΩ**	**6.28 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**178.8**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**187.3**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.24 25/12PT-B1 INSTRUMENT TRANSFORMER TEST

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**2016**
CIRCUIT ID:	**25/12kV BUS#1**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**
PRIMARY FUSE AMPACITY:	**0.5 A**	**0.5 A**	**0.5 A**
PRIMARY FUSE RESISTANCE:	**5.77 Ω**	**5.42 Ω**	**5.75 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:	**54525354**		**54525408**		**54525409**	
	RATIO	EXCITING	RATIO	EXCITING	RATIO	EXCITING
H1-H2:X1-X3	**59.98:1**	**1 mA**	**59.901:1**	**1 mA**	**59.91:1**	**1 mA**
H1-H2:X2-X3	**119.77:1**	**1 mA**	**119.82:1**	**1 mA**	**119.83:1**	**1 mA**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**2.278 nA**	**2.885 nA**	**2.940 nA**
X-GND INSULTATION RESISTANCE:	**287 GΩ**	**137.7 GΩ**	**337.4 GΩ**
H-GND INSULATION RESISTANCE:	**2.18 TΩ**	**1.725 TΩ**	**1.693 TΩ**
POLARIZATION INDEX:	**2.47**	**2.91**	**2.62**
DIELECTRIC ABSORPTION RATIO:	**1.29**	**1.38**	**1.43**
X+H-GND:	**417.1 GΩ**	**309.7 GΩ**	**326.9 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.25 25/12PT-B2 INSTRUMENT TRANSFORMER TEST

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**2016**
CIRCUIT ID:	**25/12kV Bus #2**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**	**FUSE TEK- FCA22-0.5E**
PRIMARY FUSE AMPACITY:	**0.5 A**	**0.5 A**	**0.5 A**
PRIMARY FUSE RESISTANCE:	**6.04 Ω**	**5.66 Ω**	**5.69 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:						
	RATIO	EXCITING	RATIO	EXCITING	RATIO	EXCITING
H1-H2:X1-X3	**59.92:1**	**1 mA**	**59.89:1**	**1 mA**	**59.90:1**	**1 mA**
H1-H2:X2-X3	**119.87:1**	**1 mA**	**119.78:1**	**1 mA**	**119.81:1**	**1 mA**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**1.647 nA**	**1.532 nA**	**1.718 nA**
X-GND INSULTATION RESISTANCE:	**277.5 GΩ**	**502 GΩ**	**171.1 GΩ**
H-GND INSULATION RESISTANCE:	**3.019 TΩ**	**3.245 TΩ**	**2.896 TΩ**
POLARIZATION INDEX:	**3.34**	**3.36**	**3.43**
DIELECTRIC ABSORPTION RATIO:	**1.54**	**1.45**	**1.44**
X+H-GND:	**275.8 GΩ**	**483.3 GΩ**	**214.1 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

1.26 25/12SES CB-6 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-6**	PHASES:	**3**
SERIAL #:	**17 91733**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE 3**	OPERATION COUNTER:	**70**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.27 25/12SES CB-6 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-6**	FEEDS TO:	**SPARE 3**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 91733**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**70**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**0.05 mΩ**	**0.04 mΩ**	**0.06 mΩ**
CONTACT OPENING TIME:	**27.2 ms**	**27.0 ms**	**26.9 ms**
CONTACT CLOSING TIME:	**49.7 ms**	**50.0 ms**	**49.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**8.98 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**16 mA**	**16 mA**	**16 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**184.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**183.9**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**9.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.28 25/12SES ES-6 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-6**	PHASES:	**3**
SERIAL #:	**1198226/3**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.29 25/12SES ES-6 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-6**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/3**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**22 µΩ**	**15µ Ω**	**16µ Ω**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.30 25/12SES CB-7 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-7**	PHASES:	**3**
SERIAL #:	**17 90647**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE 4**	OPERATION COUNTER:	**84**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

1.31 25/12SES CB-7 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-7**	FEEDS TO:	**SPARE 4**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 90647**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**84**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 µΩ**	**18 µΩ**	**18 µΩ**
CONTACT OPENING TIME:	**27.3 ms**	**27.3 ms**	**27.6 ms**
CONTACT CLOSING TIME:	**48.8 ms**	**49.7 ms**	**48.9 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**6.5 TΩ**	**>10 TΩ**	**7.00 TΩ**
LINE TO GROUND:	**5KVDC**	**3.06 TΩ**	**2.14 TΩ**	**1.53 TΩ**
ACROSS CONTACTS:	**5KVDC**	**5.2 TΩ**	**3.88 TΩ**	**4.1 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**180.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**179.5**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.6**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.32 25/12SES ES-7 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-7**	PHASES:	**3**
SERIAL #:	**1198226/6**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.33 25/12SES ES-7 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-7**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/6**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**16 µΩ**	**15 µΩ**	**21Ω**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.34 25/12SES CB-8 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-8**	PHASES:	**3**
SERIAL #:	**1790650**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**HVSP (FUTURE)**	OPERATION COUNTER:	**76**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.35 25/12SES CB-8 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-8**	FEEDS TO:	**HVSP (FUTURE)**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790650**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**76**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	New Installation	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**24 µΩ**	**18 µΩ**	**19 µΩ**
CONTACT OPENING TIME:	**27.6 ms**	**27.2 ms**	**27.2 ms**
CONTACT CLOSING TIME:	**50.2 ms**	**50.6 ms**	**50.1 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**4.37 TΩ**	**6.11 TΩ**	**5.13 TΩ**
LINE TO GROUND:	**5KVDC**	**1.87 TΩ**	**2.37 TΩ**	**3.17 TΩ**
ACROSS CONTACTS:	**5KVDC**	**4.53 TΩ**	**4.91 TΩ**	**5.49 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**185.2**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**184.0**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.6**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.36 25/12SES ES-8 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-8**	PHASES:	**3**
SERIAL #:	**1198226/12**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**Pass**
Verify correct phase barrier installation.	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**N/A**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.37 25/12SES ES-8 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-8**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/12**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**17 µΩ**	**17 µΩ**	**17µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.38 25/12SES CB-9 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-9**	PHASES:	**3**
SERIAL #:	**17 90649**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE 5**	OPERATION COUNTER:	**90**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.39 25/12SES CB-9 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-9**	FEEDS TO:	**SPARE 5**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 90649**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:		RATED CURRENT:	**1200A**	OPERATION COUNTER:	**90**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 μΩ**	**24 μΩ**	**16 μΩ**
CONTACT OPENING TIME:	**27.0 ms**	**27.1 ms**	**27.4 ms**
CONTACT CLOSING TIME:	**49.4 ms**	**49.7 ms**	**49.4 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**6.09 TΩ**	**5.83 TΩ**	**8.55 TΩ**
LINE TO GROUND:	**5KVDC**	**3.70 TΩ**	**2.21 TΩ**	**2.66 TΩ**
ACROSS CONTACTS:	**5KVDC**	**5.63 TΩ**	**5.96 TΩ**	**6.53 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**182.2**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**182.3**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.2**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.40 25/12SES ES-9 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-9**	PHASES:	**3**
SERIAL #:	**1198226/1**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.41 25/12SES ES-9 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-9**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**08/06/2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/1**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**21 µΩ**	**16 µΩ**	**23 µΩ**

INSULATION TESTING

	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.42 25/12SES CB-10 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-10**	PHASES:	**3**
SERIAL #:	**1790646**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE 6**	OPERATION COUNTER:	**76**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.43 25/12SES CB-10 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	25/12SES CB-10	FEEDS TO:	SPARE 6	MANUFACTURER:	SQUARE D
MFG DATE:	2016	TYPE:	VR	INTERRUPTING CAPACITY:	40KA
SERIAL #:	1790646	STYLE:	VACUUM	CONTROL VOLTAGE:	125VDC
INTERLOCK KEY #:	N/A	RATED CURRENT:	1200A	OPERATION COUNTER:	76
B.I.L.:	125KV	RATED VOLTAGE:	27KV		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**17 µΩ**	**17 µΩ**	**16 µΩ**
CONTACT OPENING TIME:	**27.4 ms**	**27.3 ms**	**27,8 ms**
CONTACT CLOSING TIME:	**49.9 ms**	**50.4 ms**	**49.8 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**7.95 TΩ**	**7.78 TΩ**	**7.37 TΩ**
LINE TO GROUND:	**5KVDC**	**1.25 TΩ**	**1.97 TΩ**	**2.60 TΩ**
ACROSS CONTACTS:	**5KVDC**	**3.51 TΩ**	**5.90 TΩ**	**5.98 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**180.6**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**181.4**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**11.2**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.44 25/12SES ES-10 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-10**	PHASES:	**3**
SERIAL #:	**1196226/4**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**08/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer’s published data. In the absence of manufacturer’s published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer’s published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.45 25/12SES ES-10 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-10**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**08/06/2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1196226/4**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**19 µΩ**	**18 µΩ**	**16 µΩ**

INSULATION TESTING

	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.46 25/12SES CB-11 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-11**	PHASES:	**3**
SERIAL #:	**1790657**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**MAIN SUBSTATION**	OPERATION COUNTER:	**95**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.47 25/12SES CB-11 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-11**	FEEDS TO:	**MAIN SUBSTATION**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790657**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**95**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**19 µΩ**	**19 µΩ**	**21 µΩ**
CONTACT OPENING TIME:	**27.8 ms**	**27.5 ms**	**27.4 ms**
CONTACT CLOSING TIME:	**49.1 ms**	**49.7 ms**	**49.3 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**5.58 TΩ**	**7.29 TΩ**	**7.98 TΩ**
LINE TO GROUND:	**5KVDC**	**2.80 TΩ**	**3.44 TΩ**	**3.13 TΩ**
ACROSS CONTACTS:	**5KVDC**	**4.80 TΩ**	**8.38 TΩ**	**3.24 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**182.8**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**182.6**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.7**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.48 25/12SES ES-11 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-11**	PHASES:	**3**
SERIAL #:	**1198226/18**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.49 25/12SES ES-11 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-11**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/18**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**15 µΩ**	**20 µΩ**	**18 µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.50 25/12SES CB-12 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-12**	PHASES:	**3**
SERIAL #:	**1790656**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**PHS**	OPERATION COUNTER:	**96**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.51 25/12SES CB-12 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-12**	FEEDS TO:	**PHS**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790656**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**96**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20 μΩ**	**19 μΩ**	**19 μΩ**
CONTACT OPENING TIME:	**27.7 ms**	**27.2 ms**	**27.4 s**
CONTACT CLOSING TIME:	**50.1 ms**	**50.6 ms**	**49.6 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**7.12 TΩ**	**7.43 TΩ**	**8.67 TΩ**
LINE TO GROUND:	**5KVDC**	**2.16 TΩ**	**4.48 TΩ**	**3.35 TΩ**
ACROSS CONTACTS:	**5KVDC**	**6.51 TΩ**	**3.83 TΩ**	**4.67 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**184.2**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**184.2**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.7**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.52 25/12SES ES-12 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-12**	PHASES:	**3**
SERIAL #:	**1198226/10**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.53 25/12SES ES-12 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-12**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/10**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**20 µΩ**	**18 µΩ**	**18 µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.54 25/12SES CB-13 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-13**	PHASES:	**3**
SERIAL #:	**1790655**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**NORTH SUBSTATION**	OPERATION COUNTER:	**73**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.55 25/12SES CB-13 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-13**	FEEDS TO:	**NORTH SUBSTATION**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790655**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**73**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 μΩ**	**20 μΩ**	**18 μΩ**
CONTACT OPENING TIME:	**27.3 ms**	**27.3 ms**	**27.7 ms**
CONTACT CLOSING TIME:	**49.7 ms**	**50.1 ms**	**49.4 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**3.54 TΩ**	**3.46 TΩ**	**3.12 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**3.97 TΩ**	**6.53 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**179.9**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**183.6**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**11.4**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.56 25/12SES ES-13 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-13**	PHASES:	**3**
SERIAL #:	**1198226/8**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.57 25/12SES ES-13 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-13**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/8**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**13 µΩ**	**18 µΩ**	**22 µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.58 25/12SES CB-14 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-14**	PHASES:	**3**
SERIAL #:	**1790648**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**T25/12SES-1**	OPERATION COUNTER:	**96**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer’s published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer’s data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.59 25/12SES CB-14 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-14**	FEEDS TO:	**T25/12SES-1**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790648**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**96**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**19 μΩ**	**17 μΩ**	**20 μΩ**
CONTACT OPENING TIME:	**27.1 ms**	**27.1 ms**	**27.5 ms**
CONTACT CLOSING TIME:	**49.4 ms**	**50.0 ms**	**49.7 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**9.61 TΩ**	**7.13 TΩ**	**9.30 TΩ**
LINE TO GROUND:	**5KVDC**	**3.71 TΩ**	**3.53 TΩ**	**4.26 TΩ**
ACROSS CONTACTS:	**5KVDC**	**5.03 TΩ**	**3.96 TΩ**	**6.96 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**182.5**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**183.5**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**9.8**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

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SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.60 25/12SES ES-14 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-14**	PHASES:	**3**
SERIAL #:	**1198226/11**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.61 25/12SES ES-14 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-14**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/11**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**18 µΩ**	**15 µΩ**	**13 µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.62 25/12SA-14 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-14**
MANUFACTURER:	**COOPER**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**NO DATA**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 7. Low-resistance ohmmeter 8. Calibrated torque wrench	7. Investigate connection values that deviate more than 50% from similar connections 8. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.63 25/12SA-14 Surge Arrester Test and Inspection

CIRCUIT ID:	**25/12SA-14**
MANUFACTURER:	**COOPER**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**NO DATA**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**√**			**A: 100.4GΩ B: 72.4GΩ C: 65.3GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10ADC	**√**			**A: >.5Ω B: >.5Ω mΩ C: >.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10,

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.64 25/12SES CB-15 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-15**	PHASES:	**3**
SERIAL #:	**1790645**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**MUNROE HEAD**	OPERATION COUNTER:	**71**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.65 25/12SES CB-15 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-15**	FEEDS TO:	**MUNROE HEAD**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790645**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**71**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 µΩ**	**18 µΩ**	**21 µΩ**
CONTACT OPENING TIME:	**27.4 ms**	**27.0 ms**	**27.0 ms**
CONTACT CLOSING TIME:	**49.6 ms**	**50.1 ms**	**49.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**8.53 TΩ**	**7.08 TΩ**	**6.81 TΩ**
LINE TO GROUND:	**5KVDC**	**0.99 TΩ**	**2.39 TΩ**	**2.12 TΩ**
ACROSS CONTACTS:	**5KVDC**	**5.82 TΩ**	**7.00 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**182.8**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**185.3**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**12.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.66 25/12SES ES-15 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-15**	PHASES:	**3**
SERIAL #:	**1198226/7**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.67 25/12SES ES-15 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-15**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/7**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**18 μΩ**	**16 μΩ**	**16 μΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.68 25/12SES CB-16 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-16**	PHASES:	**3**
SERIAL #:	**1790659**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**NLWS**	OPERATION COUNTER:	**72**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.69 25/12SES CB-16 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-16**	FEEDS TO:	**NLWS**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790652**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**72**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLTION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20 µΩ**	**20 µΩ**	**20 µΩ**
CONTACT OPENING TIME:	**27.6 ms**	**27.3 ms**	**27.2 ms**
CONTACT CLOSING TIME:	**49.9 ms**	**50.3 ms**	**49.6 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**2.73 TΩ**	**3.54 TΩ**	**8.05 TΩ**
LINE TO GROUND:	**5KVDC**	**1.84 TΩ**	**2.47 TΩ**	**3.45 TΩ**
ACROSS CONTACTS:	**5KVDC**	**4.76 TΩ**	**2.01 TΩ**	**4.57 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**181.0**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**183.0**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**9.9**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

1.70 25/12SES ES-16 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-16**	PHASES:	**3**
SERIAL #:	**1198226/16**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**06/09/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

1.71 25/12SES ES-16 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-16**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/16**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**10 µΩ**	**22µΩ**	**15 µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.72 25/12SES CB-17 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-17**	PHASES:	**3**
SERIAL #:	**1790641**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE 1**	OPERATION COUNTER:	**84**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer’s published data. In the absence of manufacturer’s published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer’s published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer’s published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer’s published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer’s published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer’s published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.73 25/12SES CB-17 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-17**	FEEDS TO:	**SPARE 1**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790641**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**84**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20 µΩ**	**18 µΩ**	**18 µΩ**
CONTACT OPENING TIME:	**27.1 ms**	**26.7 ms**	**26.7 ms**
CONTACT CLOSING TIME:	**49.8 ms**	**50.3 ms**	**49.8 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**2.16 TΩ**	**5.55 TΩ**	**7.55 TΩ**
LINE TO GROUND:	**5KVDC**	**1.47 TΩ**	**1.85 TΩ**	**1.98 TΩ**
ACROSS CONTACTS:	**5KVDC**	**0.72 TΩ**	**3.77 TΩ**	**3.57 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**179.8**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**183.3**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.2**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.74 25/12SES ES-17 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-17**	PHASES:	**3**
SERIAL #:	**1198226/9**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.75 25/12SES ES-17 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-17**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/9**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**20 µΩ**	**15µΩ**	**22 µΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.76 25/12SES CB-18 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-18**	PHASES:	**3**
SERIAL #:	**1790642**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SSSR**	OPERATION COUNTER:	**75**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.77 25/12SES CB-18 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-18**	FEEDS TO:	**SSSR**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790642**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**75**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**	**Pass**	
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**18 µΩ**	**19 µΩ**	**18 µΩ**
CONTACT OPENING TIME:	**27.0 ms**	**26.6 ms**	**26.6 ms**
CONTACT CLOSING TIME:	**49.3 ms**	**49.6 ms**	**48.9 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**3.21 TΩ**	**4.82 TΩ**	**3.78 TΩ**
LINE TO GROUND:	**5KVDC**	**2.26 TΩ**	**2.72 TΩ**	**4.96 TΩ**
ACROSS CONTACTS:	**5KVDC**	**0.75 TΩ**	**2.97 TΩ**	**0.85 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**184.5**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**184.8**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**10.9**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

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SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.78 25/12SES ES-18 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-18**	PHASES:	**3**
SERIAL #:	**1198226/17**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.79 25/12SES ES-18 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**25/12PHS ES-18**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/17**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**20 μΩ**	**14 μΩ**	**17 μΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

1.80 25/12SES CB-19 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-19**	PHASES:	**3**
SERIAL #:	**1790653**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE 2**	OPERATION COUNTER:	**88**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**Pass**
Verify cell fit and element alignment	Pass/Fail	**Pass**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Verify racking mechanism operation.	Pass/Fail	**Pass**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**Pass**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**Pass**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**Pass**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**Pass**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.81 25/12SES CB-19 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**25/12SES CB-19**	FEEDS TO:	**SPARE 2**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**1790653**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**88**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**Pass**		
CONDITION OF BREAKER CELLS:	**Pass**		
RACKING MECHANISM OF RAILS:	**Pass**		
SIGNS OF OVERHEATING:	**NA**	NEW INSTALLATION	
CONDITION OF FINGERS AND CLUSTERS:	**Pass**		
OPERATION OF SHUTTERS:	**Pass**		
GROUND CONNECTIONS:	**Pass**		
LUBRICATION OF MECHANISM:	**Pass**		
CONNECTIONS TORQUED:	**Pass**		
SECONDARY WIRING:	**Pass**		
SPRINGS / PUFFERS / DAMPERS:	**Pass**		
AUXILIARY CONTACTS:	**Pass**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**21 μΩ**	**19 μΩ**	**20 μΩ**
CONTACT OPENING TIME:	**27.2 ms**	**26.9 ms**	**26.8 ms**
CONTACT CLOSING TIME:	**50.0 ms**	**50.5 ms**	**50.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**4.50 TΩ**	**5.21 TΩ**	**5.73 TΩ**
LINE TO GROUND:	**5KVDC**	**1.55 TΩ**	**1.53 TΩ**	**1.69 TΩ**
ACROSS CONTACTS:	**5KVDC**	**4.28 TΩ**	**5.20 TΩ**	**5.25 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**√**			**185.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**√**			**184.0**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**√**			**11.0**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

NUMBER OF OPERATIONS RECORDED UPON COMPLETION OF EQUIMPENT TESTING. IN SERVICE NUMBERS WILL VARY DUE TO ADDITIONAL OPERATIONS FOR SCADA COMMISSIONING AND TRAINING PURPOSES.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.82 25/12SES ES-19 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-19**	PHASES:	**3**
SERIAL #:	**1198226/2**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**09/06/2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**Pass**
Inspect physical and mechanical condition	Pass/Fail	**Pass**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**Pass**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**Pass**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**Pass**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**N/A**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**Pass**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**Pass**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**Pass**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**Pass**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**Pass**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**Pass**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**Pass**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.83 25/12SES ES-19 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12PHS ES-19**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1198226/2**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**Pass**	Electronic Interlock
INSULATORS:	**Pass**	
CONTROL:	**Pass**	
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:	**N/A**	
BONDING:	**Pass**	
ANCHORAGE:	**Pass**	
CLEARANCES:	**Pass**	
INDICATION/ CONTROL DEVICES:	**Pass**	
CLEANLINESS:	**Pass**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**15 μΩ**	**20 μΩ**	**20 μΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5kVDC**	**219.5 MΩ**	**221.7 MΩ**	**209.2 MΩ**
ACROSS CONTACTS:	**5kVDC**	**96.8 MΩ**	**110.5 MΩ**	**101.2 MΩ**
OVER POTENTIAL TEST:	**60kVDC**	**1 mA**	**1 mA**	**1 mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

INSULATION RESISTANCE TESTING AND OVER POTENTIAL TESTING PERFORMED AND RECORDED DURING SWITCHBOARD ASSEMBLY TESTING.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.84 DC BATTERY CHARGER COMMISSIONING & INSPECTION

MANUFACTURER:	RIC	MFG. DATE:	2016
MODEL #	SB7-120/3-AB-1	SERIAL #:	C-13311

	INPUT	OUTPUT
VOLTAGE	120/208/240	125VDC (NOM)
CURRENT:	54.2/31.3/27.1	30 AMPS
KVA:	-	-
FLOAT LEVEL:		131.7 VDC 2.195 VDC/CELL
UNDER VOLTAGE ALARM:		109.8 VDC /1.830 V PER CELL

INSPECTION

	PASS/FAIL/N/A	NOTES
VERIFY EQUILIZATION VOLTAGE CURRENT:	PASS	
VERIFY FLOAT VOLTAGE CURRENT:	PASS	
TORQUE CONNECTORS:	PASS	
VISUAL BATTERY INSPECTION:	PASS	
POLARITY CHECK:	PASS	
CHARGER VENTILATION:	PASS	
CHARGER ISOLATION:	PASS	
FLAME ARRESTORS:	NA	
VERIFY MOUNTING:	PASS	
VERIFY ALARMS AND TRIPS:	PASS	

BATTERY COMMISSIONING

CELL VOLTAGE (VDC)		CELL IMPEDANCE (μΩ)	
#1: 13.88		#1: 3680	
#2: 13.81		#2: 3538	
#3: 13.80		#3: 3525	
#4: 13.72		#4: 3980	
#5: 13.40		#5: 3960	
#6: 13.95		#6: 3560	
#7: 14.00		#7: 3474	
#8: 13.52		#8: 3722	
#9: 13.62		#9: 3569	
#10: 13.68		#10: 3784	
MEASURED BANK VOLTAGE (BEFORE CHARGE)	127.8 VDC	CALCULATED VOLTAGE (BEFORE CHARGE)	127.82 VDC
MEASURED BANK VOLTAGE (AFTER CHARGE):	137.1 VDC	CALCULATED VOLTAGE (AFTER CHARGE)	137.1 VDC
MINIMUM CELL VOLTAGE (BEFORE CHARGE)	12.75 VDC	MAXIMUM CEL VOLTAGE (BEFORE CHARGE)	12.80 VDC
MINIMUM CELL VOLTAGE (AFTER CHARGE)	13.40 VDC	MAXIMUM CEL VOLTAGE (AFTER CHARGE)	14.00 VDC

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

CHARGER SETTINGS			
FLOAT VOLTAGE	137.0VDC	HIGH VOLTAGE ALARM	148.0V
EQUALIZE VOLTAGE	145.0VDC	HIGH VOLTAGE ALARM TD	5s
CURRENT LIMIT	20A	SHUNT TRIP RESET SETTING	FLOAT_V
EQUALIZE TIME LIMIT	10HR	AC FAIL	ENABLED
BATT MIDPOINT ALARM	DISABLED	AC FAIL TIME DELAY	2s
BATTERY SHUNT	200A	GF mA ALARM SET-POINT	5mA
AUTO SLOPE CALC.	DISABLED	GF ALARM TD	5s
BATTERY AH RATING	100AH	HIGH RIPPLE DC VOLT ALARM	2%
BATTERY AH RESET	DISABLED	EX DEVICE	NONE
ALL OTHER CHARGER SETTINGS LEFT AS DEFAULT. SEE USER MANUAL			

EQUIPMENT ID

PE-DMM-28, PE-CC-01

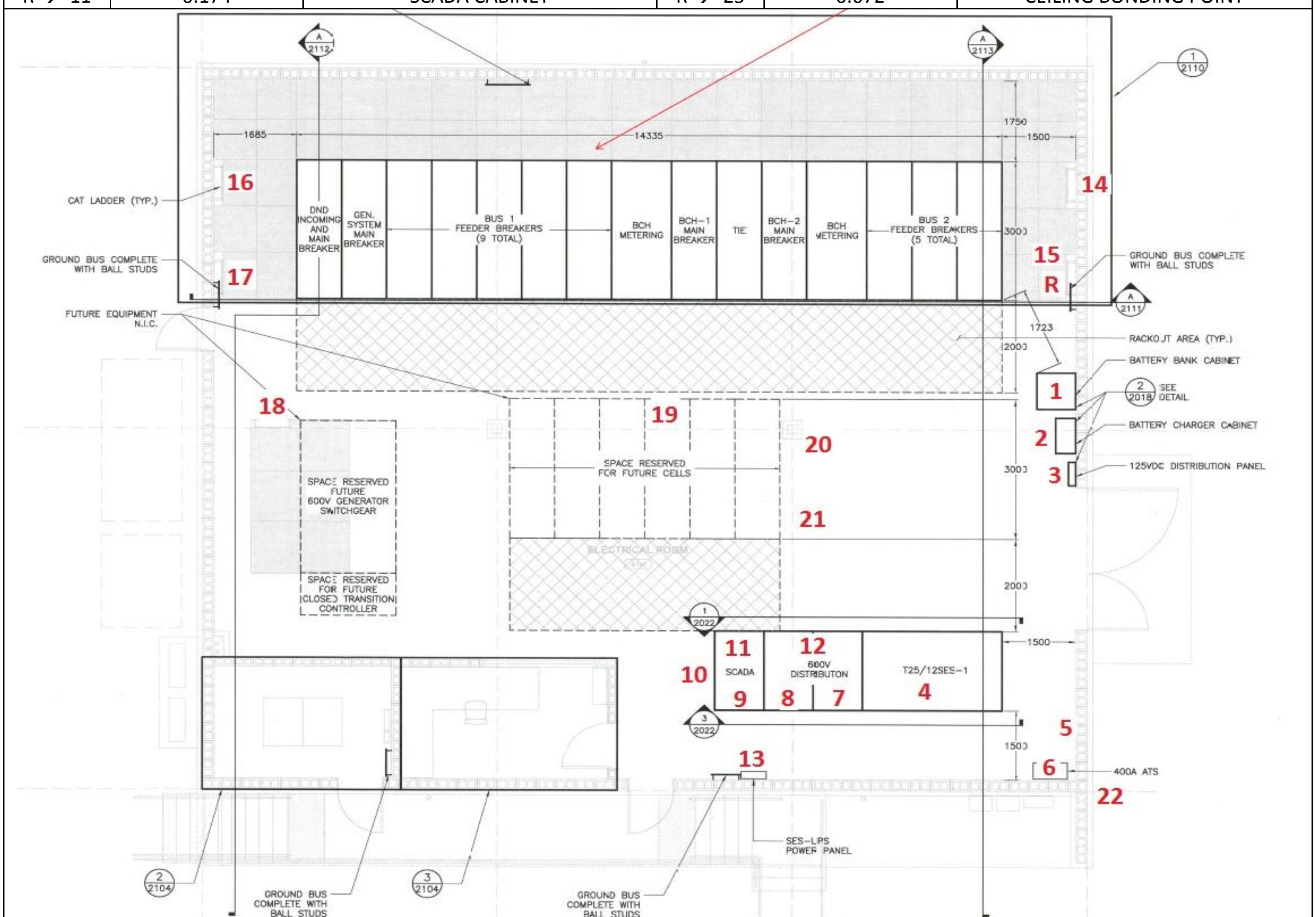
GENERAL COMMENTS

BATTERY INFORMATION

C&D TECHNOLOGIES
UPS TYPE
MODEL OR TYPE: UPS12-400MR
CELL VOLTAGE: 12 VOLTS
20 HOUR RATED TO 1.75VDC VPC @ 77^{o}F (25 ^{o}C)
102AH
NON SPILLABLE
FLOAT CHARGE VOLTAGE: 13.5VDC TO 13.8VDC @ 77^{o}F (25 ^{o}C)

1.85 SES Grounding and Bonding Point to Point Resistances

REFERENCE DRAWING R.018739.001 2100			REFERENCE NODE (R): EAST WALL GROUND BUS		
NODE	RESISTANCE (mΩ)	TEST POINT	NODE	RESISTANCE (mΩ)	TEST POINT
R → 1	0.076	125VDC DISTRIBUTION PANEL	R → 12	0.182	600V COMMON GROUND BUS
R → 2	0.091	BATTERY CHARGER CABINET	R → 14	0.273	SES-LPS POWER PANEL
R → 3	0.095	BATTERY BANK CABINET	R → 15	0.073	LADDER
R → 4	0.178	T25/12SES-1 GROUND BUS	R → 16	0.078	LADDER
R → 5	0.176	120V LIGHTING PANEL	R → 17	0.137	LADDER
R → 6	0.160	400A ATS	R → 18	0.143	LADDER
R → 7	0.146	600V DISTRIBUTION PANEL	R → 19	0.178	LADDER
R → 8	0.144	600V DISTRIBUTION PANEL	R → 20	21.00	STEEL STRUCTURE I-BEAM
R → 9	0.142	600V DISTRIBUTION PANEL	R → 21	40.78	STEEL STRUCTURE VERTICAL BEAM
R → 10	0.141	SCADA CABINET	R → 22	14.32	STEEL STRUCTURE I-BEAM
R → 11	0.174	SCADA CABINET	R → 23	0.072	CEILING BONDING POINT

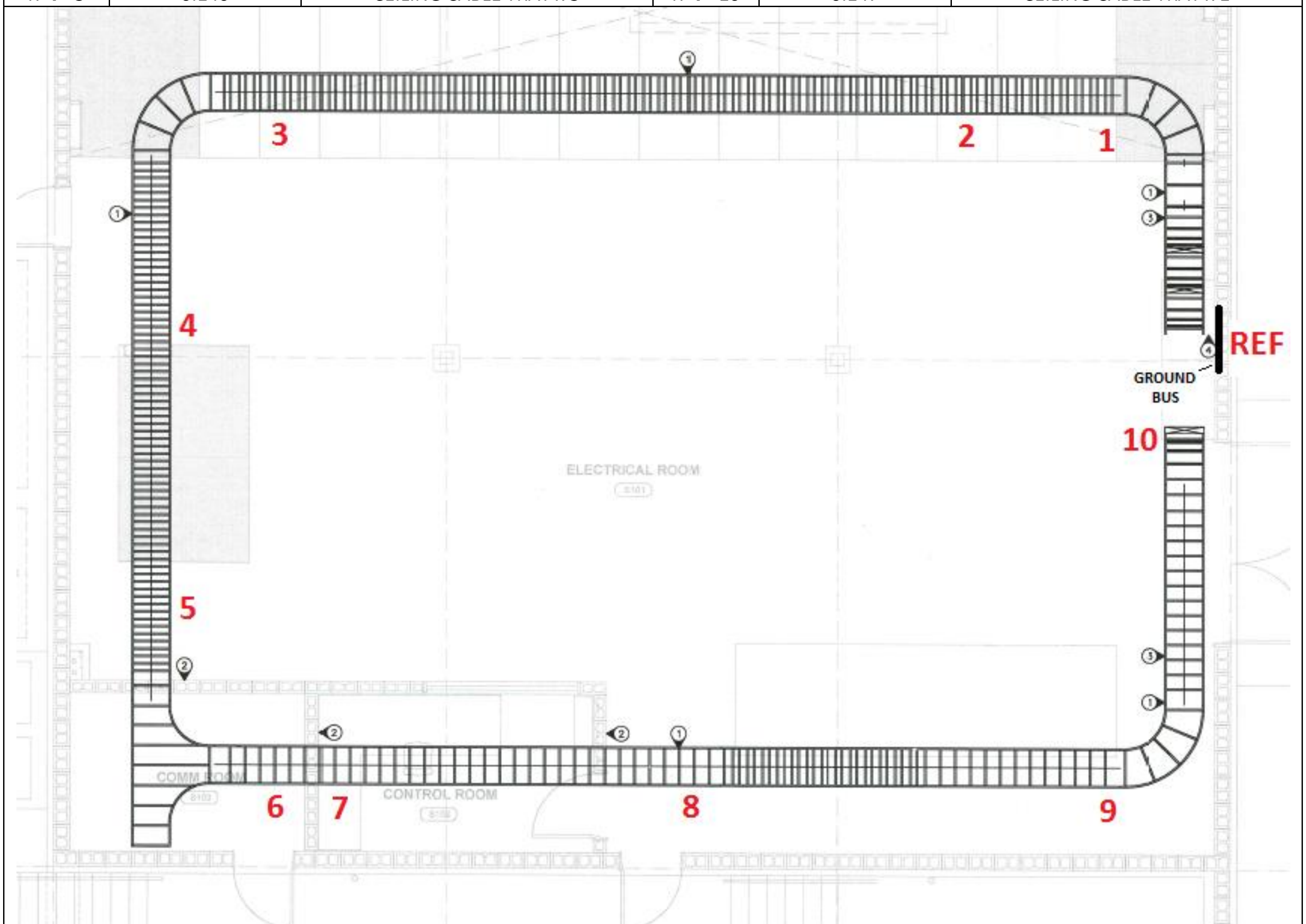


GENERAL COMMENTS

Structural steel is not bonded at any of the bolted connections.

1.86 SES Ceiling Cable Tray Bonding Point to Point Resistances

REFERENCE DRAWING R.018739.001 2102			REFERENCE NODE (R): EAST WALL GROUND BUS		
NODE	**RESISTANCE (mΩ)**	**TEST POINT**	**NODE**	**RESISTANCE (mΩ)**	**TEST POINT**
R → 1	0.132	CEILING CABLE TRAY x 3	R → 6	0.163	CEILING CABLE TRAY x 3
R → 2	0.130	CEILING CABLE TRAY x 3	R → 7	0.194	CEILING CABLE TRAY x 3
R → 3	0.130	CEILING CABLE TRAY x 3	R → 8	0.157	CEILING CABLE TRAY x 3
R → 4	0.130	CEILING CABLE TRAY x 3	R → 9	0.150	CEILING CABLE TRAY x 3
R → 5	0.140	CEILING CABLE TRAY x 3	R → 10	0.147	CEILING CABLE TRAY x 1

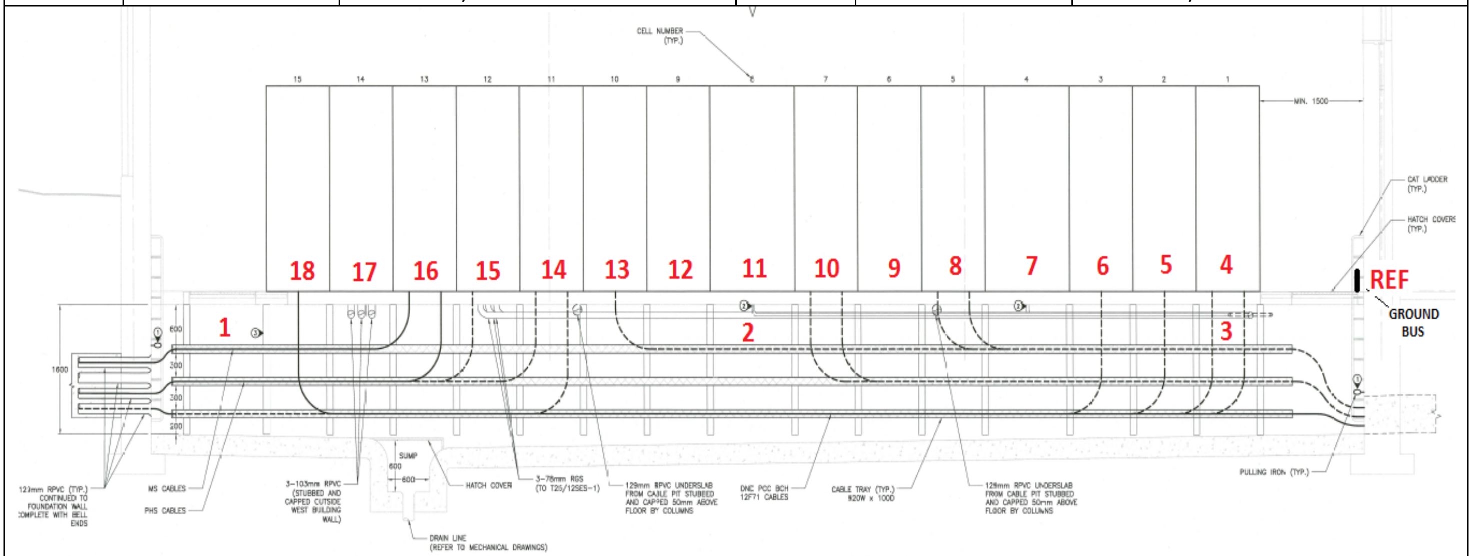


GENERAL COMMENTS
Cable tray bonding results are acceptable.

SITE:	Esquimalt Graving Dock	LOCATION:	SES
CLIENT:	EECOL	DATE:	November 2016
TECHNICIAN:	JS, KG, KB, CL	JOB:	4517.81

1.87 SES MV Cable Tray and Switchgear Bonding Point to Point Resistances

REFERENCE DRAWING R.018739.001 2111			REFERENCE NODE (R): EAST WALL GROUND BUS		
NODE	RESISTANCE (mΩ)	TEST POINT	NODE	RESISTANCE (mΩ)	TEST POINT
R → 1	0.126	CEILING CABLE TRAY x 3	R → 10	0.131	25/12SES SECTION 7
R → 2	0.125	CEILING CABLE TRAY x 3	R → 11	0.131	25/12SES SECTION 8
R → 3	0.125	CEILING CABLE TRAY x 3	R → 12	0.123	25/12SES SECTION 9
R → 4	0.152	25/12SES SECTION 1	R → 13	0.132	25/12SES SECTION 10
R → 5	0.140	25/12SES SECTION 2	R → 14	0.130	25/12SES SECTION 11
R → 6	0.131	25/12SES SECTION 3	R → 15	0.135	25/12SES SECTION 12
R → 7	0.127	25/12SES SECTION 4	R → 16	0.136	25/12SES SECTION 13
R → 8	0.131	25/12SES SECTION 5	R → 17	0.132	25/12SES SECTION 14
R → 9	0.127	25/12SES SECTION 6	R → 18	0.135	25/12SES SECTION 15



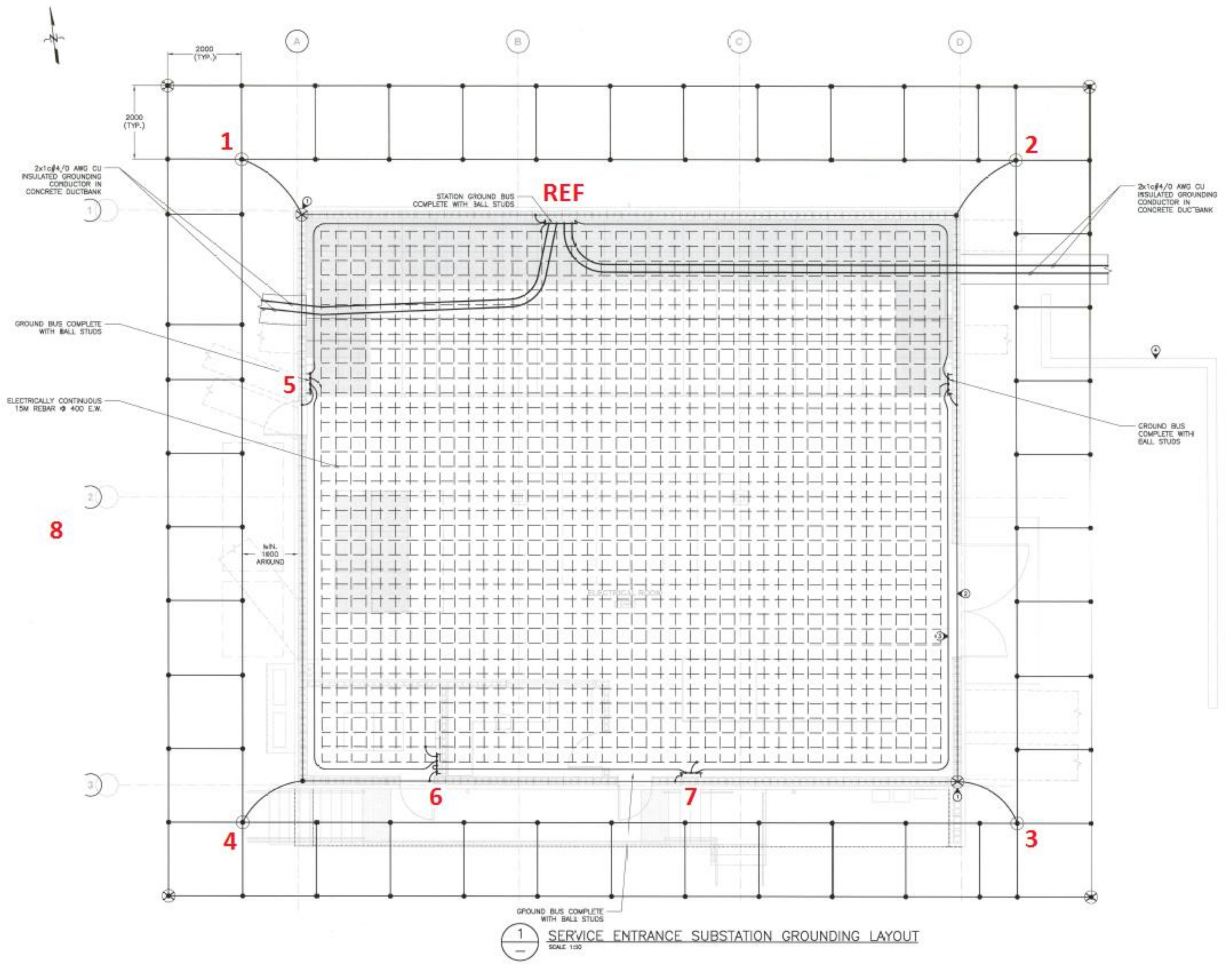
GENERAL COMMENTS

MV cable tray and switchgear bonding is results are acceptable.

Only one 4/0AWG bonding conductor to switchgear. It is recommended that this equipment be bonded in multiple locations.

1.88 SES Grounding/Bonding Conductor(s) Point to Point Resistances

REFERENCE DRAWING R.018739.001 2400			REFERENCE NODE (R): NORTH WALL GROUND BUS		
NODE	**RESISTANCE (mΩ)**	**TEST POINT**	**NODE**	**RESISTANCE (mΩ)**	**TEST POINT**
R → 1	0.186	GROUND WELL NW CORNER	R → 5	0.138	WEST WALL GROUND BUS
R → 2	0.197	GROUND WELL NE CORNER	R → 6	0.159	SW WALL GROUND BUS
R → 3	0.190	GROUND WELL SE CORNER	R → 7	0.145	SE WALL GROUND BUS
R → 4	0.225	GROUND WELL SW CORNER	R → 8	0.119	EAST WALL GROUND BUS



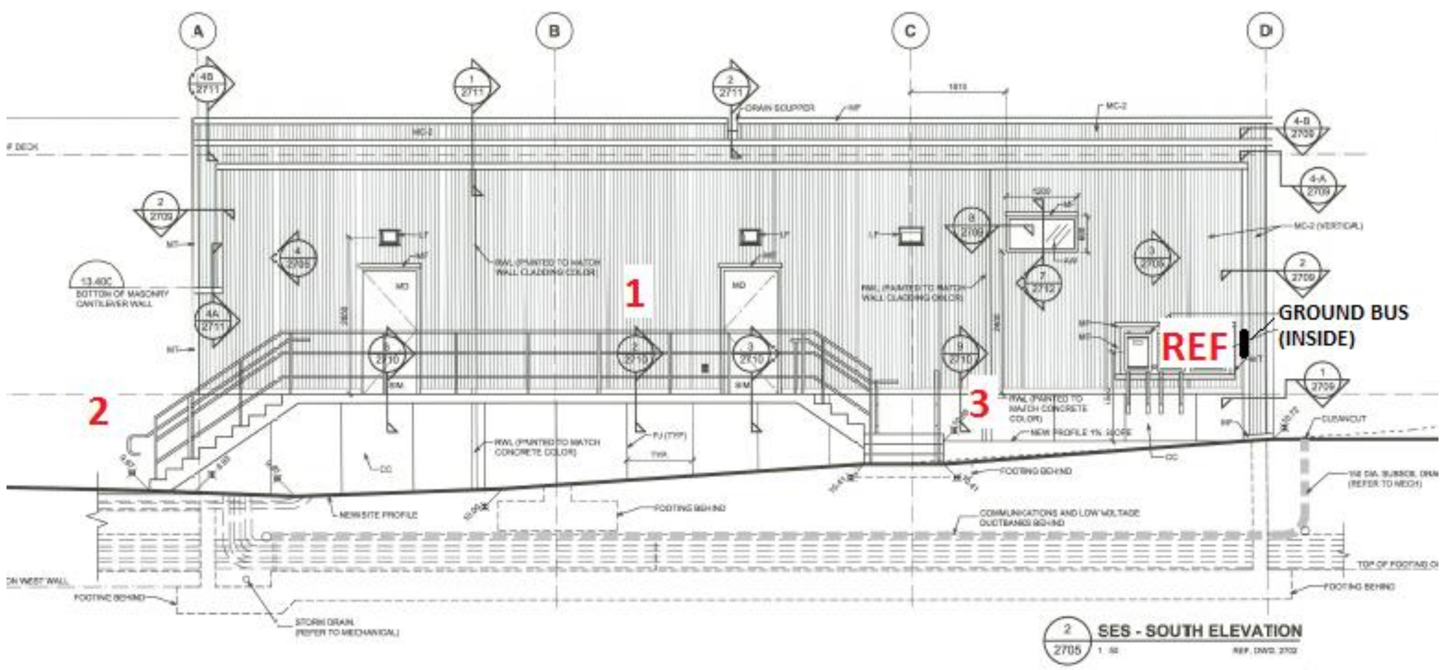
GENERAL COMMENTS

SES grounding/bonding conductor results are acceptable.

SITE:	Esquimalt Graving Dock	LOCATION:		SES
CLIENT:	EECOL	DATE:		November 2016
TECHNICIAN:	JS, KG, KB, CL		JOB:	4517.81

1.89 SES Hand Railing Point to Point Resistances

REFERENCE DRAWING R.018739.001 2705			REFERENCE NODE (R): EAST WALL GROUND BUS		
NODE	**RESISTANCE (mΩ)**	**TEST POINT**	**NODE**	**RESISTANCE (mΩ)**	**TEST POINT**
R → 1	1.71	BALCONY HANDRAILING	R → 3	OPEN CIRCUIT	STAIR HANDRAILING
R → 2	OPEN CIRCUIT	STAIR HANDRAILING	R → 4		



GENERAL COMMENTS

There does not appear to be any intentional bonding on any of the hand rails.

No reading could be obtained for sections 2 or 3

SITE:	EGD	LOCATION:	SES/PB34
CLIENT:	Eecol Electric	DATE:	November 20, 2016
TECHNICIAN:	K. Bjornson/ J. Siu	JOB:	4517.81

MEDIUM VOLTAGE CABLE TEST

MANUFACTURER:	Prysmian cable	MFG. DATE:	2016
CIRCUIT ID:	BCH 12 F71	FEEDS TO:	PB34 to SES (grounded)
CABLE TYPE/INSULATION:	Voltalene/TRXLPE	CONDUCTOR SIZE:	4/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY – TEMPERATURE:	87%/11°C
LENGTH:	286 meters	MAXIMUM TEST VOLTAGE:	31 KVAC RMS at 0.1Hz
AUTHORIZED BY:	Dave Higgins (Houle)	CABLE VOLTAGE RATING:	28Kv/100% Insulator

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	704GΩ	LINE A-B WITH C GROUNDED:	704GΩ
LINE B TO GROUND:	964GΩ	LINE B-C WITH A GROUNDED:	964GΩ
LINE C TO GROUND:	935GΩ	LINE C-A WITH B GROUNDED:	935GΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC AT 0.1 Hz	LINE A nF	LINE A mA	LINE B nF	LINE B mA	LINE C nF	LINE C mA
1	31	53.3	1.04	53.3	1.04	53.3	1.04
2	31	53.3	1.04	53.3	1.04	53.3	1.04
3	31	53.3	1.04	53.3	1.04	53.3	1.04
4	31	53.3	1.04	53.3	1.04	53.3	1.04
5	31	53.3	1.04	53.3	1.04	53.3	1.04
6	31	53.3	1.04	53.3	1.04	53.3	1.04
7	31	53.3	1.04	53.3	1.04	53.3	1.04
8	31	53.3	1.04	53.3	1.04	53.3	1.04
9	31	53.3	1.04	53.3	1.04	53.3	1.04
10	31	53.3	1.04	53.3	1.04	53.3	1.04
11	31	53.3	1.04	53.3	1.04	53.3	1.04
12	31	53.3	1.04	53.3	1.04	53.3	1.04
13	31	53.3	1.04	53.3	1.04	53.3	1.04
14	31	53.3	1.04	53.3	1.04	53.3	1.04
15	31	53.3	1.04	53.3	1.04	53.3	1.04
AC INSULATION RESISTANCE AT 0.1 Hz 15 MIN READING:		LINE A		LINE B		LINE C	
		17GΩ		17GΩ		17GΩ	

EQUIPMENT ID

PE-VLF-1/PE-M-10

GENERAL COMMENTS

Test performed with all cables not under test connected to ground.

Concentric neutrals connected to ground at SES during test.

Dead break elbows @ PB34/cold shrink terminations @ SES.

PRIME ENGINEERING – REVISION #4.0

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	EGD	LOCATION:		SES/PB34
CLIENT:	Eecol Electric	DATE:		November 20, 2016
TECHNICIAN:	K. Bjornson/ J. Siu		JOB:	4517.81

MEDIUM VOLTAGE CABLE TEST			
MANUFACTURER:	Prysmian cable	MFG. DATE:	2016
CIRCUIT ID:	BCH 12 F71	FEEDS TO:	PB34 to 25/12SES
CABLE TYPE/INSULATION:	Voltagele/TRXLPE	CONDUCTOR SIZE:	4/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY – TEMPERATURE:	87%/11°C
LENGTH:	286 meters	MAXIMUM TEST VOLTAGE:	31 KVAC RMS at 0.1Hz
AUTHORIZED BY:	Dave Higgins (Houle)	CABLE VOLTAGE RATING:	28Kv/100% Insulator

VISUAL INSPECTION			
	PASS/FAIL/N/A		PASS/FAIL/N/A
CABLE TERMINATIONS:	Pass	SHIELD GROUNDING:	Pass
STRESS CONES:	Pass	SHIELD CONTINUITY:	Pass
CABLE SUPPORT:	Pass		

INSULATION RESISTANCE AT 5000 VDC			
LINE A TO GROUND:	707.6GΩ	LINE A-B WITH C GROUNDED:	707.6GΩ
LINE B TO GROUND:	708.1GΩ	LINE B-C WITH A GROUNDED:	708.1GΩ
LINE C TO GROUND:	1.049TΩ	LINE C-A WITH B GROUNDED:	1.049TΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC AT 0.1 Hz	LINE A nF	LINE A mA	LINE B nF	LINE B mA	LINE C nF	LINE C mA
1	31	53.6	1.04	52.9	1.03	53.8	1.05
2	31	53.6	1.04	52.9	1.03	53.8	1.05
3	31	53.6	1.04	52.9	1.03	53.8	1.05
4	31	53.6	1.04	52.9	1.03	53.8	1.05
5	31	53.6	1.04	52.9	1.03	53.8	1.05
6	31	53.6	1.04	52.9	1.03	53.8	1.05
7	31	53.6	1.04	52.9	1.03	53.8	1.05
8	31	53.6	1.04	52.9	1.03	53.8	1.05
9	31	53.6	1.04	52.9	1.03	53.8	1.05
10	31	53.6	1.04	52.9	1.03	53.8	1.05
11	31	53.6	1.04	52.9	1.03	53.8	1.05
12	31	53.6	1.04	52.9	1.03	53.8	1.05
13	31	53.6	1.04	52.9	1.03	53.8	1.05
14	31	53.6	1.04	52.9	1.03	53.8	1.05
15	31	53.6	1.04	52.9	1.03	53.8	1.05

AC INSULATION RESISTANCE AT 0.1 Hz 15 MIN READING:	LINE A	LINE B	LINE C
	17GΩ	17GΩ	17GΩ

EQUIPMENT ID

PE-VLF-1/PE-M-10

GENERAL COMMENTS

Test performed with all cables not under test connected to ground. Concentric neutrals connected to ground at SES during test. Dead break elbows @ PB34/cold shrink terminations @ SES.

PRIME ENGINEERING – REVISION #4.0

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

ESQUIMALT GRAVING DOCK PUMPHOUSE SUBSTATION

Main Dewatering Pump Protection Relay Settings Report

CLIENT: EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Details**	**Prepared By:**	**Reviewed By:**	**Date**
2.0	For External Review	Kevin Bjornson	Chris Duggan/ Eric Sleigh	April 7, 2017
4.0	Issued for Construction	Kevin Bjornson		May 10, 2017
5.0	As-Built	Kevin Bjornson	Keisan Goldsmith	June 27, 2017

Table of Contents

#1-717 Aldebury Street, Victoria, BC V9A 5T2, Phone: (250) 590-8912, Fax: (250) 590-8917

List of Tables and Figures

Definitions

Abbreviation	Definition
EGD	Esquimalt Graving Dock
PWGSC	Public Works and Government Services Canada
DND	Department of National Defense
BCH	British Columbia Hydro
WSP	WSP Consulting Engineers
AES	Applied Engineering Solutions
PE	Prime Engineering
MDWP	Main Dewatering Pump
SEL	Schweitzer Engineering Laboratories

1 Scope

The scope of this document covers the new protection settings and main dewatering pump performance data gathered for the 1000HP synchronous motors to comply with the requirements and specifications of the *"Esquimalt Graving Dock SES-PHS Upgrade Project*."

2 Project Information

There are three main dewatering pumps located within the existing pump house. During the "Esquimalt Graving Dock SES-PHS Upgrade Project", these synchronous motors were transferred from the existing 2.4kV starters located on the Pumphouse floor, to the new 5kV motor starters located in the new Pumphouse Substation (PHS). Each main dewatering pump starter contains one Schweitzer Engineering Laboratories 710-5 motor protection relay (Part # 071050E1A1ABA75861330) in conjunction with one synchronous motor voltage divider module (Part #915900294) to provide a complete synchronous motor protection system. This document will cover those settings entered into the relays for Main Dewatering Pumps #1, #2 and #3 and a brief description of the operation of excitation systems.

3 Main Dewatering Pump Operation

Mimicking the existing starters, these motors continue to be started and brought to near synchronous speed by an autotransformer based reduced voltage starting method. Direct current excitation supply is derived from a 16kW, 125V, 128A direct current generator mounted on the common motor shaft. Once the stator is energized, the rotating magnetic field induces an EMF in the amortisseur windings and the field winding. The torque produced by the induced current causes the motor to act as an induction motor, also building a self-excited DC source to the motor field excitation circuit. Once the motor starts to rotate and is near synchronous speed, the field contactor closes applying DC excitation current to the motor field pulling in and forcing the rotor to spin at the same speed as the stator rotating magnetic field. The discharge valve is then opened to allow for pumping.

4 Motor Data

With limited manufacturer's information due to the age of the equipment, certain motor data has been based on typical values for this size and type of synchronous motor utilizing "*ETAP Version 16.1 power system modeling software*" *or* industry standards and from motor performance and starting data measured during dry dock pumping processes.

Note: Items with and asterisk * are either estimated, calculated, measured or derived from typical data provided by *"ETAP Version 16.1 power system modeling software" or industry standards as no manufacturers data was presented or available to Prime Engineering upon request.*

Manufacturer	Canadian Westinghouse Co. /GMR
Horsepower (HP)	1000
Rated full-load current (Amps)	208
Rated Voltage (Volts)	2400
Rated Speed (RPM)	360
Service Factor	1.15*
Locked Rotor Current (Amps)	1248*
Maximum locked rotor time with the motor at ambient and/or operating temperature (Seconds)	11*
Maximum starts per hour	2*
Number of Poles/Rotor Type	20/Salient Pole*
Motor accelerating time to reach full speed (Seconds)	10-15 Seconds*
Synchronous motor direct axis reactance Xd (Per unit of motor base positive sequence impedance)	1.55*
Synchronous motor transient reactance X'd (Per unit of motor base positive sequence impedance)	0.28*
DC Generator	16kW, 125V, 128A

Table 1 - Main Dewatering Pump Typical Data

5 SEL-710-5 Protection Settings

The following sections pertain to the protection settings implemented within the SEL-710-5 protection relays for the main dewatering pumps. This content is intended to serve those in the review and analysis of the protection settings and to assist those implementing and commissioning the devices. Settings are depicted as entered within SEL programming software Accelerator Quickset. Digital copies of these settings will also be provided upon completion of commissioning and integration for the end users records.

6 Group Settings (SET Command)

6.1 Identifier

UNIT ID LINE 1 (16 Characters)	**RID :=** MCCX-PR-YY
UNIT ID LINE 2 (16 Characters)	**TID :=** EGD-PHS

6.2 Configuration

SYN MOTOR TYPE (BRUSH, BRUSHLESS, NONE) *(SYNTYPE forced to NONE and hidden if Slot E 75)*	**SYNTYPE :=**BRUSH
PHASE CT RATIO (1–5000)	**CTR1 :=**60
MOTOR FLA (0.2–5000.0 A)	**FLA1 :=**208
VFD APPLICATION (Y, N)	**VFDAPP :=**N
NEUTRAL CT RATIO (1–2000)	**CTRN :=**10
PHASE PT RATIO (1.00–250.00)	**PTR :=**20
LINE VOLTAGE (100–30000 V)	**VNOM :=**2400
XFMR CONNECTION (DELTA, WYE)	**DELTA_Y :=**DELTA
SINGLE V INPUT (Y, N)	**SINGLEV :=**N

MCCX-PR-YY = X to be either 1 or 2 depending on which MCC the protection relay resides (1 for 2.4PHS-MCC1 or 2 for 2.4PHS-MCC2). YY refers to starter section within the respective MCC.

7 Thermal Overload

Note: For thermal modeling, fuse curves and ground fault coordination with upstream devices and motor damage curves, refer to Figures 1 and 2.

THERMAL OVERLOAD PROTECTION ENABLE:	49RSTP :=Y
THERMAL METHOD (RATING, RATING_1, CURVE)	SETMETH := CURVE
OL RESET LEVEL (10–99%TCU)	**49RSTP :=**75
SERVICE FACTOR (1.01–1.50)	**SF :=**1.15
THERM OL CURVE1 (1–46) *(Hidden when SETMETH := RATING or RATING_1)*	**CURVE1 :=**46
TRIP TIME @ 1.20FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1; hidden and not used when SF□□ 1.30)*	**TTT120 =**AUTO
TRIP TIME @ 1.30FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1; hidden and not used when SF□□ 1.30)*	**TTT130 :=**AUTO
TRIP TIME @ 1.40FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1; hidden and not used when SF □□1.40)*	**TTT140 :=**AUTO
TRIP TIME @ 1.50FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1; hidden and not used when SF := 1.50)*	**TTT150 :=**AUTO
TRIP TIME @ 1.75FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT175 :=**AUTO
TRIP TIME @ 2.00FL (1.0–6000.0 sec) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT200 :=**100.0
TRIP TIME @ 2.25FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT225 :=**AUTO
TRIP TIME @ 2.50FL (1.0–6000.0 sec) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT250 :=**30.0
TRIP TIME @ 2.75FL (1.0–6000.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT275 :=**AUTO

TRIP TIME @ 3.00FL (1.0–6000.0 sec, AUTO) **TTT300 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 3.50FL (1.0–6000.0 sec, AUTO) **TTT350 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 4.00FL (1.0–6000.0 sec, AUTO) **TTT400 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 4.50FL (1.0–6000.0 sec, AUTO) **TTT450 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 5.00FL (1.0–600.0 sec, AUTO) **TTT500 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 5.50FL (1.0–600.0 sec) **TTT550 :=**5.0
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 6.00FL (1.0–600.0 sec) **TTT600 :=**4.0
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 6.50FL (1.0–600.0 sec) **TTT650 :=**3.3
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 7.00FL (1.0–600.0 sec, AUTO) **TTT700 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 7.50FL (1.0–600.0 sec, AUTO) **TTT750 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 8.00FL (1.0–600.0 sec, AUTO) **TTT800 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 8.50FL (1.0–600.0 sec, AUTO) **TTT850 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 9.00FL (1.0–600.0 sec, AUTO) **TTT900 :=**AUTO
(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)

TRIP TIME @ 9.50FL (1.0–600.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT950 :=**AUTO
TRIP TIME @ 10.0FL (1.0–600.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT1000 :=**AUTO
TRIP TIME @ 11.0FL (1.0–600.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT1100 :=**AUTO
TRIP TIME @ 12.0FL (1.0–600.0 sec, AUTO) *(Hidden when CURVE1 := 1–45 or SETMETH := RATING or RATING_1)*	**TTT1200 :=**1.0
OL WARN LEVEL (OFF, 50–99%TCU)	**TCAPU :=**85
START INH. LEVEL (OFF, 1–99%TCU)	**TCSTART :=**OFF
STOP COOL TIME (1–6000 min)	**COOLTIME :=**30
LEARN COOLTIME? (Y, N) *(Hidden when E49RTD := NONE)*	**COOLEN :=**N
OL RTD BIASING? (Y, N) *(Hidden when E49RTD := None)*	**ETHMBIAS :=**N

8 Overcurrent

8.1 Phase

- Because the load jam element is only enabled after the motor is determined to be running, one level of phase overcurrent has been added to protect the motor from locked rotor conditions while starting. An intentional delay and inhibit logic has been implemented to ensure that the starter fuse operates first for fault currents above 4.16kA as each starter contactor is only rated to interrupt 5kA. (Refer to inhibit logic) SV05 on Page 46.

PH OC TRIP LVL (OFF, 0.10–20.00 xFLA)	**50P1P :=**12.00
NEU OC TRIP DLAY (0.00–5.00 sec) (Hidden if associated pickup is OFF)	**50P1D :=**0.4
PH OC WARN LVL (OFF, 0.10–20.00 xFLA)	**50P2P :=**20.00
NEU OC TRIP DLAY (0.00–5.00 sec) (Hidden if associated pickup is OFF)	**50P2D :=**0.0

8.2 Neutral

NEUT OC TRIP LVL (OFF, 0.01–650.00 A)	**50N1P :=**3.5
NEU OC TRIP DLAY (0.00–5.00 sec) *(Hidden if associated pickup is OFF)*	**50N1D :=**1.00
NEUT OC WARN LVL (OFF, 0.01–650.00 A)	**50N2P :=**OFF

9 Jam

Load-jam protection is available only when the relay detects that the motor is in a running state. During a load-jam condition, the motor stalls and the phase current (note positive sequence current is used for the load jam element) rise to near the locked rotor value. Set the load jam trip leave greater than the expected normal load current but less than the rated locked rotor current.

JAM TRIP LEVEL (OFF, 1.00–6.00 xFLA)	**LJTPU :=**3.00
JAM TRIP DELAY (0.0–120.0 sec) *(If LJTPU := OFF, LJTDLY is hidden and JAMTRIP is deasserted all the time)*	**LJTDLY :=**0.4
JAM WARN LEVEL (OFF, 1.00–6.00 xFLA)	**LJAPU :=**OFF

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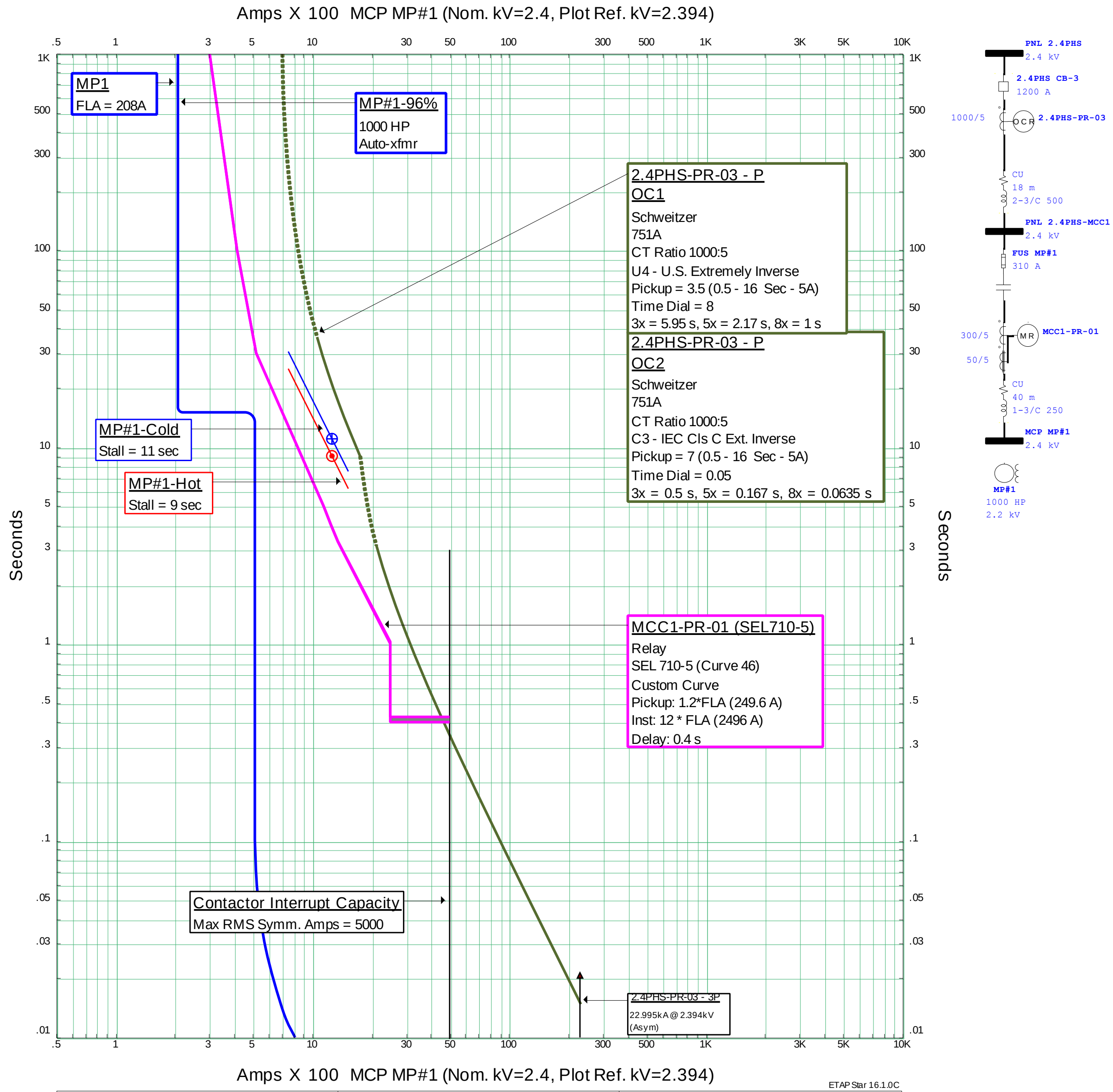

	1.3 2.4PHS-MCC1_MP#1	prime engineering
Project: SES-PHS Location: Esquimalt Graving Dock Contract: 4517.03		Date: 10-26-2016 Rev: Base Fault: Phase

Figure 1-Main Dewatering Pump TCC (Phase)

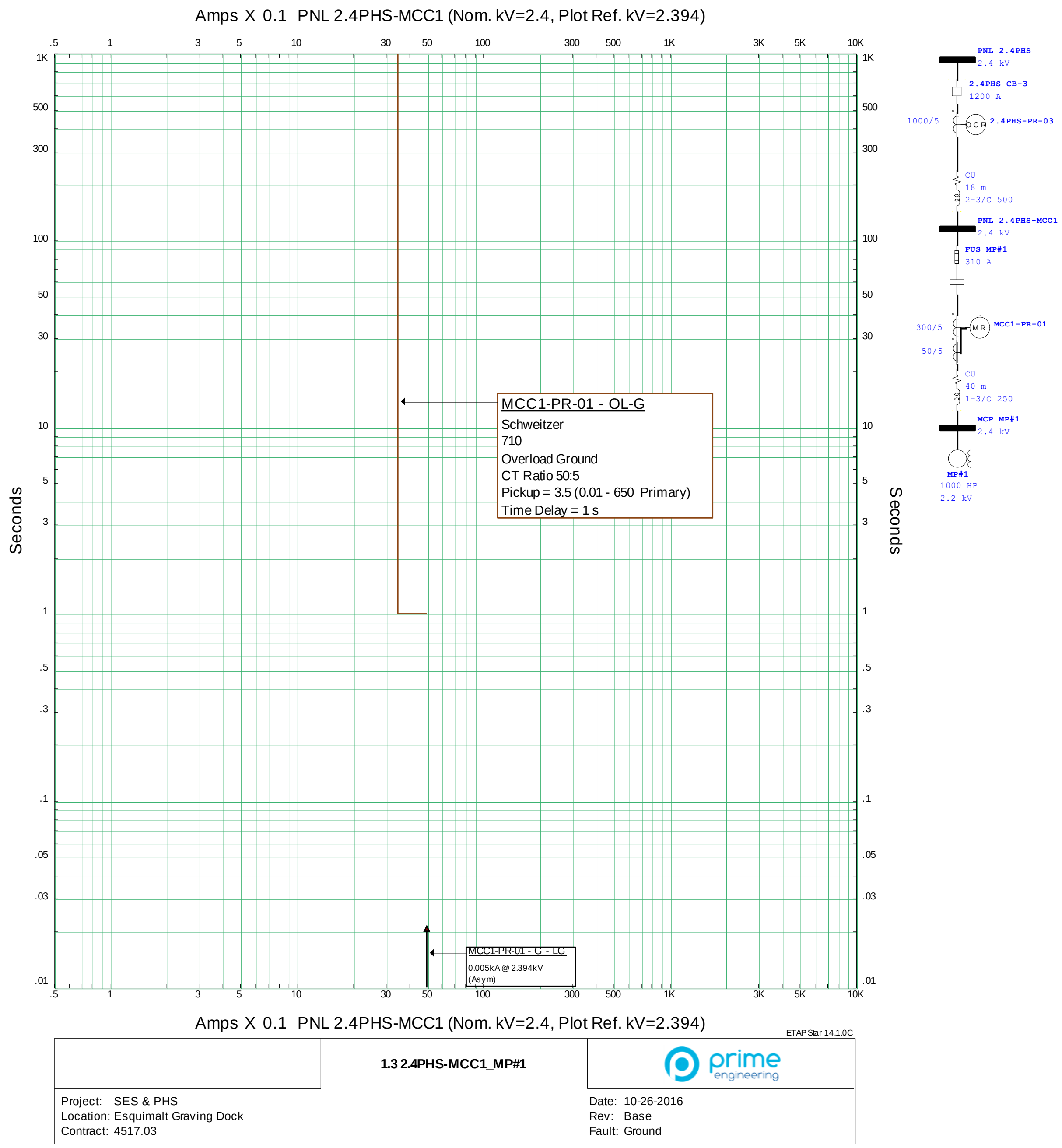

Figure 2-Main Dewatering Pump TCC (Ground)

10 Undercurrent

- Undercurrent protection has been incorporated to detect loss of prime mover, pumping cavitation and broken shaft or coupling failure. As determined from Figure 3, Figure 4 and Figure 5, continues operating currents for each pump were record in excess of 100Amps on each phase. With a rated FLA of 208Amps, the undercurrent trip has been set to .33xFLA or approximately 70Amps to ensure sufficient coupling to external loads are well below normal operating conditions. This setting was also determined by reviewing main dewatering pump #3 starting characteristic, where approximately 33 seconds elapsed before the load current stabilized above this trip value.
- An undercurrent alarm has been set to .43xFLA or approximately 90 Amps for 5 seconds to warn operators of a pending load loss or undercurrent trip.
- Arming or element start delay is set to 180 seconds to avoid nuisance tripping during starts by ensuring the motor has started, synchronized, discharge valve has opened and the pumping system has stabilized before enabling this element. As can be seen from Main Dewatering Pump #3 current summary, time to reach full loading took in excess 90 seconds and other starts up to 120 seconds were noted. The exact scenario that led to prolonged loading for this particular start is not known and it is suggest that this condition be investigated and any further recommendations on this setting be brought to Prime Engineers attention by PWGSC or approved delegate.
- The trip time has been set to 5.0 seconds upon a detected undercurrent value after expiration of the arming or element start delay mentioned above.

UC TRIP LEVEL (OFF, 0.10–1.00 xFLA)	**LLTPU :=**0.33
UC TRIP DELAY (0.4–120.0 sec) *(Hidden if associated pickup is OFF)*	**LLTDLY :=**5.0
UC WARN LEVEL (OFF, 0.10–1.00 xFLA)	**LLAPU :=**0.43
UC WARN DELAY (0.40–120.0 sec) *(Hidden if associated pickup is OFF)*	**LLADLY :=**5
UC START DELAY (0–5000 sec) *(Hidden when LLTPU and LLAPU are OFF)*	**LLSDLY :=**30

*LLSDLY will enable alarm element 30 seconds after synchronization however the trip will be supervised by SV18T for 180 seconds after synchronization.

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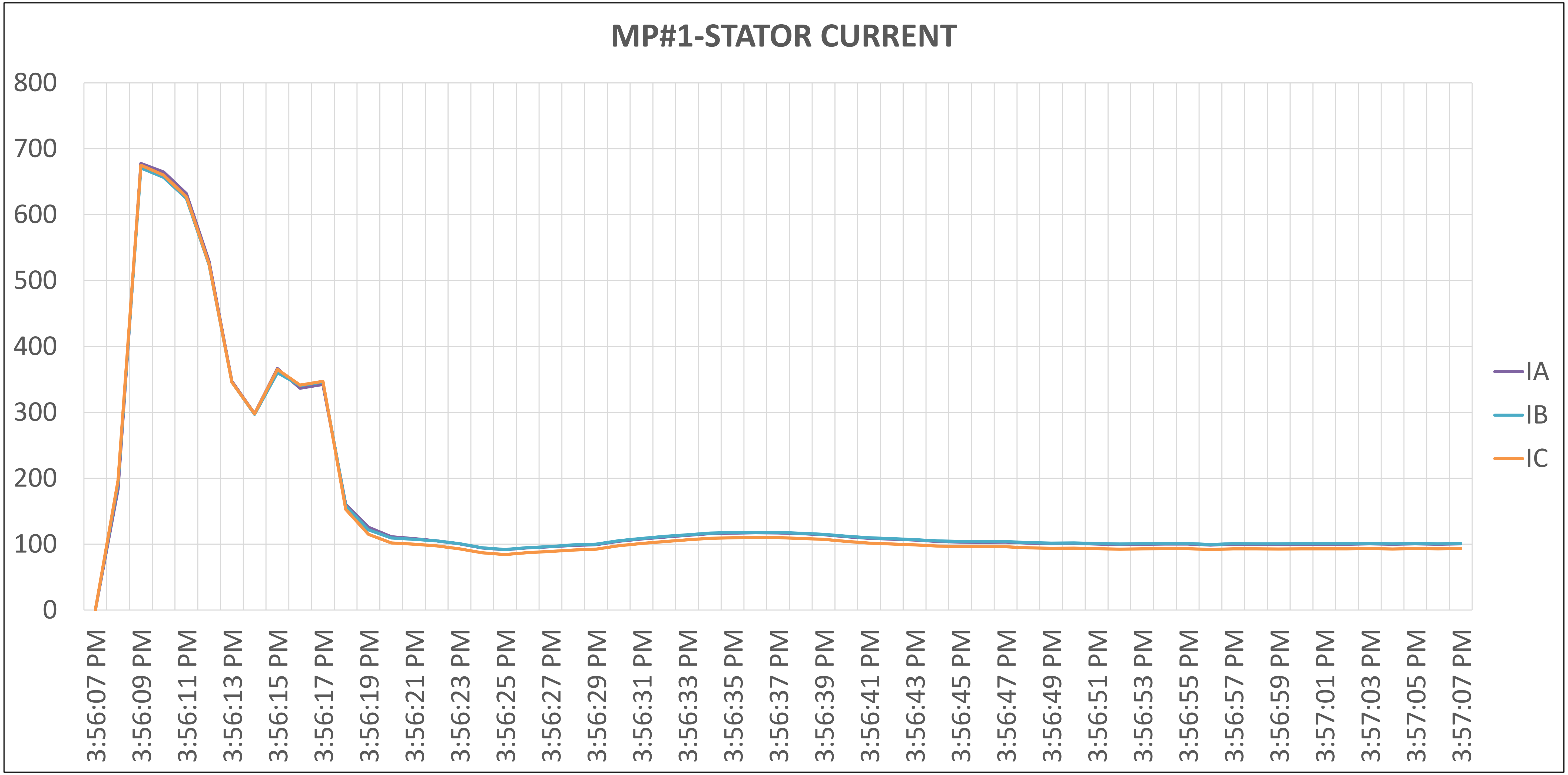

Figure 3-Main Dewatering Pump # 1 Current

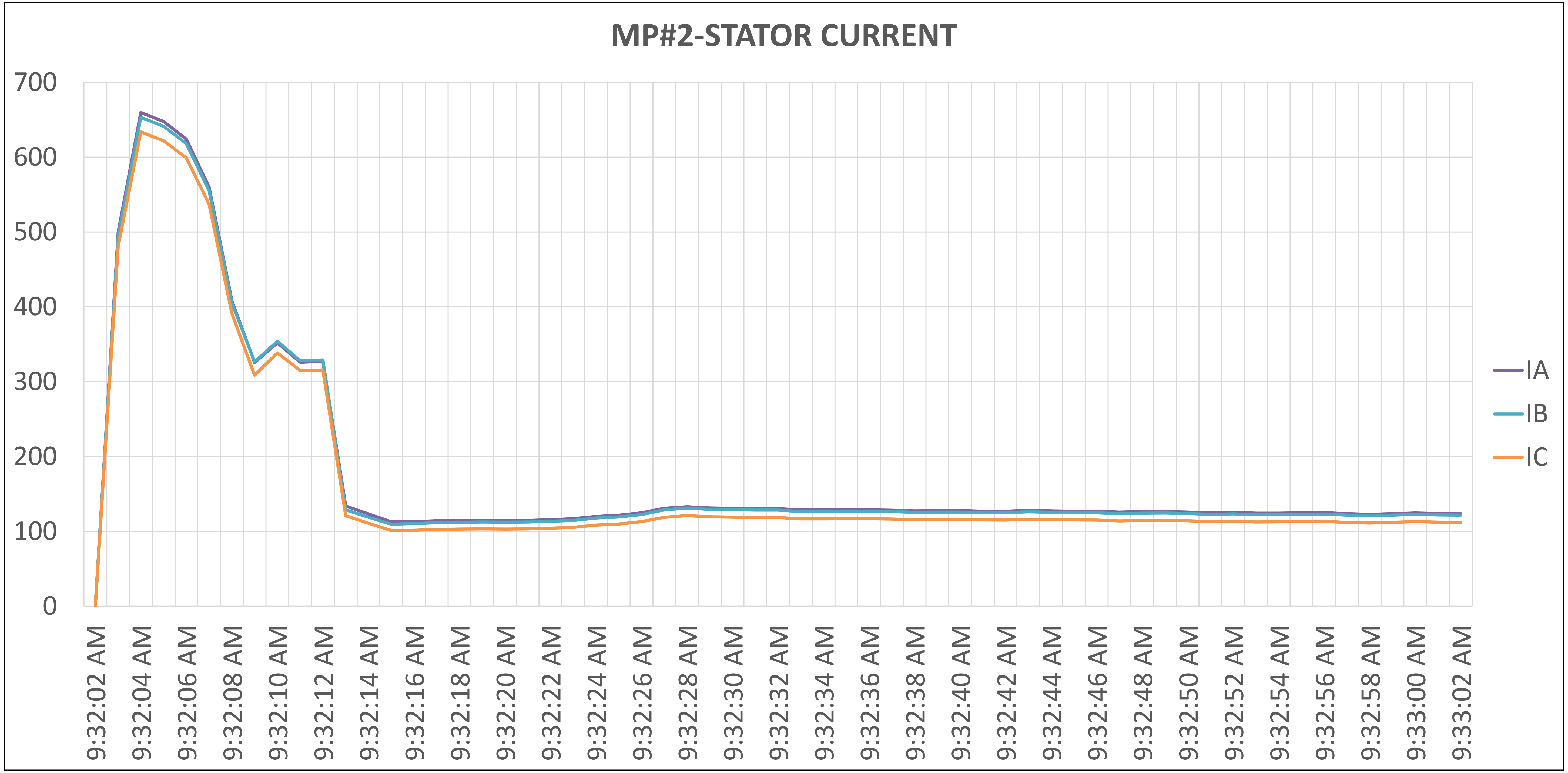

Figure 4-Main Dewatering Pump # 2 Current

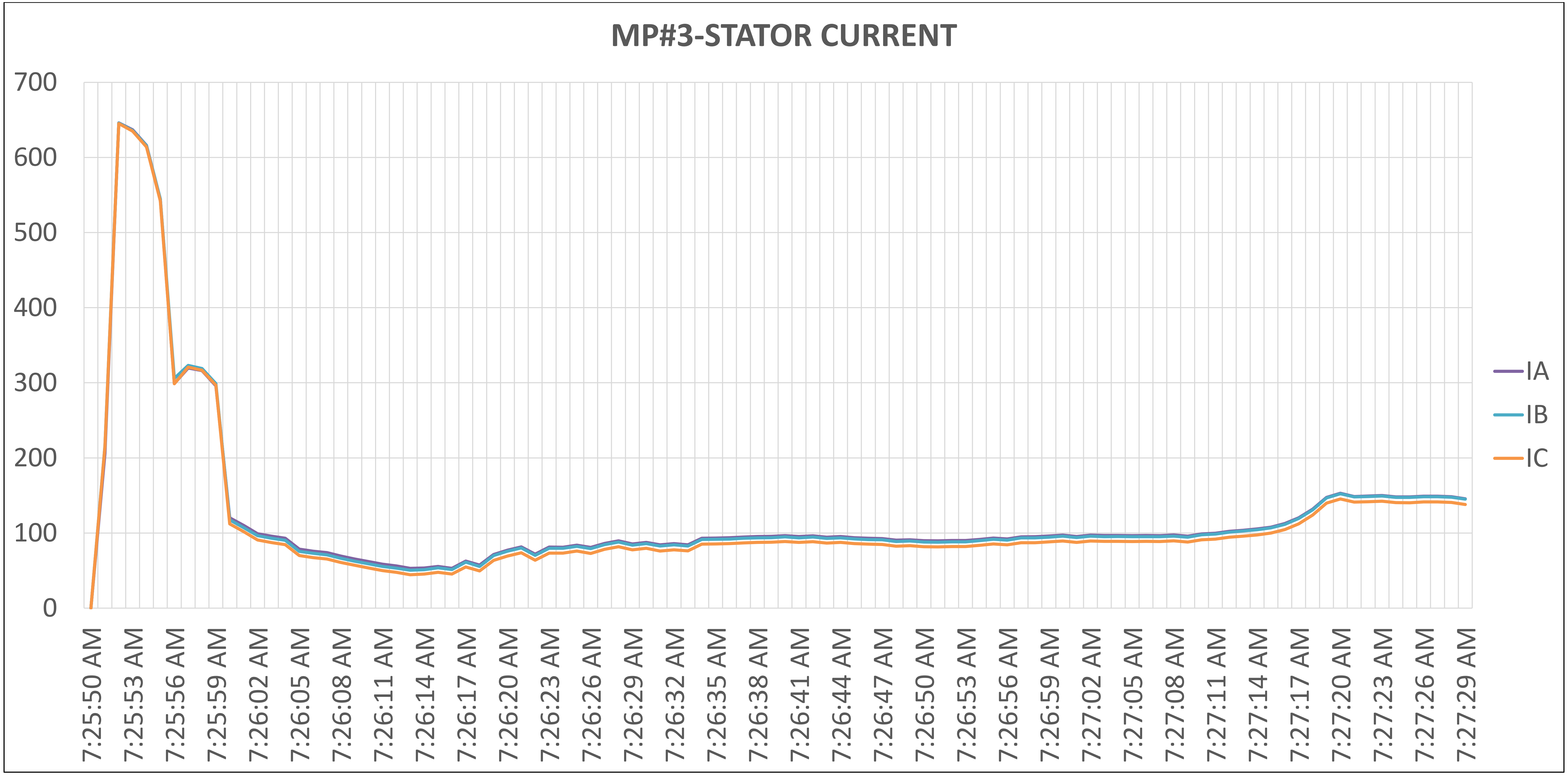

Figure 5-Main Dewatering Pump # 3 Current

11 Current Imbalance

- Unbalanced terminal voltages cause unbalanced stator currents to flow in the motor. The negative-sequence current component of the unbalanced current causes significant rotor heating. A 1 percent voltage unbalance typically causes approximately 6 percent current unbalance in synchronous and induction motors. Assuming the potential for a 2% voltage unbalance, the alarm has been set above 12% current imbalance to 15% (approximately 2.5 percent voltage unbalance) for 10 seconds. The trip has been set to 20 percent current unbalance which corresponds to approximately 3.3% voltage unbalance.
- Referring to Figures 6, 7 and 8 each pump stabilizes to run with an approximate voltage unbalance of 1% and an approximate current unbalance of 6%.

CI TRIP LEVEL (OFF, 5–80%)	**46UBT :=**	20
CI TRIP DELAY (0–240 sec) *(Hidden if associated pickup is OFF)*	**46UBTD :=**	5
CI WARN LEVEL (OFF, 5–80%)	**46UBA :=**	15
CI WARN DELAY (0–240 sec) *(Hidden if associated pickup is OFF)*	**46UBAD :=**	10

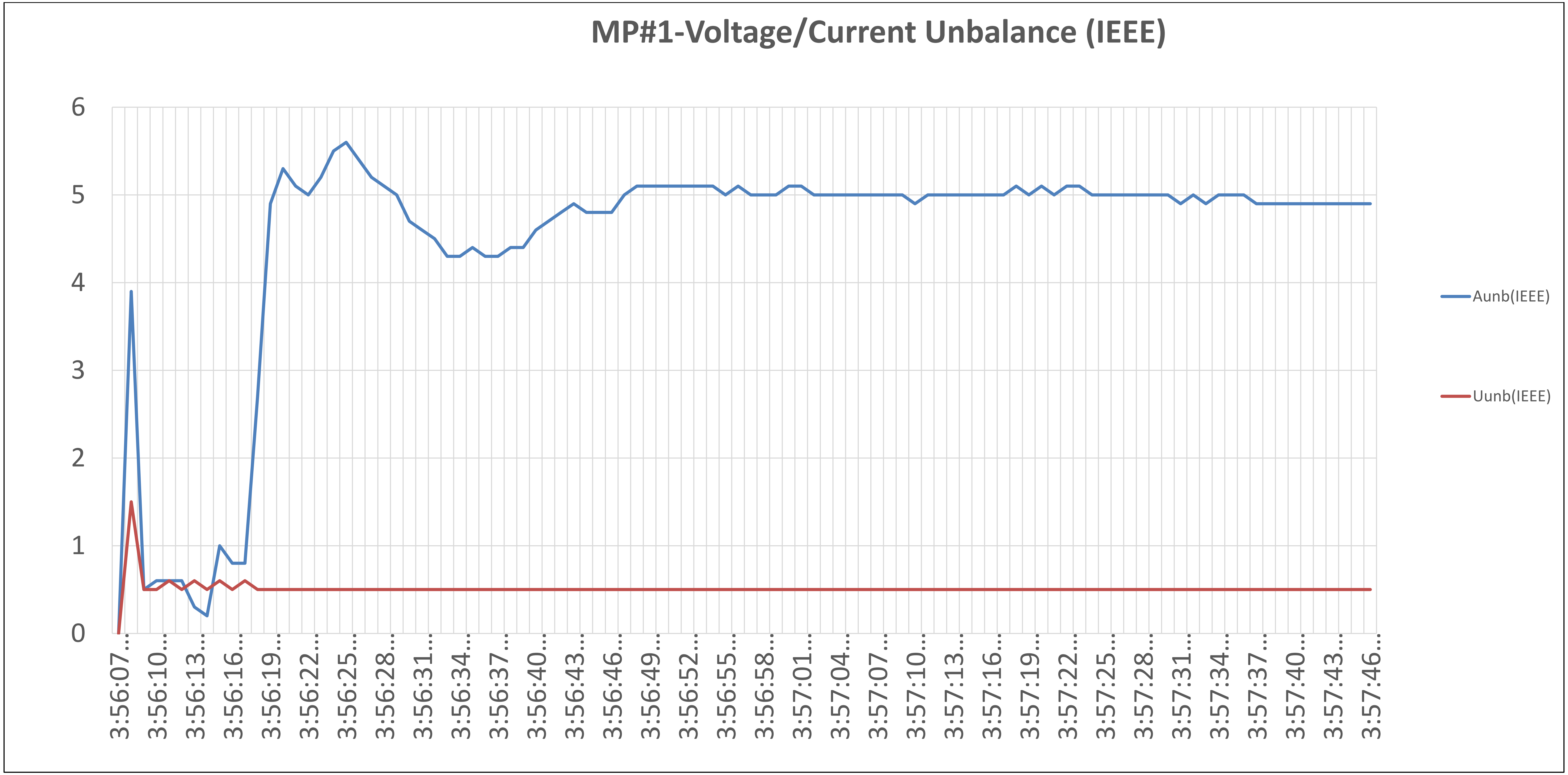

Figure 6 -Main Dewatering Pump # 1 Voltage/Current Unbalance (IEEE)

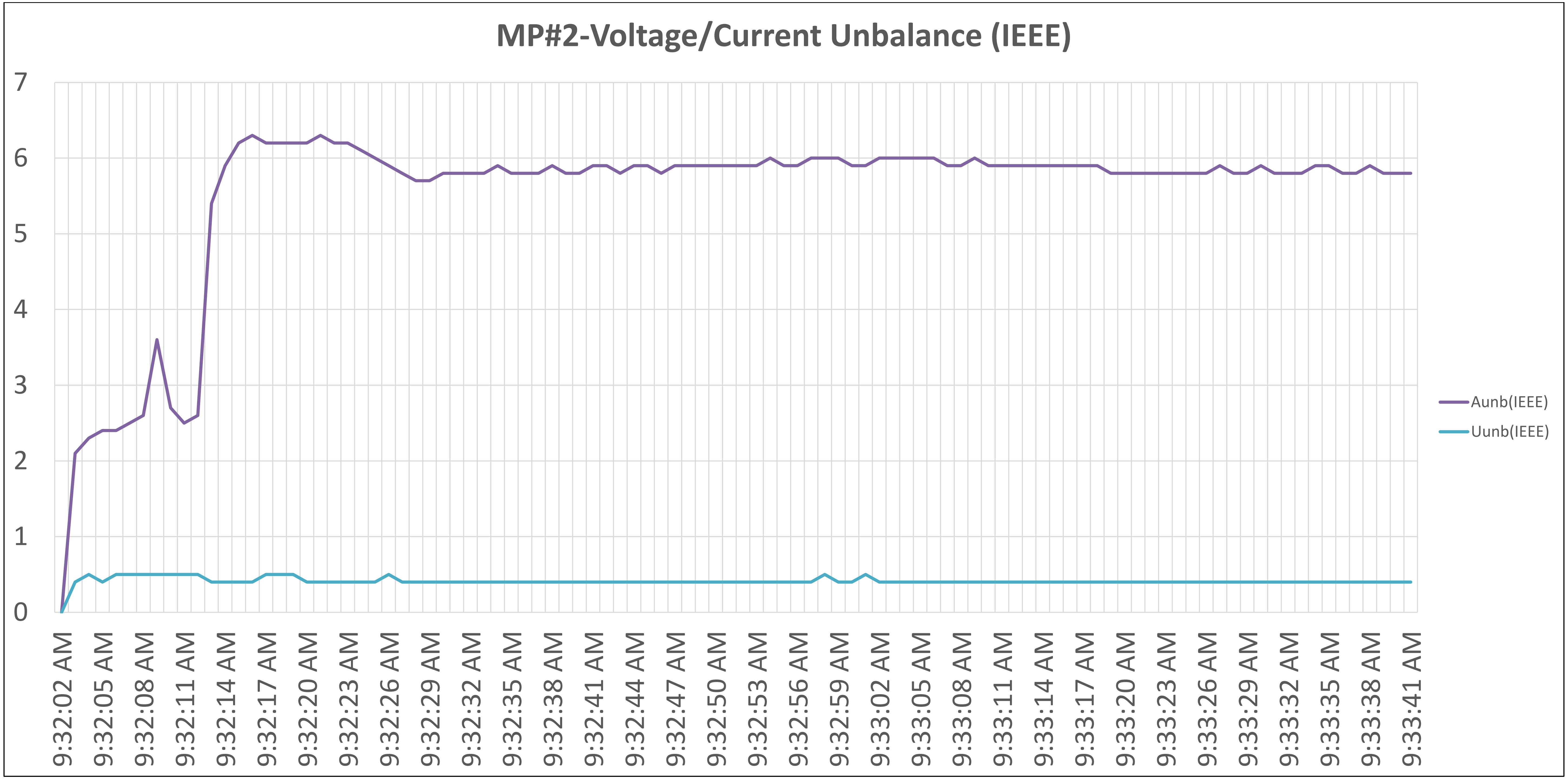

Figure 7-Main Dewatering Pump # 2 Voltage/Current Unbalance (IEEE)

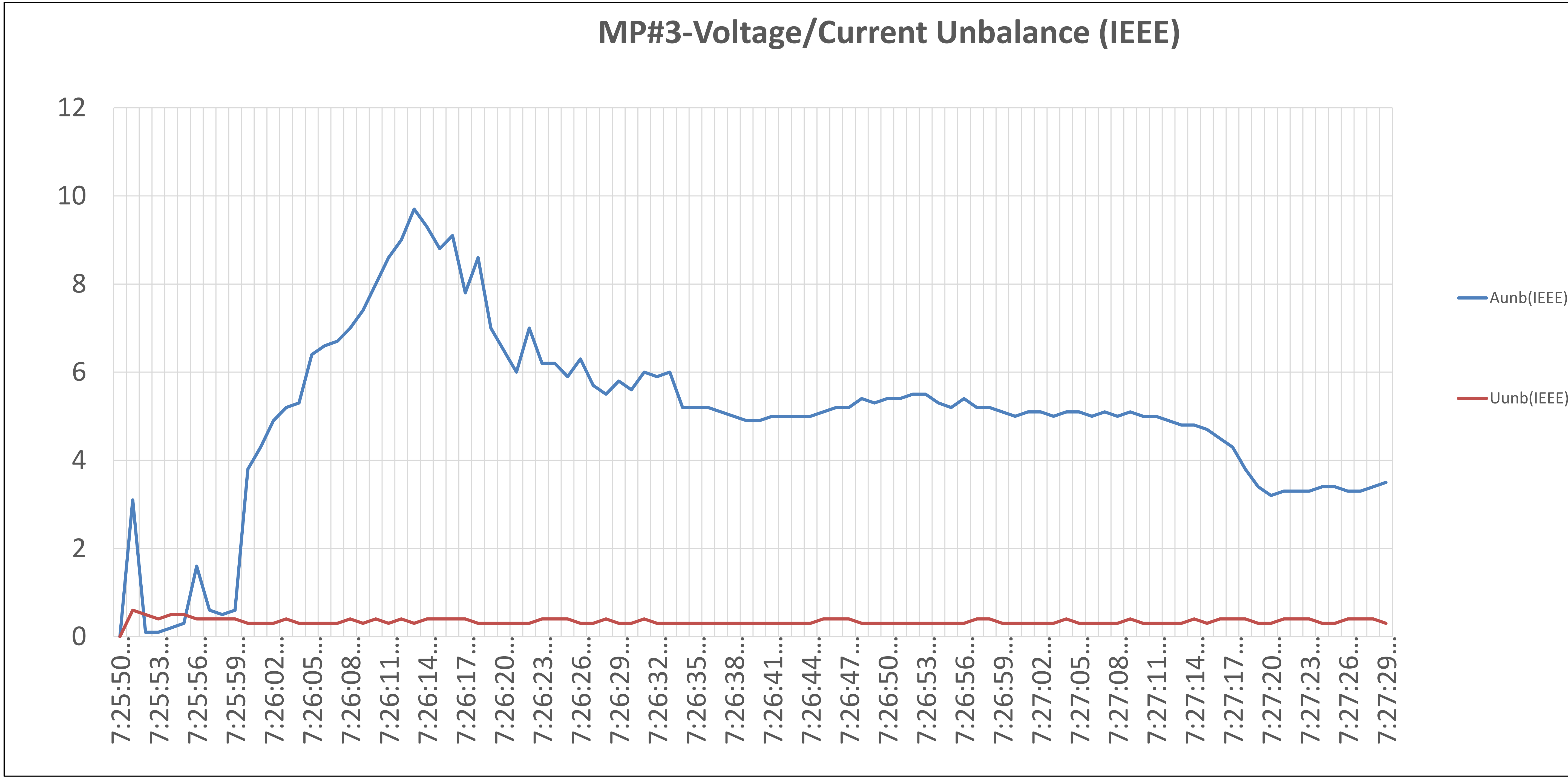

Figure 8-Main Dewatering Pump # 3 Voltage/Current Unbalance (IEEE)

12 Start Monitoring

- If motor starting has not finished by the set time, the relay will trip the starter. For synchronous motor applications, if the motor has not synchronized within the START_T duration (SRUNNING=0), the relay will trip.
- Typical start durations for each main dewatering pump are less than 15 seconds. Allow an additional 5 seconds before initiating tripping to protect the squirrel cage winding during extended starting.
- When observing the existing PLC program used to start and monitor the main dewatering pumps in automatic mode, the failure to synchronize shutdown time is also set to 20 seconds.

START MOTOR TIME (OFF, 1–240 sec)	**START_T :=**20

13 Start Inhibit

- Due to a lack of manufacturer's recommendations, to protect the stator and rotor from thermal damage due to large inrush currents upon starting, the maximum number of starts per hour has been set to 2. This setting is subject to PWGSC review of existing documentation.
- A minimum off time between starts has been implemented to ensure sufficient cooling time of the autotransformer starter. Motor time between starts is unknown due to insufficient data provided.
- A restart block to prevent motor starting in a backspin condition has been implemented at 2 minutes to ensure enough time has elapsed for the discharge valve to close.
- This element will act as a backup to the thermal model which will monitor the total thermal capacity used (TCU) during each start and prohibit starting it the expected TCU for subsequent starts will be exceeded.

STARTS/HR. (OFF, 1–15)	**MAXSTART :=**2
MIN. OFF TIME (OFF, 1–150 min)	**TBSDLY :=**10
RESTART BLK TIME (OFF, 1–1500 min)	**ABSDLY :=**5

14 Phase Reversal

- Phase rotation protection has been implemented to protect the motor against harmful conditions that could occur from rotating in the opposite direction than what is intended. The relay trips 0.5 seconds after incorrect phase rotation signals are applied to the relay

PH REV. ENABLE (Y, N)	**E47T :=**Y

15 RTD (Resistance Temperature Device)

- Bearing and winding temperatures are registered via a fiber connection to a remote SEL-2600D RTD monitoring module. Alarm and trip settings have been derived from existing site data. Refer to existing site drawings TS17, TS19 and TS21.
- When trip or alarm set-points have not been reached, the SEL-710-5 relay will send a permissive via OUT302 to the PLC indicating bearing and winding temperatures are ok to for operation.
- Along with issuing a trip that will drop out the starter, the SEL-710-5 relay will also issue a trip via OUT301 to the PLC indicating bearing or winding temperatures have exceed allowable levels.
- Table 2 provides a description for each RTD input

RTD INPUT	DESCRIPTION
RTD1	MOTOR UPPER BEARING TEMPERATURE SENSOR
RTD2	MOTOR WINDING TEMPERATURE SENSOR #1
RTD3	MOTOR WINDING TEMPERATURE SENSOR #2
RTD4	MOTOR WINDING TEMPERATURE SENSOR #3
RTD5	MOTOR WINDING TEMPERATURE SENSOR #4
RTD6	MOTOR LOWER BEARING TEMPERATUR SENSOR
RTD7	THRUST BEARING TEMPERATURE SENSOR
RTD8	MOTOR SHAFT UPPER BEARING TEMPERATURE SENSOR
RTD9	MOTOR SHAFT LOWER BEARING TEMPERATURE SENSOR
RTD10	PUMP UPPER BEARING TEMPERATUE SENSOR
RTD11	PUMP LOWER BEARING TEMPERATURE SENSOR
RTD12	SPARE

Table 2 - RTD Input Descriptions

RTD ENABLE (INT, EXT, NONE) **E49RTD :=**EXT
(INT option is hidden from the range if there is no internal RTD card installed; all RTD setting below are hidden if E49RTD equals NONE)

RTD1 LOCATION (OFF, WDG, BRG, AMB, OTH) **RTD1LOC :=**BRG
(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)

RTD1 TYPE (PT100, NI100, NI120, CU10) **RTD1TY :=**PT100

RTD1 TRIP LEVEL (OFF, 1–250 degC) **TRTMP1 :=**90

RTD1 WARN LEVEL (OFF, 1–250 degC) **ALTMP1 :=**70

RTD2 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD2LOC** :=WDG
RTD2 TYPE (PT100, NI100, NI120, CU10)	**RTD2TY** :=PT100
RTD2 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP2** :=80
RTD2 WARN LEVEL (OFF, 1–250 degC)	**ALTMP2** :=60
RTD3 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD3LOC** :=WDG
RTD3 TYPE (PT100, NI100, NI120, CU10)	**RTD3TY** :=PT100
RTD3 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP3** :=80
RTD3 WARN LEVEL (OFF, 1–250 degC)	**ALTMP3** :=60
RTD4 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD4LOC** :=WDG
RTD4 TYPE (PT100, NI100, NI120, CU10)	**RTD4TY** :=PT100
RTD4 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP4** :=80
RTD4 WARN LEVEL (OFF, 1–250 degC)	**ALTMP4** :=60
RTD5 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD5LOC** :=WDG
RTD5 TYPE (PT100, NI100, NI120, CU10)	**RTD5TY** :=PT100
RTD5 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP5** :=80
RTD5 WARN LEVEL (OFF, 1–250 degC)	**ALTMP5** :=60
RTD6 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD6LOC** :=BRG
RTD6 TYPE (PT100, NI100, NI120, CU10)	**RTD6TY** :=PT100
RTD6 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP6** :=70
RTD6 WARN LEVEL (OFF, 1–250 degC)	**ALTMP6** :=50
RTD7 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD7LOC** :=BRG
RTD7 TYPE (PT100, NI100, NI120, CU10)	**RTD7TY** :=PT100
RTD7 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP7** :=80

RTD7 WARN LEVEL (OFF, 1–250 degC)	**ALTMP7 :=**60
RTD8 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD8LOC :=**BRG
RTD8 TYPE (PT100, NI100, NI120, CU10)	**RTD8TY :=**PT100
RTD8 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP8 :=**80
RTD8 WARN LEVEL (OFF, 1–250 degC)	**ALTMP8 :=**60
RTD9 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD9LOC :=**BRG
RTD9 TYPE (PT100, NI100, NI120, CU10)	**RTD9TY :=**PT100
RTD9 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP9 :=**90
RTD9 WARN LEVEL (OFF, 1–250 degC)	**ALTMP9 :=**70
RTD10 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF)*	**RTD10LOC :=**BRG
RTD10 TYPE (PT100, NI100, NI120, CU10)	**RTD10TY :=**PT100
RTD10 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP10 :=**70
RTD10 WARN LEVEL (OFF, 1–250 degC)	**ALTMP10 :=**50
RTD11 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF; RTD11LOC hidden and forced to OFF if E49RTD equals INT)*	**RTD11LOC :=**BRG
RTD11 TYPE (PT100, NI100, NI120, CU10)	**RTD11TY :=**PT100
RTD11 TRIP LEVEL (OFF, 1–250 degC)	**TRTMP11 :=**70
RTD11 WARN LEVEL (OFF, 1–250 degC)	**ALTMP11 :=**50
RTD12 LOCATION (OFF, WDG, BRG, AMB, OTH) *(RTDnTY, TRTMPn, and ALTMPn settings are hidden if RTDnLOC equals OFF; RTD12LOC hidden and forced to OFF if E49RTD equals INT)*	**RTD12LOC :=**OFF

16 Under voltage

- Low voltage on a motor results in high current and either failure to start, to reach speed, or to lose speed and perhaps pull out of step.
- Under voltage conditions lead to increased motor current, motor heating and overall motor performance.
- This element can act as a backup to the thermal model. When sustained under voltage conditions exist, it may be desirable to trip the motor faster than thermal overload elements.
- The under voltage setting should be 80-90% of nameplate, with a time delay set long enough to override temporary voltage sags from other motors on the same bus when starting, or when starting the protected motor. A time delay of 5.0 seconds should suffice to allow the bus voltage to restore to above 90% of nominal during main dewatering pump starting.
- A second and reduced definite time voltage element has been set to operate during utility outages. This element will also block motor starting and has a short time delay to prevent inadvertent energization from future ATS/standby generation being applied to the out of phase generated motor voltage while spinning down to a stop.
- Because the voltage reference points are connected to the common MCC bus, no supervision from the main, run or start contactors is required for this element.

UV TRIP LEVEL (OFF, 0.02–1.00 xVnm)	**27P1P** :=0.90
UV TRIP DELAY (0.0–120.0 sec) *(Hidden if associated pickup is OFF)*	**27P1D** :=5.0
UV WARN LEVEL (OFF, 0.02–1.00 xVnm)	**27P2P** :=0.50
UV WARN DELAY (0.0–120.0 sec) *(Hidden if associated pickup is OFF)*	**27P2D** :=0.2

17 Overvoltage

- Motors are typically designed to operate close to their saturation point for better utilization of core materials and increasing the V/HZ ratio can cause saturation of air gap flux leading to motor heating. Typical settings for the overvoltage element are 110% of the motors nameplate.
- A second definite time overvoltage element has been set with minimal operation time to protect winding insulation against sudden overvoltage conditions.

OV TRIP LEVEL (OFF, 0.02–1.20 xVnm)	**59P1P** :=1.10
OV TRIP DELAY (0.0–120.0 sec) *(Hidden if associated pickup is OFF)*	**59P1D** :=2.0
OV WARN LEVEL (OFF, 0.02–1.20 xVnm)	**59P2P** :=1.20
OV WARN DELAY (0.0–120.0 sec) *(Hidden if associated pickup is OFF)*	**59P2D** :=0.2

18 Frequency

- One level of under frequency protection has been implemented to operate during utility outages, similarly to that described for second level under voltage setting.

FREQ1 TRIP LEVEL (OFF, 15.00–70.00 Hz)	**81D1TP** :=56.40
FREQ1 TRIP DELAY (0.0–240.0 sec) *(Hidden if associated pickup is OFF)*	**81D1TD** :=0.0
FREQ2 TRIP LEVEL (OFF, 15.00–70.00 Hz)	**81D2TP** :=OFF
FREQ3 TRIP LEVEL (OFF, 15.00–70.00 Hz)	**81D3TP** :=OFF
FREQ4 TRIP LEVEL (OFF, 15.00–70.00 Hz)	**81D4TP** :=OFF

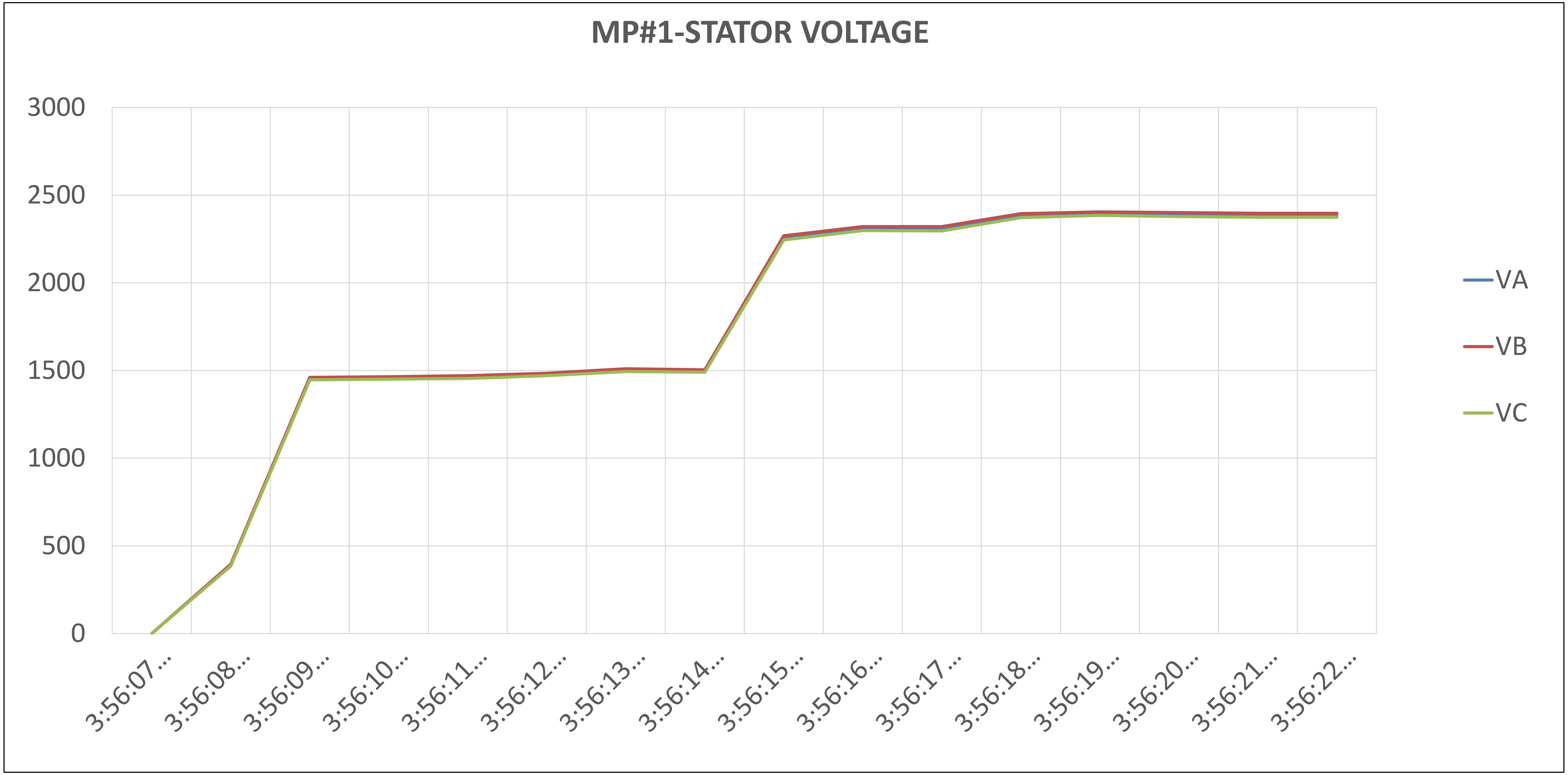

Figure 9-Main Dewatering Pump # 1 Voltage During Start

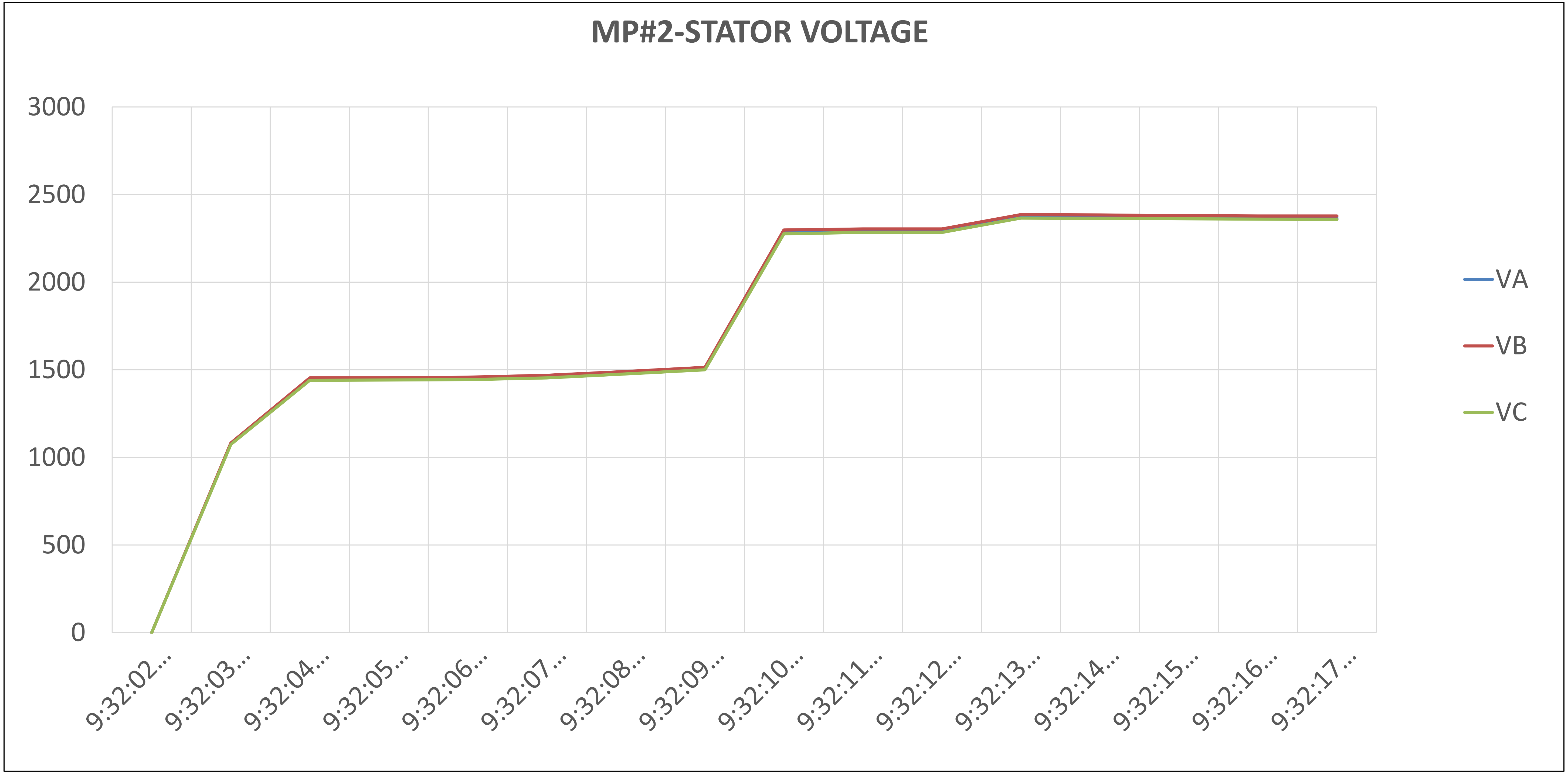

Figure 10-Main Dewatering Pump #2 Voltage During Start

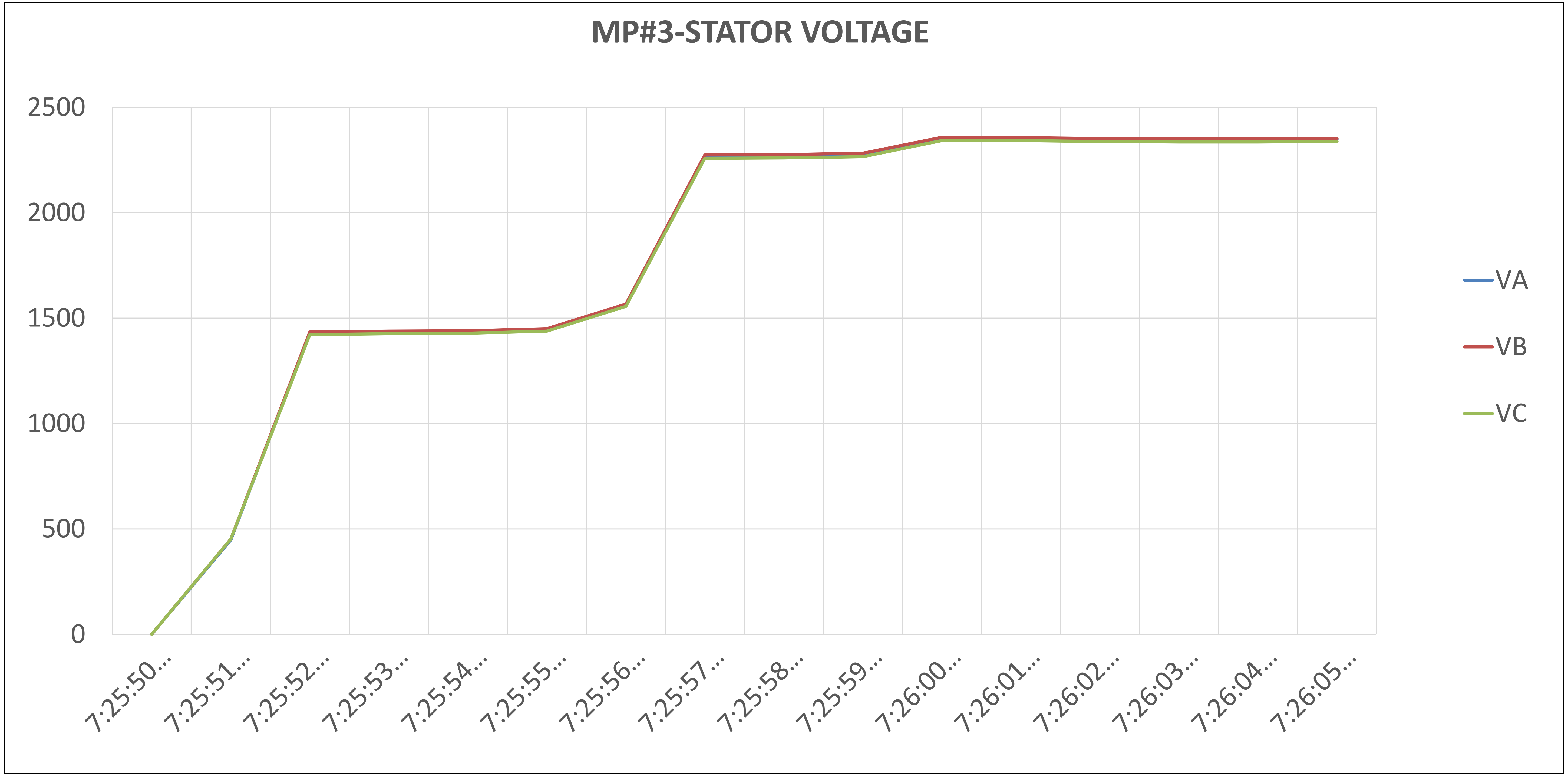

Figure 11-Main Dewatering Pump # 3 Voltage During Start

19 Loss of Field

- Loss-of-field current causes the synchronous motor to act as an induction motor, requiring reactive power from the utility system, thus lagging current flows into the motor.
- A pair of offset mho circles is used to detect loss-of-field. Because loss-of-field affects all three phases, the condition is a balanced one and uses measured positive-sequence impedance to form the mho circles
- Zone 1 and Zone 2 are offset from the impedance plane origin by a value equal to half of the machine transient reactance. Zone 1 is intended to operate with little time delay in the event of loss of field under full load conditions. Zone 2 is intended to trip for loss-of-field conditions that occur under light load conditions.
- Because of a lack of manufacturers data, settings are derived from utilizing typical synchronous motor direct axis reactance Xd and transient reactance X'd values for this size and type of synchronous motor from "*ETAP Version 16.1 power system modeling software.*"

40Z1P = VNOM/(1.732*INOM)
40XD1=X'd/2
40Z2P=Xd
40XD2=X'd/2

Where:
VNOM = 120Vsec
INOM = 3.47Asec
Z = 19.8Ω = 40Z1P
Xd = 1.55 PU of Z
X'd= 0.28 PU of Z

(Hidden if SYNTYPE := NONE and E40 forced to default, N)

LOSS OF FIELD EN (Y, N) **E40 :=**Y
(All the following settings are hidden if E40 := N)

Z1 MHO DIAMETER (OFF, (0.5–500.0)/INOM Ohm sec) **40Z1P :=**19.8
(INOM = 5 A or 1 A)

Z1 OFFSET ((0.0–250.0)/INOM Ohm sec) **40XD1 :=**2.8
(Hidden if 40Z1P := OFF)

Z1 TIME DELAY (0.00–400.00 sec) **40Z1D :=**0.00
(Hidden if 40Z1P := OFF)

Z2 MHO DIAMETER (OFF, (0.5–500.0)/INOM Ohm sec) **40Z2P :=**30.7
(INOM := 5 or 1)

Z2 OFFSET ((0.0–250.0)/INOM Ohm sec) **40XD2 :=**2.8
(Hidden if 40Z2P := OFF)

Z2 TIME DELAY (0.00–400.00 sec) **40Z2D** :=0.50
(Hidden if 40Z2P := OFF)

40Z TRQ CTRL (SELOGIC) **40ZTC** :=NOT LOP AND SV07T

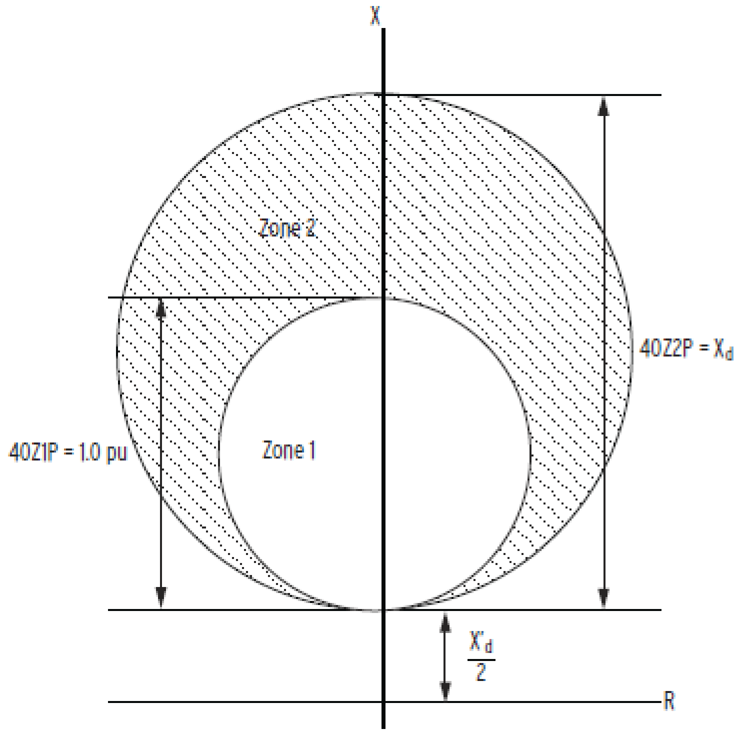

Figure 12 - Loss of Field Operating Characteristic

20 Field Current

- Field current monitoring has been employed to protect against loss of field or over excitation conditions.
- Field undercurrent set to 65% and field overcurrent set to 150% of recorded running amps as depicted in Figures 13, 14 and 15. Field current protection will only be employed 5 seconds after excitation has been applied. Time delay set for 1 second.
- Field undercurrent warning set to 70% and field overcurrent warning set to 135% of recorded running amps depicted in Figures 13, 14 and 15. Field under/over current warning will only be employed 5 seconds after excitation has been applied. Time delay set for 1 second.
- Field current supervision will serve as a backup element to Power Factor, Loss of Field and Var Elements.

(Hidden if SYNTYPE := NONE; FDUC1P, FDUC2P, FDOC1P, and FDOC2P forced to default, OFF)

FLD CURRENT IN (I, V)	**FDCURIN :=**I
FLD CUR @ 20 mA (1.0–2000.0 A) *(Shown if FDCURIN := I)*	**FD_20mA :=**200.00
FLD UC TRIP LEVEL (OFF, 1.0–2000.0 A)	**FDUC1P :=**65.0
FLD UC TRIP DLY (0.3–100.0 sec) *(Hidden if associated pickup is OFF)*	**FDUC1D :=**1.0
FLD UC WARN LVL (OFF, 1.0–2000.0 A)	**FDUC2P :=**70.0
FLD UC WARN DLY (0.3–100.0 sec) *(Hidden if associated pickup is OFF)*	**FDUC2D :=**5.0
FLD OC TRIP LVL (OFF, 1.0–2000.0 A)	**FDOC1P :=**150.0
FLD OC TRIP DLY (0.3–100.0 sec) *(Hidden if associated pickup is OFF)*	**FDOC1D :=**1.0
FLD OC WARN LVL (OFF, 1.0–2000.0 A)	**FDOC2P :=**135.0
FLD OC WARN DLY (0.3–100.0 sec) *(Hidden if associated pickup is OFF)*	**FDOC2D :=**5.0
FLDC TRQ CTRL (SELOGIC)	**FDCTC :=**SV07T

21 Field Voltage

- Field voltage protection/monitoring has been employed to protect against field over voltage conditions and to ensure adequate field voltage is built prior to applying field excitation
- Field voltage protection will only be enabled once the motor is synchronized or synchronously running.
- Field under voltage trip will be set to 50% and field overvoltage trip will be set to 150% of recorded running voltage. Field under/over voltage will only be employed 5 seconds after excitation has been applied. Time delay set for 1 second.
- Field under voltage alarm will be set to 70% and field overvoltage alarm will be set to 135% of recorded running voltage. Field under/over voltage will only be employed 5 seconds after excitation has been applied. Time delay set for 1 second.

(Hidden if SYNTYPE := NONE; FDUV1P, FDUV2P, FDOV1P, FDOV2P forced to default, OFF)

FLD UV TRIP LVL (OFF, 1.0–350.0 V) **FDUV1P :=**65.0

FLD UV TRIP DLY (0.3–100.0 sec) **FDUV1D :=**1.0
(Hidden if associated pickup is OFF)

FLD UV WRN LVL (OFF, 1.0–350.0 V) **FDUV2P :=**90.0

FLD UV WARN DLY (0.3–100.0 sec) **FDUV2D :=**5
(Hidden if associated pickup is OFF)

FLD OV TRIP LVL (OFF, 1.0–350.0 V) **FDOV1P :=**195.0

FLD OV TRIP DLY (0.3–100.0 sec) **FDOV1D :=**1.0
(Hidden is associated pickup is OFF)

FLD OV WARN LVL (OFF, 1.0–350.0 V) **FDOV2P :=**175.0

FLD OV WARN DLY (0.3–100.0 sec) **FDOV2D :=**5
(Hidden if associated pickup is OFF)

FLD TRQ CTRL (SELOGIC) **FDVTC :=**SV07T

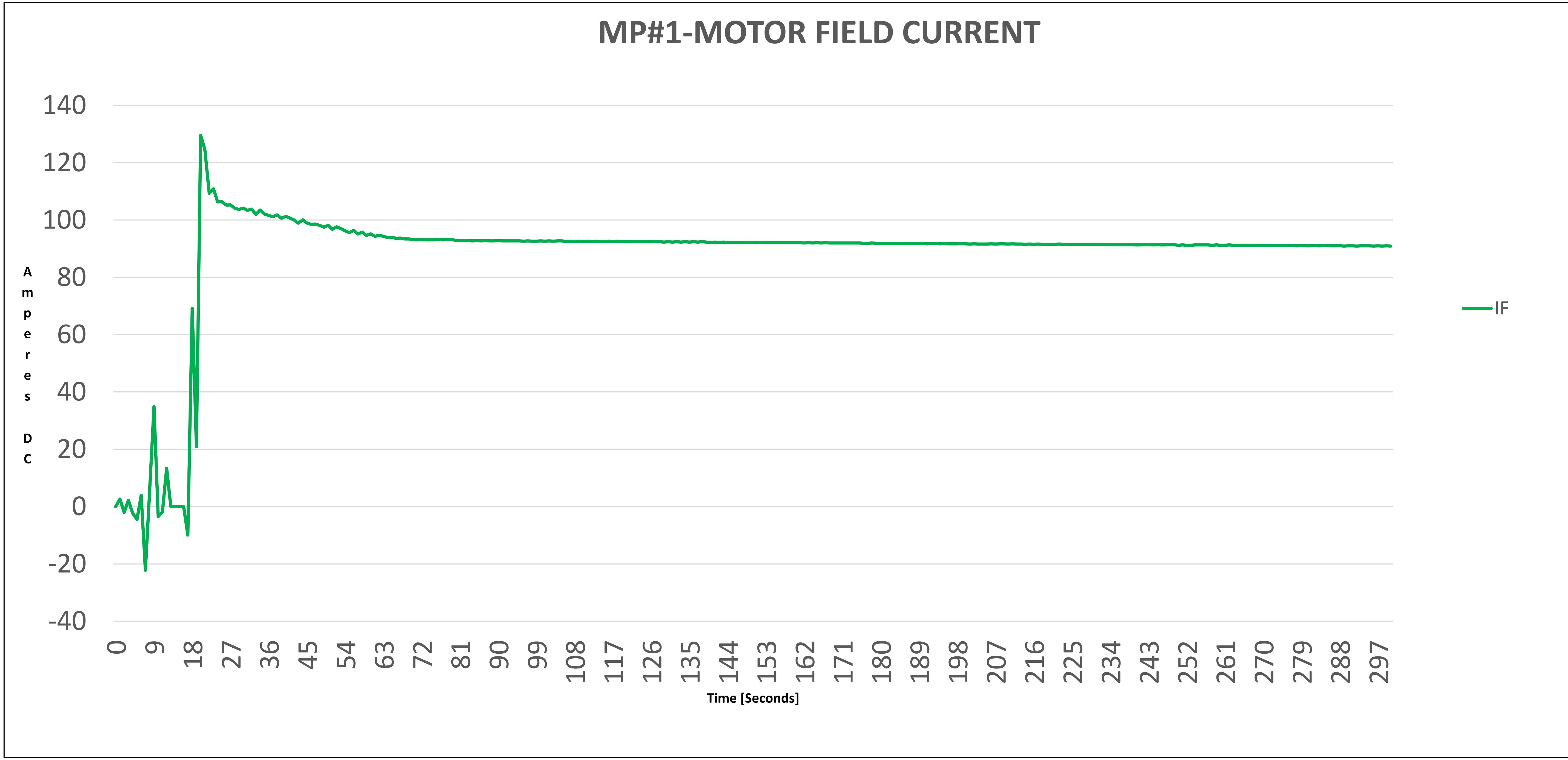

Figure 13-Main Dewatering Pump # 1 Motor Field Current

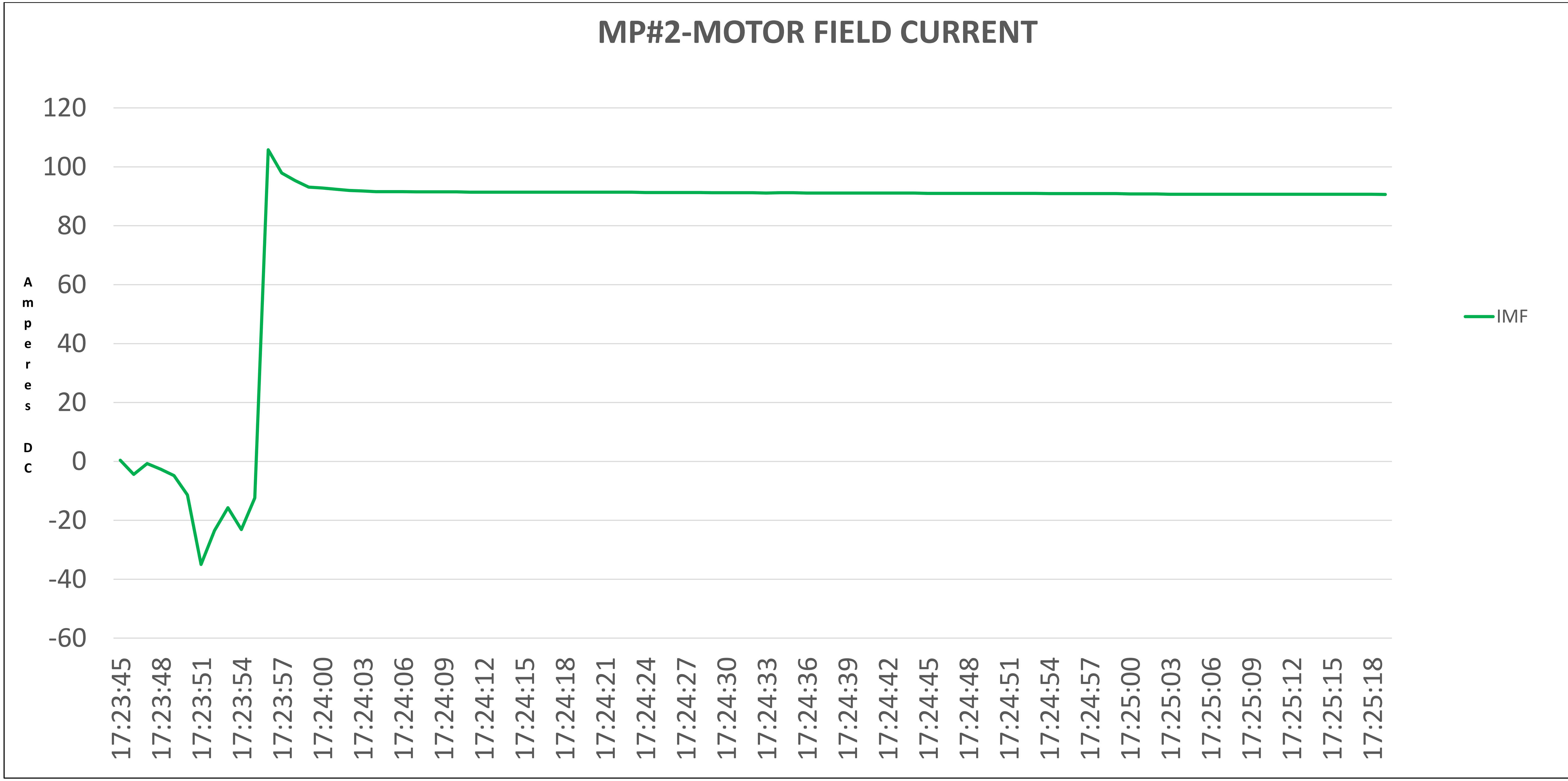

Figure 14-Main Dewatering Pump #2 Motor Field Current

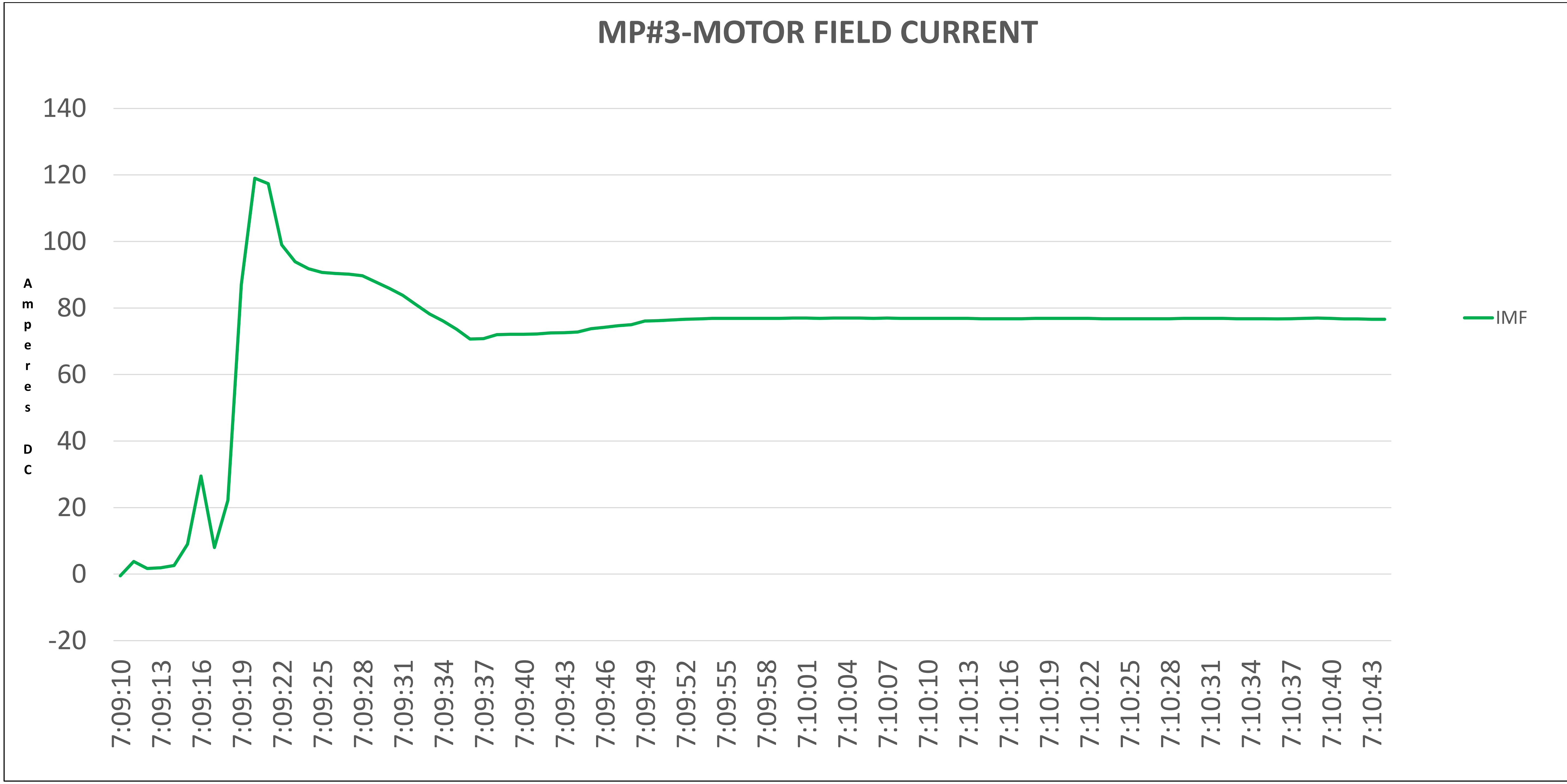

Figure 15-Main Dewatering Pump #3 Motor Field Current

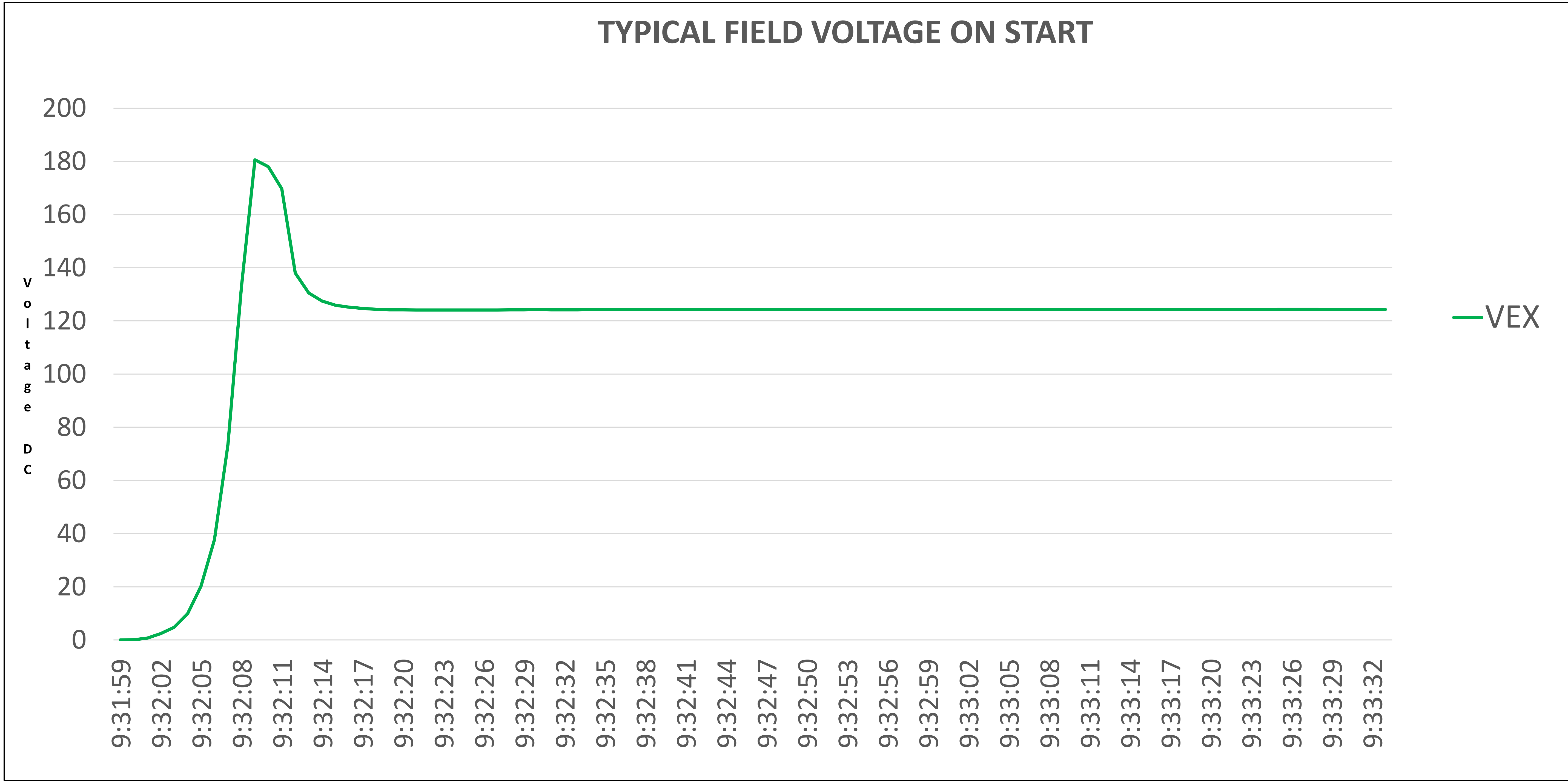

Figure 16 - Typical Field Voltage Curve on Start (Measured at Terminals DCG+ and DCG-)

22 Start Sequence

The following steps are part of the synchronization process:

1) Closing the field circuit via the field discharge resistor
2) Application of three-phase power to the stator
3) Application of field excitation when desired slip and angle are reached
4) Tripping of the motor in case of incomplete sequence

The start sequence is described below:

1. The motor will be started with the discharge resistor connected across the motor field winding via the 41b auxiliary contact. The brush-type motor is started by applying ac power to the stator windings. This results in a rotating magnetic field in the air-gap at synchronous speed. The rotating magnetic field, in effect, induces EMF in the amortisseur windings and the field winding. The torque produced by the induced currents in the amortisseur windings cause the motor to operate as an induction motor and to accelerate to near synchronous speed.
2. As the induced current in the field circuit circulates through the motor field discharge resistor, the relay senses the voltage across this resistor to determine the exact moment to energize the field windings.
3. The start sequence to allow excitation to be applied is permitted when the relay's internal STARTING or RUNNING logic is true, phase rotation is correct, there are no active trips and field voltage is present before the start sequence is initialized.
4. Once item #3 has been met, the relay looks for a decaying induced frequency to qualify a proper start sequence.
5. The relay continues to calculate the frequency of the voltage signal across the field discharge resistor at every zero crossing and compares it to the synchronize slip setting. If the calculated rotor slip frequency is less than or equal to the synchronize slip setting, the relay declares that the required slip is reached, permitting field excitation application.
6. The synchronization slip setting has been set to 5%. This is based off the data gathered from a typical motor start where the last data point before the field contactor closed showed an induced frequency of 2.6 Hz or 4.33% slip. Refer to Figure 17.
7. Speed sensors mounted on the motor main shafts will be also block application of excitation to the rotor until the motor is at 95% rated speed.
8. Presence of adequate field voltage is also monitored and must be met prior to issuing the command for field contactor closure.
9. Once the field contactor is closed, there must be a minimum of 50 amps flowing in the motor field windings to validate that the motor is synchronously running "SRUNNING".

(Hidden if SYNTYPE := NONE; hidden and not processed if VFDAPP := Y)

STRT SEQ ENABLE (SELOGIC) *(Shown if SYNTYPE := BRUSH)*	**STSEQEN :=**(STARTING OR RUNNING) AND NOT 47T AND NOT TRIP
SYNCHRONIZE SLIP (1.0–10.0%) *(Shown if SYNTYPE := BRUSH)*	**SYNSLIP :=**5.0
UNLATCH 41CLOSE (SELOGIC) *(Shown if SYNTYPE := BRUSH)*	**UL41CL :=**NOT 52A OR NOT IN301 OR TRIP OR STOPPED OR NOT IN403*
MN FDC TO SYNC (0.5–2000.0 A)	**FDCMIN :=**50

*=Setting to be reviewed upon replacement of field discharge contactor

23 Starting Protection (Amortisseur or Cage Winding)

- The amortisseur, or cage winding of a synchronous motor, is probably the element most susceptible to thermal damage. Its function is essentially operative only during starting, and there are limitations on space available for its construction onto the rotor. Hence, it is usually made of lighter material than the cage winding on an induction motor. The cage winding is also vulnerable for situations where field excitation is lost causing the typically synchronous motor to run as an induction motor as the cage winding is not designed to maintain rotor rotation continuously.
- The SEL 710-5 does not incorporate a specific function to ensure that the rotor upon start up is continuing to increase in speed to a point to allow synchronization. Failure to do so could indicate a locked rotor condition or continuous operation at a reduced voltage level (failure of the autotransformer starter) both of which could lead to cage winding damage. Utilizing variable timers the following functionality will be implemented:
    1. The rotor slip in % of synchronous speed will be measured and utilized to determine the speed of the rotor.
    2. During starting the rotor must reach various speeds within a certain time delay or else tripping will occur. This tripping characteristic has been plotted for a typical motor start as shown in Figure 18.
    3. Initiation of this element will be active anytime the main contractor closed status (IN101) is detected.
    4. If there is a locked rotor condition, failure to reach speed or sustained running operation of less than 95% rated speed (loss of excitation) tripping will occur.

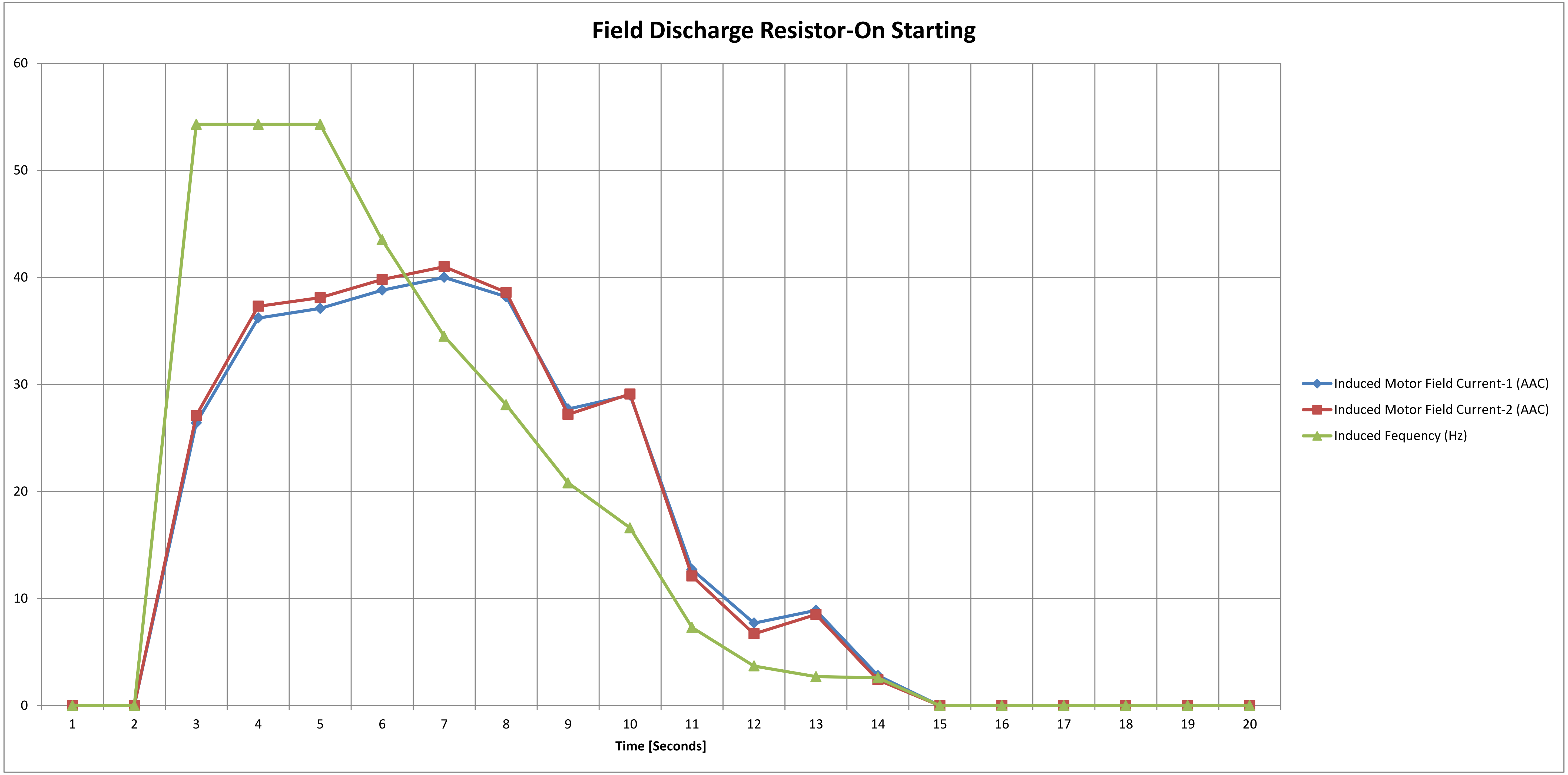

Figure 17- Field Discharge Resistor-On Starting

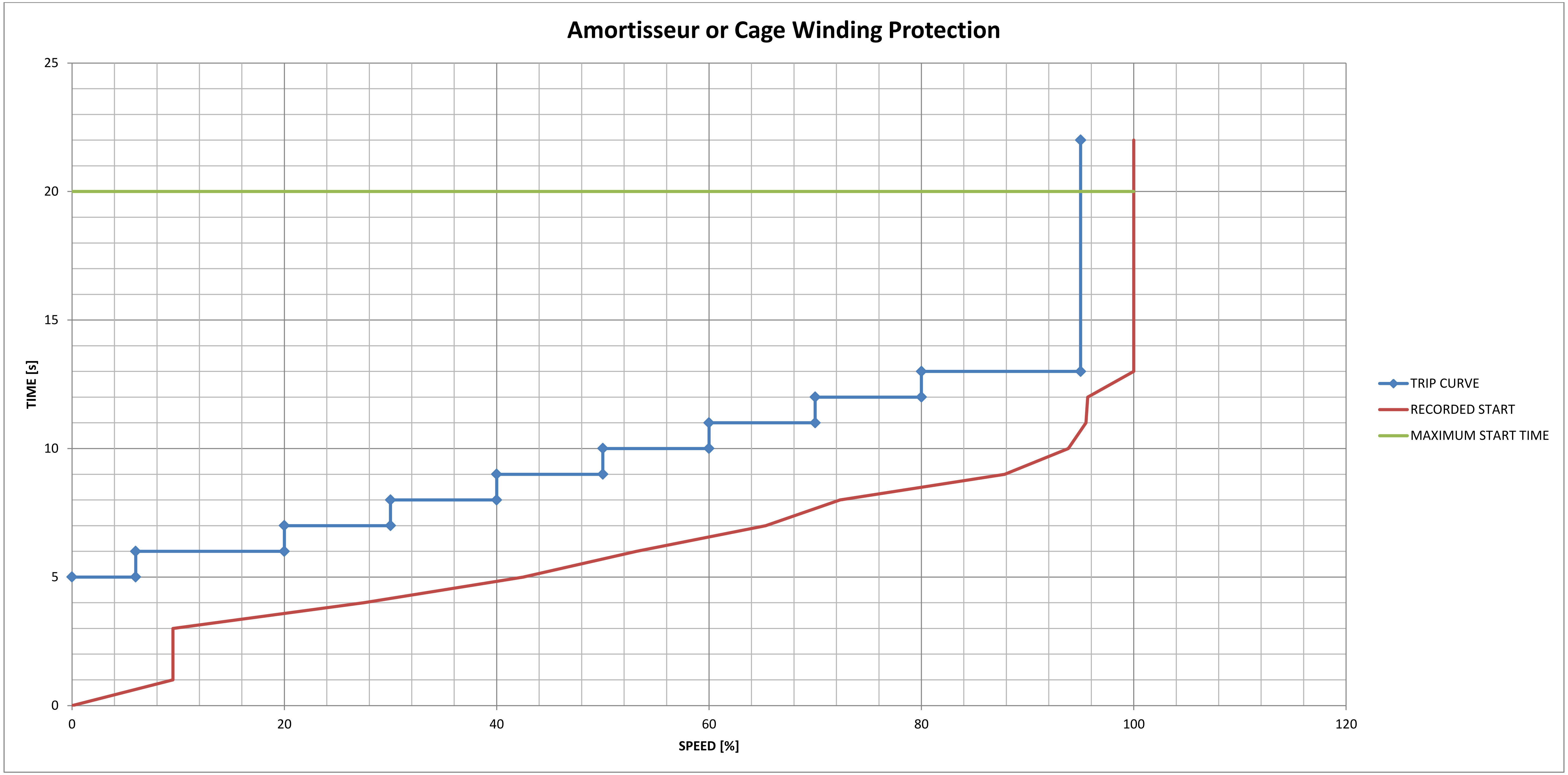

Figure 18 - Main Pump Amortisseur or Cage Winding Protection

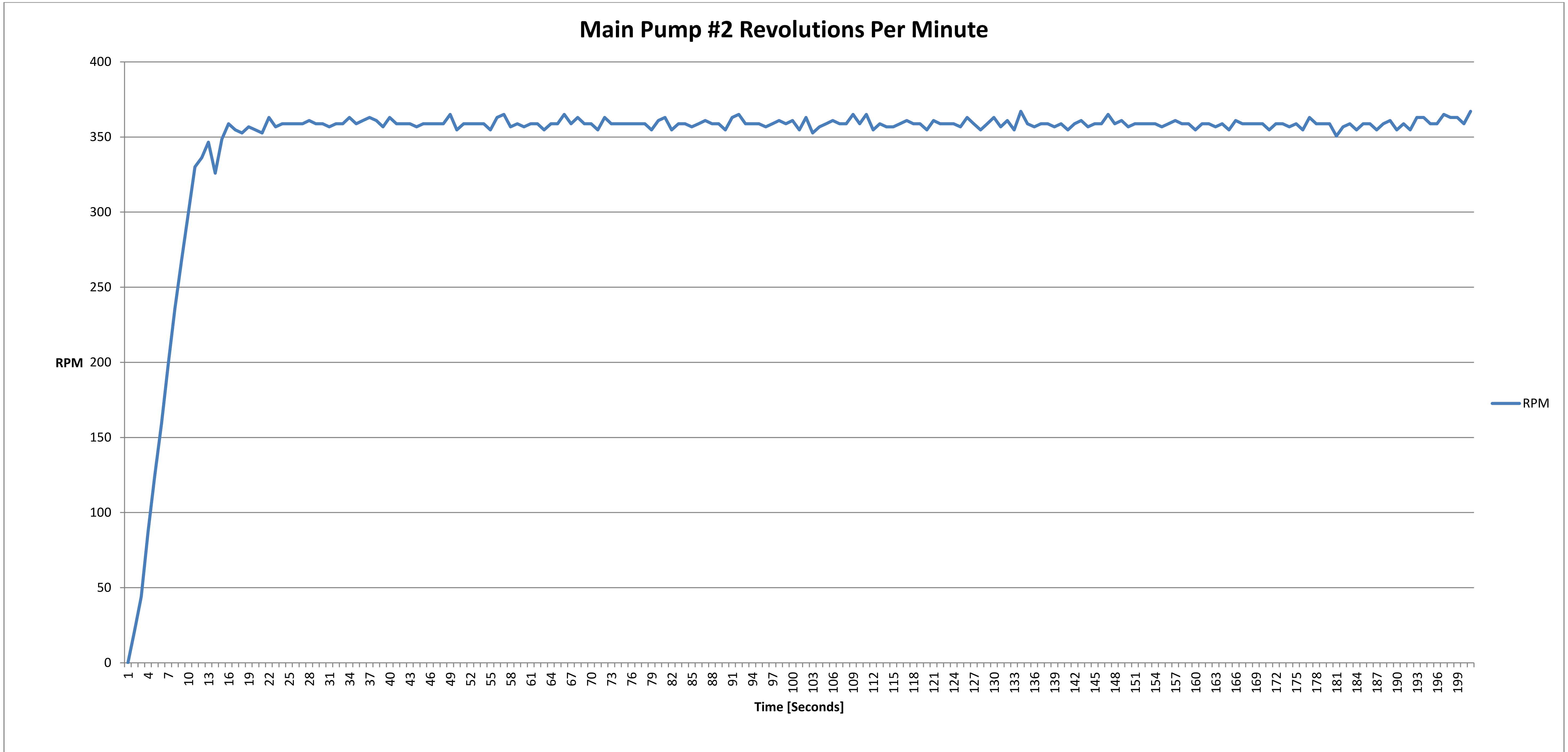

Figure 19 - Main Dewatering Pump #2 Revolutions per Minute

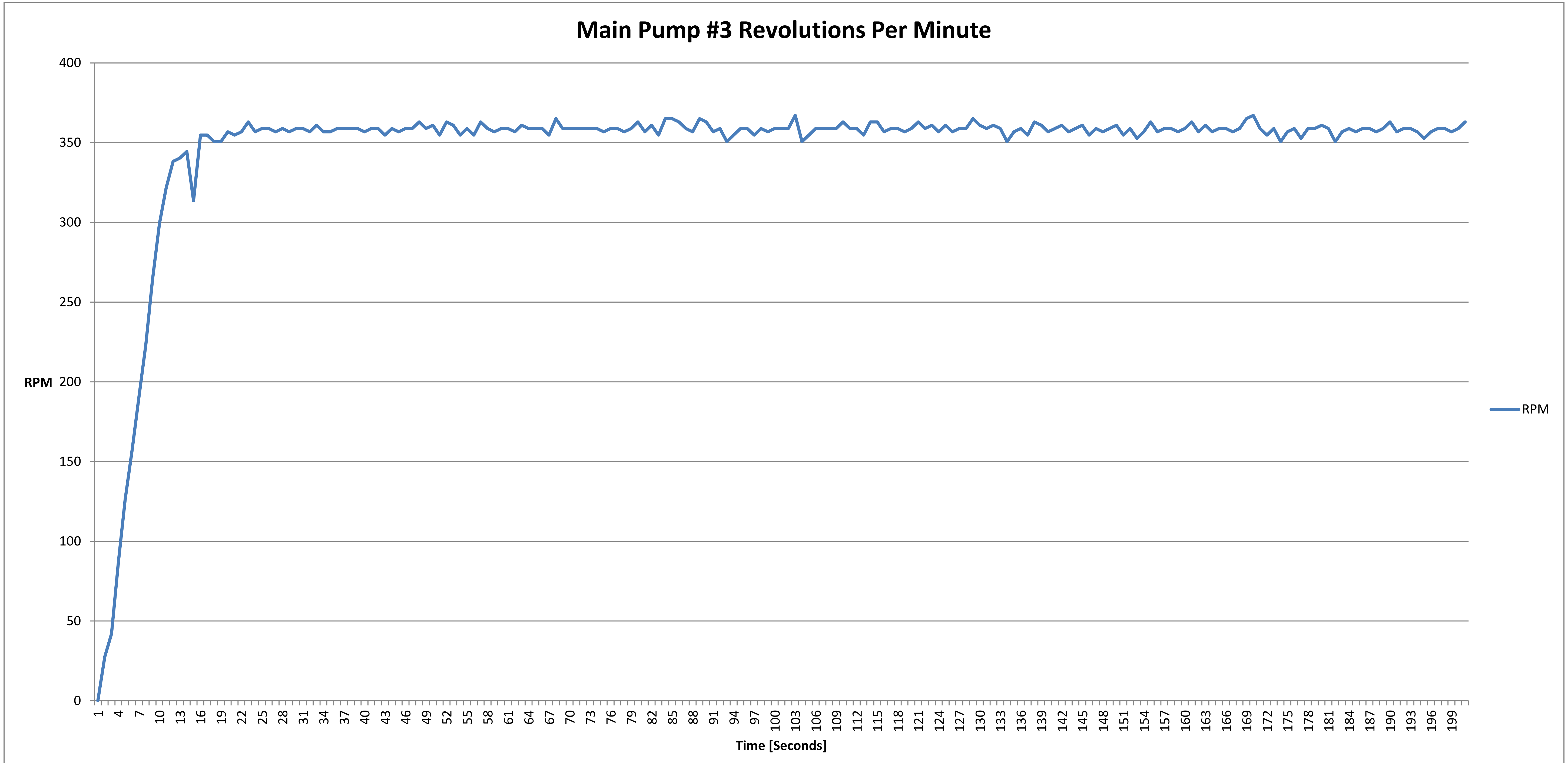

Figure 20 - Main Dewatering Pump #3 Revolutions per Minute

24 Under power

- Under power settings are derived from Figures 21, 23 and 25
- Trip is set to 70% of expected kW (420kW or greater) for 5 seconds
- Warning is set to 80% of expected kW (420kW or greater) for 5 seconds
- Arming delay is set to 180 seconds (SV18T) to avoid nuisance tripping during starts by ensuring the motor has started, synchronized, discharge valve has opened and the pumping system has stabilized before enabling this element. As can be seen from Main Dewatering Pump #3 summary, time to reach full loading took in excess 90 seconds with other reordered starts in excess of 120 seconds. The exact scenario that led to prolonged loading for this particular start is not known and it is suggest that this condition be investigated and any further recommendations on this setting be brought to Prime Engineers attention by PWGSC or approved delegate. Alarm will be enabled 30 seconds after synchronization inform operators corrective action is required.

UP TRIP LEVEL (OFF, 1–25000 kW)	**37PTP :=**300
UP TRIP DELAY (1–240 sec) *(Hidden if associated pickup is OFF)*	**37PTD :=**5
UP WARN LEVEL (OFF, 1–25000 kW)	**37PAP :=**350
UP WARN DELAY (1–240 sec) *(Hidden is associated pickup is OFF)*	**37PAD :=**5
UP ARMING DELAY (0–5000 sec)	**37DLY :=**30

25 Power Factor

- Existing control system, when in **automatic mode,** attempts to regulate the power factor between .98 leading and .98 lagging.
- A synchronous motor should not get into the lagging power factor range for long periods of time. A synchronous motor should be in the unity or leading power factor (importing watts [+] and exporting VARS [-]) area during normal running conditions.
- Power Factor trip set for 0.9 or lower lagging Power Factor with an arming time delay of 5 seconds after synchronization to allow sufficient time to stabilize. Once this arming delay has expired, the Power Factor trip delay will be one second.
- Power factor lead trip has been disabled as various motor start sequences have shown longer than expected times for kW loading to reach steady state values. As a result, because the excitation system when in manual does not perform any corrections, nuisance tripping may occur for pumps that are not fully primed.
- Power Factor alarm set for 0.9 or lower lead and .95 or lower lag with a time delay of 5 seconds.

PF LAG TRIP LEVL (OFF, 0.05–0.99)	**55LGTP :=**0.90
PF LD TRIP LEVEL (OFF, 0.05–0.99)	**55LDTP :=**OFF
PF TRIP DELAY (1–240 sec) *(Hidden if 55LDTP and 55LG TP are OFF)*	**55TD :=**1
PF LAG WARN LEVL (OFF, 0.05–0.99)	**55LGAP :=**0.95
PF LD WARN LEVEL (OFF, 0.05–0.99)	**55LDAP :=**0.85
PF WARN DELAY (1–240 sec) *(Hidden if 55LDAP and 55LGAP are OFF)*	**55AD :=**5
PF ARMING DELAY (0–5000 sec) *(Hidden if 55LGTP, 55LDTP, 55LGAP, and 55LDAP are OFF)*	**55DLY :=**5
PF CURRENT SUP (OFF, 0.05–2.00 x INOM A) *(Hidden if SYNTYPE := NONE; INOM := 5 or 1)*	**55I1SUP :=**OFF
PF TRQ CTRL (SELOGIC) *(Hidden if SYNTYPE := NONE)*	**55TC :=**SRUNNING

26 Var

- Because monitoring leading power factor is unreliable due to motor loading times on startup, kilovars are monitored to determine if higher than normal excitation levels are present.
- At maximum motor loading, leading kilovar values are approximately 100kVAR, equating to power factor values between .98 lag and .98 lead.
- Prior to excitation voltage being applied to the motor field, the open circuit voltage value is approximately 170VDC. Once applied and with the power factor control rheostat bypassed, maximum leading kilovar values are limited by the exciter to approximately 400kVAR as gathered from various start data.
- To detect an abnormally high power factor, indicating a failed motor on the power factor rheostat while in auto or failed control circuitry where the power factor control rheostat remains bypassed, a negative kilovar trip setpoint of 300kVAR has been implemented. At typical motor loading (500kW) this would equate to a leading power factor of approximately .85.
- Negative var warning level has been set to 250 kilovars with a time delay of 5 seconds.
- Arming or element starting delay has been set to zero as only negative kilovars are monitored which only appear after the motor has been started and excitation is applied.
- A time delay of 5 seconds has been implemented. From all recorded data this is sufficient time for the excitation current to be applied and stabilize to a value much less than the trip setpoint.

NEG VAR TRIP LEV (OFF, 1–25000 kVAR)	**NVARTP** : 300
POS VAR TRIP LEV (OFF, 1–25000 kVAR)	**PVARTP** : OFF
VAR TRIP DELAY (1–240 sec) *(Hidden when NVARTP and PVARTP are OFF)*	**VARTD** : 5
NEG VAR WARN LEV (OFF, 1–25000 kVAR)	**NVARAP** : 250
POS VAR WARN LEV (OFF, 1–25000 kVAR)	**PVARAP** : OFF
VAR WARN DELAY (1–240 sec) *(Hidden when NVARAP and PVARAP are OFF)*	**VARAD** : 5
VAR ARMING DELAY (0–5000 sec) *(Hidden when NVARTP, PVARTP, NVARAP, and PVARAP are OFF)*	**VARDLY** : 0

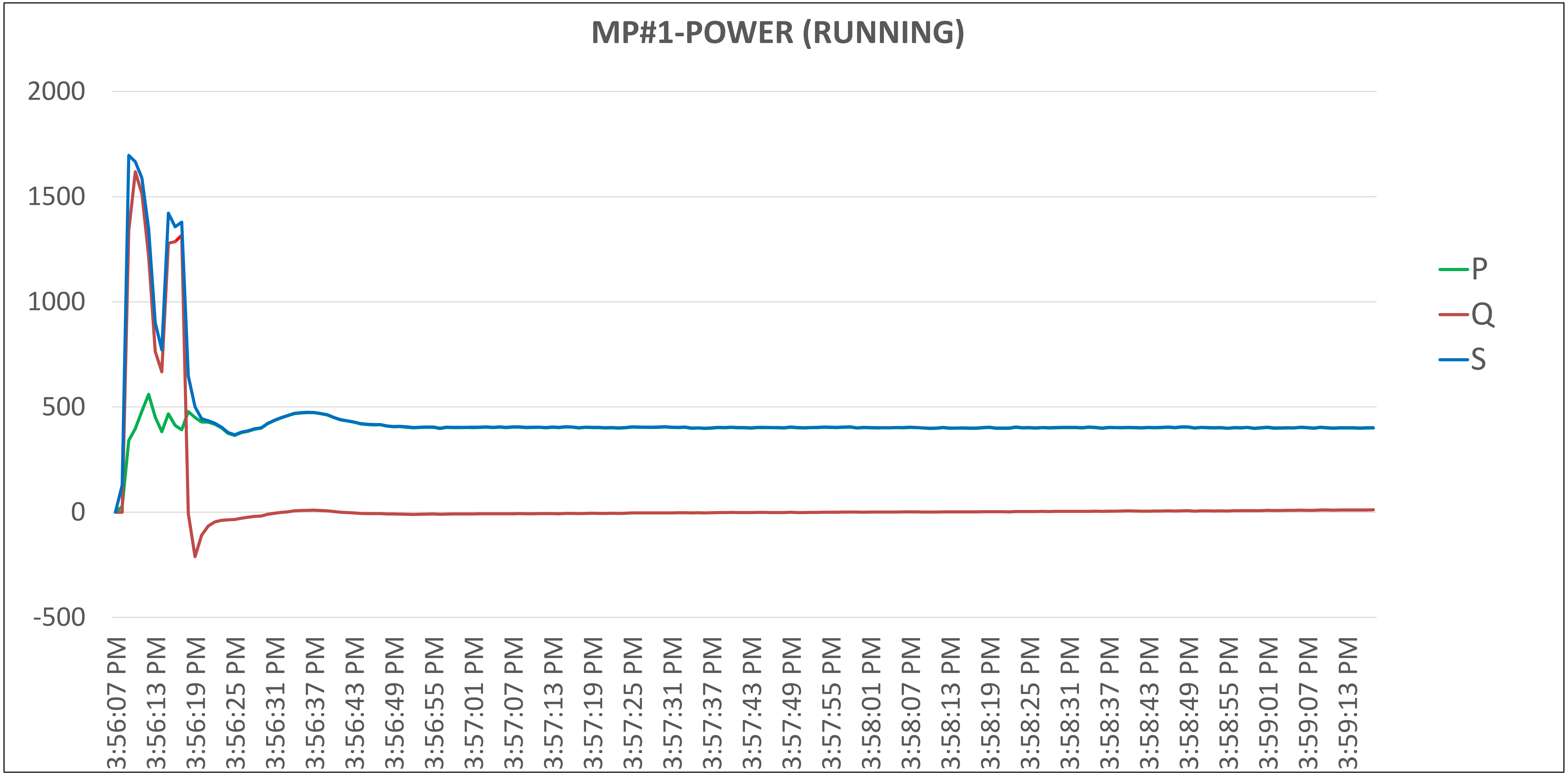

Figure 21-Main Dewatering Pump # 1 Power Summary

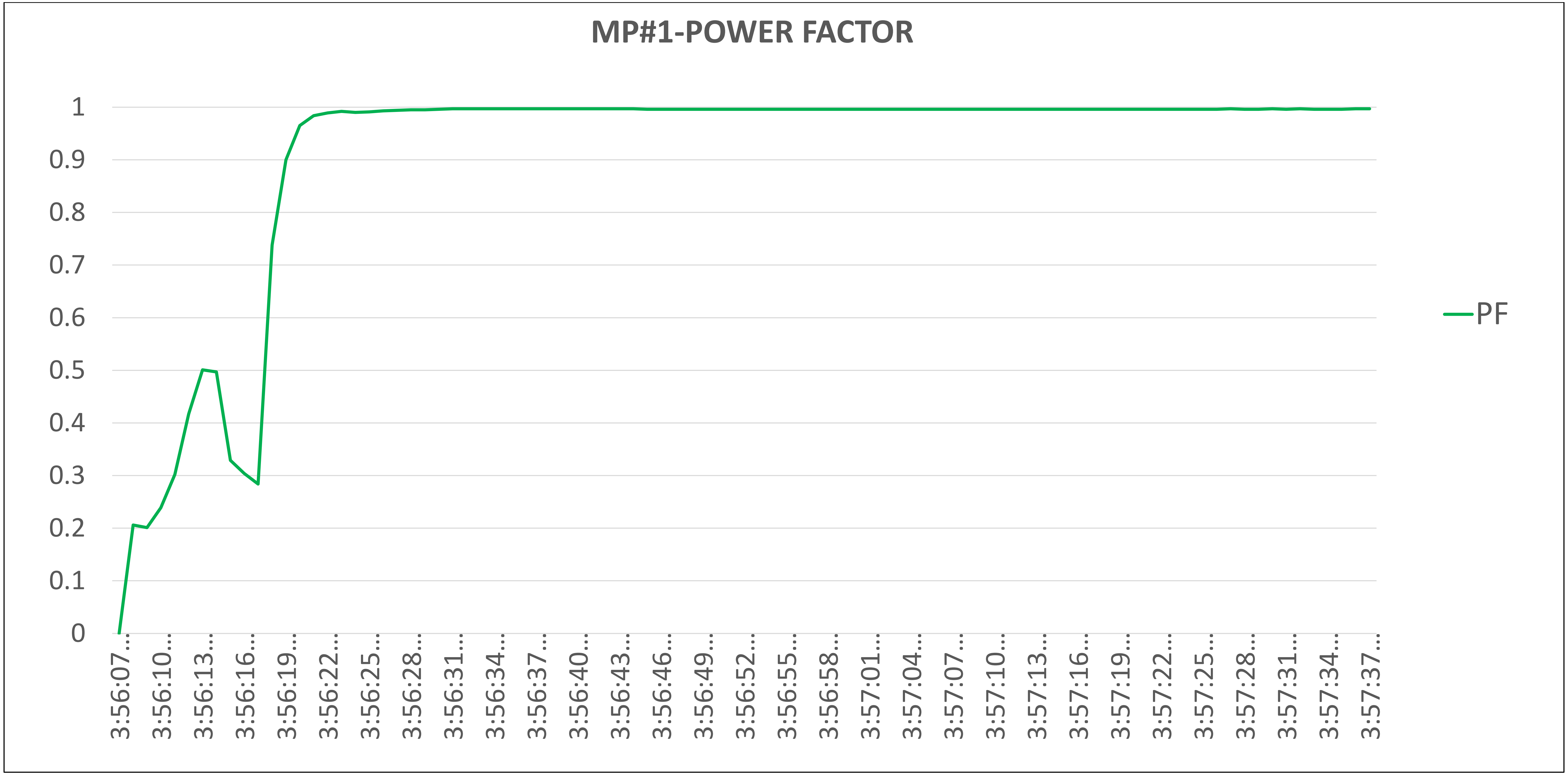

Figure 22-Main Dewatering Pump # 1 Power Factor

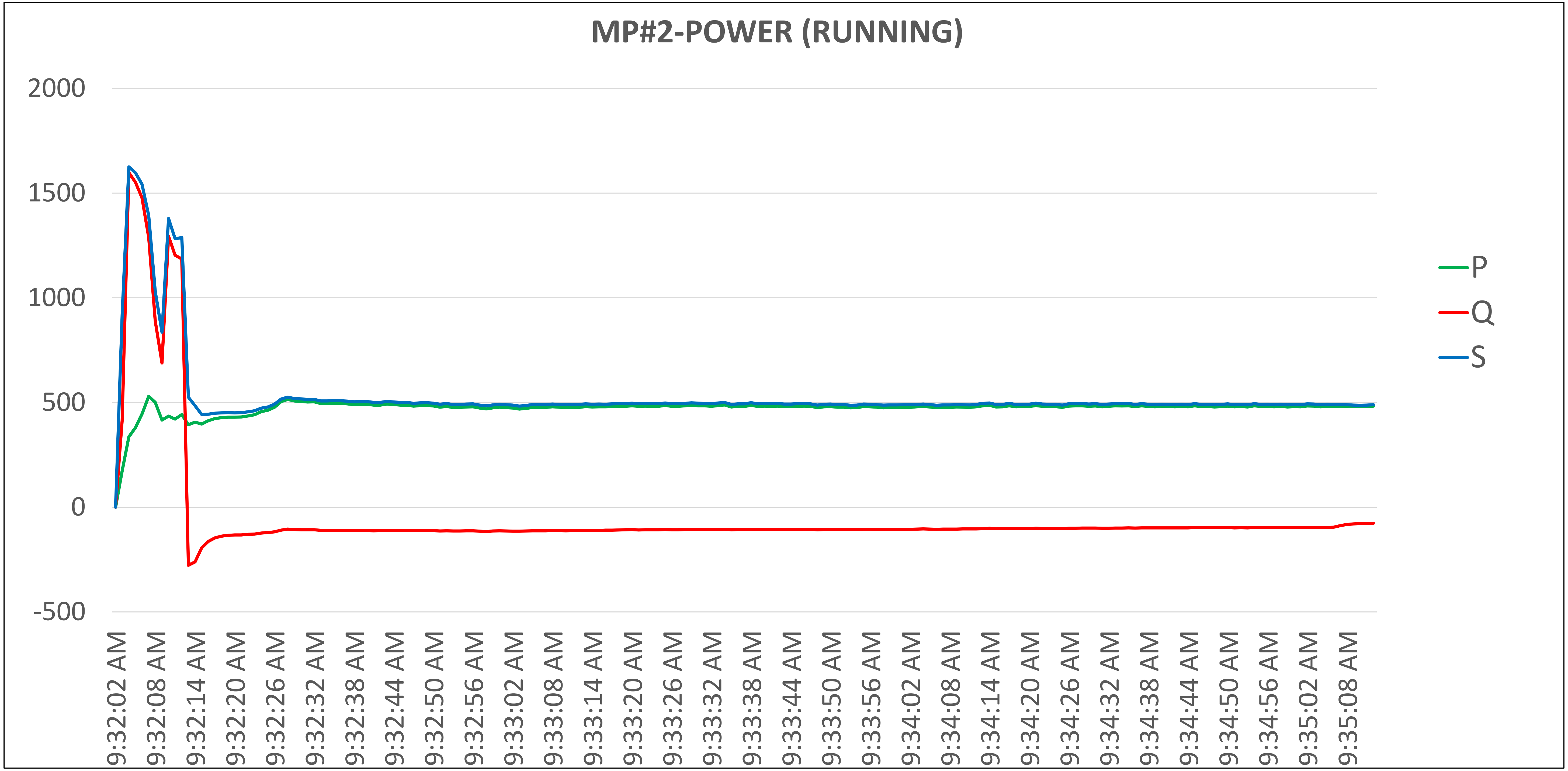

Figure 23 - Main Dewatering Pump #2 Power Summary

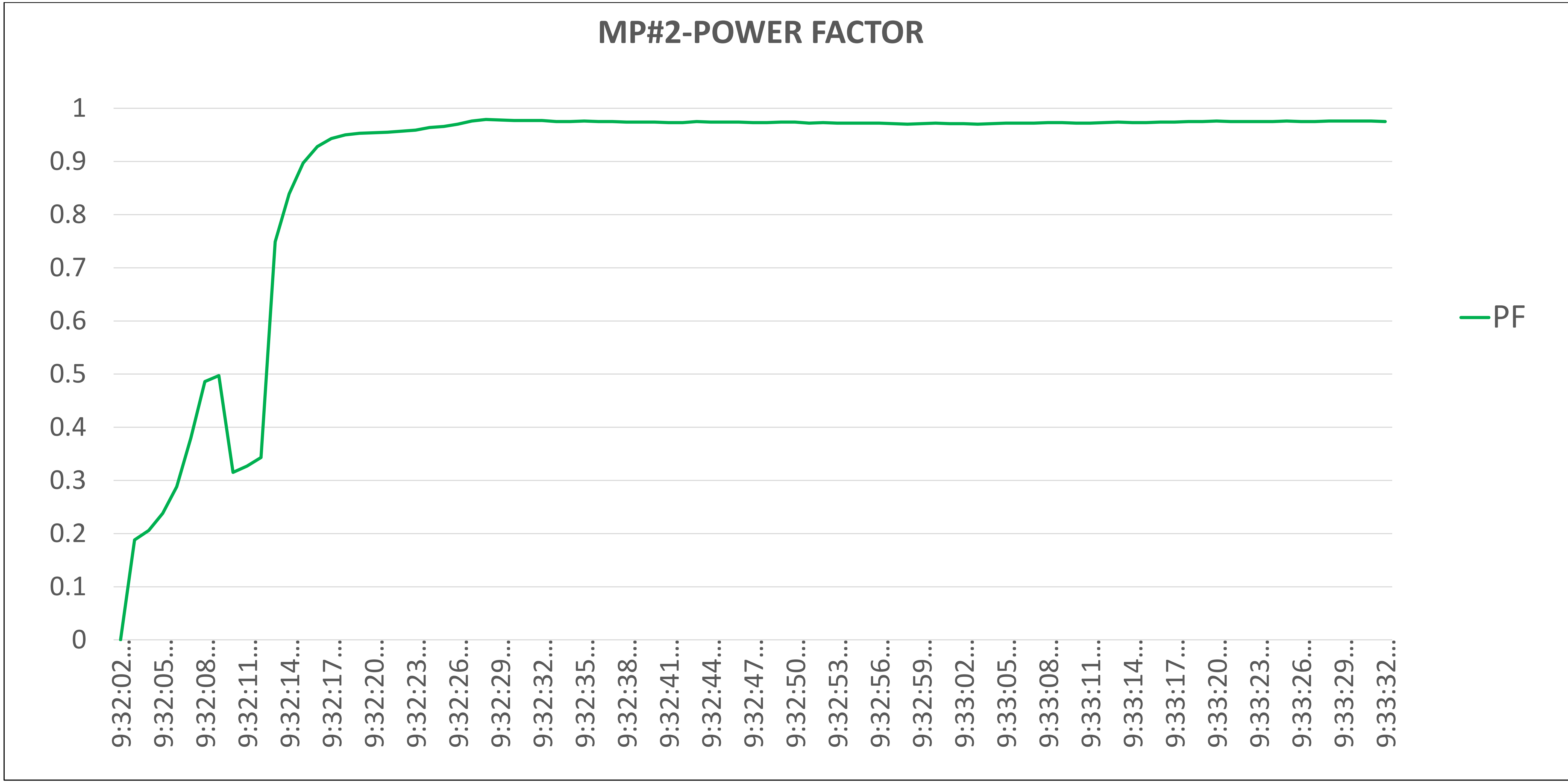

Figure 24-Main Dewatering Pump #2 Power Factor

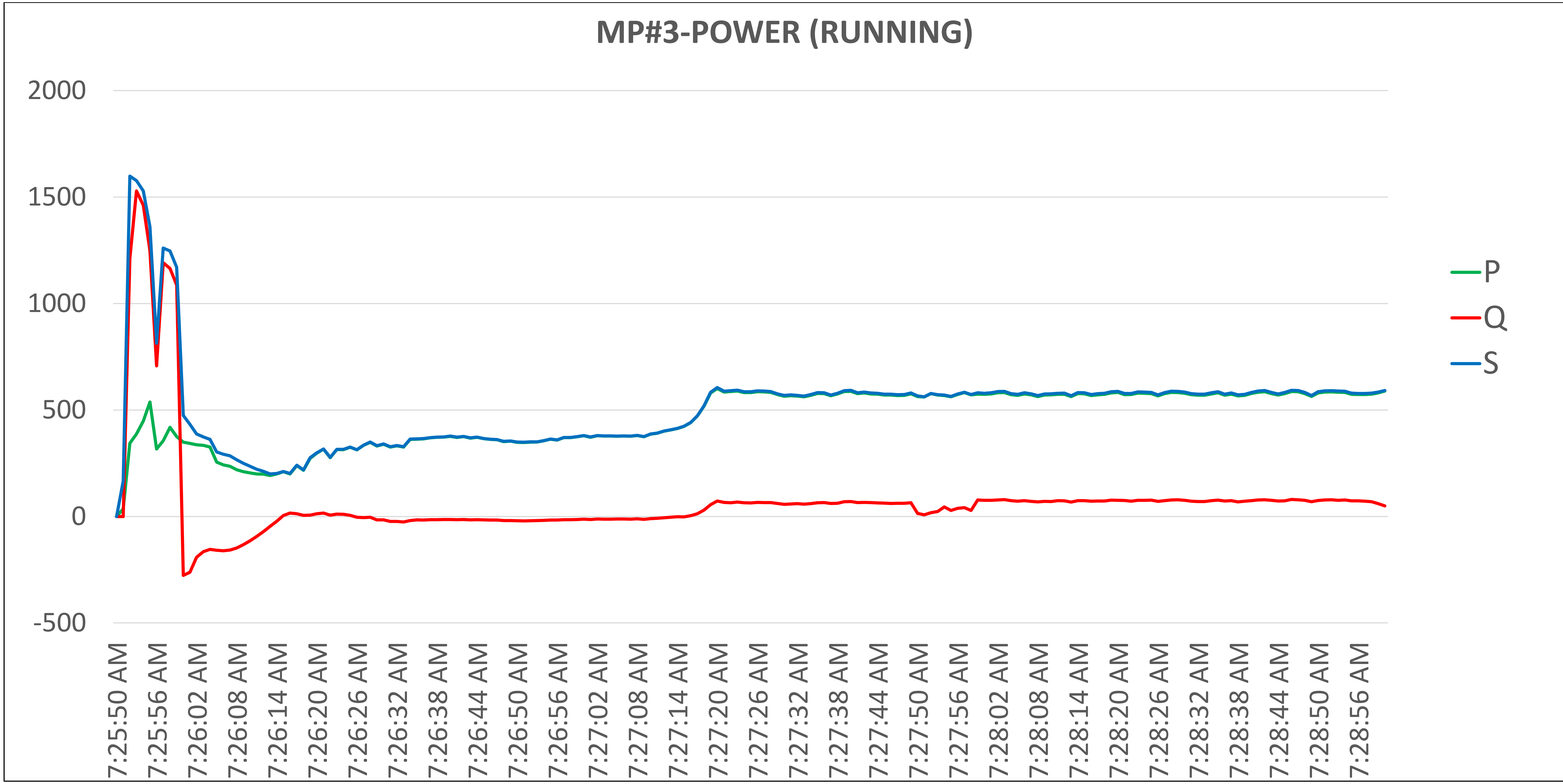

Figure 25-Main Dewatering Pump # 3 Power Summary

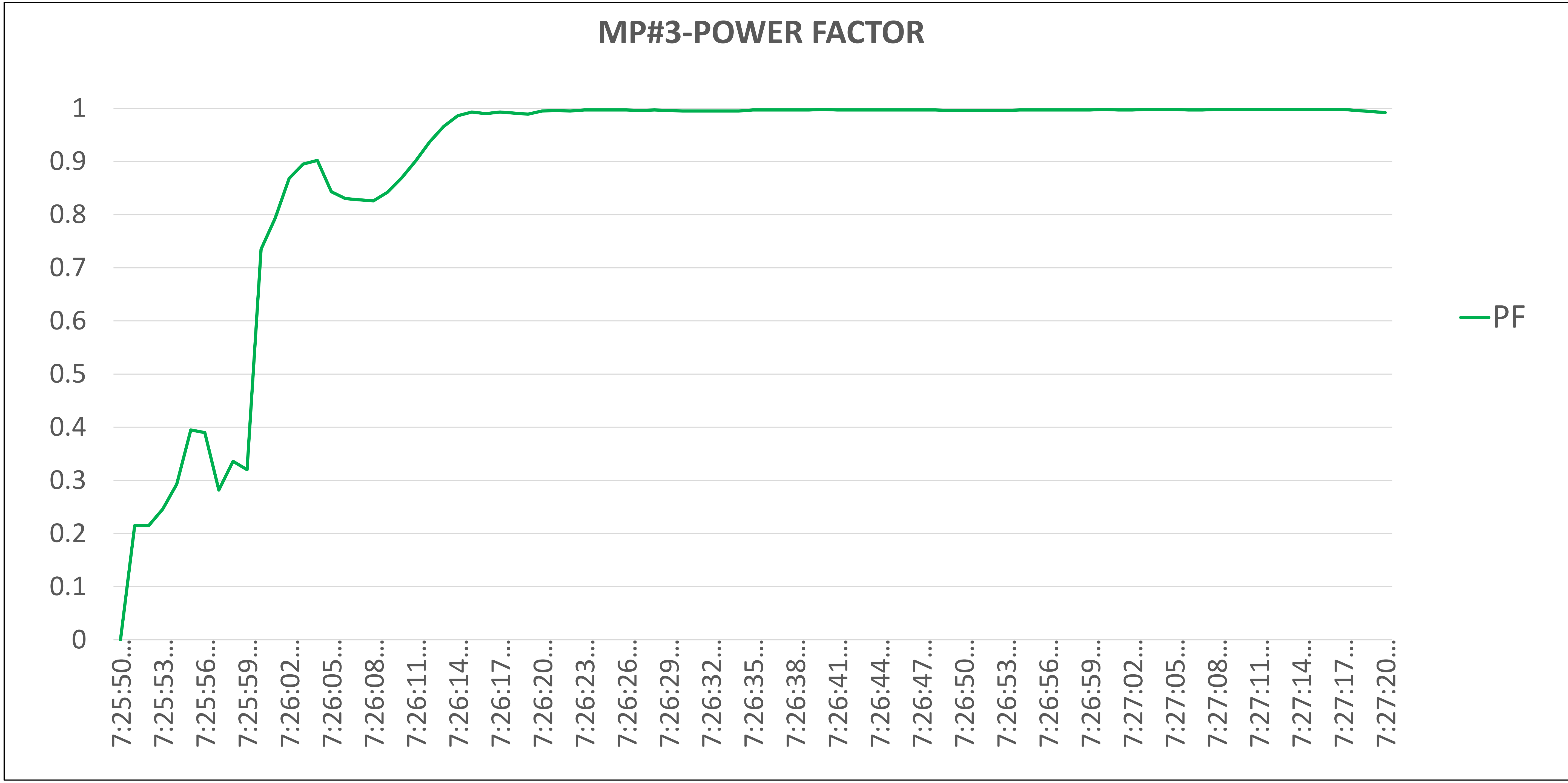

Figure 26-Main Dewatering Pump # 3 Power Factor

27 Trip Inhibit

BLOCK PROTECTION (SELOGIC)

BLKPROT :=0

CURRENT IMBALANC (Y, N)	**BLK46 :=**N
JAM (Y, N)	**BLK 48 :=**N
GROUND FAULT (Y, N)	**BLK50EF :=**N
SHORT CIRCUIT (Y, N)	**BLK50P :=**N
UNDERCURRENT (Y, N)	**BLK37 :=**N
START INHIBIT (Y, N)	**BLK66 :=**N
PTC (Y, N) *(Hidden if the PTC option is not selected)*	**BLK49PTC :=**N
RTD (Y, N)	**BLK49RTD :=**N

28 Trip/Close

MIN TRIP TIME (0.0–400.0 sec) **TDURD :=**1.0

TRIP EQUATION (SELOGIC)

TR :=LT01 OR LT03

REMOTE TRIP EQN (SELOGIC)	**REMTRIP :=**0
TRIP ON LOCKOUT (Y, N)	**TRIPONLO :=**N
UNLATCH TRIP EQN (SELOGIC)	**ULTRIP :=**STOPPED AND NOT TRIP
CONTACTOR STATUS (SELOGIC)	**52A :=**IN101
FLD BRKR STATUS (SELOGIC) *(Hidden if SYNTYPE := NONE)*	**41A :=**IN302

29 Motor Control

START EQUATION (SELOGIC)	**STREQ :=**0
BLK START (SELOGIC)	**BLKSTR :=**0
EMERGENCY START (SELOGIC)	**EMRSTR :=**0
SPEEDSW (SELOGIC)	**SPEEDSW :=**0

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30 Logic Settings (SET L Command)

30.1 SELogic Enables

SELogic LATCHES (N, 1–32)	**ELAT** :=4*
SV/TIMERS (N, 1–32)	**ESV** :=17
SELogic COUNTERS (N, 1–32)	**ESC** :=N
MATH VARIABLES (N, 1–32)	**EMV** :=1

30.2 Latch Bits Equations

- Latch bits LT03 thru LT05 are reserved for future use. LT06 thru LT32 are not used.

SET01 :=SV01T OR SV02T OR SV03T OR SV04T OR SV05T # TO TR Trip

RST01 :=TRGTR

SET02 :=(STARTING OR RUNNING)AND NOT SRUNNING # TO SV06

RST02 :=TRIP OR STOPPED OR SRUNNING OR IN302

SET03 :=SV08T OR SV09T OR SV10T OR SV11T OR SV12T OR SV13T OR SV14T OR SV15T OR SV16T OR SV17T # CAGE WINDING TRIP

RST03 :=TRGTR

SET04 :=VEX>170.00 AND 41CLOSE AND IN401 # MOTOR FIELD CONTACTOR CLOSE*

RST04 :=NOT (52A OR IN301 OR IN403) OR TRIP OR STOPPED*

SET05 :=NA

RST05 :=NA

*=Settings to be reviewed upon replacement of field discharge contactors

30.3 SELogic Variable Timers

- Variable timers SV06 and SV07 are reserved for future use. SV08 thru SV32 are not used.

SV TIMER PICKUP (0.00–3000.00 sec)	**SV01PU** :=0.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV01DO** :=0.00

SV INPUT (SELogic) — **SV01** :=49T OR 50N1T OR JAMTRIP OR (LOSSTRIP AND SV18T) OR 46UBT OR BRGTRIP OR WDGTRIP or SMTRIP# TO LT01

- SELogic Variable Timer #1. No pickup delay, no dropout delay
- Initiate for thermal overload, phase overcurrent, neutral overcurrent, load jam, load loss (undercurrent), current imbalance, bearing over temperature, winding over temperature or start monitor trip.
- Used in TR Trip (SELogic) equation

SV TIMER PICKUP (0.00–3000.00 sec)	**SV02PU** :=0.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV02DO** :=0.00
SV INPUT (SELogic) ▪ SELogic Variable Timer #2. No pickup delay, no dropout delay ▪ Initiate for phase reversal, overvoltage level 1, overvoltage level 2, loss of field zone 1, loss of field zone 2, under power, power factor or var trip ▪ Used in TR Trip (SELogic) equation .	**SV02** :=47T OR 59P1T OR 59P2T OR 40Z1T OR 40Z2T OR (37PT AND SV18T) OR 55T OR VART# TO LT01
SV TIMER PICKUP (0.00–3000.00 sec)	**SV03PU** :=0
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV03DO** :=0
SV INPUT (SELogic) ▪ SELogic Variable Timer #3. No pickup delay, no dropout delay ▪ Initiate for undervoltage level 1, undervoltage level 2, underfrequency when main contactor is closed ▪ Used in TR Trip (SELogic) equation	**SV03** :=IN101 AND(27P1T OR 27P2T OR 81D1T) AND NOT LOP # TO LT01
SV TIMER PICKUP (0.00–3000.00 sec)	**SV04PU** :=0
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV04DO** :=0
SV INPUT (SELogic) ▪ SELogic Variable Timer #4. No pickup delay, no dropout delay ▪ Initiate for field undercurrent, field overcurrent, field undervoltage, field overvoltage ▪ Used in TR Trip (SELogic) equation	**SV04** :=FUDC1T OR FDOC1T OR FDUV1T OR FDOV1T # TO LT01
SV TIMER PICKUP (0.00–3000.00 sec)	**SV05PU** :=0.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV05DO** :=0.00
SV INPUT (SELogic)	**SV05** :=50P1T AND NOT 50P2P# TO LT01
SV TIMER PICKUP (0.00–3000.00 sec)	**SV06PU** :=0.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV06DO** :=1.00
SV INPUT (SELogic)	**SV06** :=LT02 # TO OUT303
SV TIMER PICKUP (0.00–3000.00 sec)	**SV07PU** :=5.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV07DO** :=0.00
SV INPUT (SELogic)	**SV07** :=SRUNNING # LOSS OF FIELD/FIELD CURRENT/FIELD VOLT. TORQUE CONTROL
SV TIMER PICKUP (0.00–3000.00 sec)	**SV07PU** :=5.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV07DO** :=0.00
SV INPUT (SELogic)	**SV08** :=(IN101 AND SMSLIP>94) AND NOT SRUNNING

SV TIMER PICKUP (0.00–3000.00 sec)	**SV08PU** :=5.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV08DO** :=0.00
SV INPUT (SELogic)	**SV08** :=(IN101 AND SMSLIP>94) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV09PU** :=7.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV09DO** :=0.00
SV INPUT (SELogic)	**SV09** :=IN101 AND SMSLIP>80
SV TIMER PICKUP (0.00–3000.00 sec)	**SV10PU** :=8.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV10DO** :=0.00
SV INPUT (SELogic)	**SV10** :=(IN101 AND SMSLIP>70) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV11PU** :=9.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV11DO** :=0.00
SV INPUT (SELogic)	**SV11** :=(IN101 AND SMSLIP>60) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV12PU** :=10.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV12DO** :=0.00
SV INPUT (SELogic)	**SV12** :=(IN101 AND SMSLIP>50) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV13PU** :=11.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV13DO** :=0.00
SV INPUT (SELogic)	**SV13** :=(IN101 AND SMSLIP>40) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV14PU** :=12.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV14DO** :=0.00
SV INPUT (SELogic)	**SV14** :=(IN101 AND SMSLIP>30) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV15PU** :=13.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV15DO** :=0.00
SV INPUT (SELogic)	**SV15** :=(IN101 AND SMSLIP>20) AND NOT SRUNNING
SV TIMER PICKUP (0.00–3000.00 sec)	**SV16PU** :=16.00
SV TIMER DROPOUT (0.00–3000.00 sec)	**SV16DO** :=0.00

SV INPUT (SELogic) **SV16** :=(IN101 AND SMSLIP>5) AND NOT SRUNNING

SV TIMER PICKUP (0.00–3000.00 sec) **SV17PU** :=22.00

SV TIMER DROPOUT (0.00–3000.00 sec) **SV17DO** :=0.00

SV INPUT (SELogic) **SV17** :=IN101 AND NOT SRUNNING

SV TIMER PICKUP (0.00–3000.00 sec) **SV18PU** :=180.00

SV TIMER DROPOUT (0.00–3000.00 sec) **SV18DO** :=0.00

SV INPUT (SELogic) **SV18** :=SRUNNING

30.4 Base Output

OUT101 FAIL-SAFE (Y, N) **OUT101FS** :=Y

OUT101 :=TRIP OR 27P2T OR 81D1T OR NOT IN402 OR NOT IN403 #PROTECTION TRIP/STOP

OUT102 FAIL-SAFE (Y, N) **OUT102FS** :=N

OUT102 :=LT04 #MOTOR FIELD CONTACTOR CONTROL*

OUT103 FAIL-SAFE (Y, N) **OUT103FS** :=N

OUT103 :=0*

*=Setting to be reviewed upon replacement of field discharge contactor

30.5 Slot C Output

(Hidden if an output option is not included; the number of outputs depends on the I/O card option)

OUT301 FAIL-SAFE (Y, N) **OUT301FS** :=N

OUT301 :=BRGTRIP OR WDGTRIP #HIGH TEMPERATURE STOP TO PLC

OUT302 FAIL-SAFE (Y, N) **OUT302FS** :=N

OUT302 :=NOT BRGALRM AND NOT WDGALRM #TEMPERATURE OK TO PLC

OUT303 FAIL-SAFE (Y, N) **OUT303FS** :=N

OUT303 :=SV06T #EXCITER FIELD RESISTOR BYPASS CONTROL

OUT304 FAIL-SAFE (Y, N) **OUT304FS** :=N

OUT304 :=0

30.6 Slot D Output

(Hidden if an output option is not included; the number of outputs depends on the I/O card option)

OUT401 FAIL-SAFE (Y, N) **OUT401FS** :=Y

OUT401 :=HALARM OR SALARM OR AFALARM #RELAY STATUS TO METER

OUT402 FAIL-SAFE (Y, N) **OUT402FS** :=N

OUT402 :=0

OUT403 FAIL-SAFE (Y, N) **OUT403FS :=**N

OUT403 :=0

OUT404 FAIL-SAFE (Y, N) **OUT404FS :=**N

OUT404 :=0

31 Global Settings

31.1 General

PHASE ROTATION (ABC, ACB)	**PHROT :=**ABC
RATED FREQ. (50, 60 Hz)	**FNOM :=**60
DATE FORMAT (MDY, YMD, DMY)	**DATE_F :=**MDY
FAULT CONDITION (SELOGIC)	**FAULT :=**STARTING OR 50S OR 50N1P OR TRIP

31.2 Group Selection

GRP CHG DELAY (0–400 sec)	**TGR :=**3
SELECT GROUP1 (SELOGIC)	**SS1 :=**1
SELECT GROUP2 (SELOGIC)	**SS2 :=**0
SELECT GROUP3 (SELOGIC)	**SS3 :=**0

31.3 Time and Date Management

CTRL BITS DEFN (NONE, C37.118)	**IRIGC :=**NONE
OFFSET FROM UTC (–24.00 to 24.00 hours) *(Automatically rounds up to the nearest quarter)*	**UTC_OFF :=**0.00
MONTH TO BEGIN DST (OFF, 1–12)	**DST_BEGM :=**OFF

31.4 Breaker Failure

- Breaker failure function is not utilized. Settings are default.

52A INTERLOCK (Y, N)	**52ABF :=**N
BK FAILURE DELAY (0.00–2.00 sec)	**BFD :=**0.50
BK FAIL INITIATE (SELOGIC)	**BFI :=**R_TRIG TRIP

31.5 Analog Output

- This analog output will be utilized at the operators control to display motor field current. Refer to Figure 3 for required circuit board jumper configurations.

AO401 ANALOG QTY (OFF, 1 analog quantity) **AO401AQ :=**IEX
(Analog quantity to assign to this analog output)

AO401 TYPE (I, V) **AOx01TYP :=**I
(Hidden if AOx01AQ is OFF; the type selection must match the hardware jumper selection on the card; the setting is always hidden for 4DO/3DI/1AO card)

AO401 AQTY LO (–2147483647.000 to 2147483647.000) **AOx01AQL :=**0
(Hidden if AOx01AQ is OFF)

AO401 AQTY HI (–2147483647.000 to 2147483647.000) **AOx01AQH :=**200
(Hidden if AOx01AQ is OFF; must be greater than AOx01AQL setting)

31.6 Breaker Monitor

BREAKER MONITOR (Y, N) **EBMON :=**N
(All settings are hidden if EBMON := N)

31.7 Data Reset

RESET TARGETS (SELOGIC)

RSTTRGT :=0

RESET ENERGY (SELOGIC)

RSTENRGY :=0

RESET MAX/MIN (SELOGIC)

RSTMAXMN :=0

31.8 Access Control

DISABLE SETTINGS (SELOGIC)
(DSABLSET applies only to the front panel, DSABLSET := 1 does not prevent settings change via the SET serial port command)

DSABLSET :=0

32 SET PORT p (p = F, 1, 2, 3, or 4) Command

32.1 PORT F

Protocol Select

PROTOCOL (SEL, MOD)	**PROTO** :=SEL

Communications

SPEED (300, 1200, 2400, 4800, 9600, 19200, 38400 bps)	**SPEED** :=19200
DATA BITS (7, 8 bits) *(Hidden if PROTO := MOD)*	**BITS** :=8
PARITY (O, E, N)	**PARITY** :=N
STOP BITS (1, 2 bits) *(Hidden if PROTO := MOD)*	**STOP** :=1
PORT TIME-OUT (0–30 min) *(Hidden if PROTO := MOD)*	**T_OUT** :=5
HDWR HANDSHAKING (Y, N) *(Hidden if PROTO := MOD)*	**RTSCTS** :=N
SEND AUTOMESSAGE (Y, N) *(Hidden if PROTO := MOD)*	**AUTO** :=N

32.2 Front-Panel Settings (Set F Command)

32.3 General

DISPLY PTS ENABL (N, 1–32)	**EDP** :=5
LOCAL BITS ENABL (N, 1–32)	**ELB** :=N
LCD TIMEOUT (OFF, 1–30 min)	**FP_TO** :=15
LCD CONTRAST (1–8)	**FP_CONT** :=10
FP AUTOMESSAGES (OVERRIDE, ROTATING)	**FP_AUTO** :=OVERRIDE
CLOSE RESET LEDS (Y, N)	**RSTLED** :=Y
ENA_LED COLOR (R = Red, G = Green, A = Amber)	**LEDENAC** :=G
TRIP_LED COLOR (R = Red, G = Green, A = Amber)	**LEDTRPC** :=R

32.4 Target LED

(R = Red, G = Green, A= Amber)

TRIP LATCH T_LED (Y, N)	**T01LEDL** :=Y
TARGET_LED ASSERTED COLOR (R, G, A)	**T01LEDC** :=R

LED1 EQUATION (SELOGIC)	**T01_LED** :=	49T OR BRGTRIP OR WDGTRIP # THERMAL
TRIP LATCH T_LED (Y, N)	**T02LEDL** :=	Y
TARGET_LED ASSERTED COLOR (R, G, A)	**T02LEDC** :=	R
LED2 EQUATION (SELOGIC)	**T02_LED** :=	46UBT OR 50P1T OR 50N1T OR JAMTRIP # OVERCURRENT/ LOAD JAM
TRIP LATCH T_LED (Y, N)	**T03LEDL** :=	Y
TARGET_LED ASSERTED COLOR (R, G, A)	**T03LEDC** :=	R
LED3 EQUATION (SELOGIC)	**T03_LED** :=	40Z1T OR 40Z2T OR 55T OR VART # FIELD LOSS/POWER FACTOR
TRIP LATCH T_LED (Y, N)	**T04LEDL** :=	Y
TARGET_LED ASSERTED COLOR (R, G, A)	**T04LEDC** :=	R
LED4 EQUATION (SELOGIC)	**T04_LED** :=	LOSSTRIP OR 37PT #LOAD LOSS
TRIP LATCH T_LED (Y, N)	**T05LEDL** :=	Y
TARGET_LED ASSERTED COLOR (R, G, A)	**T05LEDC** :=	R
LED5 EQUATION (SELOGIC)	**T05_LED** :=	SV03T OR 47T OR 59P1T OR 59P2T #VOLTAGE/FREQU ENCY
TRIP LATCH T_LED (Y, N)	**T06LEDL** :=	Y
TARGET_LED ASSERTED COLOR (R, G, A)	**T06LEDC** :=	R
LED6 EQUATION (SELOGIC)	**T06_LED** :=	SV04T # FIELD CURRENT/FIELD VOLTAGE

32.5 Operator Control LED

Asserted/deasserted color choices: R = Red, G = Green, A = Amber, O = Off. Asserted and deasserted colors must be different.

PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB1ALEDC** :=	0
PB1A_LED EQUATION (SELOGIC)	**PB1A_LED** :=	0
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB1BLEDC** :=	AO

PB1B_LED EQUATION (SELOGIC)	**PB1B_LED :=**27P2T OR 81D1T OR NOT IN402 OR NOT IN403 #START INHIBIT
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB2ALEDC :=**AO
PB2A_LED EQUATION (SELOGIC)	**PB2A_LED :=**LT02 # STARTING
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB2BLEDC :=**AO
PB2B_LED EQUATION (SELOGIC)	**PB2B_LED :=**SRUNNING # SYNCHRONIZED
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB3ALEDC :=**AO
PB3A_LED EQUATION (SELOGIC)	**PB3A_LED :=**NOT IN403 #E-STOP
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB3BLEDC :=**AO
PB3B_LED EQUATION (SELOGIC)	**PB3B_LED :=**STOPPED
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB4ALEDC :=**AO
PB4A_LED EQUATION (SELOGIC)	**PB4A_LED :=**0
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB4BLEDC :=**AO
PB4B_LED EQUATION (SELOGIC)	**PB4B_LED :=**IN401 # SPEED SWITCH ENGAGED
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB5ALEDC :=**AO
PB5A_LED EQUATION (SELOGIC)	**PB5A_LED :=**0
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB5BLEDC :=**AO
PB5B_LED EQUATION (SELOGIC)	**PB5B_LED :=**IN101 #42 MAIN CLOSED
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB6ALEDC :=**AO
PB6A_LED EQUATION (SELOGIC)	**PB6A_LED :=**0
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB6BLEDC :=**AO
PB6B_LED EQUATION (SELOGIC)	**PB6B_LED :=**IN102 # 42 START CLOSED
PB_LED ASSERTED/DEASSERTED COLORS (AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO)	**PB7ALEDC :=**
PB7A_LED EQUATION (SELOGIC)	**PB7A_LED :=**AO

PB_LED ASSERTED/DEASSERTED COLORS
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO) **PB7BLEDC** :=AO

PB7B_LED EQUATION (SELogic) **PB7B_LED** :=IN301 # 42 RUN/MASTER CONTROL RELAY CLOSED

PB_LED ASSERTED/DEASSERTED COLORS
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO) **PB8ALEDC** :=AO

PB8A_LED EQUATION (SELogic) **PB8A_LED** :=0

PB_LED ASSERTED/DEASSERTED COLORS
(AG, AO, AR, GA, GO, GR, OA, OG, OR, RA, RG, RO) **PB8BLEDC** :=AO

PB8B_LED EQUATION (SELogic) **PB8B_LED** :=IN302 #41 FIELD CONTATCOR CLOSED

32.6 Display Point

- Display points DP05 thru DP32 are not used.

Display point settings (maximum 60 characters):
Boolean: Relay Word Bit Name, "Alias", "Set String", "Clear String"
Analog: Analog Quantity Name, "User Text and Formatting"

DISPLAY POINT DP01 **DP01** :=RID, "{16}"

DISPLAY POINT DP02 **DP02** :=TID, "{16}"

DISPLAY POINT DP03 **DP03** :=IAV, "I MOTOR {6} A"

DISPLAY POINT DP04 **DP04** :=TCUSTR, "Stator TCU {3} %"

DISPLAY POINT DP05 **DP05** :=LT03, "CAGE WINDING",TRIP

DISPLAY POINT DP06 **DP06** :=SMSLIP,"SLIP% {6} %"

33 Report Settings (SET R Command)

33.1 SER Trigger Lists

SERn = as many as 24 Relay Word elements, separated by spaces or commas. Use NA to disable the setting.

SER1 :=IN101,IN102,IN301,IN302,IN304,IN401,IN402,IN403,OUT101,OUT102,OUT103,OUT301,OUT302, OUT303,OUT304,OUT401,OUT402,OUT403,OUT404

SER2 :=27P1T,27P2T,49T,50P1T,50N1T,JAMTRIP,LOSSTRIP,46UBT,BRGTRIP,WDGTRIP,47T,59P1T, 59P2T,40Z1T,40Z2T,37PT,55T, 81D1T, SMTRIP

SER3 :=SV01T,SV02T,SV03T,SV04T,SV05T,SV08T,SV09T,SV10T,SV11T,SV12T,SV13T,SV14T,SV15T,SV16T,SV17T,FDUC1T,FDOC1T,FDUV1T,FDOV1T,STSEQEN,SYNEN,41CLOSE,RELUCLS, DRVECLS

SER4 :=HALARM,SALARM,AFALARM,STARTING,RUNNING,SRUNNING,STOPPED,TRIP

33.2 Relay Word Bit Aliases

ALIASn = 'RW Bit'(space)'Alias'(space)'Asserted Text'(space)'Deasserted Text'
Alias, asserted, and deasserted text strings can be as many as 15 characters in length. Use NA to disable the setting.

Enable ALIAS (N, 1–20) **EALIAS :=**N

33.3 Event

EVENT TRIGGER (SELOGIC) **ER :=**R_TRIG TRIP OR R_TRIG LOSSALRM OR R_TRIG 46UBA OR R_TRIG 49A OR R_TRIG 37PA OR R_TRIG 55A OR R_TRIG FDUC2T OR R_TRIG FDOC2T OR R_TRIG FDUV2T OR R_TRIG FDOV2T

EVENT LENGTH (15, 64, 180 cycles) **LER :=**15

PREFAULT LENGTH (1–59 cycles) **PRE :=**5

33.4 Start Report

MSR RESOLUTION (0.25, 0.5, 1, 2, 5, 20 cycles) **MSRR :=**5

MSR TRIGGER (SELOGIC) **MSRTRG :=**0

33.5 Load Profile

LDP LIST (NA, as many as 17 analog quantities) **LDLIST :=**NA

LDP ACQ RATE (5, 10, 15, 30, 60 min) **LDAR :=**15

34 Modbus Map Settings (SET M Command)

34.1 Modbus User Map

- MOD_70 thru MOD_125 are not used

User Map Register Label Name (8 characters); see Appendix E: Modbus Communications for additional details.

ROW_17	ROW_17
ROW_18	ROW_18
ROW_18	ROW_19
ROW_19	ROW_19
ROW_13	ROW_13
ROW_13	ROW_14

ROW_14	ROW_15
ROW_9	ROW_9
ROW_3	ROW_10
ROW_4	ROW_2
ROW_1	ROW_21
ROW_121	ROW_121
ROW_1	ROW_2
ROW_21	ROW_1
ROW_12	ROW_1
ROW_12	ROW_131
ROW_131	ROW_2
ROW_10	ROW_12
ROW_21	ROW_7
ROW_2	ROW_123
ROW_123	ROW_122
ROW_122	ROW_8
ROW_8	ROW_23
ROW_23	ROW_23
ROW_23	ROW_24
ROW_24	ROW_24
ROW_24	ROW_25
ROW_25	ROW_25
IEX	VEX
RTD1	RTD2
RTD3	RTD4
RTD5	RTD6
RTD7	RTD8
RTD9	RTD10
RTD11	ROW_8
ROW_8	ROW_45
ROW_45	ROW_45
ROW_45	ROW_45
ROW_45	ROW_45
ROW_45	ROW_47
ROW_47	TRST

ROW_53	ROW_53
ROW_53	ROW_53
ROW_53	ROW_53
ROW_6	ROS_7
ROW_6	ROW_7
ROW_0	ROW_0
ROW_0	ROW_0
ROW_0	ROW_0
ROW_0	ROW_0
ROW_34	ROW_34
ROW_34	ROW_34
ROW_34	ROW_34
ROW_35	ROW_35
ROW_35	ROW_35
ROW_35	

ESQUIMALT GRAVING DOCK PUMPHOUSE SUBSTATION MV SWITCHGEAR
25/12PHS & 2.4PHS Protection Relay Settings Report
EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Details**	**Prepared By:**	**Reviewed By:**	**Date**
2.0	For External Review	Kevin Bjornson		February 19, 2016
4.0	Issued for Construction	Kevin Bjornson		November 20, 2016
5.0	As Built	Kevin Bjornson	Keisan Goldsmith	June 27, 2017

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List of Tables and Figures

Scope

This document covers protection requirements to be implemented into the protection relays and other devices required for the new medium voltage switchgear line ups 25/12PHS and 2.4PHS. This document does not cover protective device settings or other control measures for the 2.4kV MCC's, SES substations or SCADA and PLC systems.

1 Transformer Protection

1.1 Powerhouse Substation Main Power Transformer Nameplates

T25/12PHS-1 NAMEPLATE	
Manufacturer	JINPAN INTERNATIONAL USA LTD.
Size (MVA)	5MVA (185˚C) ANN
Rated High Voltage Winding (KV)	12.5/25.0
Rated Low Voltage Winding (KV)	2.4-1.386
Impedance (%)	6.5%
Taps	+/- 5.0% (On High Voltage Winding)
Connection:	Dy1

Table 1 - T25/12PHS-1 Nameplate

T25/12PHS-2 NAMEPLATE	
Manufacturer	JINPAN INTERNATIONAL USA LTD.
Size (MVA)	.75/1.0 MVA (185˚C) ANN/ANF
Rated High Voltage Winding (KV)	12.5/25.0
Rated Low Voltage Winding (KV)	.6-.347
Impedance (%)	5.0%
Taps	+/- 5.0% (On High Voltage Winding)
Connection:	Dy1

Table 2 - T25/12PHS-2 Nameplate

T6PHS-1 NAMEPLATE	
Manufacturer	JINPAN INTERNATIONAL USA LTD.
Size (MVA)	.5MVA (185˚C) ANN
Rated High Voltage Winding (KV)	2.4-1.386
Rated Low Voltage Winding (KV)	.6
Impedance (%)	5.0%
Taps	+/- 5.0% (On High Voltage Winding)
Connection:	Yd1

Table 3 - T6PHS-1 Nameplate

Note: All protective settings that have been outlined in the following pages are based on a 12.5kV system operating voltage with the exception of T6PHS-1, which will not be effected by any future upgrades to allow for an operating voltage of 25kV.

1.2 Differential Protection

The SEL 787 relay offers dual slope percentage differential protection. The dual slope feature accommodates for CT saturation, CT errors and errors due to tap changing.

Differential zones will protect both transformer windings against internal faults but also employ selectivity to not falsely operate for thru fault conditions. Due to the physical limitations of some switchgear, the differential protection will not always extend across both primary and secondary breakers, but in most instances will incorporate most of the cabling and bus work into these differential zones. This will allow faults within main power transformer, main power cabling, and some of the various medium voltage switchgear/low voltage switchboards to be detected quickly and cleared.

1.2.1 Winding WnCTC (CT connection compensation)

T25/12PHS-1 and T25/12PHS-2 transformers are a Dy1 connected unit with the polarity of H1 connected to the non-polarity point of H2, implying a DAB type delta connection. In this instance the Delta connected primary windings lead the WYE connected secondary windings. T6PHS-1 transformer is an Yd1 connected unit with the polarity of X1 connected to the non-polarity point of X3, implying a DAC type delta connection. In this instance the Delta connected primary winding lags the WYE connected secondary winding.

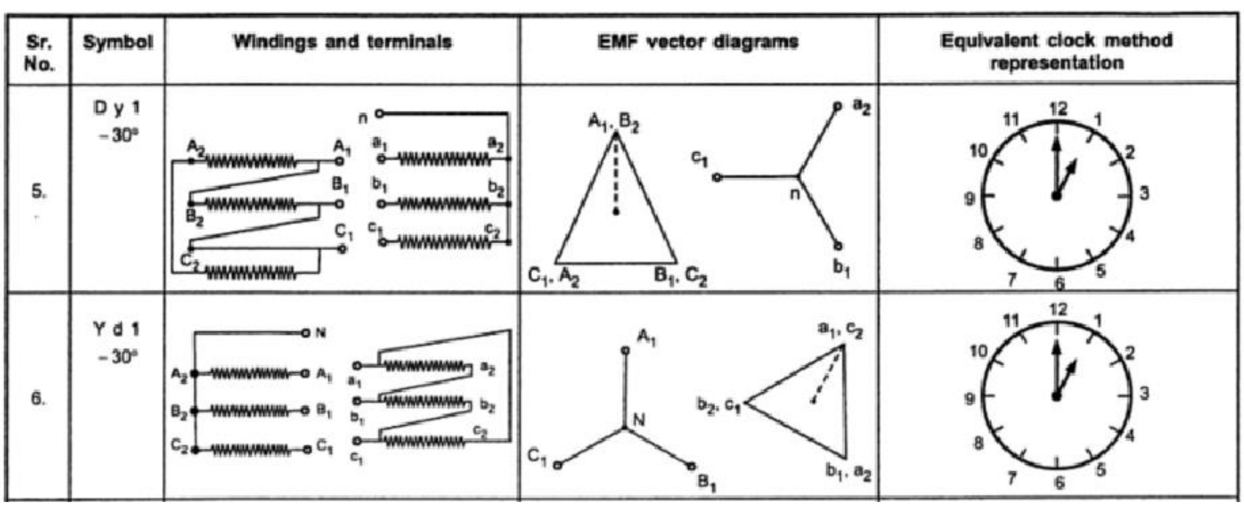

Figure 1 – T25/12PHS-1 and T25/12PHS-2 (Sr. No. 5) and T6PHS (Sr. No. 6) Winding Configuration

All current transformer secondary wiring connections to the new SEL 787 relays will utilize WYE connections. The SEL 787 relay uses an internal CT connection matrix compensation to account for phase shifts in the transformer winding and CT connections. Below is an explanation for the connection compensation constants that will be utilized.

The winding compensations settings for T25/12PHS-1 & T25PHS-2 are:

W1CTC = 0 (Reference Winding)

W2CTC = 1 (To apply one 30° phase shift in a counter clockwise direction. Establishes a 180° displacement from the reference winding used for the differential calculation).

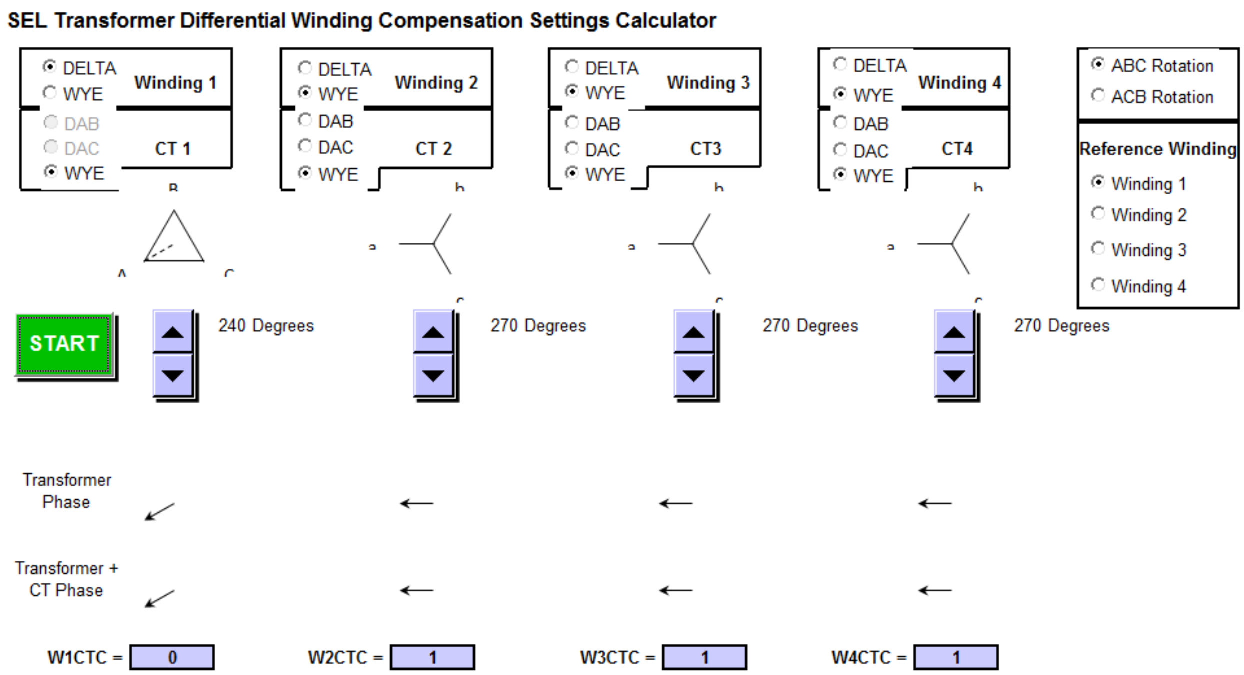

Figure 2 - SEL Transformer Differential Winding Compensation Settings Calculator T25/12PHS-1 and T25/PHS-2

The winding compensations settings for T6PHS-1 are:

W1CTC = 11 (To apply 11 30° phase shift in a counter clockwise direction. Establishes a 180° displacement from the reference winding used for the differential calculation).

W2CTC = 0 (Reference Winding)

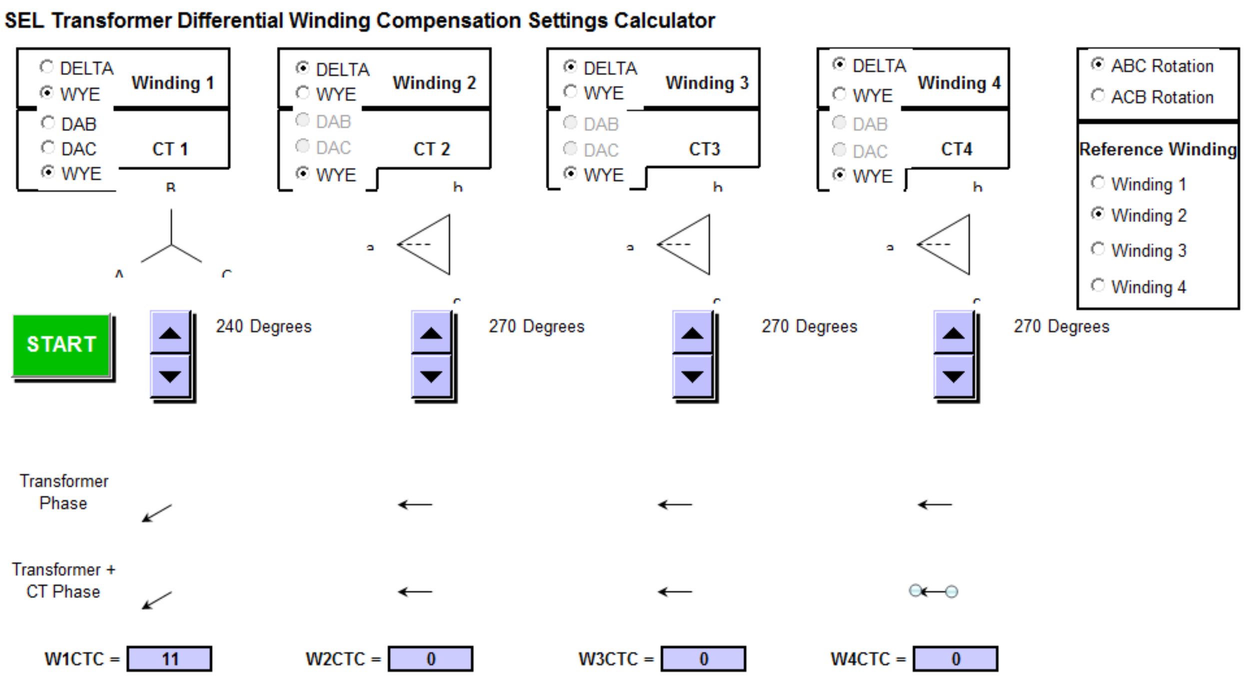

Figure 3 - SEL Transformer Differential Winding Compensation Settings Calculator T6PHS-1

1.2.2 Current Tap

The relay uses a standard equation to set TAPn, based on settings entered for the particular winding. (n denotes the winding number.)

$$\mathrm{TAPn} = \frac{\mathrm{MVA} \bullet 1000}{\sqrt{3} \bullet \mathrm{VWDGn} \bullet \mathrm{CTRn}} \bullet \mathrm{C}$$

where:

C = 1 if WnCT setting = Y (wye-connected CTs)
C = √3 if WnCT setting = D (delta-connected CTs)
MVA = maximum power transformer capacity setting (must be the same for all TAPn calculations)
VWDGn = winding line-to-line voltage setting, in kV
CTRn = current transformer ratio setting

1.2.2.1 T25/12PHS-1

TAP1 = 5 *1000/(1.732*12.5*50)*1 = 4.62
TAP2 = 5 *1000/(1.732*2.4*240)*1 = 5.01

1.2.2.2 T25/12PHS-2

TAP1 = 1*1000/(1.732*12.5*10)*1 = 4.62
TAP2 = 1*1000/(1.732*.6*200)*1 = 3.01

1.2.2.3 T6PHS-1

TAP1 = .5*1000/(1.732*.6*100)*1 = 4.81
TAP2 = .5*1000/(1.732*2.4*40)*1 = 3.00

1.2.3 Restrained Element Operating Pickup

Set the restrained element operating pickup at a minimum for increased sensitivity but high enough to avoid operation because of steady-state CT error and transformer excitation current:

1.2.3.1 T25/12PHS-1

O87P Min ≥ (0.1*INOM)/TAP MIN
O87P≥ (0.1*5)/4.62 = 0.108 Set 087P = .2

1.2.3.2 T25/12PHS-1

O87P Min ≥ (0.1*INOM)/TAP MIN
O87P≥ (0.1*5)/3.01 = 0.166 Set 087P = .2

1.2.3.3 T25/12PHS-1

O87P Min ≥ (0.1*INOM)/TAP MIN
O87P≥ (0.1*5)/3.00 = 0.165 Set 087P = .2

1.2.4 Unrestrained Element Current Pickup

Set the unrestrained element high enough so as not to react to large inrush currents. Because there is no harmonic blocking associate with this element, set magnitude to clear inrush which is expected to be 10 times transformer FLA.

1.2.4.1 T25/12PHS-1

U87P> 10*TAP1
U87P> 10*4.62*50 = (2310A primary)

1.2.4.2 T25/12PHS-1

U87P> 10*TAP1
U87P> 10*4.62*10 = (462A primary)

1.2.4.3 T6PHS-1

U87P> 10*TAP1
U87P> 10*4.81*100 = (4810A primary)

1.2.5 Slope 1 and Slope 2 Settings

The slope setting in differential protection is used to accommodate for:

- Power Transformer Tap Changer
- Magnetizing Current
- Relay Error
- CT Error
- Current Mismatch from actual interposing CT

All transformers will have Off-Load Tap Changers which may vary the outgoing voltage by +/- 5.0%. Total voltage deviation in per unit: a = .05 or 5%

Estimated CT error: e= .1 or 10%

Using these two values and assuming the worst case scenario for a through-current situation using the measured maximum positive value of the input currents, the maximum measured negative value of the output currents as well as being offset by the maximum tap changer variation the following can be calculated:

(2*e+a+e*a)/(1+a)*100 = 25.5%

Note that the restraint current is defined as the sum of the winding currents, which equals 2.0 per unit for through-current conditions. Therefore the differential current as a percentage of the restraint current (also known as slope) is

Slope = (25.5/2) = 12.75%

In addition the following factors need to be considered:

Estimated excitation current for these transformers: 3%

Maximum Relay error: 5%.

Total error: 12.75%+3%+5%= 20.75%

Using only one slope, a conservative slope setting, SLP1 would be 20.75 percent. This would represent a fixed percentage differential application and is a good average setting to cover the entire current range.

A two-slope or variable-percentage differential application, improves sensitivity in the region where CT error is small and increases security in the high-current region where CT error is great. Both slopes must be defined as well as the slope 1 limit or crossover point, IRS1. With lower thru faults or normal loading conditions, if assumed CT error is 1 percent slope 1 could be set at 16%: The slope 1 setting will be set slighting higher to avoid nuisance tripping to 18%. IRS1 will be set to 3.0 per unit of TAP as recommended by SEL.

SLP2 setting should be in the 25-70% range to avoid problems with CT saturation at high currents. Slope 2 will be set to 50%.

1.2.6 Harmonic Restraint

Second, Fourth and Fifth Harmonic blocking will be employed to block false differential trips during transformer inrush or over-excitation situations. Recommended and default settings of 15% and 35% will be applied respectively.

1.2.7 Transformer Auxiliary Protection:

Transformer auxiliary protection not incorporated in the SEL 787 will be winding temperature triggered from the Electronic Temperature Monitor (ETM) of each respective transformer. This device will also perform transformer cooling for those units equipped with fans.

- 49 – Winding Temperature

1.2.8 Transformer Lockout

All SEL-787 protection relays will trip and both primary and secondary breakers and lockout the electrical close circuits for those breakers that are equipped with that function. For those breakers that do not have a shunt release will only have an electric trip held that will case the device to trip free if a manual close is attempted The lockout function may on be released via a programmed latching bit that may only be reset by pressing the "Target Reset" pushbutton local to the initiating relay. Electrical faults causing the lockout function to initiate in each respective transformer relay are as follows in Table 4.

25/12PHS-PR-02, 25/12PHS-PR-02, 2.4PHS-PR-02	**86**
50P – Phase Instantaneous Overcurrent (Primary)	X
50G – Ground Instantaneous Overcurrent (Primary)	X
50AF (P/N) – Arc Flash Phase/Neutral	X
87-Transformer Differential	X

Table 4 – Transformer Lockout Relay Initiation

1.2.9 Arc Flash Protection

Because SEL-787 protections relays do not have the capability to accept fiber optic sensors designed to sense the light emitted from an arc flash event, various sensors for the applicable points within the switchboard will be installed to connect to various SEL-751A's (feeder protection relays). These 751A's will directly trip the transformer primary breakers as applicable if a flash is present.

Information regarding other protective/control functions are displayed on the various protective tables on *"PUMPHOUSE SUBSTATION PROTECTION SINGLE LINE DIAGRAMS" DWG's PHS-11-00 and PHS-11-01".* For information regarding transformer protective relaying overcurrent settings for both primary and secondary winding, please refer to *"EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0"*

2 Feeder Protection

Each feeder protection relay "SEL 751A" within 25/12PHS and 2.4PHS will incorporate the various protective functions as displayed on the various protective tables on *"PUMPHOUSE SUBSTATION PROTECTION SINGLE LINE DIAGRAMS" DWG's PHS-11-00 and PHS-11-01".* Each protective function excluding the time delayed open close feature will cause that particular feeder relay to open and lockout the respective circuit breaker.

Unlike the transformer protection relays, arc flash fiber optic sensors connected to SEL-751A relays are monitored directly and together with a current supervision element will clear and isolate the respective breaker to isolate the fault.

For information regarding feeder protective relaying overcurrent settings please refer to *"EGD Service Entrance Substation & Pump House Substation Upgrade Short Circuit and Coordination Analyses Rev 5.0"*

3 Circuit Breaker Control

Each circuit breaker will have the ability to be controlled by the following means:

- Directly and instantaneously from the control switch located on the switchgear
- Via time delayed pushbuttons on the protection relay, allowing the operator to get to a safe distance prior to circuit breaker operation
- Via the SCADA system initiated thru the PM8240 power meters for the respective breaker/load.

4 Main Pump Start Inhibit

Each main pump will be shut down and inhibited from starting any time 2.4PHS CB-2 is in the connected and closed position. This ensures that when 2.4PHS is placed to emergency stand by generators, the system and most importantly the Auxiliary Pumps will not be affected.

ENGINEER . IMPLEMENT . MAINTAIN

Esquimalt Graving Dock	
5014.81 – 25/12SSSR Site Acceptance Testing Report	
Client:	

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
2.0	Brent Hughes	Keith Cardiff	June 30, 2017	For External Review

prime engineering

ENGINEER . IMPLEMENT . MAINTAIN

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

DATE: **PROJECT #** 5014.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **25/12SSSR Site Acceptance Testing Report**

Dear Jean:

This report documents the site acceptance testing for the Esquimalt Graving Dock 25/12SSSR medium voltage switchgear. The testing and verification has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA).

GENERAL NOTES:

- The purpose of this report is to permit initial energization of 25/12SSSR switchgear only, for commissioning purposes on July 6, 2017.
- Power system SCADA commissioning will be completed at a later date. For initial energization, the only functional device that will be monitored is 25/12SES-MET-18, to determine overall SSSR electrical consumption.

ITEMS REQUIRING ATTENTION:

- **MV Cabling needs to be connected and torqued. Concentric neutrals need to be connected to ground.**

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

Ground Grid Calculations per IEEE Standard 80, CEC Rule 36-304 – Road Base Cover		
Date:	June 29, 2017	
Project Name:	Esquimalt Graving Dock – SSSSR	
Client:	Houle Electric Ltd.	
Site Location:	Esquimalt, BC	
Field Measurements		
Covering Medium Type:	Asphalt	
Covering Medium Depth:	0.1	Meters
Covering Medium Resistivity:	10,000	Ω-meters
Top Soil Resistivity:	59.8	Ω-meters
Top Soil Depth:	5	Meters
Bottom Soil Resistivity:	50.9	Ω-meters
Ground Grid Resistance:	1.441	Ω
Fault Duty Information		
Fault Level at Site for L-G fault[1]	3,900	Symmetrical Amperes
Fault Duration	0.3	Seconds
IEEE 80 Acceptable Levels		
Tolerable Ground Potential Rise:	5000	Volts
Tolerable Touch Voltage:	1868.7	Volts
Tolerable Step Voltage:	6982.7	Volts
Software Mathematical Calculations[2]		
Calculated Ground Potential Rise:	3084.4	Volts
Calculated Maximum Touch Voltage:	1725.8	Volts
Calculated Maximum Step Voltage:	1064.8	Volts

The results in these tables have been reviewed by and sealed by a professional engineer registered in BC, as required by the CEC.

PROFESSIONAL
PROVINCE OF
W. B. K. CARDIFF
36995
BRITISH COLUMBIA
ENGINEER

2017-07-04

[1] Based on BC Hydro present fault level, not the ultimate fault level
[2] Calculations assume a bolted connection to the system neutral, and fault current split between the system neutral and installed ground grid

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

Thank-you for selecting Prime Engineering Ltd. We hope to work with you again in the near future.
Sincerely,

Brent Hughes, EIT
Project Engineer
prime engineering
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#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-5213
f: (250) 590-8917
e: brent.hughes@primeeng.ca
www.primeeng.ca

Additional/Supporting Documentation

Item #	DWG/DOC#/NAME	REV.#	COMMENTS
1	5014.81_2512SSSR CT Results	2.0	Vangaurd Test Reports for 25/12SSSR CT's
2	5014.81_2512SSSR Protection Relay Test	2.0	Protection Relay Test Forms
3	5014.81_25_12SSSR SPE-1000 Report	-	SPE-1000 Testing/Inspection for 25/12SSSR modifications

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.1 EQUIPMENT TESTING SAFETY CHECKLIST – PRIOR TO COMMENCING WORK

ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
NAME OF THE PERSON IN CHARGE:	√		TEST VOLTAGE HAZARDS 15KV OR OVER:	√	
EMERGENCY RESPONSE:	√		LIMITS OF APPROACH:	√	
SAFTEY GROUNDING IN PLACE:	√		TEST FOR POTENTIAL:	√	
PUBLIC SAFETY/BARRIERS IN PLACE:	√		INDUCTION HAZARDS:	√	
COMMUNICATION AND NOTIFICATION:	√		CONTROL CIRCUITS LIVE:	√	
SAFE WORKING SPACE AROUND EQUIPMENT:	√		HOUSEKEEPING:	√	
PERSONAL PROTECTIVE EQUIPMENT:	√		EQUIPMENT IS GROUNDED:	√	
STROBE LIGHTS WORK:	√		OTHER:		√

ALL PERSONAL WORKING IN VICINITY MUST SIGN SAFETY RECORD

NAME	TITLE	PHONE NUMBER	INITIALS
Jordan Siu	**Field Tech**	**250 893 3528**	**JS**
Brent Hughes	**Project Engineer**	**250 893 5213**	**BH**
Clayton Laughren	**Field Tech**	**250 893 8050**	**CL**

APPROVED PERSONAL TO BE INSIDE BARRIERED AREA AFTER EQUIPMENT HAS BEEN TURNED OFF AND GROUNDED

NAME	TITLE	PHONE NUMBER	INITIALS
Jordan Siu	**Field Tech**	**250 893 3528**	**JS**
Brent Hughes	**Project Engineer**	**250 893 5213**	**BH**
Clayton Laughren	**Field Tech**	**250 893 8050**	**CL**

NOTES – COMMENTS – DESCRIPTION OF OTHER HAZARDS

Date of safety discussion: 08/06/2017

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.2 NEW INSTALLATION COMMISSIONING CHECKLIST				
	PASS	**FAIL**	**N/A**	**CEC AND WORKSAFE REQUIREMENTS, NOTES**
COMPLIANCE WITH APPICABLE STANDARDS CEC RULES: 2-024, 36-108, 36-110, 36-212, TABLES: 30, 31, 21, 33, 34, 35, BCSA BULLETIN No. B-E3 07101993				
SWITCHGEAR - CSA C22.2 NO. 31:	X			
FIELD INSPECTION – CSA SPE1000:	X			FIELD INSPECTIONOF CUSTOM CABINET
LIQUID FILLED TRANSFORMER STANDARDS:				EQUIPMENT MUST BEAR LABEL INDICATING COMPLIANCE WITH ONE OR MORE OF THE FOLLOWING: CSA C2.1, C88, C227.4, cUL
DRY TYPE TRANSFORMER STANDARDS:	X			EQUIPMENT MUST BEAR LABEL INDICATING COMPLIANCE WITH ONE OF THE FOLLOWING: CSA C9, cUL
ADEQUATE ELECTRICAL CLEARANCE:	X			25KV P-P = 9.0" (229mm), P-G = 8.0" (204mm) 12.5KV: P-P = 6.0" (153mm), P-G = 5.0" (127mm)
HEATER CONNECTED AND OPERATIONAL:			X	OUTDOOR EQUIPMENT REQUIRES WORKING MOISTURE CONTROL DEVICE
HV SWITCH OR DISCONNECT MEANS CEC RULES: 36-212, 36,214, TABLES: 35				
AT ENTRANCE OF BUILDING OR CAN BE TRIPPED FROM WITHIN BUILDING:	X			ISOLATION MEANS MUST BE PRESENT AND ACCESSIBLE
CONTACTS VISIBLE OPEN AND CLOSED:			X	
BREAKER INTERLOCKED TO ISOLATION SWITCH:			X	
POSITIVE POSITION INDICATORS PRESENT:	X			
INTERLOCKS CEC RULES: 36-208, 36-214, TABLES: 35				
FUSE COMPARTMENT CANNOT BE OPENED UNLESS SWITCH IS OFF:			X	
UTILITY METERING SECTION INTERLOCKED TO PRIMARY SWITCH:			X	
GROUND FAULT SYSTEM, GROUNDING, AND BONDING CEC RULES: 36-304, 14-102, TABLES: 52				
FALL OF POTENTIAL RESISTANCE:	X			
ALL GROUNDING/BONDING COMPLETE:	X			
OPERATION OF GROUND FAULT SYSTEM:	X			GF PROTECTION SET @ MAX 1200A OR 3000A FOR 1sec FOR LV SYSTEM RATED >1000A @ P-N > 150V OR >2000A @ P-N <150V
TRANSFORMER PROTECTION CEC RULES: 26-252				
PRIMARY FUSES ARE SIZED TO NEXT NOMINAL FUSE SIZE AT 150% FLA:			X	
XFMR HAS FUSED LB SWITCH, NO MAIN SEC. BREAKER, THERMAL OVERLOAD **OR**			X	VERIFY THERMAL OVERLOAD PROTECTION
XFMR HAS FUSED L SWITCH, MAIN SEC BREAKER **OR**	X			
XFMR HAS MAIN PRI. BREAKER WITH APPROPRIATE 50/51 PROTECTION:	X			
SWITCH, FUSE AND BREAKER RATINGS CEC RULES: 36-202, 36-204, 14-012				

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

ADEQUATE INTERRUPTING CAPACITY:	X			HV EQUIPMENT MUST MEET UTILITY REQUIREMENTS
SUITABLE OR THE APPLICATION:	X			WITH REFERENCE TO APPLICABLE CEC RULES FOR TRANSFORMERS, CAPACITORS, MOTORS, AND OTHER EQUIPMENT
EQUIPMENT COORDINATION				
EQUIPMENT SET PER COORDINATION STUDY, BOTH PHASE AND GROUND OC:	X			
SETTINGS OK FOR ARC FLASH:	X			LOW INSTANTANEOUS SETTINGS ON LOW VOLTAGE EQUIPMENT GENERALLY RESULT IN A LOWER ARC FLASH HAZARD
OTHER ITEMS				
ARC FLASH LABELS PRESENT:	X			EQUIPMENT MUST BE LABELED. GENERIC LABELS ARE ACCEPTABLE
GROUNDING BALLS IN UTILITY INCOMING/METERING SECTION:			X	LINE AND LOAD SIDE OF CURRENT TRANSFORMERS, IF APPLICABLE
UTILITY NEUTRAL BUS			X	MUST BE SEPARATE FROM UTILITY GROUND BUS AND BONDED TO GROUND BUS IN INCOMING SECTION WITH REMOVEABLE LINK
GROUNDING BALLS AND BUS EASILY ACCESSIBLE FOR MAINTENANCE:	X			
LIGHTNING ARRESTERS CONNECTED AND SIZED CORRECTLY:	X			
3 SPARE FUSES ON SITE:			X	
TRANSFORMER SEISMICALLY RESTRAINED:			X	
CABLE PHASING CORRECT – HV AND LV:	X			
NOTES AND COMMENTS AND RECOMMENDATIONS				
PRIME ENGINEERING – REVISION #4.0				

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.3 CABLE HIPOT TEST

MANUFACTURER:	Prysimain Cable	MFG. DATE:	2016
CIRCUIT ID:	25/12SES-CB-18	FEEDS TO:	25/12SSSR
CABLE TYPE/INSULATION:	Voltalene/Trxple	CONDUCTOR SIZE:	250 MCM
TEMPERATURE RATING::	90°C	HUMIDITY - %	70%/19°C
LENGTH:	475M	MAXIMUM TEST VOLTAGE:	31 KVAC @ 0.1Hz
AUTHORIZED BY:	Steve Frachette (Houle)		

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	940GΩ	LINE A-B WITH C GROUNDED:	1.869TΩ
LINE B TO GROUND:	718GΩ	LINE B-C WITH A GROUNDED:	1.543TΩ
LINE C TO GROUND:	2.014TΩ	LINE C-A WITH B GROUNDED:	1.908TΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC @ 0.1 Hz	LINE A nF	LINE A µA	LINE B nF	LINE B µA	LINE C nF	LINE C µA
1	31	2.04	105	2.04	105	2.04	105
2	31	2.04	105	2.04	105	2.04	105
3	31	2.04	105	2.04	105	2.04	105
4	31	2.04	105	2.04	105	2.04	105
5	31	2.04	105	2.04	105	2.04	105
6	31	2.04	105	2.04	105	2.04	105
7	31	2.04	105	2.04	105	2.04	105
8	31	2.04	105	2.04	105	2.04	105
9	31	2.04	105	2.04	105	2.04	105
10	31	2.04	105	2.04	105	2.04	105
11	31	2.04	105	2.04	105	2.04	105
12	31	2.04	105	2.04	105	2.04	105
13	31	2.04	105	2.04	105	2.04	105
14	31	2.04	105	2.04	105	2.04	105
15	31	2.04	105	2.04	105	2.04	105

AC INSULATION RESISTANCE @ 0.1 Hz 15 MIN READINGS	LINE A	LINE B	LINE C
	2.2 GΩ	2.9 GΩ	2.2 GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-12

GENERAL COMMENTS

Test performed with all cables not under test connected to ground.

Concentric neutrals connected to ground at SES during test.

Cold shrink terminations on both ends.

1.4 Switchgear and Switchboard Assemblies

Reference: NETA ATS-2013 Section: 7.1

CIRCUIT ID:	**25/12SSSR**	PHASES:	**3**
SERIAL #:	**37939710-001**	WIRES:	**3**
TYPE:	**Metal Clad**	VOLTAGE:	**27kV**
MANUFACTURER:	**Square D**	B.I.L.:	**125kV**
MFG. DATE:	**2016**	POWER FREQUENCY:	**60HZ**
POWER FUSE SIZE:	**N/A**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40kA**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify that the fuse and circuit breaker sizes and types correspond to the drawings and coordination study.	Pass/Fail	**PASS**
Verify that the current and voltage transformer ratios correspond to drawings.	Pass/Fail	**PASS**
Verify that the wiring connections are tight and that the wiring is secure to prevent damage during routine operation of moving parts.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Inspect insulators for evidence of physical damage or contaminated surfaces.	Pass/Fail	**PASS**
Verify correct barrier and shutter installation and operation.	Pass/Fail	**PASS**
Exercise all active components	Pass/Fail	**PASS**
Inspect mechanical indicating devices for correct operation.	Pass/Fail	**PASS**
Verify that filters are in place and vents are clear.	Pass/Fail	**PASS**

Perform visual and mechanical inspection of instrument transformers.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**
Perform electrical tests on instrument transformers	Pass/Fail	**PASS**
Determine accuracy of all meters and calibrate watthour meters	Pass/Fail	**PASS**
Control Power Transformers 1. Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be in accordance with Table 100.1 unless otherwise specified by the manufacturer. 2. Perform a turns-ratio test on all tap positions. 3. Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices. 4. Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected. 5. Verify correct function of control transfer relays located in the switchgear with multiple control power sources.	1. Turns-ratio test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. 2. Secondary wiring shall be in accordance with design drawings and specifications. 3. Secondary voltage shall be in accordance with design specifications. 4. Control transfer relays shall perform as designed	**PASS** **(Test 4 and 5 N/A)**
Voltage Transformers 1. Perform secondary wiring integrity test. Verify correct potential at all devices. 2. Verify secondary voltages by energizing the primary winding with system voltage.	1. Secondary wiring shall be in accordance with design drawings and specifications. 2. Secondary voltage shall be in accordance with design specifications	**PASS** **(Test 2 N/A)**
Perform current-injection tests on the entire current circuit in each section of switchgear. 1. Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 ampere flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.	1. Current-injection tests shall prove current wiring is in accordance with design specifications.	**PASS**

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

GENERAL COMMENTS	
No Comments	
APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.5 25/12SSSR Medium Voltage Switchboard Test and Inspection

MANUFACTURER:	**Square D**	MFG. DATE:	**2016**
EQUIPMENT ID:	**25/12SSSR**	NUMBER OF PHASES/WIRES	**3/3**
TYPE:	**Metal Enclosed**	PROTECTION:	**Digital Relay**
SERIAL #:	**37939710-001**	FAULT BRACING:	**40kA**
AMPACITY:	**1200A**	VOLTAGE RATING:	**27kV**

DIELECTRIC WITHSTAND TEST

TIME:__1min____ VOLTAGE:___30kVDC__ (All sections connected breakers disconnected and racked out)

Phase	Result	PASS/FAIL
A-GND	**1.5µA**	**PASS**
B-GND	**1.8µA**	**PASS**
C-GND	**2.4µA**	**PASS**

INSULATION RESISTANCE

Phase	Result	PASS/FAIL
A-GND	**>10TΩ**	**PASS**
B-GND	**>10TΩ**	**PASS**
C-GND	**>10TΩ**	**PASS**
A-B PHASE	**>10TΩ**	**PASS**
B-C PHASE	**>10TΩ**	**PASS**
C-A PHASE	**>10TΩ**	**PASS**

CONNECTION TIGHTNESS – SEE COMMENTS

Note: All Circuit Breakers Listed Under "Connection" To Be Connected And Closed For Following Tests

Connection	A Phase	B phase	C Phase	PASS/FAIL
CB-1 Line – CB-14 Line	**0.46mΩ**	**0.44mΩ**	**0.48mΩ**	**PASS**
CB-2 Line – CB-14 Line	**0.44mΩ**	**0.41mΩ**	**0.40mΩ**	**PASS**
CB-3 Line – CB-14 Line	**0.48mΩ**	**0.48mΩ**	**0.49mΩ**	**PASS**
CB-4 Line – CB-14 Line	**0.79mΩ**	**0.68mΩ**	**0.67mΩ**	**PASS**
CB-5 Line – CB-14 Line	**0.81mΩ**	**0.69mΩ**	**0.77mΩ**	**PASS**
CB-6 Line – CB-14 Line	**0.44mΩ**	**0.42mΩ**	**0.41mΩ**	**PASS**
CB-7 Line – CB-14 Line	**0.37mΩ**	**0.36mΩ**	**0.41mΩ**	**PASS**
CB-8 Line – CB-14 Line	**0.45mΩ**	**0.44mΩ**	**0.43mΩ**	**PASS**
CB-9 Line – CB-14 Line	**0.35mΩ**	**0.39mΩ**	**0.39mΩ**	**PASS**
CB-10 Line – CB-14 Line	**0.35mΩ**	**0.36mΩ**	**0.34mΩ**	**PASS**
CB-11 Line – CB-14 Line	**0.83mΩ**	**0.66mΩ**	**0.77mΩ**	**PASS**
CB-12 Line – CB-14 Line	**0.38mΩ**	**0.37mΩ**	**0.37mΩ**	**PASS**

TEST EQUIPMENT ID

PE-HP-01, PE-D-10, PE-M-10

ENVIRONMENTAL CONDITIONS

INDOORS, DRY

GENERAL COMMENTS

DC Hipot of all sections connected with breakers disconnected and open.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.6 25/12PT-1 INSTRUMENT TRANSFORMER TEST

MANUFACTURER:	**INSTRUMENT TRANSFORMER**	MFG. DATE:	**April 26, 2016**
CIRCUIT ID:	**25/12PT-1**	FEEDS TO:	**Meters & Protection Relays**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**14.4kV/7.2kV**	ACC. CLASS:	**Station**

VISUAL INSPECTION

	LINE A	LINE B	LINE C
PRIMARY FUSE MODEL #:	**FCA22 – 0,5E**	**FCA22 – 0,5E**	**FCA22 – 0,5E**
PRIMARY FUSE AMPACITY:	**0.5A**	**0.5A**	**0.5A**
PRIMARY FUSE RESISTANCE:	**5.5 Ω**	**5.5 Ω**	**5.5 Ω**
CONTROL WIRING:	**PASS**	**PASS**	**PASS**
GROUNDING:	**PASS**	**PASS**	**PASS**
CLEANED:	**PASS**	**PASS**	**PASS**

TRANSFORMER RATIO TEST

	LINE A		LINE B		LINE C	
SERIAL #:	**54516891**		**54516890**		**54516889**	
	RATIO	EXCITING	RATIO	EXCITING	RATIO	EXCITING
H1-H2:X1-X3	**59.922:1**	**<1 ma**	**59.907:1**	**<1 ma**	**59.931:1**	**<1 ma**
H1-H2:X2-X3	**119.83:1**	**<1 ma**	**119.81:1**	**<1 ma**	**119.84:1**	**<1 ma**
POLARITY:	**PASS**		**PASS**		**PASS**	

INSULATION RESISTANCE

	LINE A	**LINE B**	**LINE C**
TEST VOLTS:	**5KVDC**	**5KVDC**	**5KVDC**
LEAKAGE CURRENT:	**1.112 nA**	**1.249 nA**	**1.548 nA**
X-GND INSULTATION RESISTANCE:	**676 GΩ**	**1.346 TΩ**	**1.099 TΩ**
H-GND INSULATION RESISTANCE:	**4.57 TΩ**	**4.07 TΩ**	**3.289 TΩ**
POLARIZATION INDEX:	**2.79**	**2.95**	**2.71**
DIELECTRIC ABSORPTION RATIO:	**1.37**	**1.34**	**1.43**
X+H-GND:	**345 GΩ**	**876 GΩ**	**602 GΩ**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-T-10

GENERAL COMMENTS

H1-H2:X1-X3=7200-120V

H1-H2:X2-X3=14400-120V

Secondary wiring connected X1-X3 for initial operating voltage at 12.5kV L-L 7.2kV L-G

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.7 25/12SSSR CB-1 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SES CB-1**	PHASES:	**3**
SERIAL #:	**17 92281**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**T25/12SSSR-1**	OPERATION COUNTER:	**74**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and anti-pump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.8 25/12SSSR CB-1 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-1**	FEEDS TO:	**T25/12SSSR-1**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92281**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**74**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**16.1 µΩ**	**17.7 µΩ**	**17.9 µΩ**
CONTACT OPENING TIME:	**28.5 ms**	**28.3 ms**	**28.0 ms**
CONTACT CLOSING TIME:	**51.0 ms**	**51.0 ms**	**51.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**177.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**186.7**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.13**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

1.9 25/12SA-1 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-1**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.10 25/12SA-1 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-1**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 410GΩ B: 301GΩ C: 402GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.11 25/12SSSR ES-1 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SES ES-1**	PHASES:	**3**
SERIAL #:	**1274676/14**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.12 25/12SSSR ES-1 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-1**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/14**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.3mΩ**	**0.3mΩ**	**0.3mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**610GΩ**	**741GΩ**	**1032GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

prime engineering
ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.13 25/12SSSR CB-2 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-2**	PHASES:	**3**
SERIAL #:	**17 92278**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**T25/12SSSR-2**	OPERATION COUNTER:	**74**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.14 25/12SSSR CB-2 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-2**	FEEDS TO:	**T25/12SSSR-2**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92278**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**74**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**17 μΩ**	**17 μΩ**	**16 μΩ**
CONTACT OPENING TIME:	**28.0 ms**	**28.0 ms**	**28.0 ms**
CONTACT CLOSING TIME:	**51.0 ms**	**51.0 ms**	**50.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**16 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**9.9**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**177.8**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**182.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.15 25/12SA-2 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-2**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections 4. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.16 25/12SA-2 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-2**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 395GΩ B: 355GΩ C: 319GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

1.17 25/12SSSR ES-2 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-2**	PHASES:	**3**
SERIAL #:	**1274676/2**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.18 25/12SSSR ES-2 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-2**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/2**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	INTERLOCK KEY NUMBER:
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.51mΩ**	**0.55mΩ**	**0.52mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**778GΩ**	**699GΩ**	**987GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

1.19 25/12SSSR CB-3 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-3**	PHASES:	**3**
SERIAL #:	**17 92286**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE**	OPERATION COUNTER:	**76**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**

Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.20 25/12SSSR CB-3 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-3**	FEEDS TO:	**SPARE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92286**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**76**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20.1 µΩ**	**22.8 µΩ**	**19.9 µΩ**
CONTACT OPENING TIME:	**28.0 ms**	**28.0 ms**	**27.5 ms**
CONTACT CLOSING TIME:	**51.0 ms**	**51.6 ms**	**51.7 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**8.90 TΩ**	**>10TΩ**	**>10TΩ**
LINE TO GROUND:	**5KVDC**	**6.15 TΩ**	**>10TΩ**	**7.12 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10TΩ**	**>10TΩ**	**>10TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**17 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**178.3**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**177.4**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.6**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.21 25/12SA-3 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-3**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 5. Low-resistance ohmmeter 6. Calibrated torque wrench	5. Investigate connection values that deviate more than 50% from similar connections 6. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.22 25/12SA-3 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-3**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 354GΩ B: 332GΩ C: 338GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.23 25/12SSSR ES-3 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-3**	PHASES:	**3**
SERIAL #:	**1274676/1**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.24 25/12SSSR ES-3 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-3**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/1**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.33mΩ**	**0.37mΩ**	**0.34mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**1321GΩ**	**1378GΩ**	**1147GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.25 25/12SSSR CB-4 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-4**	PHASES:	**3**
SERIAL #:	**17 92285**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE**	OPERATION COUNTER:	**79**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock
LOCATION:	SSSR
CLIENT:	EECOL
DATE:	June 2017
TECHNICIAN:	CL, JS,BH
JOB:	5014.81

1.26 25/12SSSR CB-4 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-4**	FEEDS TO:	**SPARE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92285**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**79**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**16.2 µΩ**	**16.5 µΩ**	**16.0 µΩ**
CONTACT OPENING TIME:	**28.5 ms**	**27.5 ms**	**27.5 ms**
CONTACT CLOSING TIME:	**51.0 ms**	**51.0 ms**	**51.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**177.2**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**177.9**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.27 25/12SA-4 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-4**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 7. Low-resistance ohmmeter 8. Calibrated torque wrench	7. Investigate connection values that deviate more than 50% from similar connections 8. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.28 25/12SA-4 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-4**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 314GΩ B: 322GΩ C: 307GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT:10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.29 25/12SSSR ES-4 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-4**	PHASES:	**3**
SERIAL #:	**1274676/5**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.30 25/12SSSR ES-4 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-4**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/5**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.32mΩ**	**0.31mΩ**	**0.34mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**1315GΩ**	**1137GΩ**	**1581GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.31 25/12SSSR CB-5 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-5**	PHASES:	**3**
SERIAL #:	**17 92284**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE**	OPERATION COUNTER:	**77**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.32 25/12SSSR CB-5 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-5**	FEEDS TO:	**SPARE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92284**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**77**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**21.3 µΩ**	**23.9 µΩ**	**18.2 µΩ**
CONTACT OPENING TIME:	**29.0 ms**	**29.0 ms**	**29.4 ms**
CONTACT CLOSING TIME:	**50.5 ms**	**51.1 ms**	**50.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**9.77 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**8.96 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**178.6**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**180.3**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.7**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.33 25/12SA-5 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-5**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 9. Low-resistance ohmmeter 10. Calibrated torque wrench	9. Investigate connection values that deviate more than 50% from similar connections 10. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.34 25/12SA-5 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-5**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 387GΩ B: 469GΩ C: 349GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.35 25/12SSSR ES-5 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-5**	PHASES:	**3**
SERIAL #:	**1274676/15**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.36 25/12SSSR ES-5 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-5**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/15**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.39mΩ**	**0.40mΩ**	**0.38mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**2361GΩ**	**4160GΩ**	**2388GΩ**
OVER POTENTIAL TEST:	**450kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.37 25/12SSSR CB-6 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-6**	PHASES:	**3**
SERIAL #:	**17-92279**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**FUTURE LVSP#6**	OPERATION COUNTER:	**90**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.38 25/12SSSR CB-6 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-6**	FEEDS TO:	**FUTURE LVSP#6**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17-92279**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**90**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**16.3 μΩ**	**16.7 μΩ**	**16.2 μΩ**
CONTACT OPENING TIME:	**30.0 ms**	**29.9 ms**	**30.1 ms**
CONTACT CLOSING TIME:	**25.5 ms**	**31.1 ms**	**27.2 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**9.68TΩ**	**>10TΩ**	**>10TΩ**
LINE TO GROUND:	**5KVDC**	**>10TΩ**	**>10TΩ**	**>10TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10TΩ**	**>10TΩ**	**>10TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**181.2**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**177.9**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.9**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

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ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.39 25/12SA-6 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-6**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 11. Low-resistance ohmmeter 12. Calibrated torque wrench	11. Investigate connection values that deviate more than 50% from similar connections 12. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.40 25/12SA-6 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-6**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 348GΩ B: 325GΩ C: 296GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.41 25/12SSSR ES-6 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-6**	PHASES:	**3**
SERIAL #:	**1274676/4**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.42 25/12SSSR ES-6 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSR ES-6**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/4**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.79mΩ**	**0.82mΩ**	**0.80mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**3785GΩ**	**3125GΩ**	**3975GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

prime engineering
ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.43 25/12SSSR CB-7 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-7**	PHASES:	**3**
SERIAL #:	**17 92288**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**T25/12SSSR-7**	OPERATION COUNTER:	**72**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

prime engineering
ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.44 25/12SSSR CB-7 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-7**	FEEDS TO:	**T25/12SSSR-7**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92288**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**72**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20.1 µΩ**	**19.3 µΩ**	**21.8 µΩ**
CONTACT OPENING TIME:	**28.0 ms**	**28.0 ms**	**27.5 ms**
CONTACT CLOSING TIME:	**50.5 ms**	**51.0 ms**	**50.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**1.471 TΩ**	**269 GΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**mA**	**Ma**	**mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**180.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**176.7**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.4**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

prime engineering
ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.45 25/12SA-7 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-7**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 13. Low-resistance ohmmeter 14. Calibrated torque wrench	13. Investigate connection values that deviate more than 50% from similar connections 14. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.46 25/12SA-7 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-7**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 352GΩ B: 498GΩ C: 374GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.47 25/12SSSR ES-7 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-7**	PHASES:	**3**
SERIAL #:	**1274676/10**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.48 25/12SSSR ES-7 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-7**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/10**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.43mΩ**	**0.41mΩ**	**0.40mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**1628GΩ**	**3687GΩ**	**1979GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.49 25/12SSSR CB-8 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-8**	PHASES:	**3**
SERIAL #:	**17 92283**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**T25/12SSSR-8**	OPERATION COUNTER:	**71**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.50 25/12SSSR CB-8 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-8**	FEEDS TO:	**T25/12SSSR-8**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92283**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**71**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**16.8 µΩ**	**16.2 µΩ**	**16.3 µΩ**
CONTACT OPENING TIME:	**27.8 ms**	**27.6 ms**	**28.3 ms**
CONTACT CLOSING TIME:	**52.1 ms**	**53.1 ms**	**52.7 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**5.59 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**7.42 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**7.96 TΩ**	**8.12 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**179.9**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**180.4**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**10.1**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.51 25/12SA-8 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-8**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 15. Low-resistance ohmmeter 16. Calibrated torque wrench	15. Investigate connection values that deviate more than 50% from similar connections 16. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.52 25/12SA-8 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-8**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 352GΩ B: 398GΩ C: 317GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.53 25/12SSSR ES-8 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-8**	PHASES:	**3**
SERIAL #:	**1274676/6**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.54 25/12SSSR ES-8 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-8**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/6**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.54mΩ**	**0.54mΩ**	**0.57mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**2784GΩ**	**1149GΩ**	**3431GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.55 25/12SSSR CB-9 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-9**	PHASES:	**3**
SERIAL #:	**17 92277**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**FUTURE LVSP#3**	OPERATION COUNTER:	**73**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.56 25/12SSSR CB-9 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-9**	FEEDS TO:	**FUTURE LVSP#3**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92277**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**73**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**15.3 µΩ**	**15.8 µΩ**	**16.2 µΩ**
CONTACT OPENING TIME:	**28.0 ms**	**28.5 ms**	**28.0 ms**
CONTACT CLOSING TIME:	**51.5 ms**	**51.0 ms**	**52.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**179.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**177.9**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.57 25/12SA-9 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-9**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 17. Low-resistance ohmmeter 18. Calibrated torque wrench	17. Investigate connection values that deviate more than 50% from similar connections 18. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.58 25/12SA-9 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-9**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 314GΩ B: 327GΩ C: 332GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.59 25/12SSSR ES-9 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-9**	PHASES:	**3**
SERIAL #:	**1274676/11**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.60 25/12SSSR ES-9 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-9**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/11**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.31mΩ**	**0.32mΩ**	**0.32mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**2654GΩ**	**2748GΩ**	**3284GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.61 25/12SSSR CB-10 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-10**	PHASES:	**3**
SERIAL #:	**17 92282**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**T25/12SSSR-10**	OPERATION COUNTER:	**75**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.62 25/12SSSR CB-10 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-10**	FEEDS TO:	**T25/12SSSR-10**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92282**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**75**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**15.5 µΩ**	**15.3 µΩ**	**16.2 µΩ**
CONTACT OPENING TIME:	**27.5 ms**	**27.5 ms**	**27.0 ms**
CONTACT CLOSING TIME:	**52.5 ms**	**52.0 ms**	**52.5 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**179.0**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**179.9**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.8**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.63 25/12SA-10 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-10**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 19. Low-resistance ohmmeter 20. Calibrated torque wrench	19. Investigate connection values that deviate more than 50% from similar connections 20. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.64 25/12SA-10 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-10**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 315GΩ B: 352GΩ C: 338GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.65 25/12SSSR ES-10 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-10**	PHASES:	**3**
SERIAL #:	**1274676/9**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.66 25/12SSSR ES-10 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-10**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/9**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.59mΩ**	**0.62mΩ**	**0.59mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**1782GΩ**	**2714GΩ**	**2785GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

prime engineering
ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.67 25/12SSSR CB-11 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-11**	PHASES:	**3**
SERIAL #:	**17 92287**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**FUTURE LVSP#5**	OPERATION COUNTER:	**73**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.68 25/12SSSR CB-11 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-11**	FEEDS TO:	**SPARE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92287**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**73**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**21.2 µΩ**	**23.2 µΩ**	**20.1 µΩ**
CONTACT OPENING TIME:	**30.0 ms**	**29.5 ms**	**29.6 ms**
CONTACT CLOSING TIME:	**49.0 ms**	**48.8 ms**	**49.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**8.27 TΩ**	**7.26 TΩ**	**4.34 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**16 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**179.3**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**176.7**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.69 25/12SA-11 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-11**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 21. Low-resistance ohmmeter 22. Calibrated torque wrench	21. Investigate connection values that deviate more than 50% from similar connections 22. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.70 25/12SA-11 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-11**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 312GΩ B: 347GΩ C: 474GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

1.71 25/12SSSR ES-11 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-11**	PHASES:	**3**
SERIAL #:	**1274676/12**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 2017
TECHNICIAN:	CL, JS,BH		JOB:	5014.81

1.72 25/12SSSR ES-11 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-11**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/12**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.40mΩ**	**0.39mΩ**	**0.40mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**2367GΩ**	**2084GΩ**	**2157Ω**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.73 25/12SSSR CB-12 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-12**	PHASES:	**3**
SERIAL #:	**17 92280**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE**	OPERATION COUNTER:	**76**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.74 25/12SSSR CB-12 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-12**	FEEDS TO:	**SPARE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92280**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**76**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**16.3 µΩ**	**16.2 µΩ**	**16.1 µΩ**
CONTACT OPENING TIME:	**27.5 ms**	**27.5 ms**	**27.5 ms**
CONTACT CLOSING TIME:	**50.5 ms**	**51.0 ms**	**50.0 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**>10 TΩ**	**8.35 TΩ**	**>10 TΩ**
ACROSS CONTACTS:	**5KVDC**	**4.98 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 ma**	**15 ma**	**15 ma**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**180.4**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**176.9**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.7**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.75 25/12SA-12 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-12**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 23. Low-resistance ohmmeter 24. Calibrated torque wrench	23. Investigate connection values that deviate more than 50% from similar connections 24. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**N/A**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.76 25/12SA-12 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-12**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 358GΩ B: 316GΩ C: 321GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

1.77 25/12SSSR ES-12 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**25/12SSSR ES-12**	PHASES:	**3**
SERIAL #:	**1274676/8**	RATED VOLTAGE:	**24KV**
TYPE:	**OJWN 24/63A260**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**N/A**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.78 25/12SSSR ES-12 MEDIUM VOLTAGE EARTHING SWITCH TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR ES-12**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 24/63A260**	SERIAL #:	**1274676/8**
STYLE:	**N/A**	VOLTAGE RATING:	**24KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.81mΩ**	**0.88mΩ**	**0.81mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
ACROSS CONTACTS:	**5kVDC**	**2103GΩ**	**1927GΩ**	**1998GΩ**
OVER POTENTIAL TEST:	**50kVAC**	**0.4mA**	**0.4mA**	**0.4mA**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.79 25/12SSSR CB-14 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**25/12SSSR CB-14**	PHASES:	**3**
SERIAL #:	**17 92276**	RATED VOLTAGE:	**27KV**
TYPE:	**VR**	B.I.L.:	**125KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**25/12SSSR**	OPERATION COUNTER:	**105**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.80 25/12SSSR CB-14 MEDIUM VOLTAGE CIRCUIT BREAKER TEST AND INSPECTION

CIRCUIT ID:	**25/12SSSR CB-14**	FEEDS TO:	**25/12SSSR**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92276**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**105**
B.I.L.:	**125KV**	RATED VOLTAGE:	**27KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**19.2 µΩ**	**16.2 µΩ**	**16.4 µΩ**
CONTACT OPENING TIME:	**29.6 ms**	**29.7 ms**	**30.0 ms**
CONTACT CLOSING TIME:	**49.9 ms**	**50.2 ms**	**49.7 ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
LINE TO GROUND:	**5KVDC**	**7.24 TΩ**	**>10 TΩ**	**5.89 TΩ**
ACROSS CONTACTS:	**5KVDC**	**>10 TΩ**	**>10 TΩ**	**>10 TΩ**
WITHSTAND TEST ACROSS CONTACTS:	**45KVAC**	**15 mA**	**15 mA**	**15 mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**181.1**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**180.3**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.9**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-10, PE-D-10, PE-HP-02, PE-BCT-1

GENERAL COMMENTS

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

1.81 25/12SA-14 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**25/12SA-14**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 25. Low-resistance ohmmeter 26. Calibrated torque wrench	25. Investigate connection values that deviate more than 50% from similar connections 26. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**PASS**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 2017
TECHNICIAN:	CL, JS,BH	JOB:	5014.81

1.82 25/12SA-14 SURGE ARRESTER TEST AND INSPECTION

CIRCUIT ID:	**25/12SA-14**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**7.65 KV**
VOLTAGE CLASS:	**9.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX009XHS**
CURRENT RATING:	**16.1kA Pressure Relief**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 5000VDC	**X**			**A: 384GΩ B: 387GΩ C: 325GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT: 10A	**X**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-10, PE-D-10

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

ENGINEER . IMPLEMENT . MAINTAIN

Esquimalt Graving Dock	
5014.81 – 4SSSR-HFB Site Acceptance Testing Report	
Client:	EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
2.0	Keisan Goldsmith	Brent Hughes	10/10/2017	For Internal Review

ENGINEER . IMPLEMENT . MAINTAIN

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info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

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

DATE: 2017-10-05 **PROJECT #** 5014.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **4SSSR Harmonic Filter Bank Site Acceptance Testing Report**

Dear Jean:

This report documents the factory acceptance testing for the Esquimalt Graving Dock 4SSSR harmonic filter bank. The testing and verification has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA).

ITEMS REQUIRING ATTENTION:

- Online commissioning
  - The power factor controller is “self-learning” which means many of the control setpoints are generated by the device after recording the system response to bringing stages of capacitors online. This is to be completed after initial energization.

Thank-you for choosing Prime Engineering Ltd. We hope to work with you again in the near future.

Sincerely,

Keisan Goldsmith, P.Eng.
Field Service Engineer
prime engineering
ENGINEER. IMPLEMENT. MAINTAIN
#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-1854
f: (250) 590-8917
e: brent.hughes@primeeng.ca
www.primeeng.ca

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.1 Equipment Testing Safety Checklist – Prior to Commencing Work

ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
NAME OF THE PERSON IN CHARGE:	√		TEST VOLTAGE HAZARDS 15KV OR OVER:	√	
EMERGENCY RESPONSE:	√		LIMITS OF APPROACH:	√	
SAFTEY GROUNDING IN PLACE:	√		TEST FOR POTENTIAL:	√	
PUBLIC SAFETY/BARRIERS IN PLACE:	√		INDUCTION HAZARDS:	√	
COMMUNICATION AND NOTIFICATION:	√		CONTROL CIRCUITS LIVE:	√	
SAFE WORKING SPACE AROUND EQUIPMENT:	√		HOUSEKEEPING:	√	
PERSONAL PROTECTIVE EQUIPMENT:	√		EQUIPMENT IS GROUNDED:	√	
STROBE LIGHTS WORK:	√		OTHER:		√

ALL PERSONAL WORKING IN VICINITY MUST SIGN SAFETY RECORD

NAME	TITLE	PHONE NUMBER	INITIALS
JORDAN SUI	**ELECTRICIAN**	**250 893-3528**	**JS**
CLAYTON LAUGHREN	**ELECTRICIAN**	**250 893-8050**	**CL**
BRENT HUGHES	**PROJECT ENGINEER**	**250 893-5213**	**BH**
KEISAN GOLDSMITH	**ENGINEER**	**250 893-1854**	**KG**

APPROVED PERSONAL TO BE INSIDE BARRIERED AREA AFTER EQUIPMENT HAS BEEN TURNED OFF AND GROUNDED

NAME	**TITLE**	**PHONE NUMBER**	**INITIALS**
Clayton Laughren	**Electrician**	**250-893-8050**	**CL**
Jordan Sui	**Electrician**	**250-893-3528**	**JS**
Brent Hughes	**Project Engineer**	**250-893-5213**	**BH**
Keisan Goldsmith	**Engineer**	**250-893-1854**	**KG**

NOTES – COMMENTS – DESCRIPTION OF OTHER HAZARDS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.2 Fixed Step 1 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Fixed Step 1 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 79.5GΩ B - G – 97.8GΩ C - G – 85.6GΩ
	Measured Capacitance to Ground	Not able to measure
	Measured Capacitance Phase to Phase	Phase to Phase – 1187µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.3 Fixed Step 1 - REACTOR TEST AND INSPECTION	
MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Fixed Step 1
VOLTAGE CLASS:	H1
MODEL:	KY303XF Rev. 2
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.109mΩ T2-H2 – 1.099mΩ T3-H2 – 1.089mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 79.5GΩ B-G – 97.8GΩ C-G – 85.6GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.4 Fixed Step 2 Capacitors - GENERAL TESTING		
DEVICE	TEST	CONDITION
Fixed Step 2 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 102.8GΩ B - G – 117.9GΩ C - G – 122.5GΩ
	Measured Capacitance to Ground	Not able to measure
	Measured Capacitance Phase to Phase	Phase to Phase – 1193µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.5 Step 1 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 1	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	68.4GΩ	82.6GΩ	79.2GΩ
ACROSS CONTACTS:	500 VDC	50.3GΩ	54.2GΩ	57.6GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	234µΩ	233µΩ	230µΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.6 Step 1 - REACTOR TEST AND INSPECTION	
MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 1
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 05/02
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.096mΩ T2-H2 – 1.113mΩ T3-H2 – 1.094mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 68.4GΩ B-G – 82.6GΩ C-G – 79.2GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.7 Step 2 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Step 2 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 54.8GΩ B - G – 69.5GΩ C - G – 66.1GΩ
	Measured Capacitance to Ground	A - G – 2.86µF B - G – 2.88µF C - G – 2.91µF
	Measured Capacitance Phase to Phase	Phase to Phase – 588µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.8 Step 2 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 2	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	54.8GΩ	69.5GΩ	66.1GΩ
ACROSS CONTACTS:	500 VDC	41.5GΩ	46.4GΩ	53.5GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	197μΩ	186μΩ	204μΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.9 Step 2 - REACTOR TEST AND INSPECTION	
MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 2
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 05/02
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.143mΩ T2-H2 – 1.111mΩ T3-H2 – 1.081mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 54.8GΩ B-G – 69.5GΩ C-G – 66.1GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

1.10 Step 3 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Step 3 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 54.1GΩ B - G – 58.7GΩ C - G – 59.4GΩ
	Measured Capacitance to Ground	A - G – 2.88μF B - G – 2.88μF C - G – 2.88μF
	Measured Capacitance Phase to Phase	Phase to Phase – 587μF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		04/07/2017
TECHNICIAN:	JS/CL		JOB:	5014.81

1.11 Step 3 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 3	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	54.1GΩ	58.7GΩ	59.4GΩ
ACROSS CONTACTS:	500 VDC	33.71GΩ	33.88GΩ	38.04GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	163μΩ	175μΩ	186μΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.12 Step 3 - REACTOR TEST AND INSPECTION

MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 3
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 00/08
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.087mΩ T2-H2 – 1.051mΩ T3-H2 – 1.101mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 54.1GΩ B-G – 58.7GΩ C-G – 59.4GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		04/07/2017
TECHNICIAN:	JS/CL		JOB:	5014.81

1.13 Step 4 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Step 4 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 79.7GΩ B - G – 93.2GΩ C - G – 86.1GΩ
	Measured Capacitance to Ground	A - G – 2.22µF B - G – 2.21µF C - G – 2.21µF
	Measured Capacitance Phase to Phase	Phase to Phase – 587µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.14 Step 4 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 4	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	79.7GΩ	93.2GΩ	86.1GΩ
ACROSS CONTACTS:	500 VDC	35.03GΩ	42.7GΩ	44.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	226µΩ	214µΩ	231µΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.15 Step 4 - REACTOR TEST AND INSPECTION

MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 4
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 00/08
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.086mΩ T2-H2 – 1.080mΩ T3-H2 – 1.172mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 79.7GΩ B-G – 93.2GΩ C-G – 86.1GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

1.16 Step 5 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Step 5 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 89.5GΩ B - G – 90.1GΩ C - G – 97.9GΩ
	Measured Capacitance to Ground	A - G – 2.46µF B - G – 2.46µF C - G – 2.47µF
	Measured Capacitance Phase to Phase	Phase to Phase – 589µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.17 Step 5 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 5	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	80.5GΩ	90.1GΩ	97.9GΩ
ACROSS CONTACTS:	500 VDC	48.3GΩ	54.6GΩ	57.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	235µΩ	238µΩ	231µΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.18 Step 5 - REACTOR TEST AND INSPECTION

MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 5
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 00/08
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.094mΩ T2-H2 – 1.102mΩ T3-H2 – 1.101mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 80.5GΩ B-G – 90.1GΩ C-G – 97.9GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.19 Step 6 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Step 6 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 49.5GΩ B - G – 56.3GΩ C - G – 57.3GΩ
	Measured Capacitance to Ground	A - G – 2.47µF B - G – 2.47µF C - G – 2.47µF
	Measured Capacitance Phase to Phase	Phase to Phase – 587µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.20 Step 6 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 6	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	49.5GΩ	56.3GΩ	57.3GΩ
ACROSS CONTACTS:	500 VDC	32.09GΩ	35.42GΩ	36.71GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	236μΩ	262μΩ	234μΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		04/07/2017
TECHNICIAN:	JS/CL		JOB:	5014.81

1.21 Step 6 - REACTOR TEST AND INSPECTION	
MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 6
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 00/07
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING		
	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.097mΩ T2-H2 – 1.102mΩ T3-H2 – 1.106mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 49.5GΩ B-G – 56.3GΩ C-G – 57.3GΩ

EQUIPMENT ID
PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.22 Step 7 Capacitors - GENERAL TESTING

DEVICE	TEST	CONDITION
Step 7 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 44.2GΩ B - G – 39.12GΩ C - G – 43.5GΩ
	Measured Capacitance to Ground	A - G – 3.13µF B - G – 3.12µF C - G – 3.13µF
	Measured Capacitance Phase to Phase	Phase to Phase – 584µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.23 Step 7 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 7	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	44.2GΩ	39.12GΩ	43.5GΩ
ACROSS CONTACTS:	500 VDC	27.88GΩ	29.32GΩ	28.78GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	174μΩ	158μΩ	165μΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.24 Step 7 - REACTOR TEST AND INSPECTION

MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 7
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 00/07
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.099mΩ T2-H2 – 1.132mΩ T3-H2 – 1.118mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 44.2GΩ B-G – 39.12GΩ C-G – 43.5GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.25 Step 8 Capacitors - GENERAL TESTING		
DEVICE	TEST	CONDITION
Step 8 Capacitor Bank	500VDC Megger Phase to Ground	A - G – 30.14GΩ B - G – 30.65GΩ C - G – 31.71GΩ
	Measured Capacitance to Ground	A - G – 2.96µF B - G – 2.97µF C - G – 2.97µF
	Measured Capacitance Phase to Phase	Phase to Phase – 588µF

EQUIPMENT ID

PE-M-14, PE-DRMS-23

GENERAL COMMENTS

Serial number and capacitance not listed on capacitors.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.26 Fixed Step 2 - REACTOR TEST AND INSPECTION

MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Fixed Step 2
VOLTAGE CLASS:	H1
MODEL:	KY303XF Rev. 2
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.113mΩ T2-H2 – 1.138mΩ T3-H2 – 1.129mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 102.8GΩ B-G – 117.9GΩ C-G – 122.5GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/09/2017
TECHNICIAN:	CL/KG		JOB:	5014.81

1.27 LV Cable Testing – Cabling from T25/12SSSR-1 to 4SSSR-1

DEVICE	TEST	CONDITION
CABLE BUS AØ-GND	1000VDC MEGGER	17.54 GΩ
CABLE BUS BØ-GND	1000VDC MEGGER	18.25 GΩ
CABLE BUS CØ-GND	1000VDC MEGGER	16.28 GΩ
CABLE BUS AØ-BØ	1000VDC MEGGER	43.32 GΩ
CABLE BUS BØ-CØ	1000VDC MEGGER	45.80 GΩ
CABLE BUS CØ-AØ	1000VDC MEGGER	51.23 GΩ

CABLE INFORMATION

TF CABLE 90^{o}C DLO2KV 777MCM
5 CABLES PER PHASE

EQUIPMENT ID

PE-M-10

GENERAL COMMENTS

Cable bus between T25/12SSSR-1 and 4SSSR-1/2

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/09/2017
TECHNICIAN:	CL/KG	JOB:	5014.81

1.28 Step 8 - LOW VOLTAGE CONTACTOR TEST AND INSPECTION

MANUFACTURER:	Joslyn Clark	CIRCUIT ID:	Step 8	PROTECTION:	NA
MFG DATE:	Not Listed	FEEDS TO:	Reactor and Capacitors		
SERIAL #:	Not Accessible	AMPACITY:	200A		
TYPE:	Vacuum Contactor	FAULT BRACING:	Not Listed		
CAT. NO.:	CVC77UO32006	VOLTAGE RATING:	660VAC		

VISUAL/MECHANICAL INSPECTIONS

	PASS/FAIL/N/A	NOTES
PHYSICAL/MECHANICAL CONDITION:	PASS	
MECHANICAL ANCHORAGE:	PASS	
MECHANICAL ALIGNMENT:	PASS	
UNIT CLEANLINESS:	PASS	
ARC CHUTES CONDITION (IF PRESENT):	PASS	
OPERATING MECHANISM CONDITION:	NA	
CONTACT CONDITION:	PASS	
CONTACT WEAR:	PASS	
CONTACT ALIGMENT:	PASS	

ELECTRICAL TESTS

BOLTED CONNECTION RESISTANCE:	PASS	
INSULATION RESISTANCE:	PASS	
CONACT/POLE RESISTANCE:	PASS	
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:	PASS	Tested at 120VAC
TRIP AND PICKUP INDICATORS:	PASS	Orange Indicator Visible When Closed

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	NA	NA	NA
PHASE TO GROUND:	500 VDC	30.14GΩ	30.65GΩ	31.71GΩ
ACROSS CONTACTS:	500 VDC	21.58GΩ	21.75GΩ	22.46GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	164µΩ	171µΩ	175µΩ

CONTACTOR OPERATOR AND CONTROLS TEST

	PASS/FAIL/N/A	RATED VOLTS	TESTED VOLTAGE
CLOSING COIL:	PASS	120VAC	120VAC

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/09/2017
TECHNICIAN:	CL/KG	JOB:	5014.81

1.29 Step 8 - REACTOR TEST AND INSPECTION

MANUFACTURER:	BEI
MFG. DATE:	Not Listed
SHORT TIME RATING – A/sec:	Not Listed
SERIAL #:	Step 8
VOLTAGE CLASS:	H1
MODEL:	KY303XF-1 00/07
B.I.L.:	Not Listed
RATED INDUCTANCE:	305/282µH
RATED HZ:	60Hz
RATED CURRENT:	126A@60Hz/62A@300Hz
PEACK CURRENT:	126A
COOLING MEDIUM:	Air

VISUAL INSPECTION AND TESTING

	PASS/FAIL/N/A	NOTES AND COMMENTS
ANCHORAGE:	PASS	
CLEANLINESS:	PASS	
PHYSICAL CONDITION:	PASS	
BONDING CONNECTIONS:	FAIL	No bonding conductor
LOOSE CONNECTIONS:	PASS	
TAP CONNECTION:	PASS	
TEST CONDITIONS:	PASS	
WINDING RESISTANCE:	PASS	
INSULATION TEST – H-GND:	PASS	

AMBIENT TEMP:	20°C	HUMIDITY:	70%
WINDING RESISTANCE TEST CURRENT:	10A	RESISTANCE – MΩ:	T1-H2 – 1.182mΩ T2-H2 – 1.085mΩ T3-H2 – 1.083mΩ
INSULATION TEST VOLTAGE:	500VDC	INSULATION VALUE – MΩ:	A-G – 30.14GΩ B-G – 30.65GΩ C-G – 31.71GΩ

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

H2 Tap Used

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/09/2017
TECHNICIAN:	CL/KG		JOB:	5014.81

1.30 LOW VOLTAGE POWER/MOLDED CASE CIRCUIT BREAKER TEST AND INSPECTION					
MANUFACTURER:	Merlin Gerin	CIRCUIT ID:	HFB-01	PROTECTION:	STR 58U
MFG DATE:	January, 2000	FEEDS TO:	HFB		
SERIAL #:	MP005087C	AMPACITY:	2000A		
TYPE:	Masterpact	FAULT BRACING:	NL		
STYLE:	MC20 H1	VOLTAGE RATING:	635V		

1 VISUAL/MECHANICAL INSPECTIONS					
	PASS/FAIL/N/A	NOTES			
PHYSICAL/MECHANICAL CONDITION:	PASS				
MECHANICAL ANCHORAGE:	PASS				
MECHANICAL ALIGNMENT:	PASS				
UNIT CLEANLINESS:	PASS				
ARC CHUTES CONDITION (IF PRESENT):	PASS	Slight pitting present; cleaned			
OPERATING MECHANISM CONDITION:	PASS				
CONTACT CONDITION:	PASS				
CONTACT WEAR:	PASS				
CONTACT ALIGMENT:	PASS				
PRIMARY AND SECONDARY CONTACT WIPE:	PASS				
CELL FIT AND ELEMENT ALIGNMENT:	PASS				
MECHANISM OPERATION/ALIGNMENT:	PASS				
RACKING MECHANISM OPERATION:	PASS				
MECHANISM LUBRICATION:	N/A				
DEVICE SETTINGS ADJUSTMENTS:	PASS				
OPERATION COUNTER READINGS:	N/A	AS FOUND:	N/A	AS LEFT:	N/A

2 ELECTRICAL TESTS		
BOLTED CONNECTION RESISTANCE:		SEE SECTION 3
INSULATION RESISTANCE:		SEE SECTION 4
CONTACT/POLE RESISTANCE:		SEE SECTION 5
LONG-TIME PICKUP AND DELAY:		SEE SECTION 6
SHORT-TIME PICKUP AND DELAY:		SEE SECTION 6
GROUND-FAULT PICKUP DELAY:		SEE SECTION 6
INSTANTANEOUS PICKUP CURRENT:		SEE SECTION 6
MIN. TRIP/CLOSE COIL PICKUP VOLTAGES:		SEE SECTION 7
TRIP AND PICKUP INDICATORS:	PASS	
ZONE INTERLOCKING:	N/A	
ELECTRICAL TRIP OPERATION:	PASS	
ELECTRICAL CLOSE OPERATION:		
TRIP-FREE OPERATION:	PASS	
ANTIPUMP FUNCTION:	PASS	
TRIP UNIT BATTERY CONDITION:	N/A	
ALL TRIP LOGS AND INDICATORS RESET:	PASS	
CHARGING MECHANISM OPERATION:	PASS	

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/09/2017
TECHNICIAN:	CL/KG	JOB:	5014.81

1 BOLTED CONNECTION RESISTANCE TESTING			
(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	28.8 µΩ	28.2 µΩ	36.9 µΩ

2 INSULATION RESISTANCE TESTING				
1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	500 VDC	1.01 GΩ	1.36 GΩ	889 MΩ
PHASE TO GROUND:	500 VDC	317.4 MΩ	328.5 MΩ	327.2 MΩ
ACROSS CONTACTS:	500 VDC	321.5 MΩ	315.3 MΩ	306.5 MΩ

3 CONTACT/POLE RESISTANCE TESTING			
CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	28.8 µΩ	28.2 µΩ	36.9 µΩ

4 PRIMARY INJECTION TESTING			
PROTECTION SETTING	PICKUP	1 PH. / 3 PH.	DELAY
LONG-TIME			
SHORT-TIME			
GROUND-FAULT			
INSTANTANEOUS			N/A

5 BREAKER OPERATOR AND CONTROLS TEST			
	PASS/FAIL/N/A	RATED VOLTS	MINIMUM PICKUP VOLTS
CLOSING COIL:		120VAC	
TRIPPING COIL:		120VAC	

EQUIPMENT ID

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/09/2017
TECHNICIAN:	CL/KG		JOB:	5014.81

1.31 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-HFB-MET-01**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1702A333**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.122**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

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Esquimalt Graving Dock
5014.81 – 4SSSR-1/2 Site Acceptance Testing Report

Client:	EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
5.0	Brent Hughes		2017/01/12	For Record

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Table of Contents

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

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DATE: **PROJECT #** 5014.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **T25/12SSSR-1 and 4SSSR-1/2 Site Acceptance Testing Report**

Dear Jean:

This report documents the factory acceptance testing for the Esquimalt Graving Dock 4SSSR-1/2 low voltage switchgear. The testing and verification has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA).

ITEMS REQUIRING ATTENTION:

- Commissioning has not been completed on the Dock Service Kiosks or the Camlock Connection Boxes. The breakers below must remain locked out open until the downstream equipment has been commissioned by Prime Engineering.:
  - 4SSSR-2-11 DS1-W feeder
  - 4SSSR-2-12 DS1-C feeder
  - 4SSSR-2-13 DS1-E feeder
  - 4SSSR-2-14 SSSR North Camlock Connection Box feeder
  - 4SSSR-2-15 SSSR West Camlock Connection Box feeder
  - 4SSSR-2-27 DS3-E
  - 4SSSR-2-28 DS3-C
  - 4SSSR-2-34 DS2-W
  - 4SSSR-2-35 DS2-C
  - 4SSSR-2-37 DS2-E
  - 4SSSR-2-38 DS3-W
- The harmonic filter bank circuit breaker, 4SSSR-HFB-1 must also be locked out open and remain locked out open until fully commissioned.

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

Thank-you for choosing Prime Engineering Ltd. We hope to work with you again in the near future.

Sincerely,

Brent Hughes, EIT
Project Engineer
prime engineering
ENGINEER. IMPLEMENT. MAINTAIN
#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-5213
f: (250) 590-8917
e: brent.hughes@primeeng.ca
www.primeeng.ca

Attachments to this report:

5014.81_4SSSR-1_2 CT Results_2017_Rev 2.0
5014.81_4SSSR-1_2 ZCT Results_2017_Rev 2.0
5014.81_T2512SSSR-1 CT Results_2017_Rev 2.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.1 Equipment Testing Safety Checklist – Prior to Commencing Work

ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
NAME OF THE PERSON IN CHARGE:	√		TEST VOLTAGE HAZARDS 15KV OR OVER:	√	
EMERGENCY RESPONSE:	√		LIMITS OF APPROACH:	√	
SAFTEY GROUNDING IN PLACE:	√		TEST FOR POTENTIAL:	√	
PUBLIC SAFETY/BARRIERS IN PLACE:	√		INDUCTION HAZARDS:	√	
COMMUNICATION AND NOTIFICATION:	√		CONTROL CIRCUITS LIVE:	√	
SAFE WORKING SPACE AROUND EQUIPMENT:	√		HOUSEKEEPING:	√	
PERSONAL PROTECTIVE EQUIPMENT:	√		EQUIPMENT IS GROUNDED:	√	
STROBE LIGHTS WORK:	√		OTHER:		√

ALL PERSONAL WORKING IN VICINITY MUST SIGN SAFETY RECORD

NAME	TITLE	PHONE NUMBER	INITIALS
JORDAN SUI	**ELECTRICIAN**	**250 893-3528**	**JS**
CLAYTON LAUGHREN	**ELECTRICIAN**	**250 893-8050**	**CL**
BRENT HUGHES	**PROJECT ENGINEER**	**250 893-5213**	**BH**

APPROVED PERSONAL TO BE INSIDE BARRIERED AREA AFTER EQUIPMENT HAS BEEN TURNED OFF AND GROUNDED

NAME	TITLE	PHONE NUMBER	INITIALS
Clayton Laughren	**Electrician**	**250-893-8050**	**CL**
Jordan Sui	**Electrician**	**250-893-3528**	**JS**
Brent Hughes	**Project Engineer**	**250-893-5213**	**BH**

NOTES – COMMENTS – DESCRIPTION OF OTHER HAZARDS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		04/07/2017
TECHNICIAN:	JS/CL		JOB:	5014.81

1.2 T25/12SSSR-1 Transformer Test and Inspection

CIRCUIT ID:	T25/12SSSR-1	PHASES:	3
FEEDS TO:	4SSSR-1	HIGH SIDE VOLTAGE:	12500/25000V
SERIAL #:	1210040913	HIGH SIDE B.I.L.:	95/125KV
TYPE:	ANN/AFF	LOW SIDE VOLTAGE:	480/277V
SIZE:	3000/4000KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	4.97%	MANUFACTURER:	JINPAN INTERNATIONAL
TEMPERATURE RISE:	115°C	MFG. DATE:	12.28.2016
CONFIGURATION:	Δ/Y	APARATUS TEMPERATURE:	18°C
TAP POSITION AS FOUND:	C	AMBIENT TEMPERATURE:	18°C

VISUAL INSPECTION AND COMMENTS

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

TRANSFORMER TURNS RATIO HV TO LV (12.5KV CONFIGURATION)

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	13125V	12813V	12500V	12188V	11875V
CALCULATED RATIO:	47.38:1	46.25:1	45.13:1	44.00:1	42.88:1
H 1 H 2 X 0 X 2	47.400:1	46.397:1	45.253:1	44.111:1	42.964:1
EXCITING CURRENT – mA	15mA	16mA	17mA	19mA	20mA
H 1 H 3 X 0 X 1	47.310:1	46.316:1	45.184:1	44.05:1	42.917:1
EXCITING CURRENT – mA	11mA	11mA	11mA	12mA	12mA
H 2 H 3 X 0 X 3	47.399:1	46.397:1	45.250:1	44.101:1	42.954:1
EXCITING CURRENT – mA	16mA	16mA	17mA	18mA	18mA

TRANSFORMER TURNS RATIO HV TO LV (25KV CONFIGURATION)

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	26250V	25625V	25000V	24375V	23750V
CALCULATED RATIO:	94.76:1	92.50:1	90.26:1	87.99:1	85.76:1
H 1 H 2 X 0 X 2	94.785:1	92.778:1	90.478:1	88.197:1	85.892:1
EXCITING CURRENT – mA	3mA	3mA	4mA	4mA	4mA
H 1 H 3 X 0 X 1	93.682:1	91.756:1	89.558:1	87.335:1	85.107:1
EXCITING CURRENT – mA	61mA	59mA	56mA	54mA	51mA
H 2 H 3 X 0 X 3	94.864:1	92.857:1	90.561:1	88.263:1	85.968:!
EXCITING CURRENT – mA	5mA	5mA	6mA	6mA	6mA

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5KV	1KV	1KV	500VDC
PI/DAR:	3.52/1.45	2.47/1.39	3.33/1.56	3.19/1.57
INSULATION VALUE:	2.209TΩ	247.8GΩ	199.4GΩ	70.2GΩ
TEMPERATURE CORRECTED:	2.209TΩ	247.8GΩ	199.4GΩ	70.2GΩ

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	04/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

WINDING RESISTANCE														
H	1	H	2	190.83mΩ	H	2	H	3	190.66mΩ	H	1	H	3	190.88mΩ
X	0	X	1	182µΩ	X	0	X	2	178µΩ	X	0	X	3	190µΩ

EQUIPMENT ID
PE-D-14, PE-M-14, PE-T-14
GENERAL COMMENTS
T25/12SSSR-1 is seismically restrained
IGARD NGR; SN – 40160-1, Model#OHMNI-4PM-05, Wattage - 1385
NGR Resistance – 57.32Ω
NGR 500vdc Megger – 631GΩ
PRIME ENGINEERING – REVISION #4.0

1.3 LV Cable Testing – Cabling from T25/12SSSR-1 to 4SSSR-1		
DEVICE	TEST	CONDITION
CABLE BUS AØ-GND	1000VDC MEGGER	17.54 GΩ
CABLE BUS BØ-GND	1000VDC MEGGER	18.25 GΩ
CABLE BUS CØ-GND	1000VDC MEGGER	16.28 GΩ
CABLE BUS AØ-BØ	1000VDC MEGGER	43.32 GΩ
CABLE BUS BØ-CØ	1000VDC MEGGER	45.80 GΩ
CABLE BUS CØ-AØ	1000VDC MEGGER	51.23 GΩ
CABLE INFORMATION		
TF CABLE 90°C DLO2KV 777MCM 5 CABLES PER PHASE		
EQUIPMENT ID		
PE-M-10		
GENERAL COMMENTS		
Cable bus between T25/12SSSR-1 and 4SSSR-1/2		
PRIME ENGINEERING – REVISION #4.0		

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.4 Cable VLF Test – 25/12SSSR-08 to T25/12SSSR-8

MANUFACTURER:	Prysimain Cable	MFG. DATE:	2016
CIRCUIT ID:	25/12SSSR-CB-1	FEEDS TO:	T25/12SSSR-1
CABLE TYPE/INSULATION:	Voltalene/Trxple	CONDUCTOR SIZE:	4/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY - %	70%/19°C
LENGTH:	12M	MAXIMUM TEST VOLTAGE:	31 KVAC @ 0.1Hz
AUTHORIZED BY:	Steve Frachette (Houle)		

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	2.010TΩ	LINE A-B WITH C GROUNDED:	2.755TΩ
LINE B TO GROUND:	1.847TΩ	LINE B-C WITH A GROUNDED:	2.961TΩ
LINE C TO GROUND:	1.296TΩ	LINE C-A WITH B GROUNDED:	2.952TΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC @ 0.1 Hz	LINE A nF	LINE A µA	LINE B nF	LINE B µA	LINE C nF	LINE C µA
1	31	3.55	69	3.57	70	3.61	71
2	31	3.55	69	3.57	70	3.61	71
3	31	3.55	69	3.57	70	3.61	71
4	31	3.55	69	3.57	70	3.61	71
5	31	3.55	69	3.57	70	3.61	71
6	31	3.55	69	3.57	70	3.61	71
7	31	3.55	69	3.57	70	3.61	71
8	31	3.55	69	3.57	70	3.61	71
9	31	3.55	69	3.57	70	3.61	71
10	31	3.55	69	3.57	70	3.61	71
11	31	3.55	69	3.57	70	3.61	71
12	31	3.55	69	3.57	70	3.61	71
13	31	3.55	69	3.57	70	3.61	71
14	31	3.55	69	3.57	70	3.61	71
15	31	3.55	69	3.57	70	3.61	71

AC INSULATION RESISTANCE @ 0.1 Hz 15 MIN READINGS	LINE A	LINE B	LINE C
	5.3 GΩ	3.2 GΩ	3.5 GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-12

GENERAL COMMENTS

Test performed with all cables not under test connected to ground.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5 Switchgear and Switchboard Assemblies – 4SSSR-1/2

Reference: NETA ATS-2013 Section: 7.1

MANUFACTURER:	SQUARE D	MFG. DATE:	12/16
EQUIPMENT ID:	4SSSR-1/4SSSR-2	NUMBER OF PHASES/WIRES	3/3
TYPE:	QED	PROTECTION:	MICROLOGIC 6.0H
SERIAL #:	37939710-012 / 37939710-010	FAULT BRACING:	65KA
AMPACITY:	4000A	VOLTAGE RATING:	480VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed	Pass/Fail	PASS
Verify that fuse and breaker size and types correspond to the drawings and coordination study	Pass/Fail	PASS
Verify transformer ratios correspond to drawings	Pass/Fail	PASS
Verify that wiring connections are tight and that wiring is secure to prevent damage during routine operation of moving parts	Pass/Fail	PASS
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Verify operation and sequencing of interlocking systems	Pass/Fail	PASS
Verify lubrication on moving part and surfaces	Pass/Fail	PASS
Inspect insulators for evidence of physical damage or contaminated surfaces	Pass/Fail	PASS
Verify correct barrier and shutter installation and operation	Pass/Fail	NA
Exercise all active components	Pass/Fail	PASS
Inspect mechanical indicating devices for correct operation	Pass/Fail	PASS
Verify that filters are in place and vents are clear	Pass/Fail	NA
Perform visual and mechanical inspection of instrument transformers	Pass/Fail in accordance with section 2.1.3 and section 2.1.4	PASS
Perform visual and mechanical inspection of surge arresters	Pass/Fail in accordance with section 2.1.5	NA
Inspect control power transformers: 1. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring and overall condition 2. Verify that primary and secondary fuse or circuit breaker ratings match drawings 3. Verify correct functionality of draw-out disconnecting contacts, grounding contacts and interlocks	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests on each bus section, phase-phase	Insulation-resistance values should be above	PASS

and phase to ground for one minute	manufacturer's limits or if absent, greater than table 100.1	
Perform a dielectric withstand voltage test for one minute on each bus section, each phase to ground with phases not under test grounded	In accordance with manufacturer's published data. If manufacturer has no recommendation for the test, it shall be in accordance with table 100.2	PASS
Perform electrical tests on instrument transformers	In accordance with section 2.1.3 and 2.1.4	PASS
Perform ground resistance tests	In accordance with section 2.1.8	PASS
Determine accuracy of all meters and calibrate watthour meters	In accordance with section 2.1.7	PASS
Control power transformers: 1. Perform insulation-resistance tests. Perform measurements from winding-winding and each winding to ground. 2. Perform a turns ratio test on all tap positions	1. Test voltages shall be in accordance with table 100.1 unless otherwise specified by the manufacturer 2. Turns ratio test shall not deviate by more than one-half percent from either adjacent coils or calculated ratio	NA
Verify correct secondary voltage and wiring by energizing the primary winding with system voltage and measuring secondary voltage at all connected devices	Secondary wiring shall be in accordance with design specifications	TO BE DONE ONCE ENERGIZED
Verify correct function of control transfer relays located in the switchgear	Control transfer relays shall perform as designed	NA
Verify secondary voltage and wiring of voltage transformers by energizing the primary winding and checking secondary voltage and connected devices	Secondary wiring shall be in accordance with design specifications	TO BE DONE ONCE ENERGIZED
Perform current tests by secondary injection with magnitudes of at least 1 amp and verifying correct magnitude of current and each device in the circuit	Current tests shall prove current wiring in accordance with design specifications	PASS
Perform system function tests	Verify correct operation of all interlocks, fail-safe functions, sensing devices, alarms and indicating devices as per the design requirements	PASS
Verify cubicle switchgear/switchboard space heaters	Heaters shall be operational	NA
Perform phasing checks on double ended or dual source switchgear to insure correct bus phasing form each source	Phasing checks shall prove switchgear phasing is correct and in accordance to design specifications	PASS
Perform electrical tests of surge arresters	In accordance with section 2.1.5	NA

GENERAL COMMENTS

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.1 Low Voltage Switchboard Test and Inspection – 4SSSR-1

MANUFACTURER:	SQUARE D	MFG. DATE:	12/16
EQUIPMENT ID:	4SSSR-1 SEC. 1-2	NUMBER OF PHASES/WIRES	3/3
TYPE:	QED	PROTECTION:	4SSSR-1-01
SERIAL #:	37939710-012	FAULT BRACING:	65KA
AMPACITY:	4000A	VOLTAGE RATING:	480VAC

CONNECTION TIGHTNESS

Connection	A (Ω)	B (Ω)	C (Ω)	% Deviation
Thru bus to line side breakers	0.021m	0.020m	0.020m	4.76%

INSULATION RESISTANCE

TIME:__60sec._ VOLTAGE:__1000V___

Phase	**Result** (Ω)	**Acceptable**	**Phase**	**Result** (Ω)	**Acceptable**
A-GND	303.2G	X	A-B	356G	X
B-GND	461G	X	B-C	213G	X
C-GND	323.3G	X	A-C	291G	X

TEST EQUIPMENT ID

PE-M-14, PE-D-14

ENVIRONMENTAL CONDITIONS

GENERAL COMMENTS

1KV Meggar performed with all breakers in the closed position.

prime engineering
ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.2 Low Voltage Switchboard Test and Inspection – 4SSSR-2

MANUFACTURER:	SQUARE D	MFG. DATE:	12/16
EQUIPMENT ID:	4SSSR-1 SEC. 3-8	NUMBER OF PHASES/WIRES	3/3
TYPE:	QED	PROTECTION:	4SSSR-1-01
SERIAL #:	37939710-012	FAULT BRACING:	65KA
AMPACITY:	4000A	VOLTAGE RATING:	480VAC

CONNECTION TIGHTNESS

Connection	A (Ω)	B (Ω)	C (Ω)	% Deviation
Thru bus to line side breakers	0.052m	0.052m	0.050m	3.85%

INSULATION RESISTANCE

TIME:___60sec.___ VOLTAGE:__1000VDC___

Phase	**Result** (Ω)	**Acceptable**	**Phase**	**Result** (Ω)	**Acceptable**
A-GND	13.52G	X	A-B	18.61G	X
B-GND	13.02G	X	B-C	17.47G	X
C-GND	10.99G	X	A-C	16.92G	X

TEST EQUIPMENT ID

PE-M-14, PE-D-14

ENVIRONMENTAL CONDITIONS

GENERAL COMMENTS

1KV Megger performed with all breakers in the closed position.

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.3 Circuit Breakers, Molded Case, Low Voltage - 4SSSR-1-01

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-1-01	FEEDS TO:	4SSSR-2	MANUFACTURER:	**SQUARE D**
MFG DATE:	N/A	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	085343130901	STYLE:	NW 40 H	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	4000 A	OPERATION COUNTER:	**N/A**
B.I.L.:	N/A			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.4 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 4SSSR-1-01

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-1-01	PROTECTION:	MICROLOGIC 6.0 H
MFG DATE:	2016	FEEDS TO:	4SSSR-2		
SERIAL #:	085343130901	AMPACITY:	4000A		
TYPE:	PowerPact	FAULT BRACING:	100KA @480		
STYLE:	NW 40 H	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.021 mΩ	0.020 mΩ	0.021 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A (Ω)	LINE B (Ω)	LINE C (Ω)
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	303G	461G	323.3G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.021 mΩ	0.020 mΩ	0.021 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

1.5.5 Circuit Breakers, Molded Case, Low Voltage - 4SSSR-2-01

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-01	FEEDS TO:	SOUTH SUB 480V	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164530584	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections 4. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.6 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 4SSSR-2-01

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-01	PROTECTION:	6.3E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SOUTH SUB 480V		
SERIAL #:	3N164530584	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.139 mΩ	0.142 mΩ	0.139 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	87.5G	90.1G	87.4G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.139 mΩ	0.142 mΩ	0.139 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.7 Circuit Breakers, Molded Case, Low Voltage - 4SSSR-2-02

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-02	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N146220436	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 5. Low-resistance ohmmeter 6. Calibrated torque wrench	5. Investigate connection values that deviate more than 50% from similar connections 6. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.8 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 4SSSR-2-02

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-02	PROTECTION:	6.3E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164220436	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.134 mΩ	0.135 mΩ	0.129 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	87.4G	90.1G	87.4G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.134 mΩ	0.135 mΩ	0.129 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.9 Circuit Breakers, Molded Case, Low Voltage - 4SSSR-2-03

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-03	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164220432	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer’s data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer’s data	Pass
Inspect bolted electrical connections for high resistance using either: 7. Low-resistance ohmmeter 8. Calibrated torque wrench	7. Investigate connection values that deviate more than 50% from similar connections 8. Torqued to manufacturer’s data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer’s data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer’s data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.10 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 4SSSR-2-03

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-03	PROTECTION:	6.3E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164530584	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.138 mΩ	0.141 mΩ	0.136 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	78.7G	75.2G	83.0G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.138 mΩ	0.141 mΩ	0.136 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.11 Circuit Breakers, Molded Case, Low Voltage - 4SSSR-2-04

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-04	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164220437	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 9. Low-resistance ohmmeter 10. Calibrated torque wrench	9. Investigate connection values that deviate more than 50% from similar connections 10. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.12 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 4SSSR-2-04

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-04	PROTECTION:	6.3E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164220437	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.137 mΩ	0.141 mΩ	0.132 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	77.8G	80.7G	82.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.137 mΩ	0.141 mΩ	0.132 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.13 Circuit Breakers, Molded Case, Low Voltage - 4SSSR-2-05

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-05	FEEDS TO:	B1 BUILDING	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**65 KA**
SERIAL #:	020229961841 0001	STYLE:	PJ 1200	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	1200 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 11. Low-resistance ohmmeter 12. Calibrated torque wrench	11. Investigate connection values that deviate more than 50% from similar connections 12. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.14 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-05	PROTECTION:	MICROLOGIC 6.0 H
MFG DATE:	2016	FEEDS TO:	B1 BUILDING		
SERIAL #:	0202299618410001	AMPACITY:	1200 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	PJ 1200	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.050 mΩ	0.051 mΩ	0.052 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	78.0G	78.7G	97.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.050 mΩ	0.051 mΩ	0.052 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.15 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-06	FEEDS TO:	VIC SHIP FAB SHOP	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N162740341	STYLE:	LL 600	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	600 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 13. Low-resistance ohmmeter 14. Calibrated torque wrench	13. Investigate connection values that deviate more than 50% from similar connections 14. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.16 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-06	PROTECTION:	6.3E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	VIC SHIP FAB SHOP		
SERIAL #:	3N162740341	AMPACITY:	600 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 600	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.135 mΩ	0.140 mΩ	0.126 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	104.1G	102.3G	100.5G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.135 mΩ	0.140 mΩ	0.126 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

1.5.17 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-07	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164220438	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 15. Low-resistance ohmmeter 16. Calibrated torque wrench	15. Investigate connection values that deviate more than 50% from similar connections 16. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.18 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-07	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164220438	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.144 mΩ	0.137 mΩ	0.141 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	84.3G	84.7G	93.9G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.144 mΩ	0.137 mΩ	0.141 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.19 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-08	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164220434	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 17. Low-resistance ohmmeter 18. Calibrated torque wrench	17. Investigate connection values that deviate more than 50% from similar connections 18. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.20 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-08	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164220434	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.129 mΩ	0.133 mΩ	0.127 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	80.8G	83.9G	85.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.129 mΩ	0.133 mΩ	0.127 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.21 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-09	FEEDS TO:	VIC SHIP MACHINE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164220439	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 19. Low-resistance ohmmeter 20. Calibrated torque wrench	19. Investigate connection values that deviate more than 50% from similar connections 20. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.22 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-09	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	VIC SHIP MACHINE		
SERIAL #:	3N164220439	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.134 mΩ	0.136 mΩ	0.133 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	84.0G	83.1G	91.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.134 mΩ	0.136 mΩ	0.133 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.23 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-10	FEEDS TO:	NE WALL	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N163655157	STYLE:	JJ 250	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	250 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 21. Low-resistance ohmmeter 22. Calibrated torque wrench	21. Investigate connection values that deviate more than 50% from similar connections 22. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.24 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-10	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	NE WALL		
SERIAL #:	3N163655157	AMPACITY:	250 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	JJ 250	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.477 mΩ	0.445 mΩ	0.505 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	84.0G	83.1G	88.8G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.477 mΩ	0.445 mΩ	0.505 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.25 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-11	FEEDS TO:	4DS1-W	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164020350	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 23. Low-resistance ohmmeter 24. Calibrated torque wrench	23. Investigate connection values that deviate more than 50% from similar connections 24. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.26 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-11	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS1-W		
SERIAL #:	LLA36400CU54XE	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.155 mΩ	0.209 mΩ	0.166 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	89.7G	89.9G	96.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.155 mΩ	0.209 mΩ	0.166 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.27 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-12	FEEDS TO:	4DS1-C	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164530583	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 25. Low-resistance ohmmeter 26. Calibrated torque wrench	25. Investigate connection values that deviate more than 50% from similar connections 26. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.28 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-12	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS1-C		
SERIAL #:	3N164530583	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.131 mΩ	0.133 mΩ	0.129 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	83.1G	83.9G	78.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.131 mΩ	0.133 mΩ	0.129 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.29 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-13	FEEDS TO:	4DS1-E	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164530582	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 27. Low-resistance ohmmeter 28. Calibrated torque wrench	27. Investigate connection values that deviate more than 50% from similar connections 28. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

prime engineering

ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.30 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-13	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS1-E		
SERIAL #:	3N164530582	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.135 mΩ	0.129 mΩ	0.134 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	77.9G	73.5G	78.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.135 mΩ	0.129 mΩ	0.134 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.31 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-14	FEEDS TO:	400 SSSR-N	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164530580	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 29. Low-resistance ohmmeter 30. Calibrated torque wrench	29. Investigate connection values that deviate more than 50% from similar connections 30. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.32 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-14	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	400 SSSR-N		
SERIAL #:	3N164530580	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.126 mΩ	0.145 mΩ	0.150 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	75.2G	82.2G	83.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.126 mΩ	0.145 mΩ	0.150 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.33 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-15	FEEDS TO:	400 SSSR-W	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	POWER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164220435	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 31. Low-resistance ohmmeter 32. Calibrated torque wrench	31. Investigate connection values that deviate more than 50% from similar connections 32. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.34 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-15	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	400 SSSR-W		
SERIAL #:	3N164220435	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.133 mΩ	0.141 mΩ	0.129 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	79.1G	78.4G	82.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.133 mΩ	0.141 mΩ	0.129 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.35 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-16	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N16374516	STYLE:	HL 060	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	60 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 33. Low-resistance ohmmeter 34. Calibrated torque wrench	33. Investigate connection values that deviate more than 50% from similar connections 34. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.36 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-16	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N16374516	AMPACITY:	60 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	HL 060	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.356 mΩ	1.456 mΩ	1.606 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	127.9G	119.8G	117.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.356 mΩ	1.456 mΩ	1.606 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.37 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-17	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N164125198	STYLE:	HJ 150	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	100 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 35. Low-resistance ohmmeter 36. Calibrated torque wrench	35. Investigate connection values that deviate more than 50% from similar connections 36. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.38 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-17	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164125198	AMPACITY:	100 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	HJ 150	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.506 mΩ	1.550 mΩ	1.787 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	147.4G	143.5G	140.3G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.506 mΩ	1.550 mΩ	1.787 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.39 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-18	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N164125201	STYLE:	HJ 150	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	100 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 37. Low-resistance ohmmeter 38. Calibrated torque wrench	37. Investigate connection values that deviate more than 50% from similar connections 38. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.40 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-18	PROTECTION:	M ICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164125201	AMPACITY:	100 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	HJ 150	VOLTAGE RATING:	100 A		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.998 mΩ	1.120 mΩ	0.977 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	149.6G	153.1G	148.0G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.998 mΩ	1.120 mΩ	0.977 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.41 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-19	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N163655169	STYLE:	JJ 250	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	250 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 39. Low-resistance ohmmeter 40. Calibrated torque wrench	39. Investigate connection values that deviate more than 50% from similar connections 40. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.42 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-19	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N163655169	AMPACITY:	250 A		
TYPE:	PowerPact	FAULT BRACING:	64KA @ 480V		
STYLE:	JJ 250	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.887 mΩ	0.904 mΩ	0.912 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	119.8G	112.7G	133.4G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.887 mΩ	0.904 mΩ	0.912 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.43 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-20	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N163655166	STYLE:	JJ 250	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	250 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 41. Low-resistance ohmmeter 42. Calibrated torque wrench	41. Investigate connection values that deviate more than 50% from similar connections 42. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.44 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-20	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N163655166	AMPACITY:	250 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	JJ 250	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.779 mΩ	0.809 mΩ	0.699 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	121.7G	123.4G	111.9G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.779 mΩ	0.809 mΩ	0.699 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.45 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-21	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N1163655171	STYLE:	JJ 250	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	250 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 43. Low-resistance ohmmeter 44. Calibrated torque wrench	43. Investigate connection values that deviate more than 50% from similar connections 44. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.46 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-21	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N1163655171	AMPACITY:	250 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	JJ 250	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.607 mΩ	0.556 mΩ	0.617 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	123.3G	124.1G	107.8G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.607 mΩ	0.556 mΩ	0.617 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.47 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-22	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**65KA @ 480V**
SERIAL #:	3N1163655170	STYLE:	JJ 250	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	250 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 45. Low-resistance ohmmeter 46. Calibrated torque wrench	45. Investigate connection values that deviate more than 50% from similar connections 46. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass
GENERAL COMMENTS		

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.48 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-22	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N1163655170	AMPACITY:	250 A		
TYPE:	PowerPact	FAULT BRACING:	65KA @ 480V		
STYLE:	JJ 250	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.893 mΩ	0.939 mΩ	0.920 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	129.5G	130.1G	134.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.893 mΩ	0.939 mΩ	0.920 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.49 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-23	FEEDS TO:	CAPSTAN	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N134935012	STYLE:	HL 150	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	`150 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 47. Low-resistance ohmmeter 48. Calibrated torque wrench	47. Investigate connection values that deviate more than 50% from similar connections 48. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.50 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-23	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	CAPSTAN		
SERIAL #:	3N134935012	AMPACITY:	150 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	HL 150	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.887 mΩ	0.871 mΩ	0.759 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	130.0G	141.1G	135.3G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.887 mΩ	0.871 mΩ	0.759 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.51 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-24	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164125196	STYLE:	HL 150	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	100 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 49. Low-resistance ohmmeter 50. Calibrated torque wrench	49. Investigate connection values that deviate more than 50% from similar connections 50. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.52 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-24	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164125196	AMPACITY:	100 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	HL 150	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.081 mΩ	1.211 mΩ	1.113 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	141.0G	147.8G	141.6G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.081 mΩ	1.211 mΩ	1.113 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.53 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-25	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164125197	STYLE:	HL 150	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	100 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 51. Low-resistance ohmmeter 52. Calibrated torque wrench	51. Investigate connection values that deviate more than 50% from similar connections 52. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.54 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-25	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164125197	AMPACITY:	100 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	HL 150	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.878 mΩ	1.099 mΩ	0.994 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	128.5G	133.0G	150.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.878 mΩ	1.099 mΩ	0.994 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

1.5.55 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-26	FEEDS TO:	CRANE PILOT	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	32N16374515	STYLE:	HL 060	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	60 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 53. Low-resistance ohmmeter 54. Calibrated torque wrench	53. Investigate connection values that deviate more than 50% from similar connections 54. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.56 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-26	PROTECTION:	MICROLOGIC 6.2 E
MFG DATE:	2016	FEEDS TO:	CRANE PILOT		
SERIAL #:	32N16374515	AMPACITY:	60 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	HL 060	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.116 mΩ	1.091 mΩ	1.234 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	157.3G	166.2G	147.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.116 mΩ	1.091 mΩ	1.234 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

1.5.57 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-27	FEEDS TO:	4DS3-E	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340410	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 55. Low-resistance ohmmeter 56. Calibrated torque wrench	55. Investigate connection values that deviate more than 50% from similar connections 56. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

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ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.58 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-27	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS3-E		
SERIAL #:	3N164340410	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.140 mΩ	0.154 mΩ	0.142 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	63.8G	64.1G	72.3G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.140 mΩ	0.154 mΩ	0.142 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.59 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-28	FEEDS TO:	4DS3-C	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340417	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 57. Low-resistance ohmmeter 58. Calibrated torque wrench	57. Investigate connection values that deviate more than 50% from similar connections 58. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.60 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-28	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS3-C		
SERIAL #:	3N164340417	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.130 mΩ	0.140 mΩ	0.136 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	66.6G	66.7G	74.4G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.130 mΩ	0.140 mΩ	0.136 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.61 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-29	FEEDS TO:	SOUTH JETTY 1	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340418	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 59. Low-resistance ohmmeter 60. Calibrated torque wrench	59. Investigate connection values that deviate more than 50% from similar connections 60. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.62 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-29	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 1		
SERIAL #:	3N164340418	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.130 mΩ	0.152 mΩ	0.139 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	82.1G	81.6G	80.9G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.130 mΩ	0.152 mΩ	0.139 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

1.5.63 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-30	FEEDS TO:	SOUTH JETTY 2	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340413	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 61. Low-resistance ohmmeter 62. Calibrated torque wrench	61. Investigate connection values that deviate more than 50% from similar connections 62. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.64 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-30	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 2		
SERIAL #:	3N164340413	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.141 mΩ	0.136 mΩ	0.140 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	76.8G	77.1G	83.0G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.141 mΩ	0.136 mΩ	0.140 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.65 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-31	FEEDS TO:	SOUTH JETTY 3	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340405	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 63. Low-resistance ohmmeter 64. Calibrated torque wrench	63. Investigate connection values that deviate more than 50% from similar connections 64. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.66 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-31	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 3		
SERIAL #:	3N164340405	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.143 mΩ	0.131 mΩ	0.145 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	79.9G	77.9G	85.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.143 mΩ	0.131 mΩ	0.145 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.67 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-32	FEEDS TO:	SOUTH JETTY 4	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340415	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 65. Low-resistance ohmmeter 66. Calibrated torque wrench	65. Investigate connection values that deviate more than 50% from similar connections 66. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.68 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-32	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 4		
SERIAL #:	3N164340415	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.147 mΩ	0.143 mΩ	0.142 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	78.5G	79.1G	86.1G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.147 mΩ	0.143 mΩ	0.142 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

1.5.69 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-33	FEEDS TO:	SOUTH JETTY 5	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340416	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 67. Low-resistance ohmmeter 68. Calibrated torque wrench	67. Investigate connection values that deviate more than 50% from similar connections 68. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.70 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-33	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 5		
SERIAL #:	3N164340416	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.140 mΩ	0.151 mΩ	0.143 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	83.2G	84.6G	83.2G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.140 mΩ	0.151 mΩ	0.143 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

INSULATION RESISTANCE TESTED WITH ENTIRE SWITCHBOARD SECTIONS 1-8 CONNECTED, ALL BREAKERS CLOSED.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.71 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-34	FEEDS TO:	4DS2-W	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340412	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 69. Low-resistance ohmmeter 70. Calibrated torque wrench	69. Investigate connection values that deviate more than 50% from similar connections 70. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.72 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-34	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS2-W		
SERIAL #:	3N164340412	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.145 mΩ	0.143 mΩ	0.141 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	82.2G	83.6G	85.7G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.145 mΩ	0.143 mΩ	0.141 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.73 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-35	FEEDS TO:	4DS2-C	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164340411	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 71. Low-resistance ohmmeter 72. Calibrated torque wrench	71. Investigate connection values that deviate more than 50% from similar connections 72. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.74 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-35	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS2-C		
SERIAL #:	3N164340411	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	N/A	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.173 mΩ	0.149 mΩ	0.172 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	80.9G	80.3G	85.0G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.173 mΩ	0.149 mΩ	0.172 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

prime engineering
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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.75 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-36	FEEDS TO:	KIOSK #3	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164141582	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 73. Low-resistance ohmmeter 74. Calibrated torque wrench	73. Investigate connection values that deviate more than 50% from similar connections 74. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.76 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-36	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	KIOSK #3		
SERIAL #:	N164141582	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.100 mΩ	0.097mΩ	0.093 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	83.1G	82.0G	97.8G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.100 mΩ	0.097mΩ	0.093 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.77 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-37	FEEDS TO:	4DS2-E	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164530579	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 75. Low-resistance ohmmeter 76. Calibrated torque wrench	75. Investigate connection values that deviate more than 50% from similar connections 76. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.78 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-37	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS2-E		
SERIAL #:	3N164530579	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	125 VDC		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.160 mΩ	0.150 mΩ	0.156 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	72.1G	72.7G	78.4G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.160 mΩ	0.150 mΩ	0.156 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.79 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-38	FEEDS TO:	4DS3-W	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N16414158 1	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 77. Low-resistance ohmmeter 78. Calibrated torque wrench	77. Investigate connection values that deviate more than 50% from similar connections 78. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.80 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-38	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	4DS3-W		
SERIAL #:	3N164141581	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.151 mΩ	0.149 mΩ	0.156 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	83.6G	83.7G	82.9G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.151 mΩ	0.149 mΩ	0.156 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.81 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	4SSSR-2-39	FEEDS TO:	SPARE	MANUFACTURER:	**SQUARE D**
MFG DATE:	2016	TYPE:	MASTER PACT	INTERRUPTING CAPACITY:	**100KA @ 480V**
SERIAL #:	3N164141583	STYLE:	LL 400	CONTROL VOLTAGE:	**125 VDC**
INTERLOCK KEY #:	N/A	RATED CURRENT:	400 A	OPERATION COUNTER:	**N/A**
B.I.L.:	8 KV			RATED VOLTAGE:	**600 V**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	Pass
Inspect physical and mechanical condition	Pass/Fail	Pass
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	Pass
Verify the unit is clean	Pass/Fail	Pass
Operate the circuit breaker to insure smooth operation	Pass/fail	Pass
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	Pass
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	Pass
Inspect bolted electrical connections for high resistance using either: 79. Low-resistance ohmmeter 80. Calibrated torque wrench	79. Investigate connection values that deviate more than 50% from similar connections 80. Torqued to manufacturer's data or if absent than use table 100.12	Pass
Set protective devices in accordance with the coordination study	Pass/Fail	Pass
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	Pass
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	Pass
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	Pass
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	Pass
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	Pass
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	Pass
Test LT, ST and GRD trip unit settings	Pass/Fail	Pass
Verify operation of charging mechanism	Pass/Fail	Pass

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.82 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	4SSSR-2-39	PROTECTION:	6.3 E MICROLOGIC
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164141583	AMPACITY:	400 A		
TYPE:	PowerPact	FAULT BRACING:	100KA @ 480V		
STYLE:	LL 400	VOLTAGE RATING:	600 V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.140 mΩ	0.144 mΩ	0.134 mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	18.61G	17.47G	16.92G
PHASE TO GROUND:	1000 VDC	13.52G	13.02G	10.99G
ACROSS CONTACTS:	1000 VDC	75.1G	77.8G	78.9G

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.140 mΩ	0.144 mΩ	0.134 mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.83 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-1-MET-01**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1702A333-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.42**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.84 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-01**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A250-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.43**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.85 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-02**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A238-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.44**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.86 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-03**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A243-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.45**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.87 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-04**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A251-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.46**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.88 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-05**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A242-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.47**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.89 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-06**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A049-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.48**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

SITE:	Esquimalt Graving Dock		LOCATION:	SSSR
CLIENT:	EECOL		DATE:	25/07/2017
TECHNICIAN:	CL	JOB:		5014.81

1.5.90 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-07**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A264-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.49**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.91 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-08**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A201-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.50**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.92 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-09**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A246-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.51**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.93 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-10**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A349-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.52**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.94 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-11**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A258-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.53**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.95 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-12**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A209-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.54**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.96 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-13**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A270-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.55**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer’s instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer’s instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS	
VOLTAGE AND CURRENT INJECTION COMPLETE	
April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.97 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-14**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A239-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.56**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.98 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-15**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A276-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.57**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.99 Metering Devices, Microprocessor-Based Reference: NETA ATS-2013 Section: 7.11.2			
MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-19**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A261-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.58**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS
GENERAL COMMENTS		
VOLTAGE AND CURRENT INJECTION COMPLETE		
April 2016	PRIME ENGINEERING – REVISION #1.1	

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.100 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-20**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A213-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.59**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.101 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-21**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A298-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.60**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.102 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-22**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A301-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.61**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.103 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-23**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A302-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.62**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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VOLTAGE AND CURRENT INJECTION COMPLETE

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.104 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-27**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A249-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.63**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.105 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-28**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A241-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.64**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.106 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-29**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A294-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.65**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.107 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-30**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A300-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.66**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.108 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-31**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A339-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.67**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.109 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-32**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A346-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.68**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.110 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-33**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A244-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.69**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS
GENERAL COMMENTS		
VOLTAGE AND CURRENT INJECTION COMPLETE		
April 2016	PRIME ENGINEERING – REVISION #1.1	

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.111 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-34**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A278-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.70**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.112 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-35**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A240-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.71**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.113 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-36**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A248-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.72**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer’s instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer’s instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

VOLTAGE AND CURRENT INJECTION COMPLETE

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.114 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-37**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A350-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.73**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.115 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-38**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A252-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.74**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
VOLTAGE AND CURRENT INJECTION COMPLETE

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.116 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**4SSSR-2-MET-39**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1608A262-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.75**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS	
VOLTAGE AND CURRENT INJECTION COMPLETE	
April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	25/07/2017
TECHNICIAN:	CL	JOB:	5014.81

1.5.117 Multi Function Relay Test

MANUFACTURER:	I-GARD	MFG. DATE:	NA
CIRCUIT ID:	4SSSR-1/2	MODEL:	DSP-OHMNI
RELAY TYPE:	High Res. Ground Fault	SERIAL #:	NA
PASSWORD FIELD:	NA	BAUD RATE/IP ADDRESS FIELD:	10.1.4.139 / 9600

Settings

MOD ID = 1
IG = 5A
ALARM = 50%
PUL INVRT = OFF
FREQ = 0
LOCK = OFF
ZSCT RATIO = 1000:1

Test Results

TEST DETAILS	RESULTS	PASS/FAIL
ZSCT INJECTION TEST. VERIFY 2.5A ALARM PICKUP (50%) AND 5A (100%)		
4SSSR-2-01 FDR 3	OK	PASS
4SSSR-2-02 FDR 4	OK	PASS
4SSSR-2-03 FDR 5	OK	PASS
4SSSR-2-04 FDR 6	OK	PASS
4SSSR-2-05 FDR 7	OK	PASS
4SSSR-2-06 FDR 8	OK	PASS
4SSSR-2-07 FDR 9	OK	PASS
4SSSR-2-08 FDR 10	OK	PASS
4SSSR-2-09 FDR 11	OK	PASS
4SSSR-2-10 FDR 12	OK	PASS
4SSSR-2-11 FDR 13	OK	PASS
4SSSR-2-12 FDR 14	OK	PASS
4SSSR-2-13 FDR 15	OK	PASS
4SSSR-2-14 FDR 16	OK	PASS
4SSSR-2-15 FDR 17	OK	PASS
4SSSR-2-16 FDR 18	OK	PASS
4SSSR-2-17 FDR 19	OK	PASS
4SSSR-2-18 FDR 20	OK	PASS
4SSSR-2-19 FDR 21	OK	PASS
4SSSR-2-20 FDR 22	OK	PASS
4SSSR-2-21 FDR 23	OK	PASS
4SSSR-2-22 FDR 24	OK	PASS
4SSSR-2-23 FDR 25	OK	PASS
4SSSR-2-24 FDR 26	OK	PASS
4SSSR-2-25 FDR 27	OK	PASS

4SSSR-2-26 FDR 28	OK	PASS
4SSSR-2-27 FDR 29	OK	PASS
4SSSR-2-28 FDR 30	OK	PASS
4SSSR-2-29 FDR 31	OK	PASS
4SSSR-2-30 FDR 32	OK	PASS
4SSSR-2-31 FDR 33	OK	PASS
4SSSR-2-32 FDR 34	OK	PASS
4SSSR-2-33 FDR 35	OK	PASS
4SSSR-2-34 FDR 36	OK	PASS
4SSSR-2-35 FDR 37	OK	PASS
4SSSR-2-36 FDR 38	OK	PASS
4SSSR-2-37 FDR 39	OK	PASS
4SSSR-2-38 FDR 40	OK	PASS
4SSSR-2-39 FDR 41	OK	PASS
Equipment ID		
MS-2A, PE-RTS-6, PE-RTS-3		
GENERAL COMMENTS		
EACH CT VERIFIED BY PRIMARY INJECTION		
CIRCUIT BREAKER TRIP TEST VIA PRIMARY INJECTION ON ZCTs PERFORMED		
PRIME ENGINEERING – REVISION #4.0		

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.5.118 NGR Testing

DEVICE	TEST	CONDITION
4SSSR-NGR	4SSSR-1/2 NGR Resistance Test	-
	Isolate SSSR output	106.1 Ω
	Bypass (jumper) SSSR output	52.5 Ω

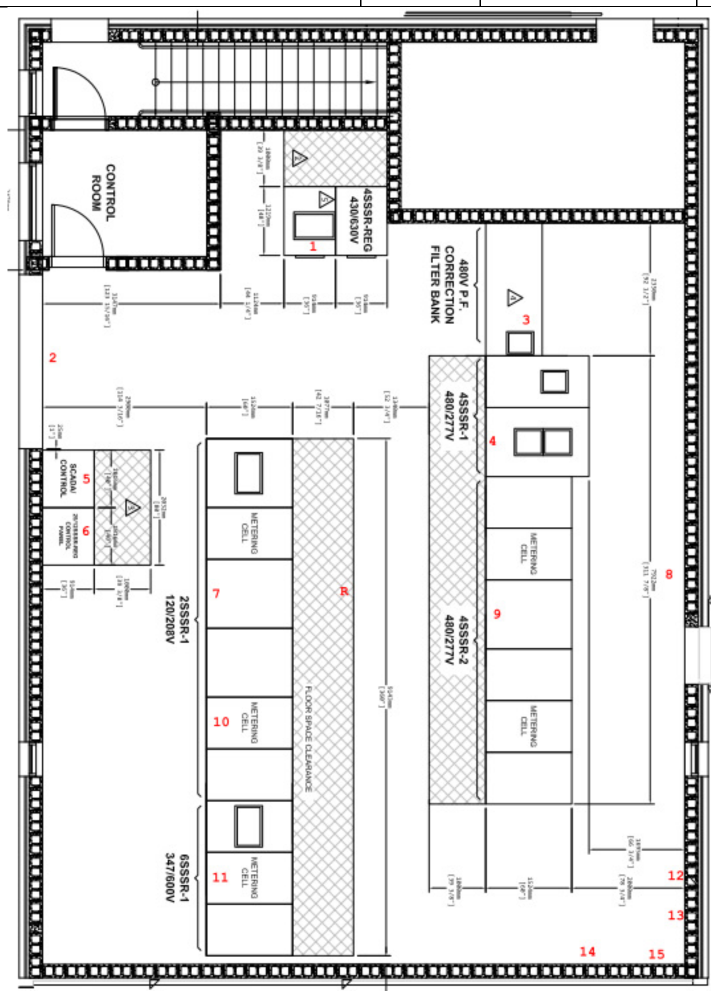
EQUIPMENT ID
PE-DMM-9

GENERAL COMMENTS
OHMNI-4PM-05
SN: 40160-1
VOLTAGE: 277V_{ln}
WATTAGE: 1385W
CURRENT: 5A
DUTY: CONT

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.6 SSSR 1st Floor Grounding and Bonding Point to Point Resistances

REFERENCE DRAWING SSSR-50-01			REFERENCE NODE (R):		
NODE	**RESISTANCE (mΩ)**	**TEST POINT**	**NODE**	**RESISTANCE (mΩ)**	**TEST POINT**
R → 1	1.5938	4SSSR-REG	R → 11	0.9130	6SSSR-1-MC-1
R → 2	0.9261	SOUTH DOUBLE DOORS	R → 12	3.9081	PANEL
R → 3	1.98	HARMONIC FILTER BANK	R → 13	3.9427	PANEL
R → 4	0.91	4SSSR-1	R → 14	2.4310	TRANSFORMER
R → 5	8.80	SCADA CABINET	R → 15	2.7361	TRANSFORMER
R → 6	2.7145	SSSR-PLC-1	R → 20		
R → 7	0.2933	2SSSR-1 SEC. 3	R → 21		
R → 8	4.26	TRANSFER SWITCH	R → 22		
R → 9	0.99	4SSSR-2	R → 23		
R → 10	0.2918	2SSSR-1-MC-2	R → 24		



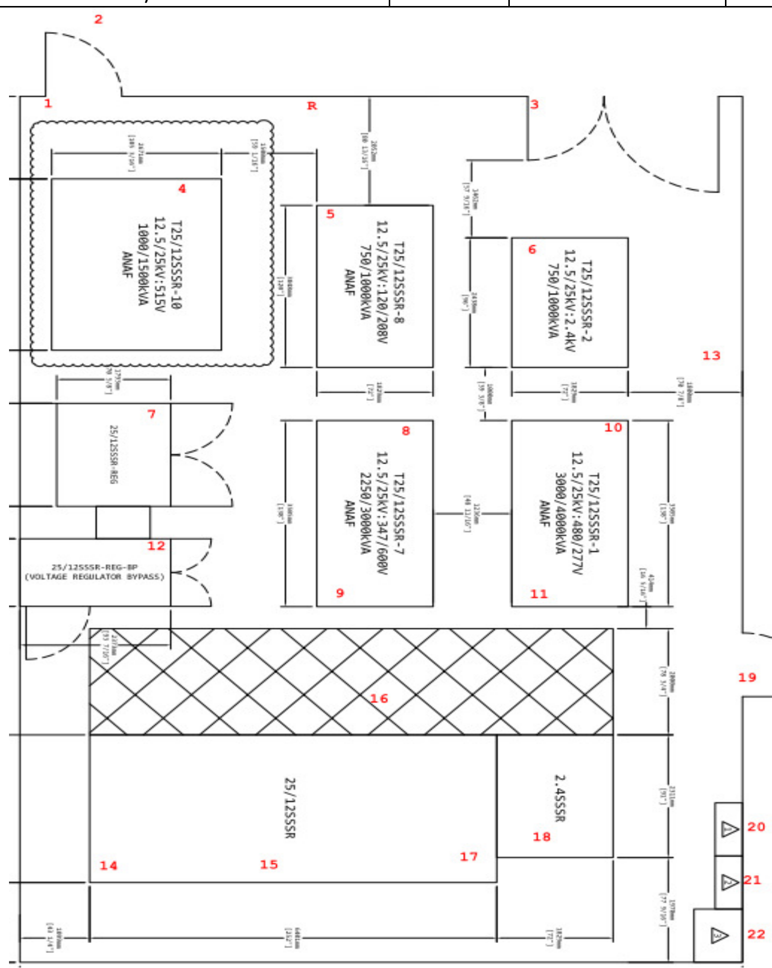
GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		25/07/2017
TECHNICIAN:	CL		JOB:	5014.81

1.6.1 SSSR 2nd Floor Grounding and Bonding Point to Point Resistances

REFERENCE DRAWING SSSR-50-02			REFERENCE NODE (R): West Ground Bus		
NODE	**RESISTANCE (mΩ)**	**TEST POINT**	**NODE**	**RESISTANCE (mΩ)**	**TEST POINT**
R → 1	1.733	WEST MAIN DOOR	R → 12	NA	25/12SSSR-REG-BP NOT INSTALLED
R → 2	24.733	OUTSIDE RAILING	R → 13	1.274	NORTH WALL
R → 3	0.941	WEST SIDE DOUBLE DOORS	R → 14	0.840	25/12SSSR CELL 1
R → 4	1.0811	T25/12SSSR-10	R → 15	0.877	25/12SSSR CELL 4
R → 5	1.481	T25/12SSSR-8	R → 16	0.983	CABLE TRAY
R → 6	2.351	T25/12SSSR-2	R → 17	0.786	25/12SSSR CELL 7
R → 7	1.1427	25/12SSSR-REG	R → 18	0.959	2.4SSSR CELL 4
R → 8	1.45	T25/12SSSR-7 LV	R → 19	1.271	NORTH DOOR
R → 9	1.59	T25/12SSSR-7 HV	R → 20	1.791	DC PANEL
R → 10	1.815	T25/12SSSR-1 HV	R → 21	1.918	BATTERY CHARGER
R → 11	1.853	T25/12SSSR-1 LV	R → 22	1.816	BATTERY BANK



GENERAL COMMENTS	
APRIL 2016	PRIME ENGINEERING – REVISION #4.0

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Esquimalt Graving Dock
5014.81 – 2.4SSSR and T25/12SSSR-2 Site Acceptance Testing Report

Client:	EECOL ELECTRIC

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
1.0	J.Siu	Brent Hughes	10/07/2017	For Internal Review
2.0	Brent Hughes	Keisan Goldsmith	12/09/2017	For External Review

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

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DATE:

PROJECT # 5014.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **2.4SSSR and T25/12SSSR-2 Site Acceptance Testing Report**

Dear Jean:

This report documents the site acceptance testing for the Esquimalt Graving Dock 2.4SSSR medium voltage switchgear and T25/12SSSR-2 transformer. The testing and verification has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA).

Thank-you for choosing Prime Engineering Ltd. We hope to work with you again in the near future.
Sincerely,

Keisan Goldsmith, P.Eng.
Field Service Engineer
prime engineering
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#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-5213
f: (250) 590-8917
e: brent.hughes@primeeng.ca
www.primeeng.ca

Attachments to this report:
5014.81_2.4SSSR CT Results_2017_Rev 2.0
5014.81_2.4SSSR PR Test Results_2017_Rev 2.0
5014.81-EGD T2512SSSR-2_2.4SSSR Energization Plan_2.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.1 Equipment Testing Safety Checklist – Prior to Commencing Work

ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
NAME OF THE PERSON IN CHARGE:	√		TEST VOLTAGE HAZARDS 15KV OR OVER:	√	
EMERGENCY RESPONSE:	√		LIMITS OF APPROACH:	√	
SAFTEY GROUNDING IN PLACE:	√		TEST FOR POTENTIAL:	√	
PUBLIC SAFETY/BARRIERS IN PLACE:	√		INDUCTION HAZARDS:	√	
COMMUNICATION AND NOTIFICATION:	√		CONTROL CIRCUITS LIVE:	√	
SAFE WORKING SPACE AROUND EQUIPMENT:	√		HOUSEKEEPING:	√	
PERSONAL PROTECTIVE EQUIPMENT:	√		EQUIPMENT IS GROUNDED:	√	
STROBE LIGHTS WORK:	√		OTHER:		√

ALL PERSONAL WORKING IN VICINITY MUST SIGN SAFETY RECORD

NAME	TITLE	PHONE NUMBER	INITIALS
Jordan Siu	**Field Tech**	**250 893 3528**	**JS**
Brent Hughes	**Project Engineer**	**250 893 5213**	**BH**
Clayton Laughren	**Field Tech**	**250 893 8050**	**CL**
Keisan Goldsmith	**Field Tech**	**250 893 1854**	**KG**

APPROVED PERSONAL TO BE INSIDE BARRIERED AREA AFTER EQUIPMENT HAS BEEN TURNED OFF AND GROUNDED

NAME	TITLE	PHONE NUMBER	INITIALS
Jordan Siu	**Field Tech**	**250 893 3528**	**JS**
Brent Hughes	**Project Engineer**	**250 893 5213**	**BH**
Clayton Laughren	**Field Tech**	**250 893 8050**	**CL**
Keisan Goldsmith	**Field Tech**	**250 893 1854**	**KG**

NOTES – COMMENTS – DESCRIPTION OF OTHER HAZARDS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	JS/CL	JOB:	5014.81

1.2 2.4PHS Switchgear and Switchboard Assemblies

Reference: NETA ATS-2013 Section: 7.1

CIRCUIT ID:	**2.4SSSR**	PHASES:	**3 PHASE**
SERIAL #:	**37939710-007**	VOLTAGE:	**4.780KV**
TYPE:	**METAL ENCLOSED**	HIGH SIDE B.I.L.:	**60KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**11/2016**	CONTINUOUS CURRENT:	**2000A**
POWER FUSE SIZE:	**N/A**	MAX INTERUPTING RATING:	**40KA**
CONTROL VOLTAGE:	**125VDC**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify that the fuse and circuit breaker sizes and types correspond to the drawings and coordination study.	Pass/Fail	**PASS**
Verify that the current and voltage transformer ratios correspond to drawings.	Pass/Fail	**PASS**
Verify that the wiring connections are tight and that the wiring is secure to prevent damage during routine operation of moving parts.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Inspect insulators for evidence of physical damage or contaminated surfaces.	Pass/Fail	**PASS**
Verify correct barrier and shutter installation and operation.	Pass/Fail	**PASS**
Exercise all active components	Pass/Fail	**PASS**
Inspect mechanical indicating devices for correct operation.	Pass/Fail	**PASS**
Verify that filters are in place and vents are clear.	Pass/Fail	**PASS**

Perform visual and mechanical inspection of instrument transformers.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**
Perform electrical tests on instrument transformers	Pass/Fail	**PASS**
Determine accuracy of all meters and calibrate watthour meters	Pass/Fail	**PASS**
Control Power Transformers 1. Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be in accordance with Table 100.1 unless otherwise specified by the manufacturer. 2. Perform a turns-ratio test on all tap positions. 3. Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices. 4. Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected. 5. Verify correct function of control transfer relays located in the switchgear with multiple control power sources.	1. Turns-ratio test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. 2. Secondary wiring shall be in accordance with design drawings and specifications. 3. Secondary voltage shall be in accordance with design specifications. 4. Control transfer relays shall perform as designed	**PASS** **(Test 4 and 5 N/A)**
Voltage Transformers 1. Perform secondary wiring integrity test. Verify correct potential at all devices. 2. Verify secondary voltages by energizing the primary winding with system voltage.	1. Secondary wiring shall be in accordance with design drawings and specifications. 2. Secondary voltage shall be in accordance with design specifications	**PASS** **(Test 2 N/A)**
Perform current-injection tests on the entire current circuit in each section of switchgear. 1. Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 ampere flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.	1. Current-injection tests shall prove current wiring is in accordance with design specifications.	**PASS**

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		10/07/2017
TECHNICIAN:	JS/CL		JOB:	5014.81

GENERAL COMMENTS	
APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.3 T25/12SSSR-2 Transformer Test and Inspection

CIRCUIT ID:	T25/12SSSR-2	PHASES:	3
FEEDS TO:	2.4SSSR-1	HIGH SIDE VOLTAGE:	12500/25000V
SERIAL #:	1210040911	HIGH SIDE B.I.L.:	95/125KV
TYPE:	ANN/AFF	LOW SIDE VOLTAGE:	2400/1386V
SIZE:	750/1000 KVA	LOW SIDE B.I.L.:	25KV
PERCENT IMPEDANCE:	4.98%	MANUFACTURER:	JINPAN
TEMPERATURE RISE:	115°C	MFG. DATE:	12.21.2016
CONFIGURATION:	Δ/Y	APARATUS TEMPERATURE:	19°C
TAP POSITION AS FOUND:	C	AMBIENT TEMPERATURE:	19°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	NA
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	PASS
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	C	D	E
HIGH SIDE VOLTAGE:	13125	12813	12500	12188	11875
CALCULATED RATIO:	9.47:1	9.24:1	9.02:1	8.79:1	8.58:1
H 1 H 2 X 0 X 2	9.4808:1	9.262:1	9.032:1	8.801:1	8.582:1
EXCITING CURRENT – mA	3	2	2	2	2
H 2 H 3 X 0 X 3	9.478:1	9.259:1	9.028:1	8.799:1	8.581:1
EXCITING CURRENT – mA	2	2	2	2	3
H 1 H 3 X 0 X 1	9.480:1	9.261:1	9.033:1	8.803:1	8.583:1
EXCITING CURRENT – mA	3	3	3	3	3
TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	26250	25625	25000	24375	23750
CALCULATED RATIO:	18.94:1	18.48:1	18.04:1	17.58:1	17.16:1
H 1 H 2 X 0 X 2	18.963:1	18.525:1	18.066:1	17.606:1	17.169:1
EXCITING CURRENT – mA	1	1	1	1	1
H 2 H 3 X 0 X 3	18.958:1	18.521:1	18.064:1	17.604:1	17.167:1
EXCITING CURRENT – mA	1	1	1	1	1
H 1 H 3 X 0 X 1	18.965:1	18.527:1	18.067:1	17.609:1	17.171:1
EXCITING CURRENT – mA	1	1	1	1	1

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5000VDC	2500VDC	2500VDC	500VDC
PI/DAR:	3.19/1.58	3.89/1.54	3.45/1.53	7.56/.75
INSULATION VALUE:	6.76TΩ	1.031TΩ	1.069TΩ	109.6GΩ
TEMPERATURE CORRECTED:	6.76TΩ	1.031TΩ	1.069TΩ	109.6GΩ

WINDING RESISTANCE														
H	1	H	2	1812.1mΩ	H	2	H	3	1811.1mΩ	H	1	H	3	1814.9mΩ
X	0	X	1	20.755mΩ	X	0	X	2	20.780mΩ	X	0	X	3	20.862mΩ
EQUIPMENT ID														
PE-M-14, PE-D-14, PE-TTR-14														
GENERAL COMMENTS														
PRIME ENGINEERING – REVISION #4.0														

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.4 25/12SSSR CB-2 Cable Very Low Frequency High Potential Test

MANUFACTURER:	General Cable	MFG. DATE:	2014
CIRCUIT ID:	25/12SSSR-CB-2	FEEDS TO:	T25/12SSSR-2
CABLE TYPE/INSULATION:	Voltalene/Trxple	CONDUCTOR SIZE:	1/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY - %	70%/19°C
LENGTH:	18M	MAXIMUM TEST VOLTAGE:	31 KVAC @ 0.1Hz
AUTHORIZED BY:	Steve Frachette (Houle)		

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	907GΩ	LINE A-B WITH C GROUNDED:	3.03TΩ
LINE B TO GROUND:	969GΩ	LINE B-C WITH A GROUNDED:	4.00TΩ
LINE C TO GROUND:	1.045TΩ	LINE C-A WITH B GROUNDED:	3.71TΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC @ 0.1 Hz	LINE A nF	LINE A µA	LINE B nF	LINE B µA	LINE C nF	LINE C µA
1	31	3.83	75	3.88	76	3.94	77
2	31	3.83	75	3.88	76	3.94	77
3	31	3.83	75	3.88	76	3.94	77
4	31	3.83	75	3.88	76	3.94	77
5	31	3.83	75	3.88	76	3.94	77
6	31	3.83	75	3.88	76	3.94	77
7	31	3.83	75	3.88	76	3.94	77
8	31	3.83	75	3.88	76	3.94	77
9	31	3.83	75	3.88	76	3.94	77
10	31	3.83	75	3.88	76	3.94	77
11	31	3.83	75	3.88	76	3.94	77
12	31	3.83	75	3.88	76	3.94	77
13	31	3.83	75	3.88	76	3.94	77
14	31	3.83	75	3.88	76	3.94	77
15	31	3.83	75	3.88	76	3.94	77

AC INSULATION RESISTANCE @ 0.1 Hz 15 MIN READINGS	LINE A	LINE B	LINE C
	15 GΩ	15 GΩ	14 GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-14

GENERAL COMMENTS

Test performed with all cables not under test connected to ground.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.5 2.4SSSR Medium Voltage Switchboard Test and Inspection

MANUFACTURER:	**Square D**	MFG. DATE:	**11/2016**
EQUIPMENT ID:	**2.4SSSR**	NUMBER OF PHASES/WIRES	**3**
TYPE:	**Metal Enclosed**	PROTECTION:	**Digital Relay**
SERIAL #:	**37939710-007**	FAULT BRACING:	**40KA**
AMPACITY:	**2000A**	VOLTAGE RATING:	**4.78KV**

CONNECTION TIGHTNESS

Connection	A Phase	B phase	C Phase	% Deviation	PASS/FAIL
CB-1 LINE CONNECTION – CB-3 LOAD CONNECTION	**0.31mΩ**	**0.31mΩ**	**0.31mΩ**	**0**	**PASS**
CB-1 LINE CONNECTION – CB-4 LOAD CONNECTION	**0.60mΩ**	**0.57mΩ**	**0.59mΩ**	**0.12**	**PASS**

INSULATION RESISTANCE

TIME:___1min___ VOLTAGE:__5kVDC___

Phase	**Result**	**Acceptable**	**Phase**	**Result**	**Acceptable**
A-GND	**2.31TΩ**	**PASS**	A-B	**2.34TΩ**	**PASS**
B-GND	**2.55TΩ**	**PASS**	B-C	**2.74TΩ**	**PASS**
C-GND	**3.12TΩ**	**PASS**	A-C	**3.25TΩ**	**PASS**

DIELECTRIC WITHSTAND TEST

TIME:__1min_____ VOLTAGE:___14kVAC__

Phase	**Result**	**Acceptable**
A-GND	**0.1mA**	**PASS**
B-GND	**0.1mA**	**PASS**
C-GND	**0.1mA**	**PASS**

TEST EQUIPMENT ID

PE-HP-02, PE-D-14, PE-M-14

ENVIRONMENTAL CONDITIONS

INDOORS, DRY

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.6 T25/12SSSR-2 2.4KV Cable Testing		
DEVICE	TEST	RESULT
CABLE BUS AØ-GND	INSULATION RESISTANCE 2500VDC	1.95 TΩ
CABLE BUS BØ-GND	INSULATION RESISTANCE 2500VDC	1.76 TΩ
CABLE BUS CØ-GND	INSULATION RESISTANCE 2500VDC	1.27 TΩ
CABLE BUS AØ-BØ	INSULATION RESISTANCE 2500VDC	4.32 TΩ
CABLE BUS BØ-CØ	INSULATION RESISTANCE 2500VDC	4.61 TΩ
CABLE BUS CØ-AØ	INSULATION RESISTANCE 2500VDC	6.05 TΩ

CABLE INFORMATION

3x 1C 350kcmil
CPT Copper
XLPE 90 5kV 100% Rated

EQUIPMENT ID

PE-M-11

GENERAL COMMENTS

Cable bus between T25/12SSSR-8 and 2SSSR-1

prime engineering	ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		10/07/2017
TECHNICIAN:	KG		JOB:	5014.81

1.7 2.4PT-1 Instrument Transformer Test

MANUFACTURER:	**ARMAN**	MFG. DATE:	**2016**
CIRCUIT ID:	**2.4PT-1**	FEEDS TO:	**METERS & RELAYS**
TYPE:	**VOLTAGE TRANSFORMER**	SECONDARY VOLTAGE:	**120V**
PRIMARY VOLTAGE	**2400V**	ACC. CLASS:	**1.2Z**

VISUAL INSPECTION

	LINE A	LINE B	
PRIMARY FUSE MODEL #:	**PANICKKER FEVT**	**PANICKKER FEVT**	
PRIMARY FUSE AMPACITY:	**0.5A**	**0.5A**	
PRIMARY FUSE RESISTANCE:	**2.8Ω**	**2.8Ω**	
CONTROL WIRING:	**PASS**	**PASS**	
GROUNDING:	**PASS**	**PASS**	
CLEANED:	**PASS**	**PASS**	

TRANSFORMER RATIO TEST

	LINE A		LINE B	
SERIAL #:	**14039N442/88606**		**14039N442/88591**	
	RATIO	EXCITING	RATIO	EXCITING
H1-H2:X1-X2	**20.01:1**	**6mA**	**20.02:1**	**6mA**
POLARITY:	**Good**		**Good**	

INSULATION RESISTANCE

	LINE A	LINE B	
TEST VOLTS:	**5KV**	**5KV**	
LEAKAGE CURRENT:	**0.59nA**	**0.59nA**	
X-GND INSULTATION RESISTANCE:	**>10TΩ @500V**	**>10TGΩ @500V**	
H-GND INSULATION RESISTANCE:	**>10TΩ**	**>10TTΩ**	
POLARIZATION INDEX:	**NA**	**NA**	
DIELECTRIC ABSORPTION RATIO:	**NA**	**NA**	
X+H-GND:	**>2TΩ @500V**	**>2TΩ @500V**	

EQUIPMENT ID

PE-M-14, PE-D-14, PE-T-14

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.8 2.4SSSR CB-1 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**2.4PHS CB-1**	PHASES:	**3 PHASE**
SERIAL #:	**17 92522**	RATED VOLTAGE:	**4.76**
TYPE:	**VR**	B.I.L.:	**60KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**50/60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**2000A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**2.4SSSR COMMON BUS**	OPERATION COUNTER:	**64**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.9 2.4SSSR CB-1 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**2.4SSSR CB-1**	FEEDS TO:	**Common Bus**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40kA**
SERIAL #:	**17 92522**	STYLE:	**VACCUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**2000A**	OPERATION COUNTER:	**64**
B.I.L.:	**60KV**	RATED VOLTAGE:	**4.76KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**OK**		
GROUND CONNECTIONS:	**OK**		
LUBRICATION OF MECHANISM:	**OK**		
CONNECTIONS TORQUED:	**OK**		
SECONDARY WIRING:	**OK**		
SPRINGS / PUFFERS / DAMPERS:	**OK**		
AUXILIARY CONTACTS:	**OK**	HIGHEST RESISTANCE:	**0.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20µΩ**	**20µΩ**	**20µΩ**
CONTACT OPENING TIME:	**30.5ms**	**30.6ms**	**30.6ms**
CONTACT CLOSING TIME:	**47.6ms**	**47.6ms**	**47.7ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
LINE TO GROUND:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
ACROSS CONTACTS:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
WITHSTAND TEST LINE TO GROUND	**14KVAC**	**0.1mA**	**0.1mA**	**0.1mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**170.3**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**184.4**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**9.2**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-14, PE-BCT-1, PE-HP-02, PE-D-14

GENERAL COMMENTS

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.10 2.4SSSR ES-1 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**2.4SSSR ES-1**	PHASES:	**3**
SERIAL #:	**1274676/3**	RATED VOLTAGE:	**12KV**
TYPE:	**OJWN 12/63A210**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**NA**
Verify correct phase barrier installation.	Pass/Fail	**NA**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.11 2.4SSSR ES-1 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**2.4SSSR ES-1**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 12/63A210**	SERIAL #:	**1274676/3**
STYLE:	**N/A**	VOLTAGE RATING:	**12KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.45mΩ**	**0.44mΩ**	**0.43mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**2.27TΩ**	**2.547TΩ**	**2.95TΩ**
ACROSS CONTACTS:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
OVER POTENTIAL TEST:	**14KVAC**	**0.1mA**	**0.1mA**	**0.1mA**

EQUIPMENT ID

PE-M-14, PE-D-14, PE-HP-02

GENERAL COMMENTS

1.12 2.4SA-1 Surge Arresters, Medium- and High-Voltage
Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**2.4SA-1**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**2.55 KV**
VOLTAGE CLASS:	**3.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX003XHS**
CURRENT RATING:	**NA**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**NA**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**PASS**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.13 2.4SA-1 Surge Arrester Test and Inspection

CIRCUIT ID:	**2.4SA-1**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**2.55 KV**
VOLTAGE CLASS:	**3.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX003XHS**
CURRENT RATING:	**NA**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE:	**PASS**			**A: 165.2GΩ B: 180.3GΩ C: 194.7GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT:	**PASS**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.14 2.4SSSR CB-3 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**2.4SSSR CB-3**	PHASES:	**3**
SERIAL #:	**17 92524**	RATED VOLTAGE:	**4.76KV**
TYPE:	**VR**	B.I.L.:	**60KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**125VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**SPARE**	OPERATION COUNTER:	**62**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer’s published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections. 2. Torqued to manufacturer’s data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.15 2.4SSSR CB-3 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**2.4SSSR CB-3**	FEEDS TO:	**SPARE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92524**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**125VDC**
INTERLOCK KEY #:	**NA**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**62**
B.I.L.:	**60KV**	RATED VOLTAGE:	**4.76KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20µΩ**	**20µΩ**	**20µΩ**
CONTACT OPENING TIME:	**30.4ms**	**30.5ms**	**30.5ms**
CONTACT CLOSING TIME:	**47.8ms**	**47.6ms**	**47.8ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
LINE TO GROUND:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
ACROSS CONTACTS:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
WITHSTAND TEST LINE TO GROUND	**14KVAC**	**0.1mA**	**0.1mA**	**0.1mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**180.1**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**182.2**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			-	-	-
MOTOR CHARGING:	**X**			**10.1**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-14, PE-BCT-1, PE-HP-02, PE-D-14

GENERAL COMMENTS

1.16 2.4SSSR ES-3 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**2.4SSSR ES-3**	PHASES:	**3**
SERIAL #:		RATED VOLTAGE:	**12KV**
TYPE:	**OJWN 12/63A210**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:		CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**PASS**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.17 2.4SSSR ES-3 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**2.4SSSR ES-3**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	**2016**
TYPE:	**OJWN 12/63A210**	SERIAL #:	**1274676/13**
STYLE:	**N/A**	VOLTAGE RATING:	**12KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.45mΩ**	**0.46mΩ**	**0.45mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**2.65TΩ**	**2.52TΩ**	**3.15TΩ**
ACROSS CONTACTS:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
OVER POTENTIAL TEST:	**14KVAC**	**0.1mA**	**0.1mA**	**0.1mA**

EQUIPMENT ID

PE-M-14, PE-D-14, PE-HP-02

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.18 2.4SA-3 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**2.4SA-3**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**2.55 KV**
VOLTAGE CLASS:	**3.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX003XHS**
CURRENT RATING:	**NA**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections 4. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**NA**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**NA**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

1.19 2.4SA-3 Surge Arrester Test and Inspection

CIRCUIT ID:	**2.4SA-3**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**2.55 KV**
VOLTAGE CLASS:	**3.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX003XHS**
CURRENT RATING:	**NA**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE:	**PASS**			**A: 198.1GΩ B: 200.9GΩ C: 205.3GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT:	**PASS**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

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ENGINEER . IMPLEMENT . MAINTAIN

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		10/07/2017
TECHNICIAN:	KG		JOB:	5014.81

1.20 2.4SSSR CB-4 Circuit Breakers, Vacuum, Medium-Voltage

Reference: NETA ATS-2013 Section: 7.6.3

CIRCUIT ID:	**2.4SSSR CB-4**	PHASES:	**3**
SERIAL #:	**17 92523**	RATED VOLTAGE:	**4.76KV**
TYPE:	**VR**	B.I.L.:	**60KV**
MANUFACTURER:	**SQUARE D**	POWER FREQUENCY:	**60HZ**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**1200A**
CONTROL VOLTAGE:	**100-140VDC**	MAX INTERUPTING RATING:	**40KA**
FEEDS TO:	**30T CRANE**	OPERATION COUNTER:	**62**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.	Pass/Fail	**PASS**
Verify cell fit and element alignment	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections. 4. Torqued to manufacturer's data or if absent than use table 100.12.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Verify racking mechanism operation.	Pass/Fail	**PASS**
Record as-found and as-left operation counter readings.	Operation counter shall advance one digit per close-open cycle.	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**

Perform a contact/pole-resistance test	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data.	Minimum pickup voltage of the trip and close coils shall conform to the manufacturer's published data.	**PASS**
Verify correct operation of any auxiliary features such as electrical close and trip operation, trip-free, and antipump function.	Auxiliary features shall operate in accordance with manufacturer's published data.	**PASS**
Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators	Protective devices shall operate the breaker per system design.	**PASS**
Perform a dielectric withstand voltage test in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Perform vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the breaker in the open position in strict accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.	**PASS**
Verify Heaters are operational	Pass/Fail	**N/A**

GENERAL COMMENTS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.21 2.4SSSR CB-4 Medium Voltage Circuit Breaker Test and Inspection

CIRCUIT ID:	**2.4SSSR CB-4**	FEEDS TO:	**30T CRANE**	MANUFACTURER:	**SQUARE D**
MFG DATE:	**2016**	TYPE:	**VR**	INTERRUPTING CAPACITY:	**40KA**
SERIAL #:	**17 92523**	STYLE:	**VACUUM**	CONTROL VOLTAGE:	**110-140VDC**
INTERLOCK KEY #:	**N/A**	RATED CURRENT:	**1200A**	OPERATION COUNTER:	**62**
B.I.L.:	**60KV**	RATED VOLTAGE:	**4.76KV**		

VISUAL INSPECTIONS

	PASS/FAIL/N/A	NOTES	
OPERATION OF INTERLOCKS:	**PASS**		
CONDITION OF BREAKER CELLS:	**PASS**		
RACKING MECHANISM OF RAILS:	**PASS**		
SIGNS OF OVERHEATING:	**NA**	NEW	
CONDITION OF FINGERS AND CLUSTERS:	**PASS**		
OPERATION OF SHUTTERS:	**PASS**		
GROUND CONNECTIONS:	**PASS**		
LUBRICATION OF MECHANISM:	**PASS**		
CONNECTIONS TORQUED:	**PASS**		
SECONDARY WIRING:	**PASS**		
SPRINGS / PUFFERS / DAMPERS:	**PASS**		
AUXILIARY CONTACTS:	**PASS**	HIGHEST RESISTANCE:	**.2Ω**

CONTACT AND INSULATION TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT RESISTANCE:	**20μΩ**	**20μΩ**	**20μΩ**
CONTACT OPENING TIME:	**29.9ms**	**29.9ms**	**30.7ms**
CONTACT CLOSING TIME:	**47.6ms**	**48.7ms**	**48.7ms**
WEAR INDICATORS:	**PASS**	**PASS**	**PASS**

INSULATION TESTING	TEST VOLTAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
LINE TO GROUND:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
ACROSS CONTACTS:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
WITHSTAND TEST LINE TO GROUND	**14KVAC**	**0.1mA**	**0.1mA**	**0.1mA**

BREAKER OPERATOR AND CONTROLS TEST

	PASS	FAIL	N/A	OHMS	RATED VOLTS	PICKUP VOLTS
CLOSING COIL:	**X**			**180.2**	**140 VDC**	**100 VDC**
OPENING COIL:	**X**			**179.0**	**140 VDC**	**70 VDC**
TRIPPING COIL:	**NA**			**-**	**-**	**-**
MOTOR CHARGING:	**X**			**10.3**	**125V DC**	**100 VDC**

EQUIPMENT ID

PE-M-14, PE-BCT-1, PE-HP-02, PE-D-10

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		10/07/2017
TECHNICIAN:	KG		JOB:	5014.81

1.22 2.4SSSR ES-4 Switches, Air, Medium-Voltage, Metal Enclosed

Reference: NETA ATS-2013 Section: 7.5.1.2

CIRCUIT ID:	**2.4SSSR ES-4**	PHASES:	**3**
SERIAL #:	**1274676/7**	RATED VOLTAGE:	**12KV**
TYPE:	**OJWN 12/63A210**	STYLE:	**N/A**
MANUFACTURER:	**ABB**	MOM:	**63KA**
MFG. DATE:	**2016**	CONTINUOUS CURRENT:	**N/A**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.	Pass/Fail	**PASS**
Verify correct blade alignment, blade penetration, travel stops, arc interrupter operation, and mechanical operation.	Pass/Fail	**PASS**
Verify that fuse sizes and types are in accordance with drawings, short-circuit study, and coordination study.	Pass/Fail	**PASS**
Verify correct phase barrier installation.	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using low-resistance ohmmeter	Investigate connection values that deviate more than 50% from similar connections.	**PASS**
Verify operation and sequencing of interlocking systems.	Pass/Fail	**PASS**
Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.	Pass/Fail	**PASS**
Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter	Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.	**PASS**
Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1	Pass/Fail	**PASS**
Measure contact resistance across each switchblade and fuse holder.	Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.	**PASS**
Perform a dielectric withstand voltage test on each pole with switch closed. Test each pole-to ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data.	If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.23 2.4SSSR ES-4 Medium Voltage Earthing Switch Test and Inspection

CIRCUIT ID:	**2.4SSSR ES-4**	MOM RATING:	**63KA**
MANUFACTURER:	**ABB**	MFG. DATE:	
TYPE:	**OJWN 12/63A210**	SERIAL #:	
STYLE:	**N/A**	VOLTAGE RATING:	**12KV**
BIL:	**N/A**	CURRENT RATING:	**N/A**

VISUAL INSPECTION

	PASS/FAIL/N/A	NOTES
MECHANICAL LOCK:	**PASS**	
INSULATORS:	**PASS**	
CONTROL:	**PASS**	
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:	**N/A**	
BONDING:	**PASS**	
ANCHORAGE:	**PASS**	
CLEARANCES:	**PASS**	
INDICATION/ CONTROL DEVICES:	**PASS**	
CLEANLINESS:	**PASS**	

CONTACT TESTING

	TEST CURRENT	LINE A	LINE B	LINE C
LINE TO GROUND:	**10ADC**	**0.45mΩ**	**0.45mΩ**	**0.46mΩ**

INSULATION TESTING

	TEST VOTLAGE	LINE A	LINE B	LINE C
LINE TO LINE:	**5KVDC**	**2.33TΩ**	**2.54TΩ**	**3.15TΩ**
ACROSS CONTACTS:	**5KVDC**	**≥10TΩ**	**≥10TΩ**	**≥10TΩ**
OVER POTENTIAL TEST:	**14KVAC**	**0.1mA**	**0.1mA**	**0.1mA**

EQUIPMENT ID

PE-M-14, PE-D-14, PE-HP-02

GENERAL COMMENTS

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.24 2.4SA-4 Surge Arresters, Medium- and High-Voltage

Reference: NETA ATS-2013 Section: 7.19.2

CIRCUIT ID:	**2.4SA-4**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**2.55 KV**
VOLTAGE CLASS:	**3.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX003XHS**
CURRENT RATING:	**NA**
TYPE:	**DISTRIBUTION**
INSULATION MATERIAL:	**METAL OXIDE**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	**PASS**
Inspect physical and mechanical condition	Pass/Fail	**PASS**
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	**PASS**
Verify arresters are clean	Pass/Fail	**PASS**
Inspect bolted electrical connections for high resistance using either: 5. Low-resistance ohmmeter 6. Calibrated torque wrench	5. Investigate connection values that deviate more than 50% from similar connections 6. Torqued to manufacturer's data or if absent than use table 100.12	**PASS**
Verify that the ground lead on each device is individually attached to a ground bus or electrode	Pass/Fail	**PASS**
If present, verify that the stroke counter is correctly mounted and electrically connected	Pass/Fail	**NA**
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	**NA**
Perform insulation-resistance tests for one minute on each arrestor phase to ground	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	**PASS**
Test grounding connection in accordance with section 2.1.8	Resistance between the arrester ground terminal and the ground system should be less than 0.5 ohms	**PASS**

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	10/07/2017
TECHNICIAN:	KG	JOB:	5014.81

1.25 2.4SA-4 Surge Arrester Test and Inspection

CIRCUIT ID:	**2.4SA-4**
MANUFACTURER:	**GENERAL ELECTRIC**
MFG. DATE:	**2016**
MCOV:	**2.55 KV**
VOLTAGE CLASS:	**3.0 KV**
SERIAL #:	**NO DATA**
MODEL #:	**9L20FXX003XHS**
CURRENT RATING:	**NA**
TYPE:	**DISTRIBUTION**

PHYSICAL INSPECTION

	PASS/FAIL/N/A	COMMENTS
ANCHORAGE:	**PASS**	
CLEANLINESS:	**PASS**	
OVERALL CONDITION:	**PASS**	
BOND CONNECTIONS:	**PASS**	
BONDING METHOD:	**PASS**	
CONNECTIONS TIGHT:	**PASS**	

TESTING

	PASS	FAIL	N/A	COMMENTS
INSULATION TEST – HV – GND TEST VOLTAGE: 2.5KVDC	**PASS**			**A: 210.3GΩ B: 180.4GΩ C: 187.3GΩ**
BOND CONTINUITY – ARRESTER – MAIN TEST CURRENT:	**PASS**			**A: >0.5Ω B: >0.5Ω mΩ C: >0.5Ω mΩ**

EQUIPMENT ID

PE-M-14, PE-D-14

GENERAL COMMENTS/ENVIRONMENTAL CONDITIONS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

ENGINEER . IMPLEMENT . MAINTAIN

Esquimalt Graving Dock

5014.81 – T25/12SSSR-7 and 6SSSR-1 Site Acceptance Testing Report

Client:

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
5.0	Brent Hughes		2018/01/12	For Record

ENGINEER . IMPLEMENT . MAINTAIN

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ENGINEER . IMPLEMENT . MAINTAIN

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

DATE: 2017-01-12 **PROJECT #** 5014.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **T25/12SSSR-7 and 6SSSR-1 Site Acceptance Testing Report**

Dear Jean:

This report documents the site acceptance testing for the Esquimalt Graving Dock 6SSSR-1 low voltage switchgear. The testing and verification has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA).

ITEMS REQUIRING ATTENTION:

- The cabling between T25/12SSSR-7 and 6SSSR-1 is now complete and has been tested and verified. The cable test sheet is now attached.

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

Thank-you for choosing Prime Engineering Ltd. We hope to work with you again in the near future.

Sincerely,

Brent Hughes, EIT
Project Engineer
prime engineering
ENGINEER . IMPLEMENT . MAINTAIN
#1-717 Aldebury Street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-5213
f: (250) 590-8917
e: brent.hughes@primeeng.ca
www.primeeng.ca

Additional/Supporting Documentation			
Item #	**DWG/DOC#/NAME**	**REV.#**	**COMMENTS**
1	5014.81_6SSSR-1 CT Results	2.0	Vangaurd Test Reports for 6SSSR CT's
2	5014.81_T2512SSSR CT Results	2.0	Vangaurd Test Reports for T25/12SSSR-7
3	5014.81_6SSSR-1 SPE-1000 Report	-	SPE-1000 Testing/Inspection for 6SSSR modifications

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL, JS, BH	JOB:	5014.81

1.1 EQUIPMENT TESTING SAFETY CHECKLIST – PRIOR TO COMMENCING WORK

ITEM	DISCUSSED	N/A	ITEM	DISCUSSED	N/A
NAME OF THE PERSON IN CHARGE:	√		TEST VOLTAGE HAZARDS 15KV OR OVER:	√	
EMERGENCY RESPONSE:	√		LIMITS OF APPROACH:	√	
SAFTEY GROUNDING IN PLACE:	√		TEST FOR POTENTIAL:	√	
PUBLIC SAFETY/BARRIERS IN PLACE:	√		INDUCTION HAZARDS:	√	
COMMUNICATION AND NOTIFICATION:	√		CONTROL CIRCUITS LIVE:	√	
SAFE WORKING SPACE AROUND EQUIPMENT:	√		HOUSEKEEPING:	√	
PERSONAL PROTECTIVE EQUIPMENT:	√		EQUIPMENT IS GROUNDED:	√	
STROBE LIGHTS WORK:	√		OTHER:		√

ALL PERSONAL WORKING IN VICINITY MUST SIGN SAFETY RECORD

NAME	TITLE	PHONE NUMBER	INITIALS
BRENT HUGHES	**PROJECT ENGINEER**	**250 893-5213**	**BH**
JORDAN SUI	**ELECTRICIAN**	**250 893-3528**	**JS**
CLAYTON LAUGHREN	**ELECTRICIAN**	**250 893-8050**	**CL**

APPROVED PERSONAL TO BE INSIDE BARRIERED AREA AFTER EQUIPMENT HAS BEEN TURNED OFF AND GROUNDED

NAME	TITLE	PHONE NUMBER	INITIALS
BRENT HUGHES	**PROJECT ENGINEER**	**250 893-5213**	**BH**
JORDAN SUI	**ELECTRICIAN**	**250 590-8912**	**JS**
CLAYTON LAUGHREN	**ELECTRICIAN**	**250 893-8050**	**CL**

NOTES – COMMENTS – DESCRIPTION OF OTHER HAZARDS

APRIL 2016	PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL, JS	JOB:	5014.81

1.2 TRANSFORMER TEST AND INSPECTION

CIRCUIT ID:	T25/12SSSR-7	PHASES:	3
FEEDS TO:	6SSSR-1	HIGH SIDE VOLTAGE:	12500/25000V
SERIAL #:	1210040912	HIGH SIDE B.I.L.:	95KV/125KV
TYPE:	ANN/AFF	LOW SIDE VOLTAGE:	600/347V
SIZE:	2250/3000 KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	5.17%	MANUFACTURER:	Japan international
TEMPERATURE RISE:	115°C	MFG. DATE:	12.28.2016
CONFIGURATION:	Δ/Y	APARATUS TEMPERATURE:	18°C
TAP POSITION AS FOUND:	2-5	AMBIENT TEMPERATURE:	18°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	NA
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	PASS
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:	FAIL

TRANSFORMER TURNS RATIO HV TO LV

TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	13125V	12813V	12500V	12188V	11875V
CALCULATED RATIO:	37.82:1	36.93:1	36.02:1	35.12:1	34.22:1
H 1 H 2 X 0 X 2	37.972:1	37.054:1	36.136:1	35.219:1	34.304:1
EXCITING CURRENT – mA	5mA	6mA	6mA	6mA	7mA
H 1 H 3 X 0 X 1	37.926:1	37.023:1	36.113:1	35.210:1	34.304:1
EXCITING CURRENT – mA	6mA	6mA	6mA	6mA	6mA
H 2 H 3 X 0 X 3	37.962:1	37.048:1	36.130:1	35.211:1	34.296:1
EXCITING CURRENT – mA	6mA	6mA	6mA	6mA	7mA
TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	26250V	25625V	25000V	24375V	23750V
CALCULATED RATIO:	75.65:1	73.85:1	72.04:1	70.25:1	68.44:1
H 1 H 2 X 0 X 2	75.966:1	74.123:1	72.289:1	70.452:1	68.611:1
EXCITING CURRENT – mA	2mA	2mA	2mA	2mA	2mA
H 1 H 3 X 0 X 1	74.834:1	73.073:1	71.304:1	69.537:1	67.768:1
EXCITING CURRENT – mA	34mA	33mA	32mA	30mA	29mA
H 2 H 3 X 0 X 3	75.984:1	74.141:1	72.303:1	70.470:1	68.631:1
EXCITING CURRENT – mA	2mA	2mA	2mA	2mA	2mA

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5KV	1KV	1KV	500VDC
PI/DAR:	3.01/1.46	4.12/1.61	3.36/173	2.21/1.56
INSULATION VALUE:	7.47TΩ	3.145TΩ	2.345TΩ	50.2GΩ
TEMPERATURE CORRECTED:	7.47TΩ	3.145TΩ	2.345TΩ	50.2GΩ

WINDING RESISTANCE

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL, JS	JOB:	5014.81

H	1	H	2	316.5mΩ	H	1	H	3	316.4mΩ	H	2	H	3	317.9mΩ
X	0	X	1	395µΩ	X	0	X	2	385µΩ	X	0	X	3	392µΩ

EQUIPMENT ID
PE-M-14, PE-D-14, PE-T-14
GENERAL COMMENTS
AS LEFT TAP: 2-5, SET UP FOR 12.5KV SERVICE
PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL, JS	JOB:	5014.81

1.3 CABLE HIPOT TEST

MANUFACTURER:	General Cable	MFG. DATE:	2016
CIRCUIT ID:	25/12SSSR-CB-7	FEEDS TO:	T25/12SSSR-7
CABLE TYPE/INSULATION:	Blocked Strand/Trxple	CONDUCTOR SIZE:	2/0 AWG
TEMPERATURE RATING:	90°C	HUMIDITY - %	70%/19°C
LENGTH:	15 m	MAXIMUM TEST VOLTAGE:	31 KVAC @ 0.1Hz
AUTHORIZED BY:	Steve Frachette (Houle)		

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	800.7GΩ	LINE A-B WITH C GROUNDED:	1.171TΩ
LINE B TO GROUND:	301.5GΩ	LINE B-C WITH A GROUNDED:	1.028TΩ
LINE C TO GROUND:	564GΩ	LINE C-A WITH B GROUNDED:	1.802TΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC @ 0.1 Hz	LINE A nF	LINE A µA	LINE B nF	LINE B µA	LINE C nF	LINE C µA
1	31	2.29	45	2.40	47	2.37	47
2	31	2.29	45	2.40	47	2.37	47
3	31	2.29	45	2.40	47	2.37	47
4	31	2.29	45	2.40	47	2.37	47
5	31	2.29	45	2.40	47	2.37	47
6	31	2.29	45	2.40	47	2.37	47
7	31	2.29	45	2.40	47	2.37	47
8	31	2.29	45	2.40	47	2.37	47
9	31	2.29	45	2.40	47	2.37	47
10	31	2.29	45	2.40	47	2.37	47
11	31	2.29	45	2.40	47	2.37	47
12	31	2.29	45	2.40	47	2.37	47
13	31	2.29	45	2.40	47	2.37	47
14	31	2.29	45	2.40	47	2.37	47
15	31	2.29	45	2.40	47	2.37	47

AC INSULATION RESISTANCE @ 0.1 Hz 15 MIN READINGS	LINE A	LINE B	LINE C
	3.6 GΩ	4.0 GΩ	6.3 GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-12

GENERAL COMMENTS

Test performed with all cables not under test connected to ground.

Cold shrink terminations on both ends.

PRIME ENGINEERING – REVISION #4.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL, JS	JOB:	5014.81

1.4 LV CABLE TESTING

DEVICE	TEST	CONDITION
CABLE BUS AØ-GND	1000VDC MEGGER	6.98 GΩ
CABLE BUS BØ-GND	1000VDC MEGGER	6.72 GΩ
CABLE BUS CØ-GND	1000VDC MEGGER	6.39 GΩ
CABLE BUS AØ-BØ	1000VDC MEGGER	15.39 GΩ
CABLE BUS BØ-CØ	1000VDC MEGGER	18.47 GΩ
CABLE BUS CØ-AØ	1000VDC MEGGER	17.17 GΩ
CABLE BUS AØ-NEUTRAL	1000VDC MEGGER	9.18 GΩ
CABLE BUS BØ-NEUTRAL	1000VDC MEGGER	8.23 GΩ
CABLE BUS CØ-NEUTRAL	1000VDC MEGGER	7.58 GΩ

CABLE INFORMATION

TF CABLE 90°C DLO2KV 777MCM
5 CABLES PER PHASE

EQUIPMENT ID

PE-M-14

GENERAL COMMENTS

LV CABLES BETWEEN T25/12SSSR-7 TO 6SSSR-1

1.5 Switchgear and Switchboard Assemblies

Reference: NETA ATS-2013 Section: 7.1

MANUFACTURER:	**Square D**	MFG. DATE:	**Dec 2016**
EQUIPMENT ID:	**6SSSR-1**	NUMBER OF PHASES/WIRES	**3 Phase/4 Wire**
TYPE:	**LV MCC**	PROTECTION:	**Micrologic 6.0**
SERIAL #:	**37939710-009**	FAULT BRACING:	**42 KAIC**
AMPACITY:	**4000 A**	VOLTAGE RATING:	**600/347 VAC**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed	Pass/Fail	PASS
Verify that fuse and breaker size and types correspond to the drawings and coordination study	Pass/Fail	PASS
Verify transformer ratios correspond to drawings	Pass/Fail	NA
Verify that wiring connections are tight and that wiring is secure to prevent damage during routine operation of moving parts	Pass/Fail	PASS
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Verify operation and sequencing of interlocking systems	Pass/Fail	PASS
Verify lubrication on moving part and surfaces	Pass/Fail	PASS
Inspect insulators for evidence of physical damage or contaminated surfaces	Pass/Fail	PASS
Verify correct barrier and shutter installation and operation	Pass/Fail	PASS
Exercise all active components	Pass/Fail	PASS
Inspect mechanical indicating devices for correct operation	Pass/Fail	PASS
Verify that filters are in place and vents are clear	Pass/Fail	NA
Perform visual and mechanical inspection of instrument transformers	Pass/Fail in accordance with section 2.1.3 and section 2.1.4	PASS
Perform visual and mechanical inspection of surge arresters	Pass/Fail in accordance with section 2.1.5	NA
Inspect control power transformers: 1. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring and overall condition 2. Verify that primary and secondary fuse or circuit breaker ratings match drawings 3. Verify correct functionality of draw-out disconnecting contacts, grounding contacts and interlocks	Pass/Fail	NA
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests on each bus section, phase-phase and phase to ground for one minute	Insulation-resistance values should be above manufacturer's limits or if absent, greater	PASS

	than table 100.1	
Perform a dielectric withstand voltage test for one minute on each bus section, each phase to ground with phases not under test grounded	In accordance with manufacturer's published data. If manufacturer has no recommendation for the test, it shall be in accordance with table 100.2	PASS
Perform electrical tests on instrument transformers	In accordance with section 2.1.3 and 2.1.4	PASS
Perform ground resistance tests	In accordance with section 2.1.8	PASS
Determine accuracy of all meters and calibrate watthour meters	In accordance with section 2.1.7	PASS
Control power transformers: 1. Perform insulation-resistance tests. Perform measurements from winding-winding and each winding to ground. 2. Perform a turns ratio test on all tap positions	1. Test voltages shall be in accordance with table 100.1 unless otherwise specified by the manufacturer 2. Turns ratio test shall not deviate by more than one-half percent from either adjacent coils or calculated ratio	PASS
Verify correct secondary voltage and wiring by energizing the primary winding with system voltage and measuring secondary voltage at all connected devices	Secondary wiring shall be in accordance with design specifications	PASS
Verify correct function of control transfer relays located in the switchgear	Control transfer relays shall perform as designed	PASS
Verify secondary voltage and wiring of voltage transformers by energizing the primary winding and checking secondary voltage and connected devices	Secondary wiring shall be in accordance with design specifications	PASS
Perform current tests by secondary injection with magnitudes of at least 1 amp and verifying correct magnitude of current and each device in the circuit	Current tests shall prove current wiring in accordance with design specifications	PASS
Perform system function tests	Verify correct operation of all interlocks, fail-safe functions, sensing devices, alarms and indicating devices as per the design requirements	PASS
Verify cubicle switchgear/switchboard space heaters	Heaters shall be operational	NA
Perform phasing checks on double ended or dual source switchgear to insure correct bus phasing form each source	Phasing checks shall prove switchgear phasing is correct and in accordance to design specifications	PASS
Perform electrical tests of surge arresters	In accordance with section 2.1.5	NA

GENERAL COMMENTS

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.6 Low Voltage Switchboard Test and Inspection

MANUFACTURER:	**Square D**	MFG. DATE:	**Dec 2016**
EQUIPMENT ID:	**6SSSR-1**	NUMBER OF PHASES/WIRES	**3 Phase/4 Wire**
TYPE:	**QED**	PROTECTION:	**25/12SSSR-PR-07**
SERIAL #:	**37939710-009**	FAULT BRACING:	**42 KAIC**
AMPACITY:	**4000 A**	VOLTAGE RATING:	**600/347 VAC**

CONNECTION TIGHTNESS

Connection	A Phase	B phase	C Phase	Neutral Bus	**% Deviation**
Across Bus to Bus Duct Connection	25 µΩ	21 µΩ	24 µΩ	25µΩ	16%

INSULATION RESISTANCE

TIME:_60sec__ VOLTAGE:_1000VDC_

Phase	**Result**	**Acceptable**	**Phase**	**Result**	**Acceptable**
A-GND	8.82 GΩ	PASS	A-B	8.19 GΩ	PASS
B-GND	9.20 GΩ	PASS	B-C	10.09 GΩ	PASS
C-GND	10.21 GΩ	PASS	A-C	10.99 GΩ	PASS
A-N	8.60 GΩ	PASS			
B-N	9.70 GΩ	PASS			
C-N	10.14 GΩ	PASS			

TEST EQUIPMENT ID

PE-M-14, PE-D-14

ENVIRONMENTAL CONDITIONS

GENERAL COMMENTS

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.7 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-01	FEEDS TO:	SOUTH JETTY KIOSK #6	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3NI64530585	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400 A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.8 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-01	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY KIOSK #6		
SERIAL #:	3NI64530585	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.154mΩ	0.133mΩ	0.140mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	120.1GΩ	136.6GΩ	118.6GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.154mΩ	0.133mΩ	0.140mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.9 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-02	FEEDS TO:	SOUTH JETTY KIOSK #7	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164141593	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections 4. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.10 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-02	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY KIOSK #7		
SERIAL #:	3N164141593	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.137mΩ	0.140mΩ	0.134mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	112.4GΩ	96.7GΩ	108.9GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.137mΩ	0.140mΩ	0.134mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.11 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-03	FEEDS TO:	6DS2-W	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164141588	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 5. Low-resistance ohmmeter 6. Calibrated torque wrench	5. Investigate connection values that deviate more than 50% from similar connections 6. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.12 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-03	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS2-W		
SERIAL #:	3N164141588	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.156mΩ	0.132mΩ	0.139mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	145.5GΩ	130.9GΩ	167GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.156mΩ	0.132mΩ	0.139mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

1.13 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-04	FEEDS TO:	6DS2-E	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164141589	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400 A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 7. Low-resistance ohmmeter 8. Calibrated torque wrench	7. Investigate connection values that deviate more than 50% from similar connections 8. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.14 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-04	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS2-E		
SERIAL #:	3N164141589	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

3(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.115mΩ	0.122mΩ	0.130mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	119.0GΩ	198.4GΩ	177.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.115mΩ	0.122mΩ	0.130mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.15 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-05	FEEDS TO:	6DS1-E	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164141592	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 9. Low-resistance ohmmeter 10. Calibrated torque wrench	9. Investigate connection values that deviate more than 50% from similar connections 10. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.16 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-05	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS1-E		
SERIAL #:	3N164141592	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.137mΩ	0.124mΩ	0.122mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	161GΩ	199.9GΩ	122GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.137mΩ	0.124mΩ	0.122mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

1.17 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-06	FEEDS TO:	6DS1-W	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164530587	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 11. Low-resistance ohmmeter 12. Calibrated torque wrench	11. Investigate connection values that deviate more than 50% from similar connections 12. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.18 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-06	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS1-W		
SERIAL #:	3N164530587	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.135mΩ	0.127mΩ	0.138mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	399.5GΩ	229.1GΩ	129.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.135mΩ	0.127mΩ	0.138mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.19 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-07	FEEDS TO:	6DS1-C	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164530581	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 13. Low-resistance ohmmeter 14. Calibrated torque wrench	13. Investigate connection values that deviate more than 50% from similar connections 14. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.20 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-07	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS1-C		
SERIAL #:	3N164530581	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.137mΩ	0.124mΩ	0.125mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	131.9GΩ	122.9GΩ	231.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.137mΩ	0.124mΩ	0.125mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.21 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-08	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164141613	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 15. Low-resistance ohmmeter 16. Calibrated torque wrench	15. Investigate connection values that deviate more than 50% from similar connections 16. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS	
April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.22 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-08	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164141613	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.144mΩ	0.127mΩ	0.129mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	119.6GΩ	117.4GΩ	89.5GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.144mΩ	0.127mΩ	0.129mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.23 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-09	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164340403	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer’s data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer’s data	PASS
Inspect bolted electrical connections for high resistance using either: 17. Low-resistance ohmmeter 18. Calibrated torque wrench	17. Investigate connection values that deviate more than 50% from similar connections 18. Torqued to manufacturer’s data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer’s data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer’s data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.24 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-09	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164340403	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.136mΩ	0.121mΩ	0.125mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	146.7GΩ	167.7GΩ	119.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.136mΩ	0.121mΩ	0.125mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.25 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-10	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N163910065	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 19. Low-resistance ohmmeter 20. Calibrated torque wrench	19. Investigate connection values that deviate more than 50% from similar connections 20. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.26 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-10	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N163910065	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.162mΩ	0.131mΩ	0.130mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	135.7GΩ	114.4GΩ	177.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.162mΩ	0.131mΩ	0.130mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

1.27 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-11	FEEDS TO:	COMPRRESSOR #4 PUMP HEATER	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164525116	STYLE:	HL 060	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 21. Low-resistance ohmmeter 22. Calibrated torque wrench	21. Investigate connection values that deviate more than 50% from similar connections 22. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.28 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-11	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	COMPRESSOR #4 PUMP HEATER		
SERIAL #:	3N164525116	AMPACITY:	60A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	HL 060	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	2.499mΩ	1.801mΩ	1.907mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	>4.00 TΩ	>4.00 TΩ	>4.00 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	2.499mΩ	1.801mΩ	1.907mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.29 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-12	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164525110	STYLE:	HL 060	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 23. Low-resistance ohmmeter 24. Calibrated torque wrench	23. Investigate connection values that deviate more than 50% from similar connections 24. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.30 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-12	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164525110	AMPACITY:	60A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	HL 060	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.492mΩ	1.363mΩ	1.429mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	987.3 GΩ	>4.00 TΩ	1.121 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.492mΩ	1.363mΩ	1.429mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.31 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-13	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N162935087	STYLE:	HL 150	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	150A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 25. Low-resistance ohmmeter 26. Calibrated torque wrench	25. Investigate connection values that deviate more than 50% from similar connections 26. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.32 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-13	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N162935087	AMPACITY:	150A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	HL 150	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.302mΩ	1.321mΩ	1.219mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	>4.00 TΩ	>4.00 TΩ	>4.00 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.302mΩ	1.321mΩ	1.219mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.33 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-14	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164115161	STYLE:	HL 150	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	150A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 27. Low-resistance ohmmeter 28. Calibrated torque wrench	27. Investigate connection values that deviate more than 50% from similar connections 28. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.34 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-14	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164115161	AMPACITY:	150A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	HL 150	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.753mΩ	0.802mΩ	0.859mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	>4.00TΩ	>4.00TΩ	>4.00TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.753mΩ	0.802mΩ	0.859mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.35 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-15	FEEDS TO:	ATS	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164530588	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 29. Low-resistance ohmmeter 30. Calibrated torque wrench	29. Investigate connection values that deviate more than 50% from similar connections 30. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.36 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-15	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	ATS		
SERIAL #:	3N164530588	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.131mΩ	0.127mΩ	0.139mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	550.3 GΩ	1.145 TΩ	1.071 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.131mΩ	0.127mΩ	0.139mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.37 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-16	FEEDS TO:	6DS3-E	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164141591	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 31. Low-resistance ohmmeter 32. Calibrated torque wrench	31. Investigate connection values that deviate more than 50% from similar connections 32. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.38 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-16	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS3-E		
SERIAL #:	3N164141591	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.129mΩ	0.120mΩ	0.138mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	202.4 GΩ	131.9 GΩ	88.9 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.129mΩ	0.120mΩ	0.138mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.39 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-17	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164530586	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 33. Low-resistance ohmmeter 34. Calibrated torque wrench	33. Investigate connection values that deviate more than 50% from similar connections 34. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.40 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-17	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164530586	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.185mΩ	0.148mΩ	0.141mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	124.5 GΩ	111.9 GΩ	133.6 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.185mΩ	0.148mΩ	0.141mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.41 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-18	FEEDS TO:	6DS3-W	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N165010472	STYLE:	LL 400	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 35. Low-resistance ohmmeter 36. Calibrated torque wrench	35. Investigate connection values that deviate more than 50% from similar connections 36. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.42 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-18	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	6DS3-W		
SERIAL #:	3N165010472	AMPACITY:	400A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	LL 400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.154mΩ	0.151mΩ	0.161mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	147.6 GΩ	118.8 GΩ	138.3 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.154mΩ	0.151mΩ	0.161mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

ALL TESTING PERFORMED AS PER NETA ATS-2003 USING EQUIPMENT CALIBRATED TO NATIONAL TRACEABLE STANDARDS AS PER THE NATIONAL RESEARCH COUNCIL OF CANADA. CERTIFICATES OF CALIBRATION ARE AVAILABLE UPON REQUEST.

1.43 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-19	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N164525118	STYLE:	HL 060	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 37. Low-resistance ohmmeter 38. Calibrated torque wrench	37. Investigate connection values that deviate more than 50% from similar connections 38. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.44 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-19	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164525118	AMPACITY:	60A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	HL 060	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.401mΩ	1.464mΩ	1.344mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	>4.00 TΩ	>4.00 TΩ	>4.00 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.401mΩ	1.464mΩ	1.344mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.45 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-20	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	3N163665024	STYLE:	HL 060	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 39. Low-resistance ohmmeter 40. Calibrated torque wrench	39. Investigate connection values that deviate more than 50% from similar connections 40. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.46 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-20	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N163665024	AMPACITY:	60A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	HL 060	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.954mΩ	0.891mΩ	1.329mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	>4.00 TΩ	>4.00 TΩ	>4.00 TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.954mΩ	0.891mΩ	1.329mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.47 Circuit Breakers, Molded Case, Low Voltage

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	6SSSR-1-21	FEEDS TO:	AIR COMPRESSOR #4	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	50KA
SERIAL #:	02022997830100002	STYLE:	PK 1200	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	1200A	OPERATION COUNTER:	NA
B.I.L.:	50 KA			RATED VOLTAGE:	600 VAC

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 41. Low-resistance ohmmeter 42. Calibrated torque wrench	41. Investigate connection values that deviate more than 50% from similar connections 42. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.48 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection

MANUFACTURER:	Square D	CIRCUIT ID:	6SSSR-1-21	PROTECTION:	Micrologic 6.0H
MFG DATE:	2016	FEEDS TO:	AIR COMPRESSOR #4		
SERIAL #:	02022997830100002	AMPACITY:	1200A		
TYPE:	PowerPact	FAULT BRACING:	50KA		
STYLE:	PK 1200	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	60µΩ	57µΩ	54µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	8.19 GΩ	10.09 GΩ	10.99 GΩ
PHASE TO GROUND:	1000 VDC	8.82 GΩ	9.20 GΩ	10.21 GΩ
ACROSS CONTACTS:	1000 VDC	134.4 GΩ	118.7 GΩ	144.3 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	60µΩ	57µΩ	54µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-D-14, PE-M-14, PE-RTS-06

GENERAL COMMENTS

Verified ENCT function of breakers and confirmed metering readout on breakers Micrologic display.

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.49 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-01**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B312-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.76**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.50 Metering Devices, Microprocessor-Based Reference: NETA ATS-2013 Section: 7.11.2			
MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-02**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1702A343-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.77**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
ASSOCIATED CB TRIPPED VIA METER

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.51 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-03**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1702A345-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.78**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
ASSOCIATED CB TRIPPED VIA METER

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.52 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-04**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1701B600-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.79**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
ASSOCIATED CB TRIPPED VIA METER

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.53 Metering Devices, Microprocessor-Based
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-05**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B318-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.80**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.54 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-06**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B311-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.81**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer’s instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer’s instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.55 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-07**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1701B599-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.82**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.56 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-08**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1701B604-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.83**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.57 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-09**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B309-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.84**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer’s instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer’s instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
ASSOCIATED CB TRIPPED VIA METER

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 14, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.58 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-10**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B321-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.85**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.59 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-16**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B306-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.86**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

ASSOCIATED CB TRIPPED VIA METER

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.60 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-17**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B313-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.87**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS	
ASSOCIATED CB TRIPPED VIA METER	
April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 14, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.61 Metering Devices, Microprocessor-Based

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**6SSSR-1-MET-18**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	**ME-1607B310-01**
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS
ASSOCIATED CB TRIPPED VIA METER

April 2016	PRIME ENGINEERING – REVISION #1.1

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Esquimalt Graving Dock
5014.81 – 2SSSR-1 Site Acceptance Testing Report

Client:	

REVISION HISTORY				
Revision:	**Prepared By:**	**Reviewed By:**	**Date**	**Comments**
5.0	Brent Hughes		01/12/2018	For Record

Table of Contents

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

DATE: 2017-08-23 **PROJECT #** 5014.81

Attention: Jean Wallace
EECOL Electric
500 Kelvin Road
Victoria, BC Canada

Project: **Esquimalt Graving Dock**
Reference: **25/12SSSR-8_2SSSR-1 Site Acceptance Testing Report**

Dear Jean:

This report documents the factory acceptance testing for the Esquimalt Graving Dock T25/12SSSR-8 power transformer and 2SSSR-1 low voltage switchgear. The testing and verification has been completed to the requirements of the specifications in accordance with the National Electrical Testing Association (NETA).

ITEMS REQUIRING ATTENTION:

- Commissioning has not been completed on the Dock Service Kiosks or the Camlock Connection Boxes. The breakers below must remain locked out open until the downstream equipment has been commissioned by Prime Engineering.:
  - 2SSSR-1-01 DS3-E feeder
  - 2SSSR-1-02 DS3-C feeder
  - 2SSSR-1-03 DS3-W feeder
  - 2SSSR-1-09 DS2-E feeder
  - 2SSSR-1-22 DS2-C feeder
  - 2SSSR-1-25 SSSR North Camlock Connection Box #1 feeder
  - 2SSSR-1-26 SSSR North Camlock Connection Box #2 feeder
  - 2SSSR-1-27 SSSR West Camlock Connection Box #1 feeder
  - 2SSSR-1-28 SSSR West Camlock Connection Box #2 feeder
  - 2SSSR-1-40 DS2-W feeder
  - 2SSSR-1-41 DS1-E feeder
  - 2SSSR-1-42 DS1-C feeder
  - 2SSSR-1-43 DS1-W feeder

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

Thank-you for choosing Prime Engineering Ltd. We hope to work with you again in the near future.

Sincerely,

Brent Hughes, EIT
Project Engineer
prime engineering
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#1-717 Aldebury street
Victoria, BC V9A 5T2
p: (250) 590-8912
c: (250) 893-5213
f: (250) 590-8917
e: brent.hughes@primeeng.ca
www.primeeng.ca

Attachments to this report:
5014.81_2SSSR-1 CT Results_2017_Rev 2.0
5014.81_T2512SSSR-8 CT Results_2017_Rev 2.0

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.1 Transformer Test and Inspection

CIRCUIT ID:	T25/12SSSR-8	PHASES:	3
FEEDS TO:	2SSSR-1	HIGH SIDE VOLTAGE:	12500/25000V
SERIAL #:	1210040910	HIGH SIDE B.I.L.:	95/125KV
TYPE:	ANN/AFF	LOW SIDE VOLTAGE:	120/208V
SIZE:	750/1000 KVA	LOW SIDE B.I.L.:	10KV
PERCENT IMPEDANCE:	5.02%	MANUFACTURER:	JINPAN
TEMPERATURE RISE:	115°C	MFG. DATE:	12.21.2016
CONFIGURATION:	Δ/Y	APARATUS TEMPERATURE:	19°C
TAP POSITION AS FOUND:	C	AMBIENT TEMPERATURE:	19°C

VISUAL INSPECTION AND COMMENTS

	PASS/FAIL/N/A		PASS/FAIL/N/A
CLEANLINESS:	PASS	LIGHTNING ARRESTERS:	NA
INSULATOR CONDITION:	PASS	COOLING AND FILTERS:	PASS
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	C	D	E
HIGH SIDE VOLTAGE:	13125	12813	12500	12188	11875
CALCULATED RATIO:	109.375:1	106.75:1	104.17:1	101.57:1	98.96:1
H 1 H 2 X 0 X 2	109.32:1	106.75:1	104.18:1	101.62:1	99.034:1
EXCITING CURRENT – mA	1	1	1	1	1
H 2 H 3 X 0 X 3	109.31:1	106.76:1	104.18:1	101.61:1	99.032:1
EXCITING CURRENT – mA	2	2	2	2	2
H 1 H 3 X 0 X 1	109.34:1	106.77:1	104.21:1	101.63:1	99.049:1
EXCITING CURRENT – mA	2	2	1	1	1
TAP POSITION	A	B	C	D	E
HIGH SIDE VOLTAGE:	26250	25625	25000	24375	23750
CALCULATED RATIO:	218.75:1	213.54:1	208.33:1	203.13:1	197.92:1
H 1 H 2 X 0 X 2	218.68:1	213.52:1	208.44:1	203.31:1	198.08:1
EXCITING CURRENT – mA	1	1	1	1	1
H 2 H 3 X 0 X 3	218.68:1	213.52:1	208.37:1	203.23:1	198.08:1
EXCITING CURRENT – mA	1	1	1	1	1
H 1 H 3 X 0 X 1	218.73:1	213.58:1	208.44:1	203.30:1	198.14:1
EXCITING CURRENT – mA	1	1	1	1	1

INSULATION RESISTANCE

	HV TO GROUNDED LV	LV TO GROUNDED HV	HV & LV TO GND	CORE - GND
TEST VOLTAGE:	5000VDC	500VDC	500VDC	500VDC
PI/DAR:	3.22/1.58	NA/2.18	NA/2.24	2.94/1.54
INSULATION VALUE:	7.06TΩ	>2.00TΩ	>2.00TΩ	87.5GΩ
TEMPERATURE CORRECTED:	7.06TΩ	>2.00TΩ	>2.00TΩ	87.5GΩ

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

WINDING RESISTANCE														
H	1	H	2	1.441mΩ	H	2	H	3	1.403mΩ	H	1	H	3	1.397mΩ
X	0	X	1	273µΩ	X	0	X	2	274µΩ	X	0	X	3	282µΩ
EQUIPMENT ID														
PE-M-14, PE-D-14, PE-TTR-14														
GENERAL COMMENTS														
PRIME ENGINEERING – REVISION #4.0														

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.2 Cable Hipot Test

MANUFACTURER:	General Cable	MFG. DATE:	2014
CIRCUIT ID:	25/12SSSR-CB-1	FEEDS TO:	T25/12SSSR-8
CABLE TYPE/INSULATION:	Voltalene/Trxple	CONDUCTOR SIZE:	1/0 AWG
TEMPERATURE RATING::	90°C	HUMIDITY - %	70%/19°C
LENGTH:	15M	MAXIMUM TEST VOLTAGE:	31 KVAC @ 0.1Hz
AUTHORIZED BY:	Steve Frachette (Houle)		

VISUAL INSPECTION

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

INSULATION RESISTANCE AT 5000 VDC

LINE A TO GROUND:	457GΩ	LINE A-B WITH C GROUNDED:	789GΩ
LINE B TO GROUND:	409GΩ	LINE B-C WITH A GROUNDED:	669GΩ
LINE C TO GROUND:	502GΩ	LINE C-A WITH B GROUNDED:	701GΩ

VOLTAGE STEP TEST				TIME WITHSTAND TEST			
TIME IN MINUTES	TEST KVAC @ 0.1 Hz	LINE A nF	LINE A µA	LINE B nF	LINE B µA	LINE C nF	LINE C µA
1	31	3.68	72	3.70	72	3.77	73
2	31	3.68	72	3.70	72	3.77	73
3	31	3.68	72	3.70	72	3.77	73
4	31	3.68	72	3.70	72	3.77	73
5	31	3.68	72	3.70	72	3.77	73
6	31	3.68	72	3.70	72	3.77	73
7	31	3.68	72	3.70	72	3.77	73
8	31	3.68	72	3.70	72	3.77	73
9	31	3.68	72	3.70	72	3.77	73
10	31	3.68	72	3.70	72	3.77	73
11	31	3.68	72	3.70	72	3.77	73
12	31	3.68	72	3.70	72	3.77	73
13	31	3.68	72	3.70	72	3.77	73
14	31	3.68	72	3.70	72	3.77	73
15	31	3.68	72	3.70	72	3.77	73

AC INSULATION RESISTANCE @ 0.1 Hz 15 MIN READINGS	LINE A	LINE B	LINE C
	15 GΩ	15 GΩ	14 GΩ

EQUIPMENT ID

PE-VLF-1, PE-M-14

GENERAL COMMENTS

Test performed with all cables not under test connected to ground.

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.3 T25/12SSSR-8 Cable Bus Testing		
DEVICE	TEST	CONDITION
CABLE BUS AØ-GND	1000VDC MEGGER	10.21 GΩ
CABLE BUS BØ-GND	1000VDC MEGGER	12.34 GΩ
CABLE BUS CØ-GND	1000VDC MEGGER	10.17 GΩ
CABLE BUS AØ-BØ	1000VDC MEGGER	21.63 GΩ
CABLE BUS BØ-CØ	1000VDC MEGGER	20.80 GΩ
CABLE BUS CØ-AØ	1000VDC MEGGER	25.96 GΩ

CABLE INFORMATION

TF CABLE 90^{o}C DLO2KV 777MCM
5 CABLES PER PHASE

EQUIPMENT ID

PE-M-14

GENERAL COMMENTS

Cable bus between T25/12SSSR-8 and 2SSSR-1

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4 Switchgear and Switchboard Assemblies – 2SSSR-1

Reference: NETA ATS-2013 Section: 7.1

MANUFACTURER:	**Square D**	MFG. DATE:	**Dec 2016**
EQUIPMENT ID:	**2SSSR-1**	NUMBER OF PHASES/WIRES	**3 Phase/4 Wire**
TYPE:	**LV MCC**	PROTECTION:	**25/12SSSR-8-PR-01**
SERIAL #:	**37939710-011**	FAULT BRACING:	**42 KAIC**
AMPACITY:	**4000 A**	VOLTAGE RATING:	**600/347 VAC**

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed	Pass/Fail	PASS
Verify that fuse and breaker size and types correspond to the drawings and coordination study	Pass/Fail	PASS
Verify transformer ratios correspond to drawings	Pass/Fail	NA
Verify that wiring connections are tight and that wiring is secure to prevent damage during routine operation of moving parts	Pass/Fail	PASS
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer’s data or if absent than use table 100.12	PASS
Verify operation and sequencing of interlocking systems	Pass/Fail	PASS
Verify lubrication on moving part and surfaces	Pass/Fail	PASS
Inspect insulators for evidence of physical damage or contaminated surfaces	Pass/Fail	PASS
Verify correct barrier and shutter installation and operation	Pass/Fail	PASS
Exercise all active components	Pass/Fail	PASS
Inspect mechanical indicating devices for correct operation	Pass/Fail	PASS
Verify that filters are in place and vents are clear	Pass/Fail	NA
Perform visual and mechanical inspection of instrument transformers	Pass/Fail in accordance with section 2.1.3 and section 2.1.4	PASS
Perform visual and mechanical inspection of surge arresters	Pass/Fail in accordance with section 2.1.5	NA
Inspect control power transformers: 1. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring and overall condition 2. Verify that primary and secondary fuse or circuit breaker ratings match drawings 3. Verify correct functionality of draw-out disconnecting contacts, grounding contacts and interlocks	Pass/Fail	NA
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests on each bus section, phase-phase and phase to ground for one minute	Insulation-resistance values should be above manufacturer’s limits or if absent, greater than table 100.1	PASS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

Perform a dielectric withstand voltage test for one minute on each bus section, each phase to ground with phases not under test grounded	In accordance with manufacturer's published data. If manufacturer has no recommendation for the test, it shall be in accordance with table 100.2	PASS
Perform electrical tests on instrument transformers	In accordance with section 2.1.3 and 2.1.4	PASS
Perform ground resistance tests	In accordance with section 2.1.8	PASS
Determine accuracy of all meters and calibrate watthour meters	In accordance with section 2.1.7	PASS
Control power transformers: 1. Perform insulation-resistance tests. Perform measurements from winding-winding and each winding to ground. 2. Perform a turns ratio test on all tap positions	1. Test voltages shall be in accordance with table 100.1 unless otherwise specified by the manufacturer 2. Turns ratio test shall not deviate by more than one-half percent from either adjacent coils or calculated ratio	PASS
Verify correct secondary voltage and wiring by energizing the primary winding with system voltage and measuring secondary voltage at all connected devices	Secondary wiring shall be in accordance with design specifications	PASS
Verify correct function of control transfer relays located in the switchgear	Control transfer relays shall perform as designed	PASS
Verify secondary voltage and wiring of voltage transformers by energizing the primary winding and checking secondary voltage and connected devices	Secondary wiring shall be in accordance with design specifications	PASS
Perform current tests by secondary injection with magnitudes of at least 1 amp and verifying correct magnitude of current and each device in the circuit	Current tests shall prove current wiring in accordance with design specifications	PASS
Perform system function tests	Verify correct operation of all interlocks, fail-safe functions, sensing devices, alarms and indicating devices as per the design requirements	PASS
Verify cubicle switchgear/switchboard space heaters	Heaters shall be operational	NA
Perform phasing checks on double ended or dual source switchgear to insure correct bus phasing form each source	Phasing checks shall prove switchgear phasing is correct and in accordance to design specifications	PASS
Perform electrical tests of surge arresters	In accordance with section 2.1.5	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.1 Low Voltage Switchboard Test and Inspection - 2SSSR-1

MANUFACTURER:	**Square D**	MFG. DATE:	**Dec 2016**
EQUIPMENT ID:	**2SSSR-1**	NUMBER OF PHASES/WIRES	**3 Phase/4 Wire**
TYPE:	**QED**	PROTECTION:	**25/12SSSR-8-PR-01**
SERIAL #:	**37939710-011**	FAULT BRACING:	**42 KAIC**
AMPACITY:	**2000 A**	VOLTAGE RATING:	**600/347 VAC**

CONNECTION TIGHTNESS

Connection	A Phase	B phase	C Phase	Neutral Bus	**Connection**	A Phase	B phase	C Phase	% Deviation
CELL 1-6	45 μΩ	44 μΩ	48 μΩ	50 μΩ					

INSULATION RESISTANCE

TIME:_60sec__ VOLTAGE:_1000VDC_

Phase	Result	Acceptable	Phase	Result	Acceptable
A-GND	2.009GΩ	PASS	A-B	2.575GΩ	PASS
B-GND	1.842GΩ	PASS	B-C	3.170GΩ	PASS
C-GND	1.838GΩ	PASS	A-C	2.918GΩ	PASS
A-N	1.817GΩ	PASS			
B-N	1.989GΩ	PASS			
C-N	2.072GΩ	PASS			

TEST EQUIPMENT ID

PE-M-14, PE-D-14

ENVIRONMENTAL CONDITIONS

GENERAL COMMENTS

INSULATION RESISTANCE TEST COMPLETED WITH ALL BREAKERS CLOSED

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.2 Circuit Breakers, Molded Case, Low Voltage – 2SSSR-1-01

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-01	FEEDS TO:	2DS3-E	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340401	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 1. Low-resistance ohmmeter 2. Calibrated torque wrench	1. Investigate connection values that deviate more than 50% from similar connections 2. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.3 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-01

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-01	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS3-E		
SERIAL #:	3N164340401	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	153 µΩ	156 uΩ	142 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	53.5GΩ	67.4GΩ	51.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	153 µΩ	156 uΩ	142 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.4 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-02

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-02	FEEDS TO:	2DS3-C	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340408	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 3. Low-resistance ohmmeter 4. Calibrated torque wrench	3. Investigate connection values that deviate more than 50% from similar connections 4. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.5 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-02

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-02	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS3-C		
SERIAL #:	3N164340408	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	130 µΩ	146 µΩ	141 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	41.4GΩ	41.7GΩ	47.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	130 µΩ	146 µΩ	141 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.6 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-03

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-03	FEEDS TO:	2DS3-W	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340406	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 5. Low-resistance ohmmeter 6. Calibrated torque wrench	5. Investigate connection values that deviate more than 50% from similar connections 6. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.7 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-03

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-03	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	DS3-W		
SERIAL #:	3N164340406	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	152 µΩ	149 µΩ	138 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	37.71GΩ	52.1GΩ	56.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	152 µΩ	149 µΩ	138 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.8 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-04

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-04	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164110566	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 7. Low-resistance ohmmeter 8. Calibrated torque wrench	7. Investigate connection values that deviate more than 50% from similar connections 8. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.9 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-04

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-04	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164110566	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	161 µΩ	156 µΩ	143 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	40.8GΩ	39.91GΩ	71.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	161 µΩ	156 µΩ	143 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.10 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-05

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-05	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164110565	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 9. Low-resistance ohmmeter 10. Calibrated torque wrench	9. Investigate connection values that deviate more than 50% from similar connections 10. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.11 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-05

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-05	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164110565	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	125 µΩ	114 µΩ	113 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	45.8 GΩ	59.3 GΩ	43.4 GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	125 µΩ	114 µΩ	113 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.12 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-06

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-06	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164110569	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 11. Low-resistance ohmmeter 12. Calibrated torque wrench	11. Investigate connection values that deviate more than 50% from similar connections 12. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.13 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-06

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-06	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164110569	AMPACITY:	400		
TYPE:	PowerPact	FAUΩLT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	123 µΩ	108 µΩ	124 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	74.8GΩ	81.3GΩ	85.6GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	123 µΩ	108 µΩ	124 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.14 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-07

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-07	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164110562	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 13. Low-resistance ohmmeter 14. Calibrated torque wrench	13. Investigate connection values that deviate more than 50% from similar connections 14. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.15 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-07

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-07	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164110562	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	154 µΩ	153 µΩ	120 µΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	54.5GΩ	63.6GΩ	49.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	154 µΩ	153 µΩ	120 µΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.16 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-08

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-08	FEEDS TO:	KIOSK 2	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N135045003	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	150	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 15. Low-resistance ohmmeter 16. Calibrated torque wrench	15. Investigate connection values that deviate more than 50% from similar connections 16. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.17 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-08

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-08	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	KIOSK 2		
SERIAL #:	3N135045003	AMPACITY:	150		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG150	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.724mΩ	0.658mΩ	0.734mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	61.1GΩ	64.4GΩ	58.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.724mΩ	0.658mΩ	0.734mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.18 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-09

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-09	FEEDS TO:	2DS2-E	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164141599	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 17. Low-resistance ohmmeter 18. Calibrated torque wrench	17. Investigate connection values that deviate more than 50% from similar connections 18. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.19 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-09

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-09	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS2-E		
SERIAL #:	3N164141599	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	160 μΩ	144 μΩ	132 μΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	51.5GΩ	53.6GΩ	49.9GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	160 μΩ	144 μΩ	132 μΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.20 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-10

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-10	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045067	STYLE:	JG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 19. Low-resistance ohmmeter 20. Calibrated torque wrench	19. Investigate connection values that deviate more than 50% from similar connections 20. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.21 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-10

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-10	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045067	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	JG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.616mΩ	0.602mΩ	0.727mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	51.5GΩ	53.6GΩ	49.9GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.616mΩ	0.602mΩ	0.727mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.22 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-11

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-11	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045073	STYLE:	JG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 21. Low-resistance ohmmeter 22. Calibrated torque wrench	21. Investigate connection values that deviate more than 50% from similar connections 22. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.23 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-11

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-11	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045073	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	JG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.557mΩ	0.533mΩ	0.661mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	39.87GΩ	31.17GΩ	41.5GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.557mΩ	0.533mΩ	0.661mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.24 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-12

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-12	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045068	STYLE:	JG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 23. Low-resistance ohmmeter 24. Calibrated torque wrench	23. Investigate connection values that deviate more than 50% from similar connections 24. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.25 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-12

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-12	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045068	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	JG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.701mΩ	0.803mΩ	0.669mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	41.1GΩ	43.6GΩ	45.6GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.701mΩ	0.803mΩ	0.669mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.26 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-13

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-13	FEEDS TO:	SOUTH JETTY REC	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045064	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 25. Low-resistance ohmmeter 26. Calibrated torque wrench	25. Investigate connection values that deviate more than 50% from similar connections 26. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.27 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-13

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-13	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY REC		
SERIAL #:	3N164045064	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.819mΩ	0.779mΩ	0.704mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	119.8GΩ	127.1GΩ	113.1GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.819mΩ	0.779mΩ	0.704mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.28 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-14

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-14	FEEDS TO:	SOUTH JETTY LIGHTS	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164545073	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 27. Low-resistance ohmmeter 28. Calibrated torque wrench	27. Investigate connection values that deviate more than 50% from similar connections 28. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.29 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-14

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-14	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY LIGHTS		
SERIAL #:	3N164545073	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.810mΩ	0.815mΩ	0.867mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	113.9GΩ	147.4GΩ	133.1GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.810mΩ	0.815mΩ	0.867mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.30 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-15

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-15	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045066	STYLE:	JG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 29. Low-resistance ohmmeter 30. Calibrated torque wrench	29. Investigate connection values that deviate more than 50% from similar connections 30. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.31 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-15

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-15	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	33N164045066	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	JG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.014mΩ	1.217mΩ	1.101mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	125.6GΩ	101.1GΩ	97.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.014mΩ	1.217mΩ	1.101mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

_1.4.32_ Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-16

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-16	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045072	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 31. Low-resistance ohmmeter 32. Calibrated torque wrench	31. Investigate connection values that deviate more than 50% from similar connections 32. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.33 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-16

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-16	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045072	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.491mΩ	0.394mΩ	0.499mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	43.6GΩ	44.GΩ	40.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.491mΩ	0.394mΩ	0.499mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.34 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-17

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-17	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045065	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 33. Low-resistance ohmmeter 34. Calibrated torque wrench	33. Investigate connection values that deviate more than 50% from similar connections 34. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.35 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-17

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-17	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045065	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.616mΩ	0.479mΩ	0.661mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	39.11GΩ	36.31GΩ	41.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.616mΩ	0.479mΩ	0.661mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

_1.4.36_ Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-18

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-18	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045082	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 35. Low-resistance ohmmeter 36. Calibrated torque wrench	35. Investigate connection values that deviate more than 50% from similar connections 36. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.37 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-18

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-18	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045082	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.601mΩ	0.479mΩ	0.661mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	33.32GΩ	34.41GΩ	37.77GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.601mΩ	0.479mΩ	0.661mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.38 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-19

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-19	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164045072	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	250	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 37. Low-resistance ohmmeter 38. Calibrated torque wrench	37. Investigate connection values that deviate more than 50% from similar connections 38. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.39 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-19

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-19	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164045072	AMPACITY:	250		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.519mΩ	0.437mΩ	0.480mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	43.3GΩ	44.5GΩ	46.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.519mΩ	0.437mΩ	0.480mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.40 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-20

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-20	FEEDS TO:	KIOSK 3	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N135045012	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	150	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 39. Low-resistance ohmmeter 40. Calibrated torque wrench	39. Investigate connection values that deviate more than 50% from similar connections 40. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.41 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-20

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-20	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	KIOSK 3		
SERIAL #:	3N135045012	AMPACITY:	150		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.862mΩ	0.901mΩ	0.897mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	4TΩ	4TΩ	4TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.862mΩ	0.901mΩ	0.897mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.42 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-21

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-21	FEEDS TO:	PNL 2T	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N135045010	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	150	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 41. Low-resistance ohmmeter 42. Calibrated torque wrench	41. Investigate connection values that deviate more than 50% from similar connections 42. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.43 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-21

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-21	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	PNL 2T		
SERIAL #:	3N135045010	AMPACITY:	150		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.801mΩ	0.910mΩ	0.815mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	4TΩ	4TΩ	4TΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.801mΩ	0.910mΩ	0.815mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.44 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-22

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-22	FEEDS TO:	2DS2-C	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165010668	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 43. Low-resistance ohmmeter 44. Calibrated torque wrench	43. Investigate connection values that deviate more than 50% from similar connections 44. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.45 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-22

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-22	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS2-C		
SERIAL #:	3N165010668	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.132mΩ	0.123mΩ	0.117mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	50.9GΩ	47.7GΩ	50.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.132mΩ	0.123mΩ	0.117mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.46 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-23

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-23	FEEDS TO:	SOUTH JETTY 4	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165010466	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 45. Low-resistance ohmmeter 46. Calibrated torque wrench	45. Investigate connection values that deviate more than 50% from similar connections 46. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.47 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-23

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-23	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 4		
SERIAL #:	3N165010466	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.154mΩ	0.128mΩ	0.119mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	75.6GΩ	71.9GΩ	73.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.154mΩ	0.128mΩ	0.119mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.48 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-24

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-24	FEEDS TO:	SOUTH JETTY 5	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340407	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 47. Low-resistance ohmmeter 48. Calibrated torque wrench	47. Investigate connection values that deviate more than 50% from similar connections 48. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.49 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-24

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-24	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 5		
SERIAL #:	3N164340407	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.151mΩ	0.131mΩ	0.121mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	69.9GΩ	70.4GΩ	59.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.151mΩ	0.131mΩ	0.121mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.50 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-25

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-25	FEEDS TO:	SSSR N CAMLOCK 1	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164141600	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 49. Low-resistance ohmmeter 50. Calibrated torque wrench	49. Investigate connection values that deviate more than 50% from similar connections 50. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.51 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-25

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-25	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SSSR N CAMLOCK 1		
SERIAL #:	3N164141600	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.155mΩ	0.146mΩ	0.129mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	93.8GΩ	95.6GΩ	94.0GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.155mΩ	0.146mΩ	0.129mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.52 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-26

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-26	FEEDS TO:	SSSR N CAMLOCK 2	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340402	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 51. Low-resistance ohmmeter 52. Calibrated torque wrench	51. Investigate connection values that deviate more than 50% from similar connections 52. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.53 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-26

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-26	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SSSR N CAMLOCK 2		
SERIAL #:	3N164340402	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.141mΩ	0.154mΩ	0.123mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	107.1GΩ	97.3GΩ	97.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.141mΩ	0.154mΩ	0.123mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.54 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-27

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-27	FEEDS TO:	SSSR W CAMLOCK 1	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164141605	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 53. Low-resistance ohmmeter 54. Calibrated torque wrench	53. Investigate connection values that deviate more than 50% from similar connections 54. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS	
April 2016	PRIME ENGINEERING – REVISION #1.1

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.55 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-27

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-27	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SSSR W CAMLOCK 1		
SERIAL #:	3N164141605	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.142mΩ	0.148mΩ	0.117mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	103.8GΩ	105.6GΩ	124.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.142mΩ	0.148mΩ	0.117mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.56 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-28

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-28	FEEDS TO:	SSSR W CAMLOCK 2	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165010471	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 55. Low-resistance ohmmeter 56. Calibrated torque wrench	55. Investigate connection values that deviate more than 50% from similar connections 56. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.57 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-28

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-28	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SSSR W CAMLOCK 2		
SERIAL #:	3N165010471	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.143mΩ	0.147mΩ	0.119mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	106.5GΩ	111.6GΩ	120.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.143mΩ	0.147mΩ	0.119mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.58 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-29

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-29	FEEDS TO:	KIOSK-1	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165010470	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 57. Low-resistance ohmmeter 58. Calibrated torque wrench	57. Investigate connection values that deviate more than 50% from similar connections 58. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.59 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-29

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-29	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	KIOSK-1		
SERIAL #:	3N165010470	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.150mΩ	0.151mΩ	0.123mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	117.3GΩ	118.0GΩ	117.6GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.150mΩ	0.151mΩ	0.123mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.60 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-30

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-30	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164535131	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 59. Low-resistance ohmmeter 60. Calibrated torque wrench	59. Investigate connection values that deviate more than 50% from similar connections 60. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.61 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-30

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-30	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164535131	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.909mΩ	0.777mΩ	0.901mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	75.1GΩ	115.5GΩ	114.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.909mΩ	0.777mΩ	0.901mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.62 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-31

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-31	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555075	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 61. Low-resistance ohmmeter 62. Calibrated torque wrench	61. Investigate connection values that deviate more than 50% from similar connections 62. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.63 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-31

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-31	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555075	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.777mΩ	0.813mΩ	0.773mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	264.8GΩ	312.4GΩ	292.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.777mΩ	0.813mΩ	0.773mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.64 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-32

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-32	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555083	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 63. Low-resistance ohmmeter 64. Calibrated torque wrench	63. Investigate connection values that deviate more than 50% from similar connections 64. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.65 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-32

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-32	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555083	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.691mΩ	0.664mΩ	0.814mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	298.3GΩ	313.7GΩ	299.2GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.691mΩ	0.664mΩ	0.814mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

_1.4.66_ Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-33

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-33	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164535130	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 65. Low-resistance ohmmeter 66. Calibrated torque wrench	65. Investigate connection values that deviate more than 50% from similar connections 66. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.67 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-33

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-33	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164535130	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.883mΩ	0.901mΩ	0.911mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	259.9GΩ	287.8GΩ	307.2GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.883mΩ	0.901mΩ	0.911mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.68 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-34

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-34	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555074	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 67. Low-resistance ohmmeter 68. Calibrated torque wrench	67. Investigate connection values that deviate more than 50% from similar connections 68. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.69 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-34

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-34	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555074	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.054mΩ	1.113mΩ	1.414mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	294.4GΩ	332.0GΩ	209.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.054mΩ	1.113mΩ	1.414mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.70 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-35

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-35	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555078	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 69. Low-resistance ohmmeter 70. Calibrated torque wrench	69. Investigate connection values that deviate more than 50% from similar connections 70. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.71 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-35

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-35	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555078	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.963mΩ	0.925mΩ	0.980mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	152.3GΩ	200.6GΩ	233.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.963mΩ	0.925mΩ	0.980mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.72 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-36

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-36	FEEDS TO:	KIOSK #1	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165552511	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 71. Low-resistance ohmmeter 72. Calibrated torque wrench	71. Investigate connection values that deviate more than 50% from similar connections 72. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.73 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-36

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-36	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	KIOSK #1		
SERIAL #:	3N165552511	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.991mΩ	0.976mΩ	0.981mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	190.9GΩ	183.4GΩ	177.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.991mΩ	0.976mΩ	0.981mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.74 Circuit Breakers, Molded Case, Low Voltage - - 2SSSR-1-37

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-37	FEEDS TO:	SOUTH JETTY 1	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165010465	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 73. Low-resistance ohmmeter 74. Calibrated torque wrench	73. Investigate connection values that deviate more than 50% from similar connections 74. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.75 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-37

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-37	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 1		
SERIAL #:	3N165010465	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.154mΩ	0.158mΩ	0.161mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	60.7GΩ	77.7GΩ	81.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.154mΩ	0.158mΩ	0.161mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.76 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-38

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-38	FEEDS TO:	SOUTH JETTY 2	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164141601	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 75. Low-resistance ohmmeter 76. Calibrated torque wrench	75. Investigate connection values that deviate more than 50% from similar connections 76. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.77 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-38

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-38	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 2		
SERIAL #:	3N164141601	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.173mΩ	0.143mΩ	0.147mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	113.7GΩ	111.6GΩ	116.2GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.173mΩ	0.143mΩ	0.147mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.78 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-39

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-39	FEEDS TO:	SOUTH JETTY 3	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164141610	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 77. Low-resistance ohmmeter 78. Calibrated torque wrench	77. Investigate connection values that deviate more than 50% from similar connections 78. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.79 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-39

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-39	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	SOUTH JETTY 3		
SERIAL #:	3N164141610	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.160mΩ	0.148mΩ	0.150mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	119.9GΩ	107.5GΩ	149.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.160mΩ	0.148mΩ	0.150mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.80 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-40

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-40	FEEDS TO:	2DS2-W	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340399	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 79. Low-resistance ohmmeter 80. Calibrated torque wrench	79. Investigate connection values that deviate more than 50% from similar connections 80. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.81 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-40

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-40	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS2-W		
SERIAL #:	3N164340399	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.152mΩ	0.142mΩ	0.137mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	130.2GΩ	118.8GΩ	134.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.152mΩ	0.142mΩ	0.137mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.82 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-41

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-41	FEEDS TO:	2DS1-E	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340400	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 81. Low-resistance ohmmeter 82. Calibrated torque wrench	81. Investigate connection values that deviate more than 50% from similar connections 82. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.83 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-41

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-41	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS1-E		
SERIAL #:	3N164340400	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.170mΩ	0.169mΩ	0.133mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	135.2GΩ	107.7GΩ	108.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.170mΩ	0.169mΩ	0.133mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

***1.4.84* Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-42** Reference: NETA ATS-2013 Section: 7.6.1					
CIRCUIT ID:	2SSSR-1-42	FEEDS TO:	2DS1-C	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164340409	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 83. Low-resistance ohmmeter 84. Calibrated torque wrench	83. Investigate connection values that deviate more than 50% from similar connections 84. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.85 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-42

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-42	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS1-C		
SERIAL #:	3N164340409	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.156mΩ	0.142mΩ	0.145mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	152.9GΩ	183.6GΩ	166.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.156mΩ	0.142mΩ	0.145mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.86 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-43

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-43	FEEDS TO:	2DS1-W	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N165010467	STYLE:	LG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	400	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 85. Low-resistance ohmmeter 86. Calibrated torque wrench	85. Investigate connection values that deviate more than 50% from similar connections 86. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.87 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-43

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-43	PROTECTION:	Micrologic 6.3E
MFG DATE:	2016	FEEDS TO:	2DS1-W		
SERIAL #:	3N165010467	AMPACITY:	400		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	LG400	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.168mΩ	0.181mΩ	0.155mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	162.2GΩ	164.9GΩ	177.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.168mΩ	0.181mΩ	0.155mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.88 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-44

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-44	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164525110	STYLE:	HL	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 87. Low-resistance ohmmeter 88. Calibrated torque wrench	87. Investigate connection values that deviate more than 50% from similar connections 88. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.89 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-44

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-44	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164525110	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HL	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.945mΩ	0.879mΩ	0.909mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	140.6GΩ	141.6GΩ	133.8GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.945mΩ	0.879mΩ	0.909mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.90 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-45

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-45	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555082	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 89. Low-resistance ohmmeter 90. Calibrated torque wrench	89. Investigate connection values that deviate more than 50% from similar connections 90. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.91 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-45

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-45	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555082	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.923mΩ	0.900mΩ	0.871mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	344.4GΩ	328.9GΩ	339.0GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.923mΩ	0.900mΩ	0.871mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.92 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-46

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-46	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555068	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 91. Low-resistance ohmmeter 92. Calibrated torque wrench	91. Investigate connection values that deviate more than 50% from similar connections 92. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.93 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-46

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-46	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555068	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.946mΩ	0.742mΩ	0.882mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	332.9GΩ	459GΩ	324.9GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.946mΩ	0.742mΩ	0.882mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.94 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-47

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-47	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	HGA36150U54X EH	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	150	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 93. Low-resistance ohmmeter 94. Calibrated torque wrench	93. Investigate connection values that deviate more than 50% from similar connections 94. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.95 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-47

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-47	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	HGA36150U54XEH	AMPACITY:	150		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.910mΩ	0.801mΩ	0.667mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	361.1GΩ	226.4GΩ	345.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.910mΩ	0.801mΩ	0.667mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.96 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-48

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-48	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164555072	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	100	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 95. Low-resistance ohmmeter 96. Calibrated torque wrench	95. Investigate connection values that deviate more than 50% from similar connections 96. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.97 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-48

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-48	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164555072	AMPACITY:	100		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.667mΩ	0.798mΩ	0.852mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	357.6GΩ	331.0GΩ	355.7GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.667mΩ	0.798mΩ	0.852mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.98 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-49

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-49	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164540533	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 97. Low-resistance ohmmeter 98. Calibrated torque wrench	97. Investigate connection values that deviate more than 50% from similar connections 98. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.99 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-49

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-49	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N1645405033	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.977mΩ	0.902mΩ	0.991mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	382.1GΩ	265.4GΩ	355.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.977mΩ	0.902mΩ	0.991mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.100 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-50

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-50	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N1645450A0	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 99. Low-resistance ohmmeter 100. Calibrated torque wrench	99. Investigate connection values that deviate more than 50% from similar connections 100. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.101 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-50

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-50	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N1645450A0	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.992mΩ	0.877mΩ	0.916mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	351.9GΩ	374.7GΩ	358.9GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.992mΩ	0.877mΩ	0.916mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.102 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-51

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-51	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164545036	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 101. Low-resistance ohmmeter 102. Calibrated torque wrench	101. Investigate connection values that deviate more than 50% from similar connections 102. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

April 2016	PRIME ENGINEERING – REVISION #1.1

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.103 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-51

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-51	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164545036	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.922mΩ	0.944mΩ	0.991mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	352.9GΩ	342.5GΩ	391.2GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.922mΩ	0.944mΩ	0.991mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.104 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-52

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-52	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164525121	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer’s data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer’s data	PASS
Inspect bolted electrical connections for high resistance using either: 103. Low-resistance ohmmeter 104. Calibrated torque wrench	103. Investigate connection values that deviate more than 50% from similar connections 104. Torqued to manufacturer’s data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer’s data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer’s data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.105 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-52

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-52	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164525121	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	1.090mΩ	1.129mΩ	0.989mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	327.1GΩ	413GΩ	266.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	1.090mΩ	1.129mΩ	0.989mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.106 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-53

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-53	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164545305	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 105. Low-resistance ohmmeter 106. Calibrated torque wrench	105. Investigate connection values that deviate more than 50% from similar connections 106. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.107 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-53

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-53	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164545305	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.809mΩ	0.845mΩ	0.900mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	287.4GΩ	386.6GΩ	341.4GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.809mΩ	0.845mΩ	0.900mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.108 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-54

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-54	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164545042	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 107. Low-resistance ohmmeter 108. Calibrated torque wrench	107. Investigate connection values that deviate more than 50% from similar connections 108. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

info@primeeng.ca | Office: 250.590.8912 | Fax: 250.590.8917 | 1-717 Aldebury St. Victoria, BC V9A 5T2

SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.109 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-54

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-54	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164545042	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.902mΩ	0.945mΩ	0.889mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	351.3GΩ	364.3GΩ	370.3GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.902mΩ	0.945mΩ	0.889mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock		LOCATION:	SSSR
CLIENT:	EECOL		DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:		5014.81

1.4.110 Circuit Breakers, Molded Case, Low Voltage - 2SSSR-1-55

Reference: NETA ATS-2013 Section: 7.6.1

CIRCUIT ID:	2SSSR-1-55	FEEDS TO:	SPARE	MANUFACTURER:	Square D
MFG DATE:	2016	TYPE:	PowerPact	INTERRUPTING CAPACITY:	65KA
SERIAL #:	3N164525116	STYLE:	HG	CONTROL VOLTAGE:	24 VDC
INTERLOCK KEY #:	NA	RATED CURRENT:	60	OPERATION COUNTER:	N/A
B.I.L.:	65 KA			RATED VOLTAGE:	600V

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect physical and mechanical condition	Pass/Fail	PASS
Inspect anchorage, alignment, grounding and required area clearances	Pass/Fail	PASS
Verify the unit is clean	Pass/Fail	PASS
Operate the circuit breaker to insure smooth operation	Pass/fail	PASS
Perform all mechanical operation tests on the operating mechanism	In accordance with manufacturer's data	PASS
Inspect operating mechanism, contacts and arc chutes	In accordance with manufacturer's data	PASS
Inspect bolted electrical connections for high resistance using either: 109. Low-resistance ohmmeter 110. Calibrated torque wrench	109. Investigate connection values that deviate more than 50% from similar connections 110. Torqued to manufacturer's data or if absent than use table 100.12	PASS
Set protective devices in accordance with the coordination study	Pass/Fail	PASS
Perform resistance measurements through bolted connections with a low-resistance ohmmeter if applicable	Investigate connection values that deviate more than 50% from similar connections	PASS
Perform insulation-resistance tests for one minute on each pole, pole to ground and pole to pole with the breaker closed and across each open pole	Insulation-resistance values should be above manufacturers limits or if absent, greater than table 100.1	PASS
Perform a contact resistance test	In accordance with manufacturer's data, or if absent investigate any results that deviate more than 50% from adjacent poles or similar breakers	PASS
Perform insulation resistance tests for one minute on each pole, PH-PH and PH-GRD with circuit breaker closed and across each open pole	In accordance with manufacturer's data or if absent refer to table 100.1	PASS
Verify correct operation of any auxiliary features such as electrical close or trips	Pass/Fail	PASS
Trip breaker by operation of each protective devices and reset all trip logs and indicators	Pass/Fail	PASS
Test LT, ST and GRD trip unit settings	Pass/Fail	PASS
Verify operation of charging mechanism	Pass/Fail	NA

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.111 Low Voltage Power/Molded Case Circuit Breaker Test and Inspection - 2SSSR-1-55

MANUFACTURER:	Square D	CIRCUIT ID:	2SSSR-1-55	PROTECTION:	Micrologic 6.2E
MFG DATE:	2016	FEEDS TO:	SPARE		
SERIAL #:	3N164525116	AMPACITY:	60		
TYPE:	PowerPact	FAULT BRACING:	65KA		
STYLE:	HG	VOLTAGE RATING:	600V		

BOLTED CONNECTION RESISTANCE TESTING

(WITH BREAKER CONTACTS CLOSED)	LINE A	LINE B	LINE C
MEASURED CONNECTION RESISTANCE:	0.977mΩ	0.798mΩ	0.844mΩ

INSULATION RESISTANCE TESTING

1 MINUTE PER TEST	TEST VOLTAGE	LINE A	LINE B	LINE C
PHASE TO PHASE:	1000 VDC	2.575GΩ	3.170GΩ	2.918GΩ
PHASE TO GROUND:	1000 VDC	2.009GΩ	1.842GΩ	1.838GΩ
ACROSS CONTACTS:	1000 VDC	325.8GΩ	350.1GΩ	358.5GΩ

CONTACT/POLE RESISTANCE TESTING

CONTACT TESTING	LINE A	LINE B	LINE C
CONTACT/POLE RESISTANCE:	0.977mΩ	0.798mΩ	0.844mΩ

BREAKER OPERATOR AND CONTROLS TEST

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

EQUIPMENT ID

PE-M-14, PE-D-14, PE-RTS-06

GENERAL COMMENTS

SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.112 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-01

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-01**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.88**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.113 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-02

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-02**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.89**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.114 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-03

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-03**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.90**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
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TECHNICIAN:	CL		JOB:	5014.81

1.4.115 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-04

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-04**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.91**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.116 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-05

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-05**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.92**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.117 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-06

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-06**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.93**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.118 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-07
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-07**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.94**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.119 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-08

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-08**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.95**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.120 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-09
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-09**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.96**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.121 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-10

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-10**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.97**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.122 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-11
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-11**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.98**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS	
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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.123 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-12

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-12**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.99**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.124 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-15

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-15**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.100**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.125 Metering Devices, Microprocessor-Based- 2SSSR-1-MET-16
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-16**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.101**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
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1.4.126 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-17

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-17**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.102**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.127 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-18

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-18**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.103**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
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TECHNICIAN:	CL		JOB:	5014.81

1.4.128 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-19

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-19**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.104**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
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1.4.129 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-20 Reference: NETA ATS-2013 Section: 7.11.2			
MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-20**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.105**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.130 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-22

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-22**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.106**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
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1.4.131 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-23
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-23**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.107**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.132 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-24
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-24**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.108**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.133 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-25
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-25**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.109**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
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TECHNICIAN:	CL		JOB:	5014.81

1.4.134 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-26

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-26**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.110**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.135 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-27

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-27**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.111**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.136 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-28

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-28**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.112**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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1.4.137 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-29
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-29**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.113**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.138 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-37
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-37**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.114**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.139 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-38

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-38**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.115**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.140 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-39
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-39**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.116**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.141 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-40
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-40**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.117**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:		SSSR
CLIENT:	EECOL	DATE:		June 20, 2017
TECHNICIAN:	CL		JOB:	5014.81

1.4.142 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-41

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-41**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.118**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.143 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-42
Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-42**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.119**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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SITE:	Esquimalt Graving Dock	LOCATION:	SSSR
CLIENT:	EECOL	DATE:	June 20, 2017
TECHNICIAN:	CL	JOB:	5014.81

1.4.144 Metering Devices, Microprocessor-Based - 2SSSR-1-MET-43

Reference: NETA ATS-2013 Section: 7.11.2

MANUFACTURER:	**Schneider Electric**	MFG. DATE:	**2016**
CIRCUIT ID:	**2SSSR-1-MET-43**	MODEL:	**PowerLogic**
RELAY TYPE:	**PM8000**	SERIAL #:	
PASSWORD FIELD:	**0000**	BAUD RATE/IP ADDRESS FIELD:	**10.1.4.120**
SOFTWARE REVISION:	**NA**	RATED CONTROL VOLTAGE:	**125 VDC**
FIRMWARE REVISION:	**001.002.014**		

Test and/or Inspection	Acceptable Results	Result
Compare equipment nameplate data with drawings and specifications	Pass/Fail	PASS
Inspect meters and cases for physical damage	Pass/Fail	PASS
Clean front panel and remove shipping restraint material	Pass/Fail	PASS
Verify tightness of electrical connections	Pass/Fail	PASS
Record model #, style #, serial #, firmware revision, software revision and rated control voltage	Pass/Fail	PASS
Verify operation of display and indicating devices	Pass/Fail	PASS
Record passwords	Pass/Fail	PASS
Verify unit is grounded in accordance with manufacturer's instructions	Pass/Fail	PASS
Verify unit is connected in accordance with manufacturer's instruction and the drawings	Pass/Fail	PASS
Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements	Pass/Fail	PASS
Apply voltage to each applicable analog input and verify correct measurement and indication	Pass/Fail	NA
Confirm operation and setting of each auxiliary input/output feature	Pass/Fail	PASS
After in service, check proper metering	Pass/Fail	PASS

GENERAL COMMENTS

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APPENDIX B

REFERENCE DRAWINGS BOUND WITH THE SPECIFICATION

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

Site Plans
- G00 - Overall Site Plan – Servicing and Infrastructure Drawings, Rev 4
- 1001 – Plan & Profile Station 3+10 To Station 4+40, Rev 5
- 1002 – Plan & Profile Station 2+30 To Station 3+20, Rev 5
- 1003 – Plan & Profile Station 1+40 to Station 2+30, Rev 5

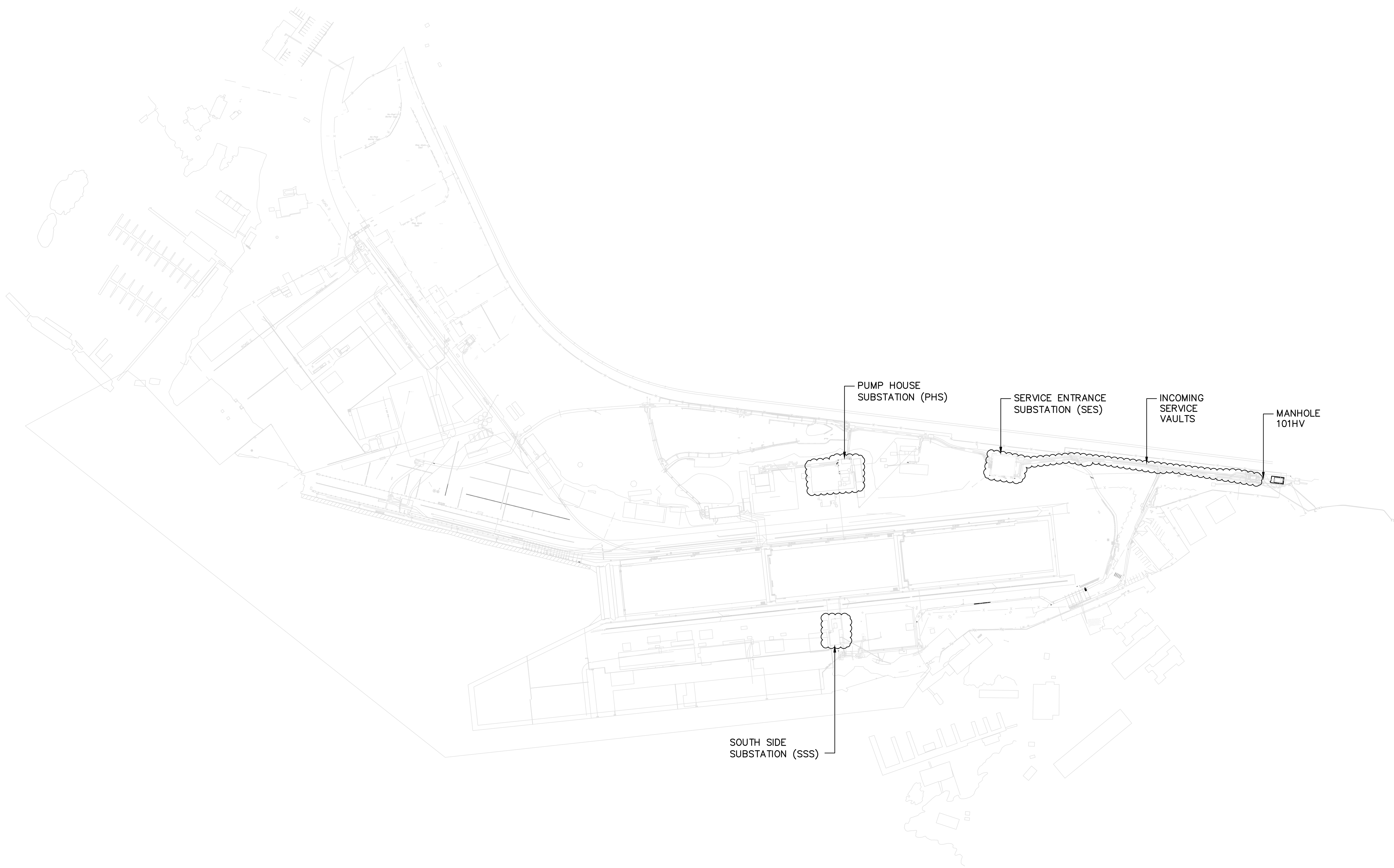
SES
- SES-10-00 – Service Entrance Substation MV Single Line Diagram, Rev 5
- SES-10-01 – Service entrance Substation LV Single Line Diagram, Rev 5
- SES-11-01 – Service Entrance Substation MV Protection Single Line Diagram (1 of 5), Rev 5
- SES-11-02 – Service Entrance Substation MV Protection Single Line Diagram (2 of 5), Rev 5
- SES-11-03 – Service Entrance Substation MV Protection Single Line Diagram (3 of 5), Rev 5
- SES-11-04 – Service Entrance Substation MV Protection Single Line Diagram (4 of 5), Rev 5
- SES-11-05 – Service Entrance Substation MV Protection Single Line Diagram (5 of 5), Rev 5

PHS
- PHS-10-00 – Pumphouse Substation MV Single Line Diagram (1 of 3), Rev 5
- PHS-10-01 – Pumphouse Substation MV Single Line Diagram (2 of 3), Rev 5
- PHS-10-02 – Pumphouse Substation MV Single Line Diagram (3 of 3), Rev 5

- PHS-10-03 – Pumphouse Substation LV Single Line Diagram, Rev 5
- PHS-11-00 – 25/12 PHS Protection Single Line Diagram, Rev 5
- PHS-11-01 – 2.4PHS Protection Single Line Diagram, Rev 5
- PHS-11-03 – 2.4PHS – MCC1 Protection Single Line Diagram (1 of 2), Rev 5
- PHS-11-04 – 2.4PHS – MCC1 Protection Single Line Diagram (2 of 2), Rev 5
- PHS-11-05 – 2.4PHS – MCC2 Protection Single Line Diagram (1 of 2), Rev 5
- PHS-11-06 – 2.4PHS – MCC2 Protection Single Line Diagram (2 of 2), Rev 5

SSS

- SSSR-10-00 – 25/12SSSR Single Line Diagram, Rev 5
- SSSR-10-01 – 2.4SSSR Single Line Diagram, Rev 5
- SSSR-10-02 – 4SSSR-1 and 4SSSR-2 Single Line Diagram, Rev 5
- SSSR-10-03 – 6SSSR-1 Single Line Diagram, Rev 53
- SSSR-11-00 – 25/12SSSR HV Protection Single Line Diagram (1 of 3), Rev 5
- SSSR-11-01 – 25/12SSSR HV Protection Single Line Diagram (2 of 3), Rev 5
- SSSR-11-02 – 25/12SSSR HV Protection Single Line Diagram (3 of 3), Rev 5
- SSSR-11-03 – 2.4SSSR HV Protection Single Line Diagram, Rev 5
- SSSR-13-00 – T25/12SSSR-10 Tap Changer Interlocking Diagram



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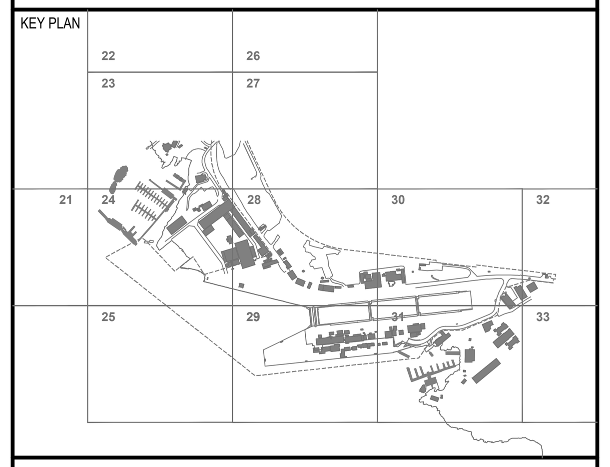
KEY PLAN



Revision/ Revision	Description/Description	Date/Date
5		
4	By WSP: Base Map Update	19/07/31
3	By Turkan: Base Map stage 3 revisions	13/03/31
2	By Turkan: Base Map stage 2 revisions	12/08/22
1	By Turkan: Base Map stage 1 revisions	12/07/16
0	Base Map Compilation	12/03/31

Client/client

ESQUIMALT GRAVING DOCK

825 ADMIRAL ROAD
VICTORIA, BC, V9A 2P1

Project title/Titre du projet

ESQUIMALT, BC
825 ADMIRALS ROAD

ESQUIMALT GRAVING DOCK BASE MAP

Consultant Signature Box Only
-

Designed by/Concept par

Approved by/Approuvée par

Drawn by/Dessine par
WSP

PWGSC Project Manager/Administrateur de Projets TPSGC

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

Drawing title/Titre du dessin

OVERALL SITE PLAN

SERVICING AND INFRASTRUCTURE DRAWINGS

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
GMD	G00 OF	4

PWGSC – B1 – 1000X707

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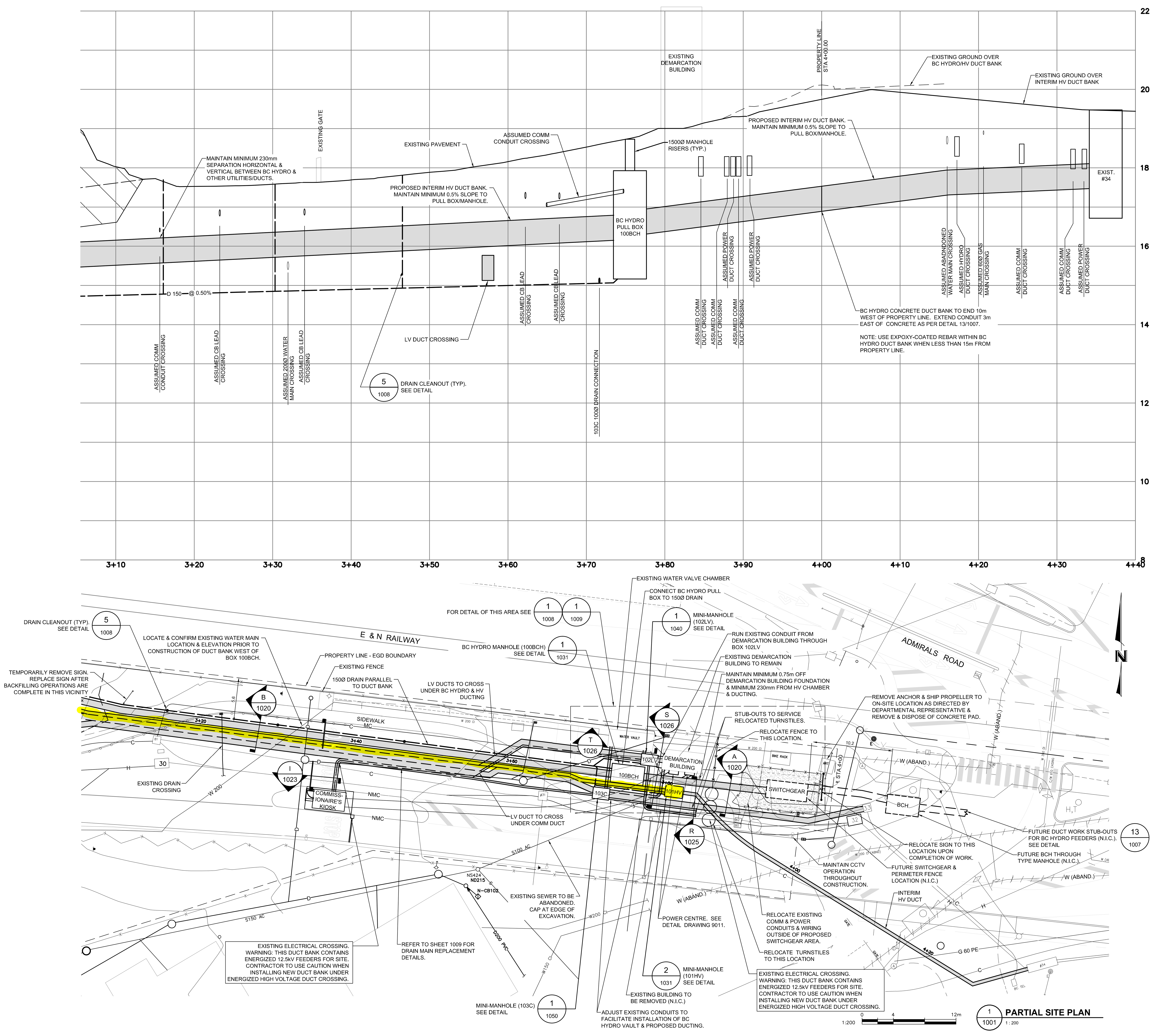

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Region de Pacifique

WESTBROOK Consulting Ltd.

KEYPLAN

PROJECT NORTH

BASE DRAWING DATA PROVIDED BY GOLDER ASSOCIATES LTD., TURKAN CONSULTING ENGINEERS INC. AND FIRST TEAM CONSULTING LTD. DRAWING COORDINATES ARE LOCAL BASED ON UTM NAD 83, ZONE 10.
ALL DISTANCES ARE GROUND LEVEL AND ELEVATIONS ARE GEODETIC.
UTM SCALE CONVERSION FACTOR 0.9996147574

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND SERVICES ON THIS DRAWING MAY NOT BE ACCURATE OR COMPLETE. THE ACTUAL HORIZONTAL AND VERTICAL LOCATIONS MUST BE CONFIRMED BY UTILITY COMPANIES AND THE CONTRACTOR PRIOR TO THE TO THE START OF ANY EXCAVATIONS.

Revision/Revision	Description/Description	Date/Date
5	ISSUED FOR TENDER	OCT 2, 2013
4	ISSUED FOR 100% CD REVIEW	AUG 13, 2013
3	99% DESIGN DEVELOPMENT	JUL 8, 2013
2	66% DESIGN DEVELOPMENT	MAY 27, 2013
1	33% DESIGN DEVELOPMENT	MAY 6, 2013
0	SCHEMATIC DESIGN	

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

SERVICE ENTRANCE SUBSTATION (SES) & PUMPHOUSE SUBSTATION (PHS)

Consultant Signature Box Only

Designed by/Concept par

Drawn by/Dessine par

PWGSC Project Manager/Administrateur de Projets TPSGC

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

Drawing title/Titre du dessin
PLAN & PROFILE STATION 3+10 TO STATION 4+40

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
R.018739.001	1001	5

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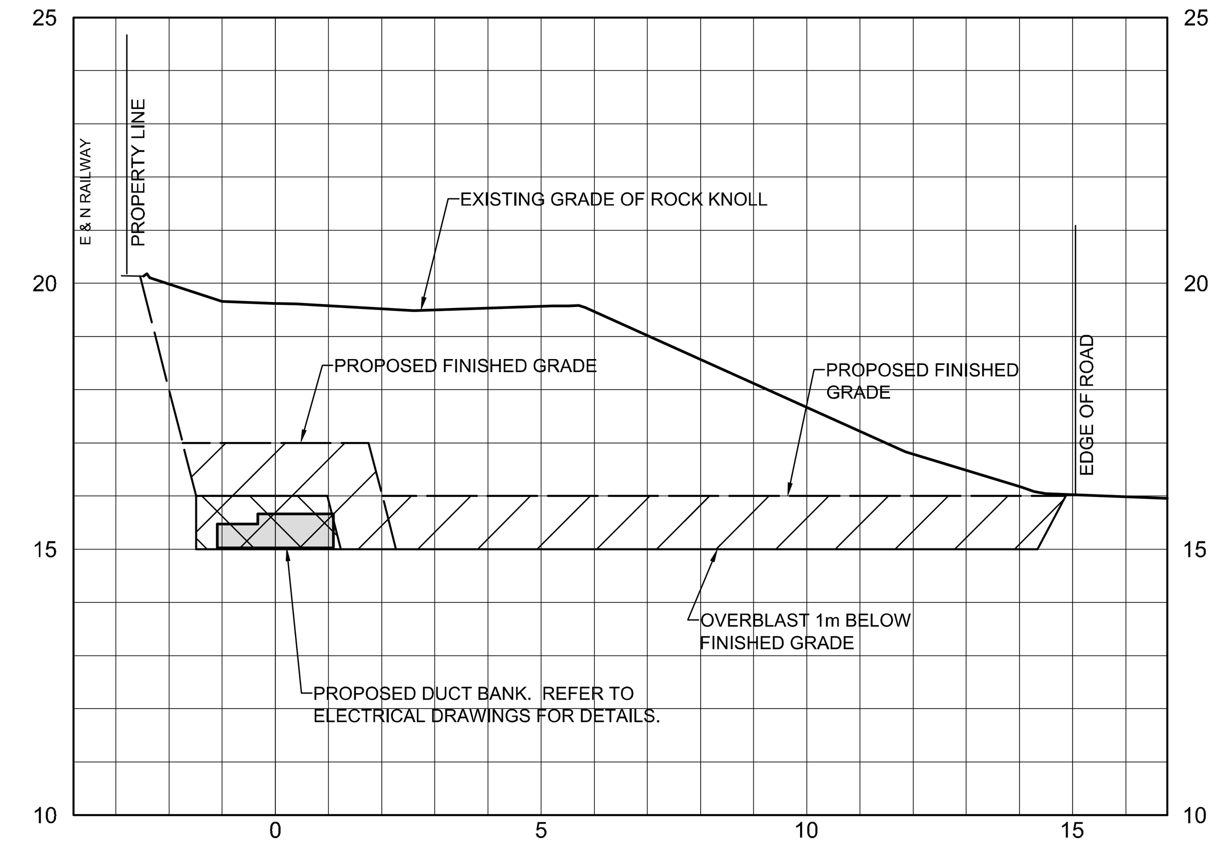

1 / 1002 **SECTION AT STATION 2+62**
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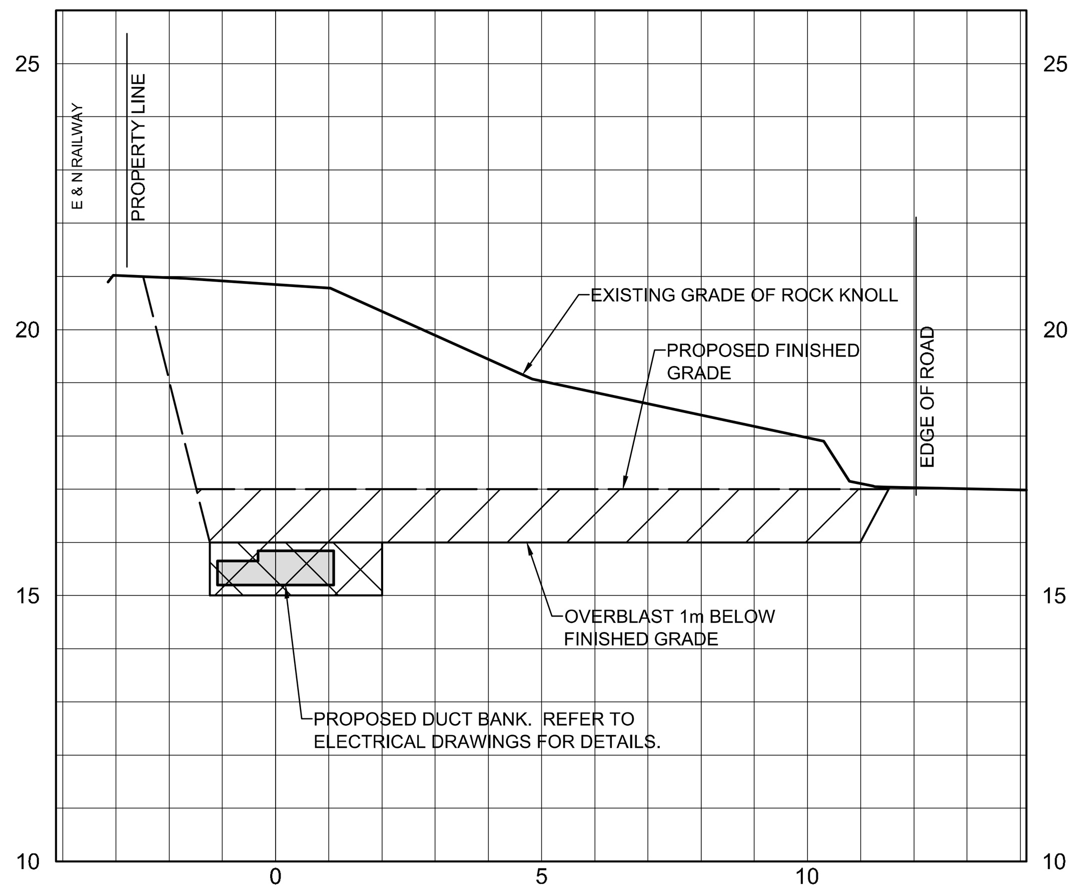

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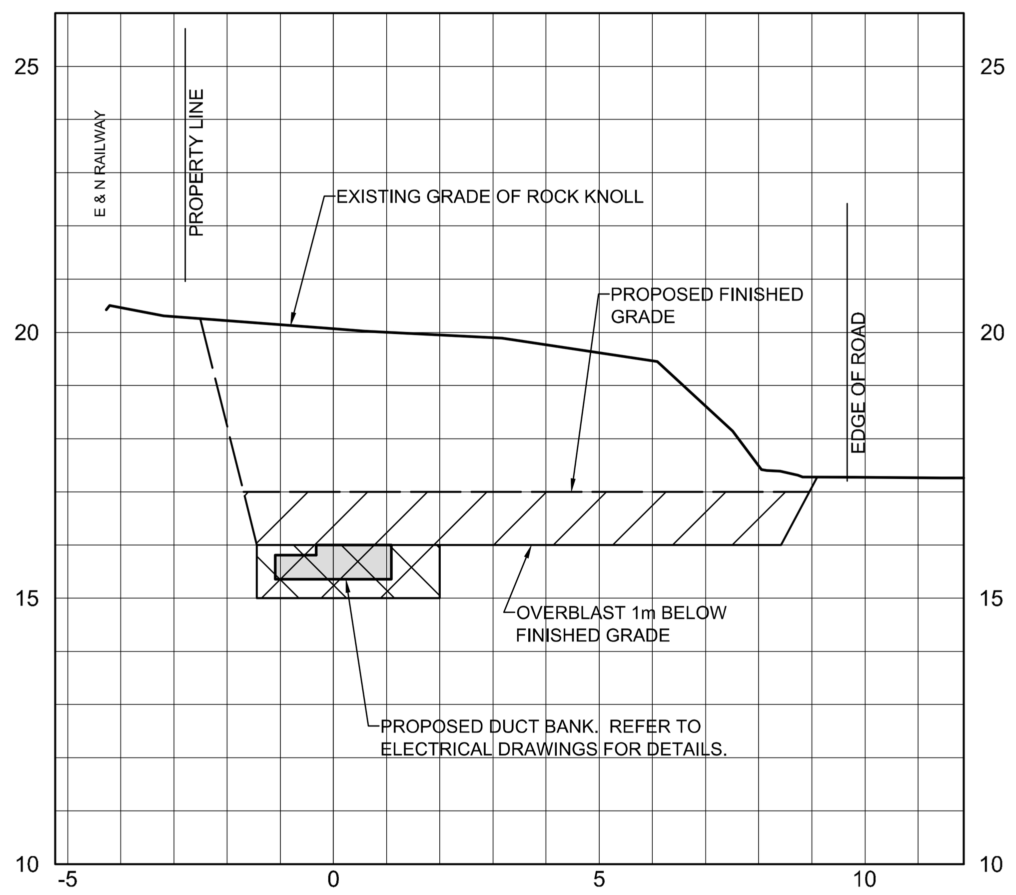

3 / 1002 **SECTION AT STA. 2+92**
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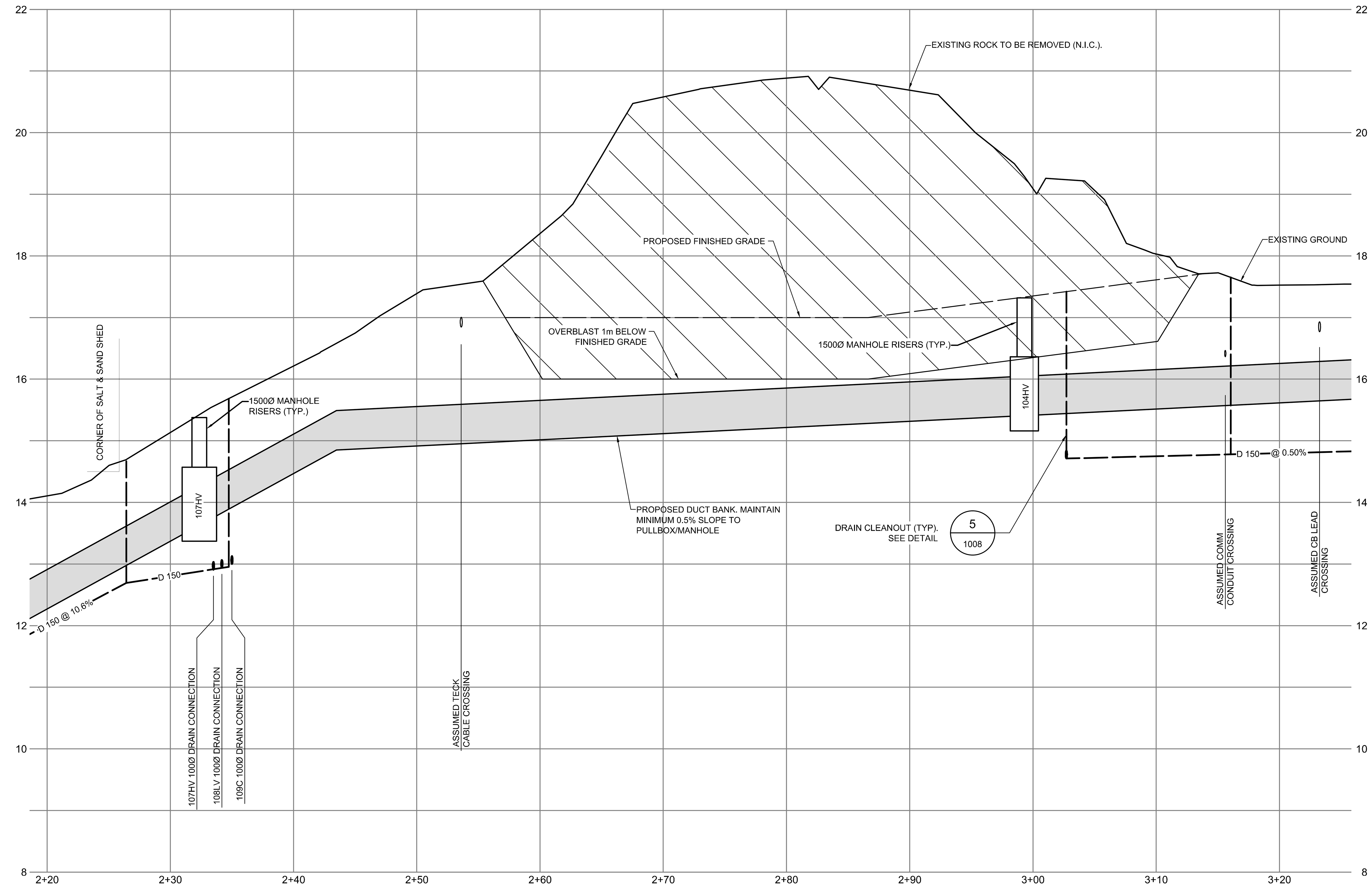

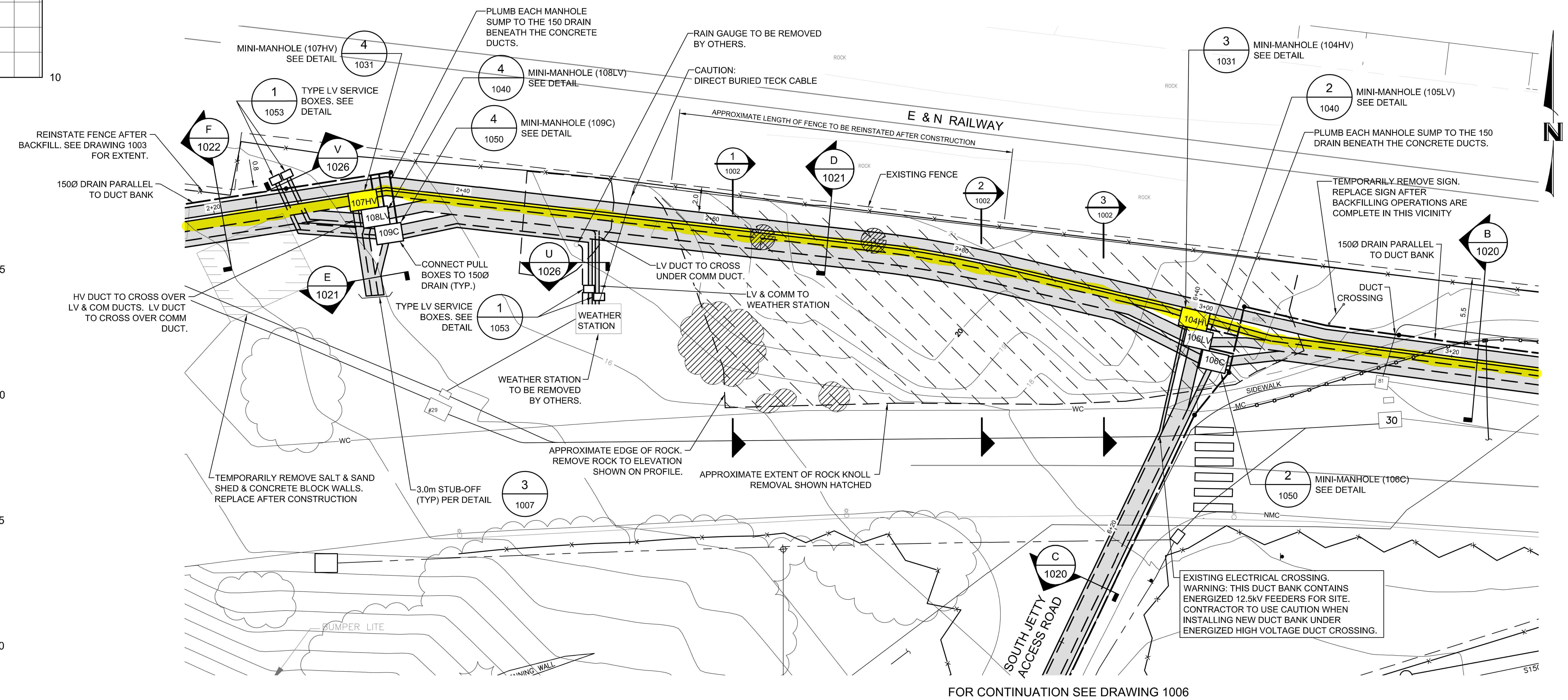

FOR CONTINUATION SEE DRAWING 1006

1 / 1002 **PARTIAL SITE PLAN**
1 : 200

1:200 0 4 12m

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Region de Pacifique

WESTBROOK Consulting Ltd.

KEYPLAN
PROJECT NORTH

BASE DRAWING DATA PROVIDED BY GOLDER ASSOCIATES LTD., TURKAN CONSULTING ENGINEERS INC. AND FIRST TEAM CONSULTING LTD.
DRAWING COORDINATES ARE LOCAL BASED ON UTM NAD 83, ZONE 10.
ALL DISTANCES ARE GROUND LEVEL AND ELEVATIONS ARE GEODETIC.
UTM SCALE CONVERSION FACTOR 0.9996147574

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND SERVICES ON THIS DRAWING MAY NOT BE ACCURATE OR COMPLETE. THE ACTUAL HORIZONTAL AND VERTICAL LOCATIONS MUST BE CONFIRMED BY UTILITY COMPANIES AND THE CONTRACTOR PRIOR TO THE TO THE START OF ANY EXCAVATIONS.

Revision/Revision	Description/Description	Date/Date
5	ISSUED FOR TENDER	OCT 2, 2013
4	ISSUED FOR 100% CD REVIEW	AUG 13, 2013
3	99% DESIGN DEVELOPMENT	JUL 8, 2013
2	66% DESIGN DEVELOPMENT	MAY 27, 2013
1	33% DESIGN DEVELOPMENT	MAY 6, 2013
0	SCHEMATIC DESIGN	

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

SERVICE ENTRANCE SUBSTATION (SES) & PUMPHOUSE SUBSTATION (PHS)

Consultant Signature Box Only

Designed by/Concept par

Drawn by/Dessine par

PWGSC Project Manager/Administrateur de Projets TPSGC

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

Drawing title/Titre du dessin

PLAN & PROFILE
STATION 2+30 TO STATION 3+20

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
R.018739.001	1002	5

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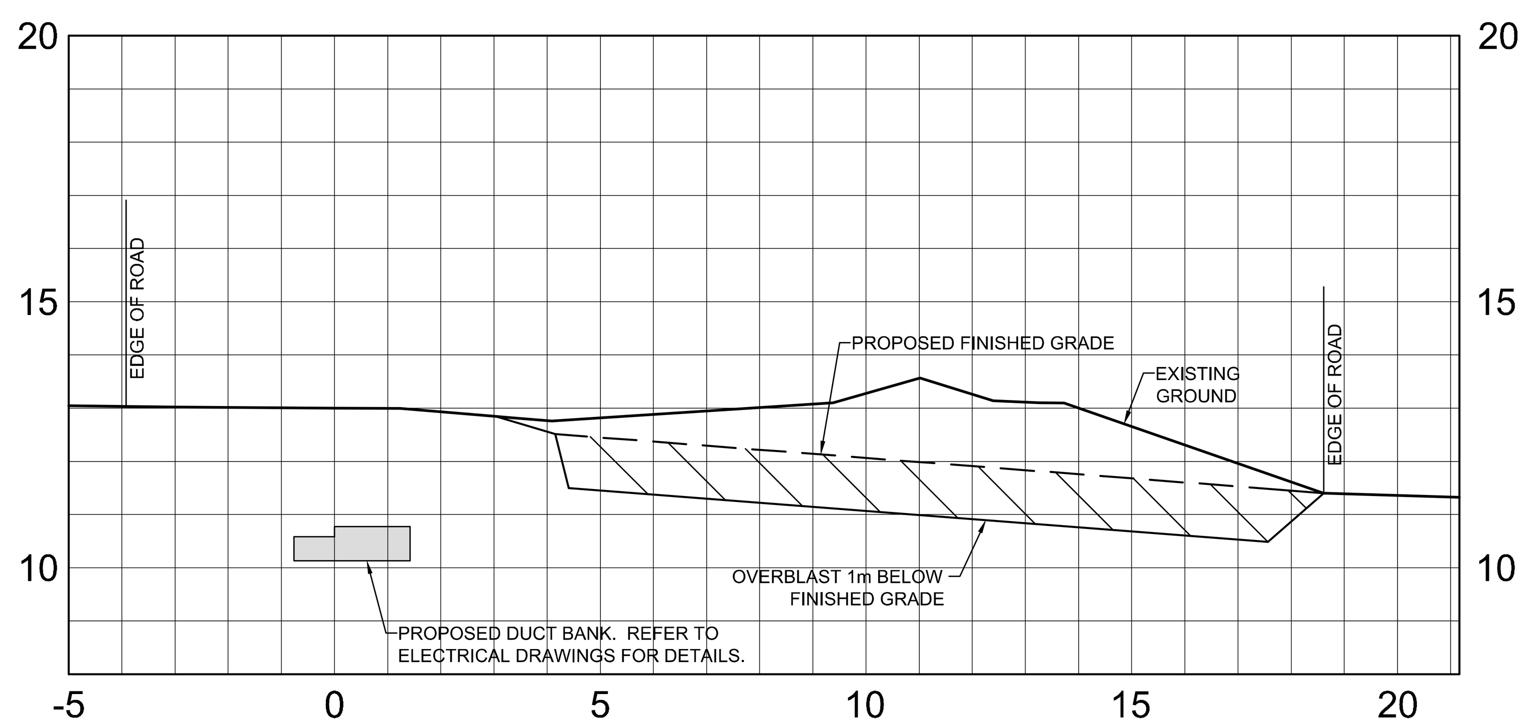
PWGSC – B1 – 1000X707



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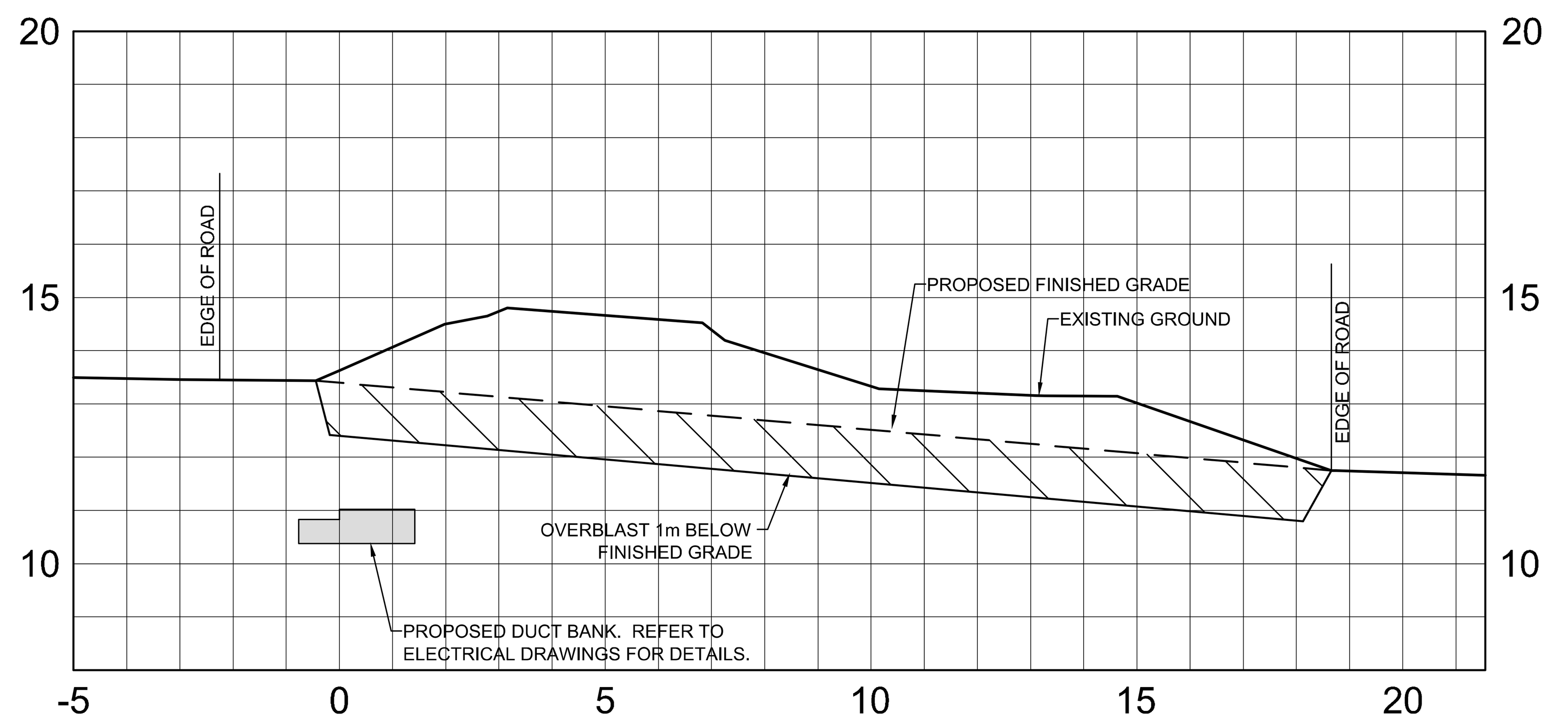

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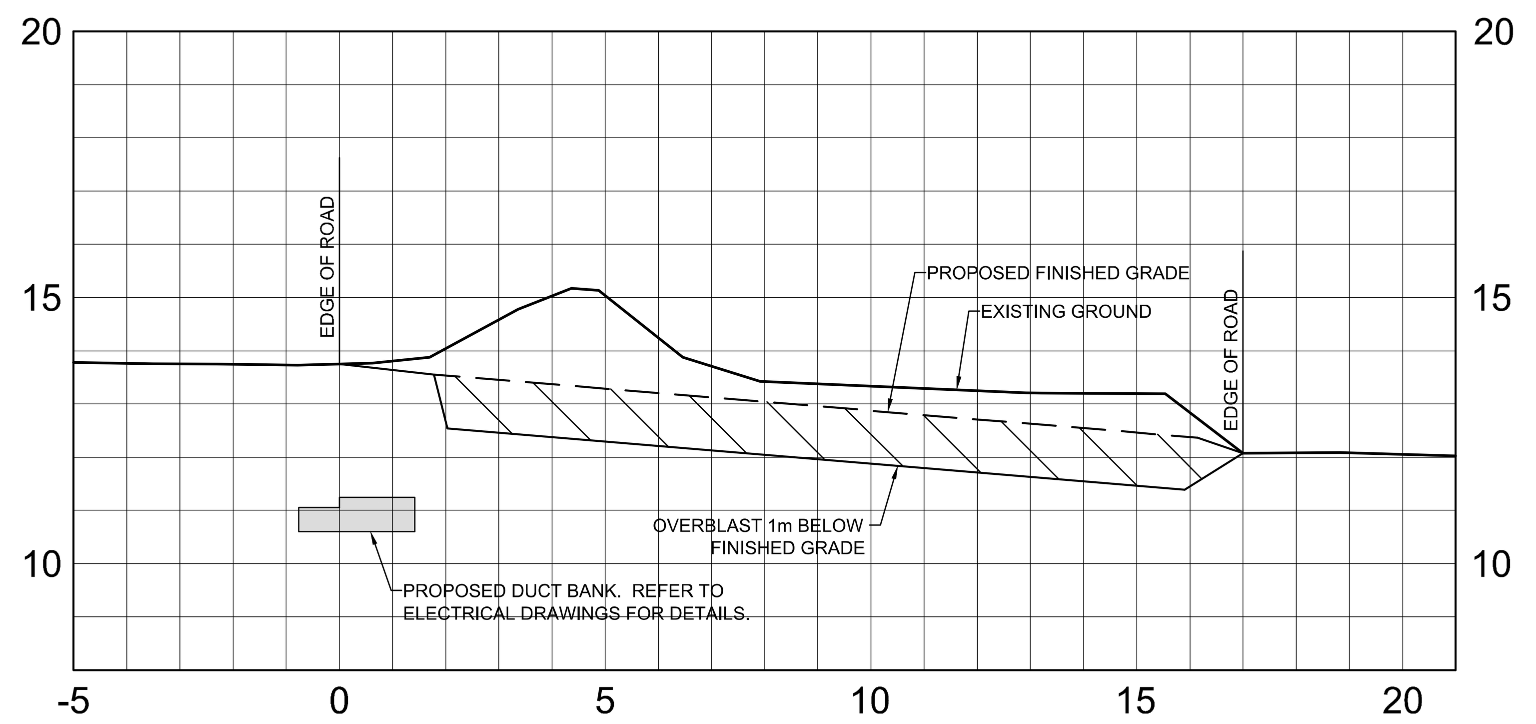

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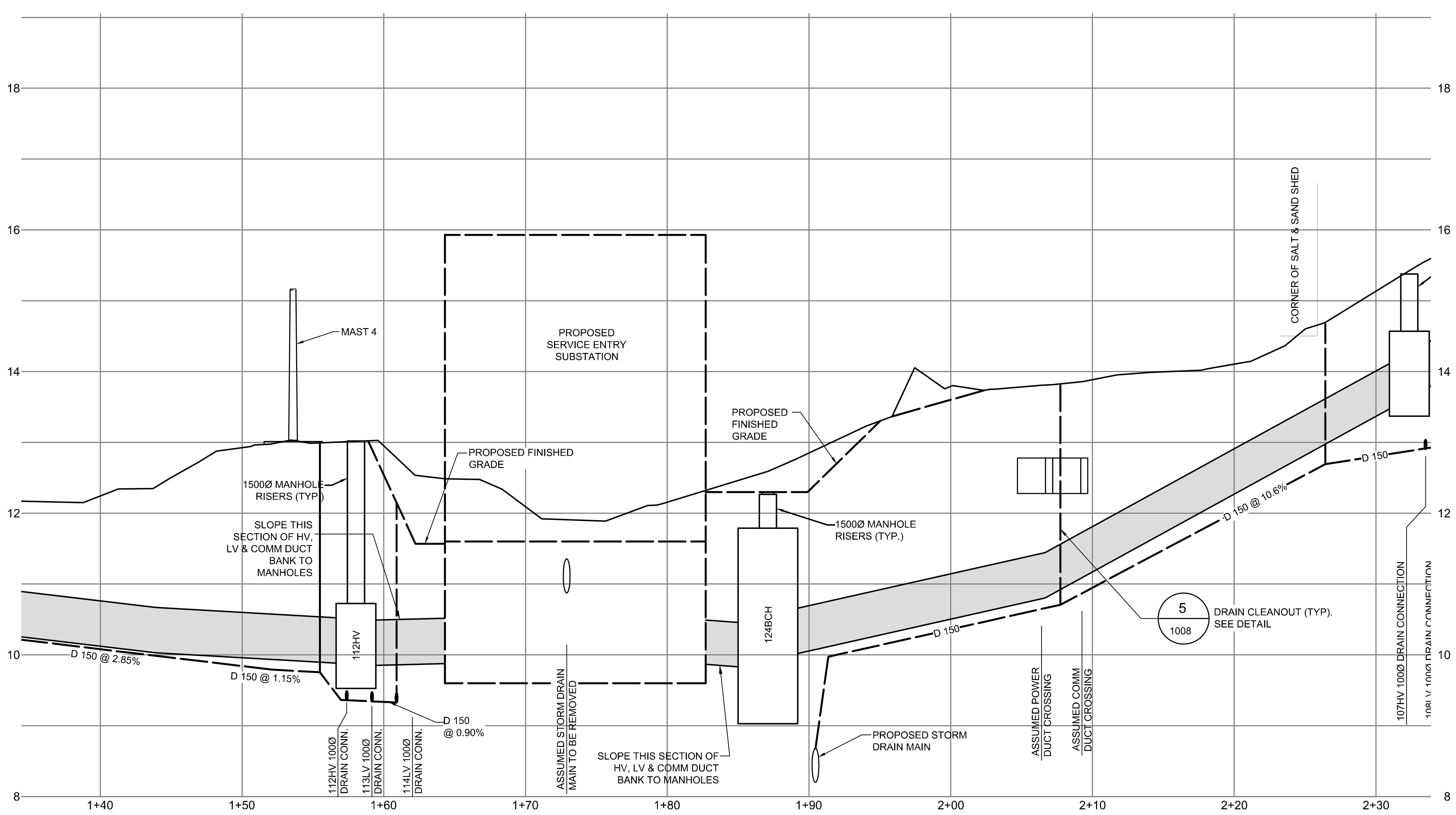
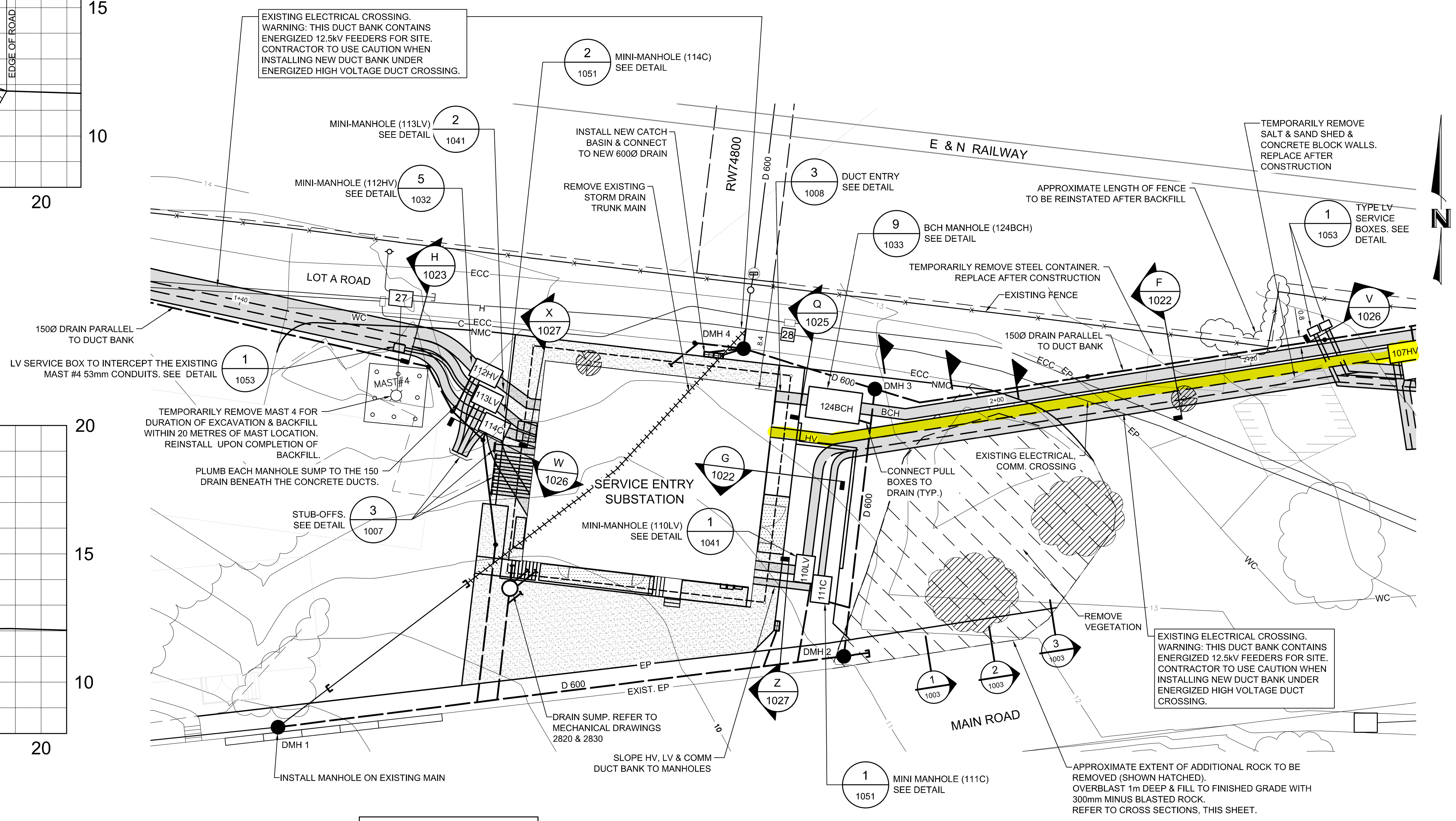




REFER TO DRAWING 2501 FOR ADDITIONAL DETAILS AND DRAIN SYSTEM DESIGN AT SERVICE ENTRY SUBSTATION

1:200

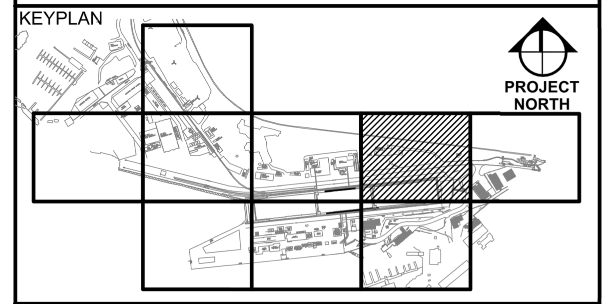
1 / 1003 PARTIAL SITE PLAN
1 : 200

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

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Region de Pacifique

WESTBROOK Consulting Ltd.

KEYPLAN



BASE DRAWING DATA PROVIDED BY GOLDER ASSOCIATES LTD., TURKAN CONSULTING ENGINEERS INC. AND FIRST TEAM CONSULTING LTD. DRAWING COORDINATES ARE LOCAL BASED ON UTM NAD 83, ZONE 10. ALL DISTANCES ARE GROUND LEVEL AND ELEVATIONS ARE GEODETIC. UTM SCALE CONVERSION FACTOR 0.9996147574

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND SERVICES ON THIS DRAWING MAY NOT BE ACCURATE OR COMPLETE. THE ACTUAL HORIZONTAL AND VERTICAL LOCATIONS MUST BE CONFIRMED BY UTILITY COMPANIES AND THE CONTRACTOR PRIOR TO THE TO THE START OF ANY EXCAVATIONS.

Revision/Revision	Description/Description	Date/Date
5	ISSUED FOR TENDER	OCT 2, 2013
4	ISSUED FOR 100% CD REVIEW	AUG 13, 2013
3	99% DESIGN DEVELOPMENT	JUL 8, 2013
2	66% DESIGN DEVELOPMENT	MAY 27, 2013
1	33% DESIGN DEVELOPMENT	MAY 6, 2013
0	SCHEMATIC DESIGN	

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

SERVICE ENTRANCE SUBSTATION (SES) & PUMPHOUSE SUBSTATION (PHS)

Consultant Signature Box Only

Designed by/Concept par

Drawn by/Dessine par

PWGSC Project Manager/Administrateur de Projets TPSGC

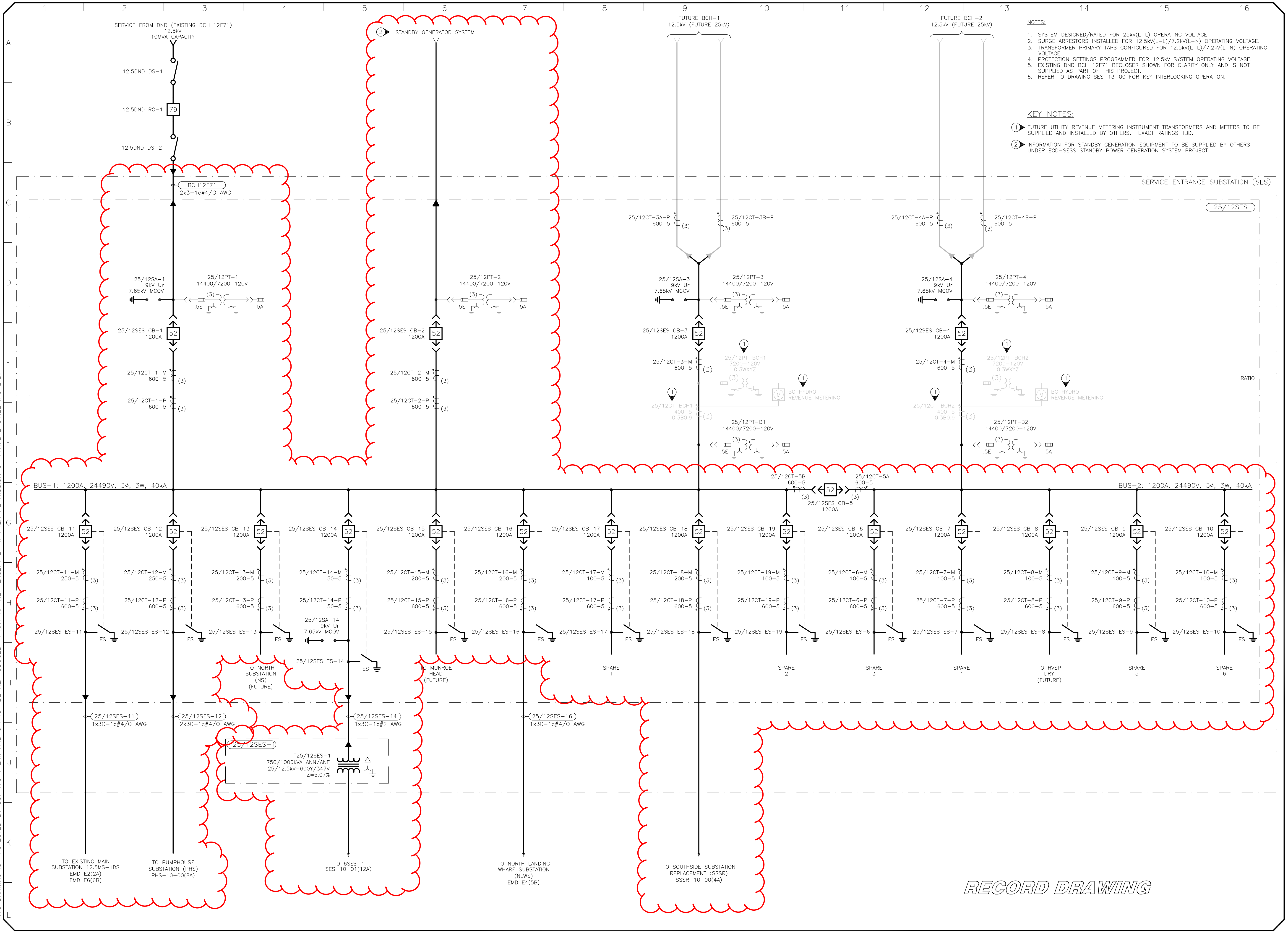
PWGSC, Regional Manager, Architectural and Engineering Services/Gestionnaire régionale, Services d'architectural et de génie, TPSGC

Drawing title/Titre du dessin
PLAN & PROFILE
STATION 1+40 TO STATION 2+30

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
R.018739.001	1003	5

Plot Date: October 1, 2013 8:08 AM Plotted by: Frank Copley
File Name: H:\PROJECTS\2668 ESQUIMALT GRAVING DOCK\EAC DRAWINGS\1003-PLAN-PROFILE.DWG

PWGSC - B1 - 1000X707



NOTES:

1. SYSTEM DESIGNED/RATED FOR 25kV(L-L) OPERATING VOLTAGE.
2. SURGE ARRESTORS INSTALLED FOR 12.5kV(L-L)/7.2kV(L-N) OPERATING VOLTAGE.
3. TRANSFORMER PRIMARY TAPS CONFIGURED FOR 12.5kV(L-L)/7.2kV(L-N) OPERATING VOLTAGE.
4. PROTECTION SETTINGS PROGRAMMED FOR 12.5kV SYSTEM OPERATING VOLTAGE.
5. EXISTING DND BCH 12F71 RECLOSER SHOWN FOR CLARITY ONLY AND IS NOT SUPPLIED AS PART OF THIS PROJECT.
6. REFER TO DRAWING SES-13-00 FOR KEY INTERLOCKING OPERATION.

KEY NOTES:

1. FUTURE UTILITY REVENUE METERING INSTRUMENT TRANSFORMERS AND METERS TO BE SUPPLIED AND INSTALLED BY OTHERS. EXACT RATINGS TBD.
2. INFORMATION FOR STANDBY GENERATION EQUIPMENT TO BE SUPPLIED BY OTHERS UNDER EGD-SESS STANDBY POWER GENERATION SYSTEM PROJECT.

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 - SES-PHS Upgrade\4517.12 - SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-10-00_5.0.dwg 13/07/2017 9:05 AM

Public Works and Government Services Canada

P. ENG STAMP

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	04/07/17	FOR RECORD
4.0	21/10/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	30/03/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION MV SINGLE LINE DIAGRAM

JOB NO. 4517.12

DWG NO. SES-10-00 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

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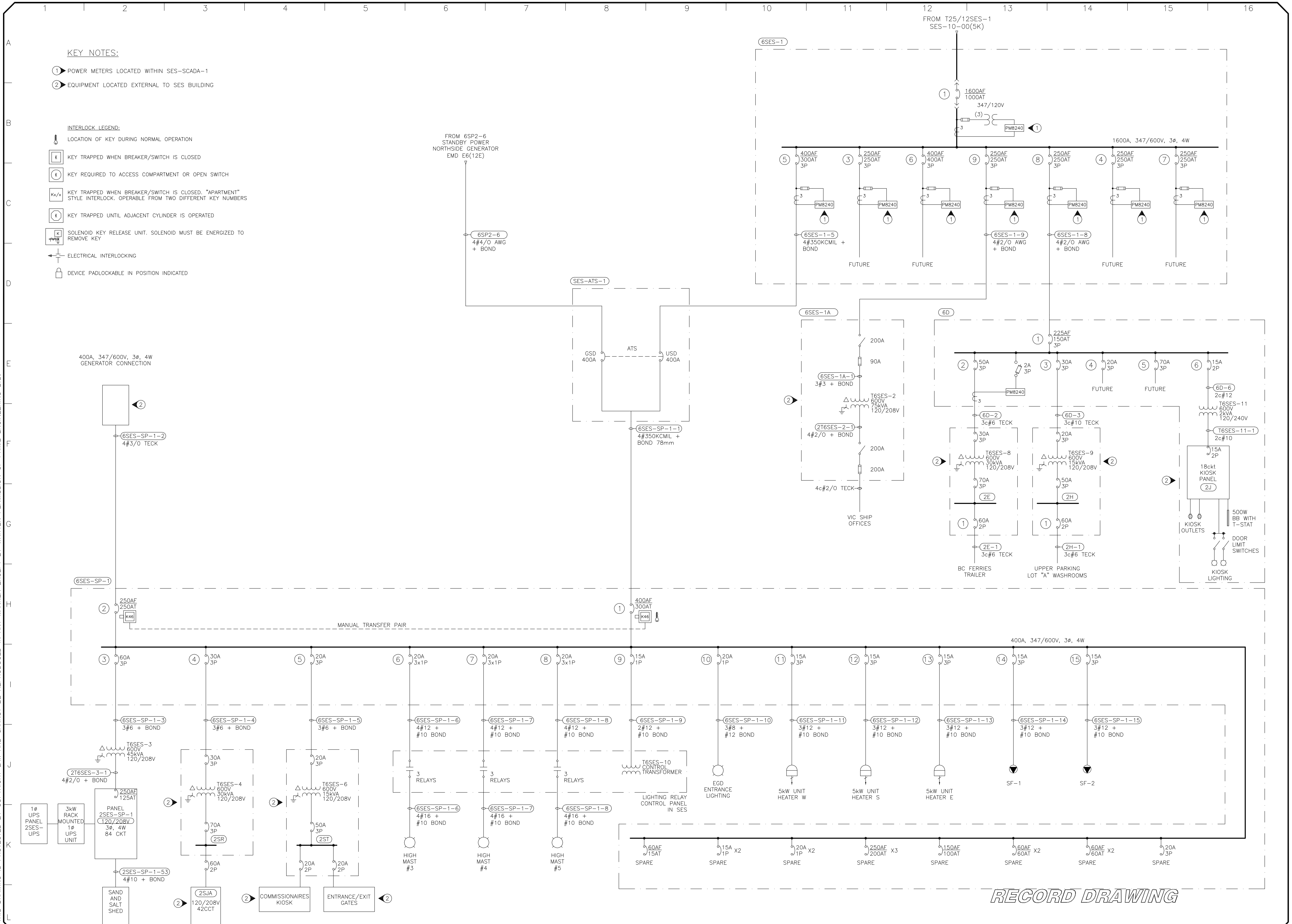

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		ISSUED FOR TENDER
		CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL SERVICE UPGRADE – SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION
LV SINGLE LINE DIAGRAM

JOB NO. 4517.12

DWG NO. SES-10-01 REV. 5.0

DESIGNER KB DRAWN BY TGH

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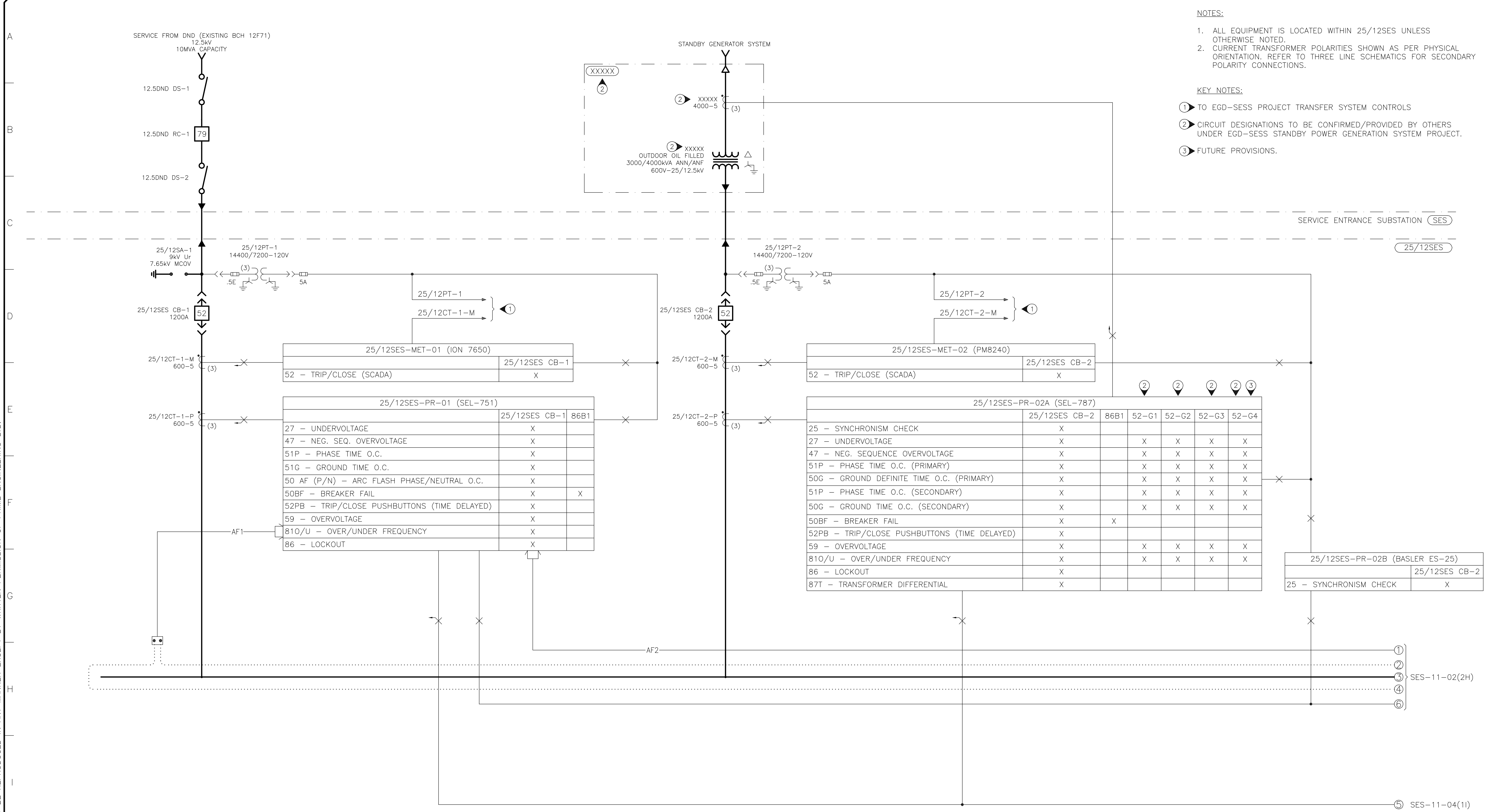
ENGINEER. IMPLEMENT. MAINTAIN

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES-PHS Upgrade\4517.12 – SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-10-01_5.0.dwg 13/07/2017 9:06 AM

DRAWINGS MARKED "FOR RECORD" CERTIFY THAT THE DESIGN INFORMATION CONTAINED WITHIN ACCURATELY REFLECTS THE ORIGINAL DESIGN AND THE MATERIAL DESIGN CHANGES MADE DURING CONSTRUCTION THAT WERE BROUGHT TO THE ENGINEERS ATTENTION. RECORD DRAWINGS ARE INTENDED TO INCLUDE MATERIAL DESIGN CHANGES BUT NOT NECESSARILY ALL SITE INSTRUCTIONS. PRIME ENGINEERING DOES NOT WARRANT OR GUARANTEE NOR ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OF THE AS-CONSTRUCTED INFORMATION SUPPLIED BY OTHERS CONTAINED IN THIS DRAWING.



25/12SES-MET-01 (ION 7650)	
	25/12SES CB-1
52 – TRIP/CLOSE (SCADA)	X

25/12SES-MET-02 (PM8240)	
	25/12SES CB-2
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-01 (SEL-751)		
	25/12SES CB-1	86B1
27 – UNDERVOLTAGE	X	
47 – NEG. SEQ. OVERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
59 – OVERVOLTAGE	X	
81O/U – OVER/UNDER FREQUENCY	X	
86 – LOCKOUT	X	

25/12SES-PR-02A (SEL-787)						
	25/12SES CB-2	86B1	52-G1	52-G2	52-G3	52-G4
25 – SYNCHRONISM CHECK	X					
27 – UNDERVOLTAGE	X		X	X	X	X
47 – NEG. SEQUENCE OVERVOLTAGE	X		X	X	X	X
51P – PHASE TIME O.C. (PRIMARY)	X		X	X	X	X
50G – GROUND DEFINITE TIME O.C. (PRIMARY)	X		X	X	X	X
51P – PHASE TIME O.C. (SECONDARY)	X		X	X	X	X
50G – GROUND TIME O.C. (SECONDARY)	X		X	X	X	X
50BF – BREAKER FAIL	X	X				
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X					
59 – OVERVOLTAGE	X		X	X	X	X
81O/U – OVER/UNDER FREQUENCY	X		X	X	X	X
86 – LOCKOUT	X					
87T – TRANSFORMER DIFFERENTIAL	X					

25/12SES-PR-02B (BASLER ES-25)	
	25/12SES CB-2
25 – SYNCHRONISM CHECK	X

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 25/12SES UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.

KEY NOTES:

1. TO EGD-SESS PROJECT TRANSFER SYSTEM CONTROLS
2. CIRCUIT DESIGNATIONS TO BE CONFIRMED/PROVIDED BY OTHERS UNDER EGD-SESS STANDBY POWER GENERATION SYSTEM PROJECT.
3. FUTURE PROVISIONS.

RECORD DRAWING

Public Works and Government Services Canada

P. ENG STAMP

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		ISSUED FOR TENDER
2.0	30/03/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL SERVICE UPGRADE – SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION
MV PROTECTION SINGLE LINE DIAGRAM
(1 OF 5)

JOB NO. 4517.12
DWG NO. SES-11-01
REV. 5.0
DESIGNER KB
DRAWN BY TGH

prime engineering
ENGINEER. IMPLEMENT. MAINTAIN

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES-PHS Upgrade\4517.12 – SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-11-01_5.0.dwg 13/07/2017 9:12 AM

NOTES:

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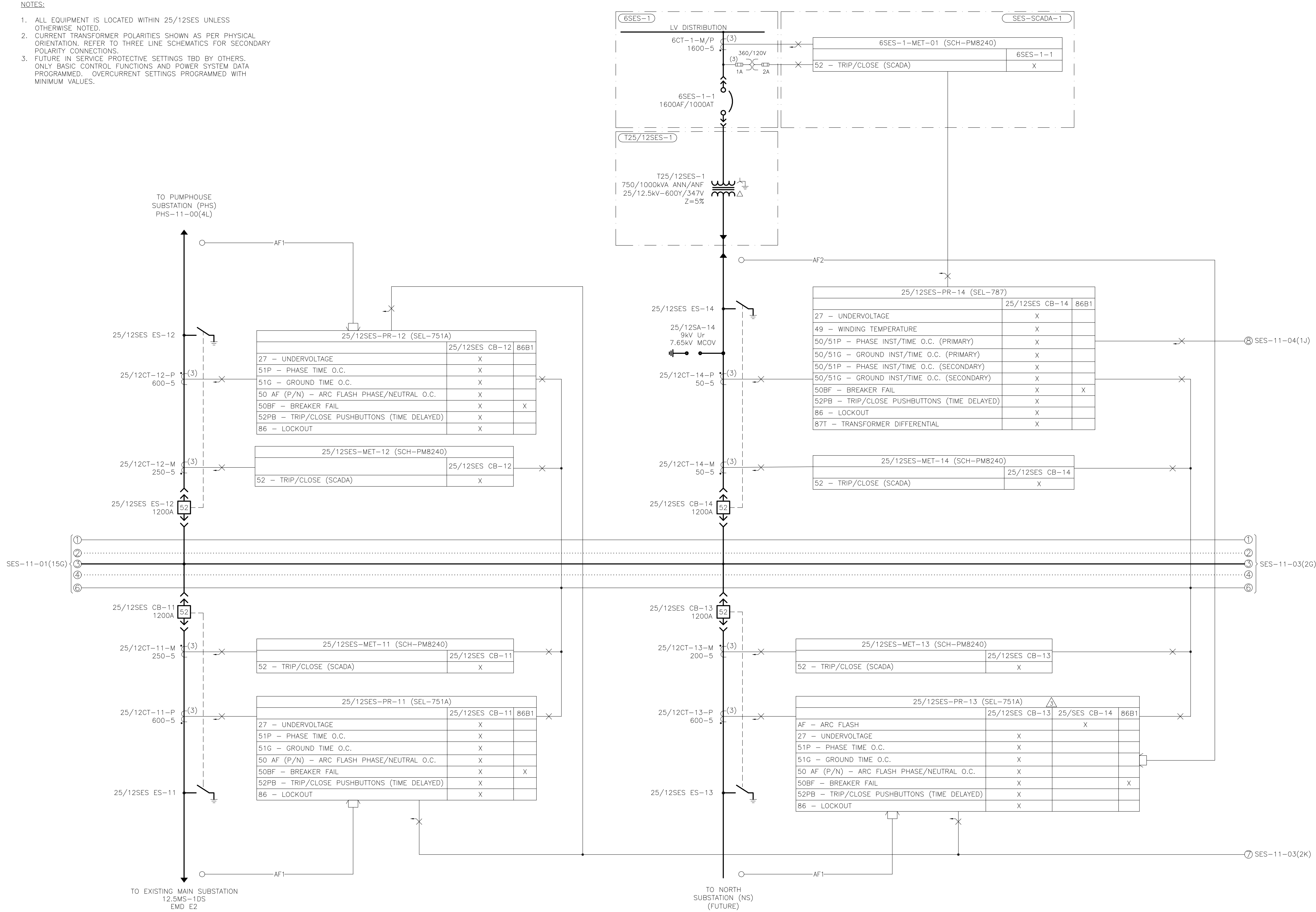
3. FUTURE IN SERVICE PROTECTIVE SETTINGS TBD BY OTHERS. ONLY BASIC CONTROL FUNCTIONS AND POWER SYSTEM DATA PROGRAMMED. OVERCURRENT SETTINGS PROGRAMMED WITH MINIMUM VALUES.



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2.0	30/03/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE - SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION MV PROTECTION SINGLE LINE DIAGRAM (2 OF 5)

JOB NO. 4517.12

DWG NO. SES-11-02 REV. 5.0

DESIGNER KB DRAWN BY TGH

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CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 - SES-PHS Upgrade\4517.12 - SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-11-02_5.0.dwg 13/07/2017 9:12 AM

NOTES:

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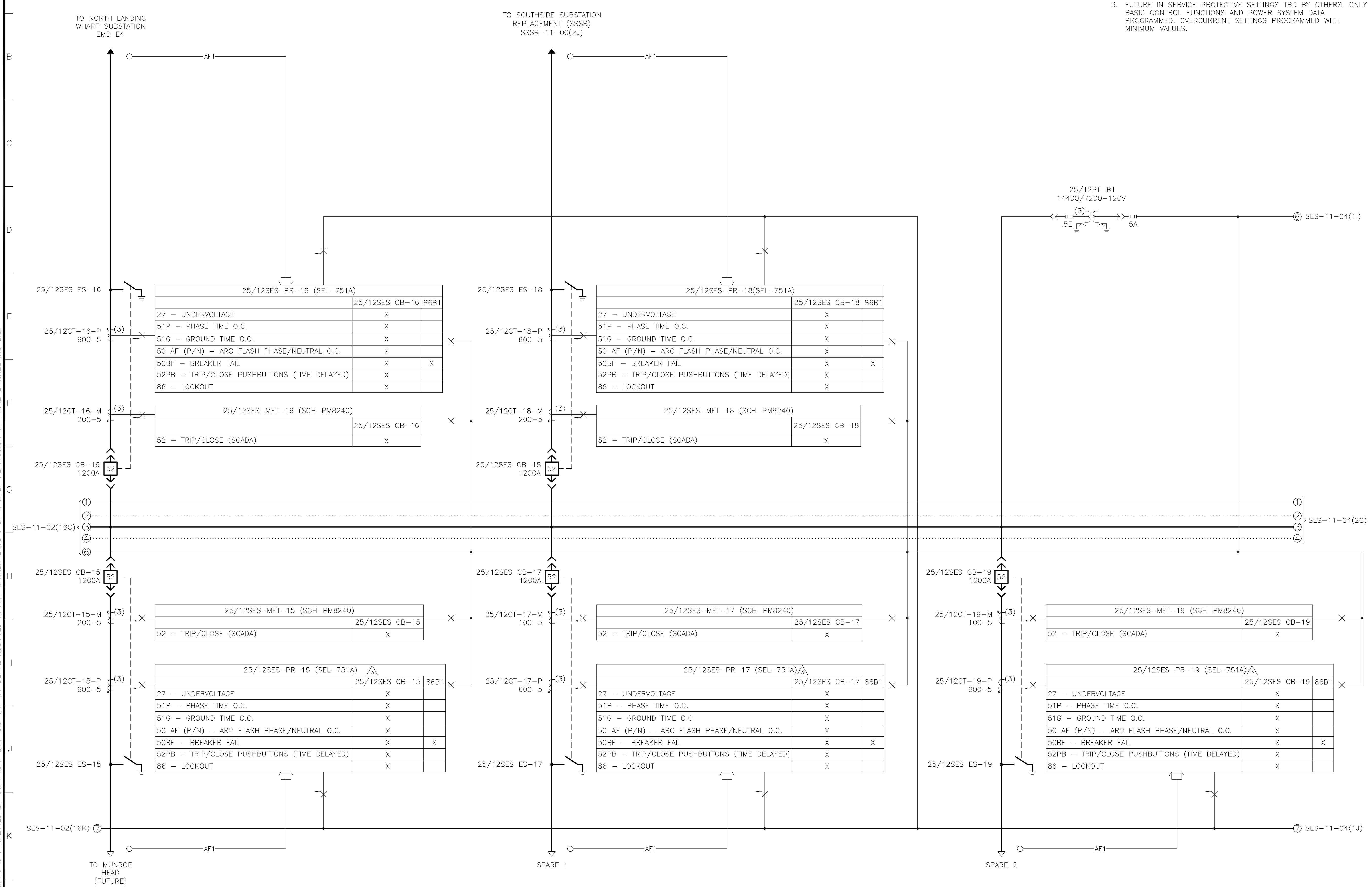

25/12SES-PR-16 (SEL-751A)	25/12SES CB-16	86B1
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-16 (SCH-PM8240)	25/12SES CB-16
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-18(SEL-751A)	25/12SES CB-18	86B1
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-18 (SCH-PM8240)	25/12SES CB-18
52 – TRIP/CLOSE (SCADA)	X

25/12SES-MET-15 (SCH-PM8240)	25/12SES CB-15
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-15 (SEL-751A) 3	25/12SES CB-15	86B1
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-17 (SCH-PM8240)	25/12SES CB-17
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-17 (SEL-751A) 3	25/12SES CB-17	86B1
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-19 (SCH-PM8240)	25/12SES CB-19
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-19 (SEL-751A) 3	25/12SES CB-19	86B1
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

RECORD DRAWING

Public Works and Government Services Canada

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2.0	30/03/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION MV PROTECTION SINGLE LINE DIAGRAM (3 OF 5)

JOB NO. 4517.12

DWG NO. SES-11-03 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

prime engineering
ENGINEER. IMPLEMENT. MAINTAIN

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES-PHS Upgrade\4517.12 – SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-11-03_5.0.dwg 13/07/2017 9:12 AM

NOTES:

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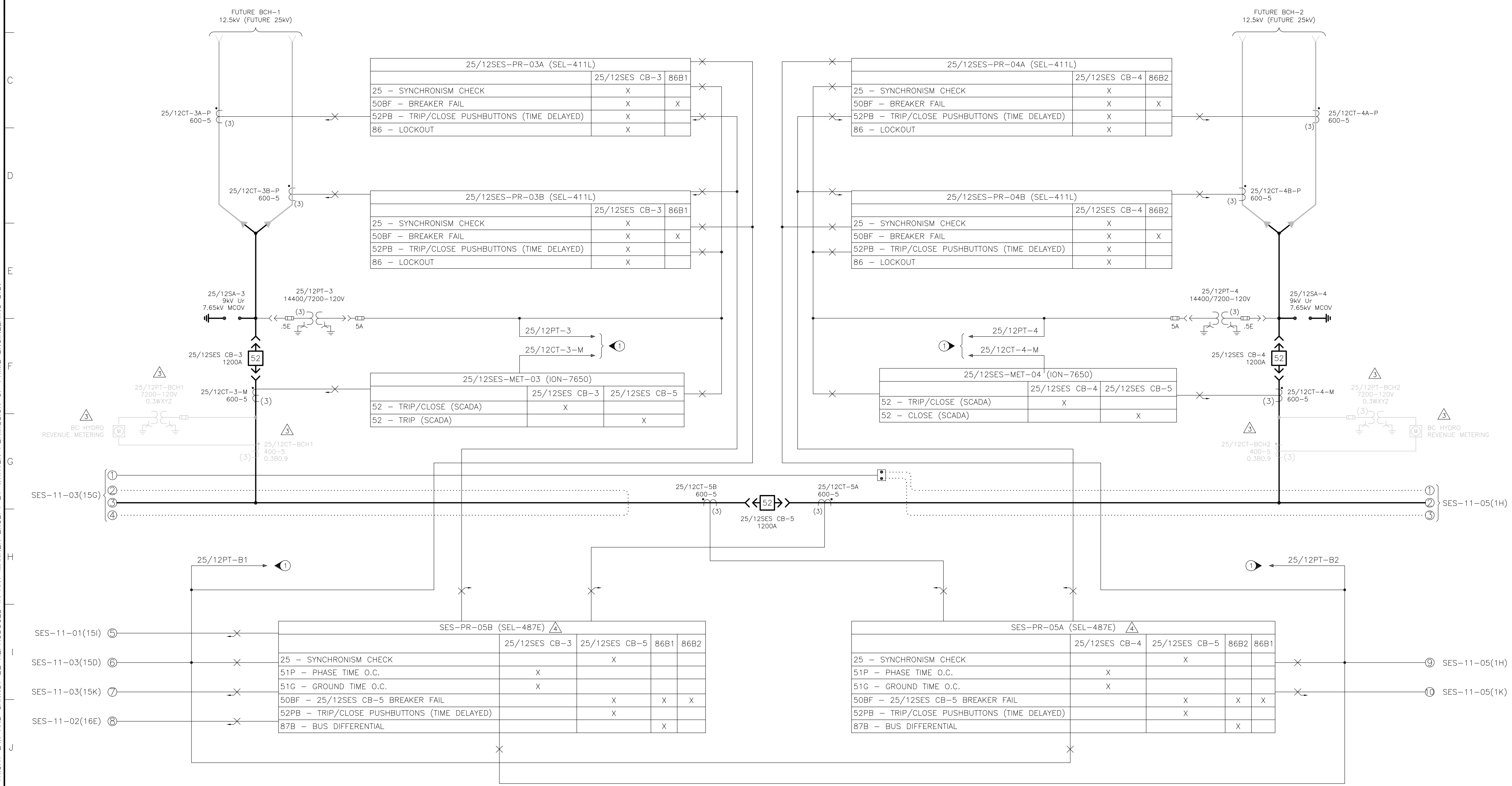
3. FUTURE UTILITY REVENUE METERING INSTRUMENT TRANSFORMERS AND METERS TO BE SUPPLIED AND INSTALLED BY OTHERS. EXACT RATINGS TBD.
4. OVERCURRENT SETTINGS FOR FUTURE BCH HIGH CAPACITY FEEDERS PROGRAMMED WITH MINIMUM VALUES.

KEY NOTES:

1 TO EGD-SESS PROJECT TRANSFER SYSTEM CONTROLS



25/12SES-PR-03A (SEL-411L)	25/12SES CB-3	86B1
25 – SYNCHRONISM CHECK	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-PR-03B (SEL-411L)	25/12SES CB-3	86B1
25 – SYNCHRONISM CHECK	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-PR-04A (SEL-411L)	25/12SES CB-4	86B2
25 – SYNCHRONISM CHECK	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-PR-04B (SEL-411L)	25/12SES CB-4	86B2
25 – SYNCHRONISM CHECK	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-03 (ION-7650)	25/12SES CB-3	25/12SES CB-5
52 – TRIP/CLOSE (SCADA)	X	
52 – TRIP (SCADA)		X

25/12SES-MET-04 (ION-7650)	25/12SES CB-4	25/12SES CB-5
52 – TRIP/CLOSE (SCADA)	X	
52 – CLOSE (SCADA)		X

SES-PR-05B (SEL-487E) 3	25/12SES CB-3	25/12SES CB-5	86B1	86B2
25 – SYNCHRONISM CHECK		X		
51P – PHASE TIME O.C.	X			
51G – GROUND TIME O.C.	X			
50BF – 25/12SES CB-5 BREAKER FAIL		X	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)		X		
87B – BUS DIFFERENTIAL			X	

SES-PR-05A (SEL-487E) 3	25/12SES CB-4	25/12SES CB-5	86B2	86B1
25 – SYNCHRONISM CHECK		X		
51P – PHASE TIME O.C.	X			
51G – GROUND TIME O.C.	X			
50BF – 25/12SES CB-5 BREAKER FAIL		X	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)		X		
87B – BUS DIFFERENTIAL			X	

LOCKOUT RELAY TRIPS	86B1	86B2
TRIP BREAKER 25/12SES CB-1	X	
TRIP BREAKER 25/12SES CB-2	X	
TRIP BREAKER 25/12SES CB-3	X	
TRIP BREAKER 25/12SES CB-4		X
TRIP BREAKER 25/12SES CB-5	X	X
TRIP BREAKERS 25/12SES CB-11 THRU 25/12SES CB-19	X	
TRIP BREAKERS 25/12SES CB-6 THRU 25/12SES CB-10		X

RECORD DRAWING

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PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION MV PROTECTION SINGLE LINE DIAGRAM (4 OF 5)

JOB NO. 4517.12

DWG NO. SES-11-04 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

prime engineering
ENGINEER. IMPLEMENT. MAINTAIN

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES-PHS Upgrade\4517.12 – SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-11-04_5.0.dwg 13/07/2017 9:19 AM

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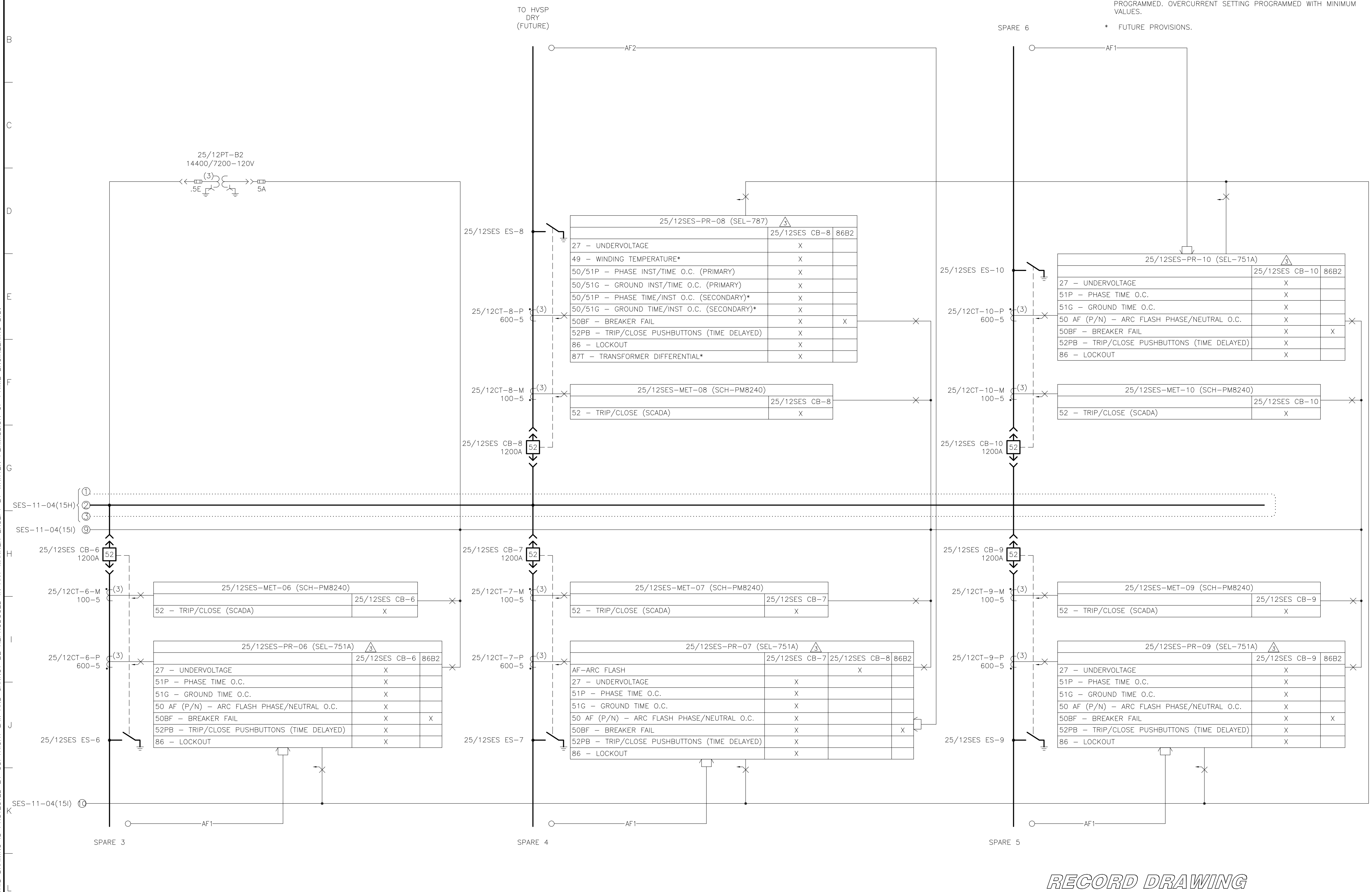
* FUTURE PROVISIONS.



25/12SES-PR-08 (SEL-787)	25/12SES CB-8	86B2
27 – UNDERVOLTAGE	X	
49 – WINDING TEMPERATURE*	X	
50/51P – PHASE INST/TIME O.C. (PRIMARY)	X	
50/51G – GROUND INST/TIME O.C. (PRIMARY)	X	
50/51P – PHASE TIME/INST O.C. (SECONDARY)*	X	
50/51G – GROUND TIME/INST O.C. (SECONDARY)*	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSER PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	
87T – TRANSFORMER DIFFERENTIAL*	X	

25/12SES-MET-08 (SCH-PM8240)	25/12SES CB-8
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-10 (SEL-751A)	25/12SES CB-10	86B2
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-10 (SCH-PM8240)	25/12SES CB-10
52 – TRIP/CLOSE (SCADA)	X

25/12SES-MET-06 (SCH-PM8240)	25/12SES CB-6
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-06 (SEL-751A)	25/12SES CB-6	86B2
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

25/12SES-MET-07 (SCH-PM8240)	25/12SES CB-7
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-07 (SEL-751A)	25/12SES CB-7	25/12SES CB-8	86B2
AF-ARC FLASH		X	
27 – UNDERVOLTAGE	X		
51P – PHASE TIME O.C.	X		
51G – GROUND TIME O.C.	X		
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X		
50BF – BREAKER FAIL	X		X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X		
86 – LOCKOUT	X		

25/12SES-MET-09 (SCH-PM8240)	25/12SES CB-9
52 – TRIP/CLOSE (SCADA)	X

25/12SES-PR-09 (SEL-751A)	25/12SES CB-9	86B2
27 – UNDERVOLTAGE	X	
51P – PHASE TIME O.C.	X	
51G – GROUND TIME O.C.	X	
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	
50BF – BREAKER FAIL	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES-PHS Upgrade\4517.12 – SES Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.12_SES-11-05_5.0.dwg 13/07/2017 9:19 AM

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	04/07/17	FOR RECORD
4.0	21/10/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	30/03/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – SES

DWG TITLE
SERVICE ENTRANCE SUBSTATION MV PROTECTION SINGLE LINE DIAGRAM (5 OF 5)

JOB NO. 4517.12

DWG NO. SES-11-05 REV. 5.0

DESIGNER KB DRAWN BY TGH

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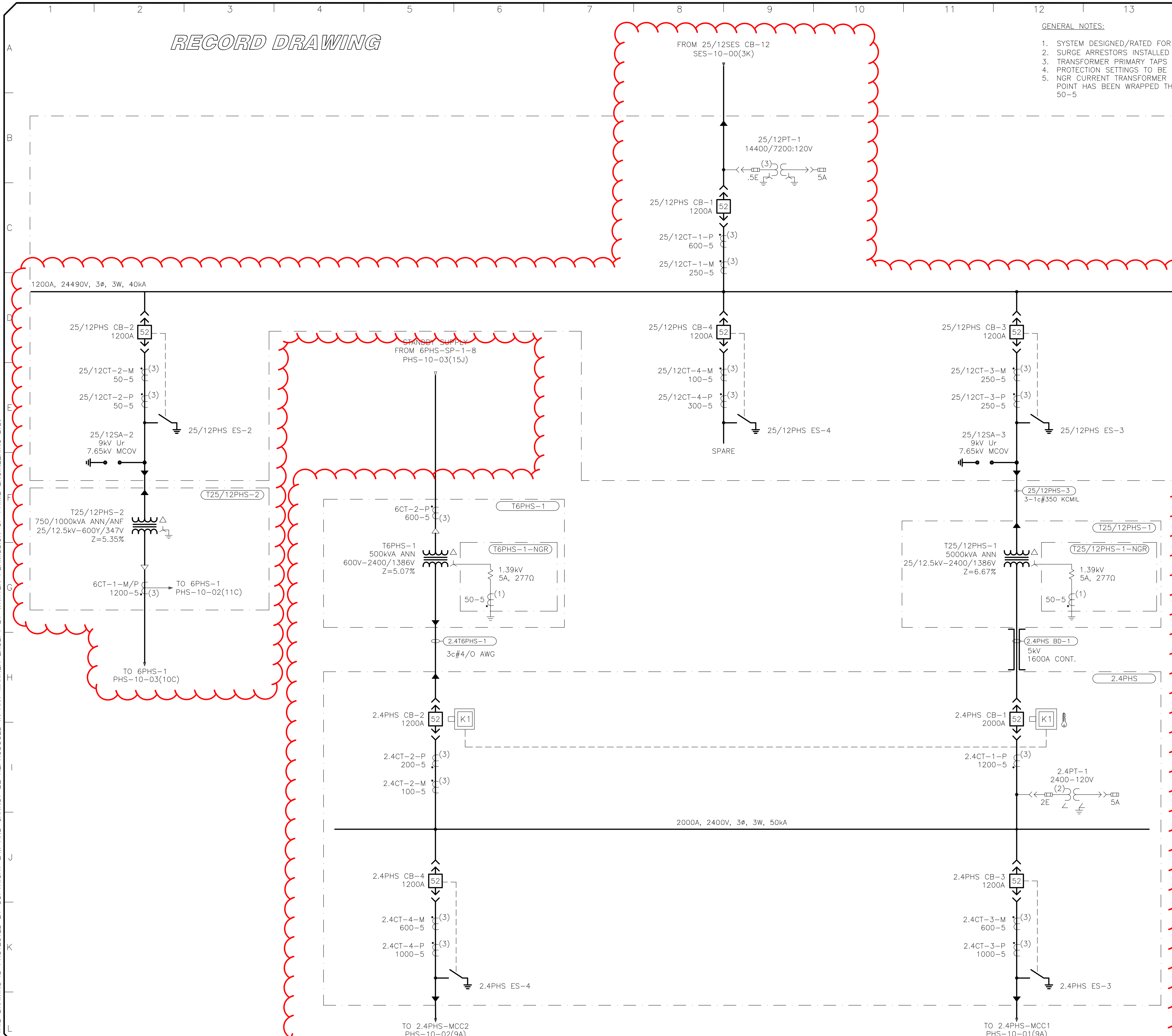
RECORD DRAWING



GENERAL NOTES:

1. SYSTEM DESIGNED/RATED FOR 25kV(L-L)/14.4kV(L-N) OPERATING VOLTAGE
2. SURGE ARRESTORS INSTALLED FOR 12.5kV(L-L)/7.2kV(L-N) OPERATING VOLTAGE.
3. TRANSFORMER PRIMARY TAPS CONFIGURED FOR 12.5kV(L-L)/7.2kV(L-N) OPERATING VOLTAGE.
4. PROTECTION SETTINGS TO BE PROGRAMMED FOR 12.5kV SYSTEM OPERATING VOLTAGE.
5. NGR CURRENT TRANSFORMER RATIOS ARE 300-5. NEUTRAL CONDUCTOR TO TRANSFORMER X0 POINT HAS BEEN WRAPPED THROUGH CURRENT TRANSFORMER 6 TIMES TO OBTAIN A RATIO OF 50-5

TO POWER AUXILIARY PUMPS ON STANDBY:

1. OPEN AND DISCONNECT 2.4PHS CB-1 TO REMOVE K1.
2. USE K1 TO CONNECT AND CLOSE 2.4PHS CB-2.
3. REVERSE PROCEDURE TO RETURN TO NORMAL POWER.

INTERLOCK LEGEND:

- LOCATION OF KEY DURING NORMAL OPERATION
- KEY TRAPPED WHEN BREAKER/SWITCH IS CLOSED
- KEY REQUIRED TO ACCESS COMPARTMENT OR OPEN SWITCH
- KEY TRAPPED WHEN BREAKER/SWITCH IS CLOSED. "APARTMENT" STYLE INTERLOCK. OPERABLE FROM TWO DIFFERENT KEY NUMBERS
- KEY TRAPPED UNTIL ADJACENT CYLINDER IS OPERATED
- SOLENOID KEY RELEASE UNIT. SOLENOID MUST BE ENERGIZED TO REMOVE KEY
- ELECTRICAL INTERLOCKING
- DEVICE PADLOCKABLE IN POSITION INDICATED

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		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL SERVICE UPGRADE - PHS

DWG TITLE
PUMPHOUSE SUBSTATION
MV SINGLE LINE DIAGRAM
(1 OF 3)

JOB NO. 4517.22
DWG NO. PHS-10-00 REV. 5.0
DESIGNER KB DRAWN BY TGH

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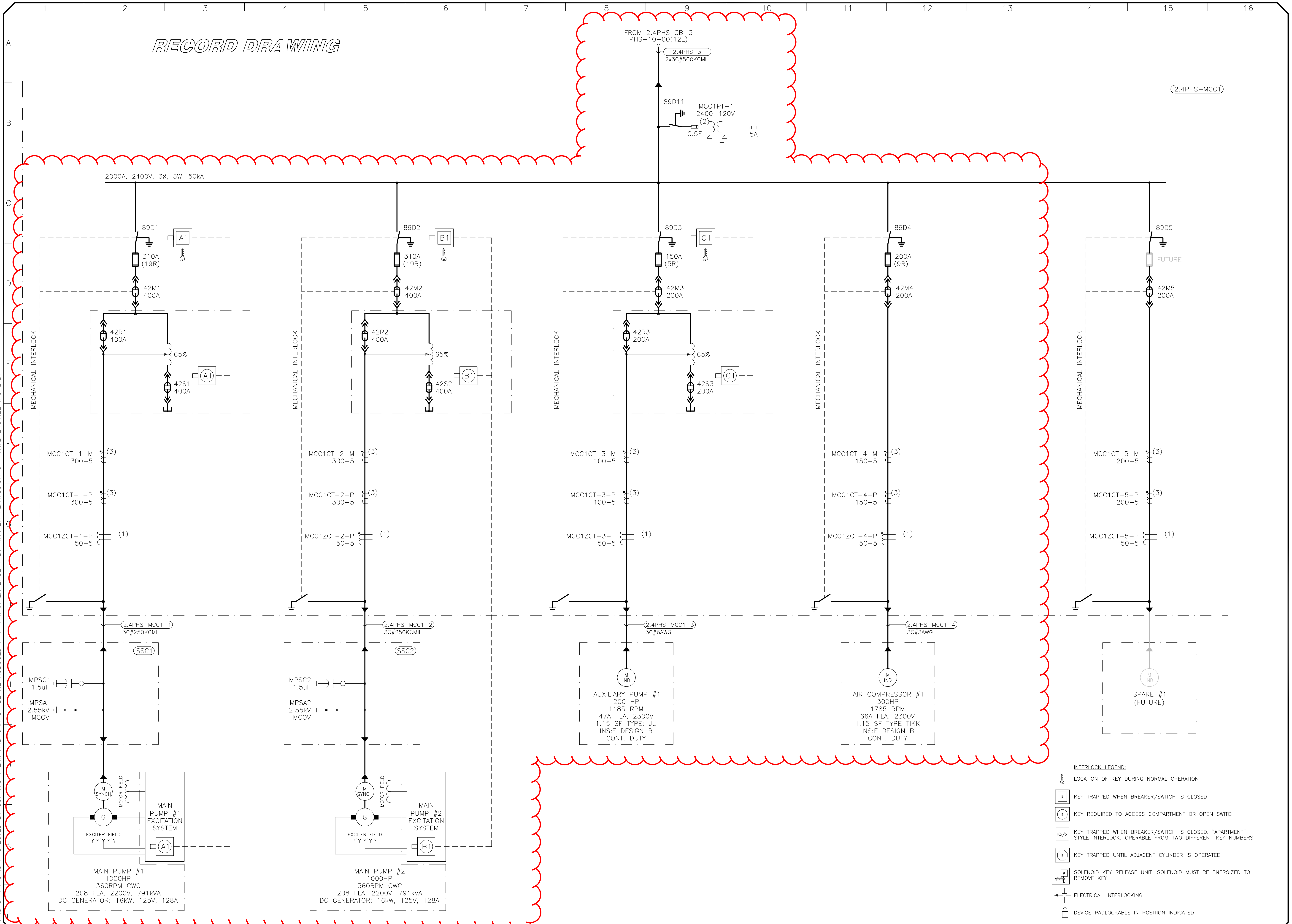

INTERLOCK LEGEND:

- LOCATION OF KEY DURING NORMAL OPERATION
- KEY TRAPPED WHEN BREAKER/SWITCH IS CLOSED
- KEY REQUIRED TO ACCESS COMPARTMENT OR OPEN SWITCH
- KEY TRAPPED WHEN BREAKER/SWITCH IS CLOSED. "APARTMENT" STYLE INTERLOCK. OPERABLE FROM TWO DIFFERENT KEY NUMBERS
- KEY TRAPPED UNTIL ADJACENT CYLINDER IS OPERATED
- SOLENOID KEY RELEASE UNIT. SOLENOID MUST BE ENERGIZED TO REMOVE KEY
- ELECTRICAL INTERLOCKING
- DEVICE PADLOCKABLE IN POSITION INDICATED

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	21/06/17	FOR RECORD
4.0	06/01/17	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
PUMPHOUSE SUBSTATION MV SINGLE LINE DIAGRAM (2 OF 3)

JOB NO. 4517.22

DWG NO. PHS-10-01 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

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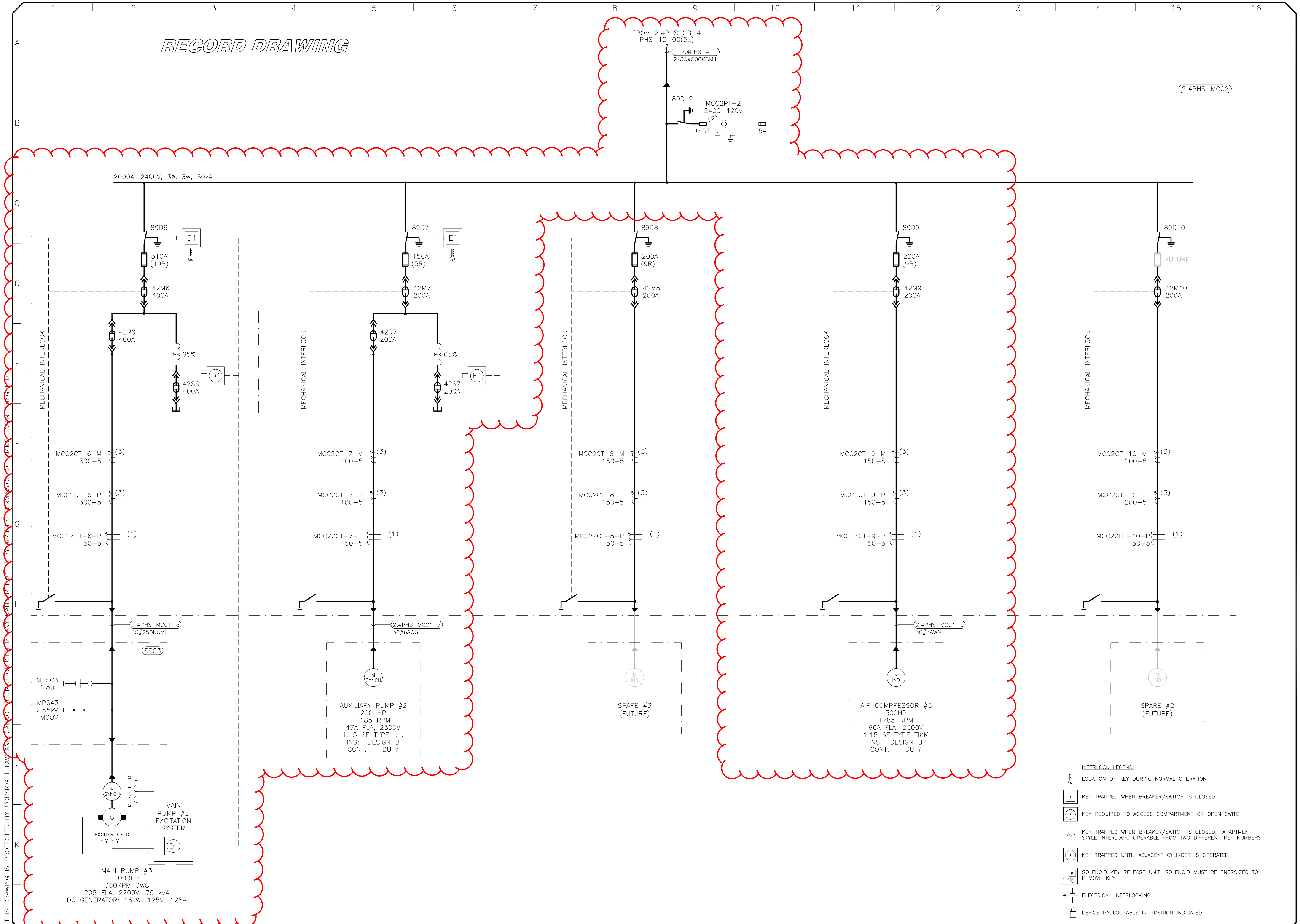

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		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
PUMPHOUSE SUBSTATION
MV SINGLE LINE DIAGRAM
(3 OF 3)

JOB NO. 4517.22

DWG NO. PHS-10-02 | REV. 5.0

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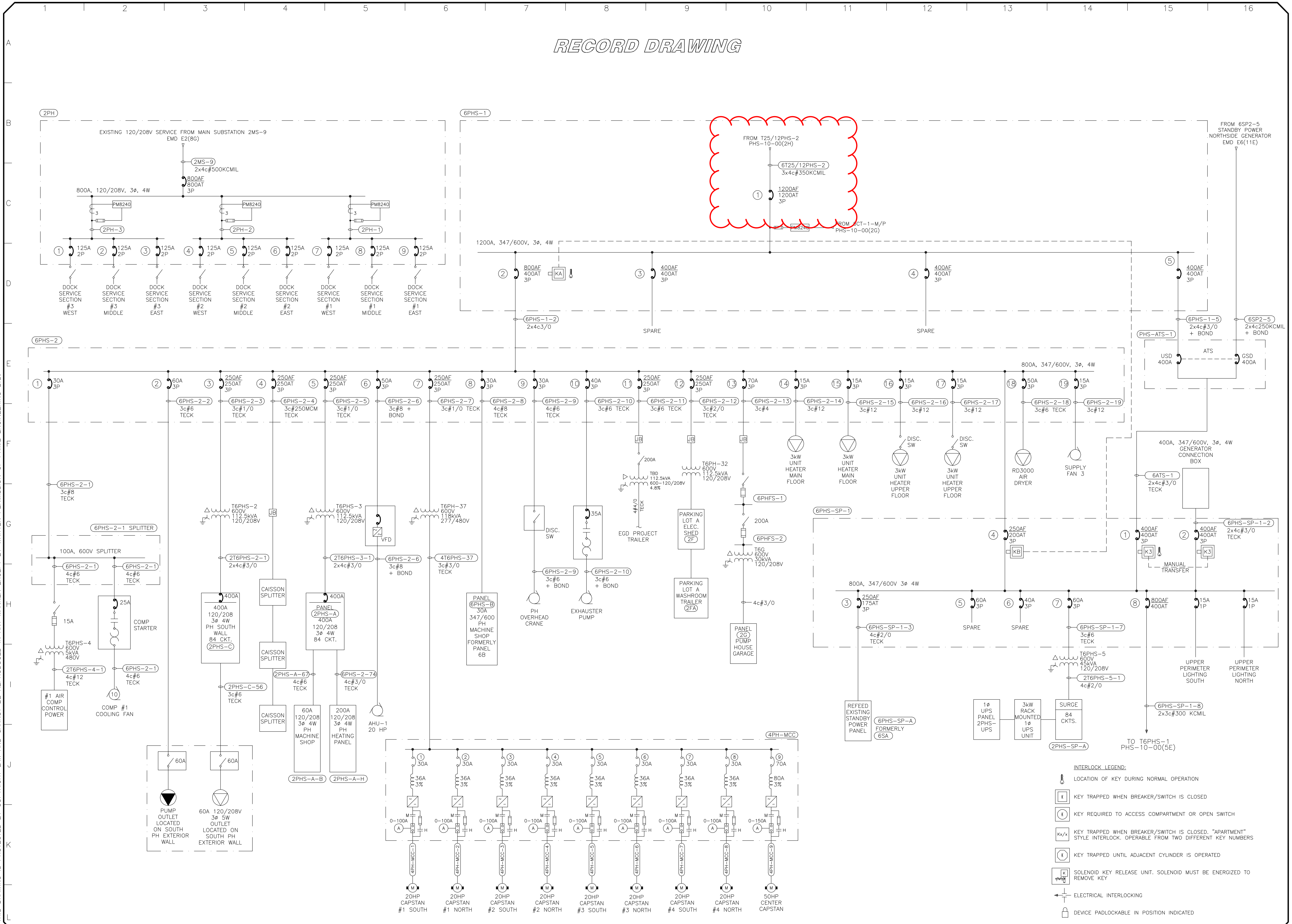

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		ISSUED FOR TENDER
		CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
PUMPHOUSE SUBSTATION LV SINGLE LINE DIAGRAM

JOB NO. 4517.22

DWG NO. PHS-10-03 | REV. 5.0

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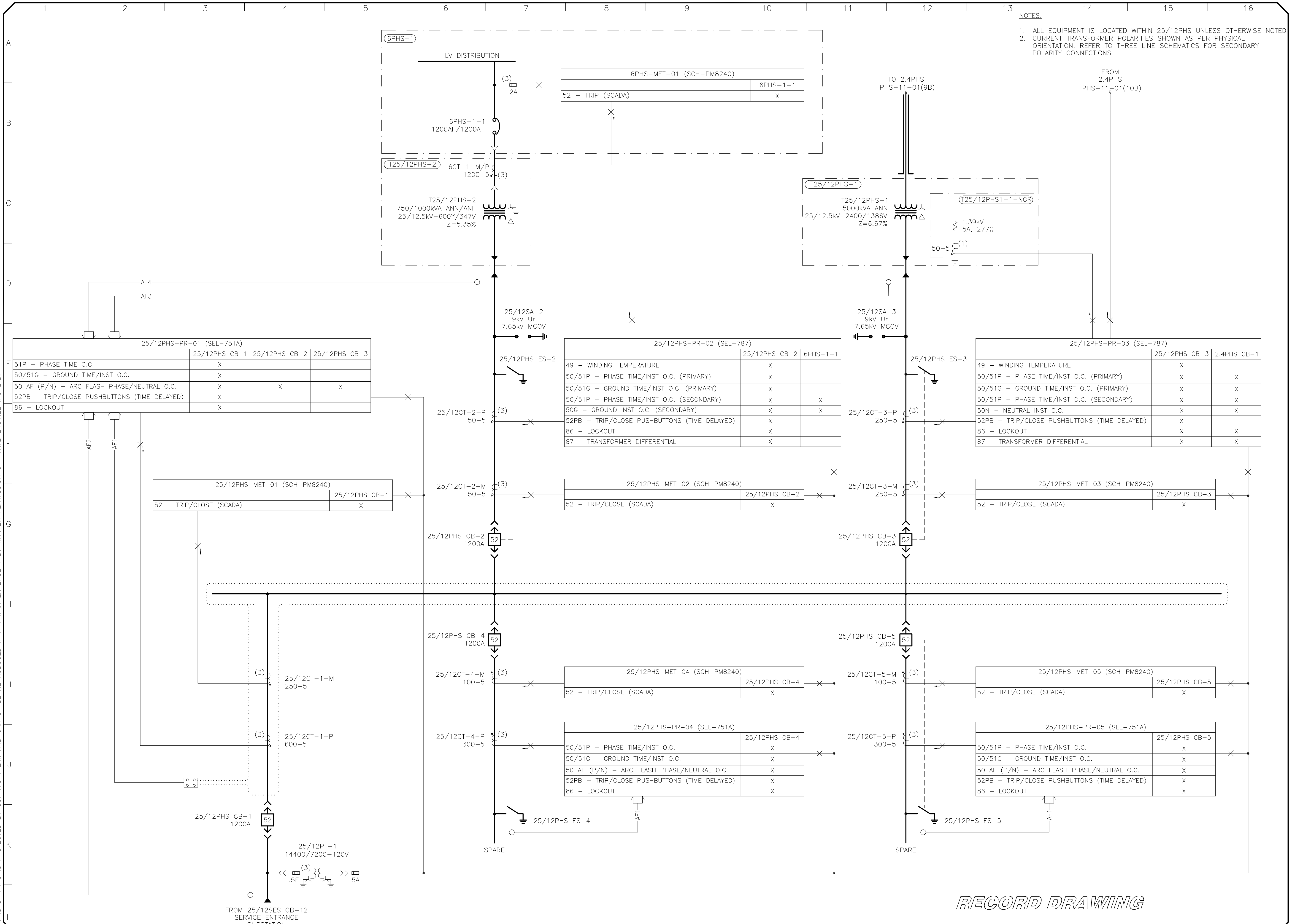

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 25/12PHS UNLESS OTHERWISE NOTED
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS

6PHS-MET-01 (SCH-PM8240)

	6PHS-1-1
52 – TRIP (SCADA)	X

25/12PHS-PR-01 (SEL-751A)

	25/12PHS CB-1	25/12PHS CB-2	25/12PHS CB-3
51P – PHASE TIME O.C.	X		
50/51G – GROUND TIME/INST O.C.	X		
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X		
86 – LOCKOUT	X		

25/12PHS-PR-02 (SEL-787)

	25/12PHS CB-2	6PHS-1-1
49 – WINDING TEMPERATURE	X	
50/51P – PHASE TIME/INST O.C. (PRIMARY)	X	
50/51G – GROUND TIME/INST O.C. (PRIMARY)	X	
50/51P – PHASE TIME/INST O.C. (SECONDARY)	X	X
50G – GROUND INST O.C. (SECONDARY)	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	
87 – TRANSFORMER DIFFERENTIAL	X	

25/12PHS-PR-03 (SEL-787)

	25/12PHS CB-3	2.4PHS CB-1
49 – WINDING TEMPERATURE	X	
50/51P – PHASE TIME/INST O.C. (PRIMARY)	X	X
50/51G – GROUND TIME/INST O.C. (PRIMARY)	X	X
50/51P – PHASE TIME/INST O.C. (SECONDARY)	X	X
50N – NEUTRAL INST O.C.	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	X
87 – TRANSFORMER DIFFERENTIAL	X	X

25/12PHS-MET-01 (SCH-PM8240)

	25/12PHS CB-1
52 – TRIP/CLOSE (SCADA)	X

25/12PHS-MET-02 (SCH-PM8240)

	25/12PHS CB-2
52 – TRIP/CLOSE (SCADA)	X

25/12PHS-MET-03 (SCH-PM8240)

	25/12PHS CB-3
52 – TRIP/CLOSE (SCADA)	X

25/12PHS-MET-04 (SCH-PM8240)

	25/12PHS CB-4
52 – TRIP/CLOSE (SCADA)	X

25/12PHS-MET-05 (SCH-PM8240)

	25/12PHS CB-5
52 – TRIP/CLOSE (SCADA)	X

25/12PHS-PR-04 (SEL-751A)

	25/12PHS CB-4
50/51P – PHASE TIME/INST O.C.	X
50/51G – GROUND TIME/INST O.C.	X
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
86 – LOCKOUT	X

25/12PHS-PR-05 (SEL-751A)

	25/12PHS CB-5
50/51P – PHASE TIME/INST O.C.	X
50/51G – GROUND TIME/INST O.C.	X
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
86 – LOCKOUT	X

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5.0	21/06/17	FOR RECORD
4.0	24/06/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
25/12PHS PROTECTION SINGLE LINE DIAGRAM

JOB NO. 4517.22

DWG NO. PHS-11-00 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

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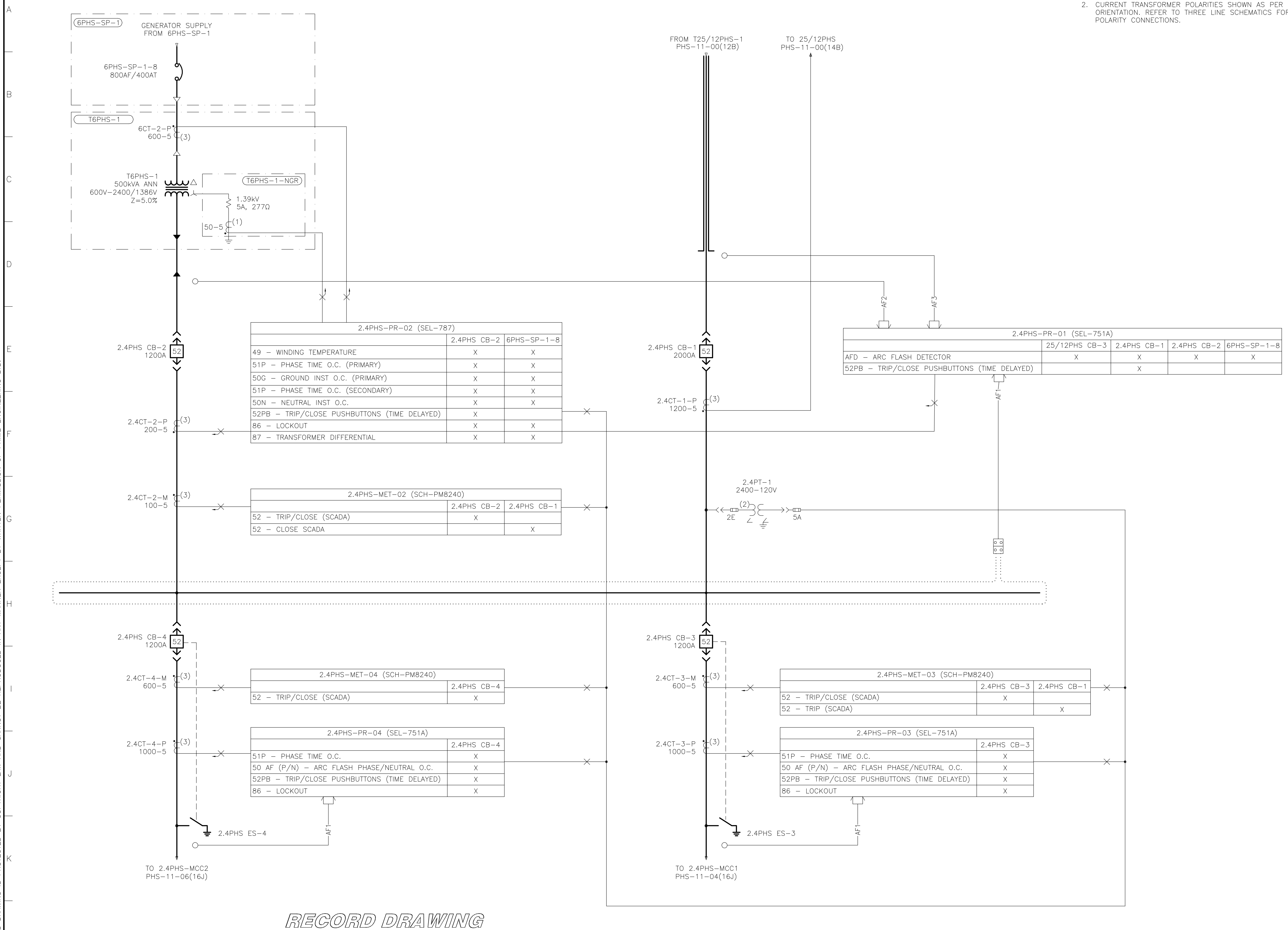
NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 2.4PHS UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.



2.4PHS-PR-02 (SEL-787)

	2.4PHS CB-2	6PHS-SP-1-8
49 – WINDING TEMPERATURE	X	X
51P – PHASE TIME O.C. (PRIMARY)	X	X
50G – GROUND INST O.C. (PRIMARY)	X	X
51P – PHASE TIME O.C. (SECONDARY)	X	X
50N – NEUTRAL INST O.C.	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
86 – LOCKOUT	X	X
87 – TRANSFORMER DIFFERENTIAL	X	X

2.4PHS-PR-01 (SEL-751A)

	25/12PHS CB-3	2.4PHS CB-1	2.4PHS CB-2	6PHS-SP-1-8
AFD – ARC FLASH DETECTOR	X	X	X	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)		X		

2.4PHS-MET-02 (SCH-PM8240)

	2.4PHS CB-2	2.4PHS CB-1
52 – TRIP/CLOSE (SCADA)	X	
52 – CLOSE SCADA		X

2.4PHS-MET-04 (SCH-PM8240)

	2.4PHS CB-4
52 – TRIP/CLOSE (SCADA)	X

2.4PHS-PR-04 (SEL-751A)

	2.4PHS CB-4
51P – PHASE TIME O.C.	X
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
86 – LOCKOUT	X

2.4PHS-MET-03 (SCH-PM8240)

	2.4PHS CB-3	2.4PHS CB-1
52 – TRIP/CLOSE (SCADA)	X	
52 – TRIP (SCADA)		X

2.4PHS-PR-03 (SEL-751A)

	2.4PHS CB-3
51P – PHASE TIME O.C.	X
50 AF (P/N) – ARC FLASH PHASE/NEUTRAL O.C.	X
52PB – TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
86 – LOCKOUT	X

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PROJECT NAME: ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE: 2.4PHS PROTECTION SINGLE LINE DIAGRAM

JOB NO. 4517.22

DWG NO. PHS-11-01 | REV. 5.0

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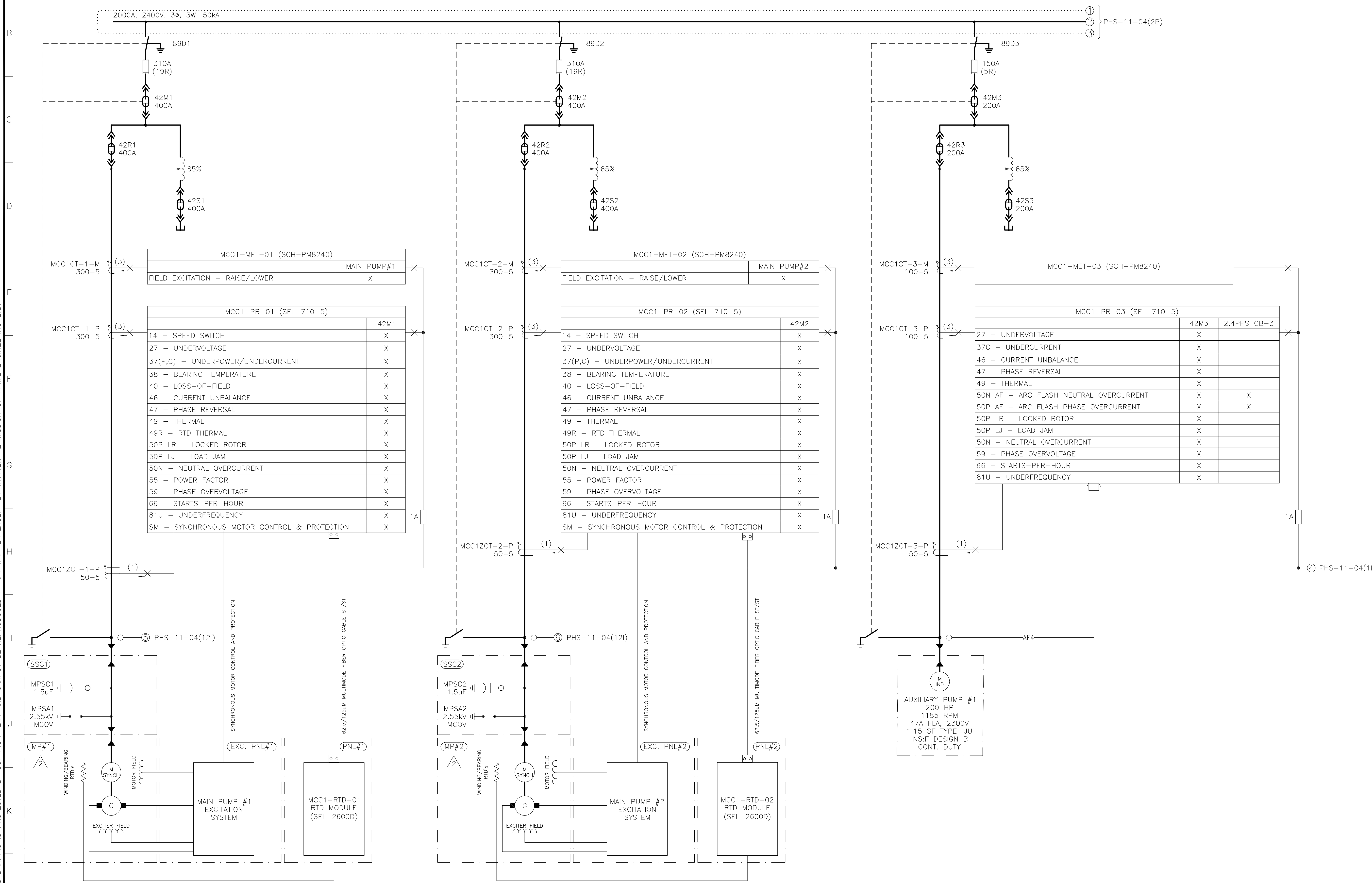
RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 2.4PHS–MCC1 UNLESS OTHERWISE NOTED.
2. MAIN PUMP DATA:
   - –1000HP
   - –360RPM CWC
   - –208FLA, 2200V, 791kVA

   DC GENERATOR DATA:
   - –16kW, 125V, 128A



MCC1–MET–01 (SCH–PM8240)

	MAIN PUMP#1
FIELD EXCITATION – RAISE/LOWER	X

MCC1–MET–02 (SCH–PM8240)

	MAIN PUMP#2
FIELD EXCITATION – RAISE/LOWER	X

MCC1–PR–01 (SEL–710–5)

	42M1
14 – SPEED SWITCH	X
27 – UNDERVOLTAGE	X
37(P,C) – UNDERPOWER/UNDERCURRENT	X
38 – BEARING TEMPERATURE	X
40 – LOSS–OF–FIELD	X
46 – CURRENT UNBALANCE	X
47 – PHASE REVERSAL	X
49 – THERMAL	X
49R – RTD THERMAL	X
50P LR – LOCKED ROTOR	X
50P LJ – LOAD JAM	X
50N – NEUTRAL OVERCURRENT	X
55 – POWER FACTOR	X
59 – PHASE OVERVOLTAGE	X
66 – STARTS–PER–HOUR	X
81U – UNDERFREQUENCY	X
SM – SYNCHRONOUS MOTOR CONTROL & PROTECTION	X

MCC1–PR–02 (SEL–710–5)

	42M2
14 – SPEED SWITCH	X
27 – UNDERVOLTAGE	X
37(P,C) – UNDERPOWER/UNDERCURRENT	X
38 – BEARING TEMPERATURE	X
40 – LOSS–OF–FIELD	X
46 – CURRENT UNBALANCE	X
47 – PHASE REVERSAL	X
49 – THERMAL	X
49R – RTD THERMAL	X
50P LR – LOCKED ROTOR	X
50P LJ – LOAD JAM	X
50N – NEUTRAL OVERCURRENT	X
55 – POWER FACTOR	X
59 – PHASE OVERVOLTAGE	X
66 – STARTS–PER–HOUR	X
81U – UNDERFREQUENCY	X
SM – SYNCHRONOUS MOTOR CONTROL & PROTECTION	X

MCC1–PR–03 (SEL–710–5)

	42M3	2.4PHS CB–3
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS–PER–HOUR	X	
81U – UNDERFREQUENCY	X	

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2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
2.4PHS – MCC1 PROTECTION SINGLE LINE DIAGRAM (1 OF 2)

JOB NO. 4517.22

DWG NO. PHS–11–03 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

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RECORD DRAWING

NOTES:
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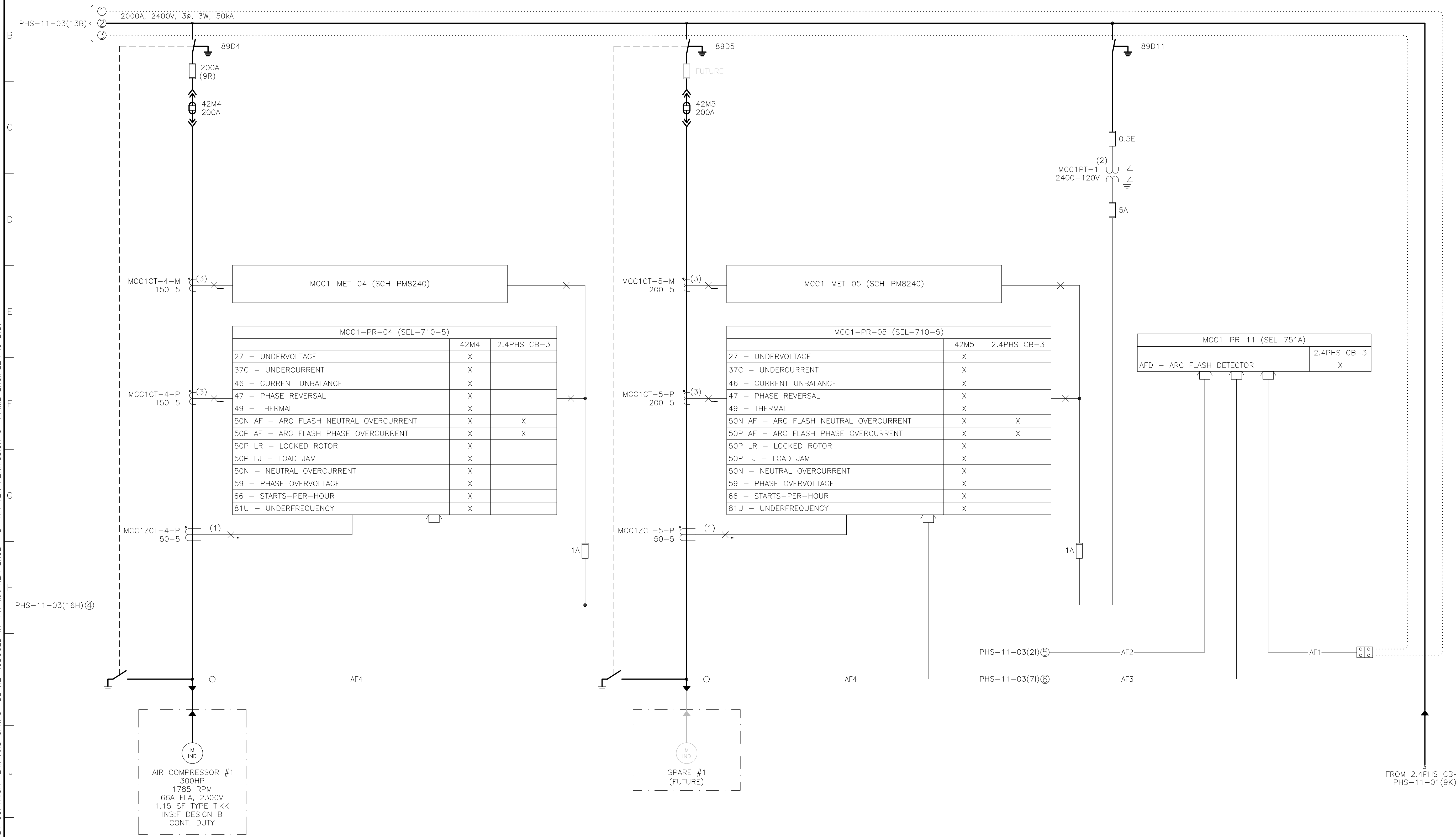

MCC1–PR–04 (SEL–710–5)

	42M4	2.4PHS CB–3
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS–PER–HOUR	X	
81U – UNDERFREQUENCY	X	

MCC1–PR–05 (SEL–710–5)

	42M5	2.4PHS CB–3
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS–PER–HOUR	X	
81U – UNDERFREQUENCY	X	

MCC1–PR–11 (SEL–751A)

	2.4PHS CB–3
AFD – ARC FLASH DETECTOR	X

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	21/06/17	FOR RECORD
		ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
2.4PHS–MCC1 PROTECTION SINGLE LINE DIAGRAM (2 OF 2)

JOB NO. 4517.22

DWG NO. PHS–11–04 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

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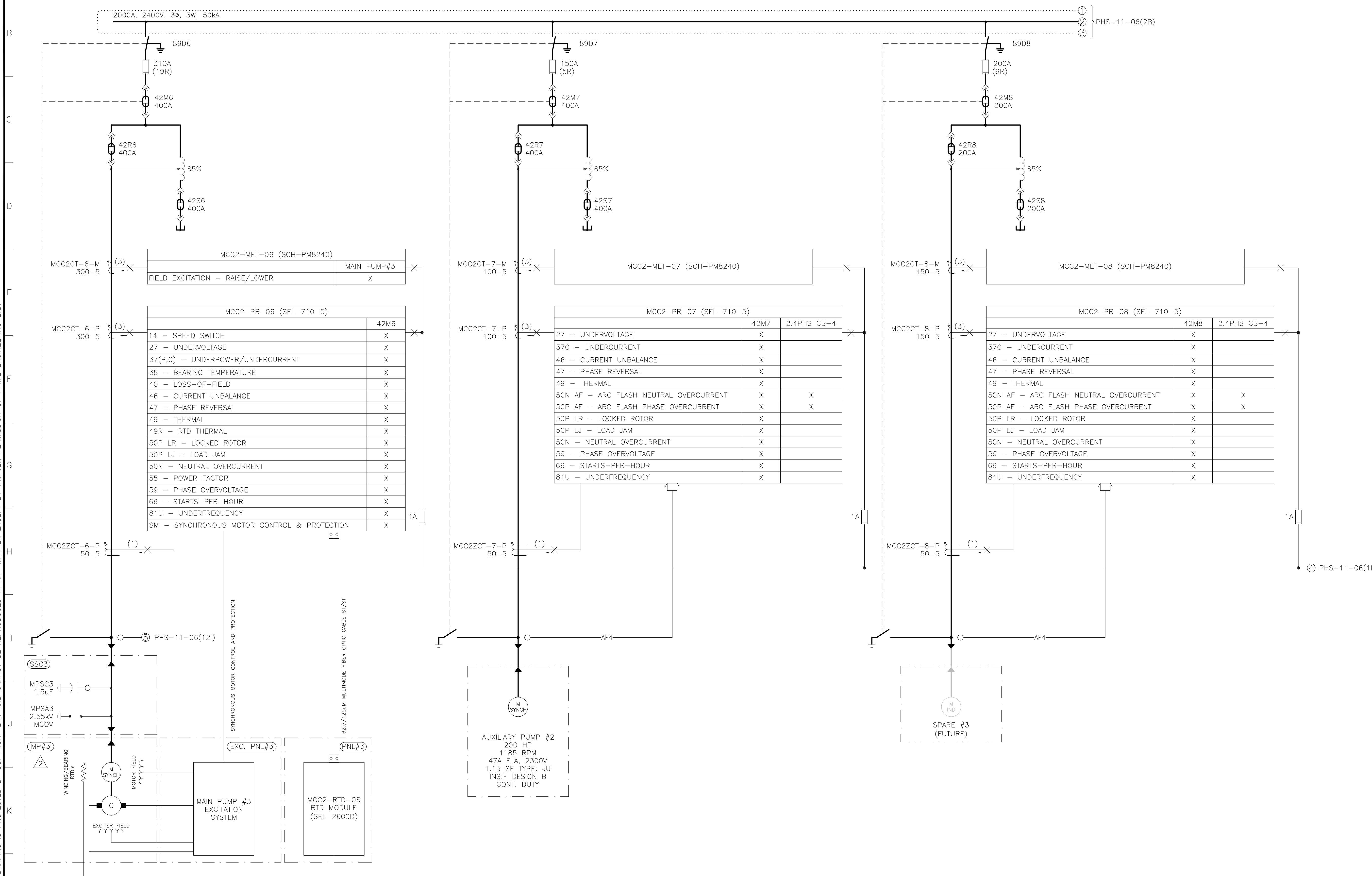
CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES–PHS Upgrade\4517.22 – PHS Switch & Panel Supply & Shop Int\Drawings\Internal\1–SINGLE LINE DWG\4517.22_PHS–11–04_5.0.dwg 10/07/2017 9:14 PM

RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 2.4PHS–MCC2 UNLESS OTHERWISE NOTED.
2. MAIN PUMP DATA:
   –1000HP
   –360RPM CWC
   –208FLA, 2200V, 791kVA
   DC GENERATOR DATA:
   –16kW, 125V, 128A



MCC2–MET–06 (SCH–PM8240)

	MAIN PUMP#3
FIELD EXCITATION – RAISE/LOWER	X

MCC2–PR–06 (SEL–710–5)

	42M6
14 – SPEED SWITCH	X
27 – UNDERVOLTAGE	X
37(P,C) – UNDERPOWER/UNDERCURRENT	X
38 – BEARING TEMPERATURE	X
40 – LOSS–OF–FIELD	X
46 – CURRENT UNBALANCE	X
47 – PHASE REVERSAL	X
49 – THERMAL	X
49R – RTD THERMAL	X
50P LR – LOCKED ROTOR	X
50P LJ – LOAD JAM	X
50N – NEUTRAL OVERCURRENT	X
55 – POWER FACTOR	X
59 – PHASE OVERVOLTAGE	X
66 – STARTS–PER–HOUR	X
81U – UNDERFREQUENCY	X
SM – SYNCHRONOUS MOTOR CONTROL & PROTECTION	X

MCC2–PR–07 (SEL–710–5)

	42M7	2.4PHS CB–4
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS–PER–HOUR	X	
81U – UNDERFREQUENCY	X	

MCC2–PR–08 (SEL–710–5)

	42M8	2.4PHS CB–4
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS–PER–HOUR	X	
81U – UNDERFREQUENCY	X	

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	21/06/17	FOR RECORD
		ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
2.4PHS – MCC2 PROTECTION SINGLE LINE DIAGRAM (1 OF 2)

JOB NO. 4517.22

DWG NO. PHS–11–05 | REV. 5.0

DESIGNER KB | DRAWN BY TGH

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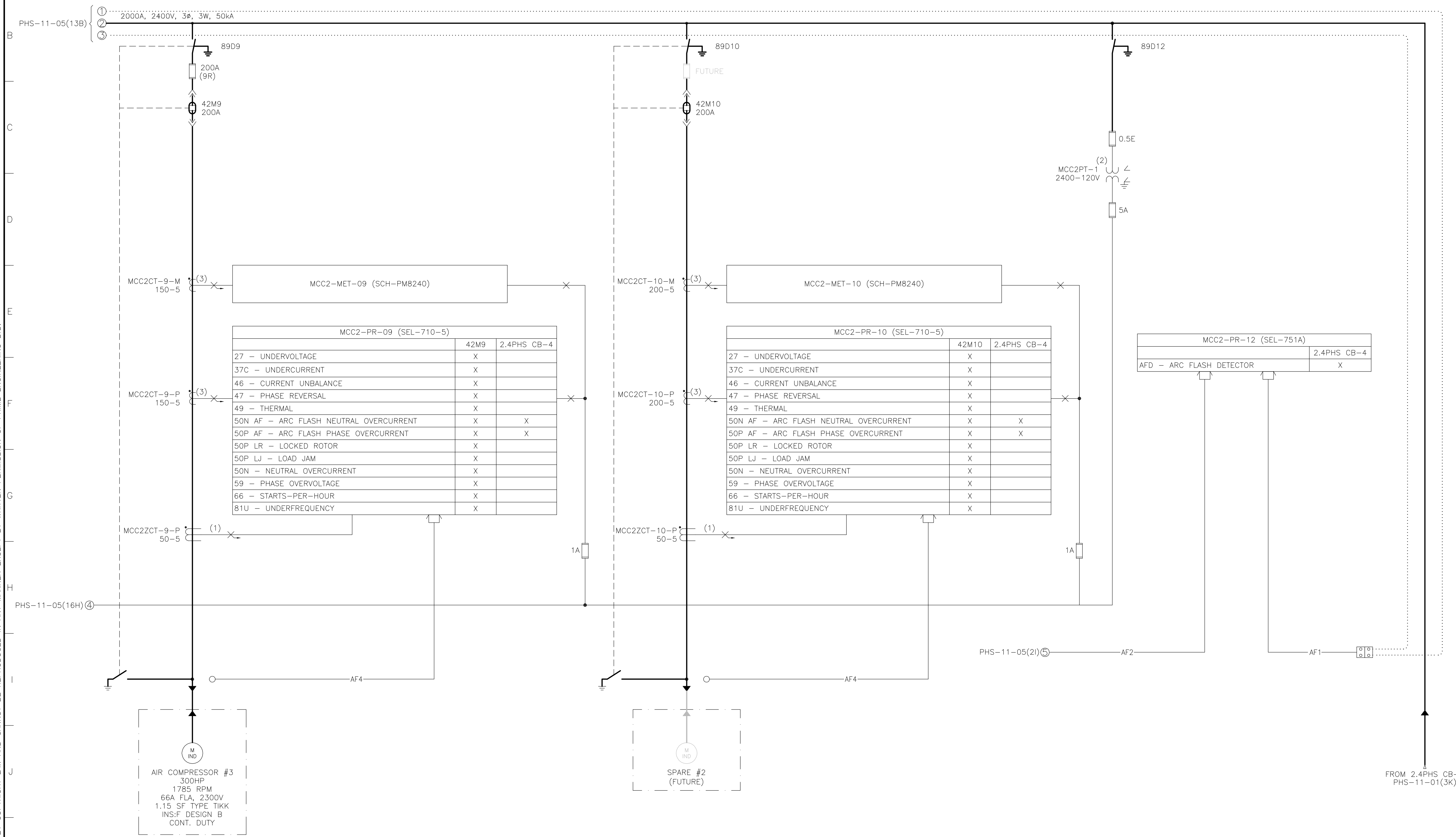
CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES–PHS Upgrade\4517.22 – PHS Switch & Panel Supply & Shop Int\Drawings\Internal\1–SINGLE LINE DWG\4517.22_PHS–11–05_5.0.dwg 17/07/2017 7:14 AM

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 2.4PHS-MCC2 UNLESS OTHERWISE NOTED



MCC2-PR-09 (SEL-710-5)

	42M9	2.4PHS CB-4
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS-PER-HOUR	X	
81U – UNDERFREQUENCY	X	

MCC2-PR-10 (SEL-710-5)

	42M10	2.4PHS CB-4
27 – UNDERVOLTAGE	X	
37C – UNDERCURRENT	X	
46 – CURRENT UNBALANCE	X	
47 – PHASE REVERSAL	X	
49 – THERMAL	X	
50N AF – ARC FLASH NEUTRAL OVERCURRENT	X	X
50P AF – ARC FLASH PHASE OVERCURRENT	X	X
50P LR – LOCKED ROTOR	X	
50P LJ – LOAD JAM	X	
50N – NEUTRAL OVERCURRENT	X	
59 – PHASE OVERVOLTAGE	X	
66 – STARTS-PER-HOUR	X	
81U – UNDERFREQUENCY	X	

MCC2-PR-12 (SEL-751A)

	2.4PHS CB-4
AFD – ARC FLASH DETECTOR	X

A B C D E F G H I J K L

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\4517 – SES-PHS Upgrade\4517.22 – PHS Switch & Panel Supply & Shop Int\Drawings\Internal\1-SINGLE LINE DWG\4517.22_PHS-11-06_5.0.dwg 10/07/2017 9:17 PM

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	21/06/17	FOR RECORD
		ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/02/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL SERVICE UPGRADE – PHS

DWG TITLE
2.4PHS-MCC2 PROTECTION SINGLE LINE DIAGRAM (2 OF 2)

JOB NO. 4517.22

DWG NO. PHS-11-06 REV. 5.0

DESIGNER KB DRAWN BY TGH

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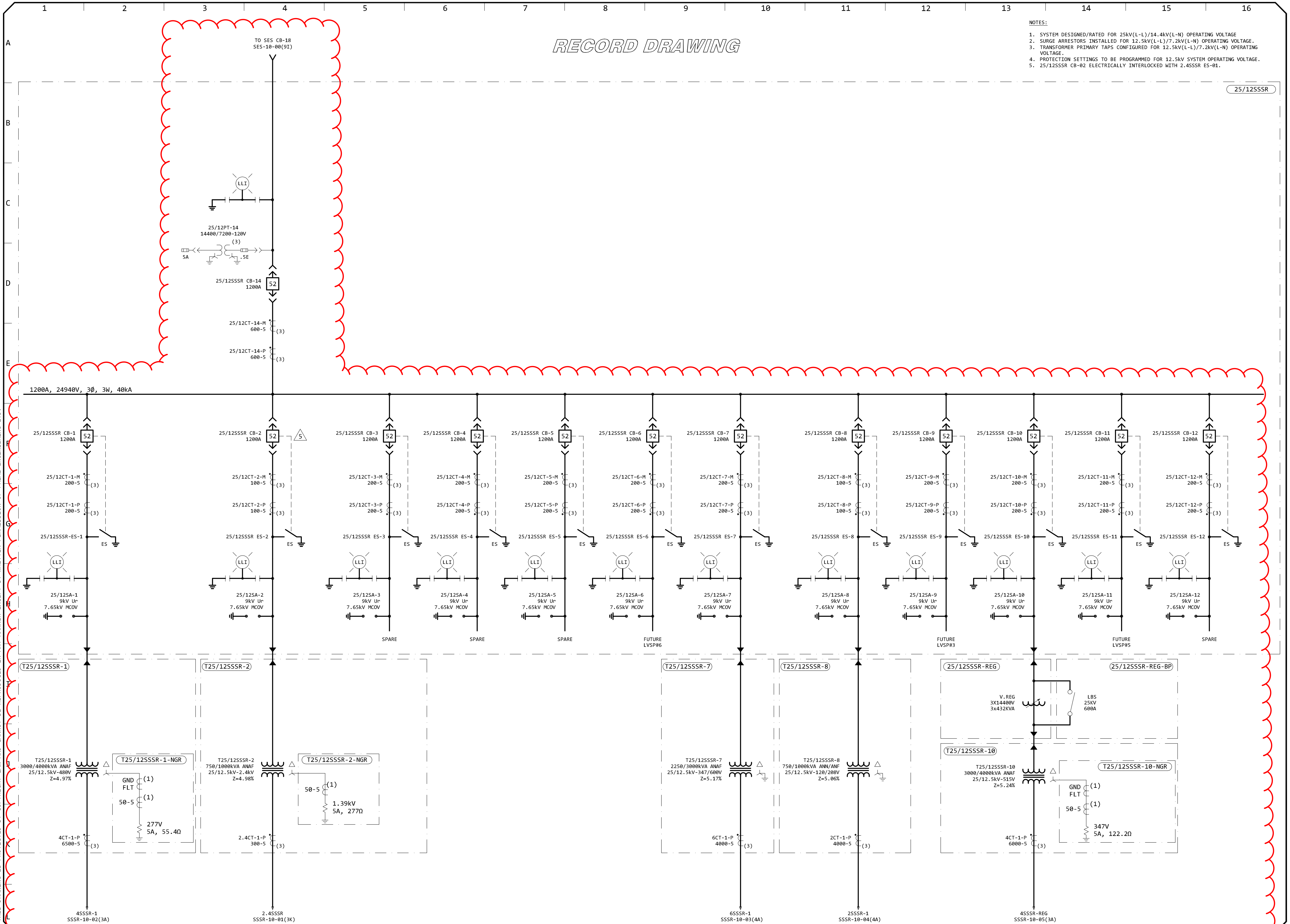
RECORD DRAWING

NOTES:

1. SYSTEM DESIGNED/RATED FOR 25kV(L-L)/14.4kV(L-N) OPERATING VOLTAGE
2. SURGE ARRESTORS INSTALLED FOR 12.5kV(L-L)/7.2kV(L-N) OPERATING VOLTAGE.
3. TRANSFORMER PRIMARY TAPS CONFIGURED FOR 12.5kV(L-L)/7.2kV(L-N) OPERATING VOLTAGE.
4. PROTECTION SETTINGS TO BE PROGRAMMED FOR 12.5kV SYSTEM OPERATING VOLTAGE.
5. 25/12SSSR CB-02 ELECTRICALLY INTERLOCKED WITH 2.4SSSR ES-01.



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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	15/11/17	FOR RECORD
4.0	21/12/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL UPGRADES - SSSR

DWG TITLE
25/12SSSR
SINGLE LINE
DIAGRAM

JOB NO. 5014.12

DWG NO. SSSR-10-00 — REV. 5.0

CURRENT REVISION INITIALS

DESIGNED:	DRAFTED:
BH	TGH
CHECKED: -	APPROVED: -

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\5014 - South Side Substation Replacement\5014.12 - Switchgear\Drawings\Internal\1-SINGLE LINE DWG\5014.12_SSSR-10-00_5.0.dwg 1/12/2017 10:26 AM

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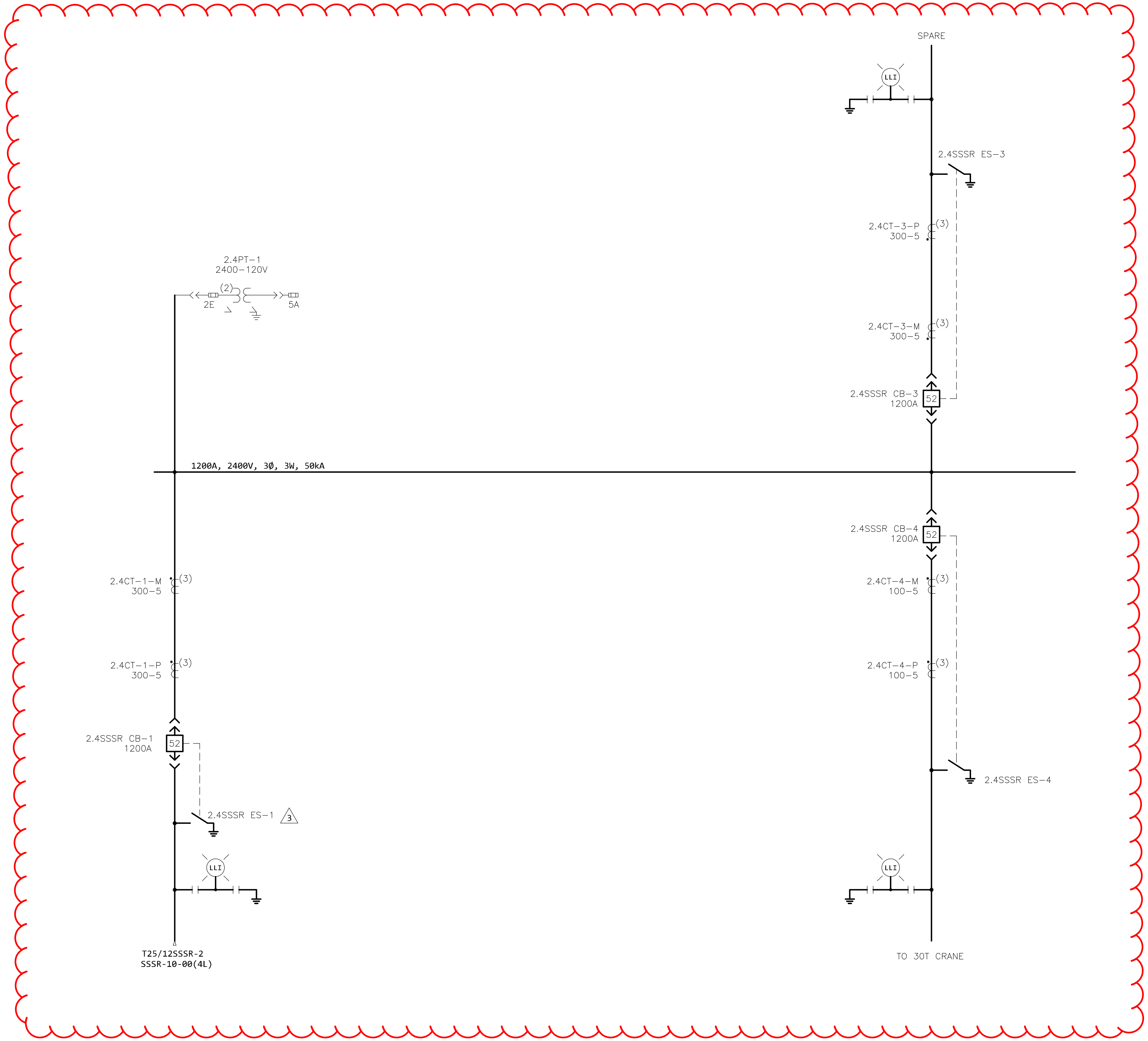
DRAWINGS MARKED "FOR RECORD" CERTIFY THAT THE DESIGN INFORMATION CONTAINED WITHIN ACCURATELY REFLECTS THE ORIGINAL DESIGN AND THE MATERIAL DESIGN CHANGES MADE DURING CONSTRUCTION THAT WERE BROUGHT TO THE ENGINEERS ATTENTION. RECORD DRAWINGS ARE INTENDED TO INCLUDE MATERIAL DESIGN CHANGES BUT NOT NECESSARILY ALL SITE INSTRUCTIONS. PRIME ENGINEERING DOES NOT WARRANT OR GUARANTEE NOR ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OF THE AS-CONSTRUCTED INFORMATION SUPPLIED BY OTHERS CONTAINED IN THIS DRAWING.

RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 2.4SSSR UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.
3. 2.4SSSR ES-1 ELECTRICALLY INTERLOCKED WITH 25/12SSSR CB-02 TO PREVENT GROUNDING OF LIVE CIRCUIT.



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REV.	DD/MM/YY	REV. DESCRIPTION

REV.	DD/MM/YY	REV. DESCRIPTION
5.0	15/11/17	FOR RECORD
4.0	06/01/17	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	12/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL UPGRADES - SSSR

DWG TITLE
2.4SSSR
SINGLE LINE
DIAGRAM

JOB NO.
5014.12

DWG NO.
SSSR-10-01

REV.
5.0

CURRENT REVISION INITIALS

DESIGNED: BH	DRAFTED: TGH
CHECKED: -	APPROVED: -

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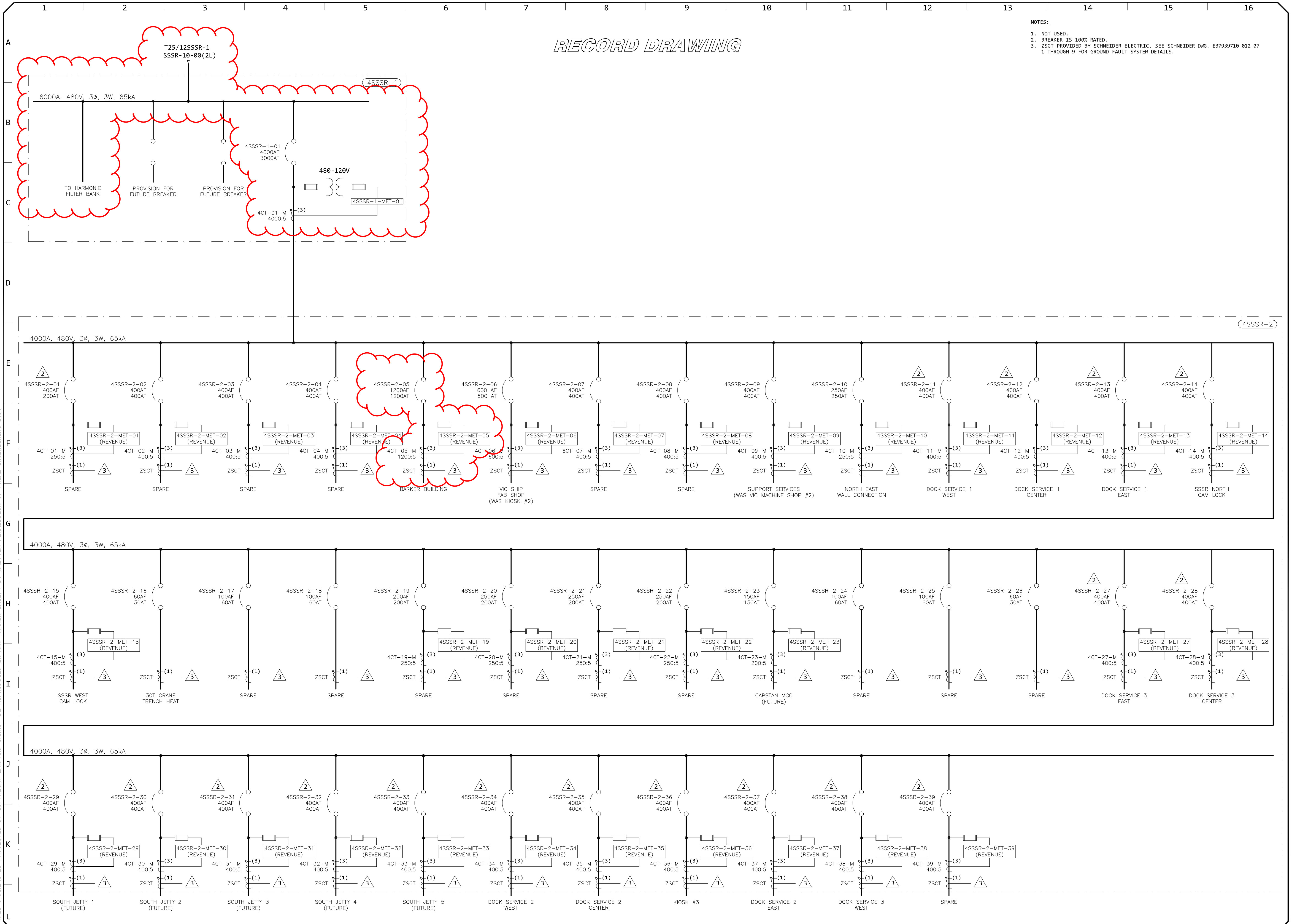

NOTES:

1. NOT USED.
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.

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	15/11/17	FOR RECORD
4.0	16/02/17	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	28/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL UPGRADES - SSSR

DWG TITLE
4SSSR-1 AND 4SSSR-2 SINGLE LINE DIAGRAM

JOB NO. 5014.12

DWG NO. SSSR-10-02 REV. 5.0

CURRENT REVISION INITIALS

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CHECKED: - | APPROVED: -

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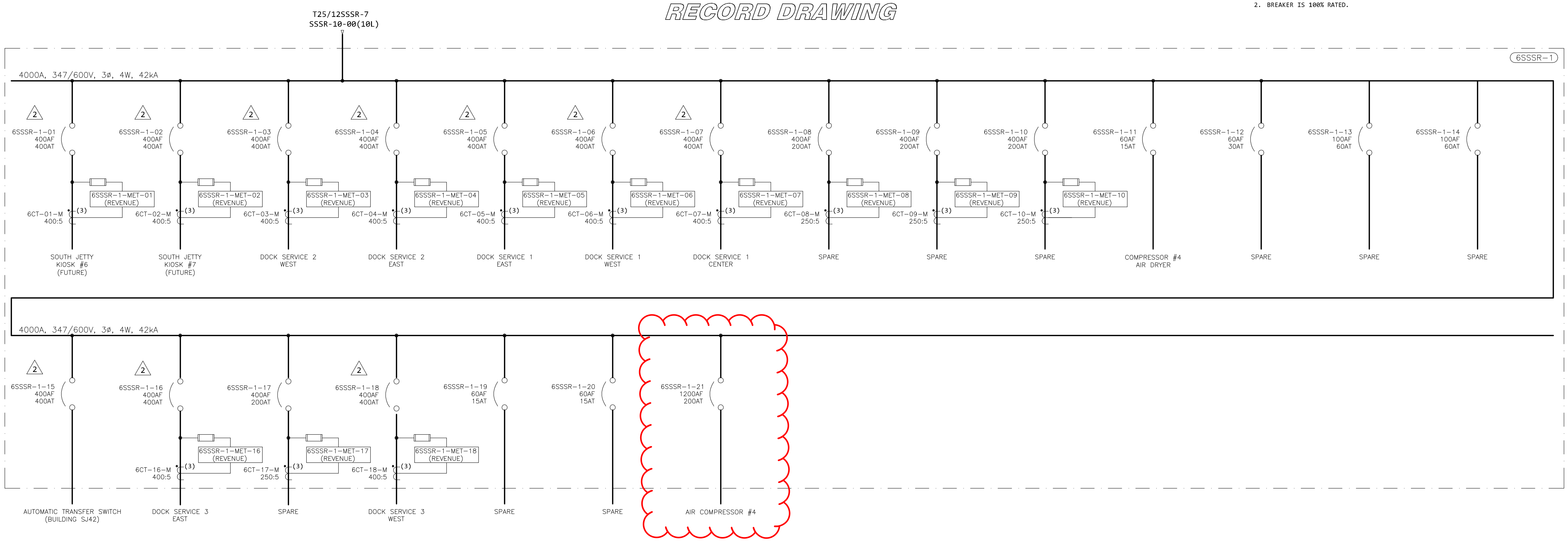
RECORD DRAWING

NOTES:
1. NOT USED.
2. BREAKER IS 100% RATED.



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REV.	DD/MM/YY	REV. DESCRIPTION

REV.	DD/MM/YY	REV. DESCRIPTION
5.0	15/11/17	FOR RECORD
4.0	16/02/17	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	28/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL UPGRADES - SSSR

DWG TITLE
6SSSR-1 SINGLE LINE DIAGRAM

JOB NO.
5014.12

DWG NO. SSSR-10-03 | REV. 5.0

CURRENT REVISION INITIALS

DESIGNED: BH	DRAFTED: NK
CHECKED: -	APPROVED: -

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CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\5014 - South Side Substation Replacement\5014.12 - Switchgear\Drawings\Internal\1-SINGLE LINE DWG\5014.12_SSSR-10-03_5.0.dwg 15/11/2017 10:35 AM

RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 25/12SSSR UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.
3. CT USED FOR 4SSSR-REG SWITCHBOARD GROUND FAULT MONITORING.

25/12SSSR-PR-14 (SEL-487E)	25/12SSSR CB-14
50/51P - PHASE INST/TIME O.C.	X
50/51G - GROUND INST/TIME O.C.	X
50BF - 25/12SSR-5 BREAKER FAIL	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
87B - BUS DIFFERENTIAL	X
MR - MOTORIZED RACKING CONTROL	X

25/12SSSR-PR-11 (SEL-751A)	25/12SSSR CB-11
50/51P - PHASE INST/TIME O.C.	X
50/51G - GROUND INST/TIME O.C.	X
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X

25/12SSSR-PR-09 (SEL-751A)	25/12SSSR CB-9
50/51P - PHASE INST/TIME O.C.	X
50/51G - GROUND INST/TIME O.C.	X
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X

25/12SSSR-MET-14 (SCH-PM8240)	25/12SSSR CB-14
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-MET-11 (SCH-PM8240)	25/12SSSR CB-11
52 - TRIP/CLOSE (SCADA)	X

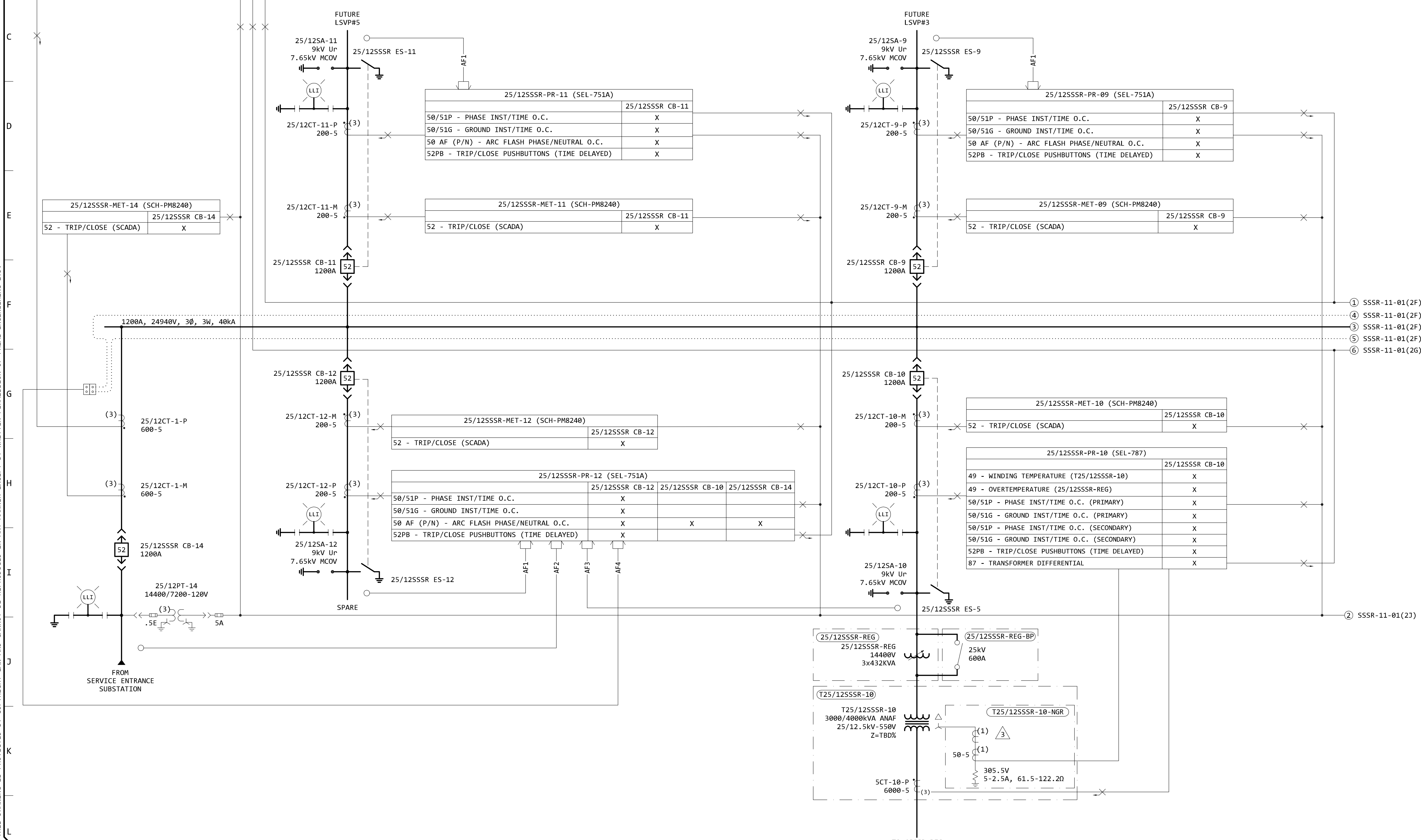
25/12SSSR-MET-09 (SCH-PM8240)	25/12SSSR CB-9
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-MET-12 (SCH-PM8240)	25/12SSSR CB-12
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-MET-10 (SCH-PM8240)	25/12SSSR CB-10
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-PR-12 (SEL-751A)	25/12SSSR CB-12	25/12SSSR CB-10	25/12SSSR CB-14
50/51P - PHASE INST/TIME O.C.	X		
50/51G - GROUND INST/TIME O.C.	X		
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X	X	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X		

25/12SSSR-PR-10 (SEL-787)	25/12SSSR CB-10
49 - WINDING TEMPERATURE (T25/12SSSR-10)	X
49 - OVERTEMPERATURE (25/12SSSR-REG)	X
50/51P - PHASE INST/TIME O.C. (PRIMARY)	X
50/51G - GROUND INST/TIME O.C. (PRIMARY)	X
50/51P - PHASE INST/TIME O.C. (SECONDARY)	X
50/51G - GROUND INST/TIME O.C. (SECONDARY)	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
87 - TRANSFORMER DIFFERENTIAL	X



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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	01/12/17	FOR RECORD
4.0	21/12/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/10/16	CLIENT REVIEW

PROJECT NAME: ESQUIMALT GRAVING DOCK ELECTRICAL UPGRADES - SSSR

DWG TITLE: 25/12SSSR HV PROTECTION SINGLE LINE DIAGRAM (1 OF 3)

JOB NO. 5014.12

DWG NO. SSSR-11-00 — REV. 5.0

CURRENT REVISION INITIALS

DESIGNED: BH	DRAFTED: TGH
CHECKED: -	APPROVED: -

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\5014 - South Side Substation Replacement\5014.12 - Switchgear\Drawings\Internal\1-SINGLE LINE DWG\5014.12_SSSR-11-00_5.0.dwg 18/12/2017 7:13 AM

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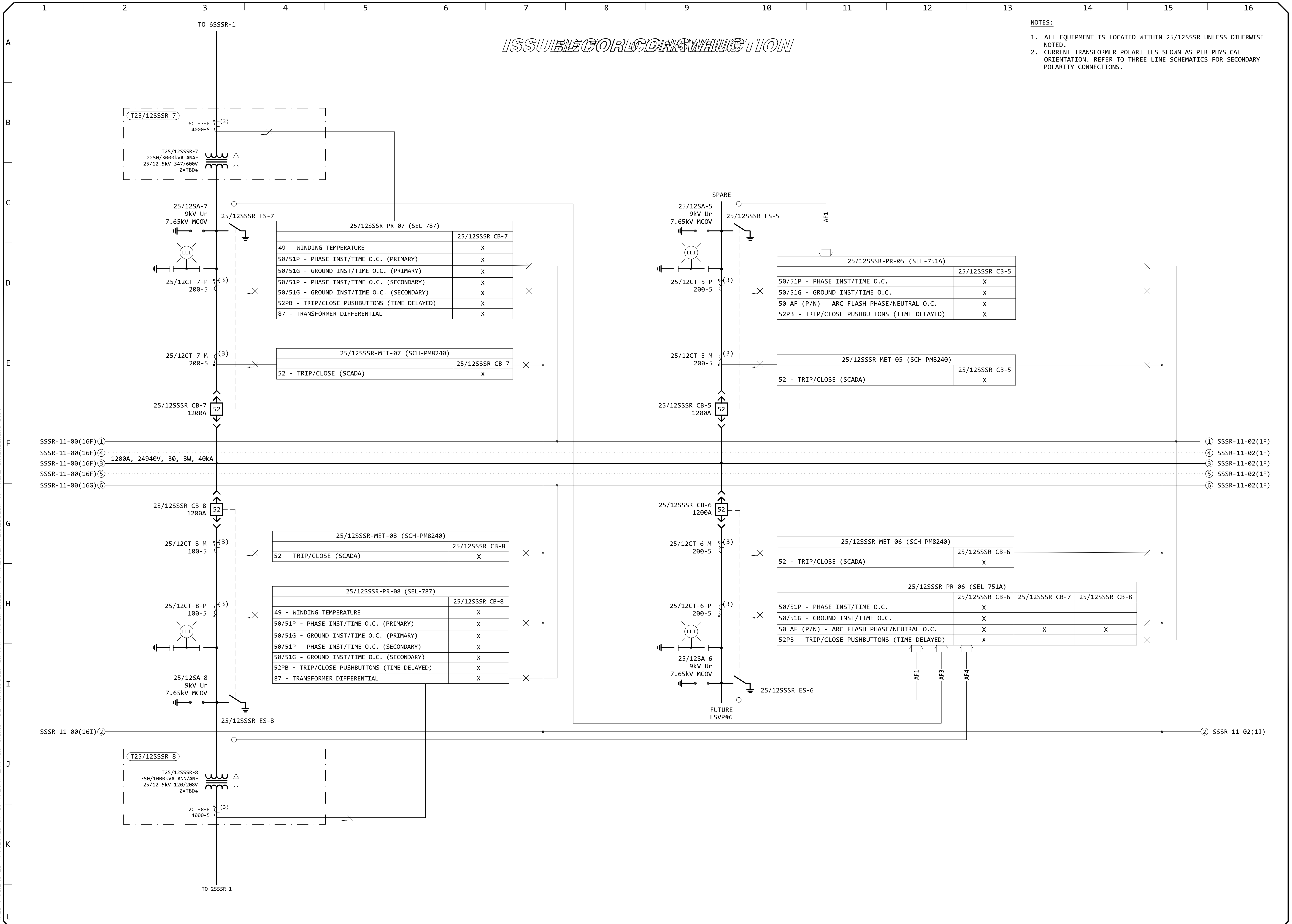
ISSUED FOR CONSTRUCTION

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 25/12SSSR UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.



25/12SSSR-PR-07 (SEL-787)

	25/12SSSR CB-7
49 - WINDING TEMPERATURE	X
50/51P - PHASE INST/TIME O.C. (PRIMARY)	X
50/51G - GROUND INST/TIME O.C. (PRIMARY)	X
50/51P - PHASE INST/TIME O.C. (SECONDARY)	X
50/51G - GROUND INST/TIME O.C. (SECONDARY)	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
87 - TRANSFORMER DIFFERENTIAL	X

25/12SSSR-MET-07 (SCH-PM8240)

	25/12SSSR CB-7
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-MET-08 (SCH-PM8240)

	25/12SSSR CB-8
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-PR-08 (SEL-787)

	25/12SSSR CB-8
49 - WINDING TEMPERATURE	X
50/51P - PHASE INST/TIME O.C. (PRIMARY)	X
50/51G - GROUND INST/TIME O.C. (PRIMARY)	X
50/51P - PHASE INST/TIME O.C. (SECONDARY)	X
50/51G - GROUND INST/TIME O.C. (SECONDARY)	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X
87 - TRANSFORMER DIFFERENTIAL	X

25/12SSSR-PR-05 (SEL-751A)

	25/12SSSR CB-5
50/51P - PHASE INST/TIME O.C.	X
50/51G - GROUND INST/TIME O.C.	X
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X

25/12SSSR-MET-05 (SCH-PM8240)

	25/12SSSR CB-5
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-MET-06 (SCH-PM8240)

	25/12SSSR CB-6
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-PR-06 (SEL-751A)

	25/12SSSR CB-6	25/12SSSR CB-7	25/12SSSR CB-8
50/51P - PHASE INST/TIME O.C.	X		
50/51G - GROUND INST/TIME O.C.	X		
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X	X	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X		

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REV.	DD/MM/YY	REV. DESCRIPTION
5.0	01/12/17	FOR RECORD
4.0	21/12/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK
ELECTRICAL UPGRADES - SSSR

DWG TITLE
25/12SSSR
HV PROTECTION SINGLE LINE DIAGRAM
(2 OF 3)

JOB NO. 5014.12

DWG NO. SSSR-11-01 | REV. 5.0

CURRENT REVISION INITIALS

DESIGNED: BH	DRAFTED: JK
CHECKED: -	APPROVED: -

CAD DWG FILE: B:\Victoria\Esquimalt Graving Dock\Current Projects\5014 - South Side Substation Replacement\5014.12 - Switchgear\Drawings\Internal\1-SINGLE LINE DWG\5014.12_SSSR-11-01_5.0.dwg 1/12/2017 10:36 AM

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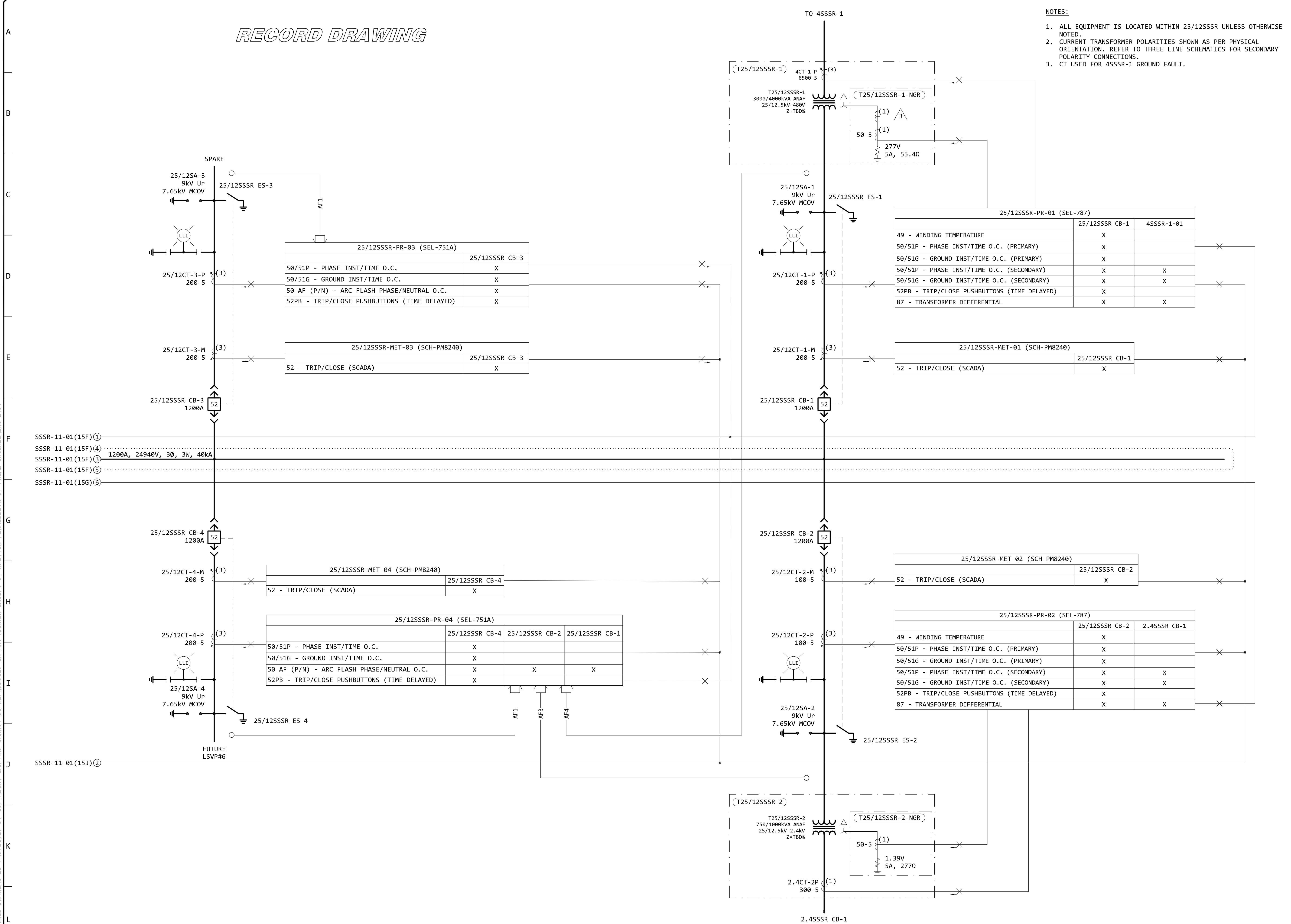
RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 25/12SSSR UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.
3. CT USED FOR 4SSSR-1 GROUND FAULT.



25/12SSSR-PR-03 (SEL-751A)	25/12SSSR CB-3
50/51P - PHASE INST/TIME O.C.	X
50/51G - GROUND INST/TIME O.C.	X
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X

25/12SSSR-MET-03 (SCH-PM8240)	25/12SSSR CB-3
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-PR-01 (SEL-787)	25/12SSSR CB-1	4SSSR-1-01
49 - WINDING TEMPERATURE	X	
50/51P - PHASE INST/TIME O.C. (PRIMARY)	X	
50/51G - GROUND INST/TIME O.C. (PRIMARY)	X	
50/51P - PHASE INST/TIME O.C. (SECONDARY)	X	X
50/51G - GROUND INST/TIME O.C. (SECONDARY)	X	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
87 - TRANSFORMER DIFFERENTIAL	X	X

25/12SSSR-MET-01 (SCH-PM8240)	25/12SSSR CB-1
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-MET-04 (SCH-PM8240)	25/12SSSR CB-4
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-PR-04 (SEL-751A)	25/12SSSR CB-4	25/12SSSR CB-2	25/12SSSR CB-1
50/51P - PHASE INST/TIME O.C.	X		
50/51G - GROUND INST/TIME O.C.	X		
50 AF (P/N) - ARC FLASH PHASE/NEUTRAL O.C.	X	X	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X		

25/12SSSR-MET-02 (SCH-PM8240)	25/12SSSR CB-2
52 - TRIP/CLOSE (SCADA)	X

25/12SSSR-PR-02 (SEL-787)	25/12SSSR CB-2	2.4SSSR CB-1
49 - WINDING TEMPERATURE	X	
50/51P - PHASE INST/TIME O.C. (PRIMARY)	X	
50/51G - GROUND INST/TIME O.C. (PRIMARY)	X	
50/51P - PHASE INST/TIME O.C. (SECONDARY)	X	X
50/51G - GROUND INST/TIME O.C. (SECONDARY)	X	X
52PB - TRIP/CLOSE PUSHBUTTONS (TIME DELAYED)	X	
87 - TRANSFORMER DIFFERENTIAL	X	X

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5.0	01/12/17	FOR RECORD
4.0	21/12/16	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	11/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL UPGRADES - SSSR

DWG TITLE
25/12SSSR HV PROTECTION SINGLE LINE DIAGRAM (3 OF 3)

JOB NO. 5014.12

DWG NO. SSSR-11-02 — REV. 5.0

CURRENT REVISION INITIALS

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CHECKED: -	APPROVED: -

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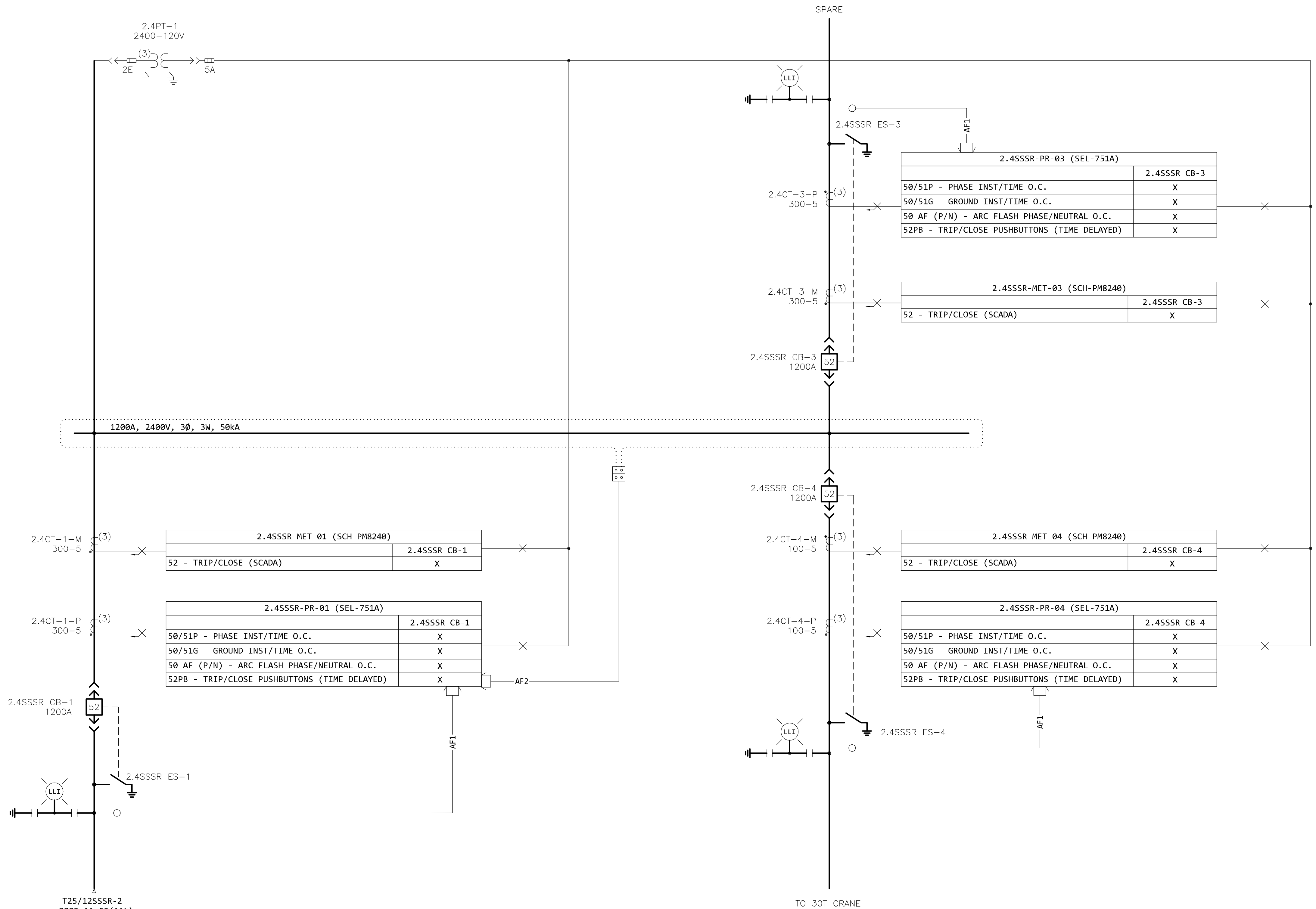
RECORD DRAWING

NOTES:

1. ALL EQUIPMENT IS LOCATED WITHIN 2.4SSSR UNLESS OTHERWISE NOTED.
2. CURRENT TRANSFORMER POLARITIES SHOWN AS PER PHYSICAL ORIENTATION. REFER TO THREE LINE SCHEMATICS FOR SECONDARY POLARITY CONNECTIONS.



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2.0	12/10/16	CLIENT REVIEW

PROJECT NAME
ESQUIMALT GRAVING DOCK ELECTRICAL UPGRADES - SSSR

DWG TITLE
2.4SSSR HV PROTECTION SINGLE LINE DIAGRAM

JOB NO.
5014.12

DWG NO. SSSR-11-03 | REV. 5.0

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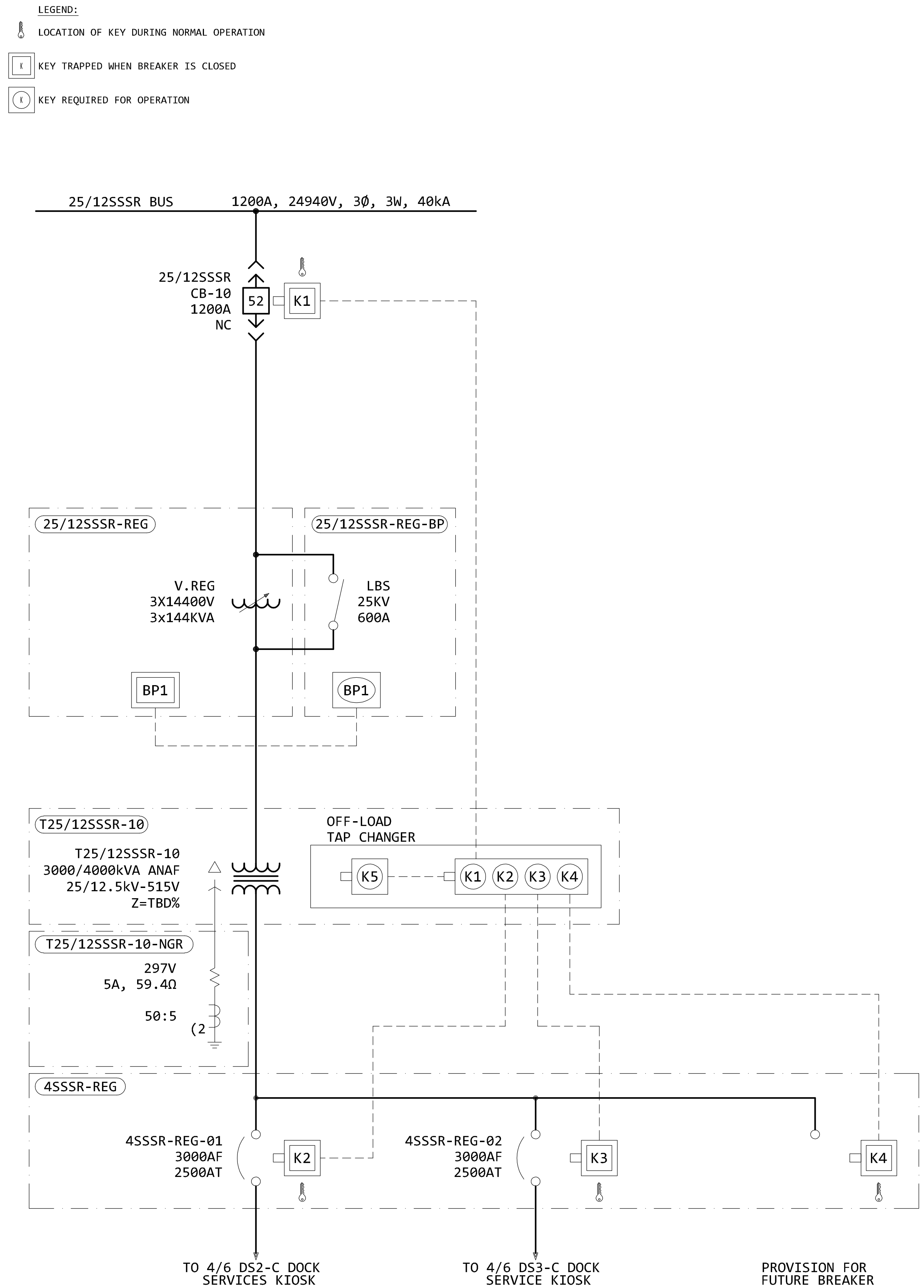

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KEY INTERLOCKING NOTES:

1. KEYS ARE REMOVABLE FROM A CYLINDER UNDER THE FOLLOWING CONIDTIONS:
   - 1.1 FOR MV CIRCUIT BREAKER: WHEN THE CIRCUIT BREAKER IS IN THE "WITHDRAWN" OR "DISCONNECTED" POSITION.
   - 1.2 FOR LV CIRCUIT BREAKERS: WHEN THE CIRCUIT BREAKER IS IN THE "OPEN" POSITION.

T25/12SSSR-10 TAP CHANGER INTERLOCKING SCHEME:

1. KEYS ARE CAPTIVE UNDER THE FOLLOWING CONDITIONS:
   - 1.1 FOR MV CIRCUIT BREAKERS: WHEN THE CIRCUIT BREAKER IS IN THE "TEST" OR "CONNECTED" POSITION.
   - 1.2 FOR LV CIRCUIT BREAKERS: WHEN THE CIRCUIT BREAKER IS IN THE "CLOSED" POSITION.
2. OPERATION OF TAP CHANGER WILL BE COMPLETED ONLY WITH CIRCUIT BREAKER 25/12SSSR-10 OPEN AND DISCONNECTED, AND CIRCUIT BREAKERS 4SSSR-REG-01, 4SSSR-REG-02 AND 4SSSR-REG-03 (FUTURE) IN THE OPEN POSITION.
3. TO OPERATE TAP CHANGER:
   - 3.1 25/12SSSR-10 MUST BE OPEN AND DISCONNECTED. TURN AND REMOVE K1.
   - 3.2 4SSSR-REG-01, 4SSSR-REG-02 AND 4SSSR-REG-03 (FUTURE) MUST BE OPEN. TURN AND REMOVE K2, K3 AND K4.
   - 3.3 INSERT KEYS K1, K2, K3 AND K4 INTO TAP CHANGER INTERLOCK INTERCHANGE ON THE T25/12SSSR-10 TRANSFORMER. TURN THESE KEYS TO RELEASE K5. REMOVE K5.
   - 3.4 INSEET K5 INTO TAP CHANGER INTERLOCK AND ROTATE. THE TAP CHANGER CAN NOW BE OPERATED.
4. ONCE TAP CHANGER IS IN THE DESIRED POSITION, RETURN KEY K5 TO THE TAP CHANGER INTERLOCK INTERCHANGE AND ROTATE TO RELEASE KEYS K1, K2, K3 AND K4. RETURN KEY K1 TO 25/12SSSR-10, K2 TO 4SSSR-REG-01, K3 TO 4SSSR-02 AND K4 TO 4SSSR-REG-03 (FUTURE), TO ALLOW CIRCUIT BREAKER OPERATION.

25/12SSSR-REG-BP INTERLOCK SCHEME:

1. WHEN REGULATOR IS NOT IN BYPASS (25/12SSSR-REG-BP IS OPEN), THE BP1 KEY IS TRAPPED IN THE 25/12SSSR-REG INTERLOCK (LOCATED ON THE 25/12SSSR-REG CABINET DOOR), AND 25/12SSSR-REG-BP CANNOT BE CLOSED.
2. TO RETURN 25/12SSSR-REG TO THE NEUTRAL POSITION:
   - 2.1 PLACE THE "REGULATION MODE SWITCH" ON THE FRONT OF THE SSSR-PLC-1 CABINET TO "OFF"
   - 2.2 25/12SSSR-REG MUST BE IN THE NEUTRAL POSITION VIA THE "RETURN TO NEUTRAL" SWITCH ON THE 25/12SSSR-REG CABINET.
   - 2.3 TURN THE "RETURN TO NEUTRAL" SWITCH TO THE "ON" POSITION. THE REGULATOR WILL MOVE TO THE NEUTRAL POSITION, AND THE "25/12SSSR-REG IN NEUTRAL BYPASS PERMISSIVE" LIGHT WILL ILLUMINATE.
   - 2.4 ONCE THE "25/12SSSR-REG IN NEUTRAL BYPASS PERMISSIVE" ILLUMINATES, TURN AND REMOVE KEY BP1.
   - 2.5 PRIOR TO INSERTING KEY BP1 INTO THE 25/12SSSR-REG-BP AND OPERATING, THE FOLLOWING CHECKS MUST BE COMPLETED:
     - 2.5A. VERIFY THAT THE "NEUTRAL" LIGHTS ON THE CL7 CONTROLLER ARE ILLUMINATED
     - 2.5B. VERIFY THE TAP INDICATORS ON 25/12SSSR-REG INDICATE THE "N" POSITION.
   - 2.6 ONCE IN THE NEUTRAL POSITION, BUT PRIOR TO BYPASSING, THE FOLLOWING ADDITIONAL SAFETY ACTIONS MUST BE TAKEN:
     - 2.6A. PLACE THE CONTROL FUNCTION SWITCHES ON THE CL7 CONTROLLER TO THE "OFF" POSITION.
     - 2.6B. REMOVE THE 3 MOTOR FUSES FROM THE CL7 CONTROLLER.
3. BYPASSING 25/12SSSR-REG:
   - 3.1 INSERT BP1 KEY INTO THE 25/12SSSR-REG-BP INTERLOCK.
   - 3.2 INSERT THE OPERATING HANDLE INTO THE BYPASS SWITCH OPERATING MECHANISM.
   - 3.3 TURN THE OPERATING HANDLE CLOCKWISE TO CHARGE THE BYPASS SWITCH. ONCE CHARGED TURN THE OPERATING HANDLE COUNTERCLOCKWISE TO CLOSE 25/12SSSR-REG-BP. 25/12SSSR-REG IS NOW BYPASSED.
4. REMOVING 25/12SSSR-REG BYPASS:
   - 4.1 OPEN 25/12SSSR-REG-BP BY TURNING THE 25/12SSSR-REG-BP OPERATING HANDLE CLOCKWISE TO THE OPEN POSITION.
   - 4.2 TURN KEY BP1 TO LOCK THE 25/12SSSR-REG-BP IN THE OPEN POSITION.
   - 4.3 INSTALL MOTOR FUSES BACK INTO THE CL7 CONTROLLER. PLACE THE CONTROL FUNCTION SWITCHES ON THE CL7 CONTROLLER TO THE AUTOMATIC POSITION. CLOSE CL7 DOOR AND 25/12SSSR-REG DOOR.
   - 4.4 INSERT THE BP1 KEY INTO THE 25/12SSSR-REG INTERLOCK AND ROTATE.
   - 4.5 TURN THE "RETURN TO NEUTRAL" SWITCH TO THE OFF POSITION.

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5.0	01/12/17	FOR RECORD
4.0	15/11/17	ISSUED FOR CONSTR.
		ISSUED FOR TENDER
2.0	07/11/16	CLIENT REVIEW

PROJECT NAME: ESQUIMALT GRAVING DOCK ELECTRICAL UPGRADES - SSSR

DWG TITLE: T25/12SSSR-10 TAP CHANGER INTERLOCKING DIAGRAM

JOB NO.: 5014.12

DWG NO.: SSSR-13-00 | REV.: 5.0

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DESIGNED: BH	DRAFTED: JK
CHECKED: -	APPROVED: -

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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:

DP058

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.

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

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

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

The Guarantor will also:

DP058

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

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

QUALIFIED PERSON/ QUALIFIED ELECTRICIAN

DP058

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

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

PERSON IN CHARGE (PIC)

DP058

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

The Person in Charge will:

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

PWGSC ELECTRICAL SUPERVISOR at EGD:

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

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

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

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

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

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

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

SAFETY WATCHER:

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

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

The Safety Watcher shall be:

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

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

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

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

4.0 LOCKOUT DEFINED AND WHEN REQUIRED:

What is Lockout?

WORKSAFEBC 10.1

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

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

When is Lockout Required?

Lockout is required under the following circumstances.

WORKSAFEBC 10.2, 10.3

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

When is Lockout not required?

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

WORKSAFEBC 10.11

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

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

5.0 PERSONAL SAFETY LOCKS AND PERSONAL PROTECTIVE EQUIPMENT:

Personal Safety Locks

WORKSAFEBC 10.4

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

Your key is your life insurance!

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

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

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

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

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

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

Personal Protective Equipment (PPE):

WORKSAFEBC
10.4
DP058

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

DP058

The Person in Charge will also ensure that all tools and equipment are stored, maintained, inspected and tested by a Qualified Person. The Person in Charge will also remove from service all tools/equipment failing testing and tag until repaired or removed from the workplace. Contractors must supply their own tested and approved grounding devices and not use EGD grounding equipment.

6.0 PRIOR TO ISOLATION:

Before implementing a lockout the following must take place:

Prepare a Job Hazard Analysis

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

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

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

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

Confined Space Entry & Manholes

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

Protection From Ship's Power:

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

Prepare a Lockout Procedure

DP058

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:

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

DP058

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.

Use of Qualified, Trained Workers Only

DP058

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.

WORKSAFEBC 10.10

Note that lockout of Control Circuits alone is not considered total isolation and would require WORKSAFEBC approval to be acceptable.

WORKSAFEBC 10.5

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 19.19(4)

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.

FOR CONTRACT WORK

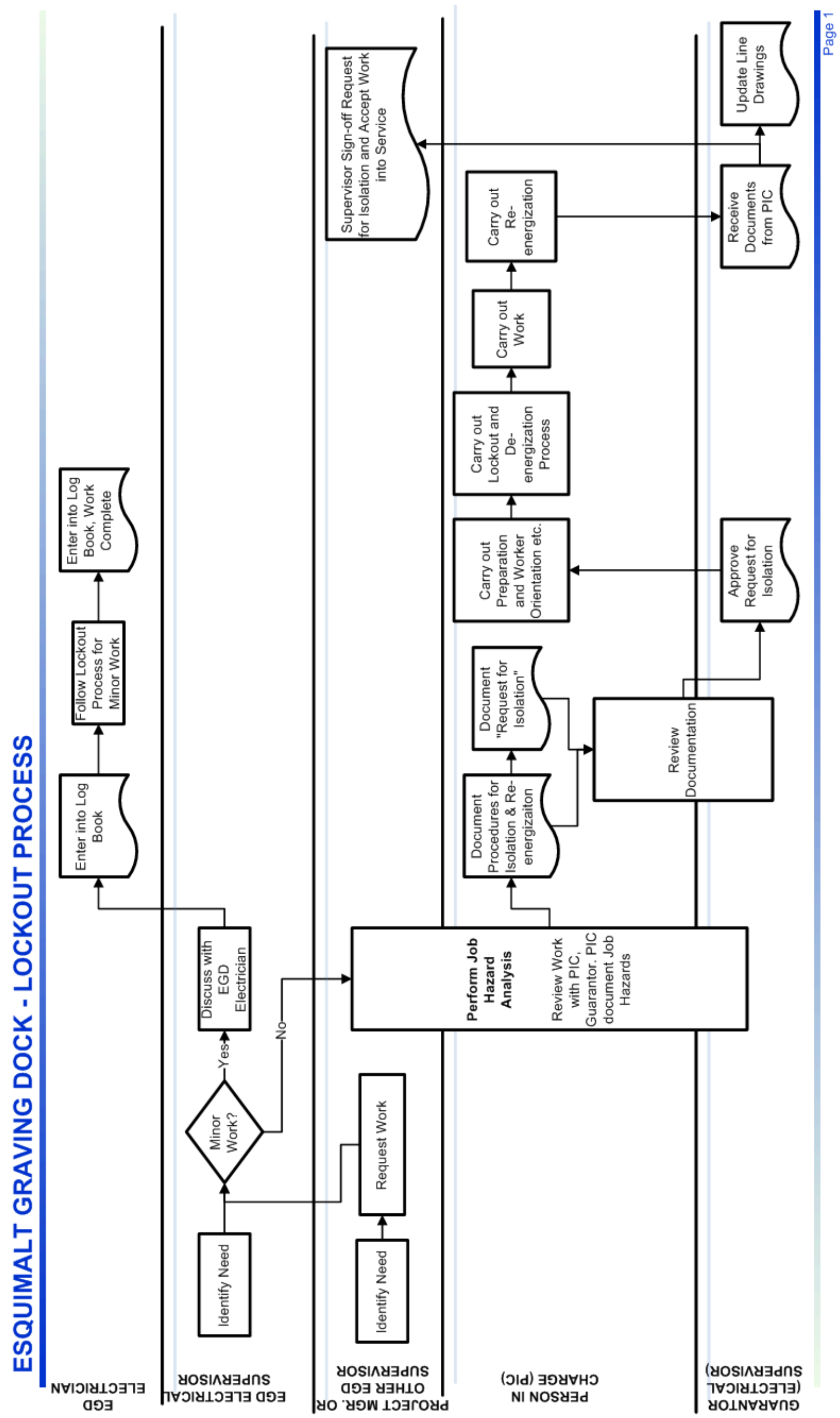
The following procedure applies. See Appendix 4 for Sample Forms. PWGSC will perform the isolation and review the details with the Contractor's Superintendent. A Group Lockout will be performed permitting all affected workers to apply their personal lock to the lock box (see section 11).

1. The EGD Project Manager will request the work to proceed verbally and follow up with an e-mail to the Electrical Supervisor detailing the project name and number and work activity to be performed and Contractor's Superintendent name.
2. The PWGSC Person In Charge will document the isolation procedures and review them with the Guarantor and the Contractor's Superintendent.
3. The Person in Charge on the REQUEST FOR ELECTRICAL ISOLATION form (PWGSC-13) is the Qualified Person in charge of doing the isolation. The Person in Charge completes boxes A, C & D and the detailed Procedures for Isolation form (PWGSC-12), in consultation with the Guarantor and the Contractor's Superintendent.
4. The Contractor will provide a written list of all Workers and those persons Qualified to work within the Limits of Approach to the Guarantor along with their qualifications. If additional persons will work on the power system after the work begins the names and qualification must be provided to the Guarantor before they are authorized to work on the system. (WorkSafeBC 19.29)

EGD Basic Lockout Process Flowchart:

See next page. A larger version of this chart is available.

Note that isolation and lockout for non-electrical work is also carried out by the Electrical Dept.


ESQUIMALT GRAVING DOCK - LOCKOUT PROCESS
EGD ELECTRICIAN
EGD ELECTRICAL SUPERVISOR
PROJECT MGR. OR OTHER EGD SUPERVISOR
PERSON IN CHARGE (PIC)
GUARANTOR (ELECTRICAL SUPERVISOR)
Identify Need
Minor Work?
Yes
No
Discuss with EGD Electrician
Enter into Log Book
Follow Lockout Process for Minor Work
Enter into Log Book, Work Complete
Identify Need
Request Work
Perform Job Hazard Analysis
Review Work with PIC, Guarantor. PIC document Job Hazards
Document Procedures for Isolation & Re-energizaiton
Document "Request for Isolation"
Review Documentation
Approve Request for Isolation
Carry out Preparation and Worker Orientation etc.
Carry out Lockout and De-energization Process
Carry out Work
Carry out Re-energization
Receive Documents from PIC
Update Line Drawings
Supervisor Sign-off Request for Isolation and Accept Work into Service
Page 1

7.0 LOCKOUT STEPS FOR MINOR LOW VOLTAGE JOBS:

For minor low voltage (</=750V) jobs involving 3 or fewer steps (generally one isolation point) and one worker the following procedures apply:

1. The requirement for written procedures will be replaced by an entry in the Minor Maintenance Log controlled by the Guarantor or worker's Supervisor.
2. The Qualified Person will discuss the work with the Guarantor/Supervisor who will complete the "Record of Electrical Work for Minor Projects" (PWGSC 69) or an equivalent form – See Appendix 6. The Guarantor/Supervisor must be satisfied that the worker has the proper safety equipment and procedures to carry out the work.
3. All of the steps under Basic Lockout Steps in section 8.0 must still be followed ***except*** the on-site documentation requirements (Detailed Procedures, Request For Isolation, Request for Re-Energization described in section 6 above).
4. When finished, the worker will record the completion in the Record of Electrical Work for Minor Projects log.

8.0 BASIC LOCKOUT STEPS (L.V. & H.V.):

The following apply to all types of lockout situations except as noted. See also the additional requirements specific to Low Voltage (policy section 9.0) or to High Voltage (policy section 10.0)

BE SURE - ASSUME NOTHING!

1. ***Identify the machinery or equipment*** that needs to be locked out to ensure worker safety. Be sure to consider interlocks to multiple sources.
2. ***Shut off the machinery or equipment***. The Person in Charge or Contractor's Superintendent will
   a. Make sure that all moving parts have come to a complete stop
   b. Ensure that the act of shutting off equipment will not cause a hazard to other workers prior to shutting it off.
   c. Ensure potential energy is blocked and any pneumatic, hydraulic or other pressure has been bled or rendered safe.

3. The Person in Charge or Contractor's Superintendent will identify and ***de-energize the main energy-isolating device*** (feeder) for each energy source. Wear eye protection, and standing to the side of the panel (in case of explosion), turn off the breaker or activate the isolating equipment.
4. **Visually verify** disconnecting means for possible defects and ensure blades are open; or if blades are not visible remove and insulate conductors or remove fuses with an insulated Fuse Puller.
5. **Check with a tester** on a known voltage and then test on the load side to be sure the circuit is de-energized. Only a Qualified Electrician shall use the Potential Tester.
6. In the case of air or hydraulic systems ensure the system has been bled and all potential energy is either blocked or eliminated.

7. Person in Charge will apply his/her personal lock(s) with ID tag. Record the isolation and initial the Procedures for Isolation (PWGSC-12) form next to each operation.

NOTE:

Initials of TWO (2) Qualified Persons are required next to each step of the Procedure for High Voltage work or Group Lockout.

8. Doors of electrical disconnect switches must be closed before installing any locks and the locks are to be applied in such a manner that the doors are locked closed.
9. ***Each worker applies a personal lock*** with ID tag (identifying worker, his/her company and date/time applied) to the energy-isolating device for each energy source, and observes that all parts and attachments are secured against inadvertent movement.
10. Ensure that all ***workers are in the clear*** and that no hazard will be created if the testing of the lockout fails. Ensure no one can inadvertently energize the equipment while testing or work is underway.
11. ***TEST the lockout*** to make sure it's effective and to verify that each energy source has been effectively locked out. Attempt to start the de-energized piece of equipment. Repeat for each piece of equipment.
12. Lockout will be tested after each energy-isolating device is locked out or after a group of devices is locked out. ***Treat all equipment as LIVE until locked out and tested!***
13. Carry out the work for which de-energization and lockout is necessary.
14. Upon completion of the work and being ready to re-energize, the Person in Charge of Isolation will ensure that all ***workers are in the clear and that all guards have been re-installed***. Remove grounding chains, where applied. Place warning signs close to the equipment to be re-energized stating " Danger, Energized Equipment". WORKSAFEBC 19.11
15. All workers will ***remove their locks*** at the end of each shift with the Person in Charge of Isolation being the last to do so. In the event work has not been completed and will be continued the next shift/day, see the Continuity of Lockout provision, Section 11.
16. Person in Charge of Isolation ***Re-energize*** the machinery or equipment again standing to the side of the panel. To prevent loading the disconnect, be sure the Control Station is in the OFF position when re-energizing the disconnect.
17. Complete the "REQUEST FOR ELECTRICAL ISOLATION" form and provide to the Guarantor to be filed for 1 year in the office of the PWGSC Operations Manager. DMD58

9.0 WORKING ON LOW VOLTAGE (</=750V) EQUIPMENT:

De-Energized Low Voltage Equipment:

Low Voltage means a potential difference (voltage) from 31 to 750 volts inclusive, between conductors or between a conductor and ground. The following steps will apply to all lockouts **except Group Lockouts**, (see section11). For minor L.V. jobs, see section 7.0 above.

WORKSAFEBC 19.1

The steps in section 8.0 must be followed whenever lockout is required in addition to L.V. requirements noted below. Supervisors must ensure every worker knows these steps and follows them. The steps to be followed ***must be in writing*** and ***must be posted*** in the area where lockout is taking place. The procedure will be the result of completing the steps under Section 6.0 (Prior To Isolation).

WORKSAFEBC Lockout Pamphlet & 10.4 DP058

If work is to be done by a Contractor, the Person In Charge of isolation is responsible for documenting and posting the detailed Procedures for Isolation (PWGSC-12), including the procedures for re-energization and approved Request for Electrical Isolation Form (PWGSC-13). The Guarantor will identify and confirm all sources of power to equipment and assess the impact of equipment isolation on other systems and/or equipment.

The Guarantor may also be involved in actually supervising or carrying out the work.

Be sure to check steps in the lockout process against the single line diagram(s) in Manual Section 3.

Capacitors:

If disconnecting a capacitor that could be dangerous to Workers allow at least 5 minutes before short-circuiting or applying a safety ground. Ensure procedures prevent any Worker from contacting the terminals before grounds are applied and ensure a Safety Watcher is present if the Person In Charge considers it necessary.

Working on/near Low Voltage Energized Equipment:

Work shall not be carried out on live equipment or installations. However, sometimes machinery or equipment has to be energized for a specific task (e.g. fine adjustments or troubleshooting).

Work on energized equipment must be performed ONLY by workers who:

1. Are qualified to do the work
2. Have been authorized by their supervisor to perform the work.

3. Have been informed of the potential hazards and provided with and follow appropriate ***written*** safe work procedures.

WORKSAFEBC 19.5

The procedures will require:

1. The use of appropriate electrical protective equipment including rubber gloves and cover up, approved eye protection, and other necessary line tools.
2. If practicable, uncontrolled liquid is not permitted close to any worker working on the equipment.
3. Where practicable, prohibit the use of metal ladders, metal scaffolds, metal work platforms and wooden ladders with wire reinforced side rails.

WORKSAFEBC 19.10

Suitable physical barriers or covers must be provided to cover any un-insulated, live, energized parts if a worker unfamiliar with the hazards is working within 1m (3.3ft.) of the parts.

WORKSAFEBC 19.12

Where it is absolutely necessary to have power on and operate equipment while repairs or adjustments are made, a responsible person MUST BE AT THE CONTROLS AND IN DIRECT AND PERSONAL COMMUNICATION with the Person in Charge at all times.

Working on ***energized*** parts of lighting circuits operating at over 250V to ground is prohibited without first obtaining written permission of the WORKSAFEBC.

WORKSAFEBC 19.10

***LIVE TESTS*:**

A separate Guarantee of Isolation is required to conduct live tests.

No Guarantee of Isolation shall be issued for live tests unless:

1. Any other Guarantee of Isolation respecting the subject equipment has been terminated, and all workers working under the guarantee informed of its termination.
2. Steps are taken to ensure the health and safety of anyone conducting the live test
3. The person(s) conducting the live test have informed anyone that could be affected by the test of the potential hazard.

10.0 LOCKOUT ON HIGH VOLTAGE EQUIPMENT (>750V)

De-energizing High Voltage Equipment:

High Voltage means a potential difference (voltage) of more than 750V between conductors or between conductors and ground. **Follow the basic lockout procedures in section 8.0 and also the following:**

WORKSAFEBC 19.1

1. At EGD, H.V. electrical equipment must be completely isolated, *grounded*, and locked out before starting work on it. To ensure nothing is overlooked, Electrical Personnel should use Checklists (see Appendix for example) and ensure workers sign acknowledging agreement to proceed with isolation or re-energization. Note this DOES NOT REPLACE properly completed and approved forms PWGSC-12 and 13.
2. When working on H.V. systems, isolating devices used for safety protection guarantees must provide for *visual verification* of the isolation point.
3. ***In addition*** to applying personal locks as required by this policy, a distinctive "DANGER - DO NOT OPERATE" tag must be securely placed on each isolating device used for a safety protection guarantee. See sample in Appendix.
4. All H.V. work requires <u>2 or more Qualified Electricians authorized by the Guarantor,</u> to be present while the work is being done.
5. Barriers or distinctive identification must be used to differentiate de-energized from energized equipment at the work location when lack of identification could result in undue risk to workers.
6. Outer clothing of non-flammable material with long sleeves fastened at the wrists shall be worn
7. No person shall work on electrical equipment unless the Worker uses such protective and insulated clothing and equipment as necessary.

WORKSAFEBC 19.16

WORKSAFEBC 19.21

WORKSAFEBC 19.16(2)

WORKSAFEBC 19.18

DP 058

Grounding of H.V. Equipment and Conductors:

Safety grounding shall be applied for hand contact work on isolated lines or apparatus either existing or under construction, wherever a hazard of energizing may occur from any source, including the following:

b) Faulty apparatus, conductors or adjacent lines.
c) Accidental energizing from a power source.
d) Accidental backfeed.
e) Contact with crossed or fallen live conductors.
f) Lightning strikes.

f) Electromagnetic or electrostatic sources (eg. Wind, dust storms, adjacent lines, static capacitors, etc.).

Grounding will be built into the Procedures for Isolation as appropriate.

Note: **In the following procedure, a second Qualified Person will always accompany the Person In Charge**. Both individuals must be Qualified Electricians and be authorized by the Guarantor

WORKSAFEBC 19.22

1. After a safety protection guarantee has been approved, the Person in Charge will ensure equipment is tested for isolation before any safety grounds are attached or blocking begins. The Person in Charge will then verify that a Guarantee of Isolation and required grounding and blocking devices are in place before work begins.
2. Ensure that there is no possibility of back feed, and that approved procedures to discharge equipment have been taken.
3. Temporary grounding devices, when required by the Canadian Electrical Code or CSA, will be installed between the location where the work is being carried out and all possible sources of supply. Grounding and blocking of equipment must be carried out as close as practicable to the worksite.
4. Grounding devices shall be connected to the low resistance ground (i.e.. ground grid) *before* being brought into contact with any isolated conductors. Remove from conductors first, and then from the ground connection when removing.
5. When isolating H.V. electrical equipment, use a grounding stick to allow discharge of capacitance in the conductors and H.V. cables before grounding.
6. Grounding and blocking may be removed for the purpose of conducting tests.
7. See also Canada Labour Code Part VIII “Safety Grounding” (Section 7 of Lockout Manual) for additional details regarding requirements for grounding equipment.
8. Connect a “Grounded” tag (green) to the equipment to indicate it has been grounded out.
9. Contractors must supply their own tested grounding devices and not use EGD grounding equipment.

Work on/near Energized High Voltage Equipment or Electrical Parts:

Informing workers about high voltage electrical equipment and conductors (WorkSafeBC19.24):

Before a person starts work close to high voltage electrical equipment or conductors that are exposed or that might become exposed during work at a workplace, the person must be informed of

(a) the existence, location and voltage of the high voltage electrical equipment and conductors, and

(b) the work arrangements and procedures to be followed to ensure compliance with this Part.

Authorization by Owner: WorkSafeBC 19.29

Qualified workers and workers under their direct supervision may work within the minimum distances to energized high voltage electrical equipment and conductors, as specified below when authorized by the owner of the power system and using work procedures acceptable to the Board.

Contractors will provide a written list of all Workers and those persons Qualified to work within the Limits of Approach to the Guarantor along with their qualifications. If additional persons will work on the power system after the work begins the names and qualification must be provided to the Guarantor before they are authorized to work on the system.

Work on or near ***energized*** High Voltage Equipment or Electrical Parts at EGD is NOT permitted.

If testing is to be done on energized H.V. Equipment or Electrical Parts ensure that the following limits of approach are adhered to by Workers and Qualified Electricians under the direction of a PIC authorized by the Guarantor:

Limits of Approach:

The following are combined limits per WorkSafeBC Regulations Part 19 and those of CLC and reflect the most stringent.

Voltage Range of Phase to Phase	Limit of Approach for Qualified Electrician only	General Limit of Approach for any Worker [2]
Over 736 to 20,000 [3]	0.9 Meters	3 Meters

1. Ensure, through barricades and supervision, that unqualified personnel and any equipment, material, or work they could come in contact with (including inadvertent movement) are kept at least three (3) metres from the live parts.
2. Limits of approach apply to workers, a tool, a machine, material or equipment at the workplace.
3. At EGD the maximum nominal voltage encountered is 7,200V to ground or 12500V AC line to line.

Note that a separate Request for Isolation is required for the live test and the requirements listed under LIVE TESTS in section 8 also apply for High Voltage.

Where Workers are working on or near electrical equipment that is live or could become live, the PIC will ensure the equipment is guarded and warning signs attached or if guarding is not practicable, take measures to protect Workers by insulating either the equipment or the Worker from the other. See also

[2] CLC Lower limit is 736 and WorkSafeBC Upper Limit is 75000V Phase to Phase
[3] Lower limit CLC and Upper limit WorkSafeBC

CLC Occupational Health & Safety PART VIII Electrical Safety 8.4 to 8.7 re working near energized equipment (Section 7 of the EGD Lockout manual).

Assurance in writing: WorkSafeBC 19.25

(1) If the minimum distance of 3 metres cannot be maintained because of the circumstances of work or the inadvertent movement of persons or equipment, an assurance in writing on a form acceptable to the Board and signed by a representative of the owner of the power system, must be obtained.

(2) The assurance must state that while the work is being done the electrical equipment and conductors will be displaced or rerouted from the work area, if practicable.

(3) If compliance with subsection (2) is not practicable the assurance must state that the electrical equipment will be isolated and grounded, but if isolation and grounding is not practicable the assurance must state that the electrical equipment will be visually identified and guarded.

(4) The safeguards specified in the assurance must be in place before work commences and effectively maintained while work is taking place.

(5) If guarding is used,

(a) neither equipment nor unqualified persons may touch the guarding, and

(b) a safety watcher must be designated, or range limiting or field detection devices acceptable to the Board must be used.

(6) The assurance must be available for inspection at the workplace, as close as practicable to the area of work, and must be known to all persons with access to the area.

[Amended by B.C. Reg. 312/2010, effective February 1, 2011.]

Minimum clearance distance when passing under exposed electrical equipment and conductors (WorkSafeBC 19.24.2):

1) This section applies in the circumstances where a person working at a workplace is moving or is involved in moving equipment under exposed electrical equipment or conductors and is not performing any work other than work related to moving the equipment.

(2) Unless otherwise permitted by this Part, in the circumstances set out in subsection (1), if exposed electrical equipment or conductors have a voltage within a range set out in Column 1 of Table 19-1B, the following must maintain at least the clearance distance from the exposed electrical equipment and conductors that is set out in Column 2 opposite that range of voltage:

(a) a person moving or involved in moving the equipment under the exposed electrical equipment or conductor;

(b) the equipment that a person referred to in paragraph (a) is moving;

(c) the load carried by the equipment referred to in paragraph (b).

Table 19-1B

Column 1 Voltage	Column 2 Minimum clearance distance for passing under exposed electrical equipment or conductors	
Phase to phase	Metres	Feet
Over 750 V to 75 kV	2	6.5
Over 75 kV to 250 kV	3	10
Over 250 kV to 550 kV	4	13

[Enacted by B.C. Reg. 312/2010, effective February 1, 2011.]

Assurance not practicable: WorkSafeBC 19.26

(1) If exposed high voltage electrical equipment and conductors cannot be isolated, rerouted or guarded, work must not be done within the 3 metre limit of approach until the following precautions are taken:

(a) the area within which equipment or materials are to be moved must be barricaded and supervised to restrict entry only to those workers necessarily engaged in the work;

(b) a safety watcher must be designated;

(c) a positive means must be provided for the safety watcher to give a clear, understandable stop signal to workers in the area, and the watcher must give the stop signal by no other means.

(2) While equipment is in motion in an area in proximity to energized electrical equipment or conductors, no person other than the equipment operator may touch any part of the equipment or the material being moved by it.

(3) No person may move a load or any rigging line from its position of natural suspension if it is in proximity to an energized electrical conductor or equipment.

[Amended by B.C. Reg. 312/2010, effective February 1, 2011.]

[Amended by B.C. Reg. 188/2011, effective February 1, 2012.]

11.0 GROUP LOCKOUT PROCEDURES:

In some cases the number of points to be isolated and the numbers of workers required to lockout may be large enough that a "lock-box" or "key-box" approach would be beneficial. If a group lockout is required, the following procedure will be followed. **Note**: In the following procedure, a second Qualified Person will always accompany the Person In Charge and both persons must be authorized by the Guarantor.

WORKSAFEBC 10.9

The following outlines the variations required for a Group Lockout.

BE SURE - ASSUME NOTHING!

1. **The steps under Section 6 "Prior to Isolation" also apply to a Group Lockout**. Prepare the required Procedures and approval forms.
2. **FOLLOW THE PROCEDURES DEFINED IN SECTIONS 8, 9 AND 10 ABOVE FOR THE APPROPRIATE LOW OR HIGH VOLTAGE SITUATION**.
3. The approved REQUEST FOR ELECTRICAL ISOLATION and PROCEDURES FOR ISOLATION (including Re-energization procedures) will be conspicuously posted at the place where the system is in use and the "lock-box" is kept. The Lockout Policy will be readily available through the Electrical Supervisor, or Contractor's Superintendent.
4. Lockout will be tested after each energy-isolating device is locked out or after a group of devices is locked out. The 2 qualified persons will <u>initial</u> the PROCEDURES FOR ISOLATION (PWGSC-12) to verify the isolation of <u>each point</u> 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. <u>***Each worker will apply a personal lock***</u> <u>with ID tag</u>, 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:

WORKSAFEBC 10.8

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:

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:

DP 058

Those required to work on electrical equipment and installations shall wear:

- 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 Lezetc**	**Reviewed By**: **Mike Ledson**	**Approved By**: **Joe Lezetc**
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

Isolation Request No. / Nº de demande de coupure à la source: EGD - 473

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

Date and Time of Request - Date et heure de la demande
Date (Y-A M D-J) ▶ 10,20,3,15 Hour/Heure (HH:MM) ▶ 09:00

Isolation to Start On / Coupure à la source devant débuter le
Date ▶ 10,20,3,20 Hour/Heure ▶ 07:00

Isolation to End On / Coupure à la source devant se terminer le
Date ▶ 10,20,3,22 Hour/Heure ▶ 16:00

Description of Installation or Equipment to be Isolated
Description de l'installation ou de l'appareillage devant être coupé à la source

30T CRANE GANTRY, MAIN HOIST & SLEW FUNCTIONS & CHOCK WHEELS

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	0,2,0,3,1,0	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	0,2,0,3,1,5	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	0,2,0,3,2,0	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	0,2,0,3,2,2	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.

	Name - Nom	Time - Heure	Date (YY-MM-DD)
Prepared by - Préparé par	MIKE LEDSON *M. Ledson*	09:00	02-03-13
Checked by - Vérifié par	JOE LEZETC *J. Lezetc*	08:00	02-03-14
Issued by - Émis par	JOE LEZETC *J. Lezetc*	09:00	02-03-15
Performed by - Effectué par	*M. Ledson* *J. Lezetc* MIKE LEDSON & JOE LEZETC	07:30	02-03-20
Operating diagram adjusted by - Schéma fonctionnel corrigé par			

PWGSC-TPSGC 12 (12/1997)

THIS RECORD MUST BE KEPT FOR ONE YEAR FOLLOWING COMPLETION OF WORK
À CONSERVER PENDANT UN AN APRÈS LA FIN DES TRAVAUX

Copy 1(White) / Copie 1 (Blanc) ▶ Manager in Charge of Worksite or Supervisor / Gestionnaire responsable du lieu de travail ou superviseur

Copy 2 (Yellow) / Copie 2 (Jaune) ▶ Originator / Demandeur

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

SAMPLE

PROCEDURES FOR ISOLATION
PROCÉDURES DE COUPURE À LA SOURCE

PROCEDURES

This form must be completed when high voltage equipment or installations are to be isolated.

This form must be completed and attached to all Request for Electrical Isolation forms when more than one operation is required in the isolation process.

These procedures must indicate the correct sequence to be followed in the isolation process and the correct procedures to follow to re-energize.

This sequence must be followed without deviation.

See reverse for additional instructions.

PROCÉDURES

Vous devez remplir ce formulaire lorsque vous avez à couper à la source un appareil ou des installations à haute tension.

Vous devez remplir ce formulaire et l'annexer à toutes les «demandes de coupure à la source électricité» lorsque le procédé d'isolation comporte plus d'une opération.

Ces procédures doivent indiquer la séquence exacte des étapes du procédé de coupure à la source et la marche à suivre normale pour la remise sous tension.

Vous devez sans faute suivre cette séquence.

Voir les renseignements complémentaires au verso.

These operating procedures shall be carried out in conjunction with Request for Isolation No.
La procédure est liée à la demande de nº de coupure à la source

Request for Isolation No. - Demande de nº 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. / Nº séquentiel	Equipment affected / Appareillage concerné	Tag no. installed on Equipment / Nº d'étiquette installée	Functions to be performed and specific safety measures required / Fonctions à remplir et mesures de sécurité spéciales requises	Initials / Initiales
12	MAIN HOIST		ARMATURE POWER ON	J.L. M.L.
13	GANTRY DRIVE		FIELD POWER ON	J.L. M.L.
14	GANTRY DRIVE		ARMATURE POWER ON	J.L. M.L.

	Name - Nom	Time - Heure	Date (YY-MM-DD)
Prepared by - Préparé par	MIKE LEDSON M. Ledson	09:00	02-03-13
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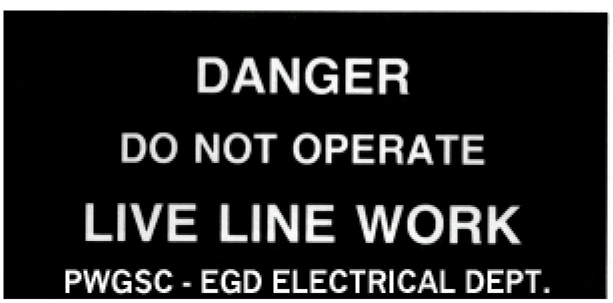
Copy 2 (Yellow) / Copie 2 (Jaune) ▶ **Originator / Demandeur**

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

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

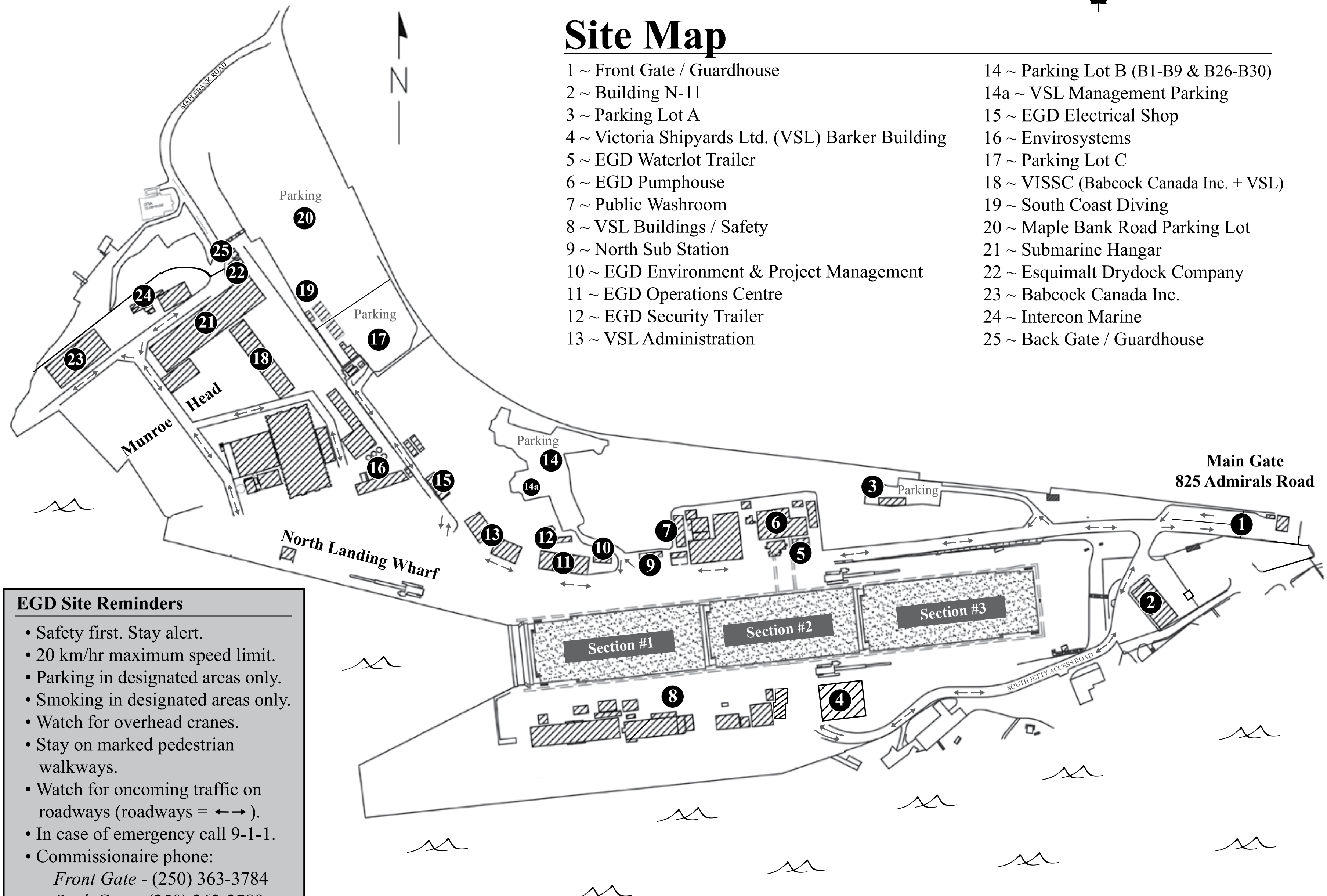
Canada

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

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.

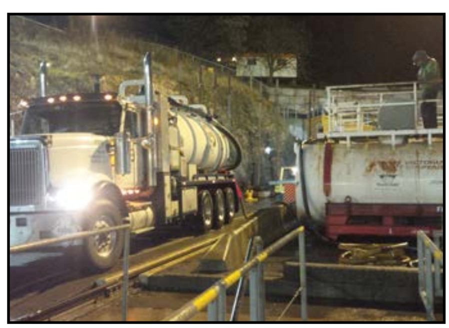
Management of Pressure Wastewater in Upland Areas/Dockside

- 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.

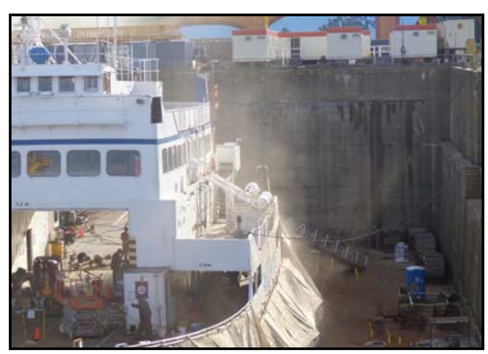
Dust Control

- 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

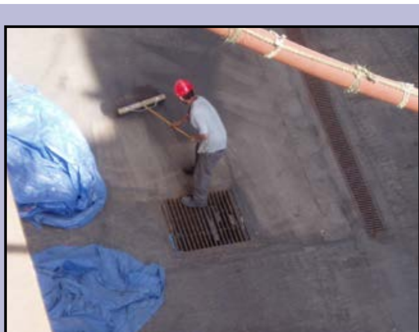
- Cover trench drains and tunnel grates in work areas with filter cloth. Replace the cloth as required.
- Manage waste grit by sweeping it into central areas, away from trenches, tunnel grates and dock floor traffic.
- Remove waste grit from work areas as soon as possible.
- Store all waste grit in appropriate 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

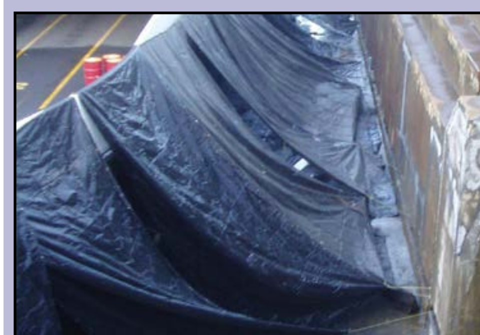
Ship repair and maintenance often requires the painting and coating of vessel surfaces to protect them from corrosion or to inhibit the growth of marine life. The industrial nature of marine paints and solvents, in particular antifouling paints, may result in negative impacts to the environment and surrounding 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.
  - o Containment should be large enough to adequately enclose or segregate the working area.
  - o Ensure containment is secured so there are no gaps.
  - o Ensure that containment reaches the dock floor or walls.
  - o 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.

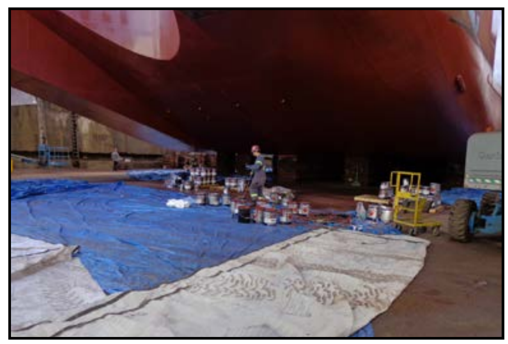
ADEQUATE containment on stablizer pocket doors.

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.

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.

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

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.

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.

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.

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.

Environmental Best Management Practices

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EBMP #9: Fish & Wildlife Management	

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.

- 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.

Environmental Best Management Practices

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EBMP #10: Water Use	

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.

Environmental Best Management Practices

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.

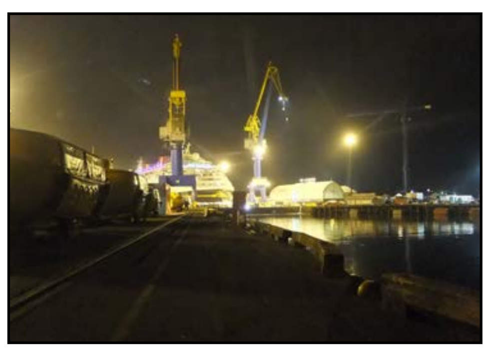
EBMP #11:
Energy Conservation

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.



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*).

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.

Be aware of the potential impacts of emmissions on neighours near the EGD.

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.

EGD Esquimalt Graving Dock

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EBMP #12: Nuisance Pollution

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 Control*.

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.

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*.

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.*

ADEQUATE containment of odorous waste.

INADEQUATE containment of odorous waste.

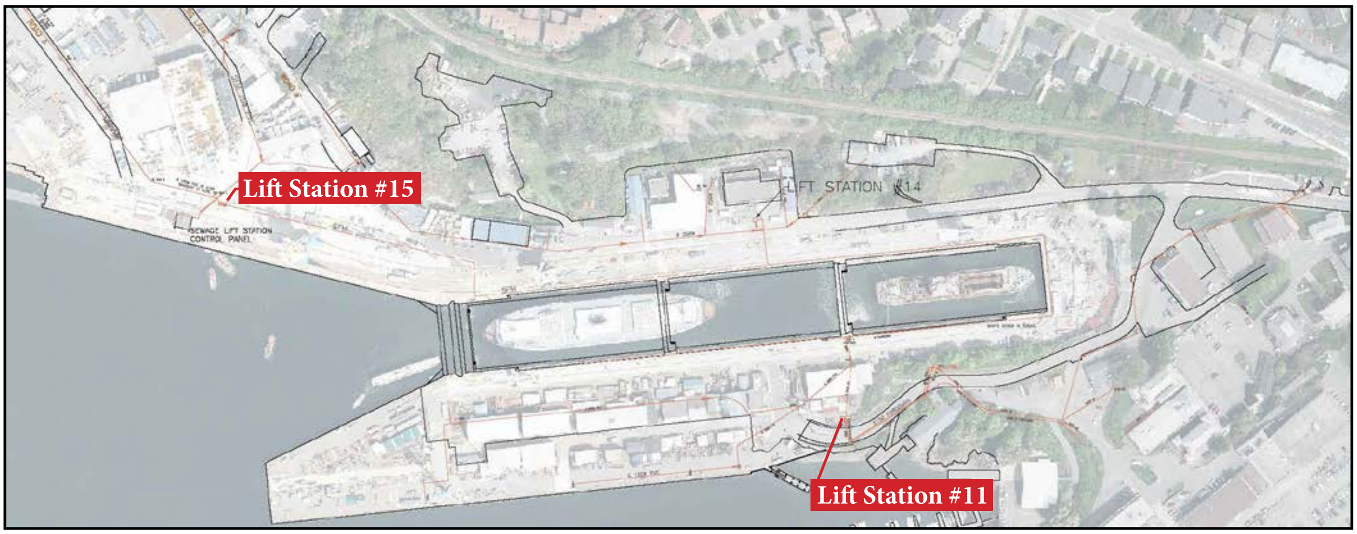
Only utilize spotlights when necessary.

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.
    - o Pumphouse Operators will ensure that sanitary sewer discharges are in accordance with applicable regulations and authorizations.
    - o 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.

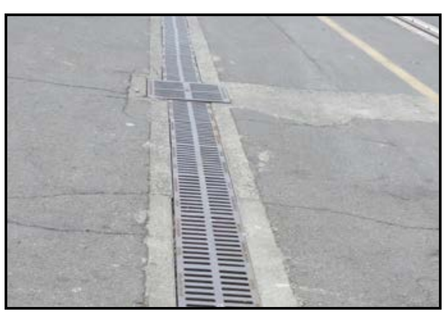
Lift Station Maintenance

- 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).

Esquimalt Graving Dock

Environmental Best Management Practices

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EBMP #14: Spill Preparedness	

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* (EMBC). 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.

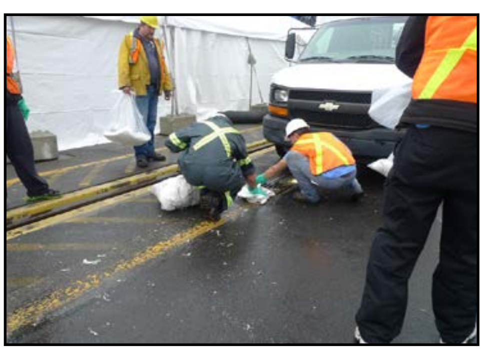
Spill response training at EGD.

Spill response equipment: Skimmer.

Spill response equipment: Spill Kit.

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:
    - o 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.

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.

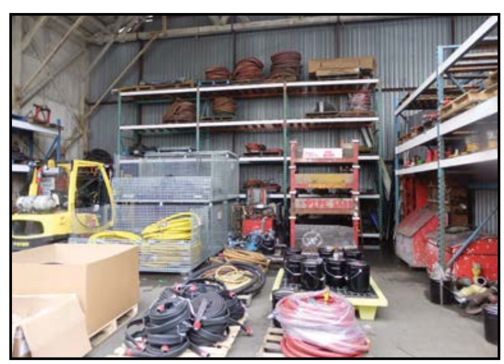
Storage

- 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.

Environmental Best Management Practices

Revision Number:	*05*
Revision Date:	*October 2016*
Page:	*Page 1 of 2*
Approved by:	*Stafford Bingham*
EBMP #17: Stormwater Management	

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 line*r) 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.106345.001
Location:	Esquimalt Graving Dock
Date:	November 14, 2019
Name of Departmental Representative:	Jon Siska
Name of Client:	PSPC
Name of Client Project Co-ordinator	Tim Aikin

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	
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	
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.
Suspended / Mobile Work Platforms		X		X	
Other:					
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			