BC Hydro's Occupational Safety & Health Standards

(February 2022)

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Contractors working for BC Hydro are responsible to work to the expectations specified in their contract, including adherence to BC Hydro rules and standards.

The version of the Occupational Safety & Health (OSH) standards included in this document is designed to provide prospective contractors with an understanding of the safety expectations related to their work with BC Hydro. Once a contract is awarded, however, contractors must adhere to our most current safety policies and procedures—including the latest OSH standards—which can be found on the password-protected Safety Extranet.

Prospective contractors must also be familiar with our Life Saving Rules and our Safety Practice Regulations, which aren't included in this document.

How the OSH standards are used

These standards cover expectations for managing safety. They complement and reinforce existing safety legislation, including WorkSafeBC's Occupational Health and Safety regulations. The date of the most recent published version for each OSH standard is in the bottom left footer.

The OSH standards are applied in conjunction with our Safety Practice Regulations. It's expected that contractors working for BC Hydro will meet the performance expectations expressed in the OSH standards.

Note that work procedures used by contractors to meet these OSH Standards are the responsibility of the contractor, but they must be acceptable to BC Hydro.

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1. Scope

1.1 This standard sets out the safety requirements associated with job safety planning folders, preliminary job safety planning (planning work during job safety planning activities that typically take place prior to arriving on site), pre-job conferences, tailboards and post-job activities. It does not cover the planning associated with the development of annual safety plans.

2. Purpose

2.1 The purpose of this standard is to set out the requirements for planning work to ensure:

- The risk of serious incidents occurring is reduced.
- An opportunity to identify and control hazards through application of multiple independent barriers is provided before work begins.
- Safety is integrated into the work planning, design and scheduling phases.
- Managers, supervisors and workers (engineers, designers and tradespersons) practise effective communication.
- Changes that occur during a project or job are effectively identified and managed.

2.2 Contractors are expected to follow their own planning process. BC Hydro's expectation of contractors is that all hazards are identified and multiple independent barriers are applied for each identified hazard.

3. Standard

3.1 BC Hydro shall achieve and maintain continuous compliance with the Workers Compensation Act, Part 3, Division 3 – General Duties of Employers, Workers and Others. The Job Planning Process shall be structured to assist to fulfil the Act's expectations regarding the identification and communication of hazards in the workplace, and remedying workplace conditions that are hazardous to the health or safety of workers.

3.2 Job Safety Planning Requirements

3.2.1 All BC Hydro personnel that plan, assign, and/or supervise the performance of work having the potential to result in injury to workers (e.g., Managers, Designers, Engineers, Project Managers, Supervisors, and Crew Leaders) shall ensure that the Job Safety Planning activities described in this standard (e.g., job planning folders, pre-job conferences, job activity sheets, and/or tailboards) are effectively completed and communicated to workers involved in the work, and use current process, materials, and forms available from the Job Planning webpage or your Business Group.

3.2.1.1 All BC Hydro field personnel (e.g., Managers, Supervisors, Crew Leaders, Workers) must complete initial Job Planning training, and refresher training every two year. Refresher training must include conducting effective Tailboards.

3.2.2 All Job Safety Planning activities must incorporate:

3.2.2.1 The identification of all hazards with the potential to result in a fatality or permanent disability. Refer to Appendix 4 for common high hazard work activities at BC Hydro.

3.2.2.2 The selection of the most effective barriers as practicable to prevent injury.

Engineers and Designers. For each identified hazard, every effort must be made to eliminate, minimize, or substitute the hazard through design decisions prior to assignment of work to field crews (e.g., application of Safety by Design). Refer to OSH 110 Hazard Identification and Risk Assessment sections 3.4, 3.5, and 3.6 for requirements to use Safety by Design, the Hierarchy of Controls, and the Safety Decision Making Principles.

Field Crews (e.g., Managers, Project Managers, Supervisors, Crew Leaders, Workers). For each hazard that remains in the workplace, identify or confirm multiple independent barriers to protect workers from each hazard. Refer to the Hazard Barrier Reference sheet on the Job Planning webpage for guidance.

- The Hazard Barrier Reference (HBR) sheet is a job-aid and is not required to be filled out. The requirement is for the HBR sheet to be used as guidance in the selection of barriers, and for those barriers to be identified and recorded in Design Reviews (section 3.3.1), Pre-job conferences (section 3.3.2), and on Tailboards (section 3.3.3).
- Barriers are shown on the HBR sheet in sequence from MOST effective to LEAST effective. When identifying or confirming multiple independent barriers for each hazard, there must be at least one barrier utilized from the MOST effective column for each hazard.
- For work situations where there is no barrier identified in the MOST effective list, work may only proceed if the work can be completed following existing safety rules or approved safe work procedures.

3.2.2.3 Managers are responsible to report all work situations where it is discovered that there is no barrier identified in the MOST effective column of the HBR sheet. This reporting is to be done using the Hazard Barrier Deficiency on-line entry form available on the Job Planning webpage. The information will be captured in a Hazard Barrier Registry which will be used by BC Hydro Safety to identify where new barriers must be developed.

NOTE – Only newly discovered work situations are required to be reported. If the situation is already known and shows on the Hazard Barrier Registry it does not need to be repeated

3.2.3 Crews who are assigned work must be capable of identifying the hazards described in section 3.2.2.1, and selecting and implementing multiple independent barriers in response to those hazards.

3.2.4 All job planning activities must consider and document emergency response plans, including rescue, appropriate rescue equipment and first aid provisions.

3.2.4.1 Per WorkSafeBC Regulation 4.13 (3) written rescue and evacuation procedures plus specialized rescue equipment and techniques are required for but not limited to the following types of work:

- Work at high angles (worker is in a location or position that has constrained access, and cannot be reached for rescue purposes by a standard stairway or elevator, e.g., on a ladder or pole, in an excavation, on a tower, crane, or swing stage, etc.).
- Work in confined spaces or where there is a risk of entrapment
- Work with hazardous substances (e.g. chemicals)
- Underground work
- Work on or over water
- Workplaces where there are persons who require physical assistance to be move

3.2.4.2 Rescue procedures and equipment shall be confirmed to be available prior to work commencing.

3.2.4.3 Designated personnel to conduct rescue shall be identified and documented on the tailboard, and their training confirmed as current, prior to work commencing (per WorkSafeBC Regulation 32.2 and Safety Practice Regulation 203).

3.2.5 For jobs that require protective grounding/bonding, a documented grounding plan must be completed before work begins. In areas where worker protection practices exist (i.e. lockout in generating stations), group or personal lockout sheets and associated switching orders suffice as the required documented grounding plan.

3.2.6 Each BC Hydro Business Group must determine the scope of work activities required to use the Job Safety Planning process, and to develop and maintain the tools required to support the Job Safety Planning process (e.g., Job Planning folders, tailboards, job activity sheets, etc.), in a manner consistent with the requirements of this Standard.

3.2.6.1 Transmission and Distribution Business Group has delegated these responsibilities to the T&D Technical Working Groups (alternative arrangements must be made should eligible work activities not be covered by the T&D Technical Working Groups).

3.2.6.2 Generation Business Group has delegated these responsibilities to Planning Managers, or others as required.

3.3 Job Safety Planning Process

Safety shall be integrated into each phase of the job planning process and barriers identified for use will be documented.

Note:

Job Safety Plan documents consist of, but are not limited to, any combination of:

- Job Safety Planning Folders
- Pre-job Conference forms
- Job Activity Sheets (used in Generation) and work/business-specific Tailboard forms (used in T&D)
- Safety Management Plans, used in Construction Services for projects deemed too complex to use a Job Planning Folder

3.3.1 Preliminary Job Safety Planning. The following requirements for preliminary job safety planning will be met, where applicable.

3.3.1.1 Hazards, barriers, residual risks and required safety equipment will be identified.

3.3.1.2 Design Review. Where hazards with a potential to result in a fatality or permanent disability are present, designers/project managers will involve Field Crews (e.g., Managers, Supervisors, Crew Leaders, Workers) as early as possible, by asking them to review preliminary designs/job specifications to design out specific hazards where practicable.

Using the Hazard Barrier Reference (HBR) sheet as guidance Field Crews will advise if there is any difficulty identifying and implementing barriers from the MOST effective column of the HBR sheet for each hazard. If there are no barriers available in the MOST effective column for any hazard, an interim solution must be identified (see section 3.2.2.2).

When contractors will be carrying out the work, designers/project managers are encouraged to involve contractors in the same manner wherever possible.

Note: Eliminating, substituting or minimizing hazards through design is the primary objective

3.3.1.3 Establish the scope and task sequence of the planned work.

3.3.1.4 Establish crew complement for numbers and types of trades.

3.3.1.5 Establish safety management plans and, if the job may lead to environmental impacts, suitable environmental mitigation measures.

3.3.1.6 Establish emergency response plans, including rescue and first aid provisions.

3.3.2 Pre-job Conferences

3.3.2.1 Pre-job conferences will be completed for large or complex jobs.

3.3.2.2 Pre-job conferences will ensure Job Safety Planning folder is reviewed, procedures reviewed and signed off, isolation plan and additional barriers finalized.

3.3.2.3 Pre-job conferences will review all identified hazards with the potential for fatality or permanent disability in the planned work area, and will identify, confirm, and document multiple independent barriers that will be implemented to perform the work.

Using the Hazard Barrier Reference (HBR) sheet as guidance Field Crews (e.g., Managers, Supervisors, Crew Leaders, Workers) will determine if there is any difficulty identifying and implementing barriers from the MOST effective column of the HBR sheet for each hazard. If there are no barriers available in the MOST effective column for any hazard, an interim solution must be identified (see section 3.2.2.2).

3.3.2.4 Pre-job conferences will confirm that the resources that are allocated to the job meet the following conditions:

- Workers are qualified to perform their assigned tasks, or there is a process in place to make this determination prior to work commencing.
- The tools and equipment that will be used are in a safe condition and appropriate for the job, or a process is in place such that this determination will be made prior to work commencing.
- Emergency response plans, including rescue, appropriate rescue equipment, and first aid provisions are identified and will be available.

3.3.3 Tailboards

3.3.3.1 As per Safety Practice Regulation rule106, documented tailboards will be held for all hazardous work involving one or more worker:

- Before work commences
- And/or whenever there is a significant change in the work plan
  Work is considered hazardous, and therefor requiring a documented tailboard, where the hazardous energy of the activity being performed has a credible and realistic potential to cause death or probable permanent disability. For more information on hazardous work definition, refer to Section 7 Definitions and Appendix 4 Common High Hazard BC Hydro Activities.

3.3.3.2 For low hazard work, verbal tailboards can be used. As per Safety Practice Regulation rule 718, when working under Group Lockout, hold a documented tailboard meeting to ensure all workers understand which energy sources have been controlled and which equipment is in a protected state.

3.3.3.3 Everyone involved in the on-site work must participate at the tailboard meeting.

3.3.3.4 Each hazard with the potential for fatality or permanent disability must be confirmed and individually

recorded on the applicable job planning documentation (Job Planning Folder, Tailboard).

Using the Hazard Barrier Reference (HBR) sheet as guidance, Field Crews (e.g., Managers, Supervisors, Crew Leaders, Workers) must list multiple independent barriers, in order of effectiveness, for each hazard.

Barriers are shown on the HBR sheet in sequence from MOST effective to LEAST effective. When identifying or confirming multiple independent barriers for each hazard, there must be at least one barrier utilized from the MOST effective column for each hazard.

For work situations where there is no barrier identified in the MOST effective column, work may only proceed if the work can be completed following existing safety rules or approved safe work procedures.

Supervisors, Crew Leaders, and/or Workers are responsible to ensure their Manager is made aware of any work situation where it is discovered that there is no barrier identified in the MOST effective column. Managers are to report any newly discovered work situations of this nature (see section 3.2.2.3 for reporting method).

3.3.3.5 The tailboard discussion must review, confirm availability, and document emergency response plans, rescue equipment, and first aid provisions.

3.3.3.6 All tailboard documentation will be retained for two years.

3.3.4 Safe Work Observations

3.3.4.1 During regular Safe Work Observations, managers must ensure and verify application of the Job Safety Planning requirements and completion of accompanying Job Safety Planning documents. This includes:

- Having Workers identify to the Manager each hazard with the potential for fatality or permanent disability in the work zone.
- Having Workers show and explain to the Manager the barriers used to protect Workers from each hazard, in order of effectiveness, with at least one barrier from the MOST effective column of the Hazard Barrier Reference sheet.
- The Manager confirming that each hazard has been recorded on the Tailboard or Job Activity sheet with corresponding barriers written in order of effectiveness.
- The Manager confirming that emergency response plans, including rescue and first aid provisions have been discussed, and that rescue equipment is available.

3.3.5 Post-Job Debriefs

3.3.5.1 Where key safety issues have been identified in the course of work, post-Job Debriefs will be held to ensure that safe work observations are shared to allow for improvements to be incorporated in future jobs.

If work situations have been identified where there is no effective barrier identified in the pertinent MOST effective column on the Hazard Barrier Reference sheet, then the work situation must be reported in the Hazard Barrier Deficiency process (see section 3.2.2.3 for reporting method)

3.3.5.2 All tailboards will be reviewed by managers until they are satisfied with their quality. Once satisfied,

tailboard reviews will be carried out periodically, but more frequently for large, complex jobs.

4. Roles and Responsibilities

4.1 Managers

4.1.1 General roles and responsibilities for managers are to ensure that:

- Proper safety planning of all work is completed.
- Pre-job conferences are conducted and documented where applicable.
- Contractors and/or subcontractors have WorkSafeBC coverage and liability insurance.
- The qualification and authorization of workers under their authority and direction is appropriate for the work to be performed.
- Work procedures and safety standards will be followed and maintained.
- Workplace risk assessments are completed and issues are corrected as required.
- Orientation of all workers to the job site and associated hazards are completed.
- Emergency response equipment and personnel certification are up-to-date.

4.2 Senior Managers (i.e. M3/M4)

4.2.1 Senior managers are responsible for:

- Ensuring Safe Work Observations occur on a pre-determined frequency in order to be satisfied that the processes are carried out in a manner that meets their expectations.
- Ensuring there is a process for monitoring the quality and effectiveness of Job Safety Plan documents and Safe Work Observations which is sufficient to ensure Senior Management is knowledgeable of the process.
- Ensuring that work situations where there is no effective barrier identified in the MOST effective column on the Hazard Barrier Reference sheet are reported; that new barriers are being considered to provide additional protection in these circumstances, and that work is being done safety until additional barriers are available.

4.3 First Line Managers (i.e. M1/M2)

4.3.1 First line managers are responsible for:

- Ensuring workers are qualified to identify the hazards described in section 3.2.1, by conducting a hazard assessment prior to work and to select and implement effective barriers in response to those hazards.
- Ensuring Job Safety Plan documents are completed.
- Conducting documented Safe Work Observations as often as is required to ensure quality of the Job Safety Planning process.
- Ensuring Safe Work Observations include querying Workers on workplace hazards with the potential for fatality or permanent disability.
- Providing feedback to workers on the quality of Job Safety Plan documents.
- Conducting a documented assessment of completed Job Safety Plan Folders as often as is required to ensure quality of the Job Safety Planning process.
- Reporting new work situations where there is no effective barrier in the MOST effective column of the Hazard Barrier Reference sheet (refer to section 3.2.2.3).

- Ensuring Pre-job conferences are held and that all relevant parties understand and are prepared to discharge their roles and responsibilities.
- Disallowing addition of significant work to the work plan within ten days of the work taking place (applicable to BC Hydro's Generation Business Group).
- Maintaining a file of Job Safety Planning documents for a minimum of two years.

4.4 Supervisors (i.e. Crew Leaders, Work Leaders, Foremen, Sub-Foremen)

4.4.1 Participate and contribute during Pre-job Conferences and Tailboard Discussions to ensure understanding of the potential hazards, barriers, and any specific rescue considerations required in the event of an incident.

4.4.2 Prepare written Job Safety Plan documents in advance.

4.4.3 Review and sign-off Job Safety Plan documents.

4.4.4 Ensure that hazards are identified and barriers are in place and communicated to workers, with at least one barrier utilized from the MOST effective column of the Hazard Barrier Reference sheet for each hazard. If no barrier is identified in the MOST effective column for any particular hazard, ensure the work is completed following existing safety rules or approved safe work procedures, and ensure any work situations where this condition is discovered is reported to the responsible Manager.

4.4.5 Ensure tailboard discussions are held with workers.

4.4.6 Use the Job Safety Plan documents to record identified changes during the work that may require specific action.

4.4.7 Monitor the work in reference to the plan.

4.5 Workers

4.5.1 Participate and contribute during Pre-job Conferences when requested to ensure understanding of the potential hazards, barriers, and any specific rescue considerations to be used in the event of an incident.

4.5.2 Participate and contribute during tailboard discussions to ensure:

- Identification and understanding of any hazards with the potential for fatality or permanent disability,
- Implementation of multiple independent barriers for each hazard with at least one barrier per hazard from the MOST effective column of the Hazard Barrier Reference sheet, and
- Review specific rescue considerations to be used in the event of an incident.

4.5.3 Review Job Safety Plan documents for identified changes during the work that may require specific action.

4.6 Occupational Safety and Health (OSH) Specialists

4.6.1 Participate and contribute as required during Pre-job Conferences as Subject Matter Expert on potential hazards, barriers, and any specific rescue considerations to be used in the event of an incident.

4.6.2 Develop safety documents associated with Job Safety Planning as required.

4.6.3 When at worksites, query Workers on work zone identification of hazards and barriers.

4.7 Trades Training Instructors (TTIs)

4.7.1 Provide Job Safety Planning training as required.

4.7.2 Act as Job Safety Planning Subject Matter Experts.

4.7.3 When at worksites, query Workers on work zone identification of hazards and barriers.

4.8 Safety Advocates

4.8.1 Act as Job Safety Planning Subject Matter Experts.

4.8.2 When at worksites, query Workers on work zone identification of hazards and barriers.

4.9 Office Administrators

4.9.1 Maintain a file of Job Safety Planning documents for a minimum of two years.

5. Records and Documentation

5.1 Job Safety Planning Folders

5.2 Pre-Job Conference forms

5.3 Tailboard Forms for Specific Business Groups and Jobs

5.4 Specific Work Procedures and Operating Orders

5.5 Hazard Barrier Reference Sheet (see Job Planning website)

5.6 Hazard Barrier Deficiency Process and Hazard Barrier Registry (see Job Planning website)

6. References

6.1 WorkSafeBC Part 3, Division 3 – General Duties of Employers, Workers and Others

6.2 Power System Safety Protection, System Operating Order (SOO) IT-12L – Module 2, Section 3, Module 3, Section 3

6.3 BC Hydro Safety Practice Regulations Book

6.4 BC Hydro Job Planning Webpage

7. Definitions

High Hazard Activity

Activity is considered high hazard if the hazardous energy of the activity being performed has a credible and realistic potential to cause death or probable permanent disability. Refer to **Appendix 4** for examples of common BC Hydro high hazard activities.

Hazardous Energy: Any electrical, mechanical, hydraulic, pneumatic, chemical or thermal energy, or force such as gravity that could potentially harm workers (Source: BC Hydro Safety Practice Regulations Glossary)

Attention:
BC Hydro defines high hazard activity for the general purpose of job planning/documenting tailboards.

Note that WorkSafeBC Regulation 9 and OSH Standard 303 “Confined Space”, distinguishes between “high”, “moderate” and “low hazard atmosphere”. Workers involved in confined space activities must determine and record through tailboards confined space atmosphere hazard accordingly.

Preliminary Job Safety Planning: Planning and coordination activities, including Design Review, that are carried out with sufficient lead time such that work can be safely and successfully completed when the workers arrive on site.

Pre-Job Conferences: Meetings that are held in advance of large or complex jobs to ensure that all relevant parties understand and are prepared to discharge their roles and responsibilities.

Tailboards: On-site discussions that shall be held immediately before work commences or during the course of work when there is a change in the job or crew composition to ensure that all workers understand the hazards, barriers in place, risks and procedures associated with the job.

Post-Job Debriefs: Discussions that are held following large or complex jobs to ensure that key safety issues are discussed, allowing for improvements to be incorporated for future jobs.

Personal Protective Equipment:

- Personal Barrier – PPE means any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards during accidents.

Rescue/Medical Aid – The worker is rescued in some way following contact with the hazard.

Preventative Barriers – Barriers that are put in place to prevent the loss of control of a hazardous energy source.

Mitigating Barriers – Barriers that are put in place to reduce or eliminate the potential for harm to workers in instances where there been a loss of control of a hazardous energy source (i.e. in instances where preventative barriers fail).

Revision Rationale:
OSH Standard 122 V5: This standard has been revised in response to the corrective actions related to November 2014 electrical contact at the New Westminster Substation.

OSH Standard 122 V5-1 (Updated February 10, 2016): Additional edits made to rescue section 3.2.4 in response to WorkSafeBC orders related to November 2014 electrical contact at the New Westminster Substation.

OSH Standard 122 V5-2 (Updated July 12, 2016):

- Removal of content from Appendix 1 and edits to section 3.2.2.2 to reflect and point to the new OSH Standard 110 Hazard Identification and Risk Assessment that replaces this information.
- Update section 3.2.4.1 to provide clarity on the term “high angle” when considering rescue requirements.

Appendix 1

Hierarchy of Accident Sequence Controls

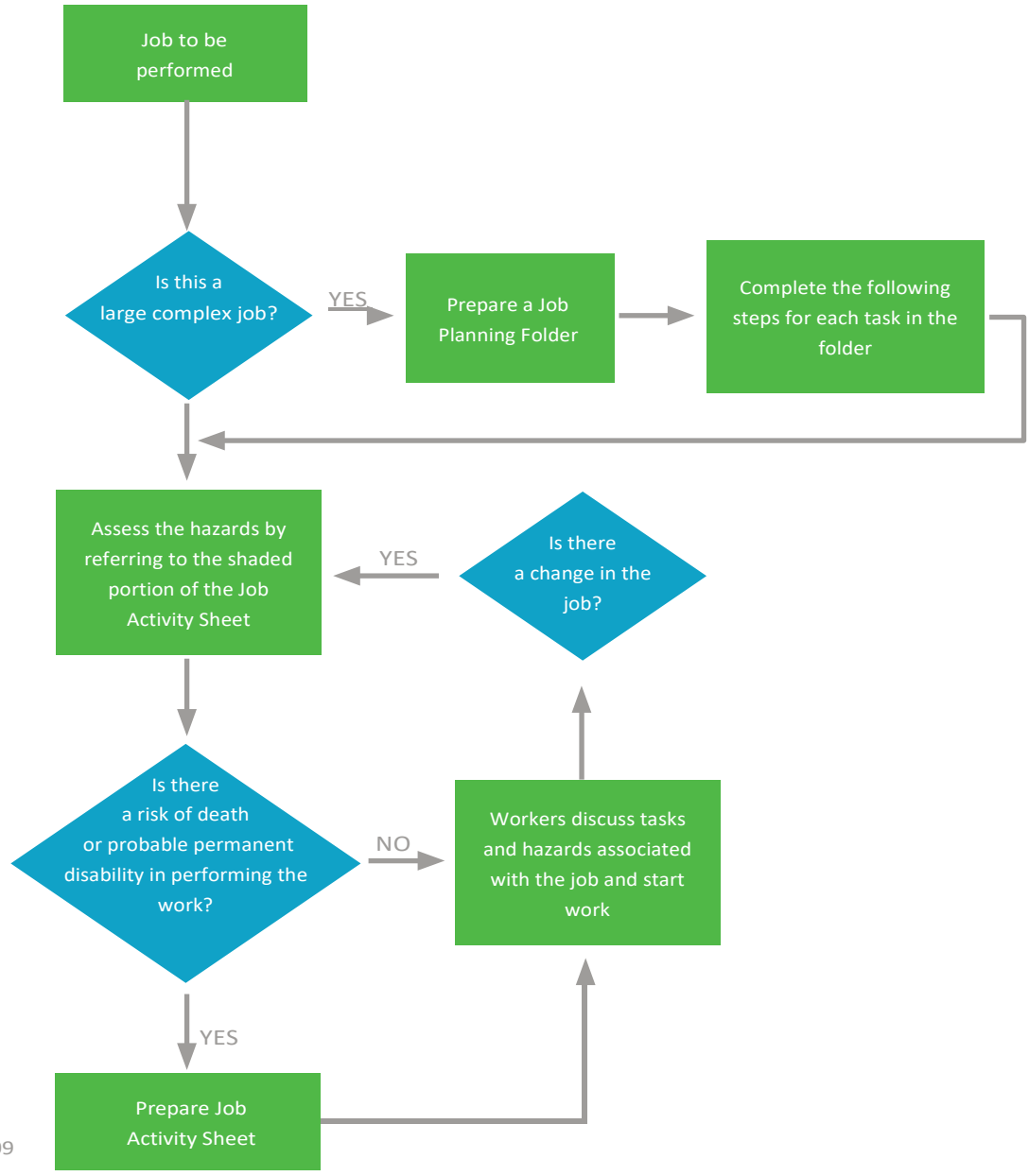
Please note that the contents of this appendix have been moved from this standard to a new location in Appendix 4 of the July 2016 updated version of OSH Standard 110 Hazard Identification and Risk Assessment.

Appendix 2

Generation Safety Planning Decision Tree for the Job Planning Folder

(Stand Alone Jobs)

Job Safety Planning Decision Tree
Job Planning Folder



Revised: June 9, 2009

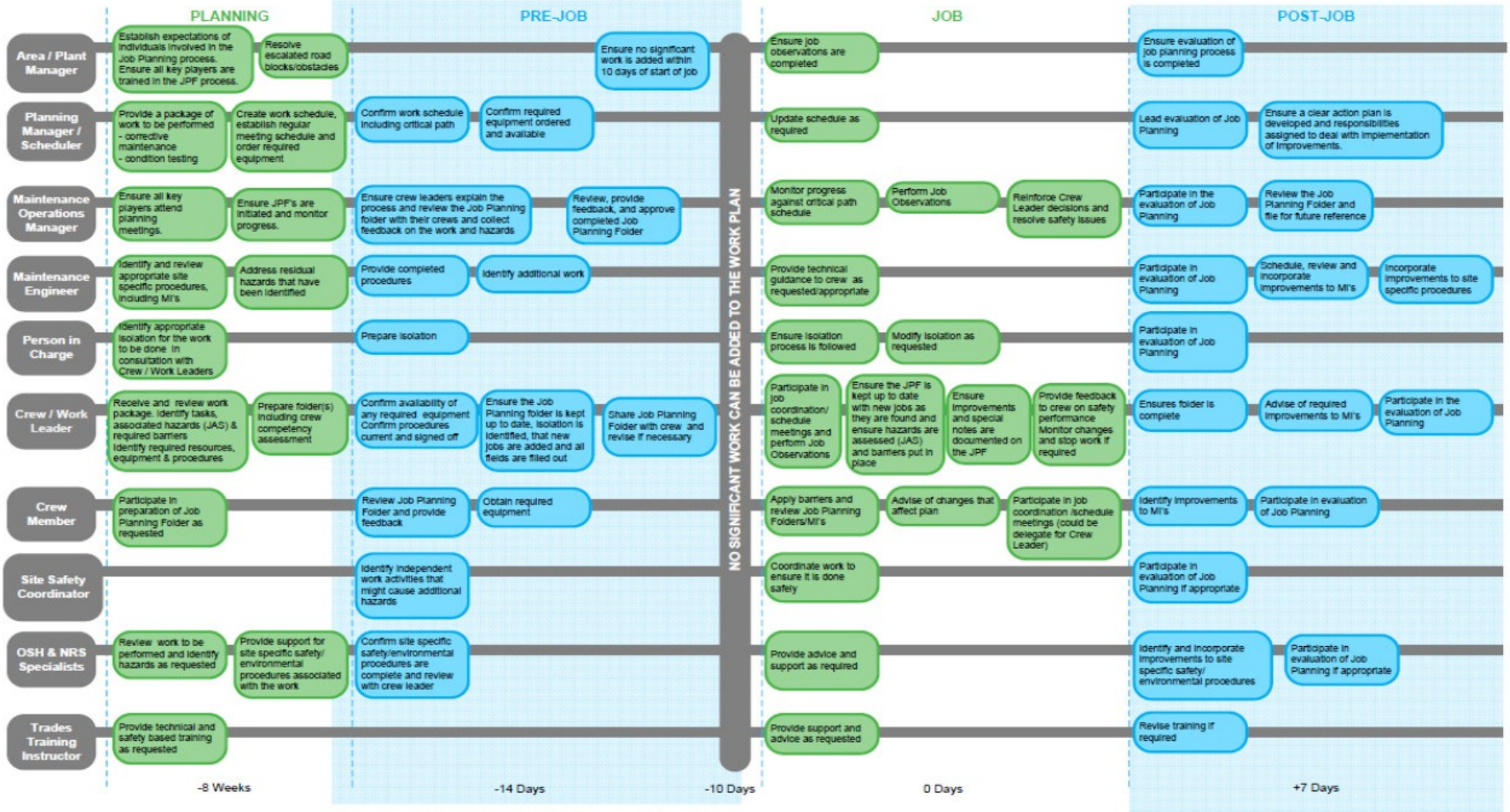
Generation Job Safety Planning Folder Road Map for Larger Jobs

Generation Job Planning Road Map

Version: July 2012

Purpose : To promote a consistent approach to Job Planning across Generation Operations

Examples: 1. Unit overhaul (DY4) **2.** Replacement of a major piece of equipment



Appendix 3

Additional Requirements for Preliminary Job Safety Planning,

Pre-Job Conferences and Tailboards

Preliminary Job Safety Planning

- As required, ensure that system and local component training for workers assigned to the job is current.
- For multiple employer worksites ensure that a site safety coordinator is designated
- Documented preliminary grounding plans, including isolation requirements, will be prepared. The preliminary job safety plan will consider the effects of having more than one set of grounds applied on the same isolated section of line at different work locations.
- Obtain applicable operating orders, BC Hydro OSH Standards, and written procedures
- Ensure an authorized worker to act as the Person in Charge (PIC), when operating responsibility is assigned by Fraser Valley Operations (FVO) to BC Hydro for the planned work.
- Ensure that all required specialized tools and equipment meet applicable BC Hydro standards (inspections, etc) and will be on the job site (e.g., air monitors, live line tools, vehicles, man lifts).
- Worksite risk assessments are completed where applicable
- Documentation (e.g., WHMIS, Notice of Project (NOP), etc.) and permits (e.g., Transportation of Dangerous Goods (TDG), diving, etc.) are obtained.

Pre-Job Conferences

- A risk assessment will be done, or reviewed if a pre-existing risk assessment is applicable, for the work to be carried out so that related safety and health hazards are identified and appropriate barriers are put in place to control these hazards.
- For work involving contractors, BC Hydro's relationship with the contractor (e.g., dependent, independent or prime contractor) will be reviewed as per the Workers Compensation Act.
- All relevant work groups are to be represented at the pre-job conference.
- For large or complex jobs involving contractors and/or subcontractors, a pre-job conference will be held in accordance with BC Hydro's OSH Standard covering contract management.
- A safety plan will be developed as required. It will include, as a minimum, emergency response details specific to the planned work, and worker job/site orientation.
- Pertinent operating orders and BC Hydro OSH Standards are to be identified and reviewed.
- Establish a method of communication between the work groups for emergency response purposes.

Tailboards

- Workers who are working alone shall apply the tailboard requirements, set out in below, prior to commencing work.
- Tailboard discussions shall include the following topic areas:
  - The scope and task sequence of the planned work, including any applicable procedures.
  - A review of any relevant preliminary or pre-job documentation.
  - The location and boundaries of the work and the placement of signage/demarcation of safety zones to establish safety zones as required.
  - Environmental conditions which could impact the work.
  - Communication requirements and systems.
  - Rules and regulations applicable to the work being performed.
  - All the known hazards and the required barriers.
  - Required personal protective equipment.
  - Safety management plans and environmental management plans, including requirements for emergency response, rescue plans and first aid.
  - Other work that could affect the work area.
  - Worker experience and knowledge of the job at hand.

Appendix 4

Common High Hazard BC Hydro Activities

The table below is not all inclusive but is meant to list examples of most common high hazard

BC Hydro activity/work situations broken down by hazard category. Documented tailboard is required prior to any of these (or similar) activities/work situations.

Hazard Category	Activity/Work Situation	Potential Consequences
Electrical	• Working on energized lines and/or equipment (>= 150 V DC or >=30 V AC) • Working in close proximity of energized/exposed lines and/or equipment [closer than Unqualified Limits of Approach (LOA)] • Working with hazardous test energy • CT work • Working with equipment isolated not de-energized per SPR rule 512 (1) • Working on/near failed equipment • Electrofishing	• Electrocution • Electrical burns • Ventricle fibrillation
Gravity	• Working at height • Working with objects at height • Working in or above excavations • Working above water	• Falling • Falling objects, crushing • Asphyxiation • Drowning
Mechanical	• Working on or near moving equipment or equipment that may move unexpectedly • Working on or near power tools or machinery/ equipment with moving parts or stored energy o Springs o Pulling cable o Stringing conductor o Jacking conductor (“sucking bubbles”) o Replacing insulators	• Crushing • Entanglement • Component failure • Struck by cable/conductor or jack
Chemical	• Working in a toxic atmosphere or with hazardous substances: asbestos, lead, mercury, PCBs, ammonia, chlorine, silica dust, acid, caustic, flammables (gasoline, hydrogen), radioactivity etc.	• Harmful exposure • Burns • Asphyxiation
Pressure	• Sudden uncontrolled release of high pressure gas or fluid	• Harmful exposure • Burns
Thermal	• Working in proximity to high temperature sources • Implosive sleeves	• Fire • Burns • Explosion
Biological	• Working in proximity of rodent droppings • Working in proximity of blood-borne pathogens	• Hanta virus • HIV, hepatitis
Other	• Working in confined space • Working in water including the use of divers	• Asphyxiation • Drowning

BC Hydro
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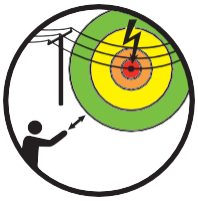
OSH Standard 201
Worker Qualifications for Limits of Approach Authorization

OSH Standard 201
Worker Qualifications for Limits of Approach Authorization



1. Scope

This standard applies to the process of authorization for workers intending to work for BC Hydro on or in proximity to exposed energized conductors or equipment of BC Hydro's power system in accordance with Safety Practice Regulation (SPR) Section 400, Limits of Approach (LOA).

2. Purpose

The purpose of the standard is to:

- Identify the workers who can be authorized for LOA
- Establish worker qualifications for Qualified electrical workers (QEW) and Unqualified workers (Unqualified) in relation to LOA authorizations:
    - QEW LOA = qualified electrical workers permitted to work to the qualified electrical worker distance as defined in SPR section 400 Table 401 and Table 403.
    - Unqualified LOA = unqualified worker permitted to work to the unqualified distance as defined in the SPR section 400 Table 401.
    - CUA LOA = Certified utility arborist permitted to work to the WorkSafeBC table 19.3.
- Assist managers accountable for authorization in carrying out their responsibility for assigning LOA authorization to workers based on worker qualification, experience and competence.

3. LOA Authorization Requirements

3.1 Each worker must be authorized by their manager as QEW LOA or Unqualified LOA. To determine if a worker qualifies for LOA authorization, Managers will determine each worker's understanding of the electrical hazards to which he or she will be exposed and the appropriate LOA authorization. To determine appropriate LOA authorization managers can use results of the SAFE-401a assessment, if available.

3.2 The authorization must be recorded in PSSP/WPP Manager as QEW, Unqualified or CUA.

3.3 When workers transfer, their LOA authorization must be reviewed by their new manager and be confirmed or changed as required in PSSP/WPP Manager.

4. Specific Worker Qualification Requirements

The specific requirements below (by category) apply to worker that may be seeking LOA authorization.

4.1 Qualified Electrical Workers

4.1.1 Only experienced electrical utility trades or technical workers who have achieved and maintained their qualifications may be designated as Qualified Electrical Workers. Recognized trades or technical classifications consist of Power Line Technicians, Electricians, Cable Splicers, Winders, CPC Technologists, P&C Technologists (Engineering), Instrumentation & Controls Technologists, Meter Technicians, Project Equipment Specialists, Electrical Engineers, Power Electrical Equipment Technologists (electrical diploma only), Diesel Station Attendants, Generation and Thermal Plant Operators, Electrical Engineering Technologists (Site Engineering and Acceptance) and Field Technicians 2 (Site Engineering and Acceptance, electrical diploma only).

4.1.2 Only the following qualified electrical workers are permitted to provide Safety Watch for unqualified workers and their equipment in relation to high voltage electrical hazards (as referenced in SPR Table 401 and uninsulated equipment distance and SPR 805): Power Line Technicians, Cable Splicers, Electricians and Winders.

4.1.3 Worker's must meet the minimum requirements for QEW LOA Authorization as follows:

1. Meet the requirements of a qualified electrical worker as outlined in 4.1.1.
2. Successful completion of SAFE-401 or equivalent training received through a BC Hydro Apprenticeship and authorized to at least PSSP Category 5 or WPP Category C.
3. BC Hydro Manager Authorization The Safe 401 assessment is to be initiated by the manager when they deem the individual is ready which can typically take up to 6 months from their start of employment or contract. Prior to the assessment and/or where gaps have been identified after completion of the Safe 401 assessment, qualified electrical workers may work up to qualified electrical worker LOA distances specified in the SPR section 400 Table 401 and Table 403 if they are working under the direct and continuous supervision of a qualified electrical worker authorized to QEW LOA.

4.2 Certified Utility Arborists

4.2.1 Certified utility arborists (CUA) may be authorized to CUA LOA and work up to the distances specified in WorkSafeBC 19.3, if all of the following are met:

1. Authorized to at least PSSP Category 4.
2. BC Provincial Trade Certificate as a Certified Utility Arborist.
3. BC Hydro Manager Authorization, as CUA LOA, restricted to WorkSafeBC 19.3 distances

4.2.2 Certified Utility Arborist Apprentices shall be authorized as Unqualified LOA, but may work up to the distances specific in WorkSafeBC 19.3 if they are working under the direct and continuous supervision of a Certified Utility Arborist authorized to CUA LOA.

4.3 Electrical Workers in Training

4.3.1 Electrical workers in training (ie, apprentices, Graduate Technologists in Training) must be from one of the recognized trades or technical worker classifications in 4.1.1 and shall be authorized to Unqualified LOA and to at least PSSP Category 3 or WPP Category B.

4.3.2 These workers may work up to QEW LOA distances specified in SPR Table 401 if all of the following are met:

1. They are working under the direct and continuous supervision of a Qualified Electrical Worker authorized to QEW LOA.
2. They are working in accordance with the Level Requirements, established by the A&TTC or the Engineering GTT Subcommittee.

4.3.3 These workers may work up to the restricted work distances specified in SPR Table 403 if all of the following are met:

1. They are apprentice Power Line Technicians working on the Transmission System at voltages of 138 kV and above and they are working in accordance with the Level Requirements of their apprenticeship.
2. They are working under the direct and continuous supervision of a qualified electrical worker (Power Line Technician) authorized to QEW LOA.
3. They are performing work in accordance with an Approved work procedure.
4. For training of this nature, the Apprentice shall not be considered a Qualified Electrical Journeyperson for the interpretation of Safety Practice Regulation crew complement requirements.

4.3.4 These workers may participate in high voltage rubber glove field training if all of the following are met:

1. They are apprentice Power Line Technicians working in accordance with the Level Requirements of their apprenticeship.

2. They are working under the direct and continuous supervision of a Qualified Electrical Worker (Power Line Technician) authorized to QEW LOA and certified in rubber glove work procedures.
3. They have received formal classroom rubber glove training by a Trades Training Instructor, and have demonstrated technical competence at an approved training facility.
4. For training of this nature, the Apprentice shall not be considered a Qualified Electrical Journeyperson for the interpretation of Safety Practice Regulation crew complement requirements.

4.4 Unqualified Workers

4.4.1 Workers that do not meet the requirements stated in sections 4.1 to 4.3 are considered unqualified. These workers must maintain Unqualified LOA distances. Note: Unqualified workers and their equipment may work up to the uninsulated equipment distance specified in SPR Table 401 when continuously directed by a qualified electrical worker as defined in 4.1.2.

5. References

5.1 BC Hydro Safety Practice Regulations Rule 401, 402 and 403 Limits of Approach to Exposed Energized Conductors and Equipment.

5.2 WorkSafeBC Occupational Health and Safety Regulation Part 19 “Electrical Safety”.

Revision Rationale:

February 3, 2020 major edit:
a) Update the wording to reflect new Limits of Approach rules.

BC Hydro
Power smart

OSH Standard 203
Welding, Cutting and Hot Tapping

OSH Standard 203
Welding, Cutting and Hot Tapping

1. Scope

1.1 This standard covers safety aspects and hazards associated with welding, cutting and hot tapping (hot tapping is welding on vessels that contain liquids or gases).

2. Purpose

2.1 This standard identifies requirements associated with welding, cutting and hot tapping which must be in place for reducing the risk associated with these hazards.

3. Standard

3.1 Hazard Assessment

A detailed hazard assessment of welding and cutting operations conducted by a person with a thorough understanding of the process hazards is required which includes:

- Type of welding or cutting that needs to be done;
- Air contaminants generated from the welding or cutting operation, including by-products;
- Physical hazards in the area;
- Fire and explosion hazards;
- Other hazards resulting from associated processes (e.g. cleaning the metal, grinding, chipping, removing existing coatings) such as electricity, UV exposure, noise and burns from slag.

3.1.1 Written procedures will be developed to control hazards identified in clause 3.1.1 and will address the following:

- Hazard control;
- Administration controls (i.e. Hot work permit);
- Engineered controls;
- Personal protective equipment.

Small welding contractors without occupational health & safety resources may accomplish this by following procedural guidelines contained in CSA Standard W117.2-94.

3.2 Exposure Control Plan

Due to the potential exposure to designated hazardous substances, an exposure control plan must be developed.

3.3 Safe Work Procedures

3.3.1 Written procedures must be developed to control hazards identified in the hazard assessment and will follow the hierarchy of controls:

- Elimination or substitution (e.g. use of welding rods with lower concentration of hazardous contaminants);
- Engineering controls (e.g. ventilation);
- Administrative controls (i.e. Hot work permit);
- Personal protective equipment.

3.3.2 For all welding operations appropriate personal protective equipment is required, including flame resistant clothing, helmet, eye protection and respiratory protection appropriate to the job and location.

3.3.3 Protection is to be in place (e.g. welding screens, ventilation, barriers and signage) so that other workers in the area will not be exposed to arc flashes and other welding related hazards.

4. Roles and Responsibilities

4.1 Managers

4.1.1 Managers are responsible for providing risk assessments, safe work procedures and approved equipment for welding, cutting and hot tapping.

4.1.2 Managers must ensure that employees who perform welding, cutting or hot tapping are qualified for the assigned work and have reviewed the Exposure Control Plan and safe work procedures.

4.2 Workers

4.2.1 Workers who operate gas or electric welding equipment are responsible for doing so safely, including using appropriate personal protective equipment.

4.2.2 Workers are responsible for identifying and reporting potential high risk areas and following written work procedures.

4.2.3 Workers must only carry out work they are trained and qualified for.

5. References

5.1 WorkSafeBC OHS Regulation Part 12.

5.2 CSA W117.2-94 (referred to by WorkSafeBC Part 12)

5.3 National Fire Code, N.F.P.A. 51B Fire Prevention in Use of Cutting and Welding Processes, 1994 edition

5.4 ANSI Z491 1973 Safety in Welding and Cutting

5.5 BC Fire Code, Division B, Part 3 (Indoor and Outdoor Storage) and Part 5 (Hazardous Processes and Operations)

5.6 BC Hydro Electric Arc Welding, Welding Fume Exposure Control Plan and Welding Work Procedures

5.7 BC Hydro OSH Standard 313 and OSH Standard 601

OSH Standard Key Contact: Andre Bock 604 528 2027

Subject Matter Expert: Randy Urbanowski 250 549 8670

Revision Rationale:

Wording throughout this standard was revised based on comments received from knowledgeable persons in order to add more clarity, including the following:

- Added a requirement for an Exposure Control Plan in accordance with Safety Directive 2016-7-D
- Moved supplementary information into Appendix 1
- Additional references added such as the BC Fire Code, BC Hydro Exposure Control Plan and Work Procedures

Appendix 1

Additional Information

Gas Welding and Oxy-fuel Cutting

- Grease or petroleum products shall not be used on oxygen fittings or hoses because as oxygen is release from a cylinder, it expands and can form an explosive mixture with oil. Oil and grease should also be kept clear of rubber hoses because they cause deterioration. See that jointing surfaces in cylinder valves and regulators are free from oil or grease. If they are found to be oily, do not attempt to clean them; return them to the supplier for exchange.
- Acetylene cylinders will not be used when cylinder pressure is less than 103 kPa (15 lb/in2). Oxygen cylinders will not be used when cylinder pressure is less than 172 kPa (25 lb/in2).
- Acetylene and oxygen cylinders are not permitted inside confined spaces.
- Regulators will be set such that safe working pressures recommended by the manufacturer are not exceeded.
- Acetylene, in contact with certain metals, particularly alloys of copper, can form explosive compounds. Acetylene should therefore never be allowed to come into contact with copper or any alloy containing more than 70% copper.
- All cylinders must be secured upright when they are in use. Only sufficient spare cylinders for one day's use may be stored at the immediate work area. Others must be in an approved storage space elsewhere. When stored, cylinders must be upright and secured (against a wall by an adjustable chain where possible). Oxygen will be grouped separately from acetylene (a half-hour fire-rated partition between them is ideal). When transported in a vehicle or trailer, cylinders must be secured. Regulators, hoses and torch assemblies must be removed from cylinders and cylinder safety caps screwed on, hand tight, to protect valve heads from damage in an accident. Gas lines must be bled. Use appropriate equipment (e.g. dolly) to transport cylinders. Never drag, slide, or roll cylinders.

Note: If the valve breaks off, a pressurized cylinder becomes a lethal torpedo.

- Valves, hoses and torches shall be kept free of dust, dirt or any such obstruction.
- Inspect for leakage or defects prior to each use and test frequently for leaking connections. Escaping acetylene can generally be detected by the odour. Test with soapy water, never with an open flame.
- Should any compressed gas cylinder develop a leak, take it out in the open air, keep it well away from ignition sources, secure it in an upright position and notify the supplier at once.
- Flashback arrestors must be used.
- Use only friction lighters for lighting torches. Do not attempt to re-light a torch that has blown out without first closing both torch valves.
- Remember: oxygen regulators use right hand threads, acetylene regulators use left hand threads but to increase pressure they both turn clockwise. Always use the correct wrench supplied for the regulators. The nut for oxygen is purposely different from the acetylene nut to avoid mixing accessories.
- The key for opening the acetylene cylinder valve must be kept on the valve stem while the cylinder is in use so that the acetylene may be quickly turned off in an emergency. Use the "turn of the wrist" rule.
- Acetylene cylinder pressure is greatly affected by heat and cold. Pressure gauge readings do not indicate contents.
- When welding is stopped for a long period (lunch, or overnight), first turn off the acetylene torch valve, then the oxygen torch valve. Close the cylinder valves. Remove the residual pressure in the lines and regulators relieving the oxygen first, then the acetylene. Do not open the cylinder valves suddenly.
- Torches and hoses must be removed from a confined space when not in use and when the confined space is vacated.

Electric Welding

- Never change the polarity or the rotary switch of an electric welding machine when the machine is under a load. If done under load, the switch contacts will probably be burnt, and the resulting arc may injure the operator.
- The welding machine must be properly grounded. Pipelines carrying gasses or flammable liquids and conduits carrying electrical conductors must not be used for grounding the welding machine.
- The polarity or the rotary switch of an electric welding machine must not be switched when the machine is under a load.
- Compressed gas cylinders not required for the welding operation will be kept clear of the work area. Those in the work area will be protected from arc flash.

Welding or Hot Tapping on Equipment that Contain Flammables

- The contents of the equipment being welded must not unintentionally alter the metallurgical or chemical properties of the material being heated.
- Welding will not be performed on equipment that is operating above its rated working pressure and temperature, or on equipment that is operated at less than atmospheric pressure.
- Check that the material to be welded is of sufficient strength and thickness for the welding.
- Where flammable vapours are likely to be present in equipment, work may not proceed until a qualified person has conducted tests to ensure that work may be safely performed.
- Positive flow in the line being welded should be maintained, at least until after welding operations have been completed so that heat is dissipated. Where there is insufficient flow, the line must be flushed with steam, inert gas or hydrocarbon gas. Such steam or gas should be kept flowing through the line during the welding operation.
- Air lines or vessels must be free from lubricating oils (e.g. those that could be distributed through the system by a compressor) prior to welding.
- Prevent the ignition of a flammable atmosphere in the vapour space due to the application of external heat or release of flammable vapours from vents.
- A suitable fire extinguisher (minimum 4A-40BC) or a pressurized fire hose must be ready at the job-site. It is highly recommended that extinguishers with a hose as opposed to a stubby discharge nozzle and spark blankets be used. A water pressure or water mist type extinguisher may also be appropriate depending on the hazard.
- Never pump fluid in or out of tanks, agitate the contents or cause venting while hot work is in progress. Personal lockout should be applied to:
    - Agitator switches
    - All valves on product lines at the tanks
    - Gas-blanketing valves
    - Heater coil valves

Flashback

- When the flame flashes back into the mixing tube and sustains itself there, it is called “flashback”. It is caused by:
  - Overheating the tip and torch mixer tube
  - Keeping the tip in a small space so long that it cannot be cooled by the air around it
- A shrill hissing or squealing usually accompanies a flashback.
- Extinguish a flashback immediately by shutting off the preheat oxygen valve. Without oxygen, the flame cannot burn inside the torch.
- To protect the welder, check valves must be installed. Some are placed in each hose-line just behind the torch; other types are installed at the regulator.

BC Hydro
Power smart

OSH Standard 204
Personal Lockout

OSH Standard 204
Personal Lockout

1. Scope

1.1 The scope of this standard is limited to personal locks and lockout requirements.

1.2 WorkSafeBC Regulations Part 10 applies when work is conducted on equipment that is not part of the Power System.

1.3 On the Power System:

1.3.1 System Operating Order 1T-12 Power System Safety Protection (PSSP) applies within the PSSP boundaries. Refer to System Operating Order (SOO) 1T-12 A and 1T-12B and SPR 600 in combination with this standard to identify what equipment is subject to personal lockout and how the lockout is to be applied.

1.3.2 Work Protection Practices (WPP) applies for all work performed on equipment within the Generation boundaries. See SOO 1T-12A 6.0 and SPR 700 for further clarification on how personal lockout procedures apply.

Note:
Non-Integrated Area (NIA) facilities are implementing a staged conversion from PSSP to WPP starting May 30, 2014 and concluding March 2015. Upon completion of implementation at each facility, the requirements at that facility change from section 1.3.1 of this Standard to section 1.3.2.

1.4 All work performed on customer equipment will be in accordance with SOO 1T-12H. Customer lockout will:

- Follow WorkSafeBC personal lockout procedures.
- Be isolated by the customer using the customer's procedure.
- Be over-locked with BC Hydro worker personal locks and a lockout tag.

2. Purpose

2.1 The purpose of this standard is to clarify how WorkSafeBC Regulations Part 10 is applied within BC Hydro in conjunction with System Operating Order (SOO) 1T-12 (PSSP-SPR 600) and Work Protection Practices (WPP-SPR 700). The requirements for safe lockout, published in WorkSafeBC Regulations Part 10, should be reviewed in combination with this standard.

3. Standard

3.1 Equipment not on the power system requires specific written procedures. The specific written procedure is to include the following steps:

- Identify the equipment to be locked out.
- Stop the equipment.
- Disconnect the hazardous energy sources.
- Verify lockout effectiveness.
- Apply personal locks.

3.2 Workers must use only locks that are assigned to them.

3.2.1 Personal locks that are assigned to workers will have affixed labels that clearly identify the name (first and surname) of the designated user.

3.2.2 Personal locks provide worker protection. A personal lock may be utilized only by its designated user.

3.2.3 Within PSSP boundaries, Lockout Tags are to be used to draw attention to locks. Tags designated for use on the Power System (Section 500 of the Safety Practice Regulations) must not be used for personal lockout. See Appendix 1 for tags used in personal lockout.

3.2.4 Locks may be issued to workers for retention throughout their career in BC Hydro. It is also acceptable to issue personal locks for the duration of a job.

3.3 All electrical power supplies must be individually lockable – with the exceptions of the following two scenarios and their resolutions:

3.3.1 The machine receives power from a plug.

- If the work will be out of the immediate and direct control of the worker, the plug must be locked in a short stop.

3.3.2 The machine is hard-wired to a circuit breaker panel.

- The appropriate circuit breaker must be individually locked in the **open** position.
- A circuit breaker that cannot be individually locked open may be safeguarded by opening the circuit breaker and securing the circuit breaker panel door with a personal lock, only if:
  - There is a main switch to kill all power to the locked panel, and;
  - Either the worker is the only person required to lock out the equipment; or the panel door is transparent – allowing other workers to view the breaker status before applying their own locks.

3.4 Scissor clips may be used when two or more workers have to apply locks and when the isolation point cannot accept more than one lock.

- In the event that a scissor clip has to be attached to an isolation point that is already locked out, the original lock holder must remove the lock. The scissor clip may now be inserted and all workers must apply their locks to it.

3.5 All external contractors working on BC Hydro equipment subject to personal lockout must follow BC Hydro procedures when working within the Power System boundary area (PSSP or WPP boundaries). This requirement will be written into contracts, and the person responsible for the equipment will ensure that applicable BC Hydro procedures are followed.

4. Roles and Responsibilities

4.1 Workers

4.1.1 Each worker is personally responsible for the isolation and lockout of all hazardous energy sources that may jeopardize their safety during the course of their work.

4.1.2 The worker must have full knowledge of: the hazardous energy sources that will be isolated; the boundaries of the safe work area; and the safety procedures for the job.

4.1.3 Follow written lockout procedures during all maintenance work. The written procedures must be readily accessible for every job.

4.1.4 Remove the last lock. Ensure that that all persons are clear and that the machinery or equipment can be operated safely.

4.2 Managers

4.2.1 Master or spare keys must be kept in a secure place accessible only to the manager for emergency use.

5. Records and Documentation

5.1 Lockouts must be conducted in accordance with documented procedures. The procedures must be readily available to all workers that are required to work on the machinery or equipment.

5.2 A checklist must be used when the number of personal lockout points is three or more.

5.3 The manager's removal of a worker's lock in an emergency must be recorded.

6. References

6.1 WorkSafeBC Regulations Part 10 De-energization and Lock

7. Glossary

7.1 **Control device** – A means of isolating machinery or equipment from the flow of energy. The control device may be a switch, circuit breaker, valve, latch or clutch. Electrical switches or push buttons that control current flow remotely by means of relays or contactors are not considered suitable isolating devices for the purpose of lockout.

7.2 **Hazardous energy** – Energy that could injure or endanger a worker (e.g. electric, compressed gas, steam, chemical, hydraulic, tensioned spring or elevated object.).

7.3 **Lockout** – Use of lock(s) to render machinery or equipment inoperable or to isolate an energy source in accordance with written procedures.

7.4 **Maintenance** – Work of keeping machinery or equipment in a safe operating condition and includes, but is not limited to, repairing, adjusting, cleaning, lubricating and the clearing of obstructions to the normal flow of material.

7.5 **Personal lockout** – The use of personal locks to secure the control devices which regulate the release of hazardous energy. It is intended to provide safety for workers during maintenance work.

7.6 **Short Stop** – A lockable plastic cover that clamps over the male end of an electric plug to prevent its connection to a power supply.

Revision Rationale:

OSH Standard 204 R1 June 10, 2011: The scope of this standard was revised to include maintenance of low voltage equipment in Non-Integrated Generating Stations in the application of lockout procedures, consistent with Safety Practices Committee Bulletin 134. This is a change in practice where previously workers were required to follow Power System Safety Protection (PSSP).

OSH Standard 204 R1 June 10, 2011 (R1-1 Updated December 4, 2014): The scope of this standard was revised to reflect the implementation of Work Protection Practices (WPP) within the non-integrated Generating Stations and Substations.

Appendix 1

Lockout Equipment

The BC Hydro stores catalogue and list of stationery items for lockout.

Personal Lock – Stores stock #110 0510. This padlock is issued with two keys: one for the assigned lock holder; and one for the supervisor. All locks are uniquely keyed.

Scissor Clip – Stores stock #110 0511. This multiplex device allows six padlocks to be locked on to one isolating point.

Short Stop – Stores stock #110 0512. This is a plastic lockable box that clamps over an electric plug to prevent its connection to a power source.

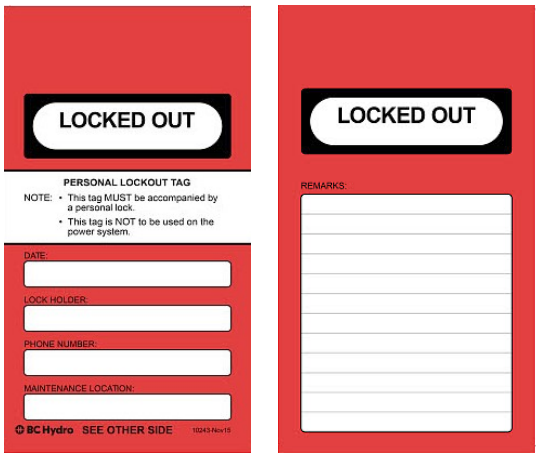
Lockout Clip – Stores stock #110 0513. This device is used to immobilize a circuit breaker. It is designed to fit over several varieties of panel mounted circuit breakers (up to 15 amp).

Lockout Clip – Stores stock #110 0514. This is similar to 110 0513 but specifically designed for FPE circuit breaker, style AB, type NEG311015.

Lockout Sticker – Stationery form #10236. This is a circular orange adhesive tag, 3.8 cm diameter, which draws attention to equipment that is subject to personal lockout procedures.

Attention Tag – Stationery form #LG02-20. This yellow tag can be attached to equipment that is not locked out but which needs attention.

Locked Out Tag – Stationery form #10243. This red tag can be attached to equipment that is locked out. The tag is used to supplement the personal lock – not replace it.



Notes:

- It is recommended that, where appropriate, electrical supplies to machinery should be fed through individual disconnect switches that can be locked, or through removable plugs. In single-phase supplies, it is often easy to insert an in-line plug and socket such as a Twistlok in a flexible supply cable.
- Other items of hardware for lockout may be obtained from outside the BC Hydro stores system. Suppliers of many types of panel mounted circuit breakers have single-pole and multi-pole clips and other lockout devices.

BC Hydro
Power smart

OSH Standard 208
Chainsaws and Portable Power Tools

OSH Standard 208
Chainsaws and Portable Power Tools

1. Purpose

1.1 To communicate acceptable and required safety equipment and practices for the use of chainsaws and other portable power tools.

2. Scope

2.1 This standard shall apply to all BC Hydro work whether conducted and supervised by BC Hydro employees or assigned to contractors.

3. Requirements

3.1 Chainsaws and power tools will be operated in accordance with WorkSafeBC (WSBC) Occupational Health and Safety Regulation (OHSR), plus other references as identified in Section 5 of this standard.

3.2 Chainsaws

3.2.1 Chain Saw—a power-driven tool designed to cut wood with a saw chain and consisting of an integrated compact unit of handles, power source, and cutting attachment, designed to be supported with two hands.

Note: A "Hot Saw," which is a saw mounted on an extended pole, is not considered a chainsaw for the purposes of this standard since it is not a compact unit. Therefore only section 3.4 of this standard would apply.

3.2.2 All chainsaws used at BC Hydro must have the following safety features:

- Chain brake (inertial)
- Chain catcher
- Bumper or bucking spikes ("dogs")
- Hand guards front and rear
- Reduced radius chain bar tip on top-handled saws
- Spark arresting muffler (gas powered saws)

3.2.3 Basic personal protective equipment (PPE) (including hard hat, hearing protection, safety glasses, gloves and steel toed boots) must be worn when using a chainsaw.

3.2.4 Additional PPE for all chainsaw use must include:

- Face shield
- Leg protection such as pants, chaps or apron meeting the requirements of WSBC OHSR 8.21, Schedule 8-A.

3.3 General Rules for Safe Chainsaw Operation

3.3.1 Any BC Hydro employee who uses a chainsaw at work must have had formal training in safe chainsaw operation. Minimum training is BC Hydro SAFE-529 (Chainsaw Operation).

3.3.2 Any worker who falls a standing tree larger than 6 inches in diameter must be certified to the BC Faller Training Standard or be a Certified Utility Arborist (CUA) with falling certification acceptable to WSBC.

Note: this requirement does not apply to work related to clearing trees that have already fallen (e.g.: storm damage).

3.3.3 The saw must be in good operating condition with all safety features in place, chain tension properly adjusted, and the chain brake confirmed to be working properly.

3.3.4 Saw use must be restricted to cutting wood only.

3.3.5 Workers must not work alone when operating chainsaws except as specified in Safety Practice Regulation 801.1.

3.4 Portable Power Tools Including Powder Actuated Tools

This section applies to all portable power tools include nailers, drills, grinders, saws and others where energy operating the tool is electrical, pneumatic, hydraulic, internal combustion or explosive cartridge (i.e., powder actuated).

3.4.1 Any employee required to use portable power tools must be instructed in the safe use of those tools.

3.4.2 Any employee using portable power tools will wear applicable basic PPE as well as any additional PPE, such as respiratory protection, as identified in safe work planning.

3.4.3 All power tools will be used only for their intended purpose and as per the manufacturer's instructions.

3.4.4 All guards and other safety devices provided by the tool's manufacturer must be kept in good working condition and never defeated.

3.4.5 Powder actuated tools – refer to WSBC OHSR 12.51 through 12.57 for specific requirements on the selection, use, and storage of these tools.

4. Roles and Responsibilities

4.1 Workers

4.1.1 Comply with the provisions of this standard and all referenced regulations, standards and rules as applicable.

4.1.2 Follow all BC Hydro safe work procedures and Work Methods applicable to the work.

4.2 Supervisors

4.2.1 Supervisors must ensure that workers are instructed on the safe use of portable power tools and trained in the safe use of chainsaws.

4.2.2 Supervisors must ensure all elements of a safe work plan are in place before work begins.

5. Regulation and Related Documents

5.1 CSA Standard Z62.1-95 Chainsaws

5.2 CSA Standard Z62.1-15 Chainsaws

5.3 WSBC OHSR 26.1 and Guideline Part G26.1-1

5.4 WSBC OHSR 8.21 and Guideline Part G8.21

5.5 WSBC OHSR and Guideline "Powder Actuated Tools" Parts12.51 to 12.57

5.6 WSBC OHSR Part 12.72 to 12.73

5.7 WSBC OHSR and Guideline Part G26.21

5.8 BC Forest Safety Council

5.9 BC Hydro Safety Practice Regulations rules 310 and 801.1

5.10 BC Hydro SPR 405

5.11 BC Hydro OSH Standard 601

5.12 SAFE 529 Chainsaw training

6. Information Controls

6.1 Revision History

Revision History		
Date	**Version**	**Comments**
July 14, 2016	V1-0	Complete re-write

BC Hydro
Power smart

OSH Standard 209
Isolation of Mechanical Apparatus

OSH Standard 209
Isolation of Mechanical Apparatus

1. Scope

The scope of this safety standard is to address acceptable isolation of mechanical devices including such equipment as:

- Intake and spillway gates
- Large valves – penstock inlet valve, turbine inlet valve, pressure regulating valve
- Wicket gates, deflectors, needles
- Any other hydraulic operated equipment
- Piping systems
- Generating Units

2. Purpose

The purpose of this standard is to establish a consistent approach to the isolation and blocking of mechanical apparatus used as isolating devices. Where it is not practicable to apply the minimum standard, the facility WPP/PSSP local operating order shall specify alternate procedures which achieve an equivalent level of worker safety (e.g. engineered systems).

3. Standard

See Appendix 1 to learn about design concepts for isolation of mechanical devices.

3.1 Application Concepts

3.1.1 General Requirements

Prior to worker access to mechanical apparatus, all hazardous energy sources shall be isolated.

Due to the wide variety of systems and designs in use, specific energy control measures shall be designed on a system by system basis, by first analyzing every energy source individually and then in combination with the other energy sources present.

3.1.2 Isolating Devices

Isolating devices shall be rated to withstand the maximum credible pressure and/or forces that could be applied to them in their isolated state. All isolating devices shall be lockable.

3.1.3 Reliance on Pressure

It is not acceptable to rely on fluid pressure to maintain isolation or blocking of mechanical apparatus. Exemptions may be made with approval in writing from both the Safety Practices Committee (SPC) and a Professional Engineer.

3.1.4 Reliance on Check Valves

It is not acceptable to rely on check valves to maintain isolation.

3.1.5 Verification

i) Concept for Blocking

Blocking shall be verified by confirming that the correct blocking device is installed and locked (tagged if PSSP) in the correct position.

ii) Concept for Piping Systems

The isolation of a piping system shall be verified by one of the following methods, listed in order of preference. In each case, several attempts could be used to demonstrate the cause and effect relationship between the drain and the observation.

- Visually monitor the dissipation of stored energy from the system into the drain as a direct result of opening the valve. Shortly after opening little or no flow should exist.
- Audibly monitor pressure dissipation from the system into the drain by hearing flow noise as direct result of opening the valve. Shortly after opening, no flow noise should exist.
- Using a pressure gauge, observe the pressure in the system decrease as a result of opening the drain valve. The pressure gauge must originally record pressure present, to check its operation, and then decrease to zero.
- Open a drain valve to atmosphere and confirm it is not plugged, possibly by inserting a rod long enough to reach the main pipe into the drain.

3.1.6 Visual Check

i.) Concept for Blocking

Blocking shall be visually checked by confirming that the correct blocking device is installed and locked (tagged if PSSP) in the correct position.

ii.) Concept for Piping Systems

Isolation of a piping system shall be visually checked by confirming all valves are in the correct position and are locked (tagged if PSSP) in that position.

3.2 Large Gates and Valves

3.2.1 Hydraulically Operated

Acceptable methods of isolating hydraulically operated devices include, in order of preference:

1. Complete depressurization of the system with a drain open, and isolation of all energy sources. If the device must be held in position to prevent it from moving, positional blocking must be installed as well.
2. Single valve and drain with full-force blocking.
3. Double valve and drain with a second drain line to ensure the actuator remains without any pressure, and positional blocking.

For large gates and valves held in place by gravity, refer to A (iii) in Appendix 1, which defines gravity as fulfilling the requirements of positional blocking in some situations.

3.2.2 Water Operated

Acceptable methods of isolating water operated devices are the same as for hydraulically operated devices.

If a water-operated device receives its energy from a line or header which has already been isolated in accordance with this document, the energy source for the water operated device can be considered isolated as well. Note that blocking may still be required.

3.2.3 Wire Rope

Wire rope devices shall be isolated by disconnecting electrical power to the devices, isolating any manual/ auxiliary operators, and using positional blocking to maintain the device in position.

Blocking applied to the hoist braking mechanism such as brake clamps shall be considered an acceptable method of blocking the gate in a desired position, provided the design of the clamp and the suitability of the system has been approved by a Professional Engineer.

3.2.4 Crane and Lifting Beam

When a device is solely operated using a crane with a lifting beam, the device may be isolated using one of the following methods, in order of preference:

1. Removing the lifting beam from the device and locking the access for the beam to the gate slot.
2. Removing the lifting beam from the device and locking the lifting beam.

3.2.5 Direct Drive

A direct drive device such as belt, chain or shaft driven shall be isolated by disconnecting electrical power to the device and isolating any manual/auxiliary operators. Positional blocking is required unless the system is approved as self locking by a Professional Engineer.

3.3 Hydroelectric Generating Units

Each generating unit must be considered individually. The subsections here set out guidelines for isolating the higher hazard sources of energy. It is not intended to be a complete list of all points to isolate a generating unit, but rather a list to address the major sources of energy. Although not specifically listed, consideration must be given to the other sources of energy present such as fire protection and brake air systems.

3.3.1 Servomotors and Wicket Gates

Isolation of the wicket gates shall be by one of the following three methods:

1. Depressurizing the accumulators and opening a drain, isolating the air supply, electrically isolating the oil pumps, and installing positional blocking on the servomotors; or

2. Isolating the hydraulic and pneumatic energy using single valve and drain of the piping, and installing full force blocking on the servomotors.

3. Isolating the hydraulic and pneumatic energy using double valve and drain of the piping, and installing either positional or full force blocking on the servomotors. If this method is used, the possibility of stored energy in the servomotors must be addressed, as described in Appendix 1, Section B iv.

3.3.2 Unit Rotation

Full force mechanical blocking of the rotating components is not practical. Therefore, isolation of the hazardous energy is necessary and shall include the following components:

1. Intake operating/maintenance gate, penstock inlet valve and associated bypass valves, turbine inlet valve and associated bypass valves, or other device closed to block the flow of water into the turbine;

2. Penstock or scroll case drain valve open (or equivalent, such as an open scroll case door) to drain leakage from item 1 above;

3. All raw water valves necessary to prevent back flow shall be closed;

4. Generator electrical isolation – perform as required by local operating order and the Recommended Grounding Practices for Hydroelectric Generators Maintenance Standard (01.20.MTCE.03); generally it includes:

    a. Disconnect open or flex links removed and grounded, neutral disconnect open or secondaries open, and neutral ground installed; and

    b. Inadvertent rotor movement blocked by:

        i. Isolating the energy from the generator lift pump; if a unit does not have a lift pump inadvertent movement can be considered blocked; and

        ii. Restricting backflow of water through the turbine by installing draft tube gates or isolating and blocking the wicket gates in the closed position; and

        iii. Isolating the energy from the unit jacking system.

3.3.3 Unit Rotation – Brushgear Maintenance

Note:
Brushgear maintenance generally includes measuring brushes, replacing brushes, and/or cleaning the slipring and collector assemblies. It does not generally include removing the speed switches, PMG, slipring assembly or collector assembly. Due to the risk of rotation while performing work, adequate safe work procedures are required to prevent minor worker injury due to pinch hazard. If the unit creeps for any reason the Brushgear maintenance is stopped and established isolation reviewed.

1. Hazard

    The residual magnetism in the rotor is only a hazard if the rotor is able to spin allowing this magnetism to interact with the stator winding. This can result in an undetermined amount of continuous current flow (rotor

speed dependant) in the stator winding Worker Protection Grounds which may affect their integrity. These grounds are applied on the stator to protect the workers from inadvertent energization of the stator and their integrity must be maintained.

- Rotation hazard of the slip rings – pinch factor or loose clothing getting caught between the brush holders and sliprings

2. Equipment Protection Methodology Associated with a Pressurized Scroll Case

- Generator brakes must remain applied to prevent unit rotation:
  - To mitigate residual magnetism interacting with the stator to ensure integrity of the worker protection stator grounds
  - Enable creep detection systems to protect the generator bearing
- Governor in an active, but shutdown condition to maintain gate squeeze
- Lift pump operational and **NOT isolated** to protect the generator bearing:
  - Creep detection systems protect the generator bearing and must be in an operational state. If a creep operation initiates gate opening to take the unit to speed-no-load, the **scroll case must be drained**

3. Isolation of Prime Mover Methodology

- Wicket gates blocked closed, verified and locked or nozzles blocked closed, verified and locked

3.3.4 Water Passages

Some water passages are considered confined spaces. Check with area Occupational Safety and Health (OSH) Specialist to confirm classification. For water passages which are classified as confined spaces, refer to Section 3.5 of this standard.

3.3.5 Pressurized Air Admission Systems

Pressurized air is considered a hazardous substance as it could cause injury in a confined space, even if it is considered breathable air.

For entry of personnel into the water passages of generating units equipped with synchronous condense operation or pressurized air injection, isolation will be determined by the classification of the water passage:

1. Confined Space – isolation to meet the requirements of WorkSafeBC OSHR Part 9 and OSH Standard 303 for confined space entry; or
2. Not a Confined Space – isolation to be single valve and drain.

3.4 Work on Piping Systems

This section is intended to outline the isolation required for working on a piping system, not entry into the piping system or a confined space connected to the piping system. Entry into confined spaces is subject to additional considerations to meet the requirements of WorkSafeBC OSHR Part 9 and OSH Standard 303.

Isolation may not be required for all piping system work provided an alternate approved work procedure is followed (e.g. hot tapping).

When establishing isolation, a drain might be remote to the work. Best practice for disconnecting or opening a pipe is to treat it as live until is obviously open to atmosphere. For example, flange bolts should be loosened on the side opposite the worker.

A piping system, including pipes for air, oil, and water, can be isolated in any of the following three manners, listed in order of preference.

3.4.1 Depressurizing

It is preferable to remove the hazard by depressurizing, but often this is not practical. Note that the section of piping may have to be specifically depressurized in addition to depressurizing the equipment at the source.

3.4.2 Disconnecting

Removing a section of piping to ensure the hazardous energy cannot reach the work area.

3.4.3 Blanking

Installing a blank in the line and draining the line section to be worked on.

3.4.4 Single Valve and Drain

At a minimum, depressurizing will consist of isolating the energy source and opening a drain line in the section of piping to be worked on.

3.5 Confined Spaces

For entry into a confined space, the requirements of WorkSafeBC OSHR Part 9 and OSH Standard 303 must be fulfilled in addition to those presented in this Standard.

Isolation options for hazardous substances in lines adjacent to a confined space include disconnecting, blanking, double block and bleed, and single device isolation. For details and formal definitions, see the references.

3.6 Cranes

Cranes have both electrical and gravitational hazards. Electrical isolation shall be made using the main disconnect. Isolation for the gravitational hazard is required when movement of the load bearing components would endanger a worker (e.g. replacing the brake pads or the brake assembly); this requires the hoist to be dogged or the hook placed on the floor.

3.7 Auxiliary Equipment (i.e. Pumps and Compressors)

For work on auxiliary equipment, electrical isolation is required as per WPP/PSSP, in combination with isolation and draining of the piping system connected to the equipment. Piping system isolation shall be by single valve and, if necessary, a drain. The drain is required if pressure could be stored or built up in the isolated area.

4. Roles & Responsibilities

4.1 Managers

4.1.1 Required to manage the work for the requirements of this standard are met

4.1.2 For generating stations, ensure the WPP local operating order contains necessary procedures.

4.1.3 Ensure spaces which workers are required to enter are reviewed to determine if they are confined spaces. A written entry procedure is required for workers to enter a confined space.

4.2 Workers

4.2.1 Follow applicable safe work practices and procedures

5. References

5.1 WorkSafeBC OHSR Part 9 Confined Spaces

5.2 BC Hydro Safety Practice Regulation (SPR) Rule 518

5.3 OSH Standard 303 – Confined Spaces

5.4 Recommended Grounding Practices for Hydroelectric Generators Maintenance Standard (01.20.MTCE.03); (accessible by using the FileNet Search Engine and login with BC Hydro login and password)

6. Glossary

Blocking – Physically securing mechanical equipment against inadvertent movement, or maintaining a physical opening in the case of electrical installations.

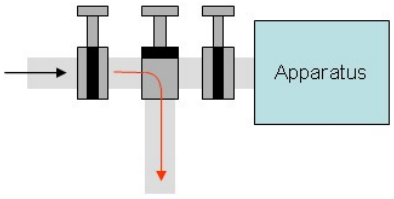
Brake Clamps – A device applied to a brake disk or assembly meeting the requirements of blocking.

Direct Drive – A system where the rotational energy is transmitted by a belt, chain or shaft.

Dissipating – Reducing hazardous energy to a level that is required by regulation or is otherwise safe for humans, including measures such as releasing pneumatic, gas, or hydraulic pressure; releasing spring energy; and applying Worker Protection Grounding/Bonding or Blocking.

Double Valve and Drain – To close two designated isolating valves in the piping and open a designated drain valve located in between the two designated isolating valves. The drain line can be less than the diameter of the line being isolated. This does not meet the requirements of WorkSafeBC OSHR Part 9.1 – additional requirements must be met for Confined Space Entry. If the drain line is the diameter of the line being isolated then this is Double Block and Bleed.

Double Block and Bleed (for confined space entry) – The closure of adjacent piping by locking out a drain or vent in the open position in the line between two locked out valves in the closed position. The diameter of the bleed line must be no less than the diameter of the line being isolated, unless certified by a Professional Engineer.



Drain – A method for the safe release of a liquid or a gas.

Hazardous Energy – Any electrical, mechanical, hydraulic, pneumatic, chemical, or thermal energy, or force such as gravity that could potentially harm workers.

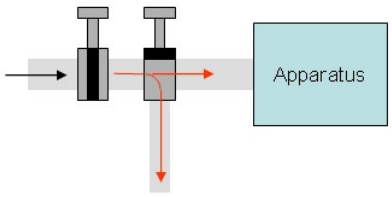
Hydraulically–Operated Device – A device, the movement of which is controlled by fluid pressure.

Isolated – For electrical equipment, the normal sources of hazardous energy have been disconnected by opening and securing all associated switches or by making a line or bus cut. For mechanical equipment, the equipment has been rendered and secured non-operative by installing a blank in a pipe line, closing a valve, depressurizing, draining, venting, or other effective means.

Isolating Device – A device that physically prevents the transmission or release of hazardous energy to equipment, such as a switch, line or bus cut, fuse, or valve.

Single Valve and Drain – To close a designated isolating valve in the piping and open a designated drain valve. Does not meet the requirements of WorkSafeBC OHSR Part 9 – additional requirements must be met for Confined Space Entry.

Vent – a safe opening for the escape of a gas or liquid or for the relief of pressure



Revision Rationale:

The following changes and their accompanying references are as follows:

- Added unit jacking to isolation for unit rotation (3.3.2)
- Clarified scope of brushgear maintenance (3.3.3)
- Changed brushgear maintenance section to apply to a pressurized scroll case rather than a primed penstock (3.3.3)
- Expanded requirements for considering gravity when working on cranes (3.6)

Appendix 1

DESIGN CONCEPTS FOR ISOLATION OF MECHANICAL APPARATUS

This section outlines the underlying design concepts which form the basis for the standard. It is intended to provide background information for the more specific cases outlined in Section 3 of this standard.

A. Blocking

The intention here is to clarify the requirements in SPR Rule 518 by providing guidelines for the design and use of blocking while still meeting Rule 518. Two categories of blocking, full force and positional, are defined for use in different situations.

i) Design

Devices used for blocking shall be designed by a Professional Engineer to withstand the maximum credible force on the mechanical apparatus for the specific position(s) in which the apparatus is secured. Determination of the maximum credible force will take the following factors into consideration:

- Actuator or hydraulic forces acting on the device (e.g. actuator forces resulting from leakage of isolation points)
- Other forces acting on the device (e.g. worker climbing on mechanical linkages)
- Weight of the components acting to hold the device in the required position (e.g. lever arm, piston, rod, etc.)
- Effects of friction where the co-efficient of friction can be shown to be predictable over time
- Forces required to maintain a positive seal on the device (e.g. to keep a large valve from leaking)

Blocking must have provision for being secured and locked in position.

ii) Full Force Blocking

Full-force blocking of mechanical apparatus shall be designed to withstand the maximum credible actuator force in combination with other forces.

Since full force blocking is designed to a higher standard than positional blocking, full force blocking may always be used in place of positional blocking when positional blocking is called for in the standard.

iii) Positional Blocking

Positional blocking does not need to consider actuator forces.

Positional blocking is generally a device designed to hold an isolating device in an open, closed, or incremental position. However, for the purposes of this standard, if gravity is holding the device in position, the device is considered to have positional blocking applied. In other words, gravity can perform as positional blocking if the physical configuration is appropriate.

iv) Application

All blocking devices shall be visually inspected for deformation or damage prior to use and removed from service if unacceptable.

v) Testing

All blocking must be tested at least once, generally as a commissioning test when it is first fabricated or constructed, to ensure it withstands its maximum credible force without significant damage or deformation.

B. Vents and Drains

i) Design

Devices used for vents and drains shall be designed to dissipate stored or residual energy. Vents and drains shall be designed with consideration to the following factors:

- Minor leakage from the isolating device
- Fluid expansion/contraction resulting from thermal effects.
- Provision for verification and visual checking as defined by Safety Practice Regulations (SPRs)
- Prevention of introduction of air into a system or drainage of residual oil from a system when it could cause erratic operation or equipment damage
- Provision to prevent accidental oil spills
- Dissipation of stored or residual energy

All components of vent and drain piping must meet the minimum diameter requirements given in B (ii) below.

Vent and drain valves used for immobilizing an isolating device shall not be used to accommodate excessive leakage from an isolating device. As a general guideline, the drain shall have free space available in the pipe and fluid must not be 'spraying' from the outlet.

ii) Sizes

Drains and vents shall be sized to accommodate reasonably anticipated leakage. In general, the diameter of the drain line should be no less than 10% of the diameter of the supply line.

The intention is for the drain to accommodate minor leakage through the valve and to act as a telltale for the condition of the isolating valve, not to fully relieve pressure in the case of a complete isolating valve failure.

iii) Sizes of Vents and Drains for Confined Spaces

The requirements in B (ii) do not meet the requirements of WorkSafeBC OHSR Part 9.18 for entry into confined spaces. For piping where a harmful substance could enter an occupied confined space, double valve and drain with a drain line equal in size to the isolating valve size, a blank in the line, or a Single Device Isolation Certificate must be in place. See Section 3.5 of this Standard for more details.

iv) Trapped Pressure

Double valve and drain does not necessarily drain the pressure from piping and equipment downstream of the isolation. Pressurized oil or gas could be trapped in a device or build up due to thermal expansion.

When used on a hydraulic device where complete immobilization of the device is critical for worker safety, double valve and drain shall incorporate a second drain line on the actuator to bleed off any residual pressure. This second drain shall be a minimum of ¼ inch nominal diameter for dissipating energy. The second drain line is not required if minor movements of the device are deemed to be not hazardous by a Occupational Safety and Health (OSH) Specialist or Professional Engineer.

Additionally, a proper switching sequence must be followed to prevent trapping pressure in piping or equipment.

BC Hydro
Power smart

OSH Standard 212
Safe Handling of Oils, Liquids, and Compressed Gases

OSH Standard 212
Safe Handling of Oils, Liquids, and Compressed Gases

1. Scope

1.1 This standard describes the safe handling of oils, liquids, and compressed gases.

2. Purpose

2.1 This standard identifies the potential safety problems and mitigation of hazards for oil handling and transportation as well as the safe handling and storage of compressed gases. It does not cover the environmental issues and procedures for spill protection and response.

3. Standard

3.1 Transferring Oil

3.1.1 Oil transfer practices must prevent a static charge from accumulating and discharging whenever flammable vapours may exist.

3.1.2 Before commencing an oil transfer, all components from the receiving vessel to the dispensing vessel (including all equipment such as pumps and hoses) shall be bonded to a common ground. A bonding plan must be prepared as required by the system used to transfer oil.

3.1.2.1 Except as permitted in clause 3.1.2.2, all hoses shall be fitted with a bond consisting of a continuous spiral wire securely connected at each end to the camlock fitting. This bond shall be physically inspected and electrically tested for continuity before each use. Annual date due test tags should be allocated to the transfer hose.

3.1.2.2 When transferring oil using a 1" diameter hose in a substation or switchyard, conditions may exist where the use of a hose fitted with a spiral bonding wire would create a touch or step potential hazard created through induction. This will typically occur when the hose is positioned so that the free end is moved a significant distance–either horizontally or vertically–from the location where the fixed end is bonded. The preferred method for dealing with this hazard is to apply a draining wire to the transfer hose to dissipate induced charges. Alternatively, it is permissible to use a hose that does not contain a spiral bonding wire only when the hazard created by touch or step potential is deemed to be greater than that created by the use of a non-bonded hose. All other requirements for grounding and bonding of equipment still apply.

3.1.2.3 After transferring oil, wait at least 30 minutes to allow dissipation of static charges before connecting anything to ground.

3.2 Liquids and Compressed Gases

3.2.1 Low lying spaces in which denser than air gases are used or stored must have suitable detection devices in place and have adequate ventilation (natural or forced).

3.2.2 Loose fitting, well-insulated gloves and eye protection must be worn when handling super cooled liquids. E.g. SF6, propane, and natural gas.

3.2.3 Cylinders of compressed gas must be handled with care.

3.2.3.1 Cylinders must not be allowed to fall or strike each other. They must be transported and stored securely with an adjustable chain or other suitable securement clamp and be in the upright position with the contents identified.

3.2.3.2 Cylinders shall be stored in a cool, dry, well ventilated area protected from sparks, flames, excessive heat, physical damage, electrical contact or corrosion. Full cylinders must be separated from empty ones.

3.2.3.3 Valve protection caps will be left in place until cylinders are individually secured and ready for connection to their intended equipment.

3.2.3.4 Cylinder valves are to be opened fully when in use and closed fully at other times, even when the cylinder is empty.

4. Roles and Responsibilities

4.1 Managers

4.1.1 Ensure storage facilities are in place, regularly inspected, and in compliance with this standard and WorkSafeBC OHS Regulations.

4.1.2 Ensure bonding plans are checked and in place before each oil transfer

4.1.3 Ensure spill response procedures and equipment are in place when handling oil.

4.2 Workers

4.2.1 Handle oils, liquids, and gases in accordance with this standard.

4.2.2 Report all spills as required.

5. References

5.1 WorkSafeBC OHS Regulations Part 4, 5, and 23.

5.2 BC Fire Code 4.6.4.5 – Bonding and Grounding

5.3 NFPA 77 – Recommended Practice on Static Electricity

Revision Rationale:

OSH Standard 212 R0 August 2006: (V0-1 Updated February 2, 2015): Minor edit to Section 3.2.3.2—Revision made to respond to WorkSafeBC concern regarding storage conditions at a specific site, and an expectation that wording in this standard clearly reflect WorkSafeBC regulatory requirements.

Appendix 1

Additional Information

Oil Handling Hazards

- Insulating oils release flammable vapours in amounts dependent on the oil condition, temperature and quantity of gases present. Insulating oil, particularly when removed from a tap changer, or a diverter on reactive equipment, can contain dissolved hydrogen and/or acetylene gas. These gases are extremely flammable.
- Containers, including oil tanks, barrels and station equipment that are not completely filled with oil will have a space above the oil level where flammable vapours can accumulate. Vapour concentrations that fall between the Lower Flammable Limit (LFL) and Upper Flammable Limit (UFL) are extremely hazardous. Hydrogen and Acetylene have exceptionally wide flammable ranges, from 4.0% to 75% and 2.5% and 81% respectively.
- Whenever oil is handled, there is the potential for a static charge to be established both within the oil and its processing equipment and will dissipate if given enough time. It can rapidly dissipate by discharging to ground. If this discharge to ground requires the charge to jump an air gap, sufficient energy may be released to ignite flammable vapour.
- There is a direct relation between the rate at which static charge accumulates, and the speed with which oil is pumped.
- Dry and cold weather greatly increases the possibility of static activity. Extra care should be taken under such conditions to reduce charge accumulation. It has also been observed that wind can generate charge accumulation on tank surfaces.

Cylinder Hazards

- Gaseous vapours are dangerous if allowed to spill and accumulate. Some, like propane and SF6, are colourless and denser than air, and they tend to settle in sumps and drains.
- Sudden release of pressure could cause a cylinder to become a missile capable of being projected through a concrete wall.
- See OSH Standard 203 – Welding, Cutting, and Hot Tapping for more information on oxygen and flammable gases.

Additional Care for Handling oil

In addition to bonding and grounding, take the following steps to minimize the production of static charge:

- When filling containers, all efforts shall be made to avoid splashing or agitation of the oil, as this promotes the accumulation of static charge and the release of dissolved combustible gases.
- Where possible, fill the container from the bottom. If this is not possible, employ a down tube constructed of metal piping to allow the oil to be gently delivered to the bottom of the container.
- Ensure pumping speed not exceed 1 metre per second, particularly when non-bonded hoses are used.
- The use of grounded metallic screens on pump outlets are effective in removing or reducing charge from high speed oil flow.
- Certain types of pumps and oil filters can act as charge generators particularly if they produce high exit velocities. Extra care should be taken when transferring oil using such equipment. Transfer lines should be steel or cast iron, rather than PVC or other non-conducting materials.
- Oil that is transported in containers, particularly large tanks that do not have internal bafflers, may become statically charged due to sloshing.
- Before removing a container cover, provide bonding between the lid and the equipment.
- When connecting a hose to a valve located above the liquid level of the tank, ensure that the valve is in the fully closed position. This will minimize the quantity of flammable vapour present should a spark occur.
- When planning any oil or gas operations, make sure all environmental concerns are addressed before commencing work.

BC Hydro
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OSH Standard 216
Underwater Diving at BC Hydro Facilities

OSH Standard 216
Underwater Diving at BC Hydro Facilities

1. Scope

1.1 This standard specifies the requirements associated with diving at BC Hydro facilities.

2. Purpose

2.1 This standard is intended to ensure that contractor work practices and procedures are adequately planned and implemented.

3. Standard

3.1 General

3.1.1 Diving activities are frequently carried out at BC Hydro power generating plants, dams, lakes, reservoirs, power intakes, tailraces and cable installations. Nearly all of our diving operations are performed by outside contractors. The work performed includes a wide range of underwater activities such as:

- inspections or repair of structures (concrete, steel, timber and soil) and support cables
- removing accumulated debris from power intake trash-racks
- underwater construction
- underwater salvage
- underwater cable installations
- vegetation control

3.1.2 Occupational or commercial diving is exhausting and it exposes the divers to risks. Because of this, it is important that all diving operations be conducted in a prudent manner that will prevent or minimize the potential for personal injury, loss of life, occupational illness and property damage. The requirements for underwater operations are published in WorkSafeBC OHS Regulations Part 24, should be reviewed in combination with this standard.

3.2 Requirements

The following information must be obtained from a prospective diving contractor; some of which is required before the contract is awarded, and some before the work commences.

3.2.1 WorkSafeBC Coverage

- It is mandatory that individuals and companies contracted to perform work for BC Hydro arrange and maintain compensation coverage through the WorkSafeBC for themselves and all of their employees whose duties may include the provision of service to BC Hydro under the terms of the contract. Evidence of such coverage must be supplied to BC Hydro before work begins, and periodically as required during the life of the contract.

3.2.2 Safe Diving Procedures

- Each contractor must submit a complete set of safe diving instructions (overall safe diving program) before commencing any diving activities. This document must include the contractor's entire diving program as required by the WorkSafeBC OHS Regulation, Part 24. The procedures must be kept at the dive location and made readily available to dive team members, BC Hydro representatives and to WorkSafeBC officers.

3.2.3 Diver Qualification/Certification

- Only divers who meet the minimum requirements of CSA Standard Z275.4 M97 (or alternatively CSA Standard Z275.4-02) shall be hired as required by the WorkSafeBC OHS Regulation, Part 24. No Recreational Diving Certificates will be accepted. For each diver, a certified copy of competency documents must be available on site for inspection. Divers, including standby divers, must be trained and equipped to operate at the depths and circumstances of the dive.
- Work on BC Hydro facilities, equipment and structures where construction work, entrapment or pressure differentials (i.e. upstream face of dams, power intakes, gates, canal linings, etc.) are involved require divers certified to a standard acceptable to WorkSafeBC, which are:
  - Diver Certification Board of Canada (DCBC), or a school accredited by DCBC. A list of accredited schools may be found at www.divercertification.com
  - National Energy Board of Canada. Refer to National Energy Board – Application for Diving Certification

For questions about whether a diver has been certified to a standard acceptable to WorkSafeBC, please contact WorkSafeBC's diving coordinator at (604) 276-3100.

Note:
Many divers have occupational training/certificates (2 to 4 weeks training) meeting the minimum requirements of CSA. Some divers with occupational certificates may have been upgraded due to experience or documentation, but do not have the full commercial training provided by those schools listed in Appendix 1. A diver that has attended a 6 month commercial course is more qualified to handle surface or in water emergencies than a diver with only 2 to 4 weeks training.

- All divers, diving supervisors and divers' tenders must be trained in CPR, oxygen therapy and diving accident management as required by the WorkSafeBC OHS Regulation, Part 24. Records of this training must be available at the dive site. The qualifications of each diver can be verified by the WorkSafeBC Occupational Health department.

3.2.4 Standby Divers

- A Standby diver and tender must be present at all times and utilized as outlined in WorkSafeBC Regulation, Part 24. The standby diver must be equipped for the same mode of diving that is taking place. The diver, if situated on the surface, must be able to render immediate assistance at all times when diving operations are in progress.

3.2.5 Contractor Diving Operations Plan

- A diving operations plan (job specific daily dive plan) must be developed by the contractor or their dive supervisor for each specific diving activity taking place as per the WorkSafeBC OHS Regulation, Part 24. This diving plan must be submitted to the BC Hydro representative for review before diving operations commence. As a minimum, the diving operations plan must contain the following information:
- detailed description of the mission
- date, time and location of operation
- description of any known potential hazards
- nature of the work to be performed by the divers and other workers
- names and duties of the dive team members
- diving mode to be utilized (scuba or surface supplied air) including a description of the backup air supply

Refer to Appendix 2 of this standard for additional information on contractor diving requirements.

3.2.6 Medical Certification

- Contractors must have available on site, up to date medical certificates prepared by a physician knowledgeable and competent in diving medicine for all divers working on the project, as required by the WorkSafeBC OHS Regulation, Part 24. This certification must be renewed every two years up to age 39 and annually from age 40 onwards.
- The Occupational Health Section of the WorkSafeBC website contains a list of physicians recognized by the Board to be knowledgeable and competent in diving medicine. This list can verify the medical certification of each diver, if required. They can be reached at (604) 276 5140. A copy of a “WCB Medical Certificate” is shown in
Appendix 3.

3.2.7 Surface Supply Diving

- Underwater diving work on BC Hydro facilities or structures must comply with WorkSafeBC OHS Regulation Part 24, including:
- A minimum crew of 3 shall be present if planned dive does not exceed 40m (130ft) or the decompression limits, and when there are no hazards present with roles and qualifications as defined in WorkSafeBC Part 24.
- For planned dives exceeding 40m (130 ft), or the decompression limits, the dive crew must consist of a minimum of 4 workers with roles and qualifications as defined in WorkSafeBC Part 24
- Diver qualification and certification. See additional requirement in Section 3.2.3.
- Divers shall use full-face mask or helmets with effective hardwired two way voice communication to the surface. Hooka equipment is not permitted.

- Use of bail out bottles in the event of a malfunction of the primary breathing gas supply.
- Where pressure differentials (i.e. upstream face of dams, power intakes, gates, canal linings, etc.) or entrapment are involved, additional precautions shall to be taken. These include a minimum crew of 4 present at the dive site (i.e. dive supervisor, 2 divers, diver's tender).

3.2.8 Scuba Diving

- Refer to WorkSafeBC OHS Regulation, Part 24. Underwater diving at BC Hydro facilities using only scuba equipment is restricted to all of the following:
- Minimum Crew Size for depths 18 meter (60 feet) is 3 workers.
    - Supervisor tender
    - 2 divers
- Minimum Crew size for diving beyond 18 meter (130 feet)
    - Supervisor/Tender
    - 2 divers
    - Surface dressed standby diver/tender
- Dives exceeding 40 meters (130 feet) must have prior authorization from the Board.
- Areas away from dam and powerhouse facilities (i.e. reservoirs, rivers) or areas of open water where there is no risk of entrapment or pressure differential and the diver(s) have free access to the surface.
- Work that does not involve underwater construction, burning, welding, salvage operations, demolition, jetting/suction dredging, exposure to a contaminated environment or pressure differential structures (i.e. a draft tube gates when draft tubes unwatered).

3.2.9 Notice of Project for Diving (NOPD)

- As outlined in the WorkSafeBC OHS Regulation, Part 24, the diving contractor must submit a "Notice of Project for Diving Activity" or notify the Board via telephone, at least 24 hours in advance, or in the case of an emergency within the following 24 hours, if a diving operation involves any of the following:
    - construction diving
    - diving in a contaminated environment

- diving for the purposes of engineering inspections
- diving under ice, under or between nets, or into other area of potential entrapment
- exceeding the no decompression limits
- using mixed gas other than nitrox as a breathing medium

The notice must indicate the date, the location, the diving equipment to be used and the scope of the diving operation. A copy of the notice must be posted at the work site before diving commences.

3.3 Safety

3.3.1 Before diving operations commence, safety inspections of the dive site must be conducted and recorded. Checklists are required for this and they will include, as a minimum, those checks outlined in Appendix 4 – Diving Safety Checklist.

3.3.2 Coordination of multiple employer workplaces as per Corporate Safety Management System No.10 must be carried out. All hazards must be identified and communicated to each contractor.

3.3.3 Diving contractors working in Generation must be trained and Authorized to the appropriate WPP Category for System and Local Components. Diving contractors working in Field Operations must be trained and Authorized to the appropriate PSSP Category for System and local component.

3.3.4 Appendix 5 provides an Environmental Conditions checklist.

3.3.5 Appendix 6 provides a list of B.C. emergency contact numbers.

3.3.6 Important Safety Reminders

- Divers must abort a dive if they feel ill in any way.
- If, for any reason, there is an alteration to the approved dive-operating plan, a tailboard involving all workers must be held prior to the commencement / continuation of the dive operation.

4. Roles and Responsibilities

4.1 Contractors

4.1.1 Contractors must, at all times, comply with Part 24 of the WorkSafeBC OHS Regulation entitled 'Diving, Fishing and Other Marine Operations'. The diving contractor is the employer as far as the term "employer" is referred to in Part 24 of the WorkSafeBC OHS Regulation.

4.2 Managers

4.2.1 BC Hydro will be required to manage the contractors' compliance with the basic requirements as outlined in this standard. BC Hydro must inform the contractor of any known BC Hydro operations or site conditions likely to be encountered by the divers as outlined in the WorkSafeBC OHS Regulation, Part 20 – Coordination of multiple employer workplaces. Refer to the BC Hydro Diving Safety Checklist included in Appendix 4 of this standard for additional information.

5. References

5.1 WorkSafeBC OHS Regulation, Part 24

5.2 CSA Standard Z275.4 M97, Competency Standard for Diving Operations

5.3 CSA Standard Z275.4 02, Competency Standard for Diving Operations

6. Glossary

6.1 **Scuba** – self contained underwater breathing apparatus utilizing the equipment outlined in the WorkSafeBC OHS Regulation, Section 24.38.

6.2 **Surface Supply Diving** – supplying air or a mixture of gases to a diver through a hose from the surface, utilizing the equipment outlined in the WorkSafeBC OHS Regulation, Section 24.42 to 24.46.

Revision Rationale:

OSH Standard 216 V1-1 updated to reflect current WorkSafeBC requirements for diver certification. This updated version replaces OSH Standard 216 R0.

Appendix 1

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Appendix 2

Contractors Diving Operations Plan

This appendix contains minimum requirements for the required contractors **Diving Operations Plan**. Individual contractors may adapt them for each diving mode when preparing to perform diving operations for BC Hydro.

Work Plan

- Define objective
- Collect and analyze data
- Job hazard analysis
- Establish operational tasks
- Diving mode and technique
- Means of water entry and exit
- Dive team members assignments and responsibilities
- Written designation of the diving supervisor given to the person in charge of the vessel or facility
- Report on the nature and planned times of the planned diving operations
- Relevant WPP and PSSP training, if necessary.
- Relevant Local Operating Orders referred to (i.e. Site Emergency Procedures, etc.)
- The plan to be available at the dive site to dive team members
- Notice of work location and time to Port Authorities if applicable.

Emergency Rescue Aid

- Air or ground emergency transportation
- Hyperbaric facility (off site)
- Nearest hospital or medical treatment facility
- Canadian Coast Guard Rescue Coordination Centres (coastal areas only)
- Emergency rescue source other than Canadian Coast Guard
- Area Control Centre emergency desk
- Two way communications available on site

First Aid

- Approved first aid kit (i.e. WorkSafeBC Level 1 Crew First Aid Kit)
- Bag type manual resuscitator
- Oxygen Therapy unit

Surface Conditions

- Surface vessel traffic and vehicular traffic
- Displayed diver signals (during diving operation only)
- Critical dive system to vessel or platform
- Weather forecast: tides, current and wave action, and temperature

Underwater Hazards

- Depth and type of bottom
- Diver fouling or entrapment: culverts, penstocks, sluice valves
- Contamination or toxic liquids
- Confined space penetration
- Use of explosives or seismic activities
- Visibility
- Energized cables

Record Keeping

- Divers personal log
- Treatment records and accident reports
- Diving supervisor's log
- Diver qualification/certification/medical records

Appendix 3

WorkSafeBC Medical Certificate

Street Address: 8100 Granville Avenue Richmond BC V6Y 3T8

Mailing Address: PO Box 5350 Stn Terminal Vancouver BC V8V 5L5

Telephone 604 276 3100

OCCUPATIONAL DIVER'S CERTIFICATE OF MEDICAL FITNESS

Prevention Division

This certificate of medical fitness is granted as a result of having passed a comprehensive occupational diver's medical fitness examination conducted by a physician knowledgeable and competent in diving medicine.

DIVER INFORMATION

Diver's Last Name (please print)	First Name(s)	Social Insurance Number	Date of Birth (mth/day/yr)
Mailing Address		City	Postal Code
Home Telephone Number		Business Telephone Number	

OCCUPATIONAL DIVER'S MEDICAL FITNESS EXAMINATION RESULTS

Classification ❑ Fit ❑ Unfit ❑ Fit with Restrictions (specify restrictions)			
Date of Examination (mth/day/yr)	Date of Medical Certification (mth/day/yr)		
Expiry date of medical fitness certificate (must be renewed at least every 2 years up to age 39 years and annually from age 40 years onwards, or MORE FREQUENTLY IF CLINICALLY INDICATED*) ❑ 2 years from date of examination ❑ 1 year from date of examination ❑ Other* -Specify expiry date_____(mth/day/yr)			
Physician's Signature	Mailing Address		
Physician's Name (please print clearly)	City	Province	Postal Code
	Telephone Number	Fax Number	

57D1 (R8/98) WHITE – Diver's CANARY – Employer's PINK – Physician's GOLDENROD – WCB, Diving

Appendix 4

Diving Safety Checklist

Date and Time: _____ Contractor:_____

Location: _____ Verified By: _____

Job Description: _____

_____

Pre Job Meeting

- ❑ Copy of BC Hydro Contract Safety Procedures
- ❑ Copy of BC Hydro OSH Standard 216 – Underwater Diving at BC Hydro Facilities
- ❑ WorkSafeBC coverage for all individuals and companies contracted to perform the work
- ❑ Safe diving procedures
- ❑ Contractors "Diving Operations Plan" (including crew requirements, environmental conditions and emergency rescue) as outlined in Appendix 3.
- ❑ Diving method used is appropriate for the work being done (surface supplied or scuba). No Scuba to be used in confined areas (entrapment), upstream of structures or plants (pressure differential) or construction work.
- ❑ Verification of dive team qualifications and experience (Medical certificates, oxygen therapy certification, CPR certification, dive accident management, etc.)
- ❑ MSDSs for potentially hazardous substances to be used
- ❑ Safe means for entering and exiting the water (ladders, staging, etc.)
- ❑ Notice to Shipping Authority or Port Authorities if in an applicable shipping lane.

At the Dive Site

- ❑ Copy of Diver's Medical Certification and Competency Certification (CPR, oxygen therapy and diving accident management)
- ❑ Copy of the Contractor Diving Operations Plan and Safe Diving Procedures
- ❑ An approved first aid kit for the size of the crew including an oxygen therapy unit with sufficient capacity to reach emergency medical services is available on site
- ❑ Communication equipment is properly functioning (cellular, VHF radio, etc.)
- ❑ The Notice of Project (NOPD) is posted
- ❑ Fire extinguisher and absorbent material readily available
- ❑ Accident and emergency procedures list has been posted or made readily available including locations and telephone numbers of the nearest hospital with appropriate medical assistance
- ❑ Current list of facilities with hyperbaric chambers capable of providing emergency treatment
- ❑ Emergency contacts between BC Hydro and contractor
- ❑ Emergency signalling between divers or between divers and attendants
- ❑ Logbooks as per WorkSafeBC OHS Regulation, Part 24.
- ❑ Diving tables as per WorkSafeBC OHS Regulation, Part 24.
- ❑ Environmental conditions (see Appendix 4 of this standard)
- ❑ Final briefing or tailboard held and documented
- ❑ Documentation of air analysis test for compressor
- ❑ Copy of BC Hydro OSH Standard 216 – Underwater Diving at BC Hydro Facilities
- ❑ First Aid Attendant BC Hydro or Contractor provided

Scuba Operation Specific Operational Requirements

- ❑ Minimum crew required from zero to 18 m (60 ft) 3 workers:
  - Supervisor/tender
  - 2 divers
- ❑ Minimum crew required beyond 18 m (60 ft) 4 workers:
  - Supervisor/tender
  - 2 divers
  - Surface dressed standby diver/tender
- ❑ A scuba diver is in constant two way voice communication with the surface or tended by the lifeline from the surface or accompanied by another diver in the water who shall remain in continuous visual or physical contact during the diving operations.
- ❑ Scuba operation does NOT include confined spaces
- ❑ A time keeping device is available and used by support personnel for recording diving times for all Scuba operations.
- ❑ A spare set of scuba gear with fully charged cylinder is ready for emergency purposes.
- ❑ Diving depth does not exceed 40 m (130 ft) unless prior authorization from WorkSafeBC
- ❑ Operations are not to be conducted against currents exceeding one knot unless line tended

Surface Supply Operations Specific Operational Requirements

- ❑ Minimum crew requirements from zero to 40 m (130 ft) 3 workers for each dive (provided the dive does not have significant hazards present):
  - supervisor/tender
  - 2 divers (one standby)
- ❑ Minimum crew required beyond 40 m (130 ft) or on pressure differential structures/hazards present 4 workers:
  - supervisor/tender
  - 2 divers
  - Diver's tender
- ❑ A standby diver readily available while a diver is in the water (ready to render assistance at all times)
- ❑ A diver must be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
- ❑ Divers each have "bailout bottle" in case of compressor failure or loss of primary air supply.
- ❑ Divers use a full-face mask or helmets with effective hardwired two-way voice communication to the surface.

Appendix 5

Environmental Conditions

Surface:

- ❑ Visibility
- ❑ Wave action
- ❑ Current
- ❑ Air temperature
- ❑ Wind direction
- ❑ Cloud description
- ❑ Surf visibility
- ❑ Local characteristics

Sub sea:

- ❑ Depth
- ❑ Type of bottom
- ❑ Visibility
- ❑ Water temperature
- ❑ Tides
- ❑ Pollution
- ❑ Obstacles and hazards
- ❑ Marina life

Others:

- ❑
- ❑
- ❑

Others:

- ❑
- ❑
- ❑

Appendix 6

B.C. Diving Emergency Assistance

Emergency Evacuation

- For contact to B.C. Ambulance Services, refer to the Site Local Operating Orders for emergency procedures and contact numbers.

Marine Recovery

- Contact a Coast Guard radio station. Frequencies are:
  - VHF 156.8MHz (channel 16)
  - MF 2181kHz

Isolated Location (Coastal Emergencies only)

- Contact the Rescue Coordination Centre (RCC). Phone number is:
  - GVRD: (604) 666 4302
  - Outside Lower Mainland: 1 800 742 1313

Other Emergency Phone Numbers

- Hyperbaric Chamber
  - Vancouver Hospital: (604) 875 4111
  - Dr. Mike Lepawsky (Hyperbaric Chamber expert): (604) 325 8111
  - Fleet Diving Unit, Victoria, 24 hour emergency: (250) 363 2379

BC Hydro
Power smart

OSH Standard 217
Work Near Interprovincial and International Pipelines

OSH Standard 217
Work Near Interprovincial and International Pipelines

1. Purpose

The purpose of this Standard is to ensure that all work done near federally regulated interprovincial and international pipelines is done safely and in accordance with Canada Energy Regulator (CER) regulations.

2. Scope

2.1 This standard shall apply to all BC Hydro work on or near the rights-of-way of interprovincial and international pipelines, either conducted and supervised by BC Hydro employees or assigned to contractors.

2.2 This standard does not apply to provincially regulated pipelines (i.e. those that do not cross provincial boundaries) which are regulated separately by the BC Oil and Gas Commission and the Technical Safety BC.

3. Requirements

3.1 BC Hydro shall achieve and maintain compliance with:

- The Canadian Energy Regulator Pipeline Damage Prevention Regulation - Authorizations, SOR/2016-124, and
- The Canadian Energy Regulator Pipeline Damage Prevention Regulations – Obligations of Pipeline Companies, SOR/2016-133 (Jointly referred to as the "Damage Prevention Regulations")

  The Damage Prevention Regulations and the CER's guidance document Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings (June 2016) are available on the CER's website at **https://www.cer-rec.gc.ca/sftnvrnmnt/dmgprvntn/grnddstrbnc/index-eng.html**.

3.2 Any BC Hydro work done on or near pipeline rights-of-way must be authorized in accordance with the Damage Prevention Regulations. Work that requires authorization under the Regulations includes Facility Construction, Ground Disturbance and Crossing a Right of Way (ROW). Definitions and procedures are provided in Appendix 1 to 4.

3.3 Any known breach of the Damage Prevention Regulations, or any communication from the CER or the pipeline company of an actual or suspected unauthorized activity, must be reported on the BC Hydro Safety, Health and Environment Incident Management System (IMS).

3.4 Executive Vice Presidents shall ensure implementation of this Standard and related procedures in their business units.

3.5 The SVP, Safety & Chief Compliance Officer shall provide oversight of BC Hydro performance and compliance with this standard, and shall report status to the Chief Executive Officer and Board of Directors according to the schedule set out in the audit plan.

3.6 Overhead Lines: Consent of the pipeline company under this Standard is not required to construct an overhead line across a pipeline provided that ground disturbances do not occur or that the construction does not involve vehicle or mobile equipment crossing. Other regulatory requirements exist for constructing overhead lines, which are outside of the scope of this Standard.

4. Roles and Responsibilities

4.1 Managers, Foremen/women, Sub-Foremen/women, and Crew Leaders are responsible for understanding and meeting their responsibilities as defined in this Standard and related Business Group planning and work procedures, including but not limited to:

4.1.1 Planning and supervising work.

4.1.2 Ensuring workers are trained and competent.

4.1.3 Responding to, reporting and investigating incidents and non-conformances.

4.2 Workers who carry out work within the scope of this Standard are responsible for:

4.2.1 Completing any required instruction and training prior to work.

4.2.2 Adhering to work procedures that are approved for this work.

4.2.3 Stopping work immediately if they encounter unsafe conditions, and reporting any problems or concerns to their work/crew leader or manager.

5. Regulation and Related Documents

5.1 The Canadian Energy Regulator Pipeline Damage Prevention Regulations - Authorizations, SOR/2016-124, and

5.2 The Canadian Energy Regulator Pipeline Damage Prevention Regulations – Obligations of Pipeline Companies, SOR/2016-133

5.3 CER's guidance document Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings

Revision Rationale:

This OSH Standard was updated to reflect the pipeline regulatory body name change from National Energy Board to Canada Energy Regulator.

Appendix 1

Facility Construction and Ground Disturbance

1) Definitions

- Facility Construction: Any construction or installation of a Facility on, across, along, or under an interprovincial or international pipeline, including the pipeline right-of-way. 'Facility' includes overhead or underground transmission or distribution structures, pipes, fences, roads, walkways, parking lots, drainage, retaining walls, etc…
- Ground Disturbance: Any activity that causes ground disturbance that is within 30 meters (100 feet) of either side of the centreline of the pipe. Excluded from this requirement is any ground disturbance to a depth of less than 30cm and that does not reduce the depth of earth cover over the pipeline. Ground disturbance includes pole hole digging, with or without power operated equipment.

2) The following must be completed to obtain authorization for Facility Construction and Ground Disturbance:

a) At least three working days before work begins, BC Hydro must make a locate request to BC One Call.

b) Before beginning work, BC Hydro must have received from BC One Call an explanation of the pipeline locate markings and any safety practices the pipeline company may have in place for working near the pipe.

c) Before beginning the work, obtain consent from the pipeline company via a written permit. To obtain consent, contact the pipeline company for their technical guidelines, which will outline the application process. The pipeline company is required to either grant or deny an application for consent within 10 working days of receiving it.

3) Regardless of the above, ground disturbances within 3 metres (10 feet) of either side of the edge of the pipe is prohibited unless:

a) If the excavation runs parallel to the pipe, the pipe has been exposed by hand at sufficient intervals to confirm the pipe's location or the pipeline company has used a method that would permit it to confirm the pipe's exact location and has informed BC Hydro of that location,

b) If the excavation crosses the pipe, the pipe has been exposed by hand at the point of crossing or the pipeline company has used a method that would permit it to confirm the pipe's exact location, has informed BC Hydro of that location and has confirmed that the pipe is at least 60 cm deeper than the proposed excavation, and

c) If ground conditions render it impractical to locate the pipe using any of the methods set out above, the pipeline company directly supervises any excavation.

Appendix 2

Crossing a Right of Way (ROW)

1) Definition

   - Crossing an ROW: Operation of a vehicle or mobile equipment across a pipeline right-of-way unless that travel is on a highway or public road.

2) The following must be completed to obtain authorization for Crossing a ROW before beginning work:

   a) Obtain consent from the pipeline company via a written permit. To obtain consent, contact the pipeline company for their technical guidelines, which will outline the application process.

   b) The pipeline company is required to either grant or deny an application within 10 working days of receiving it.

Appendix 3

Business Group Planning

1) In addition to the above requirement for authorization, compliance includes but is not limited to:

- Work must be completed within 2 years of obtaining consent unless the permit provides a different timeline.
- Work must comply with any instructions in the pipeline company's permit or instructions from a pipeline company representative.
- Before beginning work, BC Hydro must inform all persons working on its behalf of their obligations under the Damage Prevention Regulations. This includes informing employees and contractors.
- Any changes to the design, location or type of work made after the pipeline company has issued its permit must be communicated and agreed to by the pipeline company before that work starts.
- For emergency work, BC Hydro must make an emergency call to BC One Call, and the pipeline company must be notified as soon as practicable.
- A pipeline company must be given 24 hours-notice before any backfilling occurs over a pipe.
- Any contact with a pipe or its coating must be reported to the pipeline company immediately along with any other damage that may have occurred.

Appendix 4

Contractor Work Planning

1) For work done by BC Hydro contractors that is within the scope of this Standard, the BC Hydro Contract Manager shall ensure it is done in compliance with CER direction. This includes:

   a) Provision of a copy of the CER's Pipeline Damage Prevention – Ground Disturbance, Construction and Vehicle Crossings publication to the contractor.

      - Confirmation prior to the commencement of work that the contractor has acceptable work procedures in place to perform the work in compliance with the Damage Prevention Regulations, in the same manner as described in this Standard.

      - Confirmation that the contractor's procedures are implemented in the performance of the work.

   b) BC Hydro shall have a representative on-site where the work is being performed to ensure:

      - All necessary written permissions and safety instructions have been obtained from the pipeline company prior to the start of work.

      - That the contractor is complying with any conditions and instructions set out by the pipeline in the permit or from a pipeline company representative.

   c) The BC Hydro on-site representative must have the qualifications and authority to stop the contactors work, and must do so, in any situation where the contractor has not obtained the necessary written permissions from the pipeline company, or is not in compliance with written permissions that have been obtained.

   d) In the case of contractor contraventions of the Damage Prevention Regulations or conditions of the pipeline company's written permission, BC Hydro must re-evaluate the acceptability of the contractors work procedures, ensure deficiencies are remedied by the contractor, and verify implementation of the updated procedure.

BC Hydro
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OSH Standard 302
Safety During Spill Response

OSH Standard 302
Safety During Spill Response

1. Scope

1.1 This standard covers the requirements and procedures associated with spill response safety.

2. Purpose

2.1 Pre-planning, training and written procedures are is required to prevent exposures to hazardous materials and to ensure regulatory compliance during spill response. The purpose of this standard is to outline the requirements to ensure the safety of workers involved in spill response. For information about environmental requirements, including notification procedures, emergency contacts, spill response equipment and waste handling, refer to Waste Management Standard WM-110 Spill Response.

3. Standard

3.1 General

3.1.1 Standard spill response protocol requires the following sequence of events:

- Ensure safety;
- Stop the flow;
- Secure the area;
- Contain the spill;
- Notify and report;
- Clean up.

3.1.2 This standard deals exclusively with the regulatory requirements governing the safety of spill responders.

3.2 The primary regulation governing spill response safety is Occupational Safety and Health Regulation (OHSR), Section 5.97 to 5.102 Emergency Procedures, Section 5.3 to 5.21 “WHMIS” and Section 5.2 “General Information Requirement”. The intent of the regulation is to ensure that workers are fully informed about the hazards of the products that they are required to handle, and that they have the training and the equipment needed to protect themselves from those hazards.

3.3 Regulatory compliance requires pre-planning, training and written work procedures. For assistance with implementing this standard, contact your Occupational Safety and Health (OSH) Specialist.

3.4 Develop an inventory of the hazardous materials used or stored in the workplace and obtain all the required hazard information (MSDS, label, identifier) for each product (see OSH Standard 301 WHMIS and Hazardous Materials). Hazardous materials are pesticides, hazardous wastes, consumer products and products covered by WHMIS.

3.5 Carry out an MSDS and site review to identify those products which pose serious concern from an environmental or safety point of view.

3.5.1 Spills to the environment that exceed “reportable volumes” must be reported to the Provincial Emergency Region, this is specified in Waste Management Standard WM-110. For further assistance, contact the Waste Management Specialist in each SBU environmental department.

3.5.2 Products are a potential safety spill concern if they would require special precautions during spill response or clean-up. Examples include:

- Solvents;
- Mercury;
- PCBs and PCB contaminated oils ;
- Asbestos;
- Carbon dioxide (fire suppression systems);
- Corrosives (e.g. battery acid, ammonia, chlorine).

3.6 Carry out a hazard assessment of each product identified as a potential spill concern. The potential hazard to spill responders will depend on a number of factors including product toxicity, product volume and where the spill response will take place (e.g. outdoors vs. an enclosed or confined space). It is possible to develop a single spill response procedure for a group of products with similar hazards (e.g. flammables, oils) provided that selection of personal protective equipment is based on the worst case scenario. Procedures will consider evacuation, notification, clean-up and re-entry. These procedures must, however, be specific to location and situation to ensure that appropriate personal protective equipment, particularly respiratory protection, is selected (e.g. mercury). Appendix 1of this standard contains a Spill Response Hazard Assessment Form to assist with the hazard assessment process.

3.7 Develop written procedures for each product and situation, integrating safety and environmental (WM-110) requirements. Procedures will consider evacuation, notification, clean-up and re-entry. Procedures must describe how and where the spill response will be carried out, and the required personal protective equipment. Attach a current MSDS to the spill response procedures.

3.8 Provide training on product hazards, spill response procedures, and the use and location of the required equipment for all workers who are expected to respond to spills.

3.9 Drills should be conducted regularly to test the adequacy of procedures and training.

4. Roles and Responsibilities

4.1 Managers are responsible for:

- Development of a hazardous products inventory;
- Provision of all required hazard information;
- Development of spill response procedures;
- Provision of the required equipment and materials;
- Training of spill responders;
- Training on appropriate and safe use of personal protective equipment;
- Maintaining records of spill response procedures on file at the applicable work site;
- Reviewing spill response procedures annually with responders;
- Updating spill response plans when there are changes in any of the factors that impact on the hazard assessment.

4.2 Workers are responsible for carrying out spill response in accordance with the procedures and training provided.

5. Records and Documentation

5.1 Keep records of spill response procedures on file at the applicable work site, review them annually with responders, and update them if and when there are changes in any of the factors that impact on the hazard assessment.

6. References

6.1 WorkSafeBC, Occupational Health and Safety Regulations

6.1.1 Applicable Regulations

Regulation	Applicable section(s)
WorkSafeBC Occupational Health & Safety Regulation - Part 5 (sections 5.97 to 5.102) ○ 5.97 Emergency plan ○ 5.98 Inventory ○ 5.99 Risk Assessment ○ 5.100 Procedures ○ 5.101 Procedures for spill cleanup & reentry ○ 5.102 Training & Drills	OSH Standard 302 sections: 4.3 Compliance plan 4.5 Inventory & worksite review 4.6 Hazard assessment 4.7 Written procedures 4.7 Written procedures 4.8 Training on hazards, procedures & response

6.2 Provincial WHMIS Regulations

6.3 Waste Management Standard WM-110

6.4 SMS 9 – Emergency Preparedness

Appendix 1
Spill Response Hazard Assessment

Situation

1. Product:_____(Attach MSDS)

   Permissible Concentration: _____

2. Estimated Maximum Spill Volume: _____

3. Product/Spill Location: _____

4. Ventilation:

   - Poor (Indoors with no mechanical ventilation, or enclosed, or confined space)
   - Moderate (Indoors with mechanical dilution ventilation – Note: If ventilation must be turned off during spill response to prevent contamination of occupied areas, then rate ventilation as poor)
   - Good (outdoors, or indoors with local exhaust ventilation)

Hazards (Refer to MSDS)
TDG – UN# and emergency response Guide if spilled product cannot immediately be identified.

1. **Fire Hazard:**

   - High (Flash point 100°F (37.8°C) or lower)
   - Moderate (Flash point higher than 100°F but lower than 200°F (93.3°C))
   - Low (Flash point higher than 200°F)

2. **Health Hazards (Routes of Exposure):**

   - Inhalation
   - Skin
   - Eyes
   - Ingestion

Required Hazards Controls (Refer to MSDS)
(For assistance contact your OSH Specialist)

1. Personal Protective Equipment:

Respiratory Protection: (Refer to BC Hydro Guide to Respiratory Protection, Stationery #10008)

□ Not Required

□ Required; Type: _____

Gloves:

□ Not Required

□ Required; Type: _____

Eye Protection:

□ Not Required

□ Required; Type: _____

Body Protection:

□ Not Required

□ Required; Type: _____

Protective Footwear:

□ Not Required

□ Required; Type: _____

2. Control of Ignition Sources:

□ Not Required

□ Required; Details: _____

3. Other

Access Control:

□ Not Required

□ Required; Details: _____

Ventilation Control:

Turn off Building Ventilation

□ No or N/A

☐ Yes; Details: _____

Provide local exhaust ventilation

☐ No or N/A

☐ Yes; Details: _____

Provide Air Blowers (Dilution Ventilation)

☐ No or N/A

☐ Yes; Details: _____

Evacuation:

☐ Not Required

☐ Required; Details: _____

Additional Comments:

_____

_____

_____

BC Hydro
Power smart

OSH Standard 304 Polychlorinated Biphenyls (PCBs)

OSH Standard 304
Polychlorinated Biphenyls (PCBs)

1. Scope

1.1 This standard covers hazard aspects and safe handling of polychlorinated biphenyls.

2. Purpose

2.1 This standard outlines the hazards associated with PCBs and the procedures which must be followed to prevent employee overexposures during work involving PCBs or PCB-contaminated (>50 PPM) materials (e.g. oils, wastes, equipment).

3. Standard

3.1 General

3.1.1 Polychlorinated Biphenyls (PCBs) are a group of synthetic fluids that have been widely used in electrical equipment because of their stability, fire resistance and excellent insulating and thermal properties. However, the inherent stability of PCBs also causes them to persist in the environment, which resulted in the banning of PCB manufacture in 1977 and the subsequent regulation of their use, transportation, storage and disposal.

3.1.2 For information about PCB-related environmental and fire standards and regulations, refer to the following BC Hydro Waste Management standards:

- WM-310 – Management of Materials Containing PCB
- WM-340 – Transport of PCBs

3.2 Hazards

3.2.1 Environmental Contamination

3.2.1.1 PCBs have been identified as an environmental contaminant because they persist in the environment where they accumulate in the food chain. As a result of past environmental releases of PCBs, they are found worldwide in water, air, soil, sediments, fish, birds and mammals, including man.

3.2.1.2 The main goal of current PCB-related environmental regulations is to minimize the release of PCBs into the environment and prevent further environmental effects.

3.2.2 Occupational Exposure

3.2.2.1 Workers may be exposed to PCBs through inhalation, skin contact or accidental ingestion. PCB exposure due to inhalation may occur if fluids are heated enough (>50C°) to produce vapors, if fluids are aerosolized (e.g. sprayed) or if PCB-contaminated dusts are disturbed. PCBs can also enter the body through skin absorption. Ingestion can occur whenever PCBs are transferred to food, drink or other items that may get into the mouth (e.g. pencils, cigarettes).

3.2.2.2 Studies of human occupational exposures by the U.S. National Institute for Occupational Safety and Health (NIOSH) have linked PCBs to skin/eye irritation and chloracne – a reversible skin condition which resembles severe acne. There have been no reported cases of chloracne among BC Hydro workers.

3.2.2.3 Although animal studies have identified other possible PCB health effects (e.g. cancer, reproductive effects), these effects have not been confirmed in human occupational studies, and there have been no significant differences in death rates between workers who handled PCBs for years, and those who did not.

3.2.2.4 Levels and durations of PCB exposure in the studied workers were typically in excess of 100 times the exposure levels that have been measured during routine BC Hydro PCB-related work. BC Hydro worker exposures have been confirmed to be very low via medical monitoring of PCB levels in blood.

3.2.3 Fire Hazards

3.2.3.1 PCBs are fire resistant but, under arcing or fire conditions, they can break down and produce highly toxic by-products, including polychlorinated dibenzofurans (PCDFs), hydrogen chloride and polychlorinated dibenzo-p-dioxins (PCDDs).

3.2.3.2 The health hazards resulting from fires involving PCBs are primarily due to the inhalation of PCB vapours or the vapours of toxic PCB by-products. After a fire has been extinguished, workers may be further exposed to these contaminants if they contact or inhale fire residues.

3.2.4 Safe Handling Procedures for Routine Activities

3.2.4.1 PCB-related activities that BC Hydro employees are routinely required to carry out include: sampling, pouring, transporting and inspecting PCBs, PCB-contaminated materials and/or related equipment or storage containers.

3.2.4.2 Only employees trained in the hazards and safe handling of PCBs shall work in areas where PCBs are used or stored, and the procedures outlined in clauses 3.2.4.3 through 3.2.4.5 must be followed to prevent skin contact, ingestion and inhalation if/when the nature of the PCB-related activities could result in exposure via those routes.

3.2.4.3 Protective equipment must be used to prevent potential eye or skin contact. Depending on the nature of the planned work, the required equipment may include goggles, gloves (nitrile), aprons, coveralls, jackets, pants and footwear (e.g. rubber or neoprene boots/overshoes or disposable boot covers). Protective clothing must be disposable (e.g. Tyvek) or reusable (neoprene). If reusable protective clothing is used, then it must be used only for PCB-related work and must be cleaned and maintained in accordance with the instructions provided in clause 3.2.8 of this Standard.

3.2.4.4 PCB exposure through ingestion can best be prevented through good personal hygiene practices. In addition to wearing gloves to prevent skin contact, employees involved in PCB- related activities must wash their hands prior to breaks and prior to eating, drinking or smoking. Hand washing may be done using disposable wipes, waterless cleaners or soap and water.

3.2.4.5 PCB exposure through inhalation must be prevented by providing adequate ventilation to minimize exposure levels and/or by using respiratory protection (NB respiratory protection is required when exposure levels exceed 50% of the WorkSafeBC's Permissible Exposure levels). There is normally no inhalation hazard associated with the routine PCB-related activities carried out in BC Hydro unless fluids are heated (>50C°) or sprayed/misted, or if contaminated dust is disturbed. For assistance with determining if/when respiratory protection is required, contact your local Occupational Safety and Health (OSH) Specialist. For information about the proper selection, use and maintenance of respiratory protective equipment, refer to OSH Standard 313 – Respiratory Protection.

3.2.5 Handling of Electrical Equipment After Failure Due to Arcing or Lightning Strike

3.2.5.1 Small amounts of toxic PCB by-products (e.g. PCDFs, PCDDs) may be produced when electrical equipment arcs or is struck by lightning, but the exposure risk associated with handling this equipment after the event is low if the following conditions apply:

- the fire, if any, has been completely extinguished and the fluids in the equipment have cooled (<50C°),
- the fire was minor (i.e. its spread was limited to the immediate vicinity of the transformer/ capacitor involved, and
- there is no fire residue which could become airborne and inhaled during the planned work.

3.2.5.2 If the above conditions apply, then the potential exposure risks are limited to eye/skin contact and ingestion and, if the nature of the planned work could result in exposure via those routes, then, appropriate protective equipment must be worn (clauses 3.2.4.3 and 3.2.4.4).

3.2.6 Spill Response Procedures

3.2.6.1 Managers of locations where there is a potential for a leak or spill involving PCBs or PCB-contaminated fluids must develop and implement response/emergency plans, in accordance with the requirements outlined in Environmental Standard WM 110 - Spill Response and OSH Standard 302 – Safety During Spill Response.

3.2.6.2 The type/level of personal protective equipment required during spill response will depend on the volume of the spill and other site-specific conditions (see OSH Standard 302), but the general exposure prevention guidelines provided in clauses 3.2.4.3 through 3.2.4.5 and clause 3.2.7 of this Standard will apply.

3.2.7 Fire Response and Post-Fire Clean-Up Procedures

3.2.7.1 Any fire involving PCBs or PCB-contaminated (>50 PPM) fluids must be treated as a serious event. Safe and effective handling of a PCB fire and the post-fire clean-up requires pre-planning, specialized equipment and thorough training of designated response personnel.

3.2.7.2 Post-fire clean-up requires specialized safety and environmental procedures, and must be carried out only by properly trained and equipped workers. Whenever practicable, post-fire clean-up work should be carried out by qualified internal CBU employees or external contractors. If regular BC Hydro employees must be assigned to this type of work, contact your local Occupational Safety and Health (OSH) Specialist for assistance with developing safe work and decontamination procedures. For further information about environmental standards and regulations refer to Environmental Standard WM 350 – PCB Fire Clean-Up.

3.2.8 Cleaning of PCB-Contaminated Protective Clothing and Equipment

3.2.8.1 Contaminated protective clothing and equipment must be cleaned immediately after use and cleaning must be carried out in a well-ventilated area, preferable outdoors. Wear nitrile gloves to prevent PCB contact with the skin.

3.2.8.2 The following procedure must be used to clean reusable protective clothing (e.g. gloves, aprons, jackets, pants, footwear):

- First, wipe with dry disposable wipes,
- Secondly, wipe with disposable wipes saturated with a terpene or hydrocarbon degreasing solvent, such as PF Degreaser (NB wear protective gloves to prevent skin contact – refer to applicable MSDS for details),
- Allow clothing to air dry, and
- Label clothing "PCB Free" and store in a separate locker or bag ready for the next use.

  Reusable protective clothing should be disposed of and after 10 days (80 hours) use or when material becomes cracked/worn, whichever occurs first.

3.2.8.3 To clean other PCB-contaminated protective equipment (e.g. goggles, respirators), first wipe with dry disposable wipes and then wash with soap and hot water.

3.2.8.4 All materials used to clean contaminated clothing and equipment must be treated as PCB waste.

4. References

4.1 NIOSH Criteria for a Recommended Standard, Occupational Exposure to Polychlorinated Biphenyls (PCBs). DHEW Publication No. 77 255, September 1977

4.2 Criteria Document for PCBs prepared for the EPA, July 1976. Report No. EPA 440/9 76 21

4.3 National Cancer Institute, Bioassay of Arochlor 1254 for Possible Carcinogenicity. Technical Report Series No. 38, 1978

4.4 BC Hydro Waste Management Standards: 110, 310, 340

BC Hydro
Power smart

OSH Standard 317
Battery Safety

OSH Standard 317
Battery Safety

1. Scope

1.1 This standard covers the safety requirements for battery work.

2. Purpose

2.1 The purpose of this standard is to establish safety requirements for working on batteries to ensure that workers involved in such work are protected from the risks associated with battery chemical and explosion hazards, and to ensure regulatory compliance. With the exception of tools (section 3.5 of this Standard), electrical safety requirements are addressed under Power System Safety Protection (PSSP), the Safety Practices Regulation (SPR), Work Protection Procedures (WPP) and the applicable BC Hydro Engineering and Maintenance Standards.

3. Standard

3.1 General

3.1.1 There are four main hazards associated with battery work:

- Electrical Contact - A considerable amount of stored energy is present in battery banks and, if the required work practices and procedures are not followed, flash burns due to shorting out or electrocution can occur (potential currents up to 10,000 amps);
- Chemical (Electrolyte) Exposure – The electrolyte in batteries is sufficiently acidic (Lead Antimony, Lead Acid and Lead Calcium batteries) or caustic/alkaline (Nickel Cadmium, Potash) to cause permanent damage to eyes or burns to skin if the electrolyte comes in contact with those areas; and
- Explosion (Hydrogen Gas) – Hydrogen gas is produced during equalizing and recharging electrolysis and, if the gas is allowed to accumulate due to inadequate ventilation, an explosive atmosphere can result. Hydrogen gas is colorless, odorless, tasteless and lighter than air.
- Toxic Gas (Hydrogen Sulfide) – Overcharging and overheating a lead acid battery (including lead-calcium, lead-antimony, and lead-selenium) can produce hydrogen sulfide (H2S) gas. H2S is a flammable, colorless gas that smells like rotten eggs; however, after exposure a person might lose their ability to smell it and therefore the smell is not a reliable indicator of its presence. Risks associated with H2S include irritation of the eyes, nose, and respiratory system, and, at high concentrations, loss of consciousness or death. Under extreme conditions, and if the gas can accumulate due to inadequate ventilation, hazardous levels of H2S could be generated

3.1.2 With the exceptions described in clauses 3.1.3 through 3.1.5, this Standard applies to all Stations, communications, and emergency (UPS) batteries.

3.1.3 A lower level of personal protective equipment/clothing and emergency washing may be used when working on sealed, gelled-electrolyte (e.g. Valve-Regulated Lead-Acid – VRLA) and small, sealed radio control batteries (less than five, automotive-type batteries). See clause 3.3.3 for minimum personal protective equipment/clothing and washing facilities requirements during work on these batteries.

3.1.4 The emergency eye and skin washing requirements (clause 3.3.1) do not apply to unheated Radio Repeater sites that have liquid electrolyte batteries and are accessible only by helicopter. See clause 3.3.4 for minimum emergency washing requirements and precautions for these sites.

3.1.5 The emergency skin washing requirements for Non-Routine or Major Maintenance (clause 3.3.1) do not apply to Microwave sites if/when:

- There is no plumbed water supply at the site;
- The site is only accessible via helicopter or snowmobile/snowmachine due to winter conditions; and
- Work (i.e. emergency cell replacement) can't be delayed until the weather/road conditions improve.

See clause 3.3.5 for minimum skin washing requirement and precautions for Microwave sites that meet the above conditions.

3.2 Pre-Work Checklist and Precautions

3.2.1 Before starting work on a battery bank the worker(s) must:

- Ensure required eye/skin washing facilities are available and operational (see section 3.3);
- Put on required personal protective equipment/clothing (see section 3.3);
- Ensure that spill kit and spill response plan/procedures are on site, if applicable (see section 3.4 and Appendix 1);
- Ensure that required tools are available and in good condition (see section 3.5);
- Ensure that battery room/area ventilation is adequate (see section 3.6);
- Remove any large metal adornments (e.g. wrist watch, bracelet); and
- Discharge body static by touching ground.

3.3 Personal Protective Equipment/Clothing & Emergency Washing Facilities

Note:
In addition to the hazard specific requirements outlined below, the general requirements for flame resistant clothing form OSH Standard 601 Personal Protective Equipment also apply.

3.3.1 The required PPE/clothing and emergency washing facilities depend on the planned work activity, as per the following Table.

Work Activity	**Face/Eye Protection**	**Hand Protection**	**Body/Foot Protection**	**Emergency Washing Facilities**
Routine Maintenance **(See Note[1])**	Face–Shield	Neoprene Rubber Gloves	Neoprene Rubber Apron	Plumbed or Portable Eye-Wash Station **(See Note[4])**
Routine Corrective Maintenance **(See Note[2])**	Face–Shield **Add** Chemical Goggles if two or more workers are working side-by-side removing inter–cell connectors	Neoprene Rubber Gloves	Neoprene Rubber Apron	Plumbed or Portable (self–contained) Eye–Wash Station **(See Note[4])**
Non-Routine or Major Maintenance **(See Note[3])**	Face–Shield **Add** Chemical Goggles when carrying charged battery cells	Neoprene Rubber Gloves	Neoprene Rubber Apron Steel–toed Rubber Boots when carrying charged battery cells	Plumbed or Portable (self–contained) Eye-Wash Station **(See Note[4])**; **and** Drench Hose (plumbed source) or Portable (self–contained) water supply for washing skin **(See Note[5])**

Note1: Routine Maintenance includes visual inspections, voltage readings, specific gravity checks and topping up of batteries with distilled water.

Note2: Routine Corrective Maintenance includes removing/cleaning inter-cell connectors, cleaning battery terminals, by-passing cells, carrying out load testing and replacing less than 3 cells in a battery bank.

Note3: Non-Routine or Major Maintenance includes changing battery cells (3 or more) and installing or replacing battery banks. If new cells require filling with electrolyte after installation additional precautions, including respiratory protection may be required. Contact your OSH Specialist for assistance with carrying out a risk assessment.

Note4: Eyewash station must provide continuous flow, with a minimum duration of 15 minutes, and must be located within 5 seconds walking distance of the hazard area, but not further than 6 meters (20 feet). The flushing agent (potable water or saline solution) in the eye wash station must be maintained at 15-30 degrees centigrade (60-85 F), and the eyewash station must be tested and maintained in accordance with the instructions provided in Appendix 2 of OSH Standard 604 – Emergency Showers and Eyewash Stations.

Note5: Skin washing facilities must be located within 10 seconds walking distance of the hazard area but no further than 30 meters (100 feet). At sites without a plumbed water supply, portable skin washing equipment must be provided during the work – e.g. Encon's 37-gallon ABS dual-stream self-contained eyewash with drench hose on cart (Model 01106001), or equivalent. Encon's 37-gallon tank supplies 30 gallons of useable water, providing 6 minutes of continuous skin rinsing. Encon products can be purchased from Acklands-Grainger or Fleck Brothers. If a plumbed shower is provided, it must be tested and maintained in accordance with Appendix 2 of OSH Standard 604.

3.3.2 PPE must be stored in an area away from the battery bank and must be put on at that location, before approaching and starting work on battery. If battery bank is located in a separate room, PPE must be stored outside the battery room. If battery bank is not located in a separate room (e.g. is located in control room), then PPE must be stored at least 6 meters (20 feet) from the battery bank.

3.3.3 The risk of electrolyte contact with eyes and skin is significantly reduced, but not eliminated, during work on sealed batteries with gelled electrolyte (e.g. VRLA batteries) and small, sealed radio control batteries (less than five, automotive-type batteries). To minimize risk during work on these batteries the following requirements must be met.

3.3.3.1 PPE and Clothing – Workers must wear neoprene rubber gloves, and a face-shield. Add a neoprene rubber apron when moving/carrying batteries/cells.

3.3.3.2 Emergency Eye/Skin Washing Facilities

- During Routine/Corrective Maintenance at locations where there is no permanent eyewash station on site (as per Note4, clause 3.3.1), provide 2 one-litre personal wash bottles with isotonic saline solution.
  If an eyewash station is on site, ensure that it is operational before starting work.
- During Non-Routine or Major Maintenance at locations where there is no water supply (drench hose, as per Note5, clause 3.3.1), provide 2 one-litre wash bottles with isotonic saline solution for skin (and eye) washing.

3.3.4 The following emergency eye and skin washing requirements apply to unheated Radio Repeater sites that have liquid electrolyte batteries and are accessible only by helicopter.

- For all battery-related work, transport in a Fend-All "Flash Flood" (or equivalent) portable eyewash station and two one-gallon saline solution cartridges (Note: Sealed cartridges have a two-year shelf life – maximum 6 months after seal is broken).

- Place the eyewash station on a flat surface with the back of the unit supported, within 3 meters of the area where the battery work is carried out (See Note below).
- Place the cartridges next to the station ready for mounting, if required.
- For Non-Routine or Major Maintenance use solution in the cartridge(s) to wash affected skin in the event of skin contact with electrolyte.
- Proper use of personal protective equipment/clothing to minimize the risk of injury is particularly important at remote sites and must be stressed at all times.

Note:
When cartridge is mounted the eyewash station is top-heavy and may need to be supported to keep it upright – e.g. put the back of the unit up against an equipment case and/or have the second worker on site support the station during flushing.

3.3.5 At Microwave sites that meet the conditions outlined in clause 3.1.5, transport in a minimum of 2 one-litre personal washing bottles filled with water or saline solution for skin washing (in addition to the required, on-site permanent eyewash station). Proper use of personal protective equipment/clothing to minimize the risk of injury is particularly important at remote sites and must be stressed at all times.

3.4 Spill Clean Up – Selection and Safe Use of Battery Spill Kits

3.4.1 As per the requirements of the OHSR (WHMIS) and OSH Standard 302 (Safety During Spill Response) a plan, including procedures and worker training, must be in place to address an emergency involving a controlled product.

3.4.2 Appendix 1 of this Standard is provided to assist managers with selecting a battery spill kit and developing their local response plan and clean up procedure in the event of a liquid electrolyte spill. A local procedure that includes site/job-specific information and instructions must be developed – contact your OSH Specialist for assistance.

3.5 Electrical Hazards Controls – Tools

3.5.1 All work on, or near, a battery bank must be carried out with insulated tools to minimize the risk of worker injury in the event the of inadvertent tool contact with adjacent cells. There are tools manufactured for this purpose – e.g. steel tools insulated entirely except for the contact point. Insulated tools are available through various suppliers.

Note:
Most battery manufacturers provide some wrenches in fixed sizes when a new battery bank is delivered. These tools should be retained for use after installation as they are the required size for inter-cell connectors, and are either plastic or 100% insulated.

3.6 Gas and Explosion Hazard Control – Ventilation

3.6.1 Battery rooms/areas must be ventilated (mechanically or naturally) to prevent the accumulation of hydrogen (H2) and hydrogen sulfide (H2S) gas during equalizing and recharging electrolysis.

3.6.2 To minimize the risk of an explosion and comply with WorkSafeBC requirements, ventilation must maintain the H2 concentration in the room/area at less that 20% of the Lower Explosive Limit (LEL). The LEL for H2 is 4% by volume; therefore, the ventilation must be sufficient to maintain the H2 concentration below 0.8% by volume.

3.6.3 For information about the requirements that apply to new installations, refer to the applicable Hydro Engineering Standards and the battery manufacturer's specifications. For assistance with carrying out ventilation assessments, contact your Occupational Safety and Health (OSH) Specialist.

3.7 Signage

3.7.1 A peel-and-stick, 4" x 4" (Form #80524) and 8.5" x 11" (Form #80524-1) label is available from BC Hydro Stationery and must be posted near each entry to the battery room/area, in a location where it is easily visible to anyone approaching the battery bank.

3.8 Chemical Storage

3.8.1 Chemical (electrolyte) storage at sites with batteries must not exceed quantities required for routine maintenance (maximum 1 litre).

3.8.2 Larger volumes of electrolyte may be required and stored at the site during battery bank installation or replacement, in cases where new cells arrive dry and have to be filled after installation. After completion of filling, surplus electrolyte must be removed from the site.

4. References

4.1 WorkSafeBC, Occupational Health and Safety Regulation, Part 5 – Chemical and Biological Substances

4.2 BC Hydro OSH Standards pertaining to Spill Response and Work Environment.

4.3 BC Hydro Battery Engineering and Maintenance Standards

4.4 BC Hydro Power System Safety Protection (PSSP)

4.5 BC Hydro Safety Practices Regulations

4.6 BC Hydro Batteries Workplace Label, Form 80524 and 80524-1

Revision Rationale:

OSH Standard 317 R0 August 2006 (R0-1 Updated April 16, 2014): Notation added to Section 3.3 to provide clear connection between OSH Standard 317 Battery Work Safety Requirements and OSH Standard 601 Personal Protection Equipment to ensure the requirement for flame resistant clothing is identified. Section 3.7.1 edited to include image of Form #80524 and previous wording from Section 3.7.2.

OSH Standard 317 R0 August 2006 (R0-2 Updated August 1, 2014): Section 3.7.1 edited with new image of Form #80524 and 4" x 4" size.

OSH Standard 317 R0 August 2006 (R0-3 Updated June 18, 2015): Minor edit to section 3.7.1 to include the availability of 8.5" x 11" label (Form #80524-1).

Appendix 1

Spill Clean-Up – Selection and Safe Use of Battery Spill Kits

A. Battery Type Determination

BC Hydro uses a variety of wet cell batteries that usually contain metal plates (e.g. lead, mercury or cadmium) surrounded by a corrosive liquid/gelled alkaline or acid electrolyte at varying concentrations. There are several different types of spill kits for battery electrolytes and it is important to determine the type of electrolyte that is being used before purchasing a kit (refer to electrolyte Material Safety Data Sheet). For example, the most common type of electrolyte used in lead antimony and lead calcium batteries is sulphuric acid with concentrations typically ranging from 30 to 60 percent by weight.

B. Spill Kit Selection

1. Available Battery Spill Kits

There are basically two types of battery spill kits available on the market: Neutralizing Kits and Hazardous Liquids Kits with General Sorbents (Detailed information on both kits is provided below). Whenever possible, the spill kits with general sorbents should be used for the following reasons:

- **Reduced exposure hazard for responders** (neutralization requires increased handling and can create an exothermic - heat generating – reaction); and
- From a disposal standpoint there is **no advantage to "neutralizing"** the spilled liquid because the waste material generated is still considered a special waste due to the presence of heavy metals (e.g. lead) which leach into the fluid portion on the battery during normal use.

(a) Neutralizing Kits

Some spill kits come with a neutralizing agent which reacts with the electrolyte fluid to minimize the spill hazard. These neutralizing agents can come in the form of an acid (e.g. muriatic) or alkaline (soda ash). It is important that you determine whether the battery contains an acid or alkali electrolyte so that the appropriate neutralizing agent is selected. **Caution** must be taken when attempting to apply a neutralizer to the spilled liquid as **excessive heat and gas can be generated**.

Neutralizing agents are available in liquid, dry and powdered formulations. In order to overcome the problem of adding too much neutralizer, some manufacturers also add a color indicator to the neutralizer to help identify the neutralization point.

(b) Hazardous Liquids Spill Kit with General Sorbents

Some industrial suppliers provide spill kits for hazardous liquids. These kits often contain general sorbent materials for aggressive and hazardous fluids. Typical hazardous and aggressive liquids spill kits contain a treated polypropylene (synthetic) sorbent material, which is less likely to react with the spilled liquid.

Note:
Never place an organic sorbent – e.g. sawdust – on a strong acid or base, as the mixture may spontaneously combust.

Some manufacturers also provide a powdered sorbent (e.g. alumina silicate), which will react with any liquid to form a semi solid.

Note:
Please note that this solidified material is still corrosive.

Although these powders may be harder to clean-up they are more effective at sorbing up the spill liquid and less likely to leave any corrosive residue behind. These kits may be supplemented with a neutralizing agent that should not be used.

2. Spill Kit Size Selection

There is a wide range of spill kit sizes for battery spills. Some kits can handle only 1 litre of spilled liquid while others are designed to deal with several hundred litres at once. It is very unlikely that an entire battery bank would be damaged at one time, thus when choosing a spill kit, ensure the kit is able to handle at least 125%, and preferably 200%, of the largest battery volume. For maximum/ideal protection select a spill kit with the capacity to handle 125% of the largest battery plus 10% of the facility's total battery volume.

C. Safe Use of Battery Spill Kits – Spill Clean Up

Care must be taken during clean up of battery spills. A local, site-specific hazard assessment must be carried out and an emergency/spill response plan must be in place. The plan must include written work procedures and worker training in those procedures. For assistance refer to **OSH Standard 302 – Safety During Spill Response** (Use the Spill Response Hazard Assessment form provided in Appendix 1 of OSH Standard 302 and the applicable electrolyte Material Safety Data Sheet).

The following generic clean up procedure is provided to assist with drafting of the local procedure. **The local procedure must include site-specific information and instructions – i.e. it is not acceptable to simply copy the following generic procedure.** For assistance, contact your Occupational Safety and Health (OSH) Specialist.

Generic Clean-Up Procedure For Battery Spills/Leaks

Scope

The following generic procedure is for clean up of electrolyte spills/leaks only and is based on workers using a general sorbent – i.e. there is no attempt to neutralize the electrolyte. The procedure is not adequate for dealing with situations requiring entry during/after a fire or immediately after an explosion.

Procedure

1. Ensure Safety

a) Turn on mechanical ventilation system if in place, or maximize natural ventilation by opening door(s), and allow area/room to air out for 15-20 minutes.

Note:
This assumes that ventilation system can be can be turned on without entering spill area. If this is not the case, let area/ room air out for 15-20 minutes and put on PPE before entering to turn on ventilation system.

b) Put on Personal Protective Equipment (PPE), including face-shield and rubber gloves, boots and apron/

Note:
Wear chemical goggles beneath the face-shield if there exists a risk of electrolyte splashing during spill control or clean up.

c) Do not enter spill area if it cannot be ventilated.

2. Stop the Flow

a) If required, enter the spill area and stop the flow.

3. Secure the Area

a) Limit access to properly equipped/protected workers.

4. Contain the Spill

a) Use battery spill response kit contents to contain the spill. Review spill kit instructions prior to taking action!

b) Use sorbent socks to contain any free liquid.

c) Place sorbent material over spill area, minimizing splashing.

5. Report

If the spill volume **exceeds 1 litre** (Class 9.2) **and enters the environment** (e.g. via floor drain or storm sewer system) the **Provincial Emergency Program** (PEP) must be contacted. PEP telephone number is **1 800 663 3456**.

6. Clean Up

a) Clean up contaminated sorbent in accordance with kit instructions and carefully place contaminated sorbent and materials into a leak proof container or 5 Mil. poly bag.

Note:
Used sorbent material is corrosive. Seal and label waste container (refer to section C of this Appendix). Place waste container in the special waste storage area. Call Store 12 Special Waste Coordinator for transportation and disposal assistance.

b) Outside the spill area remove PPE avoiding contact with contaminated areas. Clean contaminated PPE and reusable equipment with soap and water and rinse thoroughly with water. Any damaged PPE that cannot be repaired must be placed into the waste container for disposal.

c) Ensure any spill kit materials used during the cleanup and damaged PPE are promptly replaced.

D. Waste Storage and Disposal

All waste generated from the clean-up of a battery spill is considered a **special waste** and must be disposed of in accordance with the Provincial Special Waste Regulations. Even if the electrolyte has been neutralized, the waste material will still be a special waste because, due to the nature of wet cell batteries, heavy metals leach into the electrolyte generating a leachable hazardous waste.

All contaminated materials and sorbents generated during clean up must be placed into a leak proof plastic (5 Mil polyethylene) or corrosive resistant container. A polyethylene lined metal drum may be used as long as there is not direct contact with the metal surfaces.

Apply a **WHMIS workplace label** to the waste container. Label must include product identification, handling precautions and reference to Material Safety Data Sheet. Also indicate date and contact person/phone on label. Store container in a designated special waste storage area and contact the Store 12 Special Waste Coordinator for transportation and disposal assistance.

For further information, contact your **Environmental Coordinator.**

BC Hydro
Power smart

OSH Standard 405
Aerial Lifting Devices

OSH Standard 405
Aerial Lifting Devices

1. Scope

1.1 This standard covers the requirements for the operation, regular maintenance and field inspections of insulated and uninsulated aerial lifts.

2. Purpose

2.1 The purpose of this document is to communicate the requirements for the use and maintenance of aerial lifting devices including those used in Barehand and Live Line applications.

3. Standard

3.1 General

3.1.1 WorkSafeBC Regulations, Policies and Guidelines Part 16 (Mobile Equipment) and Part 19 (Electrical Safety), Part 13, (Temporary Work Platforms) and along with Safety Practice Regulations (SPR) should be reviewed in combination with this standard.

3.1.2 During the course of live line work, the live line tool (e.g. a hot stick) provides primary protection to the worker and the aerial lift provides back-up insulation. In the case of barehand work, the aerial lift is the primary insulation for the worker. Back-up and primary insulation will be dielectrically maintained.

3.2 Operating Limitations

3.2.1 Insulated aerial lifting devices that elevate workers are classified as follows:

- Group I—Those that are designed and manufactured for work in which the boom is considered primary insulation (barehand work). These machines are dielectrically tested to permit workers to work on lines having phase-to-phase voltages of up to 500 kV. They may also be used as Group II devices, providing they have received the appropriate dielectric test certification.
- Group II—Those that are designed and manufactured for work in which the boom is considered back-up insulation. These machines are of the articulated type. They are dielectrically tested to allow workers to work from up to, but no closer than, the Qualified LOA on lines having phase-to-phase voltages up to 69 kV and up to, but no closer than the Restricted LOA on lines having phase-to-phase voltages up to one of the following levels: 230 kV or 500 kV.
- Group III—Telescoping – Those that are designed and manufactured for work in which the boom is considered back-up insulation. These machines are dielectrically tested to allow workers to work up to, but no closer than, the Qualified LOA on lines having phase-to-phase voltages of up to 46 kV. These aerial devices are of the telescoping type and their manufacturer's rated platform height is no more than 12.5 m.

3.2.2 The location of the upper boom's clear insulating material must be clearly delineated. Group I, II and III machines shall have the insulating section of their upper booms finished in orange gel coat. BC Hydro Field Operations Type C— Telescoping machines shall have their upper boom insulated sections constructed of orange fiberglass, or finished in orange Gel-coat. The chassis insulation (i.e. the lower boom insert) on Type C—Telescoping machines shall be orange.

3.2.3 Articulating Booms (Group I and Group II machines) with Insulated Sections

- Articulating-boom bucket trucks are only acceptable for bringing workers close to energized equipment if the length of clear insulation is at least 1.5 m and never less than the Qualified LOA for the voltage being worked on.
- Lower steel booms and knuckles must maintain a distance from live conductors greater than Uninsulated Equipment LOA.

3.2.4 Telescoping Booms (group III—Telescoping machines) with Insulated Sections

- Telescoping-boom bucket trucks are acceptable for bringing workers close to energized equipment only if the extended length of clear insulation is equal to or greater than the Qualified LOA. The insulation must be effective for all boom positions.

  Note: The section of the telescoping boom's insulation that extends beyond the supporting roller or wear pad, measured with the boom fully retracted, represents the length of insulation that is not prone to being scratched by contact with the roller or pad (referred to as the insulation's protrusion). The sum of the lengths of the insulation's protrusion and the chassis insulation must be equal to or greater than: the Restricted LOA for voltages of 138 kV or greater and at least 2 feet for voltages less than 138 kV.

3.2.5 Insulated Lower Boom Insert

- Conductive components must not bridge the lower boom insert or chassis insulation, thereby negating the dielectric rating, unless specifically required by safe work procedures.

3.2.6 Live Line Jibs

- A live line jib on an insulated aerial lift must have a length of clear insulation that is at least equal to the Restricted LOA for voltages of 138 kV and greater, and at least 2 feet for voltages of less than 138 kV.
- The minimum length of clear insulation for live line jibs that are placed on the end of a boom truck must be equal to the Qualified LOA.

3.2.7 Bucket Liners

- Dielectrically tested bucket liners are required for high voltage rubber glove work.
- Plastic bucket liners are to be installed prior to the installation of the metal liners that are used in barehand work. These plastic liners provide mechanical protection to the bucket. They do not need to be dielectrically tested for this application, but require inspection for damage prior to use.

3.2.8 Any aerial lift that has failed its electrical test, including the electrical test of the lower boom insert, must be treated as uninsulated and clearly marked as such.

3.2.9 Aerial lifts that are overdue an electrical or mechanical inspection, shall with cause, be given a two month grace period during which they can continue to operate. Beyond this period such machines shall be deemed to be and treated as uninsulated.

3.2.10 Attachments or modifications to the equipment are not permitted unless the manufacturer or equivalent authority has certified that they will not adversely affect the safety of the equipment.

3.2.11 Storage and travel boom covers must not be used when an insulated aerial lift vehicle is working around live lines or equipment.

3.3 Limits of Approach for Workers in Buckets

3.3.1 The boom and bucket of an insulated aerial lift may be brought to a position that places the worker no closer than the Qualified LOA. When the boom and bucket are stationary, the worker may extend his work position no closer than Restricted LOA. For the sole purpose of moving an occupied bucket between the neutral and phase conductors (flying through the neutral), the worker can get up to but no closer than Qualified LOA. When flying through the neutral, contact between the bucket or boom and the neutral is to be avoided.

3.3.2 When work circumstances cause the boom's back-up insulation to be lost, then the bucket must be kept at a distance equal to or greater than Uninsulated Equipment LOA.

As an example, when work is done on a grounded circuit above live under-build, then Uninsulated Equipment limits must be kept between the bottom of the bucket and the live line – or adequate cover-up must be used.

3.3.3 The back-up insulation provided by an aerial lift must not be considered as primary insulation for the purpose of determining Limits of Approach.

3.3.4 Buckets have no insulation value and must not in any way be relied on as back-up protection.

3.3.5 Qualified workers must maintain at least Uninsulated Equipment LOA from energized (ungrounded) conductors when moving the boom of an uninsulated aerial device, and may extend their work position no closer than Qualified LOA only when the boom and bucket are stationary. All parts of an Aerial Lift having a boom that is not insulated must stay outside Uninsulated Equipment LOA.

3.4 Workers on the ground must maintain at least Qualified LOA from an aerial lift when work is being performed on energized equipment, until each of the following conditions prevail:

- The person aloft or in the vehicle has determined that the conductors and equipment are stable and has given verbal permission for the ground workers to contact the vehicle.
- No task is being performed that creates a risk of the vehicle becoming energized.
- Work aloft on the conductors or equipment must not resume until the ground workers have moved away from the vehicle, beyond Qualified LOA, and have verbally indicated their intention to remain clear of the vehicle.

3.5 Uninsulated Aerial Lifting Devices

- Uninsulated aerial lifting devices typically used in BC Hydro stations and powerhouses are Genie lifts, scissor lifts, articulating aerial lifts, and bucket vans.

3.5.1 The equipment must be collapsed or retracted when relocating the vehicle

3.5.2 Grounding of vehicles in substation will be done in accordance with applicable OSH standards, work procedures and SPRs.

3.5.3 No part of the aerial device can come closer than Uninsulated Equipment LOA to energized or ungrounded conductors. A qualified worker may extend their work position no closer than Qualified LOA when the equipment is stationary.

3.5.4 Equipment movements must be planned when working around energized stations or plants.

3.5.5 All workers who use aerial lifting devices must practice rescue at least twice per year as per SPR.

3.5.6 An effective means to control workers from working directly under an elevated worker in a lifting device will be put in place. E.g. safety-watch, barriers.

3.5.7 A pre-job inspection to ensure the equipment is safe to use must be done. e.g. controls and limits switches, leaks, mechanical inspection.

3.5.8 When suspending loads from boom-mounted fork lifts (Telehandlers), the manufacturers approved lift hook attachments must be used as per manufacturer's instructions.

3.5.9 When using crane supported work platforms, WCB Standard WPL 2-2004 must be followed.

3.6 Limits of Approach for Vehicles that Do Not Elevate Workers

3.6.1 A material handling vehicle or digger derrick that is to be used for work near energized lines or equipment must have an insulated section in the boom.

- The length of the clear insulation should preferably be 1.5 m or greater, but never less than 0.9 m.

3.6.2 Insulated telescoping booms may be used up to the Qualified LOA for the lifting of materials.

3.6.3 Fibreglass boom extensions may be used up to the Restricted LOA for lifting materials under the following conditions:

- They must be maintained in a clean condition and stored in a protected area when not in use.
- They must be tested electrically each year.

3.7 Aerial Lift Motion at the Job Site

3.7.1 The operator must have full and continuous view of any outrigger being deployed. The operator shall, prior to moving an outrigger, inform all persons near the aerial lift that the outriggers are about to be moved. All persons must stay clear of outrigger movements.

3.7.2 Once set up on the site, the vehicle must not be moved until after the boom or ladder is cradled and tied down, the outriggers are retracted, and the power take off is disengaged.

Note:
The only exception is for short moves, when an Aerial Lift may be moved with workers in the bucket providing the boom is in the cradled position. Such movement must be under the direction of a worker in the elevated position who must be in full view of the driver.

3.7.3 Where the vehicle cannot be leveled, it must be parked facing either uphill or downhill, without exceeding the maximum pitch angle (refer to manufacturer's operating instructions). Work must be done with the boom located uphill beyond the centre of the vehicle.

3.7.4 Vehicles equipped with torsion bars are not to be inclined sideways beyond the manufacturers' allowable limit – generally about 5 degrees.

3.8 Positioning a Bucket for Work

3.8.1 The boom, including its elbow, is to be kept clear of hazardous contact, including vehicle traffic and sources of ground (e.g. telephone lines or stays).

3.8.2 The elbow of the boom must stay outside Uninsulated Equipment LOA.

3.8.3 The worker operating the motion controls must face in the direction of travel of the bucket.

3.9 Work in Buckets

3.9.1 When two workers are in the bucket(s) of one aerial device, only one worker is permitted to signal ground workers.

3.9.2 Climbing spurs must not be worn while working in bucket trucks.

Note:
The lone exception is when a worker is preparing to transfer from the bucket to a pole.

3.10 Tools in Buckets

3.10.1 All tools not in use must be properly secured or removed from the bucket.

3.10.2 When a hydraulic power tool is not in use, it must be disengaged from its source of power (i.e. the tool's hydraulic power lever must be placed in the off position).

3.10.3 Electrically operated power tools will not be used from the bucket of an aerial lift that is close to energized primary conductors or equipment, unless the tool has a self contained power source (e.g. a battery pack).

3.11 Use of Metal Wire Holders in Buckets

3.11.1 Metal wire holders must be taken into account when determining Limits of Approach for live line work.

3.11.2 Metal wire holders must be kept well clear of energized conductors when they are not being used during live line work.

3.12 Use of Live Line Jibs in Buckets

3.12.1 Jibs must be wiped before live line applications. Their surfaces are to be inspected and waxed frequently.

3.12.2 Jibs must be handled and stored with care to maintain their dielectrical integrity.

3.12.3 Jibs must be stored in appropriate bags, bins or receptacles that protect their surfaces from abrasion and contamination when not required for use.

3.12.4 Jibs may be secured in their holders at the job site when not in actual use, but only for short periods of time.

3.12.5 Any jib holder that allows the jib to slide within it must be equipped with adequate inner protection to prevent abrasion of the jib surfaces.

3.12.6 The sliding of the jibs within their holders must be kept to a minimum.

3.13 Dielectric Testing and Inspections

3.13.1 Only the safety service shops listed in the Approved Safety Service Shops are authorized to perform dielectric testing and inspections.

3.13.2 Equipment that is suspected of being damaged or malfunctioning must be examined, and a determination made by a qualified person as to whether it constitutes a safety hazard. Unsafe items must be replaced or repaired prior to use.

- A written record of the unsafe item and its repair must be kept on file.

3.13.3 Group I aerial devices (barehand machines) must pass the AC qualification test (outlined in Table 1 of CSA C225-00) before going into service.

3.13.4 Group I aerial devices must pass the AC periodic electrical test (outlined in Table 2 of CSA C225-00) after every overhaul and major repair. They must also pass this test at an interval of no less than once every three years.

3.13.5 Group I machines must pass the DC periodic electrical test (Testing and Maintenance Instructions for Safety Service Shops) in every year in which they are not subject to an AC test. No more than 1 year is to elapse between the AC or DC testing of these machines.

3.13.6 Annual electrical inspections and tests are required for Group II and Group III aerial devices. Details of these tests are contained in the "Testing and Maintenance for Safety Service Shops" manual.

3.13.7 Mechanical inspections and tests are required annually. They are carried out in the field by the Non-Destructive Testing section of Powertech Labs. Defects will be brought to the attention of line management and Fleet Services Department.

3.14 Maintenance

3.14.1 Only approved cleaners and waxes listed in the "List of Approved Products for Servicing Live Line Tools and Equipment" are to be used to maintain booms and jibs.

Note:
Some cleaners and waxes can promote conductivity. Powdered detergents must not be used, as they tend to scratch fibreglass.

3.14.2 All scratches must be sealed as soon as possible to prevent contamination by dirt and moisture.

Note:
Small scratches may be temporarily addressed using a surface sealant such as a two-part epoxy or Terrepair. It should be noted that this is only a temporary repair and proper repairs (by Fleet Services) should be made as soon as possible.

3.14.3 The internal surfaces of aerial lift booms and extensions require special equipment for cleaning and their maintenance must be performed under the directions of an Approved Safety Service Shop or Fleet Services.

3.14.4 Group I aerial lifting devices used in Barehand applications are to have their hydraulic oil dried annually prior to the commencement of barehand season. Dielectric testing of the hydraulic oil will be done at the conclusion of the oil drying procedure and quarterly thereafter. Pass/fail is 25kV as per ASTM standard D1816.

Note:
The frequency with which the hydraulic oil is dried and tested will be periodically reviewed by Field Operations Safety and if appropriate, altered.

4. Roles and Responsibilities

4.1 Managers

4.1.1 Designate specific workers that will be responsible for field inspections and regular maintenance of aerial lifting devices and reporting malfunctioning or damaged equipment.

4.1.2 Establish the frequency by which booms and jibs will be cleaned and waxed.

4.2 Workers

4.2.1 Follow applicable safe work practices and procedures.

4.2.2 Conduct daily and monthly inspections prior to first use and preferably at the beginning of each shift.

4.2.3 Perform routine cleaning and waxing of the external surfaces of all insulated booms, jibs, and lower boom inserts, and the inner surfaces of open-ended hollow jibs.

Note:
Waxing should be conducted if water shows a tendency to form sheets rather than beads. The interval between waxing is not to exceed 3 months. Completely clean and wax surfaces, examining carefully for damage. Perform this procedure shortly before the required annual dielectric test.

5. Records and Documentation

5.1 Decals that clearly identify the maximum voltage for which an aerial device is rated will be placed in conspicuous locations (i.e. clearly visible by both ground workers and vehicle operators) on all insulated aerial lifts.

5.2 A written record of all unsafe equipment and its repair will be kept on file.

5.3 A yellow coloured Caution decal shall be attached to a fibreglass boom that has failed the annual electrical test. This decal must remain in place and the boom considered uninsulated until the problem is corrected and the boom passes the electrical test.

5.4 A fibreglass boom that passes the annual electrical test must be fitted with a Test Due decal identifying the date of the next annual inspection. The colour of these decals will change from year to year.

5.5 Mechanical Test Due decals identifying the date of the next annual inspection must be placed on the vehicle.

6. References

6.1 BC Hydro Testing and Maintenance Instructions for Safety Services Shops

6.2 CSA Standard C225 Vehicle Mounted Aerial Devices

6.3 WorkSafeBC Occupational Health & Safety Regulation, Part 16, Mobile Equipment and Part 19, Electrical Safety, Part 13 Ladders, Scaffolds and Temporary Work Platforms

6.4 BC Hydro Safety Practice Regulation – Definitions for General Rules for Workers Engaged in Work Adjacent to, or on, Energized Lines or Electrical and/or Mechanical Apparatus), Appendix VIII (Work in EHV Areas)

6.5 OSH Standard 401 Motor Vehicle Safety

6.6 OSH Standard 602 Insulated Tools and Equipment

6.7 OSH Standard 608 Fall Protection

7. Glossary

7.1 **Aerial Lift**—A vehicle-mounted lifting device that is used to position workers or equipment. The lifting boom may be telescoping, articulating or both.

7.2 **Back-Up Insulation**—A section of a piece of equipment or tool that will, when properly maintained, prevent dangerous current flow through a worker, in the event that primary insulation is accidentally defeated.

7.3 **Clear Insulation**—the portion of the boom that is constructed of insulating fibreglass and is free of metal components on the boom's external and internal surfaces for all boom positions. The clear insulated length is typically marked by the manufacturer and cannot be arbitrarily altered. It is dielectrically tested and maintained to provide worker protection.

7.4 **Digger Derrick**—A vehicle-mounted lifting device having a telescoping boom that is normally insulated. Some Digger Derricks have fibreglass 3rd extensions. Digger Derricks are designed and maintained for hoisting material, and usually not workers, near energized lines or apparatus.

7.5 **Fibreglass Boom Extensions**—Insulated, non-telescoping devices that are mechanically attached to booms for extending their work position. They are designed and maintained for work near energized lines or apparatus.

7.6 **Live Line Jibs**—Insulated, non-telescoping boom extensions that are attached to aerial lifts. They are used to make direct contact with live lines and are therefore maintained as live line tools.

7.7 **Over-Ride**—The transfer of controls from the bucket to the lower station of an Aerial Lift so that all movements can be controlled from the deck of the vehicle.

7.8 **Platform Height**—The vertical distance between the ground and the base of the platform (the bucket).

7.9 **Primary Insulation**—Tools and equipment that, when properly maintained, are highly resistant to current flow. When used, they are intentionally placed directly in contact with live equipment such that in that they may be electrically stressed to system voltage. Examples are hotsticks, live line jibs, and three-phase lifts.

7.10 **Protruding Insulation**—The section of the telescoping boom's insulation that extends beyond the supporting roller or wear pad, measured with the boom fully retracted. This is the length of insulation that is not prone to being scratched by contact with the roller or pad (referred to as the insulation's protrusion).

7.11 **System Voltage**—The voltage of the part of the power system under consideration, measured phase to phase.

7.12 **Three Phase Lift**—A set of insulated poles used with an insulated boom to support a distribution line which may be energized.

Revision Rationale: Sections 3.13.1, 3.13.5, 3.13.6 and 3.14.1 revised to align with new updated Testing and Maintenance Instructions for Safety Shops Manual announced through Safety Directive Series 2012 No. 4 'Revisions to OSH 602 Insulated Tools and Equipment'. Section 3.3.1 revised as per Safety Directive Series 2010 No. 3 'Flying Through the Neutral', Section 3.58 added as per Safety Alert Series 2012 No. 10 'Manufacturer Required Use of Lift Hooks for Suspending Loads From Telehandlers' and Section 3.5.9 added as per Safety FYI Series 2011 No. 5 'Crane Supported Work Platforms'.

BC Hydro
Power smart

OSH Standard 408
Operation of Boats

OSH Standard 408
Operation of Boats

1. Purpose

1.1 To establish the safety requirements for operation of boats at, to, and from BC Hydro worksites.

2. Scope

2.1 This standard shall apply to all BC Hydro work, either conducted and supervised by BC Hydro employees or assigned to contractors.

2.2 Where boats are owned and operated by other parties in circumstances other than BC Hydro business (e.g. ferry companies, water taxis, etc.), BC Hydro workers must comply with passenger and load regulations required of those companies.

2.3 This standard does not cover non-boating work around water or diving safety requirements.

3. Requirements

3.1 Regulatory Compliance

3.1.1 BC Hydro boat owners and operators, and contractors must ensure compliance with current regulatory requirements applicable to each individual boat as it is constructed, used, and located. Regulatory requirements pertinent to boat operation include but are not limited to the applicable sections of:

- WorkSafeBC Occupational Health & Safety Regulation (OHSR) Parts 4, 7, 8, 17 and 24;
- Canada Shipping Act and its regulations (Transport Canada); and
- Transportation Safety Board Regulations.

Note: See Appendix 1 for further guidance on Transport Canada regulatory requirements broken down into vessel categories.

3.2 Boat Registration

3.2.1 Registration for small non-pleasure human-powered boats (i.e. canoes, kayaks) and small power-driven boats with propulsion motors less than 10 horsepower (hp) is not required by Transport Canada (Ship Safety Bulletin No.: 05/2012). Transport Canada's Small Vessel Register has a simplified registration process in place for owners of these vessels that still wish to participate in registration. See link in Appendix 1 for instructions.

3.2.2 Power-driven (greater than 10hp) boats operated by BC Hydro and their contractors must be registered with Transport Canada as commercial vessels as per the Canada Shipping Act. The registration number for BC Hydro and contractor boats must incorporate the letter "C" (e.g. C00000BC) for Commercial vessels. See links in Appendix 1 for registration guidance.

Note: Registration status can be checked in Transport Canada's Vessel Registration Query System

3.2.3 In addition to registration, power-driven vessels greater than 15 gross tonnage must be inspected by Transport Canada prior to entering service, and be inspected periodically afterwards on an annual or quadrennial basis. See links in Appendix 1 for inspection guidance.

3.2.4 The vessel owner must ensure vessel construction and modifications to small vessels are done in accordance with applicable Transport Canada regulations, including Small Vessel Regulation requirements identified through resources in Appendix 1, and Transport Canada's Construction Standards for Small Vessels – TP1332.

3.2.5 Major vessel modifications must be reported to Transport Canada by updating the vessel registration details as per Small Vessel Regulations 710.

Note: Major modifications are defined as a modification or repair or a series of modifications or repairs that substantially change the capacity or size (length or gross tonnage) of a vessel or the nature of a system on board that affects its watertight integrity or its stability or that substantially increases its service life. An example of modifications impacting stability includes installation of welded arms which could alter the vessel's centre of gravity.

3.3 Risk Assessment and Procedures

3.3.1 A risk assessment must be conducted via Job Planning and Tailboard prior to a boat trip or ongoing series of similar boat use/work tasks and documented to determine the level of potential risk, exposure and likelihood of a vessel emergency including consideration of, but not limited to:

- Weather (wind, air temperature, precipitation) (including cold stress as per OHSR section 7.34);
- Water Temperature (cold stress as per OHSR section 7.34);
- Potential wave height;
- Distance from shoreline;
- Docking and boarding facilities available;
- Use of ancillary equipment (e.g. remote operating vehicles off side of boat);
- Crew complement available (working alone or in isolation as per OHSR section 4.20.2); and
- Potential rescue situations and available rescue resources as per OHSR section 4.13.

3.3.2 The Canada Shipping Act and Small Vessel Regulations require suitable safety procedures to be established and documented, based on local conditions, industry best practices and hazards identified. The following procedures must be developed where applicable:

- Safe vessel operation;
- Emergency situations (i.e. Person in water, fast flowing water, vessel breakdown as per OHSR section 4.13/4.14);
- Cold-water shock and hyperthermia prevention (where water temperature is less than 15 degrees Celsius) (and cold exposure control plan as per OHSR section 7.34);
- Operation of mechanical blowers in all gasoline spaces (including signs);
- Closing of ventilation dampers or openings before firefighting; and
- Safe refuelling and prevention of any leakage of fuel.

3.3.3 Procedures must address the requirements of this standard, and include supplementary procedural information outlined in Appendix 2: Supplementary Requirements for Procedures.

3.3.4 Crews conducting work tasks on a boat must perform and document a person in water (overboard) rescue practice specific to the vessel used and conditions of the work as per WorkSafeBC OHSR section 32.2.

3.3.4.1 The rescue practice must be representative of a real working scenario, address all applicable hazards to the job, and include a realistic representation of a body (e.g. rescue dummy or other human-like figure).

3.3.4.2 Rescue procedures must be practiced at minimum once per year to ensure awareness and effectiveness, and a record of the drills must be kept as per WorkSafeBC OHSR section 4.14(3).

3.4 Operating Limitations

3.4.1 Workers must not work alone in a boat unless the risk assessment and prescribed controls deem it safe to do so as per OSH Standard 801 and OHSR section 4.20.2.

3.4.2 If boat operations can be impacted by Dam operations, Generation Operating Order 1G-05 (Procedures for working in or adjacent to water near generation facilities) and applicable Local Operating Orders must be followed. Work in or adjacent to water includes:

- Working immediately downstream from a Facility; and
- Working immediately upstream from a Facility;
- Working either upstream or downstream of a public safety boom;
- Areas that are remote from the Facility but still under the material influence of flow and reservoir changes.

3.4.3 With the exception of emergencies, canoes less than 5m long or 1m wide and rafts must not be used unless the risk assessment and prescribed controls deem it safe to do so, and area manager approval is provided.

3.5 Instruction and Training

3.5.1 All small powered vessel (0-15GT) operators and crew members must at minimum possess the qualifications required by the Marine Personnel Regulations sections 212 (operators), and 205 (crew members).

See Section 4 of the Small Vessel Compliance Program Detailed Compliance Guidance Notes for a table of Transport Canada mandatory qualifications.

Note: Where the Marine Personnel Regulations require only a Pleasure Craft Operator Card (PCOC) for training requirements, the job specific risk assessment must determine if this is adequate for the hazards of the work. Where the PCOC is found to be insufficient, Small Vessel Operator Proficiency (SVOP) Training and MED A3 (Marine Emergency Duties) Certificates must be obtained.

3.5.2 At least one crew member must hold either a marine basic first aid certificate or any occupational first aid training course of two days minimum (as per Marine Personnel Regulations 205(9) and as clarified by Transport Canada Ship Safety Bulletin 03/2009).

Note: BC Hydro boating safety courses, including those required by Transport Canada, are listed on the BC Hydro Safety Course Catalogue (see Boats and Swift Water). All Transport Canada courses are a one-time requirement.

3.5.3 Any passengers (who are not performing any work related duties) on a boat do not have to obtain any Transport Canada training, but must obtain instruction and orientation from the Boat Operator and/or the Crewmember specifying safety requirements (including emergency procedures and lifejacket/PFD use).

Note: BC Hydro Safety Training offers SAFE-120: Boats Passenger Awareness for general passenger training, however situation and boat specific instruction must still be provided by the operator.

3.6 Safety Equipment and Lights

3.6.1 All vessels must be equipped with safety equipment required by Transport Canada and the Small Vessel Regulations relevant to the size and type of vessel. This includes, but is not limited to, the requirements outlined in Appendix 3.

3.7 Wharves, Docks and Boarding

3.7.1 BC Hydro boat owners and facility managers must ensure that adequate docking facilities are provided as per WorkSafeBC OHSR section 17.9 and G17.9. Additionally, any BC Hydro owned wharves or docks used in conjunction with the operation of boats must be in compliance with WorkSafeBC OHSR sections 24.2-24.6, which outlines requirements related to:

- Walkway slip-reducing surface finishing;
- Foundation or buoyancy for intended loads;
- Ladder installation on docks;
- Lifesaving equipment that must be available;
- Curbs, bullrails, guardrails and barriers;
- Markings for curbs, bullrails, guardrails and barriers; and
- Rescue boat.

Note: The OHSR 24.6 requirement for a rescue boat may not apply in certain work situations where work is close to the shoreline, with no expected high speed boat operations or potential exposure to vessel stability, sinking or drowning hazards (see WorkSafeBC IR201616085004A). The risk assessment must evaluate the need for a rescue boat.

3.7.2 Where wharves or docks are not available, and boarding/disembarking must occur, the operator must find a safe and stable shore location.

3.7.3 A worker must not board or leave a boat while it is in motion, except in case of emergency as per WorkSafeBC OHSR section 17.9(1).

3.8 Incident Reporting

3.8.1 In addition to reporting an incident through BC Hydro's Incident Management System, boating related incidents must be reported to the Transportation Safety Board as required by the Transportation Safety Board Regulations.

3.8.1.1 An initial report must be called in as soon as possible after an incident.

3.8.1.2 A full report must be submitted within 30 days of the incident.

Note: See the Transportation Safety Board's Report a Marine Occurrence webpage for guidance on reporting, including what should be reported.

4. Roles and Responsibilities

4.1 Managers

4.1.1 Ensure boats under his/her ownership are in compliance with applicable Transport Canada commercial vessel requirements.

4.1.2 Ensure work involving boats is in compliance with the provisions of this standard.

4.2 Workers

4.2.1 Comply with the requirements of this standard and applicable procedures.

5. References

5.1 Canada Shipping Act and its regulations

5.2 Transport Canada Marine Safety webpage (resources within)

5.3 WorkSafeBC Occupational Health & Safety Regulation Parts 4, 7, 8, 17, 24 and 32.

5.4 BC Hydro Safety Practice Regulations

5.5 BC Hydro Safety Course Catalogue

6. Information Controls

6.1 Revision History

Date	Version	Comments
August 3, 2016	**V3-0**	**This update to OSH Standard 408 has completely revised the content to align to Transport Canada and WorkSafeBC regulatory compliance requirements and address IMS Incident #28501 corrective actions.**

Appendix 1

Transport Canada Compliance Categories Relevant to BC Hydro

The following Small Non-Pleasure Vessel categories should be applied when identifying applicable Transport Canada requirements:

Category	Application	Examples	Resource (links)
Human-Powered Vessels	Vessel not propelled by an engine and is not fitted with an engine on-board to propel it.	Canoes, kayaks, oar-boats	1. **Transport Canada's Small Vessel Register (Commercial), Vessel Registration Office** (voluntary registration) 2. **Transport Canada's Compliance Guide for Human-Powered Non-Pleasure Vessels** (TP15204E) (compliance checklist) **3. Small Vessel Regulations Part 3: Human Powered Vessels other than Pleasure Craft**
Small (Powered) Vessels 0-15GT	• Vessel measures 0-15 gross tonnage* • Carry between 0-12 passengers • Not human propelled	Tug (steel), jet boat, river boat	4. **Transport Canada's Small Vessel Register (Commercial), Vessel Registration Office** (mandatory registration) **5. Transport Canada's Small Vessel Compliance Program** (voluntary compliance program) 6. **Small Vessel Compliance Program Detailed Compliance Report and Guidance Notes** (TP15111E) (compliance guide)
Small (Powered) Vessels 15-150GT	• All vessels measuring over 15 – 150 gross tonnage* • All vessels carrying more than 12 passengers • Does not include unmanned barges. • Any vessels requiring a marine mortgage	Barge	7. **Canadian Register of Vessels, Vessel Registration Office** (mandatory registration) **8. Transport Canada Initial Inspection** (mandatory prior to entering service) **9. Transport Canada Periodic Inspection** (mandatory every 1-4 years) **10. Transport Canada's Vessels of 15-150GT** (outline of compliance requirements)

***Note: Gross tonnage is the measure of the overall size of a vessel as determined by a tonnage measurer or standard calculation.**

Appendix 2
Supplementary Requirements for Procedures

The following requirements must be incorporated into to the procedures required by Section 3.3 of this Standard:

Spill Response

- Refer to the Canada Shipping Act for information requiring arrangements with a spill response organization related to the total quantity of fuel or cargo being carried.
- Fuelling procedures are to be in place for fuelling the boat, and spill response equipment must be available.
- Materials or substances brought on board for the purpose of work must be incorporated into the risk assessment in order to evaluate spill response requirements.

Pre-trip Inspection

- Prior to each trip, an inspection must be completed to check load, bilges, fuel, oil, emergency equipment and boat general condition.
- Any deficiencies observed in the inspection must be reported immediately to the boat owner, and remedied prior to boat use if safe operation is affected.
- Automatically inflatable life jackets must be inspected as per the original equipment manufacturer's requirements.

Communication

- All boats carrying passengers must have a dependable two-way communication device capable of contacting persons that can effect emergency operations if required.
- When transporting passengers, the operator must notify the contact person at a frequency determined by the risk assessment.

Adverse Weather

- The boat must be appropriate to the type of operation and water conditions to which it will be exposed.

Guides to General Boating Safety

- Unlace boots worn in canoes, rowboats or small motor boats to allow ease of removal in the event of a craft capsize.
- Carry proper equipment and know how to use it.
- Maintain the boat and equipment in good condition, keep bilges clean.
- Know and obey the Rules of the Sea/Water.
- Operate with care, courtesy and common sense.
- Always keep the boat under complete control.
- Watch posted speeds, slow-down in anchorages.
- Never overload the boat.
- Ensure that life-saving equipment is accessible.
- Check local weather reports before departure.
- Guard against leakage of engine fuel and cooking fuel.
- Have fire extinguishers ready.

Resources:

- For more information on developing procedures, templates for these procedures, as well as other example checklists and forms, visit Transport Canada's Templates for Small Commercial Vessel Procedures and Records webpage.
- For more information on Cold Water Immersion, see WorkSafe Bulletin: Cold Water Immersion.

Appendix 3
Safety Equipment for Boats

All vessels must be equipped with safety equipment required by Transport Canada and the Small Vessel Regulations relevant to the size and type of vessel. This includes, but is not limited to, the following:

- The Small Vessel Regulations specify minimum requirements of portable safety equipment, according to the length of the boat. See relevant resource links in Appendix 1 for guidance.
- Boats must be equipped with the proper lighting as specified by the regulations under the Canadian Shipping Act and WorkSafeBC OHSR section 17.26. See relevant resource links in Appendix 1 for guidance.
- Every person on board a human-powered vessel must wear a Transport Canada and WorkSafeBC (OHSR sections 8.26-8.30) approved personal flotation device (PFD) or lifejacket of an appropriate size for each person on board as per Small Vessel Regulations 310.
- Powered vessels must carry on board a Transport Canada and WorkSafeBC (OHSR sections 8.26-8.30) approved life jacket of an appropriate size for each person on board as per Small Vessel Regulations sections 409/506.

Note: OHSR section 8.26 requires that workers at risk of drowning must wear a lifejacket or personal flotation device (PFD). This must be determined in the risk assessment.

- Transport Canada approved personal PFDs may be used as the sole flotation device in lieu of lifejackets only if the conditions outlined in Ship Safety Bulletin No. 06/2012 (Wearing and Using Flotation Devices) are satisfied, including but not limited to:
- PFDs must be worn at all times when in an open boat, or when on deck on a vessel of closed construction, and underway;
- Passenger vessel length 8.5m or less or workboats length 12m or less;
- Operating on Sheltered Waters or within 2 nautical miles from shore on a lake or river;
- Be a highly visible colour (yellow, orange or red); and
- Fitted with retro-reflective tape and a whistle.
- Vessels carrying PFDs that do not meet the conditions of the above referenced Transport Canada policy must also carry Lifejackets for everyone on board.

Note: See Ship Safety Bulletin No. 06/2012 (Wearing and Using Flotation Devices) for more information on floatation device selection and specification.

- Each boat operated on BC Hydro business must be equipped with a first aid kit suitable for the number of persons on board.

BC Hydro
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OSH Standard 505
Fire Protection Program

OSH Standard 505
Fire Protection Program

1. Scope

1.1 This standard covers the BC Hydro fire protection program.

2. Purpose

2.1 This standard specifies fire safety measures to protect workers, contractors, visitors and the workplace from the consequences of fire and/or explosion.

3. Standard

3.1 Measures must be taken to ensure that BC Hydro workers, contractors and visitors, plant and equipment are protected from the risks of fire and/or explosion by the most effective, prudent and technically feasible means.

3.2 The BC Hydro Fire Protection program shall be in conformance with the following Acts, Codes, Standards and Regulations:

- BC Building Code
- BC Fire Code
- National Fire Protection Association (NFPA) Codes, Standards and Recommended Practices
- Fire Services Act of BC
- Forest Fire Prevention and Suppression Regulation (BC Reg. 169/95)
- Open Burning Smoke Control Regulation (BC Reg. 145/93)
- Workers Compensation Board Act and WorkSafeBC Occupational Health & Safety Regulation
- Canadian Standards Association (CSA)
- Underwriters' Laboratories of Canada (ULC)
- Underwriters' Laboratories (UL)
- BC Hydro Safety Practice Regulations
- BC Hydro Design Standards

3.3 The BC Hydro Fire Protection program will be based on the prevention of injuries/loss of life, damage to property and the environment through the implementation of the following elements:

3.3.1 The completion of site specific fire hazard assessments and risk analysis for facilities, equipment and work procedures.

3.3.2 The immediate elimination of fire hazards.

3.3.3 Ongoing fire inspections/fire protection audits of plant and equipment.

3.3.4 Scheduled servicing, maintenance and testing programs including records of work completed for fire protection equipment/suppression systems in conformance with current codes and standards.

3.3.5 Documented design review of fire, safety and protection systems for new facilities and/or extensions to existing facilities.

3.3.6 The development/implementation of fire emergency plans.

3.3.7 The provision of information to local fire departments on hazardous materials including hazardous wastes at BC Hydro facilities which may endanger firefighters including storage locations and safe handling procedures.

3.3.8 The provision of information to fire departments and the forest service on the hazards associated with the BC Hydro plant and the electrical system as a component of the pre-fire emergency planning process.

3.3.9 The training of all workers in the fire prevention and the emergency evacuation procedures applicable to their place of work.

3.3.10 The selection and training of workers assigned to fire fighting duties including but not limited to fire suppression methods, fire prevention, emergency procedures, the Incident Command System (ICS), firefighter team safety and communications applicable to the workplace.

3.3.11 The provision and maintenance of approved fire fighting equipment, personal protective clothing and respiratory equipment for workers assigned fire fighting duties.

3.3.12 Maintaining compliance with the Waste Management Act – Open Burning Smoke Control Regulation BC Reg. 145/93 in the management and disposal of debris (vegetative matter) or demolition waste.

3.3.13 Conducting work in areas classified as wildland in compliance with the Forest Fire Prevention and Suppression Regulation BC Reg. 169/95.

3.3.14 The prompt reporting and investigation of fires and/or explosions.

3.3.15 Maintaining records of reports and investigations of incidents involving fire and/or explosions and the release of hazardous materials.

4. Roles and Responsibilities

The implementation of Fire Protection Program requires the cooperation and coordination of all employees as follows:

4.1 Managers

4.1.1 Ensure that a fire hazard assessment is conducted for all buildings, operating equipment and work procedures in their area of responsibility.

4.1.2 Establish site specific guidelines for the prevention of fires in the workplace for workers and contractors.

4.1.3 Ensure that monthly inspections are carried out at each BC Hydro building or operation to identify and correct fire hazards.

4.1.4 Arrange for testing, maintenance and servicing of fire equipment, fire alarm and fire suppression systems in compliance with the BC Fire Code and NFPA Standards.

4.1.5 Ensure that formalized fire emergency plans for all facilities within their jurisdiction are developed, implemented and maintained.

4.1.6 Ensure that local emergency agencies such as fire departments are familiar with fire and emergency plans including site specific hazards.

4.1.7 Ensure that all workers are trained in fire prevention, emergency evacuation, and fire fighting procedures applicable to their place of work.

4.1.8 Ensure that all workers assigned to fire fighting duties are provided with the appropriate approved fire fighting equipment, respiratory equipment and personal protective clothing.

4.1.9 Ensure that annual fire emergency drills are conducted to confirm and evaluate the level of understanding of all workers with the procedures in the site emergency plans. Records of drills and exercises must be kept.

4.1.10 Ensure that information on proposed renovations or changes in usage of existing facilities including drawings is submitted to BC Hydro Engineering for code compliance review at the planning stage.

4.1.11 Ensure that within 24 hours all fires are reported to the Treasury Manager and your Occupational Safety and Health (OSH) Specialist. “Fire and Explosion Report” Form #80311 is available on the Intranet.

4.2 Supervisors/Crew Leaders

4.2.1 Conduct fire hazard assessments in their work area and correct hazards as identified.

4.2.2 Conduct or designate workers to carry out monthly fire inspections of the work area. Maintain records of inspections.

4.2.3 Ensure that workers are familiar with the fire prevention regulations and emergency procedures for the work place.

4.2.4 Complete a fire report within 24 hours of the incident on a “Fire and Explosion” Report Form #80311 available on the Intranet. Forward one copy to the Treasury Manager and one copy to your Occupational Safety and Health (OSH) Specialist.

4.2.5 Ensure that fire equipment is recharged and returned to service immediately after usage.

4.2.6 Ensure that fire emergency response equipment and fire protection systems are properly maintained.

4.2.7 Ensure that operations involving the disposal of debris (vegetative matter) or demolition waste are carried out in compliance with the Waste Management Act BC Reg. 149/93.

4.2.8 Ensure that all industrial work activities conducted under their direction in areas designated as wildland or forest are carried out in compliance with the Forest Fire Prevention and Suppression Regulation BC Reg. 169/95.

4.3 Workers

4.3.1 Report all fire hazards or hazardous conditions to their work leader, supervisor or manager.

4.3.2 Report all incidents involving fires and/or explosions to their supervisor or manager.

4.3.3 Conduct all work practices in compliance with WorkSafeBC Occupational Health and Safety Regulations and site specific fire regulations.

4.3.4 In the event of a fire, carry out emergency procedures in accordance with their site or local Fire Emergency Response Plan.

4.4 BC Hydro Engineering

4.4.1 Specify the type, location and general requirements of fire protection for all BC Hydro facilities.

4.4.2 Assist in the design and development of specifications, for fire protection and life safety systems.

4.4.3 Conduct reviews of all building plans (including substations, hydro and thermal, stationary or mobile) from a Fire Prevention and Fire Safety viewpoint, prior to calling tenders.

4.4.4 Provide consulting services on the operation of and maintenance requirements for fire protection systems.

4.4.5 Conduct periodic inspection and fire protection audits of corporate facilities.

4.4.6 Ensure that acceptance testing and verification of new or modified fire protection systems are conducted.

4.4.7 Provide consulting services in the interpretation of fire/life safety codes and standards.

5. References

5.1 BC Building Code

5.2 BC Fire Code

5.3 National Fire Protection Association (NFPA) Codes, Standards and Recommended Practices

5.4 Fire Services Act of BC

5.5 Forest Fire Prevention and Suppression Regulation (BC Reg. 169/95)

5.6 Open Burning Smoke Control Regulation (BC Reg. 145/93)

5.7 Workers Compensation Board Act and WorkSafeBC Occupational Health & Safety Regulation

5.8 Canadian Standards Association (CSA)

5.9 Underwriters' Laboratories of Canada (ULC)

5.10 Underwriters' Laboratories (UL)

5.11 BC Hydro Safety Practice Regulations (SPR)

5.12 BC Hydro Design Standards

5.13 BC Hydro SES – Fire Protection

5.14 BC Hydro SES – Emergency Preparedness

BC Hydro
Power smart

OSH Standard 601
Personal Protective Equipment

OSH Standard 601
Personal Protective Equipment

1. Purpose

1.1 This standard describes the application of Personal Protective Equipment (PPE) for:

- All persons at BC Hydro workplaces; and
- All BC Hydro employees entering other industrial workplaces.

1.2 This standard describes the accountability of the Business Group's Senior Leadership to:

- Establish PPE zones in the workplace; and
- Define basic PPE requirements for all PPE zones.

2. Scope

2.1 This standard covers the use of PPE mandated by WorkSafeBC and required by BC Hydro Safety Practice Regulations

2.2 When it has not been practicable to eliminate the hazards of a workplace, PPE shall be used. PPE represents the workers' last line of protection for the body (see OSH Standard 110 – Hazard Identification & Risk Assessment).

3. Standard

3.1 Definitions

3.1.1 PPE (Personal Protective Equipment) is defined as safety clothing/equipment that is worn by an individual as a last line of defense to protect against hazards.

3.1.2 PPE Zone is defined as a work area that requires usage of basic PPE.

3.2 Identification of PPE Zones

3.2.1 To ensure compliance with Section 8.4 of the WorkSafeBC Occupational Health and Safety (OHS) Regulation, which requires an evaluation of workplace conditions to be conducted where required in order to determine appropriate PPE, Business Groups, with support from BC Hydro Safety are responsible for defining PPE zones for their worksites. See Appendices 1 and 2 for direction on identification of PPE Zones.

- PPE zones shall be clearly established and communicated through signage and/or controlled access.
- Modifications to PPE zone must be approved by Senior Management.
- Basic PPE requirements shall be defined for PPE zones.

3.3 Basic PPE

3.3.1 Basic PPE is protection for head, foot, eyes, hearing and hands, plus high visibility clothing. Basic PPE must be worn or readily accessible in workplaces where hazard exists. These have been defined in:

Appendix 3 – BC Hydro Workplace PPE Zones and Requirements

3.3.2 Specific requirements for each type of Basic PPE must be followed as defined in:

Appendix 4 – Head Protection – General Requirements, plus Off-Road Vehicle Requirements

Appendix 5 – Foot Protection

Appendix 6 – High Visibility Clothing

Appendix 7 – Eye Protection

Appendix 8 – Hearing Protection

Appendix 9 – Hand and Forearm Protection (Gloves and Sleeves)

3.3.3 Occupations or persons not covered by the requirements of Section 3.3 shall be governed by WorkSafeBC requirements, and Sections 3.4 through 3.6 of this Standard.

3.4 Hazard Specific-PPE (HS-PPE)

3.4.1 Additional PPE (HS-PPE) is required for task-specific hazards where basic PPE does not provide sufficient protection (e.g., respiratory protection, handling of hazardous materials, fall protection, etc.).

3.4.2 HS-PPE is used in conjunction with basic PPE, and can supersede basic PPE (e.g. for chemical spill clean-up, the use of rubber boots overrides the use of leather boots)

3.4.3 HS-PPE requirements can be determined by the following:

- Consulting HS-PPE table in Appendix 10, which will give direction to other hazard specific OSH Standards; or by
- Consulting BC Hydro documentation (SPRs, Work Procedures, Local Instructions); or by
- Conducting a risk assessment for unique task-specific hazards. Contact your Occupational Safety and Health (OSH) Specialist for assistance.

3.5 PPE – General Requirements

3.5.1 All PPE shall meet the requirements of WorkSafeBC regulation and specifications.

3.5.2 BC Hydro will supply PPE as required.

- The exception to this is safety footwear which shall be purchased by employees for reimbursement (reimbursement policy detailed in Appendices or collective agreement).

3.5.3 BC Hydro employees shall use only PPE supplied by BC Hydro or meet the requirements of this and other applicable Standards.

- If unavailable through stores, exceptions can be evaluated through a Professional Engineer or OSH Specialist and approved by the Business Group.

3.5.4 PPE requires proper inspection, maintenance, cleaning, and storage.

3.5.5 PPE must not be modified.

3.5.6 PPE is available for employees to use at home. See Appendix 11.

3.6 Application of Flame Resistant (FR) Clothing*

3.6.1 Requirements – when working in proximity to energized conductors or equipment, within 10 feet to low voltage or within Unqualified LOA for high voltage, a base layer of Flame Resistant (FR) clothing (i.e., shirt and pants with full coverage of arms, torso and legs) that provides an arc thermal performance value (ATPV) of at least 8 cal/cm2 will be worn.

3.6.2 Exceptions can only be made where a hazard identification and risk assessment has been conducted by a BC Hydro OSH Specialist or Professional Engineer, or with an approved work procedure, and the area has been clearly identified

Flammable undergarments (e.g., polyester) are prohibited. FR clothing performs best when, in addition to being the outer layer, it is the layer closest to the skin. It may be worn over top of a first layer of clothes made of non-melting natural fibre (e.g., cotton, silk, wool, rayon), including undergarments and socks.

See Appendix 12 for further elaboration on the use of FR clothing.

NOTE: Some switchgear have specific operating instructions including NO RACKING OUT OF CIRCUIT BREAKERS UNLESS DE-ENERGIZED. Refer to BC Hydro Safety Alert Series 2009 No.1 Metalclad Switchgear Risk of Internal Arc Failure and 2009-4-A Arc Flash Risk of Low Voltage Metalclad Switchgear and Generator Bus.

3.6.3 When workers are required to wear FR clothing and fall protection equipment, the fall protection equipment is highly recommended to also be arc flash rated. See OSH Standard 608 (Fall Protection) for more information.

NOTE: HS-PPE requirements are normally contained in dedicated OSH standards listed in Appendix 10. A dedicated OSH standard has not yet been written for FR clothing and other HS-PPE protection against arc flash. In the interim, FR requirements are outlined above

3.6.4 Work Activities also requiring a face shield (8 cal/cm2), in addition to the FR requirements above:

3.6.4.1 Removal/Installation of revenue meters on any voltage.

3.6.4.2 Work on* exposed energized low voltage (secondary) > 250V. This includes DC excitation system which have a ceiling voltage >250V.

*Note 1: “Work on” includes opening unhinged covers containing energized equipment, connecting and removing conductors while energized, and testing for voltage using contact methods

Note 2: For circuits/busses where incident energy has been assessed as less than 4 cal/cm2, face shields are not required

4. Roles and Responsibilities

4.1 Workers

4.1.1 Must use basic PPE in PPE zones

4.1.2 Must use approved PPE appropriate to the situation

4.1.3 Alert crew leader/manager to work conditions where PPE is required but not worn

4.1.4 Regularly inspect PPE to ensure it is in good working condition. Ensure PPE is properly maintained and stored.

4.2 Crew Leader/Work Leader

4.2.1 Ensure PPE Zones are defined and clearly marked

4.2.2 Ensure PPE requirements are clearly communicated

4.2.3 Ensure crews are provided with properly maintained PPE

4.2.4 Ensure workers are wearing PPE

4.3 Managers

4.3.1 Ensure PPE Zones are defined and clearly marked

4.3.2 Ensure PPE requirements are clearly identified

4.3.3 Ensure PPE requirements are current

4.3.4 Ensure employees are trained in correct application of PPE

4.3.5 Ensure all required PPE is worn

4.3.6 Provide resources and funding for PPE programs

4.3.7 Monitor PPE programs for effectiveness

5. References

5.1 WorkSafeBC Occupational Health & Safety (OHSR) Regulation – Part 8

5.2 Safety Practice Regulations – Rule 300

Appendix Listing

Table of Appendix Numbers and Titles

Appendix Number	Title
1	Example – Implementing PPE Zones for Conforming Areas
2	Example – Implementing PPE Zones for Non-conforming Areas
3	BC Hydro Workplace PPE Zones and Requirements
4	Head Protection – General Workplace Requirements, plus requirements for ATVs, UTVs, snowmobiles, and Sno-Cats
5	Foot Protection
6	High Visibility Clothing
7	Eye Protection
8	Hearing Protection
9	Hand and Forearm Protection (Gloves and Sleeves)
10	HS-PPE Table
11	PPE for Home Use
12	BC Hydro Flame Resistant (FR) Clothing Requirements

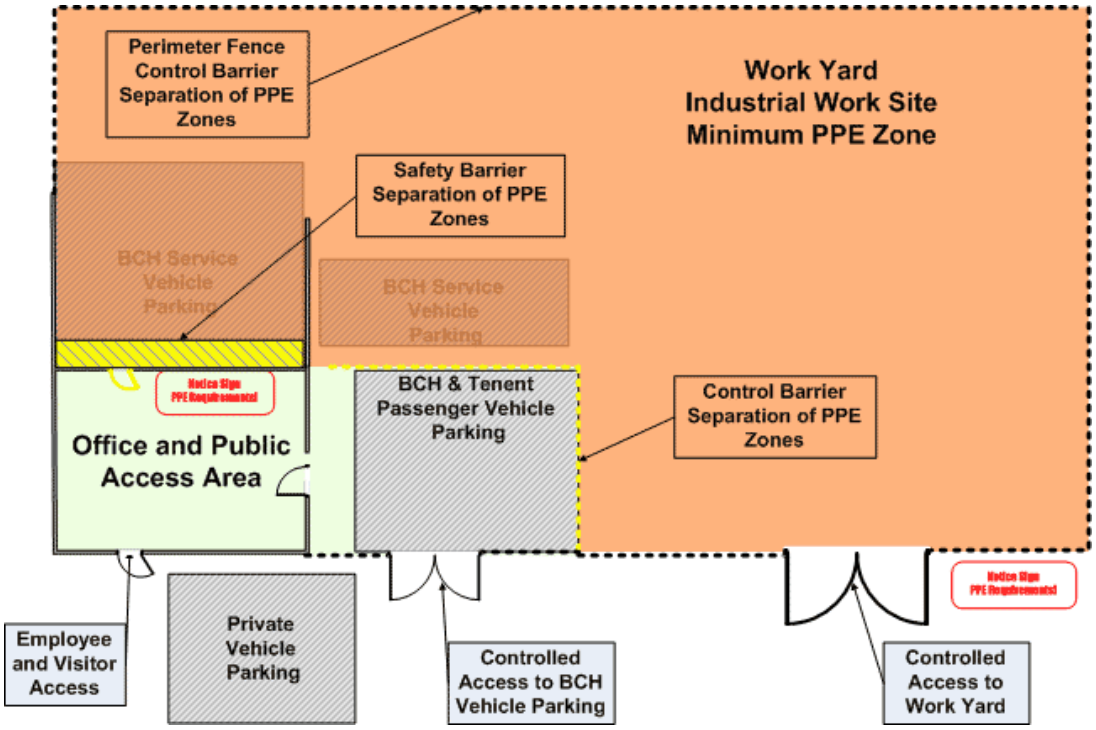
Appendix 1

Example – Implementing PPE Zones for Conforming Areas

Conforming area = A space that is being utilized as per design.

A facility with conforming areas has its office and work spaces properly situated in suitable environments. Some examples: office areas are located in proper office environments; or industrial work yards permit only service vehicles.

It is a straightforward method to establish PPE zones for conforming areas. The example diagram below demonstrates how to establish PPE zones for such areas.



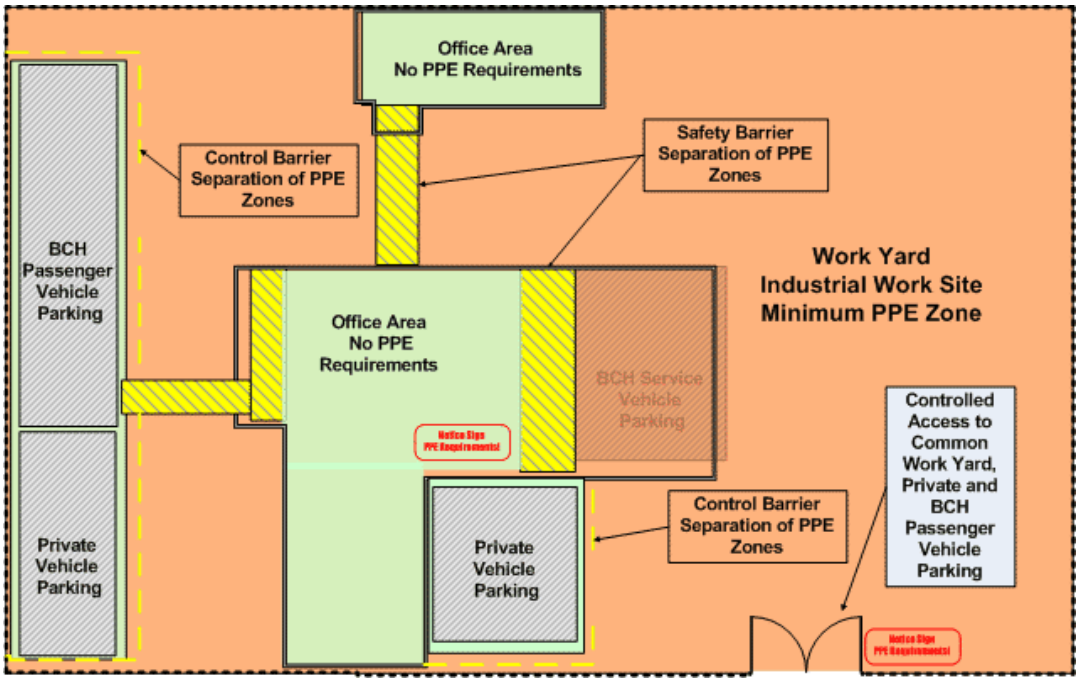
Appendix 2

Example – Implementing PPE Zones for Non-conforming Areas

Non-conforming area = a space that is not being utilized as per design

A facility with non-conforming areas has office and/or work areas that are improperly situated or areas that serve multiple/mixed purposes. Some examples: improvised office spaces occupy a corner of the warehouse floor; or a work yard is utilized for mixed use – industrial use plus warehouse loading plus employee parking plus public parking.

Establishing PPE zones for non-conforming areas can be problematic and may pose a challenge for some sites. The example diagram below demonstrates how to establish PPE zones for such areas.



Appendix 3

T&D Workplace PPE Zones and Requirements

Scope

- Per OSH Standard 601 section 4.2 this appendix establishes workplace PPE Zones and their associated Personal Protective Equipment (PPE) requirements for BC Hydro.
- BC Hydro Safety shall be consulted for circumstances or applications not described in the table below.
- Workplace PPE Zone requirements apply consistently to all employees and contractors from start of shift to end of shift.

Workplace PPE Zone	PPE to be worn at all times	PPE Required to be readily accessible and worn in the presence of hazards
Office Facilities (includes small work benches where hand tools or test instruments are used)	• None required	• Task appropriate PPE
Work Yards (including adjacent warehouses and loading bays)	• Safety boots • Hi Vis attire • Hard Hat • Eye protection	• Hearing Protection • Gloves appropriate for the task
Worksites (e.g., Overhead and Underground work, stations, microwave sites, operating areas of Generating Stations, certified utility arborist work, etc.)	• Safety boots • Hardhat (not required in control rooms) • Eye Protection • Helmets, when operating ATVs, snowmobiles or motorcycles • Hi Vis attire • FR Clothing*	• Hearing Protection • Gloves appropriate for the task
Work Shops and all other areas Workshops are defined as facilities with equipment such as lathes, drill presses, pneumatic tools, welding machines. Examples of all other areas can include utility vans, Fleet garages, environmental sites, surveying, etc.	• Safety boots • Eye protection	• Hearing Protection • Gloves appropriate for the task • Hi Vis attire (required when moving vehicles or equipment operating) • Hard Hat • FR Clothing NOTE: Some large shops have hazards present on an ongoing basis, so this PPE would be required at all times. If evaluation is required, discuss with your OSH Specialist.

* **FR Clothing** Refer to Appendix 12 – BC Hydro Flame Resistant Clothing Requirements

Appendix 4

Head Protection

General Workplace Requirements

Information on helmets for use in All Terrain Vehicles (ATVs), Snowmobiles, Utility Terrain Vehicles (UTVs) and Snowcats can still be found in this Appendix. General hard hat requirements have been restructured and can be found in:

- PPE Requirements: Hard Hats (covers requirements for selecting, using, maintaining, and replacing hard hats)

Requirements for All Terrain Vehicles (ATVs), Snowmobiles, Utility Terrain Vehicles (UTVs) and Sno-Cats

- Must be operated in compliance with WorkSafeBC OSH Regulation, Part 16 Mobile Equipment

ATVs and Snowmobiles

- ATVs and snowmobiles are characterized by straddle seating and handlebar steering.
- Operators and passengers on ATVs and snowmobiles must wear a helmet meeting the requirements of WorkSafeBC OHS Regulation, Part 8.12 Use with All Terrain Vehicles, Snowmobiles, Motorcycles, as applicable. At a minimum, the helmet must be approved by CSA or Snell, as outlined in the regulation.
    - The design of the helmet can be either open-faced (no chin/jaw protection) or full- faced (integrated chin/jaw protection).
- Eye protection must be worn by operators and passengers and can be in the form of an approved face shield from the manufacturer of the specific helmet or through the use of approved safety eyewear. Note: Full-faced helmets come with face shield built in.
- EXCEPTION – as per WSBC 8.12, when an ATV is operated within a specific location (e.g., yard) with no significant hazard of rollover or loss of control AND at a speed not exceeding 20 km/h, a CSA or Snell approved bike helmet with chinstrap or an approved hard hat with chinstrap may be used in place of an ATV helmet.

Utility Terrain Vehicles (UTVs) and Sno-Cats

- UTVs and Sno-Cats are characterized by side-by-side seating and steering wheel.
- Helmet use is not required for Snowcats.
- Similarly for ATVs and Snowmobiles, BC Hydro **does not require** helmet use if all of the following parameters can be met when operating the UTV:
  - 20 kph or lower speed
  - Equipped with roll-over protection, and seatbelts are used
  - Equipped with windshield or safety glasses are used.
  - Operated in a specific location frequently used by mobile equipment, with good terrain and no significant hazard of rollover. This means a Yard, or access roads on a right-of way. Grades cannot exceed 10%, and there cannot be adjacent ditches or slopes.

- If these conditions cannot be met, or if the UTV or Sno-Cat is to be used off-road (areas other than those described in the fourth sub-bullet above), a helmet as described for ATVs will be required.

Sizing

- For a helmet to be effective, it must feel comfortable on your head – it should fit snugly, but not painfully tight.
- Fit:
  - If you can pull the helmet on without having to spread the helmet, it is too big.
  - A properly fitted helmet might seem tight as you pull it on, because the foam components that seal out the wind noise are made to conform to your head. If a helmet pulls on too easily without resistance of such padding, it will be noisy and uncomfortable.
  - The helmet needs to fit snugly so that it is stable when you shake your head side-to-side, front-to-back or up and down. A full-face helmet should grip your cheeks and jaw as well as the top and sides of your head.
  - Grab the helmet with both hands and try to move the helmet forward and backward and from side to side. The helmet fits right if your skin moves with the liner of the helmet.
  - Try to remove the helmet from your head without undoing the retention system closures. If the helmet comes off or shifts freely over your eyes, then re-adjust and try again.
  - If you can grab the rear lip of the helmet and roll it forward off your head (even with slight pressure), you need a different helmet; it should not come off.
  - There should be very little “play” in the way the helmet sits on your head. In fact, the helmet should not be able to move around on your head without it tugging on your skin a bit.

Maintenance and Storage

- Proper storage and care of safety helmets will extend service life.
  - Store helmets in a clean dry area away from sunlight, contaminants and temperature extremes. Do not use chinstrap to hang helmets off of handlebars or hooks.
  - Helmets are to be kept clean. Use mild soap and warm water, and let air dry. Removable interior padding can be laundered by hand or machine wash gentle.

Inspection and Testing

- Helmets are to be inspected prior to each use. Follow manufacturer's instructions. Examine the components (shell, padding, chin strap, visor, face shield) for signs of damage, wear and degradation. Helmets failing showing excessive wear, loose components, cracks/gouges on shell, or face shield damage that would impede vision, must be discarded and replaced.

Replacement

- The service life of a helmet is dependent on the intensity and frequency of its use. Follow any manufacturer's instructions for service life. Discard and replace helmet if:
  - The helmet was subjected to an impact.
  - The comfort padding or the retention system has become loose due to heavy use or display signs of deterioration.
  - The synthetic foam padding displays signs of heavy use and the helmet feels too loose. Test: with the retention system fastened, the helmet turns to the side when you gently shake your head.

General

- Helmets are purchased through the local tools budget.

Appendix 5

Foot Protection

Specification

- Safety footwear (boots or shoes) must meet CSA Standards as required by WorkSafeBC and SPR Rule 302.2. WorkSafeBC OSH Regulation Part 8.22 also accepts safety footwear that is ANSI-rated. The ANSI Standard for footwear has been withdrawn and replaced by ASTM Standards. ASTM-rated footwear will only be accepted if an equivalent level of safety to CSA-rated footwear can be verified with an OSH Specialist, and all other required safety features described below are met.
- BC Hydro has determined that trade/job functions in categories F and G are exempt from the above rule. Footwear for categories F and G must be of sturdy construction and satisfy the table requirements listed below.
- Categories of safety footwear are listed in the table below. If work activity straddles various work environments with different safety requirements, select safety footwear that offers the highest level of protection.

Category	Typical Trade or Function
A	Workers who climb poles or work on high voltage lines.
B	Workers who work in substations, switchyards, or Generation plants (includes powerhouse and shops).
C	Workers who work in right-of-ways or in the bush.
D	Workers who work in heavy industrial shops or garages.
E	Workers who work in stores or warehouses.
F	Workers who work in laboratories or light non-industrial shops such as telecommunications, protection and control. (Note: Category F footwear does not require CSA approval)
G	Workers who read meters, traverse uneven, difficult terrain, or walk long distances. (Note: category G footwear does not require CSA approval)

- Required safety features for each category of safety footwear:

Required Safety Features	Category						
	A	B	C	D	E	F	G
Sturdy construction for foot protection	✓	✓	✓	✓	✓	✓	✓
Sturdy soles with good traction	✓	✓	✓	✓	✓	✓	✓
Soles with insteps and distinct heels for ladder work	✓	✓	✓	✓	✓	✓	✓
Sole puncture protection plus grade 1 toe protection (CSA symbol = green triangle, ASTM identification will specify “PR”, “I/75” and “C75”)	✓	✓	✓	✓	✓		
Sole resistance to electric shock (CSA symbol = white rectangle with Ω, ASTM identification will specify “EH”)	✓	✓					
Minimum Height of 20 cm (8 inches)	✓						
Minimum Height of 15 cm (6 inches)			✓				
Minimum Height above ankle		✓		✓			✓
No minimum height (below ankle or higher)					✓	✓	

- Safety boot remarks for electrical workers:
  - Safety boots with electrically resistive soles display a CSA symbol = 'white rectangle with Ω sign', or ASTM identification that specifies "EH". BC Hydro has mandated that these boots be worn by electrical workers.
    - Safety boots with electrically resistive soles are not permitted to be re-built or re-soled. When worn out, they must be replaced.
  - Safety boots with electrically conductive soles display a CSA symbol = 'red rectangle with letter C and grounding symbol', or ASTM identification that specifies "Cd". BC Hydro Stores carry these boots (stock series154-1900). These boots are required by BC Hydro to be used to maintain equipotential for specifically barehand work or work on energized steel structures.

Maintenance and Storage

- Proper storage and care will extend service life.

Inspection and Testing

- Visually inspect before use.

Replacement

- Units failing visual inspection must be discarded and replaced.

Reimbursement

- Employees who are required to wear CSA-approved safety boots or shoes at work are expected to purchase them. Union members shall refer to their collective agreement (MoveUp 378 - Article 16.04, IBEW 258 - Article 28), and M&P members shall refer to BC Hydro's Management and Accounting Policies and Procedures (MAPP 5.6.1B.1), with respect to safety footwear coverage.

Appendix 6

High Visibility Clothing

High Visibility High visibility clothing is worn by workers to improve how well other people "see" them (their visibility) and is usually worn to alert drivers and other vehicle operations of a worker's presence, especially in low light and dark conditions.

Specification

- High Visibility (HV) Clothing shall conform to WorkSafeBC OHS Regulation, Part 8.24.CSA Standard Z96-09 or Z96-15 are acceptable alternatives subject to qualifications as explained in WSBC Guideline G8.24.
- If high visibility components are to be integrated with Flame Resistant clothing, or if a high visibility vest is to be worn over Flame Resistant clothing, the high visibility components must also be flame resistant.

Application

Employees must wear HV clothing:

- If they are exposed to the hazards of moving vehicles/equipment; or
- If it enhances their safety (e.g. visibility in forest).
  - If the worker must wear both HV clothing and FR clothing at the same time, refer to Appendix 12 for additional direction.

Maintenance and Storage

- Keep clean and well-maintained.
- Proper storage and care will extend service life.

Inspection and Testing

- Visually inspect before use for signs of wear and tear, soiling or contamination.

Replacement

- Units failing visual inspection must be cleaned, discarded or replaced as appropriate.

General

- BC Hydro Stores stocks High Visibility Clothing.

Requirements for high vis clothing have been summarized in the table below:

Workplace Hazard	Where/When High Vis Clothing is Required	Requirement (WorkSafeBC)	Acceptable CSA Z96 Alternative
Vehicles travelling at speeds > 30 km/h	Examples: • Worksites (line work on a road where workers are not protected from moving traffic by barricades or other effective traffic control, etc.) ○ Must be worn at all times. *Note: high vis requirements may be incorporated into FR clothing where it is required*	Type 1 Vest, shirt or similar garment, worn on the torso, with a fluorescent background and attached visibility-enhancing trim *Note: BC Hydro's variance with WorkSafeBC allows bright colors to be used as opposed to fluorescent colors provided workers are not carrying out traffic control duties.*	Class 2 CSA apparel provides full coverage of the upper torso (front, back, sides, and over the shoulders). Examples can include a vest, jacket, hooded coat, and bib overalls. This apparel is acceptable to WorkSafe BC if the background material is fluorescent orange or fluorescent yellow-green.
		Type 2 Jacket, coat, coverall or other garment with a bright coloured background and attached visibility enhancing trim	Class 3 CSA apparel consists of Class 2 CSA apparel with bands encircling both arms and both legs, which are composed of combined-performance strips/bands or a combination of retro-reflective and background material. Examples can include jacket & pants, coveralls, and long coat or slicker. This apparel is acceptable to WorkSafe BC if the background material or the retro-reflective tape is in a fluorescent colour *Note: grey is not available as a fluorescent colour*

Mobile equipment	Examples:
	• Worksites (stations, etc), Work Yards (including adjacent warehouses and loading bays)
	  ○ Must be worn at all times. *Note: high vis requirements may be incorporated into FR clothing where it is required*
	
	• Work Shops
	  ○ Must be worn in the presence of hazards.
		Type 3
		A harness or suspender-type of garment worn on the torso, fabricated from parallel strips of contrasting colours. The harness has fluorescent and retro-reflective properties.
			Class 1 CSA apparel consists of a basic harness or stripes/bands over the shoulder(s) and encircling the waist. An example could be a harness.
			
			This apparel is acceptable to WorkSafe BC.

Definitions:

- Fluorescent material – material that absorbs ultraviolet radiation in daylight and emits it in the visible light region
- Retro-reflective material – material that reflects light back to the same direction as the source of light
- VE trim – visibility enhancing trim attached to the garment which has fluorescent and retro-reflective properties. Note: It can be made from combined-performance material that is both fluorescent and retro-reflective, or separate fluorescent and retro-reflective materials. If the background colour is orange or fluorescent orange, the trim must be fluorescent lime yellow.

Appendix 7

Eye Protection

Specification

Information on Eye Protection, including Prescription Eye Protection, has been restructured into:

- PPE Requirements: Eye Protection

Appendix 8

Hearing Protection

Specification

- For detailed information on hearing protection, refer to OSH Standard 309 (Hearing Conservation).
- Ear plugs (Types: Custom, Disposable, Reusable).
- Ear muffs (Hardhat mounted, typical standalone).
- Ear caps (hearing protection that fits over ear canal).

Application

- Hearing protection must be used if noise levels exceed 85 dBA.
- Training – learn how to correctly apply hearing protection.

Maintenance and Storage

- Ear muffs must be maintained in accordance with manufacturer's instructions.
- Maintain good personal hygiene and cleanliness of hearing protection.
- Proper storage and care will extend service life.

Inspection and Testing

- Visually inspect before use.

Replacement

- Units that are damaged or fail to provide adequate hearing protection must be discarded and replaced.

General

- Contact OSH Specialist for more information and/or assistance.
- Other Considerations on selection and use of Hearing Protection:
  - Daily exposure
  - Worker ability to hear
  - Communication with other worker
  - Use of other equipment and/or PPE
  - Physical constraints of worker activity
  - Temperature, climate & environment
  - Comfort

WorkSafe Reference (Hearing Loss Prevention): **http://www2.worksafebc.com/Topics/HearingLossPrevention/Home.asp**

Appendix 9

Hand and Forearm Protection (Gloves and Sleeves)

Specification

Gloves and sleeves must:

- Properly fit the user's hand and forearm.
- Provide appropriate dexterity and grip for the work task.
- Meet required protection ratings specified below:

Hazard to hand/forearm	Required Minimum Protection Rating	
Cut	ANSI:A4	EN:5
Puncture	ANSI:4	EN:3

Note: High Voltage Class 3 Rubber Glove Work Methods and Class 1 rubber glove use in proximity to broadcast antennas are exempt from the requirement for Cut and Puncture protection ratings.

ANSI / ISEA 105-2016 standard provides protection ratings for gloves and sleeves. ANSI Cut Protection ratings use a nine-level scale. Level A1 provides the least amount of cut protection and level A9 provides the most cut protection. For more information on ANSI and EN protection ratings, visit the **Gloves webpage**.

Application

- Work gloves that meet the BC Hydro minimum Cut and Puncture protection ratings must be worn when work tasks involve risk of cuts, abrasion, punctures, etc. to hands.
- Protective sleeves that meet the BC Hydro minimum Cut and Puncture protection ratings are recommended when work tasks present cut or puncture risk to the forearms.

Maintenance and Storage

- Proper storage in a cool, dry, well ventilated space away from direct sunlight will extend service life.

Inspection and Testing

- Visually inspect the glove or sleeve material for foreign objects, wear and tear before use.

Replacement

- Gloves or sleeves failing visual inspection must be discarded and replaced.

Purchasing

- Recommended gloves and sleeves that meet the minimum requirements of this standard are listed on the Gloves webpage.
- If you are unable to determine the protection ratings for gloves or sleeves that are not on BC Hydro's recommended list, contact the manufacturer directly or contact Safety Engineering for further support.

Note: Hazard-specific applications (chemical work, welding, painting, etc.) require the appropriate HS-PPE gloves. Contact an OSH Specialist for information on HS-PPE gloves.

Appendix 10

HS-PPE Table

OSH Standard #	OSH Document Title	Mandatory Usage of Basic PPE and HS-PPE
OSH 203	Welding, Cutting and Hot Tapping	• FR clothing • Hardhat • Eye protection • Respiratory protection
OSH 208	Chainsaws and Portable Power Tools	• Chainsaw pants 3600 rpm rating • Hard hat, hearing protection, safety boots with ankle protection, gloves, face shield
OSH 212	Safe Handling of Oil, Liquids & Compressed Gases	• Loose fitting, well insulated gloves • Eye protection
OSH 302	Safety During Spill Response	• Written procedure will describe PPE • Respiratory protection • Gloves • Eye protection • Body protection • Protective footwear
OSH 303	Confined Spaces	• Procedures describe PPE • Retrieval harness
OSH 304	Polychlorinated Biphenyls (PCBs)	• Goggles • Aprons • Nitrile gloves • Coveralls • Jackets • Pants • Boot covers • Respiratory protection
OSH 305	Sulphur Hexafluoride (SF6)	• Protective eyewear • Nitrile gloves • Neoprene gloves • Half-face piece respirator with combination P100 (HEPA), acid gas or organic vapour cartridges • Safety goggles • SCBA • Rubber boots • Disposable coveralls

OSH Standard #	OSH Document Title	Mandatory Usage of Basic PPE and HS-PPE
OSH 310	Selection and Use of Solvents	• Impervious gloves • Chemical goggles • Face-shield • Chemical resistant apron • Disposable coveralls • Rubber boots • Foot covers • Respiratory protection
OSH 313	Respiratory Protection	• Face seal dependent air purifying respirator • SCBA (self contained breathing apparatus) • Supplied air respirators
OSH 314	Lead Abatement	• Respiratory protection • Disposable coveralls with hood • Steel toe rubber boots • Eye protection • Face protection • Head protection • Hearing protection • Specialized protection for abrasive blasting and high pressure washing
OSH 315	Bloodborne Pathogens	• Nitrile gloves
OSH 317	Battery Work Safety Requirements	• Face shield • Chemical goggles • Neoprene rubber gloves • Neoprene rubber apron • Steel toe rubber boots
OSH 408	Operation of Boats	• Personal flotation device
OSH 505	Fire Protection Program	• PPE • Respiratory equipment
OSH 601	Personal Protective Equipment	• FR clothing information
OSH 602	Insulated Tools and Equipment	• Rubber gloves
OSH 608	Fall Protection	• Fall protection
OSH 609	Ladders	• Fall protection

Appendix 11

PPE for Home Use

- Employees are permitted to use BC Hydro equipment for home use. The equipment is to be returned by the time specified. See the table below.
- Guidelines for PPE for Home Use:
  - The borrowed equipment is for the home use of employees only and must not be used while performing work for third parties (cannot be for pay; can be for volunteer work but only if known and approved by Manager) or used by third parties.
  - Employees must be qualified and trained in the effective use of the equipment.
  - No items may be borrowed from equipment or supplies required for emergency response or system restoration.
  - Any consumables associated with PPE are either provided at Manager's discretion or the employee must purchase on their own.
  - Equipment must be returned in good condition in a timely manner as indicated in the table or the employee will be required to replace at Stores inventory or replacement cost.
  - If equipment is damaged or destroyed in performing the intended function (i.e. it prevented an injury) then BC Hydro will absorb the cost.
  - Obtain Manager approval to borrow items not listed in the table.

PPE	Code
Protective Headgear: Hard Hats	A
Eye Protection:	
• Safety glasses	C
• Face shield or Goggles	B
Hearing Protection:	
• Ear plugs	C
• Ear muffs	A
Gloves: Leather/Rubber/Nitrile	C
Safety Footwear	D
Body Protection:	
• Aprons	B
• High Vis Vest	A
• Chainsaw pants	B
Flame Resistant Clothing	E
Fall Protection	A

Code Key:

A = PPE issued to Employee – must be returned by employee's next working day

B = PPE for general use – must be returned by the next working day

C = Manager will provide item to employee for home use at reasonable intervals

D = Employee owned PPE - reimbursement as per Collective agreement

E = Not for loan as no known use at home

Notes:

- **Respiratory protection is excluded from this program.**
- **Use PPE Outside of Work Sign-Out Sheet**

Appendix 12

BC Hydro Flame Resistant (FR) Clothing Requirements

Overview:

This BC Hydro OSH Standard sets out the requirement for FR clothing.

Per WorkSafeBC regulations, workers must wear FR clothing appropriate to the risk when working near electrical energy (working in proximity to energized conductors or equipment, within 10 feet to low voltage or within Unqualified LOA for high voltage), high temperatures, flames, molten metal or sparks. The minimum level of protection provided by FR clothing in BC Hydro is an arc thermal performance value (ATPV) of 8 cal/cm².

Hazard and Barrier Assessment:

- An assessment has determined that FR clothing with an arc thermal performance value (ATPV) of 8 cal/cm² is appropriate for general use.
- There are some tasks performed by BC Hydro workers that need FR clothing with an **ATPV rating well in excess of 8 cal/cm²** (e.g. switching in an enclosed space or metal clad switchgear). CSA Standard Z462 and **BC Hydro Safety Alert Series 2009 No. 4 Arc Flash Risk Low Voltage Metalclad and Generator Bus** provide guidance in the selection of appropriate arc flash PPE for such circumstances.

  Note:
  While it is known that electrical utilities are exempt from the **CSA Z462** (Workplace Electrical Safety) standard, BC Hydro presently recognizes that this standard is a valuable reference (Specifically **Chapter 4, Tables 4 & 5**) for determining FR Clothing requirements appropriate for the risk, based on the work activity.

  High Visibility apparel is required in workplace PPE zones (see Table in Appendix 3). Either a flame resistant high-vis vest may be worn over top of the FR clothing, or FR clothing with integrated high-vis components may be used. For integrated FR/high-vis clothing, the high visibility components must also be flame resistant.

  - See OSH Standard 601 Appendix 6 for more information on high visibility clothing. If there are any concerns consult a Safety Engineer or OSH Specialist to assist with the hazard or risk assessment.

Why FR Clothing is Required?

When working on or around energized electrical equipment, there is a potential Arc Flash Hazard and workers **must** wear FR clothing **because**:

- Arc flash is a “short circuit” through the air and air temperature can exceed 35,000°F.
- Arc flash can cause serious burns even when workers are up to 10 feet or more from the location of the arc
- 50% of deaths from electrical contact are associated with arc flash burns
- Majority of hospital admissions for electrical contact are burn injuries, not shock injuries
- BCH has a history of arc flash incidents and near misses.
- FR clothing helps protect you from the arc flash hazard.

When FR Clothing is Required?

All workers required to access or work in workplace PPE zones (see Table in Appendix 3) that pose a hazard from electrical energy (working in proximity to energized conductors or equipment, within 10 feet to low voltage or within Unqualified LOA for high voltage), high temperatures, flames, molten metal or sparks will be issued FR Clothing.

The requirement in substations and switchyards has been established because these areas can have exposed high voltage conductors and equipment in confined areas that can be constrained in size. Switching is often done manually, but can also be done remotely and can occur without local awareness. The potential therefore to be in an area subject to arc flash is high.

Note:
When switching energized LV or HV Metalclad switchgear workers must wear face shields and gloves with an ATPV of at least 8 cal/cm² to protect their face and hands from the potential arc flash hazard. Class 1 rubber gloves with the leather protectors are considered to have an ATPV rating of at least 8 cal/cm².

- NOTE 1: This requirement for face shields and gloves does NOT apply to switching panel-boards or switchboards rated 240 VAC and below with moulded-case or insulated-case circuit breakers.
- NOTE 2: Some switchgear in substations have specific operating instructions including NO RACKING OUT OF CIRCUIT BREAKERS UNLESS DE-ENERGIZED. Refer to BC Hydro Safety Alert Series 2009 No.1 Metalclad Switchgear Risk of Internal Arc Failure

How to Wear FR Clothing

FR clothing performs best when, in addition to being the outer layer, it is also the layer closest to the skin. It may be worn over top of a first layer of clothes made of non-melting natural fibre (e.g., cotton, silk, wool, rayon), including undergarments and socks. Flammable undergarments (e.g. polyester) are prohibited. In addition, if the FR clothing is to provide the intended protection to the worker in an arc flash event, the clothing must be worn as follows when working in proximity to an arc flash hazard:

- Collars of FR clothing must be buttoned closed, and with sleeves and cuffs worn down and secured.
- The inner most layer of FR must be tucked in at the waist.
- Protective neck, head, hand and foot coverings must be worn if the occupational hazard warrants their use. Requirement will be documented in work procedures.
- Non-flame resistant clothing must not be worn over flame-resistant garment.

When working on or around energized conductors or equipment, a standard layer of FR clothing (i.e., shirt and pants with full coverage of arms, torso and legs) that provides an arc thermal performance value (ATPV) of at least 8 cal/cm2 will be worn.

Non Electrical Task-Specific Requirements

Refer to the Table in Appendix 3 that describes required clothing and footwear workers must wear to protect themselves from the hazards associated with their type of work. There may be site specific requirements due to equipment condition or vintage.

Ordering FR Clothing

If you need FR Clothing, there is an order form and instructions on the Safety Clothing Program webpage.

BC Hydro
Power smart

OSH Standard 602
Insulated Tools, Equipment and Rubber Gloves

OSH Standard 602
Insulated Tools, Equipment and Rubber Gloves

1. Scope

1.1 This standard covers the use, maintenance and testing requirements of insulated tools and equipment.

1.2 The categories of insulated tools and equipment include live line tools, live line guards, plastic barriers and cover-up, proximity and custom barriers, hydraulic hose, rubber gloves and other insulating rubber equipment.

2. Purpose

2.1 The purpose of this standard is to communicate acceptable practices for the safe use and care of insulated tools and equipment.

3. Standard

3.1 General

3.1.1 Insulated tools and equipment are used for work in energized high and low voltage environments. Preserving the dielectric integrity of these devices maximizes protection for workers.

3.1.2 Requirements for each category of insulated tools and equipment are specified in the Appendices and must be followed to ensure worker safety.

3.3.3 Only approved Field Testers and approved Safety Service Shops may perform tests, repairs and alterations to live line tools and equipment. See the approved lists on the Safety Service Shops.

4. Roles and Responsibilities

4.1 Workers

4.1.1 Workers are responsible for following applicable safe work practices and procedures for energized high and low voltage work.

4.1.2 Perform day to day visual inspection, cleaning and minor maintenance of insulated tools and equipment.

4.1.3 Ensure that line tools and equipment have valid test decals affixed prior to using them.

4.2 Front-Line Managers

4.2.1 Ensure employees are trained in the correct application and care of insulated tools and equipment.

4.2.2 Monitor programs for maintaining and testing of insulated equipment (e.g. washing rubber gloves, line hose, insulator covers and blankets).

5. Records and Documentation

5.1 Documents

5.1.1 An inspection log is to be kept to verify that adequate maintenance of covers and barriers is taking place.

6. References

6.1 WorkSafeBC Occupational Health & Safety Regulation Part 19

6.2 IEEE 978 Guide for In-Service Maintenance and Electrical Testing of Live Line Tools

6.3 CSA Standard C225 – Vehicle Mounted Aerial Devices

6.4 CAN/ULC (IEC Adopted Standards)

6.5 ASTM Standards

Appendix 1

Insulated Live Line Tools and Equipment Requirements

1) Live line tools are insulated tools that are designed for use on voltages greater than 750 V, including fibreglass reinforced plastic (FRP) tools (e.g. hotsticks, grip-alls, universal poles).

2) FRP tools must meet or exceed the requirements of ASTM F711 or equivalent.

3) 1.2 m (4 ft.) universal poles are:

   a. Only to be used as means of holding hand tools and other devices.

   b. Only to be used when appropriate Limits of Approach can be maintained.

   c. Never to be used for tying or untying tie-wires.

4) Lever type tools (e.g. MD6, Lever Jumper Holding Tool) of 1.2 m (4 ft) length are not to be used.

5) Only the top foamed filled section of a telescopic (extendable) live line tool (e.g. a switch stick) is to be considered insulating; the extendable hollow sections are not to be considered as insulation for determining the maximum voltage rating for this style of tool.

6) The maximum voltage rating of live line tools is determined by the clear insulation distance (includes fibreglass and plastic sections, excludes any metallic sections internally or externally). The clear insulation distance must be equal to or greater than the Qualified Electrical Worker LOA distance corresponding to the voltage that the tool will be used. Specific tools that do not meet this requirement may be still be approved for use, provided they are approved by a Professional Engineer and recorded on the BC Hydro Approved Tools List. Refer to the Tool Requirements for Insulated Live Line Tools for more information.

7) Live line tools and equipment must be marked with a valid TEST DUE date or decal from an approved Safety Service Shop or Field Tester in accordance with the “Testing and Maintenance Instructions for Safety Service Shops and Field Testers”

   a. The first test on all new live line tools must be from an approved Safety Service Shop.

   b. If the test interval is one year or greater, the tool may be used for a period of no more than two months beyond the TEST DUE date.

   c. If the interval is less than one year the tool may not be used beyond the TEST DUE date.

   d. Test intervals are set out in Table 1.

8) Damaged live line tools or equipment must be withdrawn from service and sent to an approved Safety Service Shop for repair.

9) Live line tools that do not have Qualified Electrical Worker LOA Distance of clear insulation as required by section 7 above must be approved by a Professional Engineer. The recommended criteria for this approval is that the clear insulation distance meets the requirements of the OSHA Live Line Work Minimum Approach Distances for the voltage range the tool is to be used on. Note that most major manufacturers design their tools according to these criteria

Appendix 2
Guards and Barriers Requirements

Live line guards and barriers fall into three categories:

- Plastic Cover-up
- Rubber Cover-up
- Un-tested construction awareness barriers

The effect of cover-up in relation to Worker Limits of Approach is detailed in Table 2.

1) Plastic Cover-up

i. Plastic cover-up (e.g. line guards, pole guards, arm guards, custom Lexan sheets) consists of single layer or spiral form plastic material and must be dielectrically tested.

ii. Commercially purchased plastic cover-up must meet ASTM F712, and only approved material may be used in the construction of custom covers and barriers. The manager of BC Hydro Work Methods, or a professional engineer, will provide design assistance to fit each individual requirement.

a) The design for Lexan sheets, linear polyethylene sheets and fabricated shapes must take the following into account:

- Holes for tie down purposes are to be drilled in each corner with 2.5 cm of material between the hole and sheet edges.
- The perimeter of clear barrier sheets must be marked with a 2.5 cm border of non-conductive paint.
- Use 1 cm polypropylene or nylon tie down ropes of adequate length for restraining the sheets and barriers from movement.
- For polyethylene sheets and fabricated shapes, use a medium density polyethylene material that is international orange in colour.

iii. Inspection and electrical testing of plastic cover-up must be carried out in accordance with the schedule in Table 1 by an Approved Safety Service Shop listed on the Safety Website.

iv. Plastic Cover-up must have a regular maintenance schedule for inspection and cleaning. It must be stored in a clean and dry location and treated as a live line tool.

2) Rubber Cover-up Requirements

Rubber Cover-up e.g. (Line hose, insulator covers, and rubber blankets) provides protection to workers and equipment from accidental contact with energized high and low voltage electrical apparatus.

i. Rubber cover-up is manufactured and tested in accordance with ASTM D1048, ASTM D1049, or ASTM D1050.

ii. Inspection and electrical testing of rubber cover-up must be carried out in accordance with the schedule in Table 1 by an Approved Safety Service Shop.

iii. High voltage rubber protective equipment that is left in service on energized lines or apparatus for extended periods of time, (e.g. overnight), must be removed, cleaned and visually inspected before re-use, and if suspect, submitted for electrical testing.

iv. Rubber goods that are damaged or show signs of leakage, must be immediately withdrawn from service.

v. Line hose is to be raised and lowered in hose bags. Blankets and covers are to be raised and lowered in a controlled manner, i.e. in a bag or with a hand-line hook inserted in a corner eyelet.

vi. Plastic or adhesive tape must never be used to hold rolled blankets since adhesive tape residue collects contaminants, which compromises the dielectric properties of the blanket.

vii. Bucket clamp pins (or suitable hooks) are to be used to secure the blanket to the edge of the bucket during rubber glove work when moving the bucket from one location to another or when stripping the line.

3) Untested Construction Awareness Barriers Requirements

i. Construction Awareness barriers (e.g. Instant Insulation) are used to increase the visibility of energized equipment during third party construction projects. They shall be of a high visibility orange or yellow material.

ii. They do not provide any dielectric protection, and therefore workers must observe Limits of Approach even with these barriers in place.

iii. These barriers are to be used only on voltages of 35kV (phase to phase) or less.

iv. Awareness barriers must be cleaned and inspected after removal and before returning to service if they have been in service for a total of 90 days or more. Any cover that has suspected damage must be removed from service. Damaged ends may be cut off if this is practical.

Appendix 3

Insulating Rubber Gloves Requirements

1) Rubber gloves must meet or exceed the requirements of ASTM Specification D120 or equivalent. Per ASTM D120, the rated Class of the glove shall be marked by the manufacturer on a tag on the glove.

2) All high voltage (Class 1 and above) insulating rubber gloves must be constructed of two contrasting colours in order to facilitate detection of cuts and tears during inspection.

3) All watches, rings and other jewellery must be removed before putting on gloves. The use of wool or cotton liners worn inside the gloves is recommended.

4) The rubber glove cuff must extend past the protector cuff by at least one inch multiplied by the Class number, and at least ½" for Class 0. This section must not be regarded as insulation.

5) Visual inspection and air testing of gloves must be performed before use and when damage is suspected.

6) Rubber gloves must not be worn inside out or without appropriate leather covers. Under no circumstances may the rubber gloves or the leather covers be used for any purpose other than rubber glove work.

7) Low Voltage Glove Requirements:

i. Definitions:

- Hazardous Low Voltage (HLV) – 31VAC – 750VAC or 150VDC – 750VDC

ii. For Hazardous Low Voltage glove requirements, please refer to SPR 418 – Rubber Glove Work.

Appendix 4

Live Insulator Washing Hose

Live insulator washing hose is electrically insulated hose used for washing energized electrical equipment.

1) Live insulator washing hose must have a minimum inside diameter of 2 cm (3/4”) and minimum burst rating of 27,600 kPa (4000 psi). Minimum unspliced length must be 4.5 m (15 ft) for use on voltages of up to 150 kV and 7 m (23 ft) for voltages between 150 – 500 kV.

   Note: For procedures and associated tools and equipment, see Insulator Washing Procedures in the Live Line Manual.

2) Live Insulator washing hose is subject to mechanical and dielectric testing at intervals set out in Table 1.

3) Live insulator washing hoses with cuts and/or kinks that penetrate deeper than the outer jacket or hoses that have rippled vinyl coating are to be tagged and immediately removed from service and/or sent to an approved Safety Service Shop.

Appendix 5

Hydraulic Hose

High-pressure Hydraulic Hose is hose that is rated for pressures greater than or equal to 34,500 kPa (5000 psi).

Low-pressure Hydraulic Hose is hose that is rated for pressures less than 34,500 kPa (5000 psi).

1) Insulated and non-insulated high-pressure hydraulic hose shall be subject to a mechanical test at intervals as set out in Table 1, and shall have a valid MECHANICAL TEST DUE decal affixed.

2) Insulated hydraulic hose that functions as primary insulation (e.g. hose used to actuate hydraulic tools during rubber glove procedures) requires dielectric testing at intervals as set out in Table 1. Only hydraulic hose that passes this test and that has a valid Test Due decal affixed may function as primary insulation. Hydraulic hose not used as primary insulated does not require dielectric testing.

3) Hydraulic hose must have a ratio of minimum bursting pressure to operating pressure of 3 to 1.

4) Hydraulic hose must be inspected in the field for defects and when required sent in for testing at an approved Safety Service Shop.

   i. **Hoses must be regularly inspected and maintained by the user in a manner consistent with other live line equipment maintenance.**

   ii. **Hose must not be hung on pressure points (e.g. over a nail in a wall).**

   iii. **Hose must be wiped clean before storing in a proper bag in a dry environment.**

   iv. **Hose ends are to be joined together or sealed where possible to avoid contamination of the oil.**

   v. **Hoses are not to be bent to a radius tighter than 14 times the hose diameter.**

   vi. **Hoses with cuts and/or kinks that penetrate deeper than the outer jacket or hoses that have rippled vinyl coating are to be tagged and immediately removed from service and/or sent to an approved Safety Service Shop.**

Table 1

Test intervals for tools and equipment

Item	Field Test	Safety & Service Shop Test
Live Line Tools	2 years – the test that follows a Field Test must be a Safety Service Shop test.	2 years – The test that follows a Safety Service Shop test may be either a Safety Service Shop or Field Test.
Tree Trimming Tools used by Certified Utility Arborists	—	1 year
Hydraulic Hose used as primary insulation (mechanical and electrical test – where applicable)	—	2 years
Insulator Washing Hose	—	1 year
Live Line Jumpers	—	1 year
Load Break Tools	—	2 years or 1500 operations (Whichever comes first – shop must be certified by manufacturer
Plastic and Custom Cover-up (not construction cover-up for 30M33)	—	2 years
Rubber Blankets, Line Hose, and Covers Class 0 to 4	—	1 year
Rubber Gloves Class 0, 1, and 3	—	6 months
Live Line rope and Barehand rope	—	1 year

Note: Test Intervals are based on applicable CAN/ULC and ASTM Standards

Table 2 – Worker Limits of Approach (LOA) in Relation to Cover-up

	A	B	C	D	E	F
	Tested Cover-up – Touching conductor	**Untested barrier/Cover-Touching conductor**	**Tested Barriers – Not touching conductor**	**Not tested – Grounded**	**Not tested – Not grounded – Uninsulated Equipment LOA**	**Not Tested – Not Grounded – Qualified LOA**
Examples	Rubber Cover-up blankets, Plastic cover-up	Construction cover-up	Lexan Sheet	Steel door or chain-link fence, doghouse enclosure ES 44 – 00051, 00052	Plywood or similar barrier mounted at Uninsulated Equipment LOA	Plywood barrier mounted at Qualified LOA
Where and how they are to be mounted	Touching conductor – applied by Qualified Electrical Worker	Touching conductor – applied by Qualified Electrical Worker	Not touching conductor – OSH 602 3.3.6 – Up to but not touching for 60kV and below with barrier tested to the voltage it is being applied to, no closer than Restricted LOA for voltages greater than 60kV.	Engineered secure mounting – solid barrier is desirable.	Must be securely mounted (must be able to withstand all foreseeable forces applied by worker and any equipment).	Must be installed de-energized or by qualified electrical worker using appropriate tools. A physical barrier is better at preventing contact than a 'rule' which provides for additional distance to the energized equipment. Must be approved by PEng.
Qualified Electrical Worker	Avoid contact	Qualified LOA	Avoid contact	Touch contact permitted*	Contact permitted	Contact permitted
Unqualified – Supervised by Qualified Electrical Worker	Uninsulated Equipment LOA	Uninsulated Equipment LOA	Avoid Contact	Touch contact permitted*	Work up to barrier but avoid contact	Work up to barrier but avoid contact
Unqualified, Unsupervised	Unqualified LOA	Unqualified LOA	Unqualified LOA	Touch contact permitted*	Work up to but avoid contact *(provided secure enough to prevent access outside defined work area.)	Not applicable to these workers – maintain Unqualified LOA from energized equipment.
Uninsulated Equipment Operated by Qualified Electrical Worker or unqualified who is supervised by Qualified Electrical Worker	Avoid Contact	Uninsulated Equipment LOA	Avoid Contact	Touch contact permitted*	Work up to barrier permitted.	Very dependent on level of barrier security compared to equipment being used around it. If barrier is mounted securely enough, the equipment could conceivable be permitted to operate up to but not in contact with the barrier.
Uninsulated Equipment Operated by Unqualified Worker	Unqualified LOA	Unqualified LOA	Unqualified LOA	Touch contact permitted*	Unqualified LOA	Unqualified LOA

*If barrier is not solid (e.g. chain-link fence) precautions are needed (plywood, signs, training, supervision) to prevent barrier from being defeated (e.g. tools or equipment projecting through barrier)

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BC Hydro
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OSH Standard 603
Work Area Barriers

OSH Standard 603
Work Area Barriers

1. Scope

1.1 This standard describes the application and use of work area barriers.

2. Purpose

2.1 The purpose of this standard is to communicate the installation criteria and requirements for work area barriers, and to outline the procedures for barrier deployment.

3. Standard

3.1 General

3.1.1 This standard describes methods by which work areas are to be clearly defined to help prevent workers from reaching hazards outside the work area and to make others aware of activity within the work area. This includes cordoning off the work area in order to establish its perimeter, and to control access to and from the work area. This procedure may be used to prevent pedestrian traffic from entering a work area (e.g. to cordon off a section of sidewalk when working overhead from a bucket truck). The use of work area barriers does not relieve workers of their responsibility to adhere to rules governing safe work practices.

3.1.2 This standard addresses the use of visual barriers to define work areas. The use of electrical proximity barriers may also be used to help define the work area. Use of electrical proximity barriers is described in OSH Standard 602 – Insulated Tools and Equipment.

3.2 Installation Criteria for Barriers

3.2.1 The manager or their delegate (e.g. foreman, sub-foreman or crew leader) is responsible for determining whether or not a work area will be cordoned off. This decision is to be made and documented during a pre-job planning or tailboard discussion. Factors that shall be considered include, but are not limited to:

- The requirements of WorkSafeBC regulation 19.18(2):
  "Barriers or distinctive identification must be used to differentiate high voltage electrical equipment which has been de-energized for safety reasons from similar energized equipment at the work location if lack of such identification would result in undue risk to workers."
- Work area(s) within an isolated zone will need to be defined by the use of barriers unless documented otherwise.
- Equipment testing areas usually need to be defined by the use of barriers unless documented otherwise.
- Hazardous areas (e.g. hatch covers removed) need to be defined by the use of barriers.

3.3 Barrier Requirements

3.3.1 Work area barriers at grade must be highly visible, non-conductive rope, chain or comparable material using standard yellow precautionary markings. Flags or tapes may be attached to the barriers to increase visibility. See Appendix 1 – Barrier Deployment Examples.

3.3.2 Barrier posts must be of sufficient height to allow the barrier to be securely strung above a grade at an elevation between 36 and 50 inches. Appendices 1 & 3 provide samples of suitable barrier posts.

3.4 Work Areas

3.4.1 Work area barriers will be used to establish the perimeter of a work area unless it has been predetermined in a documented pre-job plan or tailboard that barriers are not necessary.

Note: The person responsible for establishing the work area will take into account the similar appearance of substation equipment when planning work area boundaries.

3.4.2 Planned work is to be completed within the work area defined by the barriers. These areas are to be kept as small as practical.

3.4.3 The work area barriers will be placed under the direction of the work leader. Barriers must be in place before work commences, and may be disassembled only after all work inside the area is completed.

3.4.4 The perimeter of the work area will be established such that the contained work area is completely inside the isolated zone. Whenever possible, the vertical extension of the work area perimeter will also be inside the isolated zone.

- The perimeter of the work area will be such that workers inside the work area cannot reach all hazards that are outside the established work area and persons that are outside the work area cannot reach hazards that are inside the work area. (The extension of the workers reach provided by tools and equipment shall be considered and documented in the tailboard).
- The established perimeter includes any hazards above the work area. Electrical hazards in proximity above or beside the work area are to be isolated and grounded if practicable, otherwise physical or visual barriers must be installed to differentiate these electrical hazards from the de-energized work area. Proximity is to be judged using the requirements of SPR 401, plus consideration of any area that could be reached through inadvertent or unintended movement or positioning. Some examples of overhead visual barriers are shown in Appendix 3. Workers should consult a Trades Training Instructor or Safety Advocate for assistance if required.
- All defined work area boundaries shall be identified by the use of work area barriers completed with signs. A typical barrier sign will be two sided. On the Work Area side, the lettering will be black on a yellow background (see Appendix 2 – Two-sided Barrier Sign). This would indicate that area beyond the barrier would be considered the work zone. The opposite side of the sign facing inside the work area would have Danger High Voltage in black on a red background. This would indicate that all equipment on the other side of the barrier is to be considered live. Barrier warning signs must be placed in appropriate position(s) so that they are visible to all workers. Work areas must include a point of access that will be as small as practical through which tools and materials can be moved. All barriers and barrier signs must be highly visible.

Note:
Work Area Barriers are to be attached to independent stanchions placed for the sole purpose of defining the work zone. Structural steel may be used provided that it is not part of an isolation point or its use creates an excessively large work zone.

3.4.5 If work is required outside the established boundaries, this will necessitate a change in the work plan and a new documented tailboard shall be initiated. The new tailboard will include any requirements for new or re-defined work area boundaries.

3.5 Hazardous Areas

3.5.1 Conditions where inadvertent access could expose workers to hazards (e.g. equipment required to be temporarily left operating without adequate guards, hatch covers temporarily removed, etc.) shall be addressed by the use of barriers. Other circumstances may also dictate that barriers shall be erected to warn workers of potential hazards.

3.5.2 When a hazard has been identified, barriers shall be erected to warn workers of the potential hazard. All barriers shall have appropriately labelled warning signs that are visible from all access points stating "Keep Out", as well as identifying the nature of the hazard.

3.6 Testing Areas

3.6.1 Safety barriers for testing under Work Protection Practices (WPP) or under Safety Protection Guarantees (SPG) must be used to identify areas in which hazardous energy sources are introduced for test purpose. These barriers must have a single pre-determined point of entry/exit.

3.6.2 Danger High Voltage Testing warning signs visible from all access points must be posted on barriers.

3.6.3 Signs identifying work area access will state "Entering Work Area" on one side and "Leaving Work Area" on the opposite side. See Appendix 3 – Barrier Signs and Stanchions.

3.6.4 Flashing warning light(s) will further identify test areas when appropriate.

4. Roles and Responsibilities

4.1 Workers

4.1.1 Comply with procedures for barrier implementation, and ensure that barriers and barrier signs are, and remain, properly deployed.

4.1.2 Notify crew leader, supervisor or manager if work activity encroaches on defined work area boundaries.

4.2 Managers

4.2.1 Provide necessary assistance and guidance in establishing or re-defining work area boundaries.

5. References

5.1 SPR Section 700 Isolation and Lockout: WPP rules 701.10, 713.6 and 722.6

5.2 WorkSafeBC Regulation, "Isolation and Lockout," 19.18(2)

5.3 Local Operating Orders

5.4 Brady Catalogue Phone # 1 800 263 6179 (www.bradycanada.ca)

5.5 Hastings Catalogue (www.hfgp.com)

Appendix 1
Barrier Deployment Examples

Rope barrier using on-site fabricated steel stanchions

Plastic chain barrier using on-site fabricated steel stanchions

Appendix 1
Barrier Deployment Examples

Rope barrier using Bradylink stanchions stock # 92112.
Barrier bases weighted with sand or water.

Bradylink plastic chain and barrier stanchions.
Barrier bases weighted with sand or water.

Catalogue # 92122 for posts
Catalogue # 78234 for 1½" chain

Hastings Telescopic Barriers with Traffic Stanchions

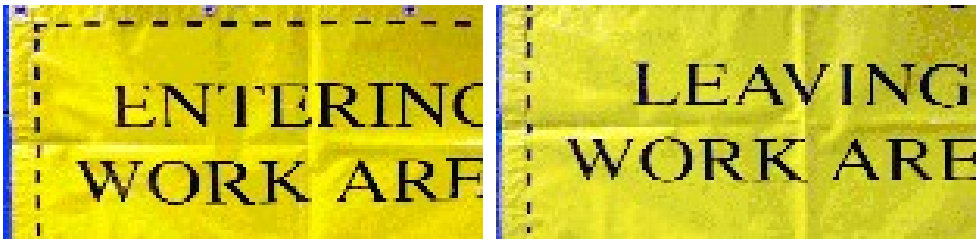
Hastings Telescopic Barrier Bar (51" to 85")
Hastings Part # 6850

Appendix 2
Two-Sided Barrier Sign

Work Area display face – two-sided barrier sign BCH stock # 96003504

Danger High Voltage display face – two-sided barrier sign BCH stock # 96003504

Appendix 3
Barrier Signs and Stanchions



18" X 30" two sided vinyl Barrier Sign with 2½" lettering – BCH stock # 96004025

Danger High Voltage or Energized Bus Above signs (45cm x 30cm) in 3 ml Sintra plastic – available through Sherine Industries Ltd. (1 800 665 0566)

7" X 10" two-sided yellow plastic sign with 2" lettering for "Caution" and 1"lettering for "Entering/Leaving work area"

Danger High Voltage (BCH stock #97000508) or Energized Bus Above (BCH stock #97000509) signs (45cm x 30cm) in 3 ml Sintra plastic

1) Traffic cone
2) Bradylink stanchion - stock # 92116
3) Site-made steel base stanchion with plastic post
4) Site-made all steel stanchion

Stanchion Wrap Signs:
Left: Danger – High Voltage Above
BCH stock #97001725
Right: Danger – Energized Bus Above
BCH stock #97001726

Example:

Barrier Sign: 8" x 24" Vinyl LOA Danger
Ordering Instructions: BCH stock #97002483

BC Hydro
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OSH Standard 609
Ladders

OSH Standard 609
Ladders

1. Scope

1.1 This standard applies only to the planned, or actual, use of fixed and portable ladders for BC Hydro work activity.

2. Purpose

2.1 The purpose of this standard is to provide corporate ladder use policy, principal safety requirements, and direction to other applicable standards, regulations or similar references to ensure ongoing safe work practice and regulatory compliance in ladder use.

3. Standard

3.1 General

3.1.1 Ladders are available, necessary, and considered acceptable apparatus for a wide variety of applications and activities in electrical utility work. A ladder may be used for access (ascent or descent), or it may be used temporarily for work positioning and execution. Ladder use must conform to WorkSafeBC OHS Regulation Part 13.

3.1.2 Consideration must be made for the use of a work platform, scaffolding, or an aerial lift device as an alternative to ladders whenever practicable. If work cannot be performed from a ladder without undue hazard to a worker, a work platform must be provided. (WorkSafeBC Regulation 13.6).

3.1.3 Depending on the nature of the intended ladder work and its assessment of risk, using a ladder during work at heights can be considered high hazard work. If this is the case, the requirements of OSH Standard 122, Job Planning, must be followed including the use of the Hazard Barrier Reference form to assist in identifying and documenting appropriate barriers on the tailboard.

3.1.4 Ladders must be confirmed to be appropriate for the work application and inspected for overall condition and work readiness before use. Refer also to Safety Practice Regulation (SPR) rule 308.

3.1.5 See Appendix 1 for the safe application of ladder related fall protection systems and also refer to OSH Standard 608 – Fall Protection.

3.2 Fixed Ladder Fall Protection

3.2.1 A fall arrest system will be used with ladders under the following conditions:

- A fixed ladder over 7.6 m (25 ft) without an approved cage.
- A fixed ladder with an approved cage over 15 m (50 ft).

3.2.2 A permanent fall protection system for fixed ladders shall be one of three types:

- A rail or cable running the entire length of the flight. This system must meet the requirements of ANSI A14.3-1992 when used as fall restraint, or CSA Z259.2.1-98 when used as fall arrest.
- A vertical synthetic rope lifeline rated as per ANSI A14.3 1992.
- A self-retracting lifeline.

3.3 Portable Ladder Use and Fall Protection

3.3.1 When working from a portable ladder, the requirements of WorkSafeBC Regulation 13.5 and the related guidance provided in Appendix 1 on ladder positioning, securement and use must be followed.

When ladders need to be secured for safe use, the worker may climb the unsecured ladder for the purpose of securing it prior to commencing work.

3.3.2 When working from a portable ladder above 3 m (10 feet) above grade (measured from the waist):

The use of fall protection is not required when:

- Performing “light duty tasks” for sporadic, short-term work.

The use of fall protection is required when:

- Work on a portable ladder is likely to exceed 15 minutes at one spot.
- A hazard exists that is greater than the fall impact on a flat surface.
- Working in proximity to high voltage equipment.

3.3.3 Per SPR 802.2 (a), for work from an unsecured ladder at a height of greater than 3 meters (10 feet) above grade there must be a second person present that is qualified and equipped to render or request emergency assistance.

3.3.4 Ladders made of wood, fibreglass, and aluminum are approved for general use. See SPR 308 and SPR 516.3 for rules using metal ladders.

3.3.5 All job-built ladders must conform to WorkSafeBC Standard LDR 1-2004.

3.3.6 Ladders in poor condition must be clearly labelled “Do Not Use” and removed from service for repair or destruction.

4. Roles and Responsibilities

4.1 Workers

4.1.1 Comply with the provisions of this standard and all referenced regulations as required.

4.2 Supervisors

4.2.1 Ensure available equipment is in good working order

4.2.2 Ensure fall protection provisions are established, understood, and in place

4.2.3 Confirm all elements of the safe work plan are in place before ladder work proceeds

5. Records and Documentation

None required.

6. References

6.1 ANSI Standard A14.3-1992, Safety Requirements for Fixed Ladders

6.2 CAN/CSA-Z259.2.1-98 (R2004)-Fall Arresters, Vertical Lifelines and Rails

6.3 OSH Standard 608 – Fall Protection

6.4 WorkSafeBC OHS Regulation Part 13, Ladders, Scaffolds and Temporary Work Platforms

6.5 WorkSafeBC OSH Guidelines Part 11 (G11.2(5)3, Fall Protection

6.6 WorkSafeBC Standard LDR 1-2004 (Job Built Ladders)

6.7 Safety Practice Regulations, Rules 308, 802.2 (a) and 516.3

7. Glossary

7.1 Fall Protection – A generic term embracing any Fall Restraint or Fall Arrest systems, equipment, work plans and work procedures that are used to minimize the risk of falling, and reduce or eliminate any possible injury resulting from a fall.

7.2 Fall Restraint – A work positioning system that prevents a worker from falling from a work position, or a travel restriction system such as guardrails or a personal fall protection system that prevents a worker from reaching to an edge from which the worker could fall.

7.3 Fall Arrest – A system that will stop a worker's fall before the worker hits the surface below (e.g. a full body harness with a shock absorbing lanyard connected to an approved anchor).

7.4 Self-retracting lifeline – Consists of a reel of stainless steel cable or nylon webbing that locks when an abrupt force is applied to the exposed section of the line. It is used as a fall arrest device and attaches to the back (dorsal) D ring of a full body harness.

Revision Rationale:

OSH Standard 609 V3-1 (Updated March 31, 2016): Clarification of section 3.1.3 for considering working from a ladder as high risk.

OSH Standard 609 V3-0 (Updated February 10, 2016): General rewrite of the standard to ensure alignment with and proper reflection of WSBC regulations, plus BC Hydro requirements from the Safety Practice Regulations. Note: Additional minor edit made February 22, 2016 removing 'measure from the waist' from section 3.3.2. Work height is to be measured from level being stood upon, the same as for fall protection.

Appendix 1

Fixed and Portable Ladder Safety

Application of Permanent Fall Protection Systems for Fixed Ladders

1. Vertical synthetic rope lifelines shall be connected to a permanent anchor having a minimum load capacity of 22 kN (5,000 lbs).
2. When a rope lifeline is suspended along the side of a fixed ladder, the back (dorsal) D ring on a full body harness shall be used to connect to the lifeline via a 0.6 m (2 ft) lanyard that is integrally sewn with a rope grab.
3. The chest (sternal) D ring shall be used only with systems that are fixed to the centre of the rungs, and attached to the rail or cable of a fixed ladder via a 23 cm (9 in) connector.

Light Duty Work from Portable Ladders

This will apply when working off of any kind of portable ladder doing a "light duty task," such as inspection or painting, where the ladder will be at any one spot for sporadic, short-term work. Portable ladders include step ladders as well as extension step ladders.

Examples of sporadic short-term work:

- Temporary service pole connections
- Gaining access to roofs
- Brief Communications Protection and Control (CPC) work on pole-mounted recloser controls
- Inspection of exterior vents, gutters, and window seals;
- Caulking;
- Touch-up painting; and,
- Maintenance-type work (such as changing light bulbs).

1. Portable ladders must:
    - Be placed on a firm and level base to achieve a secure footing, or they must be lashed or held in position and,
    - Be positioned so that the horizontal distance from the base to vertical plane of support is approximately ¼ of the ladder length
    - Be positioned far enough away from an edge or floor opening to decrease the potential fall distance.
2. Where positioning of ladders stated above is not possible due to physical site limitations such as fences, sloping ground, obstructions, etc. the following criteria shall be used, in the order shown:
    - A second person will be present and the ladder will be suitably secured, or
    - A scaffold will be erected, by a competent person, to reach to the work location.
3. Workers will keep their centre of gravity (i.e. waist) between the side rails of the ladder, and, will have one hand available to hold on to the ladder or other support to maintain three points of contact.

4. Ladders used to gain access to a roof or other areas must extend at least 0.91 m (3 ft) above the support.
5. Ladders must not be modified.
6. Ladders must not be lashed together to make them longer.
7. Not more than one person may be on any ladder at one time.
8. At least one hand will be in contact with a ladder rung when climbing up or down the ladder. While climbing or descending, heavy or bulky objects shall not be carried, nor any other objects which may make ascent or descent unsafe.

There are CSA-approved products on the market, such as Laddermaster, Stabilad and Safe Set Ladder Base, which can be used to adapt regular ladders to uneven surfaces.

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