ESAFE-220

WPP Category B: Safely working under WPP in a BC Hydro Facility

April 2025

Participant guide

BC Hydro
Power smart

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Course introduction

Welcome to ESAFE-220 WPP Category B – Safely working under Worker Protection Practices (WPP) Category B in a BC Hydro Facility.

This course was developed by BC Hydro to train workers in safe work policies and procedures of power systems and in the principles and practices of WPP Personal and Group Lockouts.

Approximate time required to complete: **5.5 hours**.

Audience

BC Hydro employees or contractors who wish to qualify for authorization to WPP Category B or higher.

Prerequisites

ESAFE-122 PSSP Category 2 / WPP Category A Basic Safety in BC Hydro Facilities.

Course goal

This course is the System Component training required for Worker Protection Practices (WPP) Category B authorization.

The goals of this course are for students to fully understand the basic procedures for Safety Protection and the processes for applying Safety Protection at BC Hydro *and* to carry out their roles and responsibilities as WPP Category B workers.

Course objectives

At the end of this course, students will be able to:

1. Identify the types of hazardous energy to be encountered in real-life work.
2. List the methods used to control and eliminate hazardous energy associated with electrical and mechanical equipment.
3. Describe the roles and responsibilities for establishing safe working conditions on the BC Hydro power system.
4. Identify the roles that a Category B worker can assume under lockout.
5. Explain the responsibilities of the Category B worker in these roles.
6. Explain when Group Lockouts are used in place of Personal Lockouts.
7. Identify the purpose of each type of lock and tag used in WPP Lockouts.
8. Identify the responsibilities of the Category B worker under Personal and Group Lockout.
9. Describe the use of the “Danger – Do Not Operate” tag in WPP Lockouts at Non-Integrated Area (NIA) workplaces.

Course topics

- Safety on the power system
- Elements of safety protection
- Safety protection roles and responsibilities
- WPP Category B Worker
- Introduction to Lockout
- Personal Lockout
- Group Lockout

Completion requirements

Students will write an exam after completing this course for WPP category of authorization.

Lesson 1 Safety on the power system

Purpose: The purpose of this lesson is to provide an overview of the types of hazardous energy to be encountered when working on the BC Hydro power system and the methods of protecting from those hazards.

Objectives: On completion of this lesson, you will be able to:

- Classify the various types of hazardous energy on the power system.
- Explain the Limits of Approach table.
- Describe how barriers and signs can protect workers.
- Summarize the use of protective equipment to control electrical energy.

Topics: This lesson covers the following topics:

- Safety protection at BC Hydro
- Hazardous energy
- Avoiding hazardous energy

Safety protection at BC Hydro

All work on BC Hydro's power system is governed by the rules and requirements defined in the Safety Practice Regulations (SPR). To ensure that these requirements are applied consistently and systematically, BC Hydro has one safety system with two comprehensive, integrated Safety Protection processes:

- Power System Safety Protection (PSSP) is used for work on the Transmission and Distribution networks and in Non-Integrated Areas.
- Work Protection Practices (WPP) is used for work on equipment in Integrated and Non-Integrated Generating Stations and Non-Integrated Substations.

Both PSSP and WPP are designed to ensure that safe working conditions are established before anyone goes to work on power system equipment. Each process defines:

- Procedures for establishing safe work conditions.
- Roles and responsibilities for participation in those procedures.
- Systems for training and authorizing workers to assume specific roles and responsibilities.

Safely working under WPP in a BC Hydro Facility provides basic training for all workers who require authorization to work under WPP. It is a prerequisite for authorization to WPP Category B.

Note

In this course, the term power system includes generating stations, high-voltage circuits, substations, transformers, reactive equipment, and distribution circuits as well as other equipment used in the production, transmission, and distribution of electrical energy. The power system can also include equipment under construction.

Hazardous energy

In *Basic Safety in BC Hydro Facilities*, you learned about some of the general hazards that are present at BC Hydro worksites and the safety precautions you must take when you work in BC Hydro facilities. You learned that:

- Safety consists of eliminating or controlling hazards to remove or reduce the risk of injury or death.

When working with or on power system equipment, the greatest danger is in coming into contact with **hazardous energy**, which the *Safety Practice Regulations* define as:

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

The most common hazardous energy on the power system is electricity. However, in your work, you will also encounter many other types of hazardous energy.

Let's take a closer look at the main types of hazardous energy and some examples of where you might encounter them.

Mechanical energy

Mechanical (or "kinetic") energy is the energy that an object has because of its linear or rotational motion. It is the kinetic energy in a moving vehicle that injures a pedestrian when it hits them. On the power system, sources of hazardous mechanical energy include:

- Internal combustion engines
- Hydraulic, gas and steam turbines
- Fans
- Cranes
- Generators
- Generating unit governors
- Circuit breakers

Operating machinery can be very hazardous, since it can snag your clothing, tools, or body parts. According to SPR 309:

- The moving parts of all machinery must be protected with appropriate guards.
- These guards must never be removed while the equipment is in operation.

When you are maintaining or repairing mechanical equipment, you must ensure that it cannot start up or move in a way that could cause injury or death.

Hydraulic energy

Hydraulic energy is the energy stored in a liquid under pressure. Many kinds of equipment use oil under high pressure to move large parts or objects. These include:

- Cranes and aerial lifts
- Circuit breakers
- Hydraulic actuators used to operate turbine intake gates

In hydroelectric generating stations, water under pressure can also pose potential hazards. Water passages, such as tunnels, surge tanks, penstocks and scroll cases, are fed by high-pressure, high-volume sources of hydraulic energy. Work inside such passages exposes a worker to a potentially uncontrolled release of water into the work area, with no easy means of escape. Protective measures must be taken to ensure that the water cannot be released into the passages.

Pneumatic energy

Pneumatic energy is the energy stored in compressed air or other gasses. High-pressure air or gas is used in equipment such as:

- Circuit breakers
- Pneumatic tools
- Generator braking system
- Governor hydraulic accumulators
- Compressed steam, in thermal generating stations

Before starting work on any equipment or machinery that has stored energy in the form of compressed air or other gases, you must follow proper procedures to safely release and isolate the pneumatic energy. An example is with generator braking systems. Before working on the generator brakes, the compressed air needs to be isolated and drained/vented to ensure the brakes cannot operate. It should be noted that additional isolation is required to perform this task.

Chemical energy

Chemical energy is the energy released from chemical reactions. Dangerous chemicals are present in equipment such as:

- Gas insulated systems and switchgear using Sulphur Hexafluoride (SF_6) gas
- CO_2 or deluge systems
- Batteries and battery rooms
- Treated wood poles
- Water treatment plants

When working on equipment that contains chemical energy, extreme caution must be taken in following proper procedures to control and/or eliminate the possibility of a release of, or exposure to, the chemicals or its by-products. An example is when working on or around SF_6 gas filled equipment. The SF_6 gas inside the equipment may be released in an uncontrolled manner and so precautions need to be taken. This may include but is not limited to the gas needing to be removed from the equipment and special PPE worn to protect against the harmful by-products that may be present in the equipment.

Energy in springs

Compressed and extended springs contain potential energy that can be dangerous if released in an uncontrolled fashion. Springs are used in many types of mechanical devices, including:

- Circuit breakers
- Hydraulic valves
- Overhead doors

Before starting work on any device that contains a spring, you must take care to release the spring's energy in a safe and controlled manner according to safe work procedures and/or equipment manufacturer recommendations.

Energy in elevated objects

Elevated objects also contain potential energy that could pose a risk. Because of the force of gravity, such objects could fall if they are not properly secured. Examples of dangerous elevated objects include:

- Any equipment or material raised by a hoist, crane, or jack.
- Raised spillway or intake gates at a generating station.

While the force of gravity cannot be eliminated, measures must be taken to ensure elevated objects cannot fall on workers. If this is not possible, workers must be kept clear of the area under the elevated object.

Thermal energy

Thermal energy is contained in very hot and very cold objects. It is the result of mechanical work, radiation, chemical reaction, or electrical resistance. Thermal energy can cause severe burning or freezing. It is found in:

- Steam and gas turbines
- Boilers
- Internal combustion engines

When working around such equipment, you must ensure that you maintain a safe distance as outlined in site-specific training. Before repairing or maintaining such equipment, you must shut it down and allow it to cool down or warm up.

Electrical energy

The most common hazardous energy on the power system is electricity. You have already learned some of the dangers of electrical energy in *Basic Safety in BC Hydro Facilities*:

- Electrical shock can produce severe burns, blindness, and death.
- Contact with even low voltages can be fatal.
- You don’t have to touch high-voltage conductors to get a shock.

The primary protection against electrical hazards is to maintain the Limits of Approach: keep all parts of your body, as well as your tools and equipment, far enough away from the electrical source that there is no risk of injury.

However, when you are working on the power system, this is not always possible. In many cases, you need to work on—or very close to—electrical equipment and conductors. Such work requires special precautions to eliminate or control the electrical hazard.

Note

When you are working in a high-voltage electric field, an electrostatic charge is induced in your body, similar to the static charge you get when you shuffle your feet on a carpet. When you then touch a conductor, this energy can be discharged, giving you a small shock, commonly called a “bite.” Although this type of shock will not hurt you, it can cause you to jump, which could cause you to fall or to touch an energized conductor.

Working safely around hazardous energy

Whether you are working on power system equipment, or simply working close to it, it is critical to ensure that you are protected from all hazardous energy. Protection can be attained through:

- **Avoiding** the hazardous energy, by observing the Limits of Approach, or erecting barriers or other protective equipment.
- **Eliminating** the hazardous energy, by isolating the equipment from the energy sources and securing the isolating devices (using tags or locks).
- **Controlling** the hazardous energy, by providing means of dissipating it (e.g., grounding or draining) or rendering it ineffective (e.g., blocking).

Note

In practice, a combination of these approaches is used on most jobs, but it is important that you understand the differences so you can use them appropriately.

Information

See OSH 110 for more detail.

Avoiding hazardous energy

In this section, we discuss the methods of avoiding hazardous energy. In the next lesson, we will discuss the methods of eliminating and controlling hazardous energy.

Observing the Limits of Approach

Observing the Limits of Approach (LOA) when you are around high-voltage electrical equipment is the primary way to protect yourself against the hazards of electrical energy.

In *Basic Safety in BC Hydro Facilities*, you learned the following:

- The Limits of Approach are a means of avoiding the risk of shock through **arcing**, by staying beyond the maximum distance that a particular voltage can arc through the air.
- Unqualified Workers are required to work at the distances specified in the *Unqualified Worker* column. If supervised by a Qualified Electrical Worker, you may work at the distances specified in the *Uninsulated equipment or Unqualified Worker and their equipment when continuously directed by a Qualified Electrical Worker* column.
- You must consider your reasonably likely movement—including the movement of any tools and equipment you are using or operating—when planning your worker positioning, so that you can always maintain your limits of approach (see SPR 402).

Figure 1. Maintain your Limits of Approach

Note

While there are no formal Limits of Approach for mechanical equipment, the same principle applies. The best protection against mechanical hazards is to maintain a safe distance.

Who is qualified?

Your manager is responsible for determining whether you qualify for Limits of Approach authorization and will authorize you as Qualified LOA or Unqualified LOA based on specific criteria.

OSH Standard 201 section 4 specifies clear criteria for determining worker qualifications:

- **Qualified Electrical Workers** must meet the requirements of 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).
  - Successfully complete SAFE-401 or equivalent training received through a BC Hydro Apprenticeship.
  - Be authorized to at least PSSP Category 5 or WPP Category C**.**
  - Receive BC Hydro Manager Authorization.
- **Qualified Electrical Workers in Training** must be from one of the recognized trades or technical worker classifications in OSH 201 section 4.1.1. They shall be authorized to Unqualified Worker limits of approach and to at least PSSP Category 3 or WPP Category B. These workers may work up to Qualified LOA distances specified in SPR Table 401 if all of the following are met:
  - They are working under the direct and continuous supervision of a Qualified Electrical Worker authorized to Qualified LOA.
  - They are working in accordance with the Level Requirements, established by the A&TTC or the Engineering GTT Subcommittee.
- **Unqualified Workers** are those who do not meet the requirements for Qualified Workers or Qualified Electrical Workers in Training.
  - Workers that do not meet the requirements stated in sections 4.1 to 4.3 of OSH 201 are considered unqualified. These workers must maintain Unqualified Worker LOA distances.

Information

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.

Table 401
Limits of Approach (LOA)

Nominal Voltage (kV)	Actual Voltage Range Phase to Phase	Qualified Electrical Worker		Uninsulated equipment or Unqualified Worker and their equipment when continuously directed by Qualified Electrical Worker		Unqualified Worker	
		m	ft	m	ft	m	ft
.751 to 35	751V to 40kV	0.75	2.5	1.20	4	3.00	10
60	40kV to 75kV	0.90	3	1.50	5	3.00	10
138	75kV to 150kV	1.50	5	2.40	8	4.50	15
230	150kV to 250kV	2.10	7	3.00	10	4.50	15
287	250kV to 325kV	2.60	8.5	3.70	12	6.00	20
345	325kV to 425kV	3.00	10	4.30	14	6.00	20
500	425kV to 550kV	3.70	12	4.90	16	6.00	20

Figure 1. Limits of Approach (LOA) Table 401

Using protective equipment

In many cases, it is not possible to maintain enough distance between workers and hazardous equipment. In these cases, the next best protection is to use protective equipment to prevent workers (and the public) from being injured by the equipment.

Work area barriers and warning signs

The simplest method of controlling hazardous energy is to erect barriers and warning signs to prevent workers from being exposed to harmful energy. Work area barriers and signs may be used to define both safe work areas and hazardous areas. Refer to OSH Standard 603 for information on Barrier Standards.

For a **safe work area**, barriers are placed around the border of the work zone to prevent workers from approaching hazards. For example, work area barriers may be placed to prevent workers from approaching too close to an open access hole or to equipment undergoing maintenance.

Hazardous areas are areas where work activities (such as testing of equipment) could result in the transmission or release of energy that could be dangerous to other workers. In these cases, it is necessary to use barriers and signs to limit access to authorized personnel through appropriately posted points of entry/exit.

Hazardous area zones need to be large enough to prevent unauthorized personnel from accidentally coming into contact with any hazardous energy sources in the zone. Warning signs indicating “Authorized Personnel Only” must be posted within sight lines around the perimeter of the hazardous area.

Each defined hazardous area zone must have one or more entry/exit points displaying:

- Information about the potential hazards in the area.
- The name of the worker responsible for the work inside the zone.

Hazardous area zones may require flashing warning lights at points of entry and exit.

Approved electrical protective equipment

The electrical industry has developed various kinds of insulating equipment that eliminates the danger of arcing and thus enables workers to work very close to live electrical equipment. Examples are Lexan barriers and high-voltage rubber hoses, hoods, and blankets.

- Under special circumstances, if a worker needs to work closer than the distance specified for their level of qualification, a qualified electrical worker must apply approved protective equipment to protect the worker from contact or arcing injuries.

Caution

OSH Standard 602 must be consulted before using insulated tools and equipment.

Figure 2. Work area barriers defining safe work area

Figure 3. Work area barriers defining a hazard zone

Using live-line methods and tools

For some types of electrical work, particularly on the transmission and distribution systems, it is necessary to work on equipment while it is still energized.

Only Qualified Electrical Workers who have received training in the use of live-line methods, live-line tools and approved protective equipment, can work on energized equipment. To perform live-line work, the workers must receive a Live Line Permit for the work in question.

The rules for live-line work are specified in SPR section 400, while the procedures and techniques are taught in specialized trades training courses.

We will **not** be addressing live-line work any further in this course.

Note

When using live-line tools, workers must observe the Limits of Approach.

Figure 4. Use of live-line tools

Lesson 2 Elements of safety protection

Purpose: The purpose of this lesson is to explain the basic elements of safety protection.

Objectives: On completion of this lesson, you will be able to:

- Identify methods of isolating equipment from sources of hazardous energy.
- Describe what an equipotential zone is and how it is established.
- Explain the purpose of mechanical blocking.
- Explain how locks and tags contribute to worker protection.

Topics: This lesson covers the following topics:

- Introduction to safety protection
- Isolation of equipment
- Worker protection grounding/bonding
- Mechanical Blocking
- Securing protection: locks and tags
- Equipment to be treated as energized

Introduction to safety protection

BC Hydro's Safety Protection systems, PSSP and WPP, specify procedures for eliminating and controlling hazardous energy to ensure equipment is safe to work on. These procedures include the following elements:

- Isolating (disconnecting) the equipment from all primary sources of hazardous energy.
- Applying worker protection grounding/bonding and/or mechanical blocking to protect against accidental re-energization or movement.
- Locking or tagging the isolation points and the grounding/bonding and blocking devices to ensure they are not restored or removed while work is in progress.

Three sections of the *Safety Practice Regulations* are dedicated to the rules and requirements for isolating equipment and securing the protection:

- SPR section 500 specifies general rules about isolation, worker protection grounding/bonding and mechanical blocking.
- SPR section 600 specifies the requirements for work on the Transmission and Distribution systems. These form the basis of Power System Safety Protection (PSSP).
- SPR section 700 specifies the requirements for work in the Integrated and Non-Integrated Generating Stations and associated facilities. These form the basis of Work Protection Practices (WPP).

Isolation of equipment

The primary means of controlling hazardous energy in a piece of equipment is to **isolate** the equipment from its primary energy sources. Isolation is slightly different for electrical and mechanical equipment, but the principle is the same.

Electrical isolation

For electrical equipment, isolation is relatively straightforward. The SPR states that electrical equipment is isolated when "the normal sources of hazardous energy have been disconnected by opening and securing all associated switches or by making a line or bus cut."

When you open a switch or cut a feeder line, normal sources of electrical energy are effectively eliminated from the equipment.

However, opening a switch on a high-voltage circuit is itself quite hazardous, because of the possibility of arcing. Only specially trained and authorized workers can perform switching or make line or bus cuts.

For detailed information on making line or bus cuts, see the *Temporary Line Cuts* work procedure.

Mechanical isolation

For mechanical equipment, isolation is more complex. The SPR states that mechanical equipment is isolated when it "has been rendered and secured non-operative by installing a blank in a pipeline, closing a valve, depressurizing, draining, venting, or other effective means."

Isolating mechanical equipment includes both disconnecting the primary sources of hazardous energy and dissipating any residual energy in the system. Here are a few examples:

- To isolate a device that is operated hydraulically, you must shut down the hydraulic pump and close a valve to remove the primary source of energy and open another valve to remove the hydraulic pressure.
- To isolate a gasoline or diesel engine, you must disconnect the starter battery either physically or by means of a disconnect switch. You may also be required to close a valve in the fuel line. Without energy to the starter, the engine cannot be turned over inadvertently, and without fuel, it cannot be started. It should be noted that neither of these measures by itself ensures complete immobilization of the engine, and certain maintenance tasks will require further isolation.

Worker protection grounding/bonding

When electrical equipment or conductors have been isolated from the sources of electrical energy, it is not yet safe to work on them. As stated in SPR 513.2, isolated equipment can be accidentally re-energized in various ways, including the following:

- Electromagnetic or electrostatic induction (from wind dust storms, adjacent conductors, power cables, static capacitors, etc.)
- A power source
- Contact with crossed or fallen conductors
- Lightning (direct or indirect)

Worker protection grounding/bonding is a method of ensuring electrical energy is controlled in the event of accidental re-energization or induction. It consists of two components:

- All conductors in the work area are “bonded” together with flexible copper leads.
- The bonded conductors are connected to ground.

Note

Induction is often unavoidable and constant in some isolated lines. Worker protection grounding/bonding continually bleeds this electrical energy to keep the lines safe for work.

Equipotential zones

Properly applied bonding forms an **equipotential zone**, a work area in which all conductive materials are always at the same voltage. In such a zone, workers are safe because there is no difference in voltage between conductors.

Connecting the bonded conductors to ground ensures that:

- All conductors remain near ground voltage.
- Any electrical charge is quickly dissipated.
- Any energization from an electrical fault result in immediate tripping of protection devices (circuit breakers or fuses) to stop the current flow.

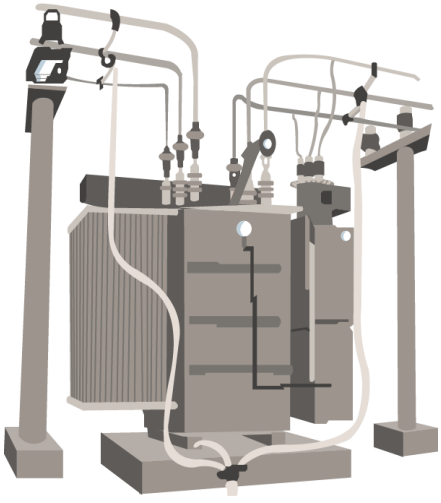


Figure 5. Equipment connected to the station ground grid

The illustrations that follow show examples of worker protection grounding/bonding used to establish equipotential zones. Note that the **pole band** in the second illustration eliminates any voltage difference between hands and feet that would result from the resistance of the wood pole.

Note

The ground grid in stations (which you learned about in *Basic Safety in BC Hydro Facilities*) functions as a built-in equipotential zone. When any conductor is accidentally energized, the entire facility rises to near the same voltage, thus minimizing step and touch hazards. Of course, when you isolate equipment in the station, you must connect it to the ground grid as well, to ensure it is part of the equipotential zone.

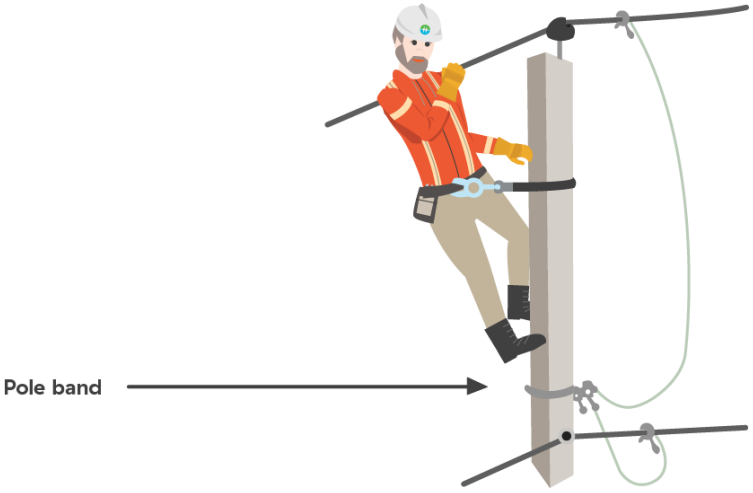


Figure 6. Use of pole band to eliminate voltage difference between hands and feet

Figure 7. Ensure that worker protection grounding/bonding is applied

Mechanical Blocking

Like worker protection grounding/bonding, blocking controls accidental energization of isolated equipment. Mechanical blocking prevents unintended movement (such as sliding, falling, or rolling) that might be harmful to workers. Such unintended movement may be introduced by:

- Accidental de-isolation
- Forces introduced by the work being done
- External forces (such as gravity)

A good example of mechanical blocking is the use of wheel chocks on vehicles to prevent them from rolling, either when you are using them to perform work or when you are working on them (changing a tire, for example).

Other examples of mechanical blocking:

- An axle stand placed under a jacked-up vehicle to prevent it from falling in the event the jack fails.
- Metal “horseshoes” placed on the hydraulic cylinders that operate the wicket gates on a generating unit to prevent the wicket gates from moving even if hydraulic pressure is accidentally applied.
- “Dogging beams” or steel pedestals placed under raised intake gates to prevent them from falling during maintenance.

Figure 8. Worker applying mechanical blocking (horseshoe) to hydraulic cylinder

Securing protection: locks and tags

Isolating equipment and applying worker protection grounding/bonding or blocking devices together provide a safe environment in which to work—but they do not ensure it.

If someone else comes along and closes the switch, opens the valve, or removes the blocking device, a very dangerous situation is created.

To fully ensure safety, it is necessary to **secure** the isolating, grounding/bonding, and blocking devices so they cannot be switched or removed inadvertently by anyone other than the worker who applied them.

On the BC Hydro power system, two methods are used to secure these devices:

- On the Transmission and Distribution systems, under PSSP, a “Do Not Operate” tag is attached to every device that is switched for safety protection purposes.
- In the Integrated and Non-Integrated Generating Stations and their associated facilities, under WPP, locks are placed on the protective devices.

Note

In many applications, “system” locks are used to secure switches and other devices in position to keep workers or the public from tampering with the device, for operational reasons. Such a lock is shown in the top photograph on the next page. These system locks must not be confused with the locks used for safety protection purposes.

Figure 9. PSSP tag

Figure 10. System locks

Figure 11. WPP locks

Equipment to be treated as energized

SPR 504 states that workers must treat all equipment as energized until it has been isolated, grounded/bonded and blocked, and tags or locks have been applied according to either PSSP or WPP procedures.

Before the equipment is completely tagged or locked out, you must:

- Observe the Limits of Approach for electrical equipment.
- Stay clear of mechanical equipment.
- Use approved protective equipment and tools when approaching or working on the equipment. For example, you must use an insulated tool (a hotstick) to connect a ground led to an isolated conductor.

Figure 12. Ensure there is a Safety Protection Guarantee or lockout in place and check that it is appropriate for your work

Reminder

No equipment is safe to work on until a full PSSP tag-out or WPP lockout is in place

Lesson 3 Safety protection roles and responsibilities

Purpose: The purpose of this lesson is to introduce the key roles and responsibilities for BC Hydro's safety protection processes.

Objectives: On completion of this lesson, you will be able to:

- Identify the authority responsible for safety protection in your area of the power system.
- Explain the responsibilities of the Person in Charge (PIC).
- Explain the purpose of alphanumeric identifiers.
- Explain the purpose of the PIC's Mimic Display.
- Indicate the purpose of pre-job conferences and tailboard meetings.

Topics: This lesson covers the following topics:

- Responsibility for operating the system
- Division of authority for work on the system
- The Person in Charge (PIC)
- System operation and safety aids
- PSSP roles and responsibilities
- WPP roles and responsibilities
- Job planning and communications
- Personal safety responsibilities

Responsibility for operating the system

BC Hydro's power system is a very complex structure. It incorporates:

- 30 hydro-electric generating stations
- 2 thermal generating stations
- 18 diesel generating stations
- Over 79,000 kilometres of transmission and distribution lines
- Interconnections with the Alberta and American power systems and with independent power producers
- Connections with tens of thousands of industrial, commercial, and residential customers

BC Hydro T&D System Operations has the overall responsibility for operating the power system to provide a safe and reliable source of energy for our customers. BC Hydro has two control centres:

- Primary control centre: Fraser Valley Operations in Langley
- Backup control centre: Southern Interior Operations in Vernon

The Control Centre in Langley is normally responsible for operating the integrated Generating Stations and the Transmission and Distribution systems to produce and distribute power. The control centre in Vernon is a completely redundant backup centre that takes control in unusual circumstances.

Besides the main power system, BC Hydro has several separate **Non-Integrated Areas** (NIA). These systems, in remote areas, consist of one or more generating stations and a distribution network for providing power to local customers. Each NIA has a control facility that is responsible for its operations.

Note

The responsibility to operate the power system to produce, transmit and distribute electrical energy is known as **operating responsibility**.

Division of authority for work on the system

Any work on the power system—to maintain, repair, replace or construct lines and equipment—has to be carefully managed for two reasons:

- To ensure that it can be carried out without disrupting the supply of power to the customers.
- To minimize the risk of injury to workers by establishing a safe work environment.

To ensure the safety of workers while maintaining the power supply, BC Hydro has assigned the role of authorizing work activities and establishing safety protection as follows:

- BC Hydro's control centre has responsibility for authorizing and directing all work on the Transmission and Distribution systems.
- Each Integrated Generating Station has responsibility for authorizing and directing all work on the equipment within its boundaries, which may include part of the switchyard associated with the station.
- Each Non-Integrated Area is responsible for authorizing and directing all work on the generation, substation, and distribution equipment within its boundaries.

Note

The right to control an assigned portion of the power system for the purposes of establishing the conditions for safe work is known as **operating authority**.

The Person in Charge

Each designated portion of the power system has one Person in Charge (PIC), who is assigned the role of controlling all work being done within the area:

- For work on the Transmission/Distribution networks, the operators on duty at the control centre assume PIC duties for the equipment under their control. There is always a PIC on duty at the control centre.
- For work in an Integrated Generating Station, an authorized worker is assigned PIC duties for the portion of the station that is being worked on. In most generating stations, there is no resident PIC when no equipment is isolated, or no changes are being made to existing safety protection.
- For work in Non-Integrated Areas, an authorized worker assumes PIC duties either for a specified shift or when required to establish safety protection in a station.

Only the PIC on duty has the right to authorize work and to establish safe conditions for that work to be carried out. Anyone who needs to perform work on power system equipment must contact the PIC and arrange for whatever safety protection is required.

Note

PIC is not a job title. It is a role that a trained and authorized worker assumes when they sign on for specific duties. At any time, there is only one PIC for any one portion of the power system.

The PIC's responsibilities

The PIC assumes both operating responsibility and operating authority for the equipment under their control. They have sole responsibility to operate the system and sole authority to establish work protection. This dual role ensures that no other individual can make any changes to the system that might place a worker in danger.

The PIC is responsible for:

- Deciding whether the work can be done without jeopardizing the power supply.
- Checking whether the workers requesting safety protection are qualified to perform the work.
- Planning and implementing (or directing) the isolation of equipment.
- Maintaining a record of the status of all equipment under their control, including the details of all safety protection measures.

System operation and safety aids

To ensure consistent and clear communication about equipment on the power system, and to facilitate operations and control, BC Hydro has established the following measures:

- Equipment identification scheme
- Operating Orders
- Operating one-line diagrams
- Isolation schematics
- Mimic Display

It is important that you understand each of these measures so you can perform your job efficiently, effectively, and safely.

Equipment identification

As mandated by SPR 505, every piece of equipment on the BC Hydro power system, from switches and fuses to transmission lines and stations, has been assigned a unique numeric or alphanumeric identifier.

For electrical equipment, the identifier usually has three parts. For example:

- 60CB8
  - The first number identifies the voltage of the device. In this case, the number 60 indicates 60 kV.
  - The letters in the middle identify the type of equipment. The letters CB in the example means this is a circuit breaker.
  - The last number distinguishes this particular device from other similar equipment in the system. In this case, this is 60 kV circuit breaker number 8.
- 5D21 indicates 500 kV disconnect switch number 21.
- 5L72 indicates 500 kV transmission line number 72.

In some cases, the identifier has a prefix that indicates the location. For example, REV5D21 indicates the 500 kV disconnect number 21 at Revelstoke. At generating stations, the identifier may have a suffix indicating the generating unit. For example, 13VT3G2 indicates the 13.8 kV voltage transformer number 3 for generating unit 2.

Mechanical devices have slightly different identification schemes, but the principle is the same: every device has a unique identifier.

An example is a valve with the unique identifier: 3/4G1GV10.

3/4 indicates the pipe size, G1 identifies it as on generator #1 and GV10 distinguishes it as governor valve #10.

Whenever any worker refers to a piece of equipment in conversation or in writing, they must use the correct identifier. This minimizes the risk of workers attempting to perform work on the wrong device and so placing themselves in great danger.

Operating Orders

The BC Hydro control centre and every generating station and substation has a set of **Local Operating Orders** (LOOs) for the portion of the power system under its control. Local Operating Orders are documents that describe:

- The power system equipment in a portion of the power system.
- Any special procedures and precautions for operating, maintaining, and repairing the equipment.
- The security, evacuation, rescue, and other procedures for the area.

BC Hydro has System Operating Orders (SOOs) that provide information and define policies and procedures for the system as a whole.

Operating one-line diagrams

An operating one-line diagram is a schematic representation of equipment in a portion of the primary Generation, Transmission and Distribution system. On the diagram:

- Each electrical device is represented by a symbol and its alphanumeric identifier.
- Non-electrical devices (such as the water passages and gates in hydro-electric generating stations) are itemized in a list.

Equipment that is shown or listed on operating one-line diagrams is under direct control of the Person in Charge (PIC) of that portion of the system. No other worker can operate this equipment without the PIC's permission. Electrical equipment shown on the one-line is categorized in Levels I to IV, according to voltage.

Equipment that is **not** shown or listed on operating one-line diagrams may be operated for the purpose of safety protection without first getting the PIC's permission, as long as system risk is assessed, and the operation does not affect the primary power system. If the system can be affected, the PIC's permission is required. Equipment in this group is categorized in Level V. Examples of this type of equipment are transmission cable oil pumping system, high-voltage distribution lines that can be isolated by a single device, low-voltage distribution lines, and low-voltage station equipment.

Operating one-line diagrams are used extensively by authorized workers to plan and execute safety protection. To take responsibility for your own safety, it is important to:

- Learn how to interpret the diagrams, including the symbols used for different types of devices.
- Become familiar with the diagrams for the area or station in which you work so you know what conditions affect your work.

PSSP/WPP boundary at BC Hydro generating stations

Because different BC Hydro safety protection practices are used on the transmission and distribution systems (PSSP) and in the generating stations (WPP), it is critical that everyone understands precisely where the boundary between the two practices lies. When you need to work on any piece of equipment near a BC Hydro generating station's fence, you have to know whether to apply PSSP or WPP procedures.

Usually, WPP rules and procedures apply to equipment in the BC Hydro generating station itself and to equipment in the station switchyard.

To ensure that there is never confusion over who is in charge and which safety protection practices apply, the boundary between PSSP and WPP at each station is:

- Clearly defined in a joint or Local Operating Order, in terms of the devices to which WPP practice applies.
- Depicted as a dotted line on the operating one-line diagrams for the station and the transmission system.

When you are working close to a BC Hydro generating station boundary, whether on the Transmission/Distribution side or the Generating Station side, you must be aware of the boundary and which safety protection process applies to the equipment you are working on.

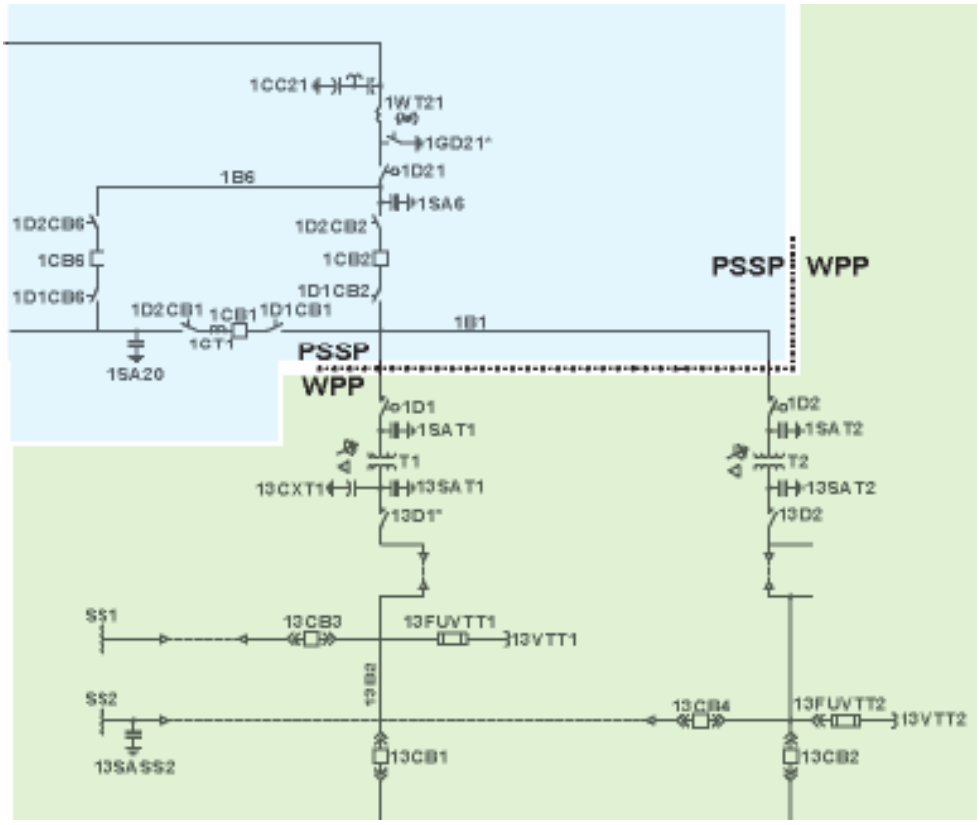


Figure 13. Part of operating one line showing the PSSP/WPP boundary

Unit isolation schematics

BC Hydro generating stations have a unit isolation schematic for each of their generating units. The unit isolation schematic displays the:

- Hazardous energy sources
- Pipes and electrical conductors in the system
- Devices for isolating the unit

The unit isolation schematic is used as a visual aid for understanding and planning isolation. It cannot be used to identify or distinguish equipment levels or to determine whether the PIC's intervention is required.

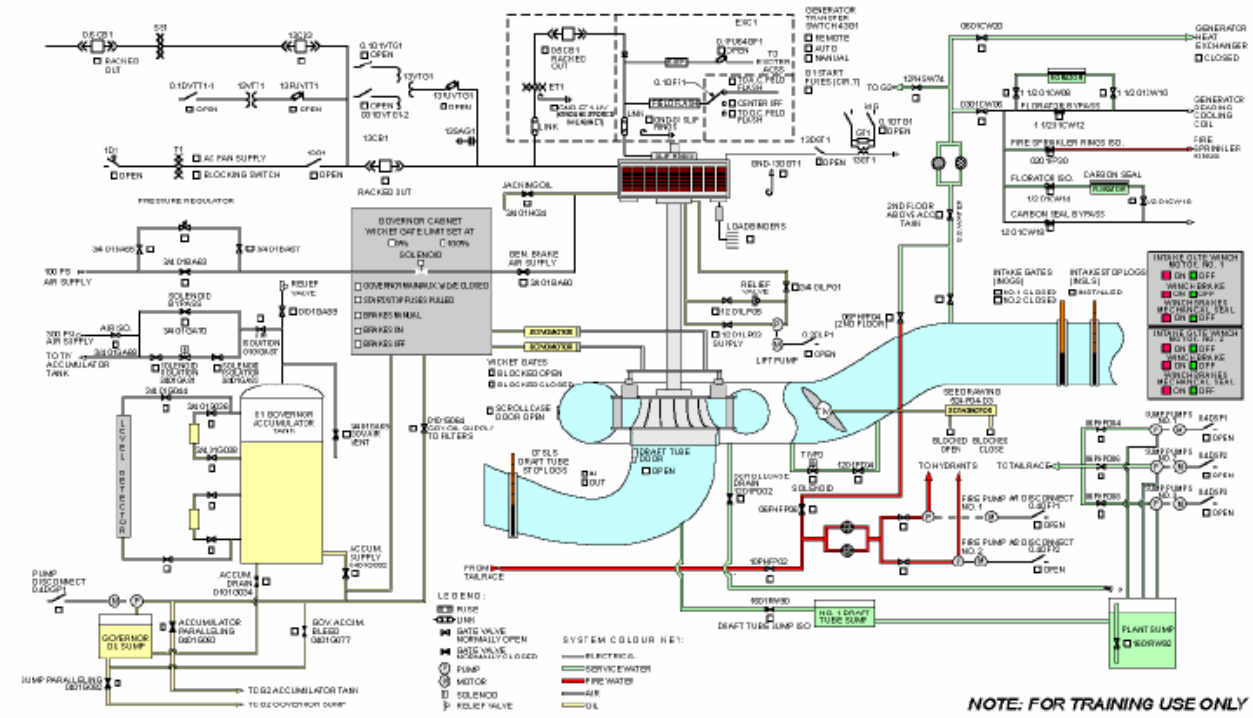


Figure 14. Unit isolation schematic

Mimic Display

Every PIC maintains an official representation of the portion of the system under their control, called the **Mimic Display**. The Mimic Display shows the configuration of the system and the current status of each device in the system. It is the PIC's primary device for planning and implementing safety protection for workers.

The Mimic Display may be an electronic display (in the control centre), an operating one-line diagram, or a unit isolation diagram (in BC Hydro generating stations). Each PIC has only one Mimic Display at any one time, so there can be no confusion about the current state of the system.

Before signing on for PIC duties, it is the worker's responsibility to review the Mimic Display carefully, so they have a clear understanding of the work being done and the status of all equipment within their area of responsibility.

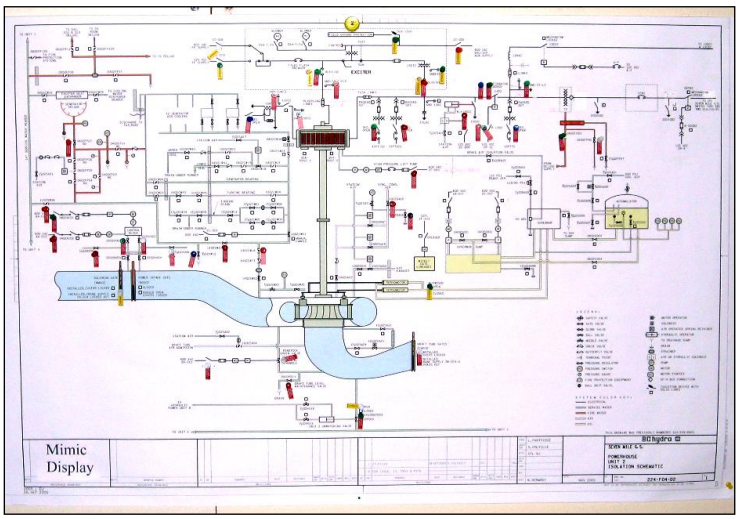


Figure 15. one line diagram

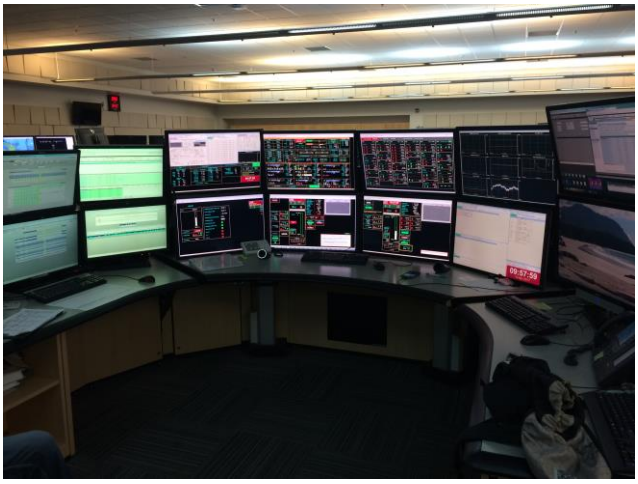


Figure 16. Mimic displays

Your notes

PSSP roles and responsibilities

PSSP uses **Safety Protection Guarantees (SPGs)** to ensure that lines and electrical or mechanical equipment are isolated and safe to work on. A Safety Protection Guarantee is a stated assurance that a specified line or piece of equipment is isolated and that it is safe to apply grounding/bonding and blocking. There are several types of SPG, which are used for different types of work on the system.

With a Safety Protection Guarantee:

- The PIC initiates or directs the isolation of equipment, including the application of Do Not Operate tags to the switching devices, then issues the SPG to a worker authorized to PSSP Category 5 or 6 (the SPG holder).
- The SPG holder applies or directs the application of the necessary worker protection grounding/bonding and blocking devices.
- Both the PIC and the SPG holder document the details of the protection on Safety Protection forms, and the PIC updates the Mimic Display to show the status of the equipment.
- The safety protection provided by these measures applies to all workers in the SPG holder's crew. The SPG holder is responsible for explaining the risks and the protections to every crew member.

The use of SPGs makes it possible for one PIC to oversee the work being performed over a large geographical area and provides the flexibility required to work on equipment that might be miles from the isolation points.

Note

If you are seeking authorization under PSSP, you will learn more about your roles and responsibilities within the process in the PSSP Category 3 course.

WPP roles and responsibilities

WPP uses personal and group lockouts to ensure that electrical or mechanical equipment is isolated and safe to work on.

Under personal lockout procedures, each worker attaches their personal locks on each isolation, grounding/bonding and blocking device to ensure that work protection is not removed before all work is completed.

For group lockout (GLO):

- A worker who is authorized to WPP Category D at the station signs on as PIC for the group lockout.
- The PIC identifies the hazardous energy sources for the work to be done, records the isolating, worker protection grounding/bonding and blocking devices and their status on a group lockout sheet, lists the switching steps on a switching order, and issues the switching order.
- Once a group lockout is in effect, each worker reviews the safety protection measures and attaches their personal lock to the group lockout board before going to work.
- Workers remove their locks when they leave the site or complete their work.
- While the PIC is responsible for establishing safe work conditions, each worker is ultimately responsible for their own safety, through the application and removal of their personal locks.

The use of personal locks for work protection is well adapted to the generating station environment, in which a large number of workers might be working on several projects within a fairly restricted space. Additionally, it is also well suited to NIA diesel generating stations and associated substations where a few workers might be working with a small number of isolating devices.

Protection devices cannot be restored or removed until every worker has removed their personal locks.

Note

If you are seeking authorization under WPP, you will learn more about your roles and responsibilities within the process in the subsequent lessons.

Job planning and communications

A key element of both PSSP and WPP is job planning and communication. Pre-job conferences and tailboard meetings provide the opportunity to apply safety protection procedures to the requirements of a particular job and to communicate the plans to all workers.

Pre-job conferences

Pre-job conferences are held before a large or complex job begins so that the participating crews can coordinate the work they are doing and fully discuss the hazards involved, the safety protection required, and any other issues or concerns. These conferences include representatives from management and from the BC Hydro and contractor crews that are involved in the work.

Pre-job conferences include discussions of:

- The nature of the work.
- The composition of the work force.
- The type of equipment to be used.
- Any constraints imposed by the job location and working environment.
- Scheduling of crews' activities.

Contractors and crew leaders are responsible for briefing their personnel on the plans defined at the conference.

For further details on pre-job conferences, see OSH Standard 122 and Generation Safe Work Standard 108.

Tailboard meetings

SPR rule 106 requires documented tailboards to be held for all high hazard work involving one or more workers:

- Before work commences each day.
- And/or whenever there is a significant change in the work plan.

A documented tailboard is also required for switching, even if the only work being done is switching.

The purpose of the tailboards is to ensure that everyone participating in the job understands:

- The work to be done.
- The hazards involved.
- The multiple independent barriers to be put in place for each hazard.
- Other precautions to be taken.
- Their own roles and responsibilities.

OSH 122 says that each hazard with the potential for fatality or permanent disability must be confirmed and individually recorded on the applicable job planning/tailboard form.

Information

See OSH 122 for more details.

Every documented tailboard form must be retained for two years.

At the tailboard meeting, the worker in charge reviews the following information:

- All the known hazards and the multiple independent barriers that will be put in place for each hazard.
- The scope and sequence of tasks for 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 barriers to establish safety zones.
- Environmental conditions which could impact the work.
- Communication requirements and the systems that will be used.
- Rules and regulations applicable to the work being performed.
- Required personal protective equipment.
- Emergency plans, first aid, rescue plans, emergency response contacts and locations.
- Other work that could affect the work area.
- Worker experience and knowledge of the job at hand.

It is your responsibility as a crew member to make sure you understand the job, the hazards, the protection, the procedures, and your own role and responsibilities. If you have any concerns, communicate them clearly in the tailboard meeting and make sure they are resolved to your satisfaction. Before beginning work, you must initial the tailboard form to indicate that you are satisfied with the plans and safety precautions for the job.

If you miss the tailboard, you must contact the work leader and complete a tailboard discussion and initial the tailboard form before beginning work.

Personal safety responsibilities

BC Hydro's safety protection policies and procedures are intended to establish a safe working environment for everyone who works on the power system. However, only **you** can ensure that the environment is safe for the work you are doing and that you work safely in that environment.

In order to take responsibility for your own safety:

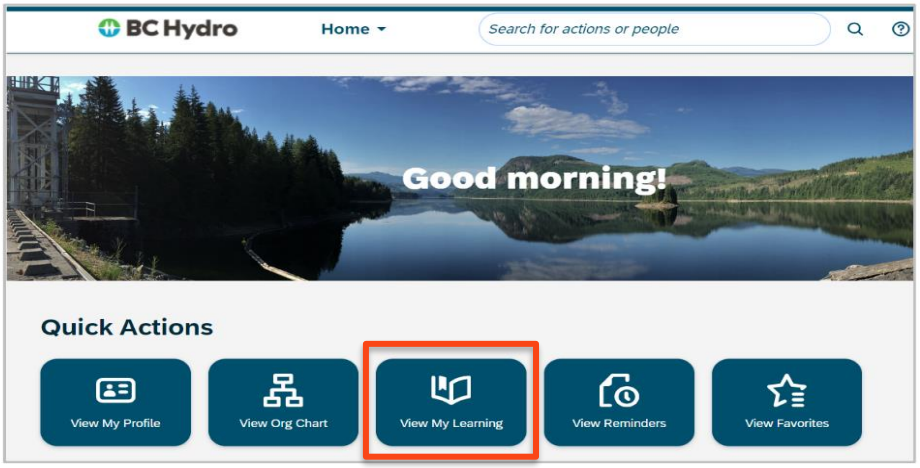
- Be sure you understand your category of authorization, the limits of what you are allowed to do, and the procedures you must follow.
- Make sure you understand the equipment you are working on and the potential hazards of the work you are doing.
- Make sure you understand the protection that has been put into place and are confident it serves your safety.
- If you have any questions or concerns, communicate with the SPG holder, work leader, or the PIC for the project. It is their responsibility to respond to any concerns you might have.
- In everything you do, exercise care and caution to ensure your own safety, as well as the safety of your fellow workers and the public.

PSSP/WPP Authorizing Manager Request

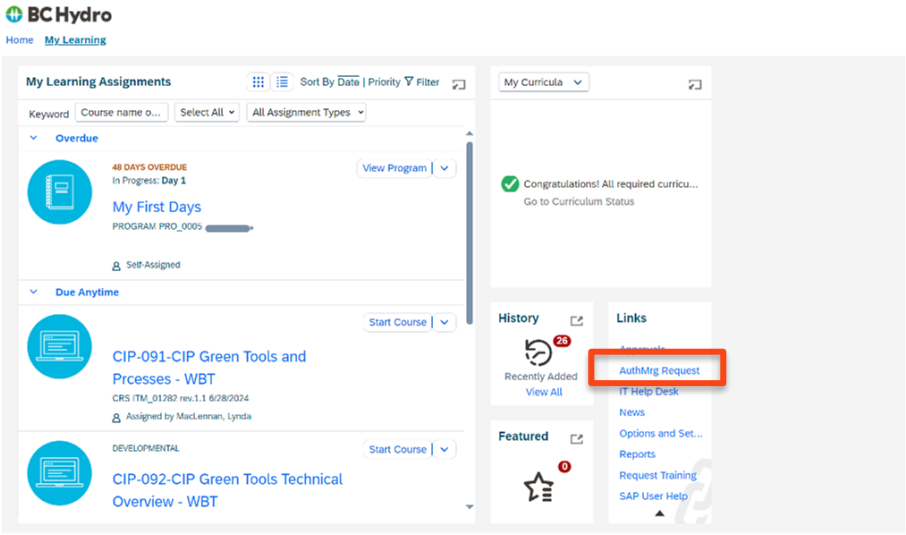
It is important you understand how to submit an authorizing manager request. Be sure to pay close attention to the steps and accompanying screenshots.

Steps

1. From the Success Factors homepage, select **View My Learning**.



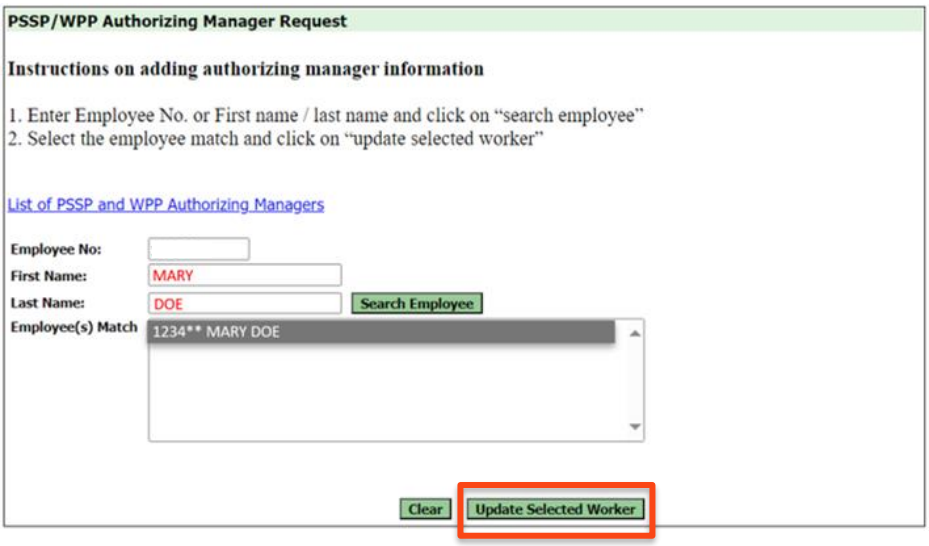
2. Under **Links** in2. Under **Links** in the **My Learning** tab in Success Factors, select **AuthMrg Request**.



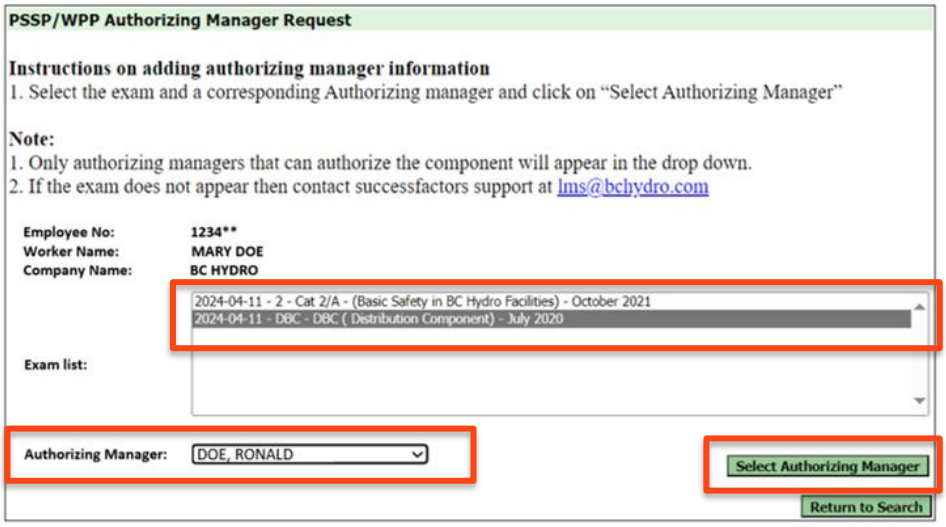
3. Selecting the link will take you to the PSSP/WPP Authorizing Manager Request.

   On the first screen:

   - Enter your first and last name, then click on Search Employee.
   - Select the correct worker if more than one name displays.
   - Click on Update Selected Worker.



4. On the second screen:
   - Select the exam.
   - Using the dropdown menu, choose your Authorizing Manager.
   - Click on **Select Authorizing Manager**.



Lesson 4 WPP Category B Worker

Purpose: The purpose of this lesson is to provide an introduction to the duties and responsibilities of the Work Protection Practices (WPP) Category B worker.

Objectives: On completion of this lesson, you will be able to:

- Identify the responsibilities workers are authorized to assume under the WPP Categories of authorization.
- Identify tasks that the Category B worker is and is not authorized to perform with respect to WPP lockout.
- Explain the roles that a Category B worker can assume under WPP lockout.

Topics: This lesson covers the following topics:

- Introduction to WPP
- WPP Categories of Authorization
- The WPP Category B Worker

Introduction to WPP

In the previous course, Working on the Power System, you learned that Work Protection Practices (WPP) is used to establish safe conditions for working on power system equipment in all BC Hydro Generating Stations and NIA Substations.

WPP incorporates:

- A strict set of procedures, using Personal and Group Lockouts, to establish safety protection for different types of work.
- A hierarchical system of authorizing workers to perform different roles within those procedures.

WPP is governed by the rules and requirements of BC Hydro's Safety Practice Regulations and WorkSafeBC's Occupational Health and Safety Regulation.

Your safety, as a worker in a BC Hydro Generating Station, depends on your understanding of WPP and your roles and responsibilities within it.

In this course, you will learn what you need to know to work under WPP Lockout as a WPP Category B worker.

WPP Categories of Authorization

WPP Categories of Authorization relate only to the workers' level of authority with respect to Safety Protection.

The higher the authorization level, the more responsibility the worker is allowed to take for Safety Protection. Achieving a higher level of authorization requires formal training (such as this course), as well as experience with the Safety Protection mechanisms and technologies.

Category	Authorization
A	• Access a generating station or associated facility
B	• Place a personal lock and work under WPP • Act as Host • Test Leader
C	• Prepare Personal Lockout for equipment not identified on the operating one-line diagram • Visually check Group Lockout • Coordinate testing under a Group Lockout
D	• Perform PIC Duties

Any worker can assume responsibilities below their level of authorization. For example, a Category D worker may not always work as the PIC but might perform work at the Category C level.

The WPP Category B Worker

Category B personnel are a diverse group that includes:

- Driver / helpers
- Temporary workers
- Contractor's workers
- BC Hydro construction workers

Authorization and Limitations

Category B workers are authorized to assume the following roles:

- Securing their own protection for work under lockout by placing personal locks. For personal lockouts, the Cat B worker must be directed by a Cat C or D worker when applying personal locks.
- Acting as a Host by supervising an unauthorized visiting worker.
- Acting as a Test Leader for testing under a lockout.
- Acting as a Work Leader under group lockout.

Category B workers are not permitted to:

- Plan a lockout.
- Isolate power system equipment.
- Apply or remove worker protection grounding / bonding or blocking devices.

As a Category B worker, you must know what you are authorized to do and never assume the responsibilities for which you are not authorized. Any violation of this rule is a serious safety infraction.

Working under Lockout

When you are working under lockout, you must:

- Attend and participate in tailboards so that you understand the risks, the work protection in place, and the roles of all workers involved.
- Review the lockout sheet and ensure the isolation, grounding / bonding, and blocking devices provide the isolation of hazardous energy sources that is appropriate for the work you will do.
- Apply and remove your personal locks according to WPP procedures for personal and group lockout
- Follow the directions of the PIC or other authorized workers when there are changes to the lockout.

Host

Workers who are not authorized to at least Category B are not normally permitted to work under WPP lockout. However, SPR 701.3 allows unauthorized workers access to protected equipment if they are “under the direct and continuous supervision” of a host who is:

- Authorized to at least Category B at the facility.
- Currently locked on to the lockout in question.

As a host, it is your responsibility to sign out sufficient locks for the visitor to use for the lockout. The visitor must attach their locks to all protective devices under the supervision of a worker authorized to Category C or higher.

Once the visitor has locked on, it is your responsibility as host to:

- Maintain sight and voice contact with them at all times.
- Ensure that they stay within the safe work zone for the job.

Test Leader

The test leader is the worker responsible for overseeing a specific test procedure to ensure that sources of test energy do not create a hazard to other workers. We will discuss this further in Lesson 7.

Work Leader

A work leader is a person, regardless of title or classification, who assumes specific responsibilities within the Lockout process. We will discuss the work leader role further in Lesson 7.

Lesson 5 Introduction to Lockout

Purpose: The purpose of this lesson is to provide an overview of WPP lockout procedures and to explain some of the essential components of lockout.

Objectives: On completion of this lesson, you will be able to:

- Identify the general policies and principles of WPP lockout.
- List the major differences between Personal Lockout and Group Lockout.
- Recognize the different types of locks and identify their uses in WPP Lockouts.
- Recognize the Attention tag and when it is used in WPP.
- Explain the role and responsibilities of the WPP PIC.

Topics: This lesson covers the following topics:

- WPP Lockout Policy
- Types of WPP Lockout
- WPP Locks
- WPP Tags
- Role of the PIC in Lockout
- Guarantees of Isolation (GOIs)

WPP Lockout Policy

Part 10 of WorkSafeBC's Occupational Health and Safety Regulation, "De-energization and Lockout," defines the requirements for lockout in BC. In that document, lockout is defined as: "the use of a lock(s) to render machinery or equipment inoperable or to isolate an energy source in accordance with a written procedure."

BC Hydro's process for lockout at all Generating Stations and NIA Substations complies with all the requirements of the Regulation and applies them to the unique conditions and circumstances of the Generating Station environment. The policies, rules, and procedures for WPP lockout are specified in the Safety Practice Regulations Section 700.

SPR 701 states the general policy for WPP lockout. The following are some important rules governing lockout:

Section	Description
701.1	If the energization or startup of equipment or the release of a hazardous energy source could cause injury, the energy source must be isolated, grounded/bonded and/or blocked, and locked out prior to the start of work…
701.2 **701.3**	Only workers who have been trained and authorized in WPP procedures may access or work on protected equipment, except … visitors … who are under the direct and continuous supervision of an authorized worker.
701.4	Each worker who accesses or works on protected equipment shall ensure the isolation of hazardous energy sources is appropriate for the work they will do and shall maintain control over the isolation through the application of personal locks according to the requirements in this section. The worker must have full knowledge of the hazardous energy that has been isolated, the boundaries of the safe work area, and the safety procedures for the job.
701.5	If two or more workers will be using the same isolation, they shall attend a documented tailboard to discuss all aspects of the isolation, the hazards of the job, and the work plan….
701.8	A personal lock is to be used for the sole purpose of work protection and may be placed only by the worker to whom it has been assigned
701.9	A personal lock shall be removed only by the worker who placed it. When this is not practicable, the matter shall be referred to the facility manager, who shall be responsible for its removal, according to the requirements in this section (SPR 725).

Types of WPP Lockout

In compliance with WorkSafeBC requirements, WPP defines separate procedures for Personal Lockout and Group Lockout. The following table outlines the basic differences between personal and group lockouts:

Personal Lockout	Group Lockout
• Each worker places a personal lock on each isolating, grounding / bonding, and blocking device. • Cat B workers must be directed by a Cat C or D worker when placing personal locks.	• Typically used where there is a large number of isolating devices or a large number of workers. • Two authorized workers lock out all isolating devices independently. • PIC places keys in a key box. • Each worker places a personal lock on the key box to secure their protection.

Note

Category B workers are permitted to lock out shop equipment and auxiliary equipment that is not directly associated with the power system if there are less than three isolating devices.

Information

Workers must follow the lockout procedures posted at the equipment, as specified in SPR 708.5.

WPP Locks

To secure protective devices, WPP uses three types of locks: Personal, Group, and Visitor.

All locks used for lockout are American Lock Model 1105 locks. These are high-security aluminum locks that are supplied with two keys, one of which is retained at the facility or headquarters in a secure key cabinet. This key cabinet is kept locked at all times, with the facility Manager and the Regional Manager each having a key, to ensure that these “back-up” keys cannot be accessed by unauthorized personnel.

Where it is not practical for the facility Manager to access the key cabinet for lock removal purposes, an additional key to the key cabinet may be stored at the facility in a “code access” key box.

All locks are engraved with a code XXX-XXX-XXX representing the facility and the purpose for which the lock is used (GRP = group lock, PER = personal lock, VIS = visitor lock). This code is followed by a unique number identifying the lock or lock set.

For example, GMS-VIS-21 would identify visitor’s lock number 21 at GM Shrum Generating Station.

Personal Locks

Personal locks are red and are issued as individually keyed locks or in sets of identically keyed locks.

- Workers who will be working under Personal Lockout are assigned a set of identically keyed locks.
- Workers who will be working only under Group Lockout are typically assigned a single personal lock.

Figure 17. Personal lock

The name of the worker to whom each individual lock or lock set is assigned is recorded in the facility Personal Lock Log and labelled on each lock.

When a worker is no longer required to work at the facility, they are required to return their personal locks to the person who issued them.

Note

Personal Locks are to be used for the sole purpose of work protection and may be placed and removed only by the worker to whom they have been assigned.

Group Locks

Group Locks are used to secure isolating devices for the purposes of Group Lockout.

These locks come in identically keyed sets of various sizes and seven colours: blue, brown, green, black, purple, orange, and yellow.

A Group Lockout requires two lock sets. Typically, these are different colours to distinguish locks placed during switching from those placed during visual checking.

If two or more Group Lockouts are in place at the same time, different coloured lock sets are used for the different lockouts to distinguish which lockout each of the locked-out devices belongs to.

Figure 18. Group locks

Each lock in a set is identified with the number of the lockset to which it belongs.

Visitor Locks

Visitor Locks are grey and are issued as individually keyed locks or in sets of identically keyed locks.

These are to be used by visitors requiring short term access to equipment protected under a lockout.

When a lock is assigned to a visitor, that person's name is recorded in the log. A name label must be attached to the lock to identify who it belongs to.

Figure 19. Visitor locks

Scissor Clips

Scissor clips are always used to allow multiple personal locks to be attached to a single device or key box:

- The first person locking on attaches a scissor clip to the device, then places their lock in one hole of the clip
- Other workers attach their locks to other holes in the clip

A lock must never be placed in the last hole of the scissor clip. If there is only one hole left, place another scissor clip in the last hole and attach your personal lock to the second scissor clip.

Figure 20. Scissor clips

Removing Personal Locks

A Personal Lock may be removed only by the worker who placed it (SPR 701.9).

However, there is a procedure for removing a lock that has been inadvertently left on, and the worker is not on-site or has misplaced their key. This procedure is necessary only when the lock is preventing equipment from being returned to service or is preventing the lockout from being modified.

Note

Only the Plant/Facility Manager has the authority to remove personal locks and can do so only with the permission of the Area or Senior Manager. This ensures that the proper procedure is followed, and no worker is placed at risk because their lock has been removed improperly.

WPP tags

Attention Tag

The **Attention Tag** is used to indicate the status of equipment, such as a switch that is opened for personal lockout but has not yet had a personal lock applied. Attention tags are used to advise workers of a condition that might lead to a service interruption, create an unusual situation, or require a special operating procedure.

The tag must be completed in legible handwriting before it is attached to the device. It must show the designation for the device it is attached to, the name of the worker applying the tag, the date the tag is applied and, on the back, the reason for applying the tag.

The application and removal of Attention tags must be recorded in the Station Log or in a logbook for Attention tags.

Figure 21. Attention tags

Warning

The Attention tag does not provide any level of worker protection. Never perform work on equipment that has only Attention tags on its isolating devices.

The tag shall be secured using a nylon tie directly to any isolating device that is not lockable.

Role of the PIC in Lockout

Integrated Areas

Normally, the Generating Station is under the control of the operator at the Control Centre, so that they can carry out their responsibility to run the power system. However, the operator does not have the authority to establish Safety Protection within the Generating Station.

When necessary, control of Generating Station equipment (Operating Responsibility) is assigned to the station. An authorized worker can then sign on to the station log to perform PIC duties, as required.

Note

A few Generating Stations (GMS, Burrard, and Fort Nelson) have operating responsibility for their equipment and have a PIC on site at all times. In those stations, the assignment of Operating Responsibility is not required.

Transferring Control

When Generation Station equipment needs to be isolated for repair or maintenance, the following procedure is followed:

- A Category D worker at the station informs the operator at the Control Centre of the required work
- The operator at the Control Centre initiates (or directs) the switching necessary to disconnect that portion of the Generating Station from the power system (usually taking a generating unit off-line and opening the unit disconnect).
- The operator at the Control Centre formally assigns operating responsibility for that portion of the system to the Generating Station.
- A Category D worker at the Generating Station signs on as the PIC of that portion of the station in the Station Log.

Non-Integrated Areas

- Normally, the NIA Generating Station is under the control of the operator at the District Central Control Facility (DCCF), so that they can carry out his/her responsibility to run the power system.
- Control of NIA Generating Station equipment is under the control of the Operator at the District Central Control Facility (DCCF). The DCCF PIC may direct the establishment of worker protection or alternatively control of NIA Generating Station equipment (Operating Responsibility) may be assigned to the station where an authorized worker can then sign on to the station log to perform PIC duties.

The PIC's Responsibilities

The Category D worker who is currently signed in as PIC is responsible for establishing safe working conditions for the equipment under their control. The PIC is authorized to:

- Prepare Personal Lockout of equipment on the operating one-line, by planning the lockout and directing the isolation, grounding / bonding, and mechanical blocking of equipment.
- Establishing Group Lockout by planning the lockout; directing the isolation, grounding / bonding, mechanical blocking, and lockout of equipment; and setting up the group lockout board.
- Plan and direct any modifications to a Group Lockout required during the course of the work.
- Plan and direct the restoration of equipment back to service.

Note

The PIC is required to maintain a local Mimic Board displaying the current status of all equipment under their control at all times.

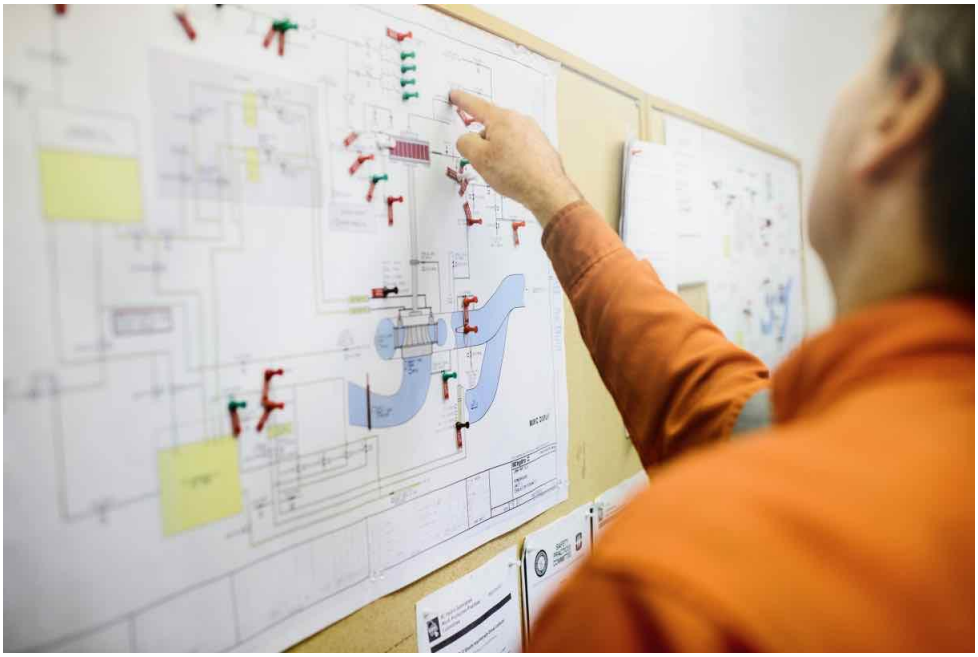


Figure 22. Mimic board

Guarantees of Isolation (GOI)

For most work in the station and switchyard, the PIC at the station or DCCF can assume complete responsibility for isolating the equipment through a Lockout procedure. However, in cases where equipment is close to (or on) the WPP/PSSP boundary, an isolating device may be on the PSSP side of the boundary and is under the control of the operator at the Control Centre or DCCF. In fact, the switch or disconnect may be miles away, along the Transmission or Distribution line.

In such cases, the operator isolates the equipment and issues a **Guarantee of Isolation** to the PIC at the station. A Guarantee of Isolation is a form of Safety Protection by which one Operating Authority assures another Operating Authority that a specific line or equipment is isolated and will remain isolated until the GOI is returned (see SPR 506 for information on GOIs.)

Note

NIA PICs may issue GOI's to themselves for establishing worker protection.

The isolating devices in question are secured using "Do Not Operate–Guarantee of Isolation" tags. Both the operator and the PIC complete a Safety Protection Form indicating:

- the isolating devices
- the date and time of issue
- the names of the PICs who issued and received the GOI
- When a GOI forms part of the isolation under a WPP lockout:
- the PIC lists the GOI isolating devices on the Lockout sheet and attaches the GOI Safety Protection Form to the Lockout Sheet
- where it is practicable, WPP locks are applied to the GOI isolating devices to provide the workers with complete control over their safety (SPR 701.11)

Note

If the isolating devices are a distance from the worksite, or it is otherwise impractical for locks to be applied, the isolation is still secured by the "Do Not Operate–Guarantee of Isolation" tags, the tags on the operator's Mimic Display, and the operator's formal assurance.

Figure 23. "Do Not Operate – Guarantee of Isolation" tag

Lesson 6 Personal Lockout

Purpose: The purpose of this lesson is to provide an in-depth understanding of Personal Lockout and the roles and responsibilities of Category B workers under Personal Lockout.

Objectives: On completion of this lesson, you will be able to:

- Identify which types of Personal Lockout require a PIC.
- Explain how the Personal Lockout process protects the worker
- Interpret a Personal Lockout Sheet.
- Identify the responsibilities of the Category B worker under Personal Lockout.
- Explain the responsibilities of the Category B worker during testing under a Personal Lockout.

Topics: This lesson covers the following topics:

- Introduction to Personal Lockout
- The Personal Lockout Process
- The Personal Lockout Sheet
- Responsibility of the Category B Worker
- Hazardous Testing under Personal Lockout

Introduction to Personal Lockout

Personal Lockout is a form of work protection in which each worker places a personal lock on each isolating, grounding / bonding, and blocking device to ensure the equipment they are working on remains in a protected state. Personal Lockout is typically used for jobs that require a small number of workers and a small number of protective devices.

Jobs that could be done under personal lockout include:

- Replacing a cooling or ventilation fan motor
- Changing filters on the hydraulic pumps of a governor
- Performing maintenance on a governor
- Checking or maintaining a high-voltage breaker in a switchyard
- Maintenance on a diesel engine

The procedure for Personal Lockout varies slightly, depending on whether the equipment to be locked out is on the operating one-line or not:

- Lockouts for equipment **not** on the operating one-line can be prepared by any Category C worker after an assessment of system risk. They need to inform the PIC (or operator at the Control Centre or DCCF) only if the isolation could affect the operation of the power system.
- Lockouts for equipment on the operating one-line require the involvement of the PIC because only the PIC is authorized to operate and apply Safety Protection on this equipment.

The rules and procedures for Personal Lockout are defined in SPR 708 – 715.

Note

As a Category B worker, your role is the same whichever procedure is followed.

The Personal Lockout Process

The general process for Personal Lockout is as follows:

1. Preparation

A qualified worker:

- Assesses the work to be done, identifies the sources of hazardous energy, the isolation devices, and the grounding / bonding and blocking required.
- Prepares a Personal Lockout Sheet and Switching Order, as required.

2. Isolation

A qualified worker:

Verification

A check or test to ensure a hazardous energy source has been isolated.

- Switches isolating devices according to the Lockout Sheet or Switching Order and verifies the isolation.
- Applies grounding / bonding and blocking.
- Secures the devices with a personal lock or an Attention Tag if they are not applying a personal lock at the time of switching.
- Posts the Personal Lockout Sheet at a location identified to all workers, typically at the work site.

3. Lock-On

If more than one worker is working on the equipment, the worker in charge holds a tailboard. Each worker:

Visual check

Involves 3 steps:

Ensure it is the correct device.

Ensure it has been switched to the correct position.

Ensure it is properly secured.

- Consults the Personal Lockout Sheet.
- **Visually checks** each protective device on the Lockout Sheet to ensure it is switched to the required position and properly secured.

Note

Category B workers must be directed by a Category C or D worker when attaching personal locks under Personal Lockout.

4. Work

Each worker does their work under the protection of their personal locks.

If locks are left on overnight, their presence must be recorded in the Station Log.

5. Lock Removal

When the work is complete:

- If the equipment is ready for service, the last worker to remove their locks returns the lockout sheet to the PIC or the authorized worker who prepared it.
- If the equipment is not ready for service, the last worker to remove their locks secures an attention tag to each isolating, grounding/bonding, and blocking device, and returns the lockout sheet to the PIC or the authorized worker who prepared it.

6. Lockout Removal

The PIC or another authorized worker returns the equipment to service or logs the equipment status in the Station Log.

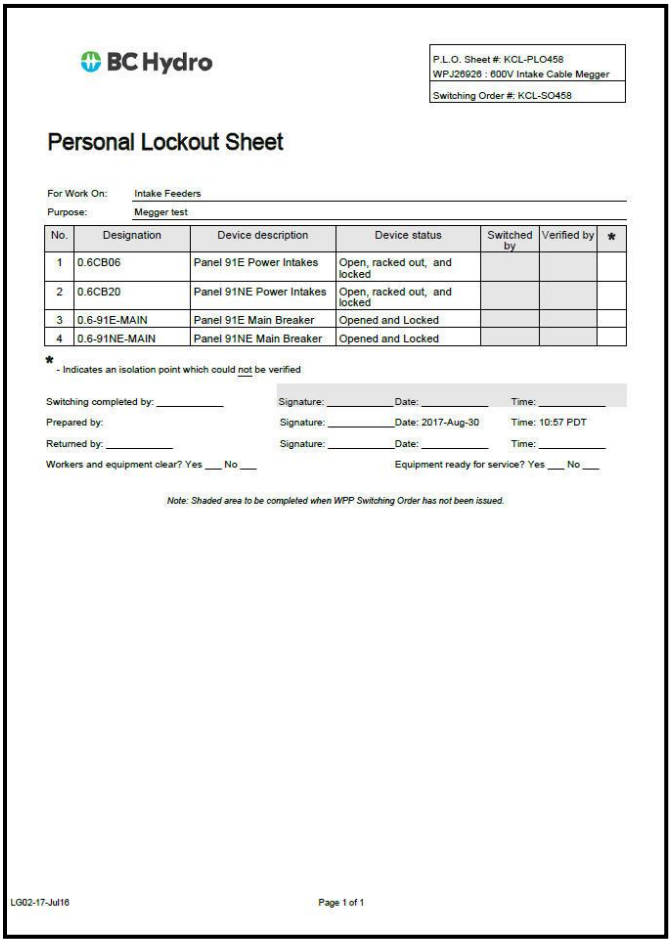
Note

With Personal Lockout, each worker is personally responsible for ensuring that the lockout is appropriate for the work they are doing. The worker who plans and directs the lockout does not retain any specific responsibility.

The Personal Lockout Sheet

The Personal Lockout Sheet is the official documentation, and it serves the following purpose:

- Aids in planning the lockout. It provides a consistent framework for specifying the isolation that needs to be applied.
- Clearly communicates the details of the lockout. It can be used by the person performing the switching to implement the isolation, and it is posted in a location identified to all workers, typically adjacent to the protected equipment.
- Provides a record of the lockout and those responsible for preparing it. It must be retained in the facility for at least two years.



BC Hydro

P.L.O. Sheet #: KCL-PLO458
WP.J26926 : 600V Intake Cable Megger
Switching Order #: KCL-SO458

Personal Lockout Sheet

For Work On: Intake Feeders
Purpose: Megger test

No.	Designation	Device description	Device status	Switched by	Verified by	*
1	0.6CB06	Panel 91E Power Intakes	Open, racked out, and locked			
2	0.6CB20	Panel 91NE Power Intakes	Open, racked out, and locked			
3	0.6-91E-MAIN	Panel 91E Main Breaker	Opened and Locked			
4	0.6-91NE-MAIN	Panel 91NE Main Breaker	Opened and Locked			

* - Indicates an isolation point which could not be verified

Switching completed by: _____ Signature: _____ Date: _____ Time: _____
Prepared by: Signature: _____ Date: 2017-Aug-30 Time: 10:57 PDT
Returned by: _____ Signature: _____ Date: _____ Time: _____
Workers and equipment clear? Yes ___ No ___ Equipment ready for service? Yes ___ No ___

Note: Shaded area to be completed when WPP Switching Order has not been issued.

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Figure 24. Personal Lockout Sheet

Note

It is very important that you learn how to interpret the Personal Lockout Sheet so that you can effectively check the isolation to ensure it is providing you with adequate worker protection.

Responsibilities of the Category B Worker

Visual check

Involves 3 steps:

- Ensure it is the correct device.
- Ensure it has been switched to the correct position.
- Ensure it is properly secured.

When working on equipment under a Personal Lockout, the Category B worker is responsible for the following:

You must advise an authorized worker of any work you are doing on power system equipment:

- If the equipment is on the operating one-line diagram, you must advise the **PIC** of the work to be done and the isolation requirements.
- If the equipment is not on the operating one-line diagram, you must advise a worker authorized to Cat C of the work to be done and the isolation requirements.
- You must participate in all tailboard meetings to fully understand the work to be done, the potential hazards, and the Safety Protection in place.
- You must **visually check** that each isolating device listed on the Personal Lockout Sheet has been switched to the required position before placing your personal locks on the devices.

As a Cat B worker

You can only place your lock on PLO isolating devices under the direction of a Cat C or D worker.

Cat B must always place personal locks on protective devices under direction of a Category C or D worker.

- You must ensure that the number of personal locks you have placed matches the number of isolating devices listed on the Personal Lockout Sheet.
- If the scope of your work changes in such a way that the isolation is no longer adequate, you must stop working and inform the worker who prepared the lockout.
- If your personal locks stay on devices overnight, you must record, in the Station Log, your name and a list of the devices on which your locks are placed.

Note

Each worker who accesses or works on protected equipment shall ensure the isolation of hazardous energy sources is appropriate for the work they will do and shall maintain control over the isolation through the application of personal locks according to the requirements in this section. The worker must have full knowledge of the hazardous energy that has been isolated, the boundaries of the safe work area, and the safety procedures for the job.

Information: SPR 701.4

Hazardous Testing Under Personal Lockout

Hazardous testing is permitted on equipment under Personal Lockout provided that it complies with SPR 713. SPR 701.10 explains how to determine whether testing is hazardous or not. Only one test procedure is to be carried out at any one time.

The worker responsible for testing under a personal lockout is required to do the following:

- Take possession of the Personal Lockout Sheet for the duration of the testing to ensure that no workers can lock on without being fully aware of the testing.
- Before starting the testing, hold a documented tailboard with all the workers who will be locked on during the test.
- Ensure that sources of test energy cannot harm other workers.
- Place the appropriate signs and barriers to protect all workers from the hazards created by the testing.

Grounding / bonding and blocking devices may be removed by an authorized worker for the purpose of testing, under the direction of the person responsible for the testing. Such devices must be replaced immediately after testing and before continuing work on the protected equipment.

Hazardous energy may be temporarily restored to equipment that is not identified on the station one-line diagram for the purpose of testing. An example would be to bump test a motor.

As a Category B worker, you must:

- Ensure that Ensure that you understand the testing procedures and the hazards involved, as communicated at the tailboard.
- Respect any barriers or signs placed to protect you from the hazards of testing.

If you are responsible for the testing, you are responsible for your own safety and the safety of all workers while the testing is in progress. If it is necessary to change the lockout by removing protective devices or restoring an energy source, you must have it done by a qualified worker.

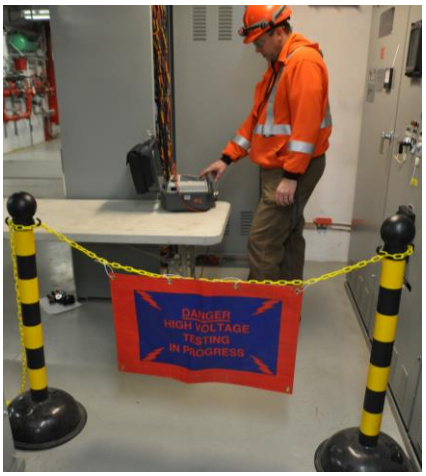


Figure 25. Sign of testing in progress

Lesson 7 Group Lockout

Purpose: The purpose of this lesson is to provide an in-depth understanding of Group Lockout and the roles and responsibilities of Category B workers under Group Lockout.

Objectives: On completion of this lesson, you will be able to:

- Explain how the Group Lockout process protects the worker.
- Explain the role and responsibilities of a work leader under Group Lockout.
- Explain the role and responsibilities of a test coordinator and test leader under Group Lockout.
- Explain the Category B worker's general responsibilities under Group Lockout.
- Interpret a Group Lockout Sheet, a Group Lockout Modification form, a Test Notification form.
- Identify the purpose and the key components of the Lockout Board.
- Identify the workers' responsibilities when a Group Lockout is being modified.
- Identify the workers' responsibilities when testing is being performed under Group Lockout.

Topics: This lesson covers the following topics:

- Introduction to Group Lockout
- Establishing Group Lockout
- The Group Lockout Sheet
- The Group Lockout Board
- Roles and Responsibilities
- Modifying a Group Lockout
- Hazardous Testing under Group Lockout

Introduction to Group Lockout

Group Lockout is an alternate form of lockout that is used for jobs that require either a large number of workers or a large number of protective devices. Typically, a Group Lockout is used for any project that requires more than one crew or the participation of contractors' crews.

For Group Lockout:

- The PIC plans and directs the lockout.
- The lockout is established by two qualified workers who independently attach group locks to each device.
- Each worker secures their own safety by placing a personal lock on a sealed key box containing the group lock keys.

Jobs that would be done under Group Lockout could include:

- Scheduled maintenance of a generating unit.
- Maintenance or repair of a unit transformer.

The rules and procedures for Group Lockout are defined in SPR 716 – 724.

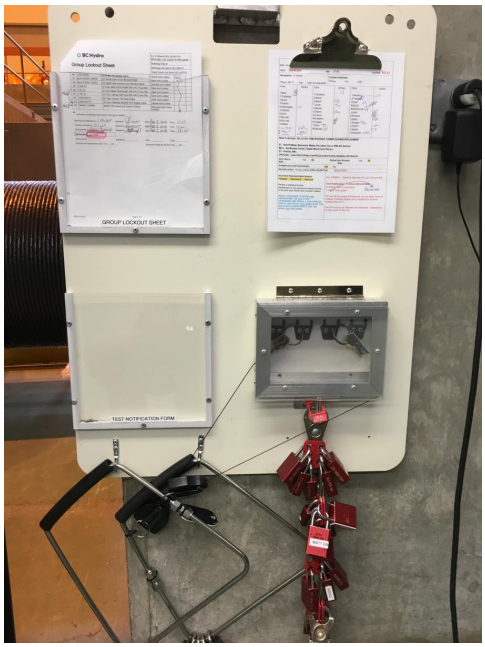


Figure 26. Group Lockout Board

Establishing Group Lockout

The general process for establishing Group Lockout is as follows:

1. Preparation

Work leaders communicate work and isolation requirements to the PIC.

- The PIC plans the Safety Protection and prepares a Group Lockout Sheet. The Sheet is checked by a qualified worker.
- The PIC creates a Switching Order for the isolation, grounding / bonding, and blocking.

2. Isolation

Verification

A check or test to ensure a hazardous energy source has been isolated.

A qualified worker independently:

- Follows the Switching Order instruction to isolate the equipment.
- Verifies the isolation, if possible, at each isolating device by checking or testing that all hazardous energy has been eliminated.
- Attaches a group lock from the first set of locks.

3. Visual Check

Visual check

Involves 3 steps:

- Ensure it is the correct device.
- Ensure it has been switched to the correct position.
- Ensure it is properly secured.

A second qualified worker independently:

- Visually checks the switching, grounding / bonding, and blocking against the Group Lockout Sheet to ensure each device has been switched to the required position and secured.
- Attaches a group lock from the second set of locks.

4. Lockout

The PIC:

- Places the group lock keys in a key box on the lockout board and seals it.
- Posts the Group Lockout Sheet on the lockout board.

Note

The Work Leader holds a documented tailboard to communicate the details of the work, the hazards, and the isolation. The Work Leader also discusses any isolating devices that could not be verified along with additional safety precautions that must be taken to ensure hazardous energy is effectively isolated.

Each worker locking on:

- Confirms that the lockout board is the correct one for their work and the seal number matches the number on the GLO Sheet.
- Attaches their personal lock to the key box to secure the lockout.

5. Work

Each worker does their work under the protection of their personal lock. At the end of each shift and the end of their job, each worker must remove their personal lock from the lockout board.

6. Lockout Removal

When all work is completed, the work leader ensures that all workers and equipment are clear, and all personal locks have been removed and completes and returns the Group Lockout Sheet to the PIC

The PIC:

- Removes the seal from the key box after all workers have removed their personal locks.
- Directs a qualified worker in unlocking and ensuring removal of grounding / bonding and blocking devices and restoring the isolating devices to return the equipment to service.

Figure 27. Group lockout process completion

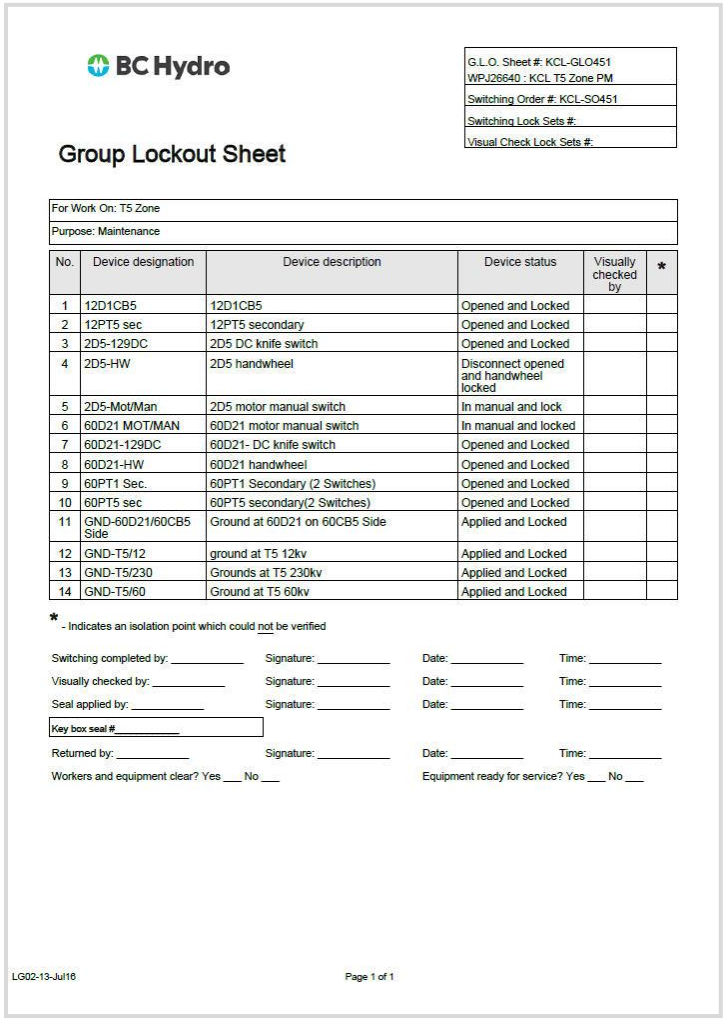
The Group Lockout Sheet

Like the Personal Lockout Sheet, the Group Lockout Sheet provides a list of all protective devices. The Group Lockout Sheet is the official record of isolating devices for a Group Lockout. Isolation schematics, operating one-line diagrams, and other aids used to locate isolating devices shall not be used by workers as an alternative to the Group Lockout Sheet for determining the energy sources that have been isolated.

The PIC prepares the Group Lockout Sheet based on input from work leaders (or crews) who will be performing work on the protected equipment.

Note

If the rightmost column for any device (✓) is checked, the isolation has not been verified. Any unverified devices will be discussed in a Tailboard (SPR 704).



BC Hydro

G.L.O. Sheet #: KCL-GLO451
WPJ26640 : KCL T5 Zone PM
Switching Order #: KCL-SO451
Switching Lock Sets #:
Visual Check Lock Sets #:

Group Lockout Sheet

For Work On: T5 Zone
Purpose: Maintenance

No.	Device designation	Device description	Device status	Visually checked by	*
1	12D1CB5	12D1CB5	Opened and Locked		
2	12PT5 sec	12PT5 secondary	Opened and Locked		
3	2D5-129DC	2D5 DC knife switch	Opened and Locked		
4	2D5-HW	2D5 handwheel	Disconnect opened and handwheel locked		
5	2D5-Mot/Man	2D5 motor manual switch	In manual and lock		
6	60D21 MOT/MAN	60D21 motor manual switch	In manual and locked		
7	60D21-129DC	60D21- DC knife switch	Opened and Locked		
8	60D21-HW	60D21 handwheel	Opened and Locked		
9	60PT1 Sec.	60PT1 Secondary (2 Switches)	Opened and Locked		
10	60PT5 sec	60PT5 secondary(2 Switches)	Opened and Locked		
11	GND-60D21/60CB5 Side	Ground at 60D21 on 60CB5 Side	Applied and Locked		
12	GND-T5/12	ground at T5 12kv	Applied and Locked		
13	GND-T5/230	Grounds at T5 230kv	Applied and Locked		
14	GND-T5/60	Ground at T5 60kv	Applied and Locked		

* - Indicates an isolation point which could not be verified

Switching completed by: _____ Signature: _____ Date: _____ Time: _____
Visually checked by: _____ Signature: _____ Date: _____ Time: _____
Seal applied by: _____ Signature: _____ Date: _____ Time: _____
Key box seal #_____
Returned by: _____ Signature: _____ Date: _____ Time: _____
Workers and equipment clear? Yes ___ No ___ Equipment ready for service? Yes ___ No ___

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Figure 28. Group Lockout Sheet

The Group Lockout Board

The Lockout Board holds the Lockout Sheet, the sealed key box, and any other information pertinent to the lockout. It is placed in a location accessible to all workers.

All workers who need to work under the Group Lockout must be made aware of its location so they can review the details of the lockout and attach their personal locks to the key box before going to work.

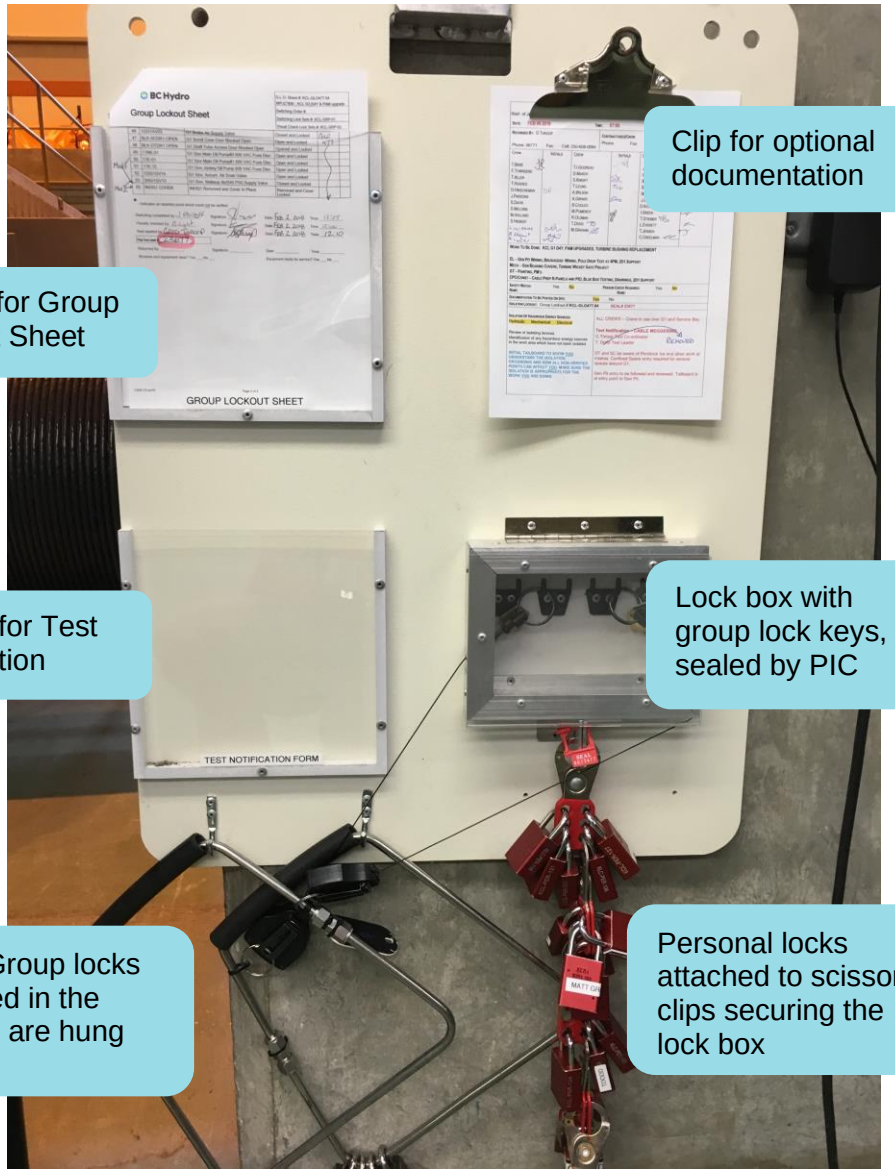


Figure 29. Group Lockout Board

Roles and Responsibilities

Category B workers can assume a variety of roles and responsibilities in the Group Lockout process.

BC Hydro Work Leaders

A worker leader is any worker who takes a lead role in ensuring the safety of a group of workers while they perform a specific set of tasks under Group Lockout. Typically, the leader of a BC Hydro or contractor's crew would act as work leader for that crew.

A work leader is responsible for the following:

- Advise the PIC of the work to be done and the specific isolation requirements for the job, as well as any changes to these requirements in the course of the job.
- Ensuring that the planned lockout is appropriate for the work for which they are responsible.
- Holding documented tailboards at required times to ensure all workers assigned to the job understand:
  - Which energy sources have been isolated and which equipment is in a protected state.
  - Any modifications to the isolation during the course of the work.
- If any hazardous test procedure is to be performed, appointing a Category C worker as the Test Coordinator.
- When the job is complete:
  - Ensuring all work is completed, all workers and equipment are clear, and workers have removed their personal locks.
  - If they are responsible for the final work under the lockout, returning the Lockout Sheet to the PIC.

Contractor's Representative

The contractor's representative or work leader is responsible for:

- Ensuring that each of their workers has been appropriately trained in WPP procedures.
- Ensuring that they have a complete understanding of the Safety Protection that is in place for the lockout and that the lockout is appropriate for the work their crew is to do.
- Checking the Lockout Board to ensure all details are complete and correct:
  - The Lockout Board is the correct one for the work to be done.
  - The key box seal number matches the seal number recorded on the Group Lockout Sheet.
  - The time and date the seal was applied are valid.

- Holding documented tailboard meetings at required times to ensure the workers assigned to the job understand the Safety Protection in place and any modifications to the Lockout as they occur in the course of the job.
- When their work is complete:
  - Ensuring all work is completed, all workers and equipment are clear, and workers have removed their personal locks.
  - Returning the Personal locks to BC Hydro's representative.

Each Worker

Each worker who requires safety protection under the Group Lockout is responsible for the following:

- Attending all tailboards relevant to the work they are doing. If a worker is not available for a tailboard meeting, they must have a documented tailboard discussion with the work leader before locking on to the key box and proceeding with any work.
- Checking the Lockout details:
  - Checks that the Lockout Board is the correct one for the job.
  - Checks that the key box seal number matches the seal number recorded on the Group Lockout Sheet.
  - Checks the time and date the seal was applied.
- Placing a Personal Lock on the scissor clip on the Lockout Board key box at the beginning of the job and at the start of each shift.
- Performing their work safely under the Lockout.
- Removing their personal lock from the Lockout Board key box at the end of each shift and at the end of the job.

Note

By locking on to the Lockout Board key box, each worker accepts that the Safety Protection that has been applied is appropriate for the work that they will perform.

In Case of a Broken Key Box Seal

A broken seal on the key box indicates that the group lockout is not secure.

If you find a broken (or missing) key box seal:

- Notify the PIC or crew leader immediately.
- Do not lock on to the lockout or do any work.
- If your lock is attached to the lockout, remove it.
- Warn other workers not to lock on and not to do any work.

The PIC will follow the procedure in SPR 724 to ensure the integrity of the isolation and lockout.

Modifying a Group Lockout

During the course of the project, it may be necessary to expand, reduce, or otherwise modify the lockout. If this becomes necessary, the following procedure is followed:

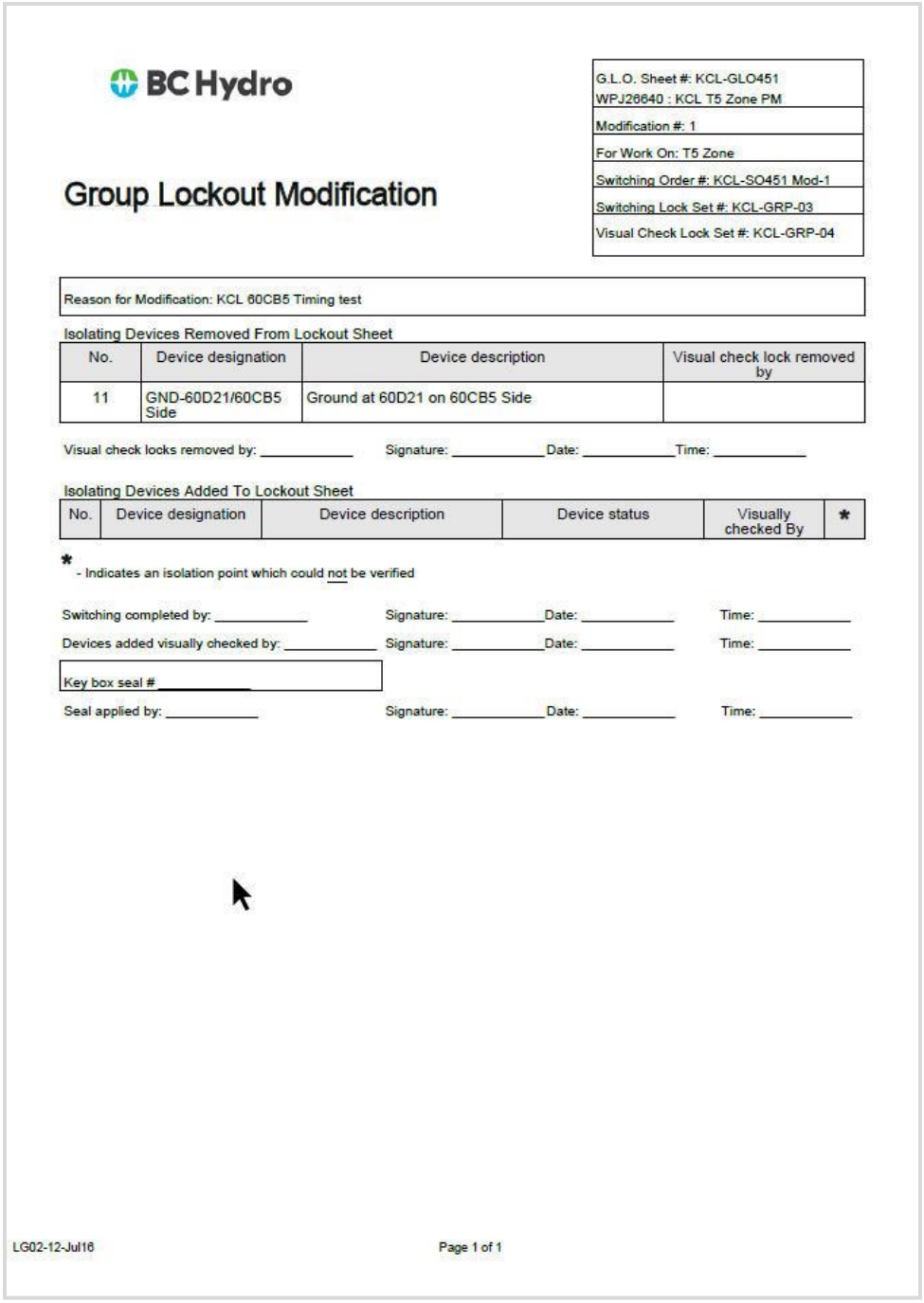
1. **The Worker Leader(s):**
   - Directs all workers to remove their personal locks from the Lockout Board.
   - Informs the PIC of the Lockout modifications required.
2. **The PIC:**
   - Prepares a Group Lockout Modification form and a Switching Order describing the changes.
   - Removes the Group Lockout Sheet from the Board and removes the key box seal and applies their Personal Lock to the key box to control the keys so that no worker shall possess both keys.
   - Directs qualified workers in making the required changes.
   - Seals the Group Lock keys in the key box, applies a new seal, and records the seal number, date, and time on the Group Lockout Modification form.
   - Posts the Group Lockout Modification form in front of the Group Lockout Sheet on the Lockout Board.
3. **The Work Leader:**
   - holds a tailboard meeting for all workers, describing the changes in the Safety Protection.
4. **All Workers:**
   - Attend the tailboard to ensure they understand the modification.
   - Check the key box seal to ensure it matches the seal number on the Group Lockout Modification form.
   - Place a Personal Lock on the Lockout Board key box and proceed to work.

Group Lockout Modification Form

The Group Lockout Modification form documents the changes made to the Group Lockout, guides the modification process, and acts as a means of communication between workers. It is posted on the Group Lockout board in front of the Group Lockout sheet.

Note

If there are more than two (2) modifications to a Group Lockout, a new Group Lockout sheet is prepared and posted on the Lockout Board.



BC Hydro

G.L.O. Sheet #: KCL-GLO451
WPJ26640 : KCL T5 Zone PM
Modification #: 1
For Work On: T5 Zone
Switching Order #: KCL-SO451 Mod-1
Switching Lock Set #: KCL-GRP-03
Visual Check Lock Set #: KCL-GRP-04

Group Lockout Modification

Reason for Modification: KCL 60CB5 Timing test

Isolating Devices Removed From Lockout Sheet

No.	Device designation	Device description	Visual check lock removed by
11	GND-60D21/60CB5 Side	Ground at 60D21 on 60CB5 Side	

Visual check locks removed by: _____ Signature: _____ Date: _____ Time: _____

Isolating Devices Added To Lockout Sheet

No.	Device designation	Device description	Device status	Visually checked By	*

* - Indicates an isolation point which could not be verified

Switching completed by: _____ Signature: _____ Date: _____ Time: _____

Devices added visually checked by: _____ Signature: _____ Date: _____ Time: _____

Key box seal # _____

Seal applied by: _____ Signature: _____ Date: _____ Time: _____

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Figure 30. Group Lockout Modification Form

Hazardous Testing under Group Lockout

Hazardous Testing may be carried out under Group Lockout using specific procedures.

If testing may result in the release of energy potentially harmful to workers, the designated Test Coordinator does the following:

- Places a “Testing in Progress” sign over the Lockout Board key box. The “Testing in Progress” sign clearly identifies the name of the Test Coordinator. You must not lock on without permission from the Test Coordinator.
- Holds a tailboard meeting with all workers to inform them of the hazards created by the testing
- Post a Test Notification form on the Lockout Board for each individual test procedure

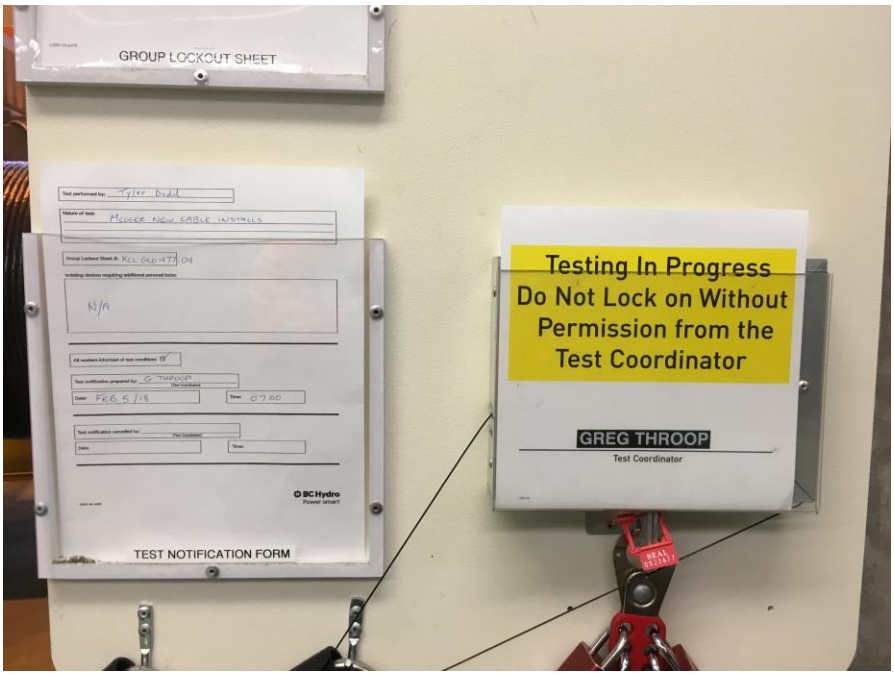


Figure 31. Testing in progress sign

Category B workers can assume the following roles with respect to testing:

Test Leader

Every test procedure requires a Test Leader who is responsible for overseeing the testing and ensuring that the sources of test energy do not create a hazard to other workers. The Test Leader is responsible for:

- Erecting the necessary barriers and signs around the equipment being tested to ensure that other workers do not come into contact with potentially hazardous energy
- Overseeing the test procedures to ensure they are done safely
- Informing the Test Coordinator when the test is completed

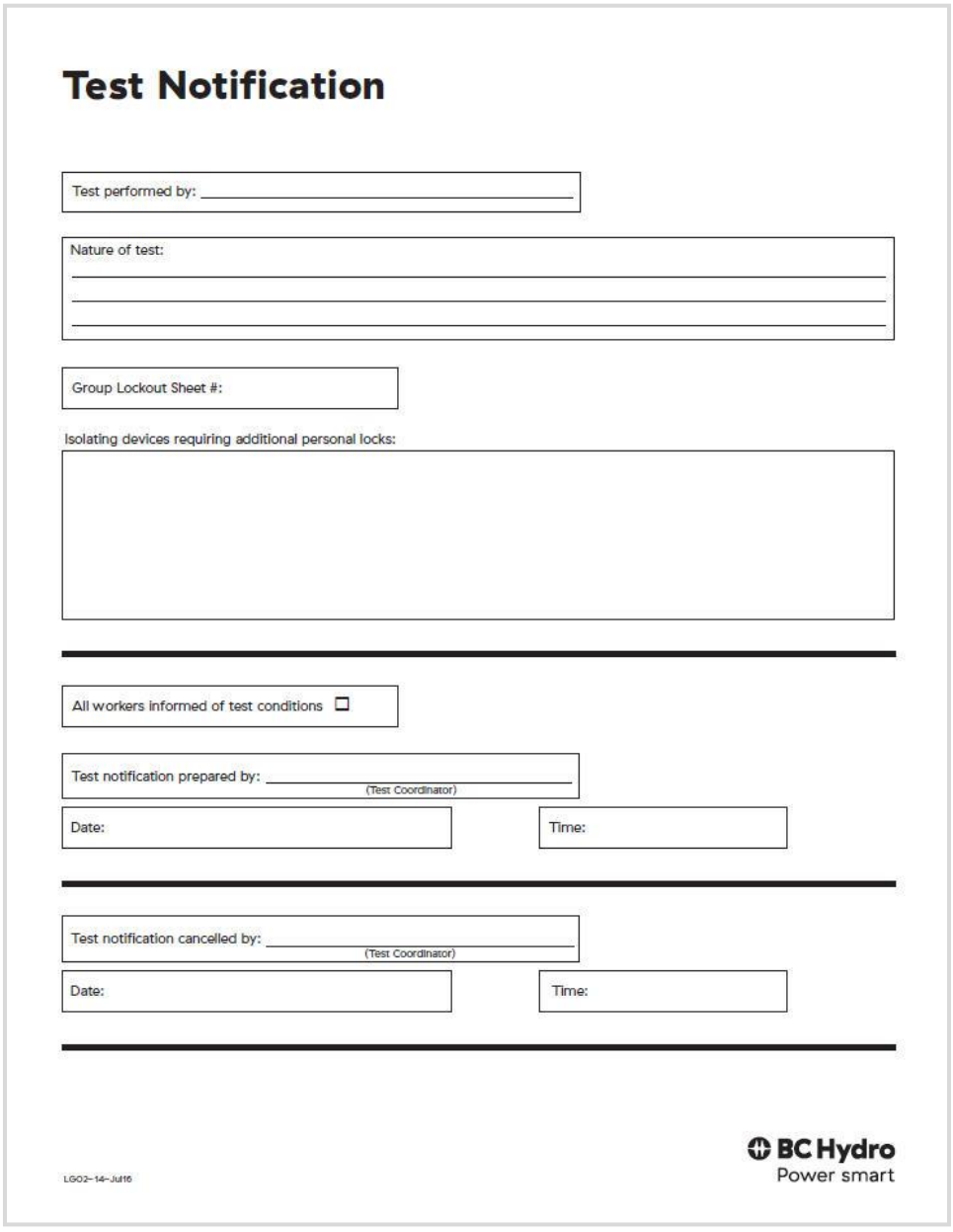
Worker

If you are directly involved in the testing, you **must** do the following:

- Place your personal lock on the Lockout Board key box
- Place a personal lock on any additional protective devices that are applied solely for the purposes of testing, as listed on the Test Notification form.

If you cannot work safely while testing is in progress, you will be asked to remove your lock from the Lockout Board key box and to stay clear of the protected equipment.

If your work is not affected by the testing, you may receive permission from the Test Coordinator to place your lock back on the key box and return to work. Always check the Test Notification form to ensure that the testing does not affect you, before asking permission to lock on.



Test Notification

Test performed by: _____

Nature of test:

_____

_____

_____

Group Lockout Sheet #:

Isolating devices requiring additional personal locks:

All workers informed of test conditions ☐

Test notification prepared by: _____
(Test Coordinator)

Date: Time:

Test notification cancelled by: _____
(Test Coordinator)

Date: Time:

LGO2–14–Jul16

BC Hydro
Power smart

Figure 32. Test Notification form

Review

As a **Category B worker**, you are authorized to:

- place personal locks and work under lockout.
- act as a Host, Work Leader, or Test Leader.

When you are **working under lockout**, you must:

- Attend and participate in tailboards relevant to your work.
- Review the lockout sheet and ensure that the lockout provides sufficient protection for your work.
- Apply and remove your personal locks according to WPP procedures.
- Follow the directions of the PIC or other authorized workers when there are changes to the lockout.

End of course.