Hydro Tasmania
“Instructed Person” training for hazardous & restricted areas
Hydro Tasmania – Instructed Person Training Content

- Hydro Tasmania Safe Work Practices
  - Purpose
  - Safety Principles
  - Basic risk management approach
  - Definitions

- Hydro Tasmania Permit to Work
  - Objectives
  - Scope
  - Process
  - Roles & Responsibilities

- Isolations & Lock Out Tag Out (LOTO)

- Hazards in high risk restricted areas

- Assessment & ESI Passport issue
Purpose

- To provide consistent safe work practices (SWP) within the Hydro Tasmania group.
- To provide a summary of all the specific safe work procedures Hydro Tasmania employees and contractors are required to follow.
Hydro Tasmania Safe Work Practices

Safety Principles
• Safety principles which underpin ‘no harm to anyone at anytime’:
  • all injuries can be prevented
  • employee involvement is essential
  • everyone is responsible for safety
  • we are all accountable for preventing injuries
  • working safely is a condition of employment
  • we promote off the job safety for our employees.
Basic risk management approach

- In addition to compliance with legislative requirements, including duty of care, all
  - work activities conducted under Hydro Tasmania direction shall have risks managed
  - to a level as low as reasonably practical (ALARP) and adhere to the basic risk management
  - process defined by the Work Cover Tasmania ‘SAFE’ concept:
    - Spot the hazard
    - Assess the risk
    - Fix the problem
    - Evaluate results
Hydro Tasmania Safe Work Practices

In order to fix the problem, the hierarchy of controls which are listed below shall be implemented to the highest level that is reasonably practical:

1. Elimination
2. Substitution
3. Isolation
4. Engineering controls
5. Administrative controls
6. Personal protective equipment (PPE)

Consistent with the basic risk management approach whenever practical, eliminate hazards by changing the work process or by substituting a less hazardous component.

When it is impractical to eliminate the hazard use the practices outlined in this handbook.

PPE should be considered and used as the last line of defense against injury.
Hydro Tasmania Safe Work Practices - Definitions

- **Permit to Work (PTW)** – a job approval and risk control system applicable to all work being carried out on Hydro Tasmania owned and/or operated plant and assets. It follows fundamental hazard identification, communication and risk management processes with some check/hold points:

- **Authorised Issuing Officer (AIO)** – An employee authorised by Hydro Tasmania, who acts on behalf of the asset owner to issue permits for approved work and who is qualified and authorised to give permission to commence work and accept the hand back of the work site.

- **Operator** - An employee who is qualified, and authorised by Hydro Tasmania to operate specific stations and/or specific equipment or a person operating a piece of apparatus being described.
Hydro Tasmania Safe Work Practices - Definitions

- **Person in Charge (PIC)** – A person trained as a PIC and is authorised to issue special permits for confined space, concealed services and hot work; and who will take charge of the conduct of work and the work site defined in a permit and is accountable for the safety of people (IPs, visitors or members of the public) and equipment within the scope of the work. An individual **shall** only assume the role of PIC where they have both the competence and confidence to fulfill the role.

- **Instructed Person (IP)** - A person who is trained and competent in the application of the Hydro Tasmania PTW and isolation procedure.

- **Safety Observer** – A competent person specifically instructed and dedicated as an observer on each occasion. Any safety observer appointed **shall** be appropriately skilled in all respects of safety observation and be fully aware of the potential risks associated with the work. Examples of where to use: confined space, hot work, work in vicinity of HV, excavation/concealed services.

- **Work Site** – Refers to any work site where Hydro Tasmania employees or contractors are engaged in work and where Hydro Tasmania has an influence over health and safety of those employees or contractors.
Objectives

The objectives of the PTW system are to:

- Ensure safety of people
- Prevent harm to the environment, equipment or other property
- Preserve our capability to deliver to our customers

Scope

The PTW procedure is applicable to all work being carried out on Hydro Tasmania owned and/or operated plant and assets.

The PTW system does not apply to routine operational and maintenance activities where the identified risk is low, and the risk management process has been achieved in routine work management systems.
Hydro Tasmania – Permit to Work

PTW Flowchart

1. Permit to work requirement
2. Completed JHA/SWI for work?
   - No
   - Yes
3. Controlled risk score
   - Moderate/High/Extreme risk
4. Low risk
5. More than one special permit required?
   - Yes
   - No
6. Can work affect energy production?
   - Yes
   - No
PTW Process

- The fundamental risk management process is followed and achieved by:
  - Defining and approving the scope of works
  - Using risk assessment and management tools to identify hazards & risks and control these with the tools available such as e.g. Confined space permit, Diving permit, Group isolation, concealed services survey, etc.
  - Approval of agreed control measures – RO, Asset Owner or delegate (permission to proceed “hold point”)
  - Hand over to Person in Charge (PIC)
  - Instructed Person(s) sign on to PTW (and lock on if group isolation).
  - Safety Observer signs on – if required
  - The work is done in accordance with the scope and agreed control measures
  - Sign off by Instructed person(s) and Safety Observer (and remove locks)
  - Hand back of PTW by PIC
Hydro Tasmania – Permit to Work

1. Scope definition and approval

2. Hazard ID, Risk Assessment & Control Measures

3. Form of Measures Approval

4. Handover to PIC

5. Instructed Person(s) & Safety Observer sign on/off

---

**Permit to Work**

<table>
<thead>
<tr>
<th>Permit to work ID No.</th>
<th>PTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Contact</td>
</tr>
<tr>
<td>Asset owner ( AO )</td>
<td>Asset owner or delegate</td>
</tr>
<tr>
<td>Location/equipment/work site</td>
<td></td>
</tr>
<tr>
<td>Brief description/scope of work (attach more detailed scope if necessary)</td>
<td></td>
</tr>
<tr>
<td>Requested/planned date and duration of work</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>Duration:</td>
</tr>
<tr>
<td>Work scope approval ( at least one of )</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
</tr>
</tbody>
</table>

**Risk management**

Key hazard identification and controls required ( Take 5 and/or JHA to be used to identify )

<table>
<thead>
<tr>
<th>Key hazards</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy sources to be isolated</td>
<td>VNI</td>
</tr>
<tr>
<td>Part of power scheme?</td>
<td>Isolate</td>
</tr>
<tr>
<td>Potential for conflicting simultaneous activities?</td>
<td>Check simultaneous operations matrix for conflicts</td>
</tr>
<tr>
<td>Are contractors to perform any of the work?</td>
<td>Use contractor management checklist</td>
</tr>
<tr>
<td>Atmospheric monitoring required</td>
<td>Use confined space permit</td>
</tr>
</tbody>
</table>

| Agreed/attached additional permits / plans / checklists/controls |
|------------------|------------------|
| Isolation required | Direct |
| Outage required - EGO | Contract site permit |
| Hot work permit | Licence/permits |
| Safety observer | Asbestos handling |
| Work site delineation | Testing procedure |
| Contractor Mnt Checklist | Other |

**Approval & agreement that risk controls are adequate**

| Hydro Tasmania Asset owner ( AO ) |
| Date: | Time: |
| Hydro Tasmania Assessor ( AO ) |
| Date: | Time: |

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**Permit to Work ID No.**

**Authorised issuing officer** (Hydro Tasmania representative) – I acknowledge that the work risk controls, timing, conditions and authorisations are acceptable.

**Person in charge** – accept / reject that the timing, conditions and authorisations are acceptable; that all isolations, earthings, energy dissipation, draining and work site delineation is in place, and give permission to commence work.

**Note:** use one person in charge – change log & acknowledgement sheets as required

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**Work party - tracking & acknowledgement**

<table>
<thead>
<tr>
<th>Name ( print )</th>
<th>Contact No.</th>
<th>Sign on</th>
<th>Time: Date:</th>
<th>Sign off</th>
<th>Time: Date:</th>
</tr>
</thead>
</table>

**Safety observer ( if required ) - tracking & acknowledgement**

<table>
<thead>
<tr>
<th>Name ( Print )</th>
<th>Contact No.</th>
<th>Sign On</th>
<th>Time: Date:</th>
<th>Sign Off</th>
<th>Time: Date:</th>
</tr>
</thead>
</table>

**Note:** use additional safety observer - tracking & acknowledgement sheets as required

**Restrictions with plant Y / N :**

**Sign off - handback**

- The work area has been left in a safe and operable condition by the contractor and the permit has been closed.
- All work has been completed as requested, all permits closed and permit board updated

**Authorised issuing officer**
Roles & Responsibilities - Summary

- **Authorised Issuing Officer**
  - Ensure equipment / work site safe prior to issue of PTW and describe hazards/danger points
  - Liaise with PIC to clarify scope of work and any special tooling, vehicles or plant to be used
  - Liaise with PIC to ensure additional control measures are identified
  - Liaise with PIC to appoint safety observer if required
  - Check currency of PIC authorisation
  - Give permission to commence work and receive handback of PTW
  - Identify and approve the conditions under which isolation, operational earths and additional safety measures can be varied for testing.
Roles & Responsibilities - Summary

• **Person in Charge**
  - Ensure current copy of SWP and PTW and Isolation procedures available at work site
  - Determine if AIO is authorised to issue PTW
  - Ensuring that the equipment/work site covered by the PTW is safe for work.
  - Ensure that IPs understand the work and the extent of the work site, hazards and danger points, agreed controls, signed onto PTW, placed personal locks, work safely and conduct regular Take 5 assessments.
  - Control the work site by being present (to the extent necessary to exercise responsibility) and removing all persons from work site if unable to appoint another PIC
  - Ensuring, where testing is approved, all Instructed persons, cease work, and remove their personal isolation locks prior to commencing testing.
  - On completion of work, PIC shall ensure that all instructed persons have signed off the PTW, removed their Personal Isolation Locks, informed the PTW is to be handed back, are located in a safe environment and clear of the equipment/work site.
Roles & Responsibilities - Summary

• **Instructed Person**
  o reviewing the Job Hazard Analysis and specific job procedures and the agreed control measures of the PTW
  o verifying green Issuing Officer lock is attached to group isolation board
  o signing on to the work party status sign on/off sheet and attaching red personal isolation lock to group isolation board
  o completing work in accordance with the JHA, specific job procedures and PIC instruction
  o communicating with the PIC and work party throughout the work activity
  o maintaining the specific work party tracking requirements during the work activity’
  o working safely

• signing off the work party status sign on/off sheet and removing red personal isolation lock from the group isolation board before leaving site or on completion of the work.
Roles & Responsibilities - Summary

- **Safety Observer**
  - Understanding the extent of the Apparatus / Work Site covered by the PTW.
  - Understanding the specific Hazards / Danger Points associated with the equipment / work site.
  - Signing on and off the PTW as a Safety Observer.
  - Performing the role of a Safety Observer exclusively and not performing any other task.
  - Being positioned at a suitable location to effectively observe and be able to immediately communicate with workers performing the work.
  - Warning against unsafe approach to Energised or moving equipment.
  - Stopping work processes to prevent unsafe situations from arising.

Note: The PIC of a PTW shall not perform the role of Safety Observer.
Hydro Tasmania – Isolations

• Scope
  o The isolation procedure is applicable to all work being undertaken at Hydro Tasmania owned and/or operated plant and assets.
  o Isolation procedures are designed to protect a worker from unexpected energisation, start-up, or release of energy, while they are working on plant.
  o Hydro Tasmania isolation procedure covers 3 categories of isolations:
    – Directly controlled isolations where locking and tagging is not necessary.
    – Personal isolations where it is practicable for the worker to personally isolate the plant, and the worker is competent and authorised to do so.
    – Group isolations where the actual isolation shall be carried out by an authorised issuing officer with appropriate competencies and is authorised to carry out the group isolations on behalf of other workers.
Isolation type flowchart

Select isolation type

- High pressure? High voltage (>1000V)? High energy?
  - Yes
  - No

- Work team member competent & authorised to isolate?
  - No
  - Yes

- Can isolation effect energy production?
  - Yes
  - No

- More than four points of isolation?
  - Yes
  - No
Isolation type flowchart

1. More than 6 workers in team?
   - Yes: Directly controlled isolation
   - No: Isolation by physical removal or barrier?
     - No: Personal isolation
     - Yes: Means of isolation under direct observation & control?
       - No: Group isolation
       - Yes: Directly controlled isolation
To protect people working on plant from sources of energy associated with that plant, the following general isolation process is necessary:

**Note: it remains essential that the work party clearly understand the workplace hazards and controls as well as the scope of the work before commencing the isolation and work:**

1. **Stop** the plant.
2. **Isolate**, dissipate or restrain the energy sources.
3. **Lock and tag** or otherwise ensure that the plant can not be re-energised.
4. **Verify** that the isolation, dissipation and restraints are effective.
5. **Sign on** to the permit to work (and lock on if group isolation).
6. **Work on** the plant.
7. **Sign off** the permit to work.
8. **Remove any locks and tags**.
9. **Restore** and re-energise the plant.
Hydro Tasmania – Isolations

- **Personal Locks**
  - Employees likely to require isolation of plant are issued a set of four Personal isolation locks.
  - Personal isolation locks are **red** in colour and issued to individuals who need to lock out energy sources. Personal isolation locks are **uniquely keyed**, have only one key and have the **name** and employee number of the holder (short term contractors personal details will be at the contractor’s lock sign out area and on an accompanying **tag/sticker**).
  - A person **shall not** lend their personal isolation lock or key to another person.
  - Loss of a personal isolation lock or a key for a personal isolation lock **shall** be reported to the lock administration officer.
  - Only locks that are approved by Hydro Tasmania and meet the criteria of the isolation procedure can be used.
Hydro Tasmania – Isolations

- **Personal isolations**
  - Where possible each worker shall lock every device used for isolating, dissipating or restraining energy on the plant. Lock with red personal isolation locks.
  - The locking shall be done with Red personal isolation locks.
  - Each worker shall tag every device or other means used for isolating, dissipating or restraining energy on the plant with a ‘Personal Danger Tag’.
  - The worker shall write on the tag in the spaces provided:
    - name
    - the reason for isolation/tagging
    - the name of the person (printed)
    - the signature of the person
Action if plant is not fit to return to service:

- If work on the plant stops without finishing the work, or otherwise leaves the plant unfit for use, the person in charge shall ensure that the plant is kept out of operation.

- **Group Isolation:** The person in charge will attach an orange ‘Defect/Restriction’ lock and ‘Hazardous or Unusual Condition’ Tag to the group isolation board and advise operational staff of the plant status.

- **Personal Isolation:** The person in charge will attach an orange ‘Defect/Restriction’ lock and ‘Hazardous or Unusual Condition’ Tag to a single or up to four isolation points stating the status of the equipment on the tag, the date and clearly printing and signing his or her name.
Hydro Tasmania – Isolations

• Group isolations
  o The actual isolation shall be carried out by an authorised issuing officer (AIO) holding appropriate competencies and who is authorised to carry out the group isolations on behalf of other workers
  o A schedule of planned operations (SOPO) shall be used to plan and document the work and to check that all isolations are carried out prior to giving permission to start work under the permit to work.
  o The authorised issuing officer shall lock every device used for isolating the plant with yellow isolation locks (or other means of immobilisation) and shall tag every isolation point with a “Danger – Do Not Operate” tag.
Group isolation locking and tagging
Group isolation locking and tagging

Note the yellow isolation locks and do not operate tags.
• **Group isolations**
  
  o The AIO shall then place all isolation lock keys in the group isolation board and any remaining isolation locks in the group isolation board or locked to the green issuing officer lock that the AIO shall place on the group isolation board before issuing the permit to work to the authorised person in charge (PIC).
  
  o All workers shall then sign on to the PTW and place their red personal isolation locks on the group isolation board.
  
  o The PIC shall then lock the PTW to the Group Isolation board with their own personal isolation lock.
  
  o Workers shall remove their personal isolation locks at the end of each day / shift and before leaving site
  
  o Workers may be recalled to remove the locks at their own time and expense.
Hydro Tasmania – Isolations

- **Group isolations – Example**
  - PTW Satchel
    - Group Isolations Board
    - PIC Personal Lock(s)
    - Spare Yellow Isolation Locks
    - IP Personal Locks
    - AIO Green Lock
**Hydro Tasmania – Hazards and Restricted Areas**

**High Risk Areas**
- Penstocks
- Pipe Lines
- Power generating equipment
- Pump station equipment
- Switchyards
- High Voltage feeders
- Tail bays below power stations & within warning signage
- Dam intake structures within booms and warning signage
- Dam spillways and outlet areas within warning signage
- Radial gates and stop logs
- Flumes and some Canals
- Wind farm infrastructure
- Diesel generating plant
Hydro Tasmania – Hazards in High Risk Areas

- **Forms of energy or hazards**
  - electrical energy (electrical power supply, static charges, batteries, capacitors)
  - mechanical energy (mechanical drives, moving and rotating machinery)
  - pressure energy (water pressure, compressed air, vacuum, hydraulics)
  - gravitational energy (counterweights, vehicle runaways, hung-up material, etc.)
  - potential energy (springs, stored water, structural strain)
  - thermal energy (hot or cold surfaces and substances, heat radiation)
  - noise (rotating machinery, hydraulics pumps, water movement, air & water release)
  - vibration (rotating machinery)
  - non-ionising radiation (lasers, welding, electro-magnetic fields, microwaves)
  - ionising radiation (X-rays, radioactive sources)
  - hazardous substances (corrosive, poisonous, asphyxiates, flammable, asbestos, explosive, chemically reactive substances)
  - biological hazards (bacteria, insects, reptiles, etc.)
Potential energy
- Stored water
- Counter weights
  - Eg; on valves

Pressure energy
- Pressure water
- Hydraulics
  - Oil
  - Water

Kinetic energy
- Moving water in;
  - Pipes & Penstocks
  - Canals & waterways

Working at heights

Hydraulic electric energy
- Induction
- Transformers, Switchyard & cables
- Electro magnetic fields
- Generator & Cables
- High and Low voltages

Mechanical energy
- Rotating plant
- Moving Linkages eg, Guide vanes
- Auxiliary plant
- Confined spaces

Hydro Tasmania – Hazards in High Risk Areas

Working at heights
The following slides show in more detail examples of some of the hazards that exist in these high risk restricted areas.

PERMIT TO WORK AREA
AUTHORIZED PERSONNEL ONLY

Restricted Area
Keep out. Water may rise without warning

CONFINED SPACE
ENTRY BY PERMIT ONLY

HIGH VOLTAGE
AUTHORIZED PERSONNEL ONLY

The following are for your awareness of the hazards and risks that can be encountered and need to be controlled.
Power Stations

- The following hazards may be encountered in Power Stations
  - electrical energy (electrical power supply, static charges, batteries, induction, capacitors)
  - mechanical energy (mechanical drives, moving and rotating machinery)
  - pressure energy (water pressure, compressed air, vacuum, hydraulics)
  - gravitational energy (counterweights, vehicle runaways, hung-up material, etc.)
  - potential energy (springs, structural strain)
  - thermal energy (hot or cold surfaces and substances, heat radiation)
  - noise / vibration
  - confined spaces
  - non-ionising radiation (lasers, electro-magnetic fields from HV power cables)
Chain drive accident

The next slide contains a graphic image!
Chain drive accident
Switchyards

- The following hazards may be encountered in switchyards
  - electrical energy (electrical power supply, static charges, induction)
  - mechanical energy (mechanical drives, moving and rotating machinery)
  - pressure energy (water pressure, compressed air, vacuum, hydraulics)
  - thermal energy (hot or cold surfaces and substances, heat radiation)
  - potential energy (springs, structural strain)
  - non-ionising radiation (electro-magnetic fields, microwaves)
Isolators or disconnectors in operation.
Heat & Radiation.
Hydro Tasmania – Hazards in High Risk Areas

Transformer Fire
Asbestos
# Asbestos

## Non-Friable and Friable definitions

<table>
<thead>
<tr>
<th>Non-Friable Asbestos</th>
<th>Over 97% of the products in Australia were non-friable material in which the Asbestos fibres were bonded by cement, vinyl, resin or other similar material. If accidentally damaged or broken these asbestos products may release a few fibres initially but will not continue to do so...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friable Asbestos</td>
<td>The hazardous friable asbestos is material which can be crumbled, pulverised, or reduced to powder by hand pressure. This may also include previously non-friable material which becomes broken or damaged by mechanical force. As a general rule - If the Asbestos containing material can be easily disturbed and become airborne - by the effect of a breeze or simply creating a breeze by walking past it - it is in a friable state.</td>
</tr>
</tbody>
</table>

EMF electromagnetic fields

- Hydro Tasmania have a number of areas with high strength electromagnetic fields. These areas have been signposted with caution signage with maximum working hours for the area when within certain distances.

Note: Due to the close proximity to live equipment no work would be expected to be undertaken in these areas unless fully isolated and made safe!
## Safe approach distances to uninsulated conductors *Note 1

**Working under PTW**

<table>
<thead>
<tr>
<th></th>
<th>Instructed person</th>
<th>Mobile plant * Note 2</th>
<th>Ordinary person</th>
<th>Working</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Working</td>
<td>(with safety observer)</td>
<td>(No safety observer)</td>
<td>Working</td>
</tr>
<tr>
<td>Up to 1000 V</td>
<td>500 mm</td>
<td>1000 mm</td>
<td>3000 mm</td>
<td>2000 mm</td>
</tr>
<tr>
<td>Above 1000 V up to and Including 22 kV</td>
<td>700 mm</td>
<td>1200 mm</td>
<td>3000 mm</td>
<td>2000 mm</td>
</tr>
<tr>
<td>Above 22 kV up to and including 110 kV</td>
<td>1000 mm</td>
<td>1800 mm</td>
<td>3000 mm</td>
<td>3000 mm</td>
</tr>
<tr>
<td>Above 110 kV up to and including 220 kV</td>
<td>1800 mm</td>
<td>2400 mm</td>
<td>6000 mm</td>
<td>4500 mm</td>
</tr>
</tbody>
</table>
The ABC of working safely near power lines and high voltage equipment.

A PTW with special conditions will be required in Zone C and where required equipment will be Isolated before work.
The ABC of working safely near power lines and high voltage equipment.

A PTW with special conditions will be required in Zone C and where required equipment will be isolated before work.
What does an Electric Shock do to?

The effect that electricity has on a person can vary and as little as 50 volts AC or 120 volts DC can be lethal.

An electrical current flowing through the body can cause:

- muscle spasms;
- electrical burns;
- respiratory arrest (breathing stops);
- uncoordinated contraction of the heart (fibrillation);
- cardiac arrest (heart stops beating); and
- injuries resulting from falls and loss of balance.

*The pathway through the body and the length of time the current flows are two important factors which determine the type and severity of the injury.*
Contact with low voltages can cause a person to tightly grip the live conductor due to muscle contraction if enough current flows. The person cannot let go until the circuit is opened.

Contact with high and low voltages can also cause the person to be thrown clear of the conductor. The secondary injuries may be more serious due to, say, a fall, than the burns received from the original incident.

Low Voltage does not mean Low Hazard!
All metallic objects, and liquids must be considered to be conductive and handled with care.

An electric charge can be induced into metallic objects, when they are in the vicinity of live high voltage conductors / apparatus. This can cause an unpleasant or lethal electric shock if the object is touched.

Earths, short-circuits and bonds must be used, to protect personnel from electric shock.

Metal Tape measures **MUST NOT** be used in switchyards or in the proximity of electrical conductors or overhead power lines.

Aluminium and metal equipment such as ladders and scaffolding shall only be used in electrical environments with approval and use of safe work methods such as work earths.
Induction Hazards and Control Measures

**Induction Hazards:**

Electromagnetic and electrostatic are the two important components of *Induction* when working on or near electrical apparatus.

It is important to recognise that both components are **ALWAYS** present.

**Control Measures:**

Appropriate application of Operational and *Work Earths*.

*Additional Safety Measures.*

Insulated work procedures; or

*Equipotential Work Area* conditions shall be created and maintained.
A double circuit transmission tower has 2 different circuits each having their own 3 phases.

Each circuit is arranged vertically.

The circuit on the left hand side is in service.

The circuit on the right hand side is isolated from the power system.

Electromagnetic induction will occur between the in service circuit and the isolated circuit when the magnetic rings pass through the out of service conductor.
Apparatus is Earthen to ensure and maintain the effective dissipation of electrical energy to the general mass of earth.

The correct application of Earths and the maintenance of Earthen and Equipotential Work Area conditions, aid in providing a safe Work Site.
Hydro Tasmania – Hazards in High Risk Areas

- **Earthing**
  - Earthing is carried out to ensure that an effective discharge of electrical energy to the general mass of earth is maintained for the reasons of personal safety.
  - When work is to be carried out on de-energised high voltage power system equipment, the equipment is to be earthed to ensure no harm to the work party through inadvertent energising, induction or capacitive discharge.
  - Operational earths shall be used to visually bond all three phases together and to bond the phases to earth through a recognised earth point.
  - In addition to operational earthing requirements, work earths shall be utilised during work to minimise the effect of induction through the creation and maintenance of an equipotential work environment.
  - Where conductors are to be disconnected within an isolated and earthed section, and simultaneous worker contact is possible between the two ends or between equipment connected to the two ends, additional work earths, short circuits or bonds must be applied, at the work site, to ensure equipotential work area conditions are maintained across the two ends before such disconnection is undertaken by the work party.
Typical Machine & Tx earthing
Look up and stay alive
Step potential is the voltage difference between the ground at each foot. Touch potential is the voltage difference between where you are standing and what you touch. When there is a voltage difference and your body becomes part of a circuit, then there will be current flow through the body.
Electric Arcs

- Electric arcs radiate intense light and heat.
- They may result in an explosion and can scatter molten material and debris, causing serious injury.
- After an electrical fault, fire or explosion, dangerous chemical compounds including gases, may be formed.
- Take extreme care to prevent personal injury, particularly in confined areas.
- Leave the worksite immediately, do not return until advised that it is safe to do so.
LV switchboard arc flash

Minimum PPE requirements in an electrical environment 185gram weight cotton outer garment!
eg: switchyard, working in HV & LV panels, or exposed to the potential of HV or LV.
• **Penstocks & Pipelines**
  
  The following hazards may be encountered with penstocks & pipelines
  
  – pressure energy (water pressure, compressed air, vacuum, hydraulics, engulfment)
  – thermal energy (hot or cold surfaces and substances, heat radiation)
  – hazardous substances (corrosive, poisonous, asphyxiate, flammable, explosive, chemically reactive substances)
  – biologic hazards (bacteria, insects, reptiles, etc.)
  – confined spaces (water engulfment, hazardous atmospheres)
  – working at heights (Michael Wheatley mid 70s Tunga Penstock sliding top to bottom)
Dams & Water Conveyances

The following hazards may be encountered with Dams & Water Conveyances

- pressure energy (water pressure, high flow rates, hydraulics)
- confined spaces (water engulfment, hazardous atmospheres)
- access and egress (steep terrain, limited to no access and egress)
- working at heights (slippery and unprotected edges)
- weather (frequently changing hot and cold conditions, consistent cold water)
Numbering, lettering and delineation of plant and equipment

- Apparatus such as generating units, circuit breakers, isolators, disconnectors, fuses must be clearly labelled by approved means. This is to ensure that all apparatus can be accurately identified and described.

Lettering and numbering can be unique to these environments and extreme care needs to be taken to make sure you are working on the correct piece of equipment.

Number or lettering may be the only difference because most of this equipment looks the same.

STOP!

THINK!

CHECK!
Delineation barriers may take the form of ropes, markers, signs and temporary fences.

The Person in Charge will show you the boundary of the work site and your entry and exit points prior to signing on to a permit to work.
Delineation of Work Site

*Work site* delineation is provided to direct movement of the work party to the area in which it is safe to work under the terms and conditions of a PTW and shall be established prior to the issue of a permit.

*Employees* shall not cross under / over or interfere with *Barrier Markers* that delineate a *Work Site* except in an *Emergency* situation that threatens the safety of personnel, *Apparatus* or the environment and then only with due consideration for personal safety.
It is everyone's responsibility to ensure that when working on these sites that they are secure or being supervised at all times to prevent unauthorised personnel, contractors, tourists, children and visitors from entering.

- Access gates, doors and roller doors must be kept closed when not in attendance.
- When open, somebody must be on continuous watch.
- Appropriate signage and delineation shall be in place to help prevent accidental entry.

As these signs suggest, power generating and distribution assets and sites are dangerous.

The Australian Electricity Supply Industry (ESI) Skills Passport now used and Nationally recognised.
ESI Passport application form (passport issue)

- The attached application form is required to be filled out after successful completion of the training.
- Upon completion of the form it is to be forwarded to the Operational Compliance Coordinator for processing.
The ESI Passport

- The ESI Passport is your personal record of your inductions, authorisations, training and qualifications.
- You must produce your ESI Passport and photo identification when working under the terms of a PTW or accessing Hydro Tasmania hazardous & restricted areas.
- Only authorised Validation Officers can make entries in your ESI Passport, entries need to be relevant to your role in ESI.

No Passport and Photo ID = No Work
• Do you understand the principles behind the safe work practices?
• Now for the assessment – please ask if you don’t understand any of the questions.
• When you finish please let your trainer know.
Congratulations:

you have completed your Hydro Tasmania “Instructed Person” training for high risk & restricted areas and will be issued with an Electricity Supply Industry Skills Passport

No harm to anyone at any time!