

Isolation procedure

In this Procedure:

1.0	Purpose	1
2.0	Scope	1
3.0	Application framework	2
3.1	Hazards associated with plant.....	2
3.2	Isolation procedures for work on plant	2
3.3	Responsibilities of operators for equipment directly associated with the power system.....	3
3.4	General principles of isolation	3
3.5	Principles of electrical isolation.....	4
3.6	Principles of mechanical isolation	4
3.7	General earthing principles	5
3.8	Delineation of work sites.....	6
4.0	Isolation process	7
4.1	General isolation process	7
4.2	Choice of particular isolation process	7
4.2.1	Directly controlled isolation	7
4.2.2	Personal isolation	7
4.2.3	Group isolation.....	8
4.2.4	Isolation type flowchart	9
4.3	Directly controlled isolation process (where locking or tagging is not necessary).....	10
4.3.1	A: Identification of sources of energy	10
4.3.2	B: Isolation, dissipation and restraint of energy sources.....	10
4.3.3	C: Verifying the effectiveness of energy controls	10
4.3.4	D: Working on the plant.....	10
4.3.5	E: Re-energising and returning the plant to service	10
4.3.6	F: Action if plant is not fit to return to service.....	10
4.4	Personal isolation process.....	11
4.4.1	A: Identification of sources of energy	11
4.4.2	B: Isolation, dissipation and restraint of energy sources.....	11
4.4.3	C: Locking and tagging.....	11
4.4.4	D: Verifying the effectiveness of energy controls.....	12
4.4.5	E: Working on the plant (including testing)	12
4.4.6	F: Prohibition on operation of locked or tagged isolation devices.....	12
4.4.7	G: Removal of locks and tags	12
4.4.8	H: Action before re-energising plant.....	13
4.4.9	I: Action if plant is not fit to return to service	13
4.4.10	J: Removal of locks and tags if worker unavailable	13

4.5	Group isolation procedure	13
4.5.1	A: Selection of person to carry out the actual isolation	14
4.5.2	B: Identification of sources of energy	14
4.5.3	C: Isolation, dissipation and restraint of energy sources.....	14
4.5.4	D: Locking and tagging the plant.....	14
4.5.5	E: Verifying the effectiveness of energy controls	15
4.5.6	F: Placing keys in a group isolation board and locking and tagging the group isolation board.....	15
4.5.7	G: Working on the plant (including testing).....	15
4.5.8	H: Prohibition on operation of locked or tagged isolation devices.....	15
4.5.9	I: Removal of locks and tags from the group isolation board ...	16
4.5.10	J: Removal of locks and tags from group isolation board if worker unavailable.....	16
4.5.11	K: Removal of locks and tags from the plant itself	16
4.5.12	L: Action if plant is not fit to return to service.....	16
5.0	Locking and tagging	17
5.1	Locking rules.....	17
5.2	Isolation points to be locked	17
5.3	Personal isolation locks (RED)	17
5.3.1	Personal isolation lock holders responsibilities	17
5.3.2	When to use a personal isolation lock	18
5.3.3	Application and removal	18
5.3.4	Equipment being tested	18
5.3.5	Work is not completed.....	18
5.4	Isolation locks (YELLOW)	18
5.4.1	Application and removal	18
5.5	Authorised issuing officer locks (GREEN)	19
5.5.1	Authorised issuing officer lock holder responsibilities	19
5.5.2	Application and removal	19
5.5.3	Work is not completed.....	19
5.5.4	Work is completed	19
5.6	Defect/restriction locks (ORANGE)	19
5.7	Group isolation boards.....	20
5.7.1	Using a group isolation board	20
5.8	Permit to work sleeve	20
6.0	Lock and key identification.....	21
6.1	Personal isolation locks and key	21
6.2	Isolation locks and keys.....	21
6.3	Authorised issuing officer locks and key	21
6.4	Defect/restriction locks and keys.....	21
7.0	Lock and key management.....	22
7.1	Lost personal isolation lock key	22
7.2	Lost/damaged personal isolation lock	22
7.3	Lost isolation lock key	22
7.4	Lost/damaged isolation lock	22
7.5	Lost authorised issuing officer lock key	22
7.6	Lost/damaged authorised issuing officer lock	22
7.7	Lost defect/restriction lock key.....	22

	7.8	Lost/damaged defect/restriction lock.....	22
8.0		Lock administration	23
9.0		Isolation and operational control tags	24
	9.1	'Danger – Do Not Operate' tag	24
	9.1.1	When do I use this tag?.....	24
	9.1.2	Application and removal	24
	9.2	'Personal Danger Tag'.....	25
	9.2.1	When to use this tag?	25
	9.2.2	Application and removal	25
	9.2.3	Equipment being tested.....	25
	9.2.4	Work is not completed.....	25
	9.2.5	Work is completed	25
	9.3	'Hazardous or Unusual Condition' tag	26
	9.3.1	When do I use this tag?.....	26
	9.3.2	Application and removal	26
10.0		Schedule of planned operations (Isolation sheets)	27
	10.1	Responsibilities.....	27
	10.1.1	Authorised issuing officer	27
	10.1.2	Authorised person.....	27
	10.2	Standard	27
	10.2.1	General.....	27
	10.2.2	Schedule of planned operations numbering	27
	10.3	Schedule of planned operations format	27
	10.3.1	Compilation	27
	10.4	Schedule of planned operations colour specifications	29
	10.5	Master schedule of planned operations	29
	10.5.1	Checking and approving schedule of planned operations.....	30
	10.5.2	Registered computer generated schedule of planned operations	30
	10.5.3	Actioning of schedule of planned operations	30
	10.5.4	Return to service of equipment (RTS).....	31
	10.5.4.1	Using a schedule of planned operations	31
	10.5.4.2	Using commissioning programs.....	31
	10.5.5	Using operational procedures and checklists	32
	10.6	Routine testing programs.....	32
	10.7	Operational terminology.....	32
	10.8	Schedule of planned operations copies and filing	33
11.0		Revision history	34
		Appendix A Lock/tag removal form	35
		Appendix B Schedule of planned operations form	36
		Appendix C Schedule of planned operations Isolation Additions/Deletions form	37
		Appendix D Master schedule of planned operations form	39
		Appendix E Terms and abbreviations.....	40
		Appendix F Personal isolation lock issue register – temporary issue	45

1.0 Purpose

The purpose of this document is to provide practical guidance about the use of isolation procedures (including isolation, earthing, and draining) to protect persons working on plant.

2.0 Scope

The isolation procedure is applicable to all work being undertaken at Hydro Tasmania owned and/or operated plant and assets. This document applies to isolation procedures designed to protect a worker from unexpected energisation, start-up, or release of energy, while they are working on plant. It 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.

This document does not cover:

- normal plant operation
- minor servicing tasks
- live work procedures

3.0 Application framework

3.1 Hazards associated with plant

During routine operations, persons will normally be protected from contact with potentially harmful sources of energy associated with plant by the usual hazard controls (separation, guarding, other engineering controls and administrative controls), or because the source of energy is contained within the plant. When work has to be carried out on the plant (during installation, servicing, maintenance, repair, cleaning, dismantling, etc.), the usual hazard controls can not always be used. In particular, guards, interlocks and other safety devices may have to be removed or by-passed, and workers may have to enter or place parts of their bodies in hazardous areas of the plant. In these cases, alternative ways to protect workers become necessary. When working on plant, protection is needed from:

- movement or operation of the plant itself
- movement of water
- contact with energy
 - used to operate the plant
 - used to carry out processes in the plant
 - produced or carried by the plant
 - stored within the plant

The forms of energy or hazards involved may include:

- 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, structural strain)
- thermal energy (hot or cold surfaces and substances, heat radiation)
- noise
- vibration
- non-ionising radiation (lasers, welding, electro-magnetic fields, microwaves)
- ionising radiation (X-rays, radioactive sources)
- hazardous substances (corrosive, poisonous, asphyxiant, flammable, explosive, chemically reactive substances)
- biologic hazards (bacteria, insects, reptiles, etc.)

3.2 Isolation procedures for work on plant

In general, when work is being carried out on plant, it is necessary for the workers to protect themselves from sources of energy associated with the plant by following an isolation procedure. The isolation procedure provides for each worker involved to personally ensure that energy sources associated with the plant are isolated, dissipated or restrained, and continue to be isolated, dissipated or restrained until the worker stops work on the plant. Work on plant varies widely in its nature and complexity, and a single isolation process can not provide the protection and flexibility required to cover all situations. To provide this flexibility, three isolation processes for use in different circumstances are given in the 'isolation process section'. The criteria for the choice of isolation process are also covered in this section.

3.3 Responsibilities of operators for equipment directly associated with the power system

The operator **shall** be an authorised person and is responsible for:

- Liaising with planning departments to plan outages where delegated.
- Negotiating access requirements.
- Preparing and authorising schedules of planned operations.
- Operating power system equipment under the direction of Hydro Tasmania.
- Actioning schedules of plant operations.
- Conducting a risk assessment for:
 - performing operational activities
 - maintaining system security prior to carrying out fault finding.
- Locking and tagging out of service, switchgear and operating control mechanisms.
- The application of operational earths and associated tags where necessary for the issue of a permit to work. The operator may engage a competent employee to apply operational earths.

3.4 General principles of isolation

- Isolated equipment **shall** be rendered incapable of being energised without premeditated and deliberate action.
- Equipment **shall** be isolated by the use of an approved method.
- All complex/group isolation operations **shall** be identified on a schedule of planned operations.
- Where Isolation points have provision for locking, such locking arrangements **shall** be used to prevent re-energising. If the Isolation point is not fitted with a built-in provision for locking, an alternative lock or other means of immobilising a point of Isolation **shall** be used.
- All isolations **shall** be locked and tagged in accordance with this procedure
- Isolation points **shall** be tagged. Where an Isolation point is used for multiple permits to work it **shall**:
 - have a separate tag for each permit to work or
 - have a separate tag for each schedule of planned operations, or
 - be tagged in accordance with approved schedule of planned operations procedures including master schedule of planned operations arrangements.
- Tags (other than SCADA) **shall** be suitably displayed, and include:
 - be cross locked in accordance with an agreed Isolation arrangement signed off as part of the permit to work
 - equipment operated via remote control subsequent to local Isolation **shall** be tagged on the SCADA system such that a premeditated action is needed to remove such tagging
 - equipment used as a point of Isolation **shall** not be worked on
 - Isolation points can only be altered with the approval of the authorised Issuing officer subject to the terms and conditions of the permit to work.

3.5 Principles of electrical isolation

- An Isolation point **shall** have a break of a distance appropriate to the voltage and insulating medium that is visible (if possible).
- For high voltage plant – if the Isolation point does not have a visible break, it **shall**:
 - be withdrawn to the isolated position
 - be proven De-energised and approved earthing devices applied to confirm isolation
 - have control circuits isolated, locked (as appropriate) and tagged. Where Isolation is performed by an MCB/CB which cannot be locked, further Isolation **shall** be required i.e. withdrawal of all applicable fuses/links to provide a double break.
- VT and CVT secondaries **shall** be isolated by the withdrawal of all applicable fuse/ links or by opening an Isolation switch or MCB. The fuses/links **shall** be secured or the Isolation switch/MCB **shall** be locked. Applicable VT selection switches **shall** be tagged. In addition to the above, for work on a CVT, secondaries **shall** be further isolated by the withdrawal of fuses/links or opening MCB's or slide disconnect links to provide a double break.
- Where isolation of low voltage circuits requires the withdrawal of fuses/links, all subsequent exposed live terminals **shall** be made safe.
- Where transformers remain connected within an isolated section of a high voltage conductor, then a risk assessment **shall** be carried out to determine the need for other safety measures to guard against alternative sources of supply e.g. backup generators or alternate supplies on the LV sides of transformers.

*NOTE: Where a switch truck/carriage has been removed from its cubicle, other safety measures **shall** be taken to prevent access to Live Conductors, e.g. spout shutters locked, busbar covers installed, switchgear door locked and Tagged.*

3.6 Principles of mechanical isolation

- Equipment **shall** be unwound, un-tensioned or drained, vented and depressurised to prevent uncontrolled movement, or otherwise made safe for work.
- An isolation device **shall** have an appropriate design to withstand the hydraulic, pneumatic, or mechanical energy.
- All necessary gates, valves and mechanical linkages utilised as isolation points **shall** be restrained in position, locked and tagged.
- Rotating and linear actuating equipment **shall** be stationary, and where appropriate, restrained and/or its motive force and control circuits Isolated.
- Pressure vessels, penstocks, piping, ducts, and vents **shall** be isolated, and drained where appropriate, to ensure their condition/status remains unchanged for the duration of the work.
- Valves utilised as drains **shall** be tagged.
- Motorised valves and gates **shall** have their control and/or power circuits isolated.
- Where energised equipment cannot be de-energised, an appropriately designed and approved locking device **shall** be used to prevent movement.
- Systems used to apply and maintain seals, **shall** be monitored for the duration of the work.
- Where the integrity of the isolation device is questionable, further isolation or additional safety measures are required.
- Where practical, the equipment **shall** be proven de-energised.

3.7 General earthing principles

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.

All earths (operational or work) **shall** be applied and removed in accordance with the requirements of the temporary earthing of power system equipment standard GS-AM-006.

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.

All high voltage electrical work **shall** be done between earthing devices unless, due to lack of space or design standard, it is not physically possible to apply earths to all sources of high voltage supply. In this situation, no work **shall** commence on isolated Equipment until it has been positively identified and proven de-energised at the work location.

All Hydro Tasmania employees when carrying out operational duties, **shall** wear and use appropriate personal protective equipment and clothing (with non-metal fittings), as specified in the safe work practices handbook and in the PPE procedure.

Operational earths **shall** be used to visually bond all three phases together and to bond the phases to earth through a recognised earth point.

All power system equipment within Hydro Tasmania's power system **shall** be 'proven de-energised' using an approved voltage detection device prior to the application of earths.

Operational earths are applied as an operational function in the preparation of equipment prior to the issue of a permit to work and are part of the terms and conditions of the permit to work.

All operational earths **shall** be tagged using the 'Danger - Do Not Operate' tag. A tag **shall** be applied for each permit to work/schedule of planned operations utilising the same set of operational earths, to specifically identify the number of permit to work/schedule of planned operations relying on the operational earths in the provision of a safe work environment. The tag **shall** be suitably displayed and applied at the recognised earth point and **shall** display the following information:

- The associated permit to work/schedule of planned operations number
- A brief description of the application point
- Applied by (print & sign)
- Date of placement

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.

3.8 Delineation of work sites

Work site delineation is provided to direct movement of the work party to and from the area in which it is safe to work under the terms and conditions of the permit to work.

All delineated work sites **shall**:

- Be established prior to the issue of the permit to work.
- Be defined by barrier markers erected to indicate, as clearly as possible, the work site in which work is to be performed. Where it is not possible and/or practicable to use physical barrier markers, approved procedures **shall** be followed.
- Be arranged so that the equipment to be worked on is accessible without interfering with the barrier markers.
- Have a clearly defined entry point. This may require separate entry points for personnel and vehicles.
- Have appropriate barrier markers and/or signs placed at points where it is possible to move into the safe approach distance to conductors, which **shall** be regarded as energised.
- Have appropriate barrier markers and/or signs placed at points where other hazards exist, e.g. excavations.

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, equipment or the environment and then only with due consideration for personal safety.

4.0 Isolation process

4.1 General isolation process

To protect people working on plant from sources of energy associated with that plant, the following 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:

- **stop** the plant
- **isolate**, dissipate or restrain the energy sources
- **lock and Tag** or otherwise ensure that the plant can not be re-energised
- **verify** that the isolation, dissipation and restraints are effective
- **sign on** to the permit to work
- **work on** the plant
- **sign off** the permit to work
- **remove any locks and tags**
- **restore** and re-energise the plant

4.2 Choice of particular isolation process

To cover the varied range of work on plant and equipment, three variations on the general isolation process are to be used. The choice of process will depend on the scope and complexity of the work.

4.2.1 Directly controlled isolation

For work on plant where:

- Isolation, dissipation or restraint of energy sources is carried out by physical removal or separation of plant components.
- Each worker can keep the means of isolation, dissipation and restraint under continuous observation and control.
- There is no potential to interrupt production.

Then a directly controlled Isolation procedure following the process steps in Section 4.2 may be used. The directly controlled isolation may be a requirement of the permit to work.

Note: Such work might include the maintenance of power tools and the servicing of light vehicles.

Note: In these cases, it may not be necessary or practicable to lock and tag energy sources. Isolation can be achieved by unplugging power leads, disconnecting pipelines and hoses, or removing vehicle ignition keys. Re-energisation of the plant can be effectively prevented, without the need for locking and tagging out, by coiling up power leads or hoses.

4.2.2 Personal isolation

In work on plant where:

- Each worker involved does not have direct close control of the means of isolation, dissipation and restraint.
- Fewer than four energy sources are involved.
- Fewer than six workers are involved and they can easily liaise with each other during the work.
- The work will be completed by the end of the current shift.

-
- There is no potential to interrupt production.
 - There are no high voltage (greater than 1,000 Volts) energy sources involved.
 - At least one of the workers involved is competent and authorised to personally determine, carry out and check the isolations required.

Then a personal isolation process **shall** be used (refer to personal isolation process section in this procedure). The personal isolation may be a requirement of the permit to work system.

Note: Such work will include most routine maintenance and similar tasks carried out by individual workers or by small groups. Note: In these cases, the plant involved should be fitted with isolating switches on electrical power sources, and other suitable devices on other sources of energy and be locked and tagged.

4.2.3 Group isolation

In work on plant where:

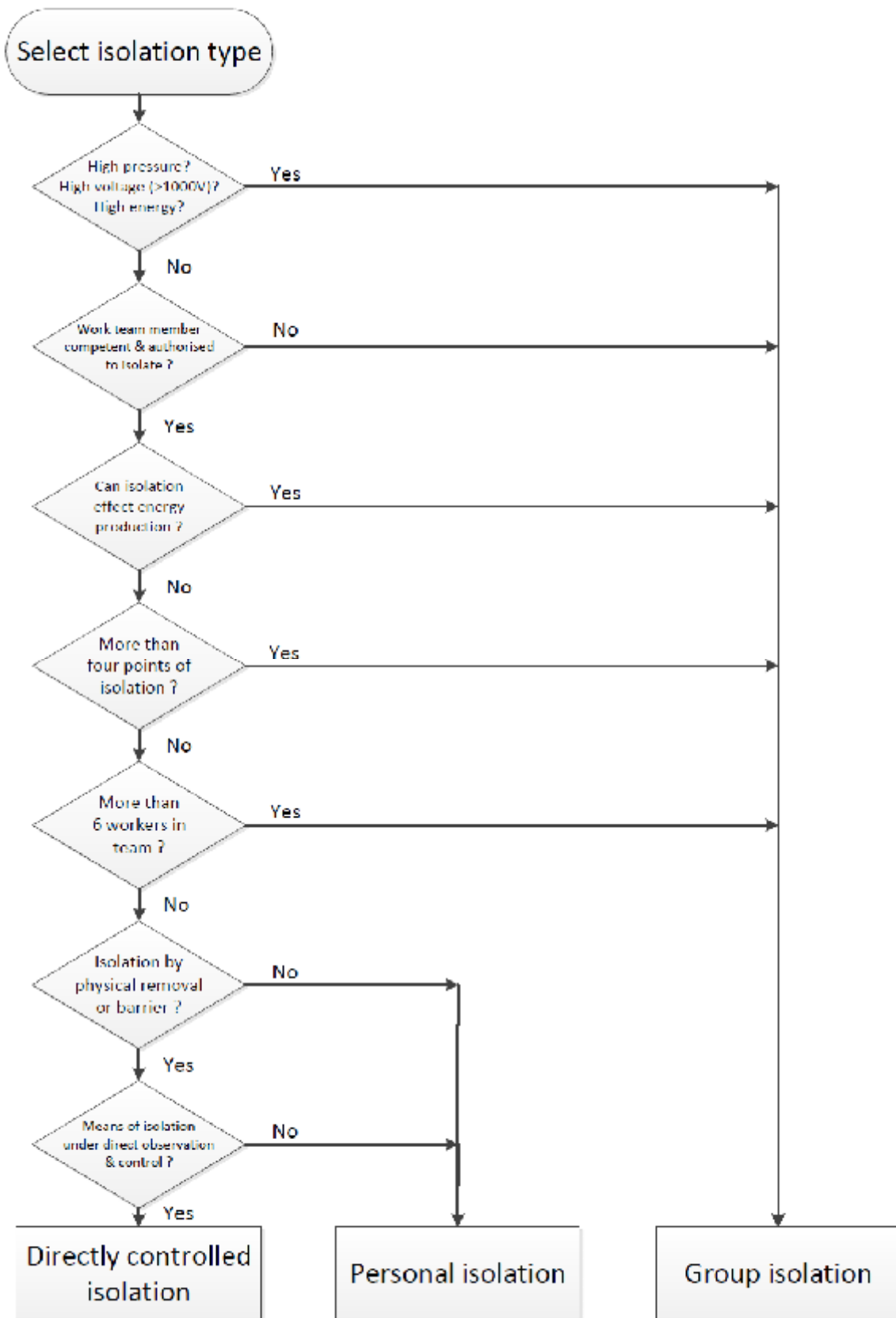
- More than four energy sources are involved.
- More than six workers are involved.
- The work will take longer than one shift to complete.
- The work has the potential to interrupt production.
- None of the workers have the specialised technical competence and authorisation to personally determine, carry out and check the isolations required.

Then a group isolation procedure following the process steps outlined in this procedure will be used. The group isolation will be a requirement of the permit to work.

Note: Such work will include major maintenance work, major construction or modification work to power stations, or work on high voltage electrical installations, etc.

Note: In these cases, it is only practicable for the isolation, dissipation and restraint of energy sources to be carried out by a designated, competent and authorised person (an authorised issuing officer) for that purpose. However, it is still necessary to give all workers involved the means (through the use of the group isolation board and personal isolation Locks) to ensure that the plant can not be re-energised until they have stopped work on the plant.

4.2.4 Isolation type flowchart



4.3 Directly controlled isolation process (where locking or tagging is not necessary)

To determine if this process is suitable for the type of work to be carried out, see Section 4.1 above.

4.3.1 A: Identification of sources of energy

- The worker **shall** personally identify:
- all potentially harmful sources of energy coming into the plant
- all potentially harmful sources of energy contained within the plant
- any plant or contents likely to move

Note: Energy fed into the plant may have more than one source and supply line.

4.3.2 B: Isolation, dissipation and restraint of energy sources

The worker **shall** bring the plant to a safe state to work on by, as appropriate:

- Stopping the plant in a controlled manner.
- Isolating any sources of energy feeding the plant.
- Dissipating any sources of energy contained within the plant.
- Restraining the plant, materials and any other sources of energy that can not be dissipated.

Note: In these cases, isolation may only involve unplugging power leads, disconnecting air hoses, turning off and removing the ignition keys of vehicles, etc.

4.3.3 C: Verifying the effectiveness of energy controls

The worker **shall** verify the effectiveness of the isolation, dissipation and restraint of energy sources. (Test and prove dead).

Note: Verification may be done by visually checking the energy controls, by attempting to start the plant, or by other suitable tests or measurements.

4.3.4 D: Working on the plant

The worker may then carry out work on the plant. While doing so, the worker **shall** ensure that no other person re-energises the plant.

Note: The worker can prevent others from re-energising the plant by keeping the leads, hoses or keys under their direct control.

4.3.5 E: Re-energising and returning the plant to service

After the work on the plant is complete, the worker **shall** check and ensure that the plant is clear of tools, equipment, materials and persons who may be affected before the plant is re-energised and returned to service.

4.3.6 F: Action if plant is not fit to return to service

If the worker stops work on the plant without finishing his or her tasks, or otherwise leaves the plant unfit for use, he or she **shall** ensure that the plant is kept out of operation and asset owners or their delegates informed of the situation and issues. Where possible a defect/restriction lock and tag should be applied.

4.4 Personal isolation process

To determine if this process is suitable for the type of work to be carried out, refer to the general isolation process in this procedure.

4.4.1 A: Identification of sources of energy

A worker intending to work on plant **shall** personally identify:

- All potentially harmful sources of energy coming into the plant.
- All potentially harmful sources of energy contained within the plant.
- Any plant or contents likely to move.

Note: Energy fed into the plant may have more than one source and supply line.

4.4.2 B: Isolation, dissipation and restraint of energy sources

Each worker **shall** either personally bring the plant to a safe state to work on, or if other workers are also working on the same plant, personally check that this has been done by another worker.

The plant **shall** be brought to a safe state by a competent person, as appropriate:

- Stopping the plant in a controlled manner.
- Isolating any sources of energy feeding the plant.
- Dissipating any sources of energy contained within the plant and preventing energy building up again during the course of the work.
- Restraining the plant, materials and any other sources of energy that can not be dissipated.

*Note 1: If the plant or equipment affects operations or services, the worker shutting it down **shall** liaise with the people affected by the isolation to ensure it can be shut down without creating an unacceptable level of risk or unintended impact.*

Note 2: Isolation of energy sources should be done by physically interrupting the supply of energy. This can be done by turning off isolating switches in electrical circuits, by closing valves, by disconnecting batteries, leads, cables or hoses, by blanking off pipelines, etc. The means of isolation should be of a type that can be readily checked by a visual inspection and it should act directly on the supply line. It should not act through control circuits or emergency stop mechanisms. The point of isolation should be as close to the plant concerned as practicable.

Note 3: Dissipating sources of energy in the plant can be done by opening valves to drain pipelines, pressure vessels and hydraulic accumulators, by opening access hatches and inspection covers, by earthing, by releasing springs, by dropping counterweights, etc.

Note 4: If internal sources of energy can not be dissipated, they can be restrained by securing mechanical sources of energy such as springs or gravity devices, by closing cover plates on radioactive gauges, etc. Plant that can move can be restrained by applying brakes, by inserting chocks or sprags, etc. Other types of plant they may have to be restrained include fans or pumps that may be moved by flow through them.

4.4.3 C: Locking and tagging

Where possible each worker **shall** lock every device used for isolating, dissipating or restraining energy on the plant. If the Isolation point is not fitted with a built-in provision for locking, an alternative lock or other means of immobilising the point of Isolation **shall** be used. 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
- the date of tagging.



Note 1: Locking provides physical security to ensure that the device used for isolating, dissipating or restraining energy is not inadvertently operated. Tags do not provide a reliable means of restraint on the device as they can inadvertently be removed. The purpose of a tag is to provide information, not security.

Note 2: If the isolation device is operated by removing a key from it and it does not have provision for individual workers to lock it, the personal isolation procedure may not be appropriate, and it may be necessary to use the group isolation procedure in Section 4.2.

Note 3: Devices which are not capable of being locked directly should, as far as practicable, be secured with a chain, pin or other suitable means, or by removing the handle or operating mechanism.

Note 4: The locks of several workers can be attached to the same device by means of hasps with holes for several locks.



4.4.4 D: Verifying the effectiveness of energy controls

Each worker **shall** either personally verify the effectiveness of the isolation, dissipation and restraint of energy sources, or if other workers are also working on the same plant, personally check and observe when this is being done by another worker.

*Note: Verification may be done by visually checking the energy controls, by reading gauges and meters, by attempting to start the plant, or by other suitable tests. However, no attempt to start the plant **shall** be made if work has already started on the plant.*

4.4.5 E: Working on the plant (including testing)

If verification shows that sources of energy have been effectively isolated, dissipated and restrained, the worker may then carry out work on the plant. If it is possible for stored energy to re-accumulate during the work on the plant, the workers **shall** monitor the re-accumulation and take appropriate action as necessary.

If and when the equipment requires testing, it **shall** be the responsibility of the person conducting the test to notify the other employees who have personal isolation locks attached to the equipment isolation points. Each of these employees **shall** remove their own personal isolation lock(s) prior to carrying out the testing and move to a safe position before testing commences. If further work on the plant is required after the testing, the isolation **shall** be fully restored and all workers **shall** then replace their personal isolation locks onto equipment isolation points. Additional copies of the schedule of planned operations may be used to ensure that the isolation is fully restored.

Note: While work is being carried out, the possibility that the plant might become re-energised or that energy might re-accumulate can be prevented by, for example, earthing electrical conductors, leaving drain valves open, etc.

4.4.6 F: Prohibition on operation of locked or tagged isolation devices

All persons **shall** be prohibited from:

- Attempting to operate an energy isolation, dissipation or restraint device which has been locked or tagged.
- Attempting to otherwise re-energise or restart the plant while persons are working on it.

4.4.7 G: Removal of locks and tags

As each worker stops work on the plant, they **shall**:

- Clear the plant of any tools, equipment or materials that they have and that are not required by other workers still working on the plant.
- Replace any guards that are not required to be left open for access by other workers still working on the plant.

After doing this and getting clear of the plant, the worker **shall** then:

- Remove their personal isolation locks and personal danger tags.
- Remove name and details from, or tear up or otherwise destroy the tags.

Note: Destruction of tags after removal will prevent re-use and indicate that the tag has not been removed inadvertently or by accident.

4.4.8 H: Action before re-energising plant

Before removing the last isolation locks and tags, the worker or group of workers involved **shall**:

- Check and ensure that the plant is clear of tools, equipment, materials and persons.
- Check and ensure that all guards have been replaced, and the plant is fit for use.

After the last worker removes their locks and tags, they **shall** inform any plant operators or other workers affected that the plant is no longer isolated, and may re-energise the plant.

*Note: The workers involved in checking the plant and re-energising it **shall** be competent and authorised to do so. If they are not, the group isolation procedure **shall** be used.*

4.4.9 I: Action if plant is not fit to return to service

If any worker stops work on the plant without finishing his or her tasks, or otherwise leaves the plant unfit for use, he or she **shall** place a defect/restriction Lock and 'Hazardous or Unusual Condition' tag to the inoperable plant isolator or otherwise ensure that the plant is kept out of operation and advise operational staff of the plant status.



4.4.10 J: Removal of locks and tags if worker unavailable

If any worker has left the site without removing his or her personal isolation lock(s), and it is not practicable to recall the worker to remove them, the lock may be removed by an authorised issuing officer after the lock/tag removal form/process has been completed and duly authorised by the responsible officer or their direct delegate to ensure that owner of the lock and/or danger tag is safe and no longer on site or around the equipment related to the lock and/or tag.

*Note: Removal of locks with this process **shall** only be used as a last resort – a worker having to drive back to site is practicable no matter how inconvenient.*

4.5 Group isolation process

To determine if this process is suitable for the type of work to be carried out, see Section 4.1 above.

4.5.1 A: Selection of person to carry out the actual isolation

The asset owner (or their delegate) will select and designate an appropriately competent and authorised person (authorised issuing officer) to plan and carry out the isolation and restoration of the plant once work is completed. The authorised issuing officer **shall** have adequate knowledge of the plant and the competencies required to carry out the isolation and restoration.

4.5.2 B: Identification of sources of energy

Based upon the scope of the work, the authorised issuing officer **shall** personally identify:

- all potentially harmful sources of energy coming into the plant
- all potentially harmful sources of energy contained within the plant
- any plant or contents likely to move.

The authorised issuing officer will then prepare a schedule of plant operations which will document all operations, isolations, earthing, dissipating, draining and restraining steps required to ensure the safety of all workers. The authorised issuing officer will take into account and plan for any testing, commissioning and progressive restoration of the plant when preparing the schedule of plant operations. The schedule of plant operations **shall** be verified by another competent and authorised issuing officer before commencing the isolation.

4.5.3 C: Isolation, dissipation and restraint of energy sources

The authorised issuing officer **shall** personally bring the plant to a safe state to work on as detailed on the schedule of plant operations. The completion of each step on the schedule of plant operations **shall** be marked as complete immediately after it is done.

The plant **shall** be brought to a safe state by, as appropriate:

- stopping the plant in a controlled manner
- isolating any sources of energy feeding the plant
- dissipating any sources of energy contained within the plant and preventing energy building up again during the course of the work including earthing and draining
- restraining the plant, materials, and any other sources of energy that can not be dissipated.

*Note: If the plant has not been shut down by Generation Operations, the authorised issuing officer shutting it down **shall** liaise with Generation Operations to ensure it can be shut down without creating an unacceptable level of risk or unintended impact on production.*

4.5.4 D: Locking and tagging the plant

The authorised issuing officer **shall** lock every device used for isolating the plant. If the isolation point is not fitted with a built-in provision for locking, an alternative lock or other means of immobilising a point of Isolation **shall** be used. The locking **shall** be done with Yellow Isolation locks. The authorised issuing officer **shall** also tag every device or other means used for isolating, dissipating or restraining energy on the plant with a 'Danger – Do Not Operate' tag. This may include "cross locking" other group isolation boards.

The authorised issuing officer **shall** ensure the 'Danger – Do Not Operate' tag has the following legible information:

- the schedule of plant operations number
- the description and state of the Equipment (the tag is applied to)
- the name and signature of the authorised issuing officer
- the date of tagging.



4.5.5 E: Verifying the effectiveness of energy controls

The authorised issuing officer **shall** verify the effectiveness of the isolation, dissipation and restraint of energy sources with the person in charge (and all the work party if practical to do so).

4.5.6 F: Placing keys in a group isolation board and locking and tagging the group isolation board

If verification shows that sources of energy have been effectively isolated, dissipated and restrained, the authorised issuing officer **shall** place the keys they used to lock the devices for isolating, dissipating or restraining energy on the plant, and any remaining isolation locks from a set of locks in a group isolation board. The authorised issuing officer will then place a green 'Authorised Issuing Officer' lock on the group isolation board. At this point the authorised issuing officer may authorise the work to commence on the plant covered by the permit to work to the person in charge of the work. All workers (including an authorised issuing officer if working on the plant being isolated) who are to work on the plant **shall** then sign on to the permit to work and lock the group isolation board with a red personal isolation lock.



Before locking on to the group isolation board, all workers should personally verify, or require the authorised issuing officer or person in charge, to demonstrate that the sources of energy have been effectively isolated, dissipated and restrained (test & prove de-energised).

4.5.7 G: Working on the plant (including testing)

After a worker has locked and tagged the group isolation board, they may then carry out work on the plant. If it is possible for stored energy to re-accumulate during the work on the plant, the workers **shall** monitor the re-accumulation and take appropriate action as necessary. This identified hazard **shall** be included on the Permit to work and JHA with appropriate control measures put in place.

If, and when, the equipment requires testing, it **shall** be the responsibility of the person conducting the test to notify the other employees who have personal isolation locks attached to the group isolation board. Each of these employees **shall** remove their own personal isolation lock(s) prior to carrying out the testing and move to a safe position before testing commences. If further work on the plant is required after the testing, the isolation **shall** be fully restored and all workers **shall** then replace their personal isolation locks onto the group isolation board. Additional copies of the schedule of planned operations may be used to ensure that the isolation is fully restored. The Permit to work procedure "change of conditions/test sheet" **shall** be used as a tool to document and inform the work team when changes take place.

4.5.8 H: Prohibition on operation of locked or tagged isolation devices

All persons **shall** be prohibited from:

- attempting to open a locked or tagged group isolation board
- attempting to operate an energy isolation, dissipation or restraint device which has been locked or tagged
- attempting to otherwise re-energise or restart the plant while persons are working on it.

4.5.9 I: Removal of locks and tags from the group isolation board

As each worker stops work on the plant and gets clear of the plant, the worker **shall** remove their personal isolation lock from the group isolation board.

*Note: Persons **shall** only need to remove their lock/tag if they are leaving the worksite. E.g. there is no need to remove locks for lunch or short periods throughout the shift if agreed by the person in charge. Personal isolation locks must stay with the person to whom they have been issued. They must be removed any time the person has to leave the work area/site. **Personal isolation lock owners may be asked to return to site to remove their locks if left on.***

4.5.10 J: Removal of locks and tags from group isolation board if worker unavailable

If any worker has left the site without removing his or her personal isolation lock from the group isolation board, and it is not practicable to recall the worker to remove them, the lock may be removed by an authorised issuing officer after the lock/tag removal form/process has been completed and duly authorised by the responsible officer or their direct delegate to ensure that owner of the personal isolation lock and/or danger tag is safe and no longer on site or around the equipment related to the lock and/or tag.

*Note: Removal of locks with this process **shall** only be used as a last resort – a worker having to drive back to site is practicable no matter how inconvenient and workers may be recalled to remove their lock and/or tag at their own time and expense.*

4.5.11 K: Removal of locks and tags from the plant itself

After all locks have been removed from the group isolation board, the authorised issuing officer may remove the green authorised issuing officer lock, open the group isolation board and remove the keys he or she used to lock the devices used for isolating, dissipating or restraining energy on the plant.

The authorised issuing officer (or another competent and authorised person if the AIO has also been the PIC on this occasion) **shall** then:

- check and ensure that the plant is clear of tools, equipment, materials and persons
- check and ensure that all guards have been replaced, safety devices are operating, and the plant is fit for use
- check that all primary protective assets are returned fully to service and that any links are returned to their normal operational state.

The authorised issuing officer may then remove the isolation locks and tags from the plant. They may then re-energise the plant and **shall** inform any plant operators or other workers affected that the plant is no longer isolated.

4.5.12 L: 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. 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.



5.0 Locking and tagging

The section below describes the types of locks and equipment used for isolation and their use to support the isolation procedures described above.

5.1 Locking rules

An isolation point **shall** not be operated, nor an attempt made to override or tamper with an isolation point that has been secured by a personal isolation lock/tag or an isolation lock.

Note: this rule is a cardinal rule that may result in severe disciplinary action.

Each person **shall** lock on using their personal isolation lock prior to starting work and remove their personal lock once they have finished work or are about to leave site. The person in charge will remove their personal lock when leaving site, but will ensure that a 'Defect/Restriction' Lock and 'Hazardous or Unusual Condition' tag is attached until the work is complete or until transferred to another person in charge.

Isolation locks **shall** only be placed or removed by a competent and authorised issuing officer.

All personal isolation locks **shall** be easily identifiable to another person.

Personal isolation locks **shall** only be placed or removed by the owner, unless the lock/tag removal process is followed with due process and authorisation.

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.

Only locks that are approved by Hydro Tasmania and meet the criteria of this procedure can be used.

5.2 Isolation points to be locked

Where isolation points have provision for locking, such locking arrangements should be used to prevent re-energising. If the isolation point is not fitted with a built-in provision for locking, an alternative lock or other means of immobilising a point of isolation should be used. The locking and tagging continuous improvement spreadsheet should be used to record isolation points that can't be locked.

All Isolation points **shall** be tagged.

5.3 Personal isolation locks (RED)

Personal isolation locks are red in colour and issued to individuals who need to lock out energy sources. Personal isolation locks are uniquely keyed 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).

The person in charge uses their personal isolation lock to lock out group isolations.

These locks have only one (1) key and no master key. They are registered locks, thus preventing duplication.



5.3.1 Personal isolation lock holders responsibilities

Ensures the lock is maintained in good condition.

Ensures their key is in their possession or control at all times.

Ensures the lock has their name attached (either by ID tag or on the lock itself).

Ensures their lock is placed on equipment isolation points or group isolation board(s) or multiclasp after signing onto a permit to work when required.

5.3.2 When to use a personal isolation lock

Personal isolation locks **shall** be used by all personnel when work requiring isolating energy sources by personal or group isolations is required.

5.3.3 Application and removal

A personal isolation Lock **shall** only be applied and removed by the person who owns it. The only time a personal isolation lock may be removed by another person is after a lock/tag removal form has been completed in full, and signed by either the RO or RO's delegate. (Appendix A - Lock/tag removal form). This must be reported as an incident in IQMS.

5.3.4 Equipment being tested

When the equipment requires testing, it **shall** be the responsibility of the person conducting the test to notify the other employees who have personal isolation locks attached to the equipment isolation points or group isolation board. Each of these employees **shall** remove their own personal isolation lock(s) prior to carrying out the testing. If further work on the plant is required after the testing, the isolation **shall** be fully restored and all workers **shall** then re-place their personal isolation locks onto the equipment isolation points or group isolation board.

5.3.5 Work is not completed

If work has not been completed and the employee needs to leave the work site, then their personal isolation lock must be removed. In the case where a personal lock is removed from a group isolation board where the work is incomplete or the equipment is out of service, the authorised issuing officer lock will remain in place to ensure safety until the work has been complete and the equipment is brought back into service. An orange defect/restriction lock and 'Hazardous or Unusual Condition' tag must also be placed on the isolation point or group isolation board by the person in charge until the equipment is fit for service.

*Note: Persons **shall** only need to remove their lock/tag if they are leaving the worksite. E.g. there is no need to remove locks for lunch or short periods throughout the shift if agreed by the person in charge.*

They must be removed any time the person has to leave the work site.

Personal isolation lock owners may be asked to return to site to remove their locks if left on. Personal isolation lock owners may be asked to return to site to remove their locks if left on.

5.4 Isolation locks (YELLOW)

Isolation locks are yellow coloured locks and come in sets of 5, 10 and 20. There are multiple sets and each set of isolation locks are keyed alike. They are applied by authorised issuing officers when isolating equipment as part of group Isolations.



5.4.1 Application and removal

Isolation locks are applied when a group isolation is required by an authorised issuing officer for the sole purpose of securing a number of isolation points, as detailed in a SOPO and accompanying a PTW.

Isolation locks must be accompanied by a completed 'Danger - Do Not Operate' tag.

Isolation points which are being used for multiple permit to work/schedule of plant operations must have a separate Isolation Lock and 'Danger - Do Not Operate' tags for each permit to work unless managed by a master schedule of plant operations arrangement.

Any isolation locks left over from a set must be locked in the group isolation board along with the keys for that set(s), or locked to the group isolation board by the authorised issuing officer lock.

Isolation locks **shall** only be removed by an authorised issuing officer when all personal isolation locks have been removed and the permit to work has been handed back by the person in charge.

5.5 Authorised issuing officer locks (GREEN)

An authorised issuing officer lock is green in colour and is used to secure all isolation point keys in a group isolation board prior to the issue of a permit to work. The green locks are individually keyed, with locks and keys held by area qualified authorised issuing officers.



The authorised issuing officer lock is the first lock on and last off a group isolation board.

5.5.1 Authorised issuing officer lock holder responsibilities

Ensures the lock is maintained in good condition.

Ensures the key is held in the operational key cabinet.

Ensures that they apply an authorised issuing officer lock to secure the isolation keys prior to Issuing the permit to work.

5.5.2 Application and removal

An authorised issuing officer lock **shall** only be applied and removed by an authorised issuing officer authorised for that area of operations and equipment. The authorised issuing officer lock is applied after the equipment has been suitably isolated and the key(s) and remaining locks have been placed in the group isolation board or group isolation board. Personal isolation locks (including the person in charge) can then be applied in line with this procedure. The authorised issuing officer lock stays in place until the equipment is ready to be de-isolated.

5.5.3 Work is not completed

If work has not been completed, all personal isolation locks will be removed by their owners. The green authorised issuing officer lock will remain in place. If a worker needs to leave the work site, then their personal isolation lock must be removed. In the case where a personal lock is removed from a group isolation board where the work is incomplete or the equipment is out of service, the green authorised issuing officer lock will remain in place to ensure safety until the work has been complete and the equipment is ready to be brought back into service. The person in charge **shall** attach an orange 'Defect/Restriction' lock and 'Hazardous or Unusual Condition' tag, and remove their personal isolation lock. Under circumstances where the incomplete work may be easily completed by another person prior to returning the plant to service, the person in charge may after handing back the permit to work transfer control of the key to 'Defect/Restriction' lock to an authorised issuing officer, asset owner or delegate.

5.5.4 Work is completed

When work is completed, all personal isolation locks are removed by their owners and the permit to work is signed off. The person in charge for the work then signs off the permit and hands it back to an authorised issuing officer listing any restrictions to the plant. An authorised issuing officer can then remove the authorised issuing officer lock to gain access to the keys and remaining locks for de-isolating the equipment and restoring the plant for operational use.

5.6 Defect/restriction locks (ORANGE)

Defect/restriction locks are orange in colour. A defect/restriction lock is placed on equipment to indicate defects, restrictions or that it is not fit for service. Anyone can attach a defect/restriction lock and a 'Hazardous or Unusual Condition' tag to defective or restricted equipment. The defect must be reported to operational staff and the defect/restriction lock key should normally be transferred to them for control.



The key may be kept in the possession of the person placing the lock for short duration situations not affecting energy production (such as replacing a non-critical fan motor over a 2 day period) or, when a permit to work is incomplete, the person in charge may keep the 'Defect/Restriction' lock key in their direct control and possession.

A defect/restriction lock and 'Hazardous or Unusual Condition' tag on operational equipment can only be removed after agreement between an operator and either the person who applied the lock, or the Asset owner or delegate.

The defect/restriction will be logged in the operational log. Defect/restriction locks must be accompanied by a 'Hazardous or Unusual Condition' tag which has been completed in full including a clear description of the issue.

5.7 Group isolation boards

Group isolation boards are to be utilised to house all isolation lock keys and any remaining isolation locks from that set relating to the isolation being performed.

These group isolation boards provide a facility for all work team members, authorised issuing officers, and the person in charge to place their personal locks on the box that house the keys to the locks that isolate the energy sources around which they will be required to work.



5.7.1 Using a group isolation board

All isolation lock keys and unused locks from that set for the pending isolation are in or locked to the group isolation board.

Authorised issuing officer places a green authorised issuing officer's lock on the group isolation board.

Authorised issuing officer issues permit to work.

Person in charge and instructed persons each sign onto the permit to work.

Person in charge places the permit to work into the lockable pouch and locks the pouch onto the group isolation board with his red personal lock.

Workers place their personal isolation locks on group isolation board.

Where not enough holes exist, always leave one (1) free spot for multi clasp on box.

5.8 Permit to work sleeve

The permit to Work sleeve holds the permit to work and is locked onto the group isolation board by the person in charge with their red personal lock. The sleeve has a clear front so the permit to work number and job details can be seen to aid in locking on to the correct job.



6.0 Lock and key identification

6.1 Personal isolation locks and key

Personal isolation locks issued to Hydro Tasmania employees are identified with:

- the employee's name (engraved on one face of the lock)
- employee number (engraved on one face of the lock)
- the unique key identification number (engraved on the side of the lock)

Personal isolation locks available for issue to contractors are identified with:

- the unique key identification number (engraved on the side of the lock)
- a sticker with the contractor's individual name and contact number **shall** be attached to one face of the lock to enable identification of the lock to the contractor

Note: Personal isolation locks available for contractors may be converted to employee locks simply by engraving the set of locks with the employees' name and employee number

6.2 Isolation locks and keys

Isolation locks come in sets of 5, 10 and 20 and are identified as follows:

- Engraved on one face of the lock:
 - Isolation
 - Lock
 - Set- NNXXX (where NN is the number of locks in the set and XXXX is the sequence number of the lock set type)
 - Lock YY (where YY is the number of the lock within the set)
- Engraved on the side of the lock:
 - **NNXXX** (where **NN** is the number of locks in the set and **XXXX** is the sequence number of the lock set type)

6.3 Authorised issuing officer locks and key

Authorised issuing officer locks are identified as follows:

- Engraved on one face of the lock:
 - Issuing
 - Officer
 - Lock YYY (where YYY is the Authorised Issuing Officer Lock sequence number)
- Engraved on the side of the lock:
 - the unique key identification number

6.4 Defect/restriction locks and keys

Defect/restriction locks are identified as follows:

- Engraved on one face of the lock:
 - Defect
 - Restrict
 - Lock YYY (where YYY is the Authorised Issuing Officer Lock sequence number)
- Engraved on the side of the lock:
 - the unique key identification number

7.0 Lock and key management

7.1 Lost personal isolation lock key

If a personal isolation lock key is lost while the worker is locked onto an isolation the lock/tag removal form/process must be completed to remove their lock when work is completed, then the owner must advise the lock administrator and be issued with a new set of isolation locks. If it is lost when not locked onto an isolation, then the owner must advise the lock administrator and be issued with a new set of isolation locks.

Note: it costs more to purchase a new key than a new set of locks

7.2 Lost/damaged personal isolation lock

If a personal isolation lock is lost or damaged the owner must advise the lock administrator and be issued with a new set of isolation locks once the owner is reduced to a number of locks that does not allow them to work effectively.

7.3 Lost isolation lock key

Isolation lock sets have 2 keys – one with the set, and the spare key kept in a locked regional lock cabinet. If a key is lost, the lock administrator must be notified so that a new key can be ordered. The lock set should be taken out of service until the new key is obtained.

Note: it is assumed that the key cannot be lost while the key is being used in an isolation, as it is locked in a group isolation board.

7.4 Lost/damaged isolation lock

If an isolation lock is lost or damaged, it must be reported to the lock administrator and the set be taken out of service until a replacement lock is obtained.

7.5 Lost authorised issuing officer lock key

If an authorised issuing officer lock key is lost while the lock is being used on isolation, the authorised issuing officer lock **shall** be removed by an authorised issuing officer and replaced with another authorised issuing officer lock until the permit to work is handed back. The authorised issuing officer removing the lock must advise the lock administrator.

7.6 Lost/damaged authorised issuing officer lock

The authorised issuing officer in control of the lock must advise the lock administrator.

7.7 Lost defect/restriction lock key

If a defect/restriction lock key is lost while the lock is being used on isolation, the defect/restriction lock **shall** be removed by an authorised issuing officer in conjunction with the person who applied the lock and replaced with another defect/restriction lock until the associated plant is fully fit for service. The authorised issuing officer removing the lock must advise the lock administrator.

7.8 Lost/damaged defect/restriction lock

The authorised issuing officer or person in charge in control of the lock must advise the lock administrator.

8.0 Lock administration

Lock administration (Generation compliance team) responsibilities include:

Maintaining a lock and key register, containing the following information:

lock and key codes for all:

- yellow Isolation locks
- green authorised issuing officer locks
- red personal isolation locks

a listing of all issued personal isolation locks and their recipients.

Maintaining a process where contractors arriving on site are trained and assessed on the isolation procedure and temporarily issued with a set of red personal isolation locks with key prior to working on site, and that all contractors who complete work on site return their red personal isolation locks.

Maintaining a process where locks will only be made available to personnel that have had appropriate training and authorisation

9.0 Isolation and operational control tags

The principle function of isolation & operational control tags is to identify isolation points upon which peoples lives depend, or to identify unsafe and/or hazardous conditions that could endanger personnel or cause damage to Equipment.

9.1 'Danger – Do Not Operate' tag

No person **shall** operate equipment to which a 'DANGER – Do Not Operate' tag is attached.



9.1.1 When do I use this tag?

In conjunction with an Isolation Lock to identify isolation points.

9.1.2 Application and removal

This tag along with an Isolation Lock **shall** be placed on all equipment isolation points required to be isolated to complete the work safely. This tag **shall** also be attached to any operational control points identified in the schedule of plant operations (auto/manual selector switches for example).

This tag must be in place prior to the issuing of a permit to work.

A 'DANGER – Do not Operate tag' is used as part of a permit to work system and **shall** only be placed and removed by an authorised issuing officer.

9.2 'Personal Danger Tag'

No person shall operate equipment to which a 'PERSONAL DANGER TAG' is attached.



9.2.1 When to use this tag?

This tag **shall** be used in conjunction with a personal isolation lock to provide additional information when a personal isolation is applied or where the personal isolation lock is not identified with the person's name and employee number.

9.2.2 Application and removal

A personal danger tag **shall** only be removed by the person who placed it. The only time a personal danger tag may be removed by another person is after a 'Personal Isolation Lock/Tag Removal' form has been completed in full, and signed by either an RO or his delegate (Appendix A - Lock/tag removal form).

9.2.3 Equipment being tested

When the equipment requires testing, it **shall** be the responsibility of the person conducting the test to notify the other employees who have personal isolation locks attached to the equipment isolation points. Each of these employees **shall** remove their own personal isolation lock(s) and personal danger tags prior to carrying out the testing. If further work on the plant is required after the testing, the isolation **shall** be fully restored and all workers **shall** then re-place their personal isolation locks and personal danger tags onto the equipment isolation points.

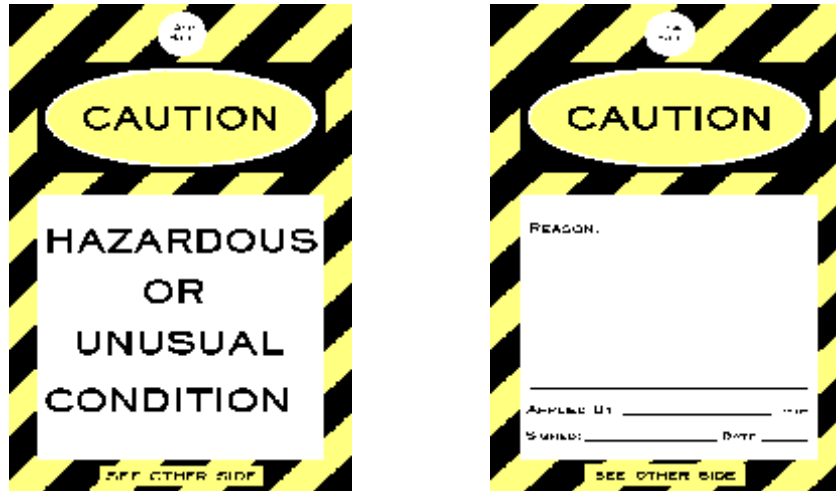
9.2.4 Work is not completed

If work on equipment has not been completed and the employee needs to leave the work site, then their personal isolation lock and personal danger tag must be removed. In the case where a personal isolation lock tag is removed from the isolation points or a group isolation board with incomplete work, a defect/restriction lock and a 'Hazardous or Unusual Condition' tag which has been completed in full is to be placed on the isolation points or the group isolation board. The person in charge **shall** leave the defect/restriction lock and 'Hazardous or Unusual Condition' tag in place till the work is complete or transferred to another person in charge.

9.2.5 Work is completed

When the work on the equipment is completed, each employee **shall** remove their own personal isolation lock and personal danger tags from the points of isolation or group isolation board.

9.3 'Hazardous or Unusual Condition' tag



9.3.1 When do I use this tag?

This tag is a dual function tag which is used to identify a 'hazardous condition' or an 'unusual condition' existing on equipment. **The word 'HAZARDOUS' or the words 'UNUSUAL CONDITION' must be circled on the tag** to indicate the condition. **Where there is a danger to people or equipment the isolation points must be locked in the safe position using a defect/restriction lock and 'Hazardous or Unusual Condition' tag** as per section 6.4 of this procedure.

These tags **shall** be used to provide:

- a visual warning that operation could be hazardous
- advice that operation, may still be possible, but caution or restrictions may apply
- a visual warning that the normal functioning or operation has been changed
- a warning that there is incomplete work on a device and it may have defects/restrictions of use.

9.3.2 Application and removal

An employee may use a '**CAUTION – HAZARDOUS OR UNUSUAL CONDITION**' tag where it would still be safe to use/operate the equipment with proper caution. **The employee must inform the appropriate line manager of the problem with the equipment to ensure remedial or corrective action is taken or arranged.**

The '**CAUTION – HAZARDOUS OR UNUSUAL CONDITION**' tag may only be removed by an **authorised** and **competent person** when:

- the equipment has been replaced, repaired and restored to it's design or 'normal operating' condition
- the changed operation or condition of the Equipment has been incorporated into standard operating procedures
- the unusual condition no longer exists.

10.0 Schedule of planned operations (Isolation sheets)

The purpose of this section is to set the standard to which schedule of planned operations (SOPO) are to be compiled/completed and filed, for the operation of Hydro Tasmania Assets and equipment.

10.1 Responsibilities

10.1.1 Authorised issuing officer

As designated in the permit to work procedure.

10.1.2 Authorised person

A person, who has delegated authority to act as the *authorised person*, **shall** be able to;

compile schedule of planned operations

sign as the 'prepared by authorised person', for schedule of planned operations

carry out duties as designated by the authorised issuing officer

10.2 Standard

10.2.1 General

All *schedule of planned operations* shall comply with this procedure.

Authorised issuing officers compiling, checking and actioning *schedule of planned operations* must be authorised for the specific site, station, location and/or the equipment.

This does not preclude persons in training from compiling and actioning *schedule of planned operations* as long as they are acting under the direction of an authorised issuing officer and sign as an *authorised person*. Persons under training **shall** not check a schedule of planned operations.

10.2.2 Schedule of planned operations numbering

As per the permit to work procedure – with a '/' then sequential alphabetic character.

10.3 Schedule of planned operations format

The format of the *schedule of planned operations* **shall** be as per form appendix B or equivalent.

When required a SOPO Addition/Deletion sheet may be used as per form appendix C or equivalent.

10.3.1 Compilation

- Schedule of planned operations can be hand written or computer generated.
- All schedule of planned operations (SOPO) **shall** be compiled by an authorised issuing officer for the station, location and/or equipment. This does not preclude persons in training from compiling a schedule of planned operations, as long as it is co-signed by an authorised issuing officer in the prepared by section of the schedule of planned operations.
- When compiling the schedule of planned operations, the authorised issuing officer is to review all relevant single line diagrams, schematic diagrams, procedures and/or any other relevant information.
- The objectives of the schedule of planned operations must be clearly defined prior to compilation as a control measure of the permit to work.
- A separate schedule of planned operations should be compiled for each objective and the objective must clearly state what is to be achieved. The schedule of planned operations may be broken down to have numerous sub-objectives.

-
- The schedule of planned operations objective **shall** make reference to the permit to work and any Generation outage approval and the scope of work where applicable.
 - All schedules of planned operations should be written in a logical operational sequence, sub-objectives if used are to be clearly identified.
 - When using the schedule of planned operations for the return to service of equipment it must be checked against, the action items of the schedule of planned operations for the equipment's removal from service.
 - All entries made on schedule of planned operations must be legible and clearly defined.
 - All Equipment **shall** be identified by; station/location, device type and device number or name.
 - If the operations are to be conducted at one station/location only, the station/location identification can be specified in the schedule of planned operations general information.
 - When two or more station/locations are involved all remote equipment **shall** have the specific station/location identification for each operational item.
 - Abbreviations in Appendix E, can be used in the compilation of the schedule of planned operations.
 - Operational items that provide Isolation **shall** be marked for tagging in the tagging column and marked for locking in the locking column of the schedule of plant operations. All operational earthing **shall** be marked for tagging in the tagging column to indicate a 'Danger - Do Not Operate' tag is attached as part of the operation.
 - The use of an approved operational procedure as an operational item within a schedule of planned operations is allowable provided that all individual isolations are detailed on the schedule of plant operations, and its completion time **shall** be recorded on the schedule of planned operations.
 - **Where another SOPO's isolations are used as part of the SOPO that you are compiling, enter the SOPO number of the other isolation as a line item. This is called "cross locking of SOPOs".**
 - Proving dead before applying earths, **shall** be recorded as a separate line item.
 - The application of earths **shall** be recorded as a separate line item.
 - The removal of each set of earths **shall** to be recorded as a separate line item.
 - Work site delineation (where appropriate) **shall** be specified as an operation on the schedule of planned operations.
 - All permit to work issue (handover) and handback **shall** be recorded as a separate line item.
 - All Assurance information **shall** be recorded as a separate line item.
 - Any error in a schedule of planned operations **shall** be crossed out with a single line, initialled by a preparing authorised issuing officer and confirmed by a checking authorised issuing officer. Correction fluid must not be used.
 - When more than one sheet is required to meet the operational objective, cross-referencing must be used i.e. 'sheet 1 of 2', 'sheet 2 of 2', etc.
 - Last Item entry requirements;
 - The last operational item on the schedule of planned operations **shall** meet the objective of the schedule of planned operations, which may include:
 - the number of the permit to work issued

- or assurance information communicated
- or operations are for changed configurations/system switching
- or return to service
- Each hand written schedule of planned operations **shall** be ruled off after the last operation.
- All entries **shall** be checked for accuracy and completeness before the schedule of planned operations is signed by the compiling authorised issuing officer.

10.4 Schedule of planned operations colour specifications

All computer generated schedule of planned operations **shall** utilise the following colours:

Black or blue Operational items.

Isolation points.

Work site delineation.

Permit to work details.

Assurance information.

Green Sub-objectives and/or locations (if applicable)

Red Earthing details

When the schedule of planned operations is hand written, the authorised person **shall** maintain the colours as defined for computer generated schedule of planned operations, if possible. When the range of colours is not available, the following **shall** apply;

Black or blue All other entries or information

Red Earthing detail

*Note! When mono-colour printer, pen or fax generated schedule of planned operations are used, other forms of highlighting **shall** be used to highlight appropriate entries e.g. underline.*

10.5 Master schedule of planned operations

The master schedule of planned operations (Appendix D or equivalent) may be utilised as a schedule of planned operations document to prepare a machine or station/location for major maintenance/refurbishment work. Where multiple permits to work will be issued utilising a selection of station, location, machine isolation points listed on the master schedule of planned operations.

The master schedule of planned operations is A3 in size and contains a matrix to identify isolation points for the specific permit to work that is being issued and it is compiled and actioned utilising the same procedures as the schedule of planned operations.

When a permit to work is to be issued from the master schedule of planned operations:

- A copy of the master schedule of plant operations with all the relevant isolations, earthing and energy/pressure draining **shall** be highlighted/marked where relevant to that permit to work, checked by an authorised issuing officer other than the one who issues the permit to work and issued with the permit to work.
- All the isolation points appropriate for the permit to work **shall** be identified by placing a cross in the appropriate item line box, within the permit to work matrix section of the master schedule of planned operations.
- The permit to work number, the date and time issued **shall** be entered into the appropriate fields on the master schedule of planned operations.
- The permit to work handover and handback **shall** also be recorded in the station/location operational log sheet.

-
- After the handback of the permit to work, the date and time of handback **shall** be entered into the appropriate fields on the master schedule of planned operations

10.5.1 Checking and approving schedule of planned operations

- Schedule of planned operations **shall** be checked to ensure that the action items meet the required objective.
- Schedule of planned operations **shall** be checked, signed and approved by an authorised issuing officer, other than the person that compiled the schedule of planned operations, before it is actioned.
- During the checking process the authorised issuing officer should check the schedule of planned operations against single line diagrams, schematic diagrams, procedures and/or any other relevant information.
- Schedule of planned operations can be checked, signed off and approved remotely by means of facsimile or verbal communication. Where verbal communication is used, all entries/items **shall** be read back and confirmed prior to signing off. This **shall** be recorded on the schedule of planned operations and **shall** include the checking officers' name, the time and date.
- When a registered computer generated schedule of planned operations is selected from the database and printed, it **shall** be checked by an authorised issuing officer for the station, location, equipment.

10.5.2 Registered computer generated schedule of planned operations

- An approved computer generated schedule of planned operations is one that has:
 - been compiled as per this standard
 - been checked as per this standard
 - been protected so it can not be modified
 - been entered into the database and approved as a computer generated schedule of planned operations
 - a '*register identification number*'
 - the '*register identification number*' is detailed in the 'prepared by' field of the schedule of planned operations
- If the registered computer generated schedule of planned operations needs modification, it **shall** not be used. A new schedule of planned operations **shall** be compiled and checked, to complete the operations.
- When a registered computer generated schedule of planned operations is required to be updated, it **shall** be checked and re-registered.

10.5.3 Actioning of schedule of planned operations

- A schedule of planned operations is to be actioned as planned. Where there is more than one operator actioning a schedule of planned operations it is allowable to carry out action items concurrently, provided it is operationally safe.
- A schedule of planned operations must not be altered once the operating sequence of actions has commenced without prior and specific approval to proceed from the operating authority, which controls the equipment affected. Where approval to change the operating sequence is granted by the operating authority, the schedule of planned operations must be amended, checked and re-authorised before work resumes. The re-authorisation of the schedule of

planned operations would normally be done by re-countersigning. Where the re-authorisation has been verbal, the details must be noted in the appropriate log prior to continuing.

- The completion of each action item **shall** be acknowledged with the actioned time and operators initials on the schedule of planned operations.
- When the actioning date of the schedule of planned operations is different to the compilation date, the actioning date and time is to be recorded in the appropriate line item/s.
- When taking over a partly completed schedule of planned operations, the contents must be fully understood before continuing.
- Any modifications to an approved computer generated schedule of planned operations are to be reflected in the database master, if applicable.
- On completion of the schedule of planned operations, the authorised person **shall**:
 - Make appropriate entries in operational log (see GS-AM-003);
 - The original/copy of the completed *schedule of planned operations* **shall** be attached to the permit to work;
 - Adjust any hand dressed mimics; and
 - Advise Generation operations that the schedule of plant operations has been completed and the plant is isolated as per the arranged outage (eGO).

10.5.4 Return to service of equipment (RTS)

The return to service of equipment can be achieved through the use of an approved;

- Schedule of planned operations
- Commission program
- Operational procedure or checklist.

The use of either is dependant on the level of risk associated with the complexity of the operational activities. However, if the operational activities involve system/network switching, the *schedule of planned operations* **shall** be used.

The start and completion times of the return to service operations are to be recorded in the operational log sheet's remarks section.

10.5.4.1 Using a schedule of planned operations

- The return to service schedule of planned operations **shall** be checked against the removal from service schedule of planned operations to ensure nothing is overlooked or omitted.
- When a *schedule of planned operations* is the documented process to be used for the return to service of equipment one of the following **shall** be carried out; (the order of preference is as listed below). Compile a specific return to service, schedule of planned operations for the operational requirement and complete as per this standard.

10.5.4.2 Using commissioning programs

*Note: The commissioning program **shall** be developed by the engineer in charge of the commissioning, and **shall** have operational input in its development.*

- The objective of the commissioning program **shall** cover the operational aspects as well as the engineering requirements for pre-commission or commissioning of the equipment.
- All operational actions within the commission program **shall** comply with the requirements of a schedule of planned operations.
- The commissioning program **shall** be checked by an authorised issuing officer against the removal from service schedule of planned operations to ensure no operational items are overlooked or omitted.

-
- All operational actions in the commissioning program **shall** be checked for completeness and accuracy by an authorised issuing officer other than the one who compiled it, as per the schedule of planned operations before the commissioning program is commenced.
 - The commissioning program **shall** be under the control of the commissioning engineer.
 - The commissioning engineer **shall** sign off each engineering section/test as acceptable, before moving onto the next section.
 - The commissioning authorised issuing officer **shall** be in control of all operational activities.
 - The approved commissioning program **shall** be actioned as planned by an authorised person, and **shall** only be modified once operations have commenced with the approval of the commissioning engineer and commissioning authorised issuing officer.
 - The commissioning authorised issuing officer **shall** document the completion time of all operational actions on the commissioning program.

10.5.5 Using operational procedures and checklists

- The operational procedure or checklist **shall** be approved for use.
- The approved operational procedure or checklist **shall** be checked by the authorised issuing officer to ensure it meets the objectives before actioning it.
- The approved operational procedure or checklist **shall** be checked against the removal from service schedule of planned operations to ensure nothing is overlooked or omitted.
- The approved operational procedure or checklist **shall** be actioned as planned by an authorised person.
- The authorised person is to ensure all tests have been carried out to ensure the Equipment is fit for service, before it is handed over and made available for service.
- A copy of the actioned approved operational procedure or checklist **shall** be attached to the associated operational documentation and permit to work for filing on completion of operations for the return to service of Equipment.

10.6 Routine testing programs

When operations are undertaken during the actioning of routine testing programs there is no need for a schedule of planned operations to be used in conjunction with the routine testing program, as long as the:

- Routine testing program has been approved for use.
- Routine testing program has been operationally checked as per this procedure.
- Completion times of the operational actions and the initials of the actioning operator are documented on the routine testing program.

10.7 Operational terminology

As an aid to develop a common understanding of operational terminology, a list of basic terms and abbreviations that **shall** be used in operational communications has been developed as Appendix E. The list is not comprehensive however it will be updated as required by the review process.

10.8 Schedule of planned operations copies and filing

When a computer generated schedule of planned operations is attached to the permit to work and issued to the person in charge, a completed copy (including completion acknowledgment) **shall** be filed appropriately in the station/location with the permit to work.

When a commissioning program or an operation procedure/checklist is utilised as a schedule of planned Operations, a copy **shall** be retained with the station/location log.

On the completion of work, the 'Removal from Service' schedule of planned operations, the associated permit to work and the 'Return to Service' schedule of planned operations or alternative, **shall** be stapled together along with any other relevant information and appropriately filed in the station/location for a minimum period of 7 years.

11.0 Revision history

Revision number	Date approved	Detailed revision description	Document owner	Document reviewer	Document approver
0	Dec 2010	Original document created.	Mick Cuppari	Critical procedure review team	Evangelista Albertini
1	Nov 2011	Included SOPO Additions/Deletions Sheet, modified Lock/Tag removal form and other minor corrections and additions.	Mick Cuppari	Grant Chorvat	Evangelista Albertini

Appendix B Schedule of planned operations form

Schedule of planned operations (SOPO) ID No.	PTW: _____ / _____
Station/location/equipment/work site	
Objective(s)	
Other stations/equipment involved:	
Special notes:	

Communication of any operational information

Received from coordinating operator _____ Auth No. _____ Location _____

OPERATING SEQUENCE

Note: Equipment configuration must be checked and generation operations should be advised prior to commencing.

Sequence	Operating action description	Tag	Lock	Time actioned	Operator initials
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					

Schedule of planned operations (SOPO) ID No.		PTW: _____ / _____			
Sequence	Operating action description	Tag	Lock	Time actioned	Operator initials
24.					
25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					
34.					
35.					
36.					
37.					
38.					
39.					
40.					
41.					
42.					
43.					

Prepared by:		Date:	Time:
Name	Signature	Contact number	
Checked by:		Date:	Time:
Name	Signature	Contact number	
SOPO (including isolation) actioned and completed by:		Date:	Time:
Hydro Tasmania authorised issuing officer – I acknowledge that this SOPO is actioned, complete and the objectives met.			
Name	Signature	Contact number	

The following hazards / danger points have been identified as the isolation was done.

Communication of any operational information Returned to coordinating operator	Auth No	Location
---	---------	----------

Appendix C Schedule of planned operations Isolation Additions/Deletions form

Schedule of planned operations (SOPO) ID No.	PTW _____ / ____
Station/location/equipment/work site	
Objective(s)	
Other stations/equipment involved:	
Special notes:	

OPERATING SEQUENCE

Note: Equipment configuration must be checked and generation operations should be advised prior to commencing if required.

Sequence	Operating action description	Tag	Lock	Time actioned	Operator initials
1.	Check condition of work site with PIC and confirm status with change of condition/test sheet.				
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.	New isolations added that are now required for: _____				
Prepared by:		Date:		Time:	
Name	Signature	Contact number			
Checked by:		Date:		Time:	
Name	Signature	Contact number			
Checked by PIC:		Date:		Time:	
Name	Signature	Contact number			
SOPO (including isolation) actioned and completed by:		Date:		Time:	
Hydro Tasmania authorised issuing officer – I acknowledge that this SOPO is actioned, complete and the objectives met.					
Name	Signature	Contact number			

The following hazards / danger points have been identified as the isolation was done.

Appendix E Terms and abbreviations

The following is a set of frequently used terms and abbreviations. The list is not comprehensive but aims to develop a common understanding. The abbreviations can be used as indicated in lieu of the full word for written communication.

Term	Abbreviation	Description
Access authority	AA	Safe Access Authority used by Transend & Aurora.
Alternating current	ac	A current that reverses at regularly recurring intervals of time and which has alternately positive and negative values.
Air break switch	ABS	An approved switch for breaking current at or below the designed rating.
Ampere	A	Unit of electrical current
Auto recloser	A/R	Automatic device that initiates the reclosing of switching equipment as desired after it has opened automatically under abnormal or fault conditions.
Automatic	AUTO	
Automatic voltage regulator	AVR	A voltage sensitive device that is used to control the voltage of the regulated circuit.
Auxiliary	Aux	An item not directly part of a specific device or system but required for its functional operation.
Bearing	Brg	Part of machine that bears the friction, commonly between rotating shaft and its housing.
Blue phase	B \emptyset	
Boiler	Blr	A closed vessel together with a furnace, in which steam or other vapour is generated for driving a turbine and / or for heating.
Capacitive voltage transformer	CVT	A voltage transformer (VT) connected to the primary conductor through a capacitance divider.
Capacitor	Cap	
Circuit	Cct	A conductor or system of conductors through which an electric current is intended to flow.
Circuit breaker	CB	A mechanical switching device capable of making carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions such as those of short-circuit.
Close		The operation of an item of equipment e.g. movement of the contacts from the normally open to the normally closed position, or movement of the position of a valve.
Closed		An operational state of an item of equipment.
Combination fuse switch	CFS	A device within a distribution switchboard that performs both LV circuit protection and close and open functions.
Combined voltage and current transformer	CVCT	Instrument transformer connected in series with the primary conductor, comprising both a CT and a VT portion.

Term	Abbreviation	Description
Commissioned		Operationally checked to comply with operational specification.
Control switch	C/Sw	A manually operated switching device for controlling power-operated devices. NOTE: It may include signalling interlocking etc, as dependent functions.
Cooling water	C/W	A fluid used to remove heat from rotating machinery or from its components.
Court	Crt	
Crescent	Cres	
Current transformer	CT	An instrument transformer, with its primary winding connected in series with the conductor carrying the current to be measured or controlled.
Delay		The operational state of an item of equipment, where a delay has been purposely introduced in the action of the equipment. e.g. sensitive earth fault protection switched to 'Delay'
Dewatering	D/W	
Direct current	Dc	Uni-directional current, practically non-pulsating current.
Disconnect	DS	A switch used for changing connections in a circuit, or for isolating a circuit or equipment from a source of power. Not normally capable of making or breaking load or fault current.
Distribution switchboard	DSB	A power switchboard used for the distribution and protection of one or more electrical circuits at Low Voltages.
Earth fault	E/F	A short-circuit current between a conductor and earth resulting from an insulation failure or from the bridging of insulation.
Earth switch	ES	An approved mechanical switching device for electrically connecting a circuit or piece of equipment to earth.
Expulsion drop out (fuse)	EDO	A vented fuse in which the expulsion effect of gases produced by the arc and lining of the fuse folder, either alone, or aided by a spring, extinguishes the arc.
Extra low voltage	ELV	See definitions
Feeder line	Fdr	
Generator	G	Electric equipment that converts mechanical power into electric power.
Guide vane	GV	Part of a reaction turbine for regulating the quantity of water admitted.
Governor	Gov	The assembly of fluid, electrical, or mechanical control equipment used for regulating the flow of water, steam, or other medium to a rotating machine's prime mover for such purposes as starting, holding speed or load, or stopping.
Hill top valve	HTV	Valve at top of higher pressured section or penstock.
High voltage	HV	See definitions.
Highway	Hwy	

Term	Abbreviation	Description
In		The operational state of an item of equipment, where a function of the equipment is enabled e.g. auto reclose 'In' means that the auto recloser is switched to initiate reclose of the respective circuit breaker.
In service		See definitions
Instantaneous	Inst	The operational state of an item of equipment, where no delay has been purposely introduced in the action of the equipment e.g. Sensitive earth fault protection switched to Instantaneous.
Instructed person	IP	See definitions.
Intake gate	I/G	
Isolator	Isol	See disconnecter
Authorised issuing officer	IO	See definitions
Junction box	JB	An enclosure for connecting conductors with the use of terminals.
Kilovolt	kV	Unit of electric potential difference and electromotive force ($\times 10^3$).
Kilovolt ampere	kVA	Unit of 'apparent' power ($\times 10^3$).
Kilwatt	kW	Unit of 'real' power ($\times 10^3$).
Low voltage	LV	See definitions
Machine	m/c	A generator or motor
Main inlet valve	MIV	Valve at exit of penstock and entry of spiral casing.
Main switch board	MSB	
Megavolt ampere	MVA	Unit of 'apparent' power ($\times 10^6$).
Megawatt	MW	Unit of power ($\times 10^6$).
Miniature circuit breaker	MCB	A LV circuit breaker assembled as an integral unit in a supporting and enclosing housing of moulded insulating material, the over-current and tripping means being integrated within the unit.
Mobile generator unit	MGU	Transportable AC power unit for temporary installation.
Motor	M	An electric equipment that converts electric power into mechanical power.
Multiple earthed neutral	MEN	A system of earthing in which the parts of an electrical installation required to be earthed are connected to the general mass of earth and, in addition, are connected within the electrical installation to the neutral Conductor of the supply system.
Neutral	N	
Number	No.	
On soak		The operational state of an item of equipment, where the equipment is energised, but is not delivering or transferring power.

Term	Abbreviation	Description
One trip to lockout		The operational state of an item of equipment, where only one opening operation of the mechanism will be permitted before the contacts are locked in the open position. This will be the case where the auto recloser is 'Out'.
Open		The operation of an item of equipment e.g. movement of the contacts from the normally closed to the normally open position, or movement of the position of a valve.
Operator		See definitions
Optical ground wire	OPGW	
Out		The operational state of an item of equipment, where the function of the equipment is disabled e.g. auto reclose 'Out' means the auto recloser is switched to not initiate reclose of the respective circuit breaker.
Out of service	OOS	See definitions.
Overcurrent	O/C	A current exceeding the rated value (for conductors, the rated value is the current-carrying capacity).
Overhead	OH	
Overvoltage	O/V	Excessive voltage, exceeding a predetermined value is the current-carrying capacity).
Overhead	OH	
Permit to work	PTW	A work approval and risk control system applicable to all work being carried out on Hydro Tasmania owned and/or operated plant and assets.
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.
Phase	∅	(pronounced Phi)
Pole	P	
Pole mounted recloser	PMR	
Primary	Prim	Referring to the main power circuits or energy input side of a transformer.
Pump		A machine for raising, driving, exhausting, or compressing fluids, as by means of a piston, plunger, or rotating vanes.
Red phase	R∅	
Receiver	Rx	A device to re-convert an intermediate signal into the original signal.
Remote terminal unit	RTU	A slave control device located at a station for remote control of units or switchgear by supervisory control or from which supervisory indications or selected telemeter readings are obtained to be displayed at a master Station.
Return to service	RTS	

Term	Abbreviation	Description
Safe approach distance	SAD	See definitions
Supervisory control and data acquisition	SCADA	
Secondary	Sec	Referring to auxiliary or control circuits, or energy output side of transformers.
Sensitive earth fault	SEF	An earth fault that is limited by the resistivity of the earth
Schedule of planned operations	SOPO	See switching sheet
Substation	SubStn	
Switching sheet	Sw/Sh	See definitions
Switch	Sw	A device used to close or open, or both, one or more electric circuits.
Tag		See definitions
Tap changer	T/C	A selector switch device used to change transformer taps to permit changing the voltage ratio.
Test energise		The operation of an item of equipment to connect de-energised equipment to the power system to evaluate its performance under controlled conditions, to place the equipment on soak.
Time delay	T/D	See delay
Tower	T	
Transmitter	Tx	A device that converts an original signal into an intermediate signal, suitable for sending via a bearer.
Transducer relay cubicle	TRC	
Transformer	TF	A device which, when used, will raise or lower the voltage of alternating current of the original source.
Transmission line	T/L	
Under frequency	UF	A frequency that is less than a predetermined value.
Underground	UG	
Undervoltage	U/V	A voltage that is less than a predetermined value.
Valve	V/v	Any device for closing or modifying the passage through a pipe, outlet, inlet or channel, in order to control the flow of liquids or gases.
Voltage transformer	VT	An instrument transformer intended to have its primary winding connected in shunt with the power supply circuit, the voltage of which is to be measured or controlled.
Volt	V	Unit of electric potential difference and electromotive force.
Volt ampere reactive	VAr	Unit of 'reactive' power.
Watt	W	Unit of 'real' power.
White phase	WØ	

