Zero incidents
Zero harm
Zero compromise
Keeping you healthy and safe, every day at work.

ESSENTIAL STANDARD no.29

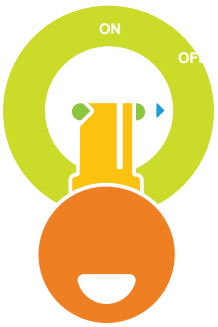
Safe Isolation of Plant and Equipment

Thames Water

KEY MESSAGES

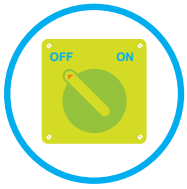
- Identify the hazards and assess the risks.
- Ensure people involved are trained and competent.
- Have a clear isolation procedure or safe system of work to follow.
- Test and monitor the effectiveness of the isolation to ensure it remains secure.
- Ensure good communication and plans are in place for safe reinstatement of assets/ processes when works are complete.

1. Introduction



Work is done on Thames Water assets every day that requires them to be safely isolated first. These works can require simple electrical or mechanical self-isolation procedures, or more complex isolations for chemical lines, tunnel inspections, pumped-mains repairs, etc. The aim of this procedure is to set out guiding principles and standards that must be used to safely isolate all assets. This includes risk assessments, proper isolation controls, and testing how well controls work.

2. Definitions



Isolation – the removal or blocking of all energy sources from an item of plant or equipment, to prevent danger from mechanical, electrical, hydraulic or stored energy hazards.

Lockout – the placement of a lockout device with a unique key, applied to an isolation point to ensure that the plant or equipment being controlled cannot be operated until the lockout is removed.

3. Competence

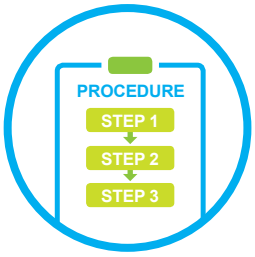
Any person involved in the isolation of plant and equipment must have the appropriate knowledge, training and competencies to ensure the isolation is carried out correctly, effectively and safely, as well as in line with Thames Water procedures. This includes, but is not limited to, responsibilities such as:

- Planning isolations
- Authorising isolations (issue of TWOSA and secondary permits)
- Receiving and implementing secondary permits
- Authorising scope of work variations
- Installing and removing isolations

The 'Thames Water Permits and Authorisations Course' provides foundation knowledge for those managing the safe isolation of plant and equipment.

The person who is responsible for issuing a permit must be formally appointed in writing for the specific location (via the LOAD document). The person receiving the permit must be formally appointed by the activity owner.

4. Procedure



Isolation of plant and equipment varies in complexity, from simple self-isolation procedures to more complicated isolations that are subject to a formal documented procedure and a permit to work.

The categories of isolations performed regularly within Thames Water are shown in Table 1. The same basic principles are applied in the majority of isolations.

Category	Activities / isolations carried out
A	• Routine works of short duration and reactive fault finding on maintainable assets by competent person including short duration mains repairs. • Self-isolation (electrical or mechanical).
B	• Isolation of maintainable assets for longer periods (e.g. while waiting for parts). • Self-isolation with key controlled by COP (maintenance isolation). • May require completion of an isolation certificate if a third party will be working on the equipment.
C	• Non-routine works, those involving multiple isolation points and/or more than one person involved in the works. • May require SHE4 or PTW.
D	• Intrusive works, or inspections involving persons entering or working directly on assets for a prolonged period from multiple parties. • Multiple isolation points require full documented procedure, permits and authorisations.

Table 1. Categories of isolation

When working on assets, define a safe system of work that properly identifies the hazards and how they are controlled. The best method of control is to eliminate the hazard. To do this, isolate the process from energised sources that have the potential to cause harm. When isolating an asset or process, use an effective and secure method.

To achieve and maintain a safe isolation, see the process detailed in Figure 1. A diagram showing how this process works is contained in Appendix I.

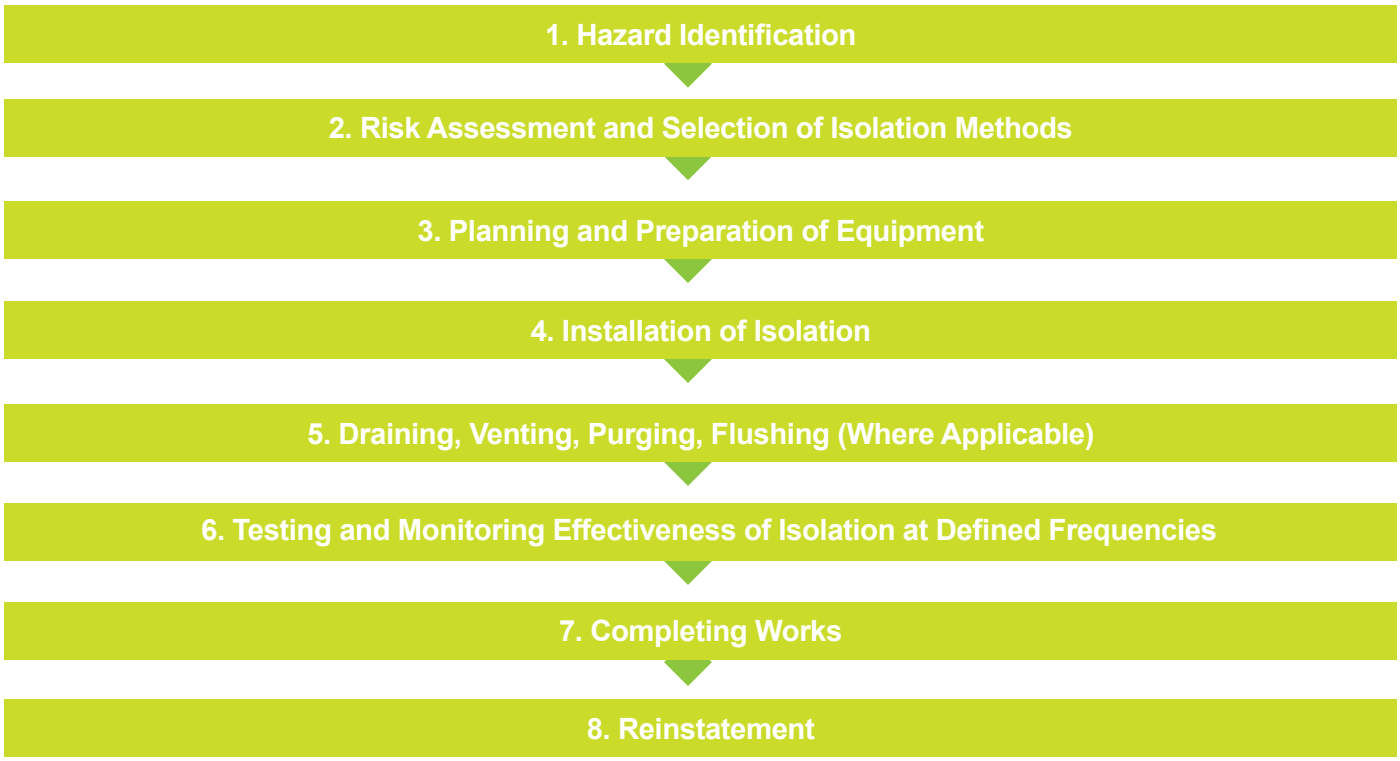


Fig 1. Safe isolation procedure

1. Hazard Identification

When identifying the hazards involved in the works, consider all types of energy that have the potential to cause harm. This can include electrical, mechanical, fluids, media, gases, and stored energy sources.

It is important to consider if there are moving parts that could be a hazard, even after equipment has been electrically isolated, for example fan blades or motor shafts. It is important to recognise that hazards may also be created by the isolation itself. For example, if an electrical panel feeds more than one item of equipment, switching it off could affect other processes or safety controls.

2. Risk Assessment and Selection of Isolation Methods

Carry out a risk assessment to determine any possible isolation failures, and also detail the likelihood and consequences of these failures. Keep the following risk factors in mind:

Severity / consequence	Y / N
Could personnel be at risk of injury or other adverse event if the isolation failed?	
Could the process be compromised if the isolation failed?	
Could the potable water supply be affected if the isolation failed?	
Could members of the public be injured or adversely affected if the isolation failed?	
Could the environment be impacted if the isolation failed? (E.g. gas or chemical leak, flooding.)	

Likelihood of failure	Y / N
Is the isolation point located in a secure area on site with restricted access from personnel?	
Is the isolation point located in an area that is accessible to the public?	
Is the isolation point located in an area where there is a history of vandalism or security breach?	
Is it possible to apply a secure lockable isolation on the asset?	
Does the isolation point operate fully and correctly? (E.g. no let-by.)	

Testing and monitoring	Y / N
Has the frequency of testing and monitoring the isolation been determined?	

The risk assessment helps in choosing the method of isolation and the equipment used for the process. Also consider the risks to persons during the installation of the isolation.

3. Planning and Preparation of Equipment

Safe and effective isolations of assets and processes require good and careful planning. Planning ensures all the possible hazards and risks are considered, and that appropriate resources and equipment are made available to put all the necessary controls in place.

When planning isolations, consider the following:

- What must be isolated?
- Where are the isolation points located?
- Are they accessible and clearly labelled?
- Have isolation points been proven as operable?
- Could isolation points impact on other areas of process?
- What type of isolation is required? (E.g. mechanical, electrical, etc.)
- Will specialist skills be required? (E.g. an electrician.)
- What is the sequence of isolation?
- Are there any enabling works required?
- Where will the keys be held?
- What permits and authorisations are required?
- Contingency planning, in case something goes wrong.
- Emergency planning, in response to an incident.
- Schematic plans, showing layout and ID's of isolation points.

When planning isolations, it is important to "walk the line", or verify on site that all isolation points are accessible and functioning correctly. It also helps determine what equipment and resources are required.

A documented isolation procedure is required for complex isolations for works such as tunnel inspections, tank inspections, chemical line works, etc.

Such a document must provide details on:

- The location of isolation points
- The equipment to be used
- The sequence of isolation
- The personnel involved
- Required permits and authorisations
- Required key controls and sign-offs

Note: If the isolation involves isolating a valve in the open position (e.g. a drain valve), include this information in the isolation schedule and lock it off in position.

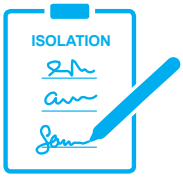
Ensure the appropriate equipment is in place to provide an effective and secure isolation. A range of isolation tools are available for this purpose, and their use will depend upon the type of isolation and the risk of failure.

Isolation equipment includes:

- Chains or steel wire
- Padlocks and multi-hasps (with secure key control)
- Valve caps
- Spades
- Tags or signs (must include name and phone number of the person performing the isolation)
- Foam spray (for network valves in pits)
- Blank flanges
- Circuit breaker lock-off clips
- Lockable fuse inserts
- Voltage detector and proving unit (electrical isolations)
- Inflatable stoppers
- Mechanical line stops

4. Installation of the Isolation

When planning, as well as before installing isolations, ensure that the asset and/or process owner (and any other parties that may be affected by the works) are consulted on the proposals. Only a person with the relevant knowledge and experience of the equipment being isolated must carry out the installation of each point in the isolation. Specific PPE may also be required during the installation of the isolation to protect against potential hazards. The risk assessment must determine if this is necessary.



Where works involve more than one person, each person working on the equipment must witness the isolation and apply their own padlock. For isolations involving contractors, representatives from Thames Water and the contractor organisation must witness each isolation point, and provide their signatures as evidence.

Ensure isolations are secure throughout the duration of the works. The level of security depends on the risk and consequence of failure, which is determined by the risk assessment (Stage 2 of this Essential Standard).

Also consider the possibility of someone unintentionally or deliberately tampering with or removing the isolation without authorisation.

Key control

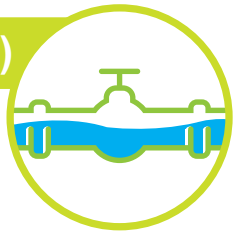
Control of the isolation padlock keys varies and is based on the category of isolation.

Category A: These short-duration isolation keys remain with the person carrying out the work.

Category B: Isolations that remain in place for a long time require central key control, particularly if the person applying the isolation is not the person who carries out the work.

Category C and D: These isolations require documented key control procedures to ensure all isolation points remain secure, and only named authorised persons have access to these keys.

5. Draining, Venting, Purging, Flushing (Where Applicable)

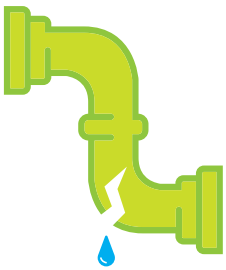


The asset to be worked on may have to be prepared for the works; for example, depressurising, draining of fluids or chemical, flushing or purging. Assess the risks relating to this task, and develop and document a safe system of work. Take the following into account:

- Hazards:
  - Asphyxiating effects of gases
  - Volatile vapours given off by a liquid
  - Formation of explosive atmospheres
  - Over-pressurisation or overfilling risks
  - Vacuum effects within vessels
  - Dead legs, valve pits and other confined spaces
  - Disposal of fluids and contaminated water
  - Compression effects leading to ignition of fluid vapours
  - Blocking of drain points with debris
  - Hydrostatic load on pipework
- Isolations required to perform this activity
- Testing, to ensure the required level of cleanliness has been achieved
- Highlight residual risks (e.g. where flushing is not possible, or if it is not possible to verify that the required level of cleanliness has been reached)

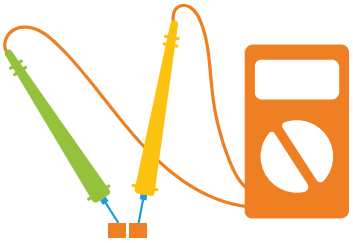
6. Testing and Monitoring Effectiveness of Isolation at Defined Frequencies

Prove isolations are effective before any work is carried out on the asset. Also check the integrity, and monitor this throughout the duration of the works. The frequency of monitoring isolations is determined by the risk assessment.



Isolation valves on pipework and within tunnels may let fluid by, so set a criteria for the quantity of fluid that may be let past over a certain period of time. Base this criteria on an assessment of the risks, and consider the following:

- Will any leakage cause a hazard to personnel or plant?
- How can the leakage be safely disposed of, considering the nature of the fluid?
- How will the leakage rate be monitored, and at what point will works have to be stopped?
- What procedures are in place to deal with a sudden or significant increase in the leakage rate?



It is important for any isolation to be subject to testing and monitoring. Specifically for any electrical work, the circuit must be tested to ensure the correct asset has been isolated, and that it cannot be energised from another source. Use an approved GS38-compliant voltage indicator and proving unit to prove that an electrical isolation has been carried out. Also verify the voltage indicator before and after use.

7. Completing the Works

Checks on isolation points should be carried out and recorded at regular intervals as determined by the risk assessment. This will ensure they remain secure and effective. Doing this is particularly important where isolation points may be at greater risk of tampering; for example, where there's a history of vandalism or areas of public access. Record these checks and keep them on file, along with the permit to work.

8. Reinstatement

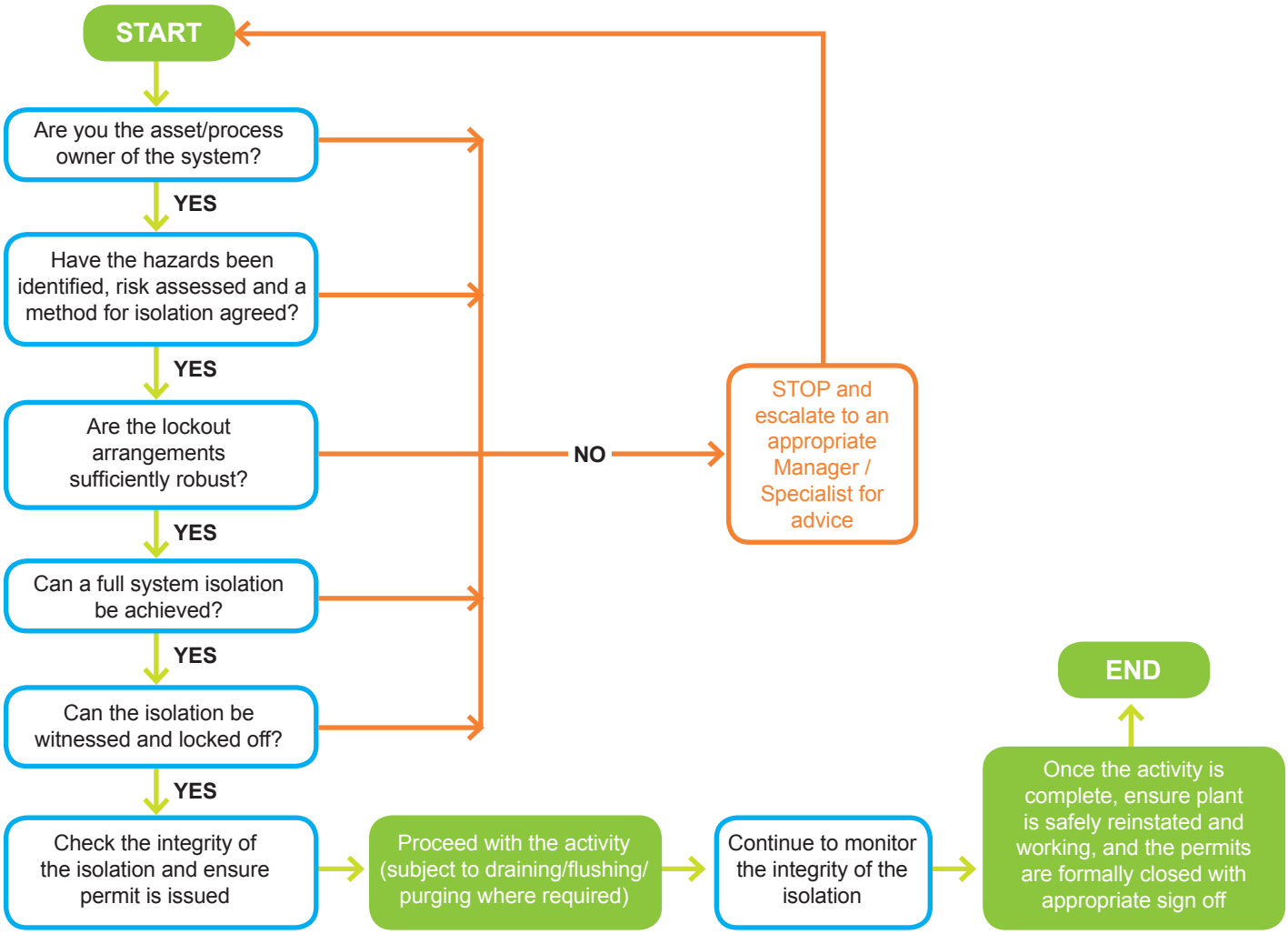
It is important to safely bring an asset and/or process back online, once the works have been completed. This means identifying a procedure for removing the isolations. That is why good and effective communication between all parties involved during the recommissioning of works is important; for example, establish that all works are complete, and that all personnel, tools and equipment have been removed from the work area.

Agree on a clearly defined sequence of recommissioning an asset or process during the planning stage. Ensure the following is understood:

- The implications of removing the isolation.
- How such removal could affect or impact on other systems, assets or processes.

APPENDIX I

Diagram showing process for controlling and installing isolations.



APPENDIX II - Further information and guidance

More detailed guidance on electrical and mechanical isolation requirements is contained in the **'Thames Water Electrical Safety Rules'** and the **'Thames Water Mechanical Safety Rules'**.

For more guidance, access the following:

Essential Standard 26 (Working on Live Water Mains)