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

ESSENTIAL STANDARD no.31

Entry into sewers behind a point of isolation

Thames Water

KEY MESSAGES

- All works must be carried out in accordance with HSP46 to ensure the safety of employees' and other stakeholders'.
- All sewer confined space entry work must go through the Independent Authorising Body (IAB) and be validated with the Waste Operations Control Centre (WOCC).
- Any works behind a point of isolation must be fully validated and authorised by IAB.
- Understand the integrity of both physical and procedural controls that are in place.
- Ensure the consequences of operational failure/worst case scenario is understood and prevented.

1. Introduction

This essential standard has been developed from HSP46 to ensure the safety of employees and other stakeholders working on tasks that require isolation and entry into confined spaces in the sewer network. This standard sets out a range of criteria and controls that must be followed to ensure safe and secure isolation for the protection of people.

The sewerage system was built in the Victorian era with the health and safety practices available at the time. Entry into the sewerage system is of a high risk nature due to the confined spaces and:

- The size and scale of the system
- Original design constraints
- Volume and changing sewage controls
- Varying asset conditions
- Aggressive substances and environment
- Tidal water, rainfall, surface water and other unplanned ingress
- Unexpected failures of controls and assets like penstocks, pumps and weirs

We must always try to avoid confined space entry if possible; if we can't, then we must ensure the right controls are in place and we understand the consequences if they were to fail, to ensure that robust emergency procedures are put in place.

2. Key principles of Safe and Secure Isolation

- Ask yourself: “Can we eliminate the need for confined space entry?”
- Prevent significant heads of water building up in the system behind a points of isolation.
- Where possible, use a combination of independent control measures or points of isolation that can be secured to prevent them from being interfered with, defeated or overridden.
- Ensure that you understand the consequences of failure/breach of an isolation point or control so that measures can be put in place to minimise the risks.
- Ensure that physical points of isolation or control measures are in good condition to prevent other points of isolation/controls failing further down in the system.
- Ensure you understand the consequence of failure, so that there is suitable warning systems and evacuation time for the entrants built into the Safe System of Work.
- You must be able to prove the effectiveness of the controls and the overall isolation arrangement. All safe and secure isolations must minimise the risk to an acceptable and safe level.
- Use modelling data or carry out a trial wet run to prove the effectiveness of an isolation arrangement.
- Always ask yourself: “What if this were to fail?”

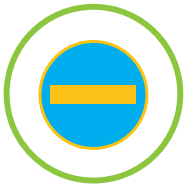
3. Role of the IAB and WOCC

All system entries involving safe and secure isolation or work that will change the way the Man Entry Sewer Network operates must be independently authorised and co-ordinated by the Thames Water Independent Authorising Body (IAB) before work starts.

Proposed changes in the system must be raised as a diversion/isolation request to the IAB. For example, changing the way the system operates could be part of operational or maintenance activities (e.g. electrical works) which could affect flows, pressures or control measures (pumps etc.).

The IAB independently reviews all Safe Systems of Work to ensure all confined space entries have been properly assessed and planned, that all isolations and controls in place are effective and that there are no other works in the area that could impact the activity. The IAB will not be responsible for reviewing the Safe System of Work for the actual physical tasks being undertaken inside the confined space.

Once approved by the IAB, the work is passed onto the Waste Operations Control Centre (WOCC). Immediately before entry, supervisors should contact the WOCC to ensure that controls are in place and no other factors, like rain, will have an effect on the work. Safe exit and status updates must also be communicated to the WOCC.



IAB will provide a list of pre-approved works to the WOCC, works not on the pre-approved list will not be allowed to go proceed.

4. The Complexity Matrix

The complexity matrix below shows the difficulty levels of confined space entry scenarios. It is used as part of the risk assessment produced to ensure the correct controls are put in place to mitigate the effects of possible failure:

Low	Up to 9m depth without secondary access
	Working in sewers with shallow depth and low velocity conditions
	Works not involving sewer diversions
	Working above the flow level of the sewer e.g. in a chamber (including Storm Relief), but not secondary access.
Medium	Any entry involving secondary access or 9m – 18m depth
	Working in storm sewers
	Any diversion or isolation not used for the protection of people (Penstock RA and NDT may still be required)
	Any diversion or isolations used for the protection of people but not holding back a head of water (Penstock RA and NDT may still be required)
High	All entries in excess of 18m depth
	Entry into C class sewers
	Any diversion or isolation holding back a head of water NOT in excess of 40% (Penstock RA required)
	Any diversion or isolation holding back a head of water in excess of 40% (Penstock RA and NDT required)

5. Procedures

When planning entry to wastewater operations, follow the HSP46 process flow below:

1. Identify the activities that need isolation in order to complete the task

2. Contact and enlist the help of modelling team and Trunk Sewer / STW teams if possible

3. Identify the complexity of the task

4. If required, select competent contractors and complete RAMS / SHE4

5. Review the activity with Area Services Manager (ASM) and Technical Co-Ordinator (TC)

6. ASM/TC engages the Independent Authorising Body (IAB)

7. Set up review sessions for any tasks that are of medium/ high complexity

8. The task will now be accepted or rejected. If it is rejected, recommendations are needed; if accepted/approved, the task will receive an approval number. Contractors must request TWOSA from ASM/TC

9. Speak to WOCC on the day of the task

10. Once the task is complete:

- Confirm with the WOCC
- Sign off with the Thames Water Operational Safety Authority (TWOSA)
- Email IAB

Safe Sewer Access and Catchment Change Control Approval

Example form (always use most up-to-date version):

Project / Work Details

Activity title		IAB Ref:	
Presenting Manager:		Company / Department:	
Planned Start Date		Completion/Reviewed Date/s:	

HSP 46 Safe and Secure Isolation and Diversion/

Low Complexity Works? (IAM sign off not required)	Medium Complexity /works? Reasoning:	High Complexity Works? Reasoning:

HSP46 Safe and Secure Isolation, complied with? Yes/No

Works Plan Rejected

Works Rejected?: Yes/No	Reason for Rejected works:	Actions Required:
	✓	✓

Approval and Critical control measures

Works Approved?: Yes/No	Critical Control Measure Agreed: ✓
SHE4/RAM's Referenced:	
Other Documents Referenced:	

Authorisation Details

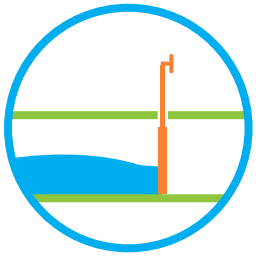
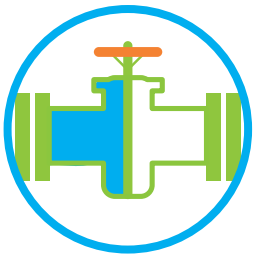
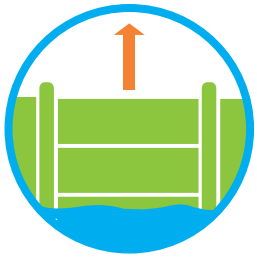
Independent Authorising Manager:		Signature:	Note: Works approved subject to IAB coordination.
Date:		Time:	

6. Controls

Controls should be unique to the environment, entry and activity taking place. Risk Assessments (HSP46) and/or structural calculations and temporary works designs must be used to prove that flow control devices (penstocks, cloughs, weirs, dams) are effective.

6.1 Physical Controls

Physical controls can stop or divert flow for a certain period of time.

When planning for entry, all control equipment, such as penstocks, valves, stop-logs etc. must be assessed. You must ensure they provide a safe, secure and isolated environment for confined space entry.

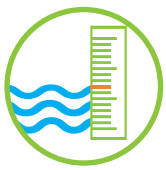
When assessing physical controls, you must confirm that the equipment:

- Can't be over-topped or by-passed by tides, rain water or other unexpected ingress
- Is robust and reliable
- Is in good condition
- Is adequate for the task
- Will not fail during entry

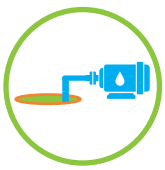
If you can't confirm the above points, then the task must not proceed or additional controls must be put in place. All additional measures should be designed and implemented for every individual situation.

6.2 Non-Physical

Non-physical controls do not hold back flows. They include processes such as:

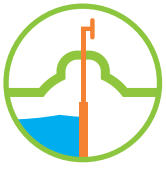


- Monitoring flow levels to ensure they stay in safe parameters or so an early warning can be made



- Pumping stations to reduce or remove flow levels from the work area

- Weather monitoring and forecasts used to provide advanced warnings and allow better planning



- Wet/Live testing can be used to prove flow levels and consequences where modelling data is not available

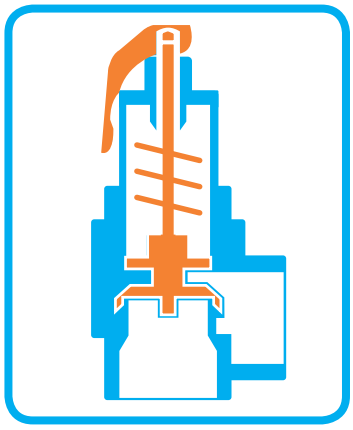
- Tide times used to calculate the best periods for safe entry

7. Penstocks, Rotorks and River Flaps

7.1 Penstocks

When using cast iron penstocks, you must ensure that:

- A penstock risk assessment and inspection is completed in advance
- Temporary solutions/modifications are explored and independently designed and implemented if the penstock is not able to pass the Risk Assessment
- A penstock won't be used as a single isolation to hold a head of water greater than 40% of maximum level.
- Only use a penstock for water levels greater than 40% of maximum level if there are appropriate temporary / permanent works designs



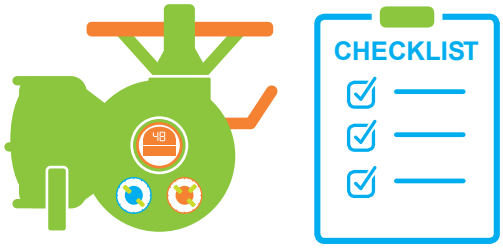
When using high-consequence valves/non-cast iron penstocks for a single isolation above 40%, ensure:

- You complete a structural and mechanical assessment
- An independent inspection and validation is done
- You receive sign off that non-cast iron penstock/high-consequence valves are the correct method of isolation for this activity

7.2 Rotorks

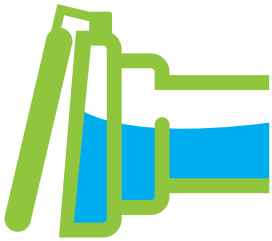
Rotorks fitted to penstocks must be:

- Tested and calibrated prior to use
- Limited specifically for the individual penstock
- Inspected annually
- Used within specified date



7.3 River Flaps

River flaps should only be used as part of an overall safe and secure isolation when combined with additional protective measures.



It's best to work in safe windows where the tidal flows don't reach the level of the river flap. To work outside of safe windows, you must prove that the flows will not present any danger to entrants.

Use modelling data to support your decision to work outside of safe windows or to help you identify additional measures of effective alternatives.

8. Flows and Water Pressure

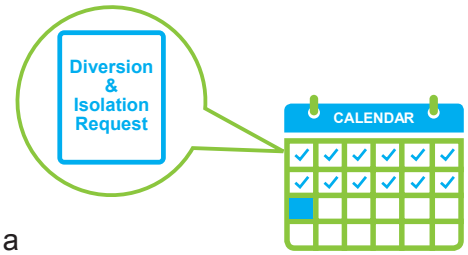
Investigations and analysis must be done as part of planning for entry. This ensures full understanding and documentation of the flows and water pressure that could have an impact on the site while workers are in the confined space.

The investigations and analysis must include:

- the maximum hydraulic height the water could rise to
- the maximum static water pressures that structures and controls could be exerted to
- the quantities and dynamic pressures, such as unintended increase in flows, pressures and surges, that could affect the control locations

9. Diversion and Isolation Requests

A member of the Trunk Sewers/Strategic Pumping Team must send a Diversion and Isolation Request Form to the Isolation and Diversion Coordinator (IDC) at least two weeks before the work starts.



Both Diversion notices and approvals are a 14 day process. Less than 14 days needs to be discussed with IAB and less than seven days needs a Thames Water ML5 agreement.

10. Modelling

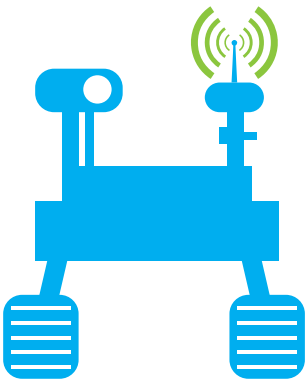
The modelling team uses a series of high tech modelling tools to provide us with information on the safety conditions surrounding the work area.

Before entry, ask the modelling team the following questions:

- Is there the potential for flooding? If so, how much time do you have?
- What are the consequences of isolation/control failure?
- Is tidal ingress going to impact the work?
- Where and when are the safe working windows?
- Are there any points that need to be critically monitored?
- Are there suitable diversions and are they effective?

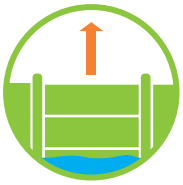
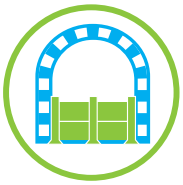
11. Remote Equipment

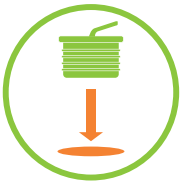
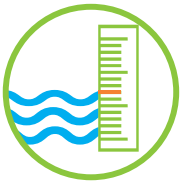
Before deciding on confined space entry, you must always consider whether the job can be done by remote equipment such as Light Detection and Ranging (LiDAR) Technology.



Appendix

Aide Memoire - Selection of isolation controls

Description	Physical/Non-physical	Pros	Cons
Penstock/Valves 	**Physical**	• Fully isolate to dry conditions • If actuated can be quick to open or close, and can be done remotely • Can be used to limit flows not just isolate	• Requires regular maintenance • Increased need for entry to asset • Need to investigate and understand condition • Actuation can risk damage to penstock
Stop logs/Cloughs 	**Physical**	• Specific design for the location • Can be relatively cost effective	• Need to be purposely designed for the span required along with appropriate supports where required • Will not provide a full seal
Temporary bulkheads 	**Physical**	• Specific design for the location	• Specific design for the location • Can take time and be difficult to fit, often requiring entry without physical isolation in place
River flaps/Flap valves 	**Physical**	• Stop back flow into a system, for example against a tidal outfall	• Need to investigate and understand condition • Can leak if seal not maintained or obstructed by debris • Not always visible at all times (tidal on outfalls) • Subject to harsh environment conditions

Description	Physical/Non-physical	Pros	Cons
Weir boards 	**Physical**	• Can be left in position to control	• Requires some form of monitoring to know when weir is close to over-topping
Temporary works solutions, bungs, stoppers, etc. 	**Physical**	• Specific design for the location and requirements • Known condition and safe operating levels	• Relatively new and unfounded technology (large inflatable stoppers) • Requires bespoke design
Flow monitoring 	**Non-physical**	• Can be inserted to monitor remotely at upstream locations • Once installed reduces confined space entry works to monitor levels • Can be used as an advanced confirmation or predictive flows and also provide live data	• Requires entry to system to insert as presently little fixed monitoring exists • Needs maintenance requiring confined space entries • Can become less reliable if not cleaned and maintained
Weather forecast 	**Non-physical**	• Can be used to provide advance forecast, understanding and warning	• Forecasts whilst generally good short range, can change unexpectedly, and rainfall can lead to a deluge on system in a relatively short period of time
Tide times 	**Non-physical**	• Fairly reliable, tides change slowly and timings are known	• Can result in a reduced working window