CIREG
Construction Insurance Risk Engineers Group

THE UK CAR UNDERWRITERS GROUP

Best Practice Guidance

Managing Escape of Water Risk on Construction Sites

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This document provides advice on the mitigation of escape of water risks on buildings undergoing construction and refurbishment during both the design (pre-construction) and construction phases. The guidance is intended for commercial and multi-tenure residential developments though some of the advice may be equally applicable to housing developments and enclosed, serviced areas of civil engineering projects. This guidance is endorsed by all CIREG and UK CAR Underwriter member companies and represents industry best practice in the avoidance of escape of water losses.

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Introduction

The purpose of this document is to outline some of the ways in which the industry can tackle the root causes of the escape of water problem and to suggest ways in which organisations and individuals can mitigate the effects should an incident occur. Water ingress, failure of drainage and flooding from external sources is not discussed in this document but must also be considered.

Following the 4th Edition of this Guidance Document published in 2015 escape of water occurrences have continued to increase substantially, both in their frequency and severity. Large losses from escape of water are now as frequent, if not more so, than fire related incidents

A large number of losses have occurred in the final weeks of projects, once susceptible fit out elements have been installed. Insurers' approach to escape of water risks is, consequently, undergoing a hardening stance. This has increased the prospect of higher insurance costs, stipulations for controls to be implemented during the construction period and increasing insurance excesses in the event of a loss.

This comes at a time when advances in technology, such as monitoring water flow and automatic flow detection shut-off systems are more widely available. Uptake of such systems continues to be disappointingly low and they are rarely considered at the design stage.

The majority of projects surveyed by CIREG members' engineers have no form of Water Management Plan in place, nor any Emergency Management Plan in the event of an escape of water.

The reasons for water leaks occurring are many and varied but include:

- A lack of awareness and insufficient risk management from design stage through to operation
- Insufficient on-site management and assignment of responsibility
- Absence of permit systems and other management systems, with water risks treated less seriously by contractors than fire or other safety risks
- Poor workmanship and the use of inexperienced or untrained personnel
- Inadequate verification of individual plumbers' installations through initial joint testing
- Increased high rise developments and vulnerable fit-out works
- A lack of understanding of the myriad of plumbing systems now available and the lack of bespoke training
- Sub-standard pipework testing regimes
- Inadequate mitigation and emergency planning delaying the response in protecting assets

The key to addressing the problem is the allocation of sufficient resources to the identification, analysis and avoidance / mitigation of the risks associated with the escape of water. The management of the escape of water risk should take a prominent place in the project's risk register. For all developments, a formal plan should be drawn up to address the following exposures:

- Those associated with the temporary water supply
- Those associated with the permanent works water systems

Historic evidence suggests that reliance on visual leak detection and manual isolation following an escape of water is wholly inadequate. The use of automated systems to detect and isolate charged pipework has proven successful, with manual monitoring and intervention being a complementary second line of defence.

A sample Water Management Plan template is appended to this document.

The project 'Water Management Plan' should ensure the following, as a minimum:

- Appointment of 'Responsible Persons' to manage the escape of water risk
- A risk assessment process for mitigating exposures at the design phase
- The selection of competent contractors
- Quality control throughout material storage, installation and testing
- Mitigation measures, identification and implementation and maintenance of those mitigation measures
- Emergency response plans
- Regular review of the risk assessment and water management plan to ensure mitigation measures remain appropriate

1. Management

1.1 A competent Responsible Person should be nominated by the Principal Contractor for the management of the escape of water risk. This Responsible Person should be overseen by the Principal Contractor.

Whilst the day to day management of the escape of water risk may often be delegated to the M&E Contractor, it remains the responsibility of the Responsible Person to ensure:

- the specified plumbing systems subject to risk assessment
- the appropriate selection and appointment of skilled contractors and labour (in accordance with Section 3)
- incorporation of written procedures (with respect to installation, testing and commissioning) into contractual terms
- verification of installation standards and adherence to codes (in accordance with Section 4)
- that independent site checks and quality control are carried out
- compliant pressure testing and commissioning procedures are specified by the Designer and adhered to
- full certification of work and auditable records
- training is provided to the emergency response team to ensure that all parties are fully aware of their roles and responsibilities
- written quality systems and document controls are maintained

1.2 The Responsible Person should ensure that a 'Water Management Plan' is developed that clearly defines responsibilities, procedures and specific actions required to manage and mitigate the risks. The Water Management Plan in Appendix 1 should be used as reference to ensure that all relevant measures have been included.

1.3 The construction work should be phased so as to mitigate the extent of damage should an escape of water occur.

- Permanent drainage should be installed early with full functionality or, alternatively, specific measures put in place to temporarily manage the discharge of water from the building.
- Any bunds should be completed and drainage from plant rooms connected before tanks are filled.
- Early commissioning of sump pump alarms, flow detection, water management devices, monitoring systems including the Building Management System. Any alert system should be routinely checked or remotely monitored.
- Pipework and valves should be identified and labelled as works proceed, not at completion of the project. Valve location and function should be included in the emergency procedures. When working on existing systems, the location and function of all valves should be established, and effectively communicated, prior to work commencing.

- Valve labelling should differentiate between:
    - Main – shut off to the facility or an entire building
    - Primary – water shut off to floors, wings or large areas
    - Critical – water shut off over critical equipment such as computer rooms
- Temporary water services should be routed in areas where any damage caused by escape of water will be minimal e.g. on the outside of the building where possible

2. Design Considerations

2.1 The selection and design of the water distribution system(s) should be based on a comprehensive risk assessment, considering the following factors:

- the building occupancy, height and susceptibility of its contents to water damage
- the future maintenance and accessibility requirements
- the competence and experience of the contractors
- design input & levels of supervision
- the presence (or absence) of mitigation features (e.g. water management devices, bunding, slab edge details, isolation valves and flow detection)

2.2 The Design Team should be tasked with designing out features that are known to exacerbate escape of water losses and include those that may mitigate a loss should an escape of water occur.

Examples of unfavourable features which should be avoided include:

- combined service risers (electrical/data cabling and water services together)
- combined single pipework for domestic and sprinkler systems
- Excessive elbow joints
- Inappropriate or concealed pipework routes
- lack of hanger supports, thrust blocks, and free-supporting pipework
- positioning of water tanks (at high level or above electrical services)
- electrical cables laid directly onto floor slabs

Examples of favourable features include:

- inclusion of pressure reducing valves
- stop valves and shutoff devices labelled and their location recorded
- relevant valves and devices including stop valves, shut off devices, terminal fittings and hoses inspected and maintained regularly
- drainage points on the floor slabs
- additional isolation valves
- upstands around risers
- plant installed on plinths
- easy access to pipes (hatches etc.)
- mitigation features (e.g. water management devices, bunding and flow detection)
- the presence of in-built jointing system safeguards
- leaving plasterboard walls 25mm off the floor slab

2.3 A means should be established for bringing in, handling and discharging temporary and permanent water supplies in the buildings under construction. This should include designated water discharge points/routes and should include supply/discharge of water from sprinklers, HVAC systems and temporary welfare & accommodation facilities, where set up inside the building.

2.4 Designers should specify automatic flow monitoring and automatic shutoff devices in the operational building. Whilst this guidance focuses on risks associated with construction, property insurers are seeing a similar increase in the frequency and severity of escape of water events.

The incorporation of permanent water management devices could improve the availability of insurance and may have a favourable influence on price and the conditions imposed. Selection of water management devices at the earliest design stages can also reduce the installation costs associated with retrofitting devices. There can be additional environmental benefits and cost savings.

3. Installation Standards

3.1 The Responsible Person should implement a procedure for independent certification of work throughout the installation, testing and commissioning. This procedure should be documented and auditable.

3.2 All Contractors should be required to work to industry recognised regulations, codes and standards which should be clearly defined in all work specifications and contractual documents. The main applicable codes are:

- The Water Supply (Water Fittings) Regulations 1999 and The Water Supply (Water Fittings) Scotland Byelaws 2014
- BS EN 806 Pts 1-5 Specifications for installations inside buildings concerning water for human consumption and BS8558: 2015 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages: Complementary guidance to BS EN 806
- BESA Good Practice Guides – including the BESA Guide to Good Practice: Site Pressure Testing of Pipework (TR/6)
- CIBSE (Chartered Institute of Building Services Engineers) standards
- CIPHE plumbing engineering services design guide

3.3 All installations should be carried out in accordance with the design guidelines and manufacturers' installation manuals.

3.4 Where plumbing systems require bespoke tools such as torque wrenches and crimping tools, these should be sourced from the appropriate supplier and routinely calibrated to manufacturers specifications.

3.5 Pressurised systems should have adequate supports between joints and thrust blocks.

3.6 Joints should be marked or initialled by the installer to provide a quick visual check that all joints on a pipe run have been fully formed. A plan of all joints in the system should be recorded and maintained to identify where each installer has undertaken work. The date and crimping tool also need to be recorded.

4. Quality Management

4.1 As part of the pre-qualification tender process, all companies should be required to submit details of their professional affiliations, membership of Approved Contractor Schemes and records of staff training.

4.2 Plumbing, heating and ventilation companies should be members of recognised industry associations.

WaterSafe is a national accreditation body which checks and approves businesses and their plumbers to give customers reassurance about the tradesmen undertaking work for them.

It brings together thousands of qualified contractors employed by plumbing businesses from the seven existing approved contractors' schemes across the UK, including:

- Chartered Institute of Plumbing and Heating Engineering (CIPHE)
- The Water Industry Approved Plumbers' Scheme (WIAPS)
- Association of Plumbing and Heating Contractors (APHC)
- Scottish and Northern Ireland Plumbing Employers' Federation (SNIPEF)
- Anglian Water's APLUS
- Severn Trent's Watermark
- Thames Water's TAPS

4.3 Only qualified, competent plumbing engineers with appropriate skill sets should be permitted to work on water distribution systems. The following minimum qualifications are:

- a Level 3 NVQ (or equivalent)
- Advanced Craft CSCS (Construction Skills Certification Scheme) card as issued by the Joint Industry Board for Plumbing and Mechanical Engineering Services (JIB-PMES)
- affiliation to a Professional Engineering Institute such as the Chartered Institute of Plumbing and Heating Engineering (CIPHE).

Equivalency of international qualifications should be checked. UK NARIC is an organisation that maps equivalent world-wide qualifications and, whilst this will allow a comparison of qualifications, it does not ensure that overseas workers have sufficient knowledge of UK regulations and standards.

4.4 At induction, all operatives should be required to produce evidence of

- Professional association membership
- Personal qualifications
- Training received in specific plumbing systems

4.5 Inexperienced operatives (not meeting requirements of 3.3) should be under the direct supervision of, and works verified by, a qualified plumbing engineer.

4.6 All operatives should be trained by the manufacturer supplying the system and training records kept verifying this training has been completed and periodically refreshed.

4.7 Before commencing work, all plumbers should provide an initial "test joint" for each type of plumbing system and joint being installed. These "test joints" should be visually inspected and verified by an independent qualified plumbing engineer with the requisite qualifications and experience of installing similar systems. Verification of installation techniques should ensure the correct insertion depth and appropriate torqueing where required.

4.8 A Water Work Permit should be used to formally control all work on live plumbing systems, including filling, testing, commissioning, snagging and maintenance. This permit system should include, as a minimum:

- Date and time of permit issue and expiry; duration not to exceed a single working shift
- Exact location and nature of the work to be undertaken
- Confirmation that the area is isolated (if applicable)
- Appropriate mitigation such as wet vacs and bunding is in place in the working area
- Where a system is under hydrostatic testing or commissioning, confirmation of a permanent manned presence from a competent plumbing engineer
- Confirmation that the flow monitoring and shutoff systems have been reinstated
- Closure by the permit issuer (appointed person of the Principal Contractor) of the Water Work Permit, countersigned by the permitted individual

4.9 A void closure hold point should be agreed in all installers' quality management plans for plumbing installations that will be enclosed. The Responsible Person should validate that the plumbing has been satisfactorily installed, tested and commissioned under the Water Work Permit before it is subsequently enclosed.

4.10 Testing and commissioning should always be attended by a competent person able to identify problems and isolate the system. Any system which remains in a pressurised state outside of normal site hours should have a qualified and competent plumbing engineer in attendance at all times. Installation of an approved flow detection system with remote alarm and automatic shutoff valve (Section 5) to isolate the charged system would be an appropriate alternative to a full-time presence.

5. Testing and Commissioning Standards

5.1 All pipework (including temporary pipework) should be subjected to a clearly defined and fully documented Pressure Testing regime. The test method should be in accordance with the manufacturer's guidelines (which will be specific to the system employed) and the pressure and duration should be defined by the System Designer.

Failure to test an installation to the correct pressure for the required duration may nullify the manufacturer's warranty (this applies to pressures and duration being too low as well as too high). All testing should be witnessed by the Responsible Person and an independent third party, such as a Commissioning Manager, and include:

- A visual inspection of all visible joints (particularly where the depth of insertion is critical to the integrity)
- In most circumstances, unless otherwise directed by the Designer, an initial air test followed by sectional hydraulic testing to manufacturers' guidelines and relevant standards. Account needs to be taken of the daily variation, including surges in pressure, when determining the normal working pressures
- Full pressure tests on systems in their entirety, including all equipment and fittings to manufacturers guidelines and relevant standards. This should be attended for its full duration by an operative familiar with the installation

5.2 Pull-out tests on bolts securing the pipe supports should be carried out and test records maintained.

5.3 There should be a full audit trail of all components used, the installation, the testing regime, commissioning procedures and approval certificates.

6. Mitigation

6.1 In all circumstances, there should be:

- A means for detecting that water is flowing when it should not be
- A means for rapidly shutting down the system when such water flow is detected

This can be achieved in a number of ways such as automated water management devices or robust physical monitoring and emergency response procedures. Rapid detection and quick isolation are key to the mitigation of water damage.

6.2 Any temporary water supplies should be switched off outside working hours. A main valve should be readily accessible, and people designated to perform the task. Temporary rising mains should be tightly controlled and protected, with lockable discharge points. Temporary water pipes should be located away from electrical risers and temporary electrical supplies, ideally external to the buildings.

6.3 A flow management device should be installed on the main temporary water supply and, if a booster set is required, between the booster pump and any water tank. This device should be set up to operate autonomously, shutting off the system outside of working hours, monitoring flow during operation and shutting off the system in the event of abnormal flow.

The flow management device should be physically checked at least weekly to ensure that it remains fully operable.

6.4 On permanent systems the supply should be isolated when the building is unattended. Where there are multiple isolation valves, an 'Isolation Register' should be maintained to ensure all valves are routinely turned off out of working hours.

6.5 A labelled plan and annotated photographs should be used to identify the location of all isolation valves. On-site signage should also be provided.

6.6 On permanent water systems automatic flow monitoring and shutoff valves should be installed in the following locations as a minimum:

- At the mains water inlet
- Before any booster pump set – this is particularly important between booster sets and water storage tanks, but should also be installed in any other plant rooms boosting water to higher levels
- On each floor

6.7 All other systems, including LTHW, MTHW, chilled water, underfloor heating and irrigation. should be fitted with automatic flow detection and automatic shutoff devices as per Section 5.3.

Some systems may be controlled by the BMS to enable periodic circulation of the water in a closed circuit, e.g. to reduce stagnation in the system. Where circulation is required this should be conducted during operational hours only. For circulation outside of working hours a competent person should be on site during the circulation times.

Consideration needs to be given to the effects of transient pressure when these systems are turned back on.

6.8 Automatic flow monitoring and shutoff devices should also be installed on any automatic refill systems.

6.9 Installed Water Management Devices should, as a minimum, be capable of, and be programmed as follows:

- Set to shut off water supplies automatically outside working hours and weekends
- Alert appointed persons when small flows are detected
- Monitor normal water usage over a time period so it can then be programmed to allow water to be shut-off at a very precise, pre-determined flow rate outside of the normal usage parameters
- Remote and audible signalling
- Battery back-up or, in the event of power failure, the device should automatically lock off the water supply
- Linked to a manual isolation device on site
- Remain fully operable until handover

6.10 In the event that severe weather conditions are forecast, unprotected pipework should be drained down. Any externally routed temporary pipes should be insulated and/or trace heated to prevent freezing.

7. Emergency Response

7.1 Emergency procedures should be clearly defined within the Water Management Plan and should include simple clear instructions. A call out list and plans showing the position of isolation valves which should be placed on noticeboards around the site.

7.2 A Method Statement for the isolation of water should be produced and updated during construction works so that is clear how isolation is to be achieved. Valves to be isolated should be clearly labelled on site with clear signage to the isolation points being in place. Photographs and plans of valve isolation locations should be included in the Method Statement documents. This procedure should be tested at intervals throughout the construction process.

7.3 An emergency response team, including out-of-hours support, should be trained to provide an early response and to manually shut down systems where appropriate. Unmanned sites should have personnel cover to respond to the activation of flow monitoring and shutoff devices.

Emergency contact details should be regularly updated and displayed on noticeboards.

7.4 Detail clear emergency response procedures. Appropriate equipment such as spill kits, wet vacs, temporary bunds, sump pumps, brushes etc. should be provided and stored on site.

7.5 All incidents of escape of water should be fully investigated and documented. This information should be shared with the Insurance Company and remedial measures put in place to prevent a reoccurrence.

Appendix 1. Water Management Plan Template

[Sample] Water Damage Mitigation Plan

Version	Person	Company	Date of Issue
Issue 1			
Revision 1			
Revision 2			

1. Purpose of the Plan

The purpose of the plan is to provide a clear and logical approach to the management and mitigation of the risk of 'escape of water' (and consequent damage) for the duration of the project. The plan references the guidance given in the 'Managing Escape of Water Risks on Construction Sites, Published by the Construction Insurance Risk Engineers Group 5th Edition September 2019'.

The plan is to be used as a guide for all contractors involved in the design, installation and commissioning of water systems and also those responsible for emergency response in the event that an escape of water occurs.

The plan will also provide evidence that suitable and sufficient measures are in place to manage the risk of water damage throughout the construction period and as such is likely to audited by the Contractors All Risks (CAR) Insurer. It is therefore essential that it is complete and routinely reviewed and updated.

N.B. Sample text provided in Italics throughout only as examples of possible management and mitigation measures. In all cases this text should be tailored to the specifics of a particular project.

2. Nominated Duty holders

Position	Name	Responsibilities
Responsible Person		*Responsible for ensuring procedures are in place for the management of the risk, that competent people are appointed and ensuring that duties are carried out.*
Services Manager		*Overall responsibility for design, commissioning and installation of all wet services. Responsible for implementation of the "Water Management Plan"*
Commissioning Manager		*Physical testing, commissioning and documentation*
Quality Assurance Manager		*Implementation, monitoring and recording of a system of quality control*
Duty Engineer		*Development and implementation of emergency response procedures*

3. Summary of Systems Installed

	System	Installer	Start date	Anticipated Commissioning
1	*Hot and cold-water supply*		*June 2019*	*August 2020*
2	*MTHW and LTHW heating systems*			
3	*Chilled water system*			
4	*Condenser water system*			
5	*Temporary Supply*			
6	*Sprinkler system*			

4. Management of Water Systems

System 1	*Hot and Cold-Water mains*
	Management and Mitigation
Overview of System	*Boosted cold water distribution fed by dual electric pumps drawing from a 20m^3 bunded storage tank in basement level 1. Two sectional mains rise in the dedicated "wet" service risers at north and south ends of the building with final distribution within the ceiling void above the corridors. Supply fed into bathrooms and kitchens of each flat on seven upper floors. All systems will be monitored and controlled on the BMS.* *The mains will be pre-welded steel sections with final distribution in crimped copper pipe work, final connections to fittings will be flexible braided pipework with compression fittings.*
Design Features	*Dedicated wet services risers. Retention to be provided at the foot of each service riser.* *Supports to be provided between joints and thrust blocks at all significant changes of direction.* *Isolation valves to be installed for each flat and accessible from corridor. Isolation valves also to be fitted to each riser main on each floor and accessible from the wet service riser. Pipework and associated valving will be accessible via service hatches and a common service key.* *Basement tank to be bunded and drain connection made prior to filling and testing of the system.* *Plasterboard will be finished 25mm off floor slab.* *A water management device to be fitted to the incoming mains to manage the flow of water during the construction phase. Automatic isolation valve to be set to limit the continuous flow of water to 50 litres*

	Leak detection to be installed underneath each shower tray and sink cabinet.
System selection	*A material matrix has been produced for the procurement of pipe materials in accordance with the relevant BS standards, code of practice, HTMs, HBMs and good working practice.* *Pre-fabricated sectional mains selected to reduce the number of site-made joints allowing factory standard quality assurance. Sections to be site welded.* *Copper crimped pipework selected due to familiarity with system, product supplier training and well-practiced installation and quality assurance standards. No incidents experienced on previous five contracts.*
Quality Assurance	*A Services Manager has been appointed to oversee the installation of all internal wet services.* *The primary mechanical contractor is a member of The Association of Plumbing and Heating Contractors (APHC) and The Heating and Ventilation Contractors Association (HVCA).* *Trade Contractors have been selected from a preferred list, these trade contractors having worked on a number of our successful projects in the past. Before final selection further checks have been carried out by the Services Manager to ensure installation, quality, health & safety and environmental standards are maintained.* *Installation will be carried out by suitably experienced and fully trained operatives with appropriate CSCS cards to their particular trade or discipline. Copies and checks will be taken prior to commencement of the works or at pre-start meetings.* *Full initial and refresher training will be provided to the operatives using the manufacturer's recommended methods for all pipework installations.* *Quality audits of each operative's work shall be carried out by the operative's supervisor on a random basis and the results will be formally recorded for review at progress meetings. Non-destructive visual checking shall be undertaken on approximately 10% of all joints. Non-destructive checking shall be evenly distributed over the whole of the works and shall be evenly split between all operatives/trades employed on the works where appropriate and applicable.*
Installation standards	*[Examples]* *The Services Manager will implement a procedure for independent certification of work throughout the installation, testing and commissioning.* ***Screwed:** The pipework will have a 50mm nominal bore and below for threading and shall be supplied in random lengths having protected threaded ends. Where screwed pipework joints are used, only tapered threads as BS 21 and BS EN 10226-1 will be accepted. The joints on the pipework shall be clean threaded, pulled up tightly and made with an approved jointing compound and long stranded fine hemp. After joints have been formed, all surplus hemp shall be cut away and joints wiped clean ready for painting. Where pipes are held in vices when screwing or jointing, care shall be taken to ensure that the surface of the pipe is not damaged in any way. Pipework that is damaged will not be accepted and if installed shall be replaced.* ***Flanges:** Pipework with a nominal bore of 65mm and above shall employ flanges for jointing at periodic distances. Where flanges are used these shall comply with BS EN 1092 and to the table suitable for the working pressure of the system. Flanges shall be machine faced and*

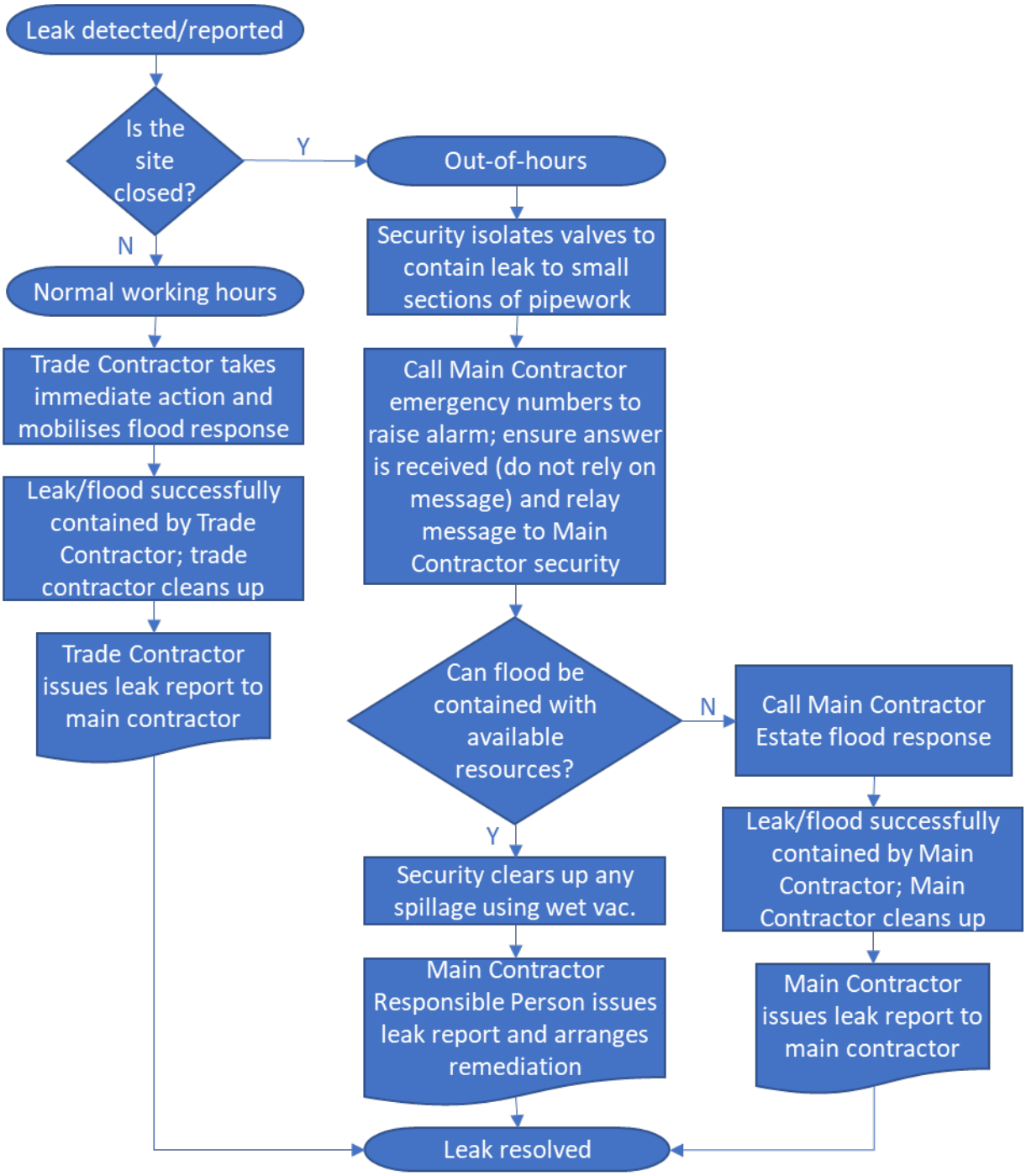
	trimmed at the edges. All joints shall be flushed and shall use full face corrugated rings coated with the appropriate jointing compound. All flanges shall be fillet welded to the pipework. ***Welding:** Any pipework that requires welding will be welded to class 2, using welders with current certification to BS EN 287-1. All welds are to have stamped identification tags. The supervisor is to submit specimen welds, representative of joints and conditions of site welding for each welder. Non-destructive testing (Ultrasonic) to be carried out on 10% of butt welds and 5% of all others, welds to be tested shall be selected by the X manager in conjunction with the contractor. Welding joints are to be to BS 2971 and to HVCA Code of Practice TR5, Welding of Steel Pipe work. Welders will be required to present certificates prior to being allowed to commence work.* ***Crimped Joints:** The contractor will be required to source the correct tools and apparatus to form bends and crimp the tube / fittings all as described in the manufacturer's technical literature. The trade contractor's supervisor will ensure that their operatives are fully conversant with the installation requirements and procedures and have attended an approved manufacturer course for crimpled cold jointing techniques. All joints to be marked prior to insertion to allow visual checking.*
Mitigation / Detection	*The BMS will be commissioned early in the construction phase with alarms transmitted to permanent Security or an on-call Engineer.* *Booster pumps to be isolated whenever the building is not attended. Valves to be isolated at the end of each working day.* *A Water Management Device will be installed to the incoming water supply to the building and will be programmed and set on a timer to shut down the water supply when the water flow exceeds pre-determined parameters. The device will be programmed to shut off water supplies out of working hours when very small flows are detected.* *A "Water-watcher" will continuously tour the building out of hours.* *Guards will patrol every hour through the night using clocking points for verification. They are trained to identify and isolate the leaking system. Isolation valves are clearly marked.* *There is an inspection checklist with specific valves and locations within the building that are inspected by security constantly. Security tick off each valve checked and record checking time followed by a signature in checklist which is kept on record.* *Temporary water leak detection to be provided at the foot of each service riser*
Isolation of water supply (in the event of a leak)	*Isolation and drain valves are clearly indicated on the drawing and unhindered access provided to the same on site. The valves have a strip of high visibility material attached and traffolyte label giving valve ID and service to which it relates to enable speedy identification in case of emergency.* *Security know the position of isolation valves in plant rooms and floors and have marked up drawings so that in the event a leak is discovered within the pipework they can act accordingly and isolate the section to stop and minimise damage to the building.* *Mechanical Drawings of water systems are kept with security at all times.* *Duty Engineer to be contacted following any incident (see emergency call-out list)*

Removing water from the building	*Within the building, the bottom of both north and south risers and all internal plant rooms will have bunding installed in order to stop water escaping in the case of leakage. An emergency pump is located at X.* *Permanent drainage pipe installations will be completed prior to filling systems with water. Before any system is filled and prior to testing, drainage provision (a drain hose) will be fitted and run to an established live building drain and fixed in such a manner that it cannot become detached from the system drain points.* *Wet vac and emergency equipment to deal with any spillage is available at the following locations: X, Y and Z* *Emergency equipment to be deployed to the risk area by the testing trade contractor for the duration of any test.*
Testing Regime	*The Commissioning Manager will manage a formal 'permit to test' system on all wet testing and enlivening of wet systems, ensuring that all elements noted on method statement are provided and in place.* *Before permits are to be issued, the Commissioning Manager will ensure that air/dry tests have been satisfactorily completed and that correct documentation is in place. A marked-up drawing of the services being tested and clearly indicating the full extent of the filled services, the pressure contained and whether left live on completion and at what pressure, will be produced and attached to the permit and also prominently displayed at all the access points to the area containing the test.* *Initial air testing to be completed at 0.5 bar before water is filled into the system in order to minimise any potential leaks once it is filled.* *Testing will be offered to the client's agent for to be witnessing. Thames Water will also be invited to witness the domestic and drain installation. Testing and filling of the pipe system will be delayed as long as possible and will be filled just before commissioning is due to commence.* *Each section of pipework will be tested at 1.5 times the working pressure for a period of 2 hours.* *Once testing has been completed and the system is live, test pressure will be removed, signage changed to indicate a live system and the permit signed off.* *The system under test will be clearly signed at regular intervals to indicate that a wet system is under test.*
Emergency Procedures	*Having isolated the leaking supply the persons on the emergency contact list will be contacted (in the order listed)* *Wet vacs are stored in north and south risers and plant room (keys being held at security). Personnel on site should commence the clear up as soon as the installation has been isolated.*

System 2	*MTHW and LTHW heating systems*
	Management and Mitigation
Overview	
Design Features	
System selection	
Quality Assurance	
Workmanship standards	
Detection of a water leak	
Isolation of water supply (in the event of a leak)	
Removing water from the building	
Testing Regime	
Emergency Procedures	

5. Emergency Procedures

First Response:



Emergency Call Out List

Persons shall be contacted in the order they are listed

Name	Position	Company	Phone

M&E Contact List

Service	Name	Company	Phone
AC / refrigeration			
Hot and Cold supplies			
LTHW			

[Sample] Appendix: Quality Regime (Compressed Joint)

The following QA regime shall be implemented when installing express jointing systems:

- *All operatives are to be trained by the supplier's representative prior to commencement of the pipe work installation.*
- *All operatives are to be issued with unique reference number for marking joints they have made.*
- *All operatives are to have the correct tools for cutting and prepping pipe, including depth gauge to ensure correct insertion depth.*
- *A drawing will be marked up indicating a crimp log of who has made the joints.*
- *Refresher training every 3 months.*
- *Mechanical trade contractor will carry out random checks on workmanship this will involve cutting out sections of pipe work and fittings, which will be sent to the supplier for analysis.*
- *Random visual checks for damage to uninstalled fittings will be carried out and defective fittings will be discarded or put into quarantine accordingly.*
- *Operatives are to ensure prior to using any fittings, the 'O' ring is intact, sitting in the fitting correctly, is clean and free from debris.*
- *Operatives are to ensure the crimping tool jaw and slings are regularly lubricated with the dri-slide lubricate.*
- *Operatives are to be made aware that if they cannot get the crimping tool square to the pipe and fitting due to the site constraints, they must not attempt to crimp the fitting, they must report to their supervisor or this, who will in turn try to resolve this by seeking assistance from fellow trade contractors removing services to achieve this.*

Endorsements

This Guidance is endorsed by the membership of the UK CAR Underwriters Group and the Construction Insurance Risk Engineers Group (CIREG)

CIREG and UK CAR Underwriters Group Members		
AIG	Gen Re	Paragon Risk Engineering
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CIREG escape of water Co-ordinator

Mark Redding MS Amlin mredding @ msamlin . com