

QBE CONSTRUCTION

PREVENTING WATER DAMAGE

Made possible



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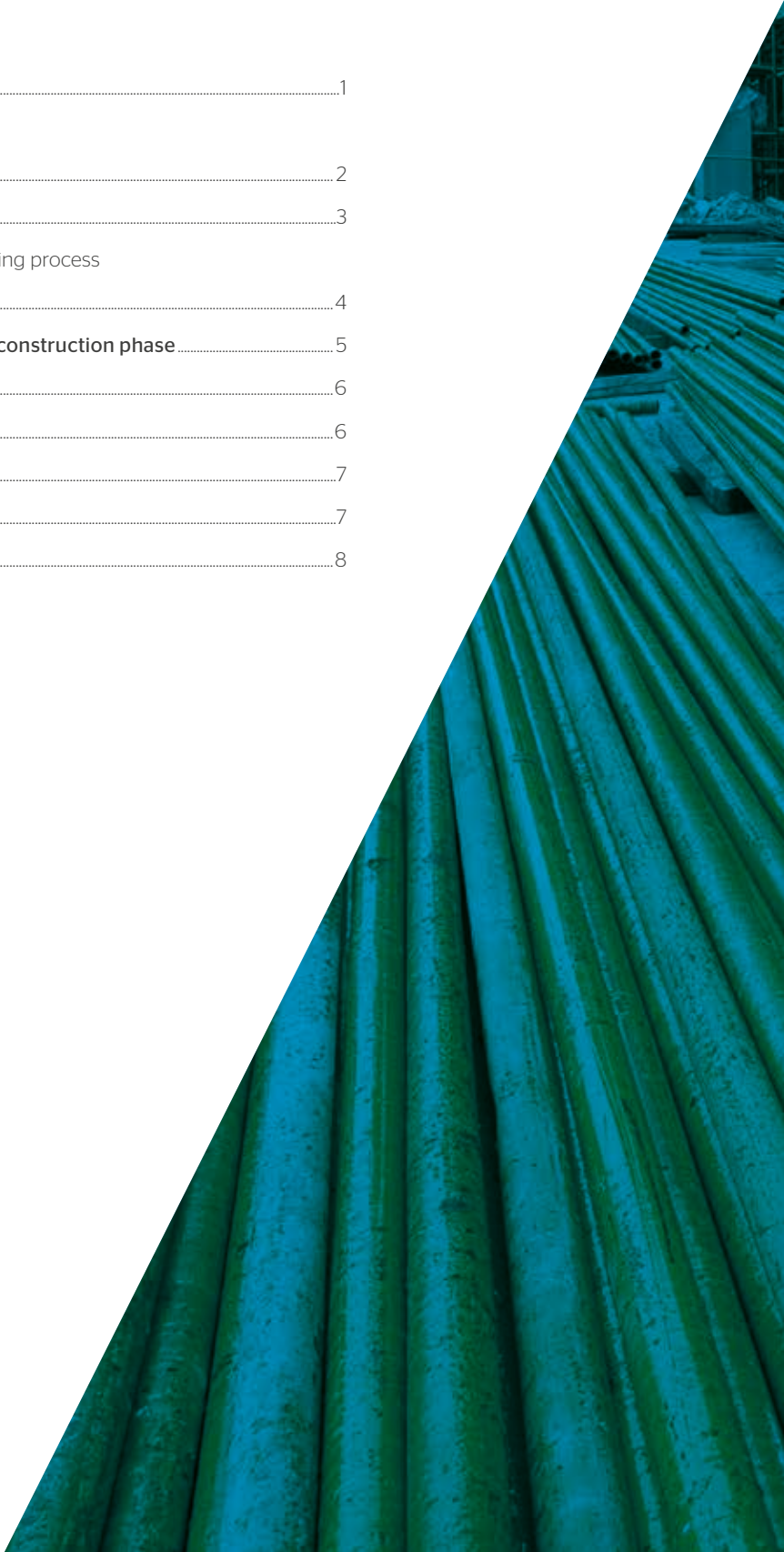
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Our experience shows that water damage is one of the most prevalent types of claim on construction sites. The Association of British Insurers states that every day around £2.5 million is paid out for claims involving water damage. During the severe winter of 2010 the insurance industry paid out an estimated £1 billion over two months for such claims.

Many of these claims will have been for domestic properties, but commercial properties and construction sites also experience such incidents on a regular basis. The average claim for a burst pipe is £7,000 and if water sensitive equipment and fittings are damaged as a result of the incident then claims costs can quickly escalate.

Damage can be sudden in the case of flooding, or slow due to water seepage that is imperceptible in the early stages of the leak.

Causes of water damage include failures of:

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- ☐ Pipes - as a result of freezing
 - ☐ Pipes, valves and fittings used in the water system due to poor quality
 - ☐ Quality systems and failure to check water systems are competently installed
 - ☐ Building and structure integrity e.g. open roofs and unfinished windows letting rain into a building
 - ☐ Security leading to vandalism and deliberate damage to water systems
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Failures in water management cause costly delays due to buildings taking time to dry out, water damaged materials being replaced and the removal of debris and floodwater. Clear up efforts impact building completion schedules and the number of lost working days whilst the site is restored significantly reduces the profitability of the project.

Risk management procedures can be applied to the strategic project planning process by assisting with 'designing out' potential sources of water damage to buildings and fittings. Key areas to focus on include monitoring water flow, risk assessment, designating responsibilities for leak prevention, quality of work and system testing throughout the construction process.

Managing the risk of water damage

The successful management of water on a construction site should be addressed in the same way as other risks such as health and safety and security and should form a prominent part of the project risk register.

The installation of systems and plant into the building should follow a formal policy and there should be a planning approach to ensure that risks are assessed, operatives are trained, incidents are investigated and working practices are audited to ensure they comply with relevant standards and contract specifications.

There should be a formal water management policy and system that is applied to all projects in the same way as a system for managing health and safety risks on site. The policy should give clear roles and responsibilities for actions to prevent water damage incidents. The management system should include procedures for risk assessment, incident investigation, vetting contractors, expected standards for monitoring water flow and isolating systems, a quality control plan including water system testing and commissioning and auditing of compliance with local regulations and the company's specified management system.

As part of the management process a detailed risk assessment should be carried out to identify potential water damage issues and should include consideration of:



Permanent internal systems containing water e.g. plumbing, drainage and fire protection



Timescales for the building being weather tight in relation to the internal works commencing and water sensitive material being installed.



Temporary water supplies in place specifically for the duration of the project



Water proofing and damp proofing activities



External water sources i.e. rain, sleet, snow entering the building during construction



The potential for cracks and deficiencies in roofs, doors, windows, rooftop water tanks and walls and waterproof structures



Any previous loss history involving water damage relating to the site



The susceptibility of building materials and fittings to water damage and necessary delivery and storage arrangements.



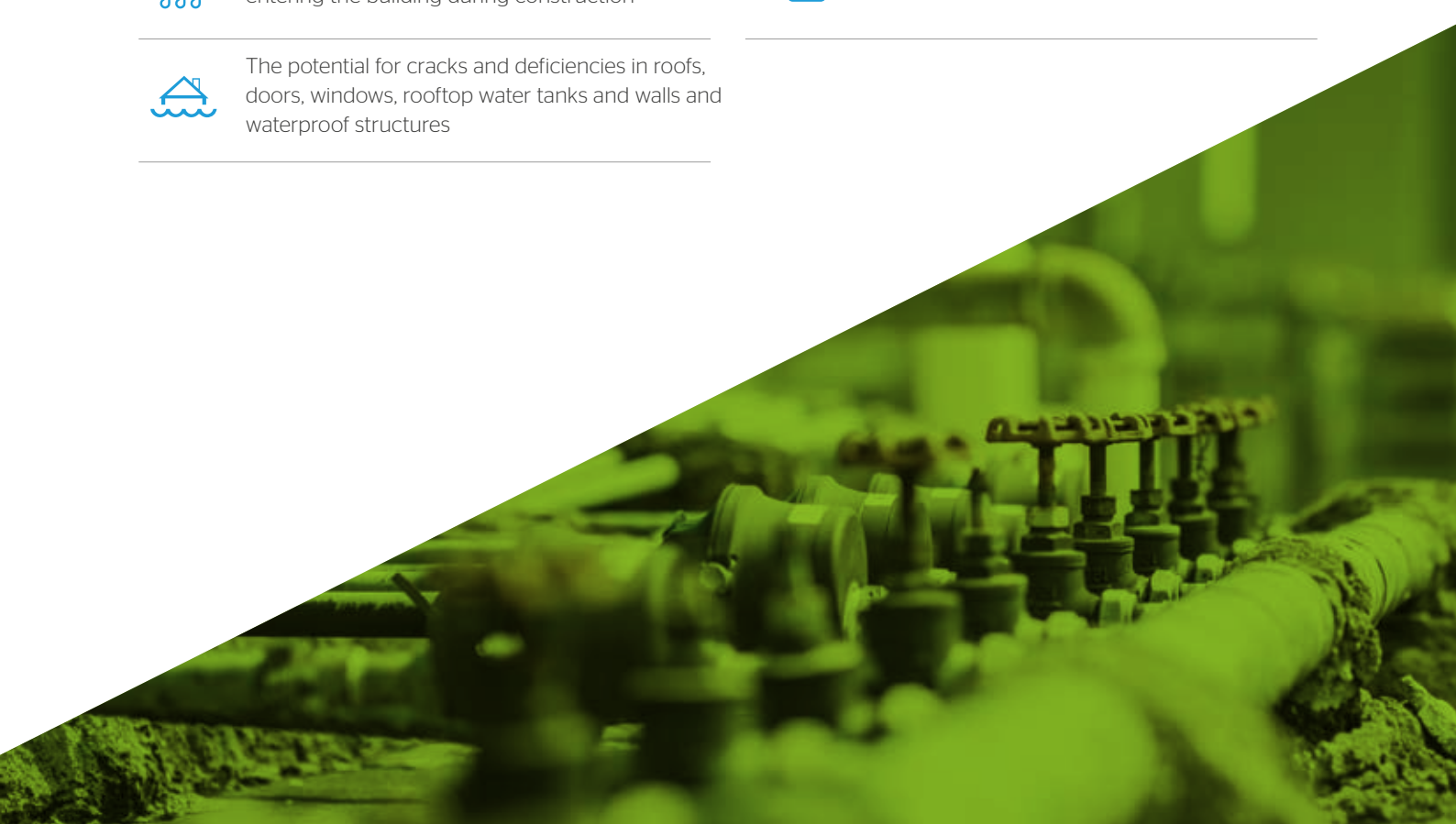
The effect of construction defects e.g. flashing, window installation etc.



Groundwater level and nearby watercourses.



Potential for flooding of excavations



Pre-construction stage

A Quality Control Plan should be designed and then a review of the project specifications and drawings should be conducted before the project commences. This review should cover:

- Identification and evaluation of any weak elements or drainage issues where water could infiltrate the structure or excavations
- Construction methods and materials.
- Code compliance and compatibility with local requirements
- Standards of work required of sub contractors
- Quality control of work and procedures used
- Drainage of the site and required working conditions

The Design team should engineer out all sources of potential water damage such as the position of water tanks, concealed pipework routes, porous cabling and combined service risers and weaknesses in plumbing systems. Robust designs should consider and include as needed additional isolation valves, riser up stands, easy access to pipework, raising water sensitive plant off the floor on platforms and fitting temporary drainage points.

An increasing number of projects involve plant being assembled and tested in modules off site in controlled conditions. Once the plant module is delivered to site there are minimal connections to be made to the in situ water systems.

The design process should evaluate how the specified building materials will work with the building processes planned for the project. This analysis will identify any potential issues and whether additional information is required from the architect.

Any testing of pipework systems and other related equipment should be scheduled as early as possible. Early testing ensures that potential delays and damage are kept to a minimum.

Some steps to consider as part of the planning process include:

- Train key personnel such as security guards on how to isolate the water supply.
- Apply timescales to key actions resulting from water damage risk assessments.
- Create mock ups of all critical waterproofing systems before construction begins and discuss building details and concerns with contractors
- Assign responsibilities for actions in the event of a severe weather incident, e.g. draining unprotected pipework. Consider different scenarios and specify clear actions to take in each scenario and who should take the actions.
- Plan to have site drainage installed, tested and operational as soon as possible.
- Consider the need for rerouting temporary pipework around areas of the building that will be containing water sensitive materials. Where possible temporary pipework should be routed around the exterior of the building where damage caused by an escape of water will be minimal.
- Consider fitting air vents to the water system as well as surge protection components such as hydraulic shock arrestors.
- Define and document a pressure testing regime for the system based on the manufacturer's guidelines.
- Specify pipe joint supports and pull out tests to ensure that the supports are robust.

During the construction phase

Appoint a senior site manager with responsibility for the implementation of the water management policy. This role will be responsible for the development and implementation of the quality control plan. The role is essential for any construction project to succeed in preventing water damage incidents and must include the manager giving updates and suggesting improvements to the initial plan.

Contractor liaison is key to ensuring a “no defects” policy and culture is adhered to throughout the construction process. Through regular and detailed quality of work inspections, completion of sign off documentation and regular meetings, no quality issues regarding the water system should be overlooked.

Contractors should be required to work to industry recognised codes; this should clearly be defined in all work specifications and contractual documents.

The main applicable codes are –



**Water Supply (Water Fittings)
Regulations 2000**



**HVCA Good Practice Guides (inc. Site Pressure
Testing of Pipework)**



BS EN 806 Pts 1-5



**Chartered Institute of Building Services
Engineers standards**

Throughout the building phase the structure should be fully enclosed as soon as possible and prior to the installation of internal finishes ensure all windows, doors, walls and roof structures are watertight. Scheduling or time pressures should not be permitted to alter this sequence of work. Once a sound roof has been installed water tightness testing of the roof structure should be carried out. Continue to ensure the new roof is clear of construction debris and regularly inspect for potential problems.

The most effective way to reduce potential water damage on a project is to use a water leak detection unit. These units can be installed on a room-by-room basis or for an entire building and should be linked to the incoming riser. The unit detects if the maximum volume of water that the user has set is exceeded, say in the event of a burst pipe. The water supply is then automatically isolated to protect the building. The unit can give an audible alarm and should be fitted with back up batteries to ensure effective operation if the power is isolated.

Building Management Systems can also be installed and operational as early as possible in the life of the project. This will allow alarms and pump activity to be monitored off site so quick action to isolate a problem can be taken.

Once the water system has been provided with the means for detecting an unplanned flow of water, the means of quickly isolating the water system must be provided. Security guards and site managers who will respond out of hours must be trained on how to isolate the water supply following a formal method statement. It will be important to identify water supply isolation points on the site plan for easy reference during an out of hour's emergency.

Sprinkler systems should be hydrostatically tested by following local testing standards for the Installation of Sprinkler Systems. Pipework should be air pressure tested prior to charging with water, even if the pipework passed a hydrostatic test earlier in the installation process, air pressure testing reduces the chance of large unnoticed water leaks. Monitoring of the pipework for the first 24 hours when charging the pipes should be undertaken by a designated member of the installation team.



Some water management techniques for the construction phase include:



Have water sensitive materials delivered on a 'just in time' basis and if they do have to be stored on site, identify a suitable location that is off the floor and under cover. Ensure the materials are not increasing the risk of fire on site.



Carry out weekly checks to identify and address water management issues.



Turn off the temporary water supply whilst the site is not manned. Ideally a member of the site management team should be given this responsibility.



Guard duties could be extended to include checks for escapes of water where wet services are live.



Fully test and commission all old and new water systems and pipework and consider using a third party commissioning expert to review the commissioning process and provide an independent certificate of work.



Never pay for work without prior testing or where a query on waterproofing exists.



Maintain all gutters, down pipes and drainage systems in an unobstructed condition. Regular surveys of the drains are recommended.



Any bunds should be completed and drainage from plant rooms connected before tanks are filled.



Clearly label pipework as systems are installed on site.



Insist on high quality work standards and vet contractors to ensure they are members of trade bodies such as The Association of Plumbing and Heating Contractors and the Heating and Ventilation Contractors Association.



Make specific enquiries to ensure that foreign workers understand local regulations and working standards and apply a practical competence test for operatives before they start work on site.



Require all work to be carried out by adequately trained plumbers. If proprietary joint forming equipment is to be used the installers should have been trained by the equipment manufacturer within the last 12 months.



Have water pumping back up systems working efficiently and as soon as possible.



Test how long it will take for the water system to be isolated once a leak is identified out of normal site hours.



Check systems are being installed appropriately, e.g. compression joints are being tightened to manufacturer's recommendations.



Keep an audit trail of all components, inspections, tests and relevant documentation.

What if a leak occurs?

Take the following steps:

- Identify the source of the leak quickly; there could be more than one source.
- Isolate the part of the system causing the leak and investigate the incident by taking photographs of any damage as evidence
- Gather information on the work of contractors, work specifications, method statements, competency and training of the installation team, etc.
- Note the type and depth of the insulation if pipes have frozen.
- Make notes of what the thermostat and heating timer settings were at the time of the leak and record weather conditions, especially temperatures for the incident period.

Treat a water leak like any other unplanned for event on site and conduct an investigation to find out what issues caused the leak and identify what management steps need to be made more robust to prevent a recurrence. The investigation should be lead by the senior manager who is the designated person for preventing water leaks on site.

Post construction phase

Ensure that enough resource is provided to monitor the building in respect of water leaks and problems with the building fabric and water systems. Thoroughly work through checklists with a dedicated team on a weekly basis to address all outstanding issues and repairs. There should be a quick response to resolve water management issues as soon as possible and always within 48 hours.

A post construction checklist should include:

- Checking for unsecured building openings e.g. roof lights, open doors and windows, gutters and flashings, damp proofing and water proofing and any structural deficiencies to exterior walls, roofs and windows.
- Water drainage and delivery system failures e.g. plumbing, fire protection and drainage systems.
- Site drainage issues affecting the buildings and including water retention ponds.
- Structural problems such as breaches in waterproof structures and materials.
- Proper installation of water sensitive equipment and water sensitive materials etc.

A review of the performance of contractors and the equipment used for the water system installation should be undertaken. Any issues found with performance should be formally recorded and communicated to the design and management team for the next project.



Conclusion

The prevention of water leaks in any building should be treated in the same way as preventing fires, accidents and other unwanted incidents.

On many projects there is a lack of awareness and planning in respect of water damage prevention. The key issues of how to detect an unwanted water flow and how to isolate it promptly are not given adequate consideration. These steps are relatively simple in comparison to the challenges facing today's project manager. They should form part of a thorough process of planning, checking training provision, implementing quality management systems and monitoring work quality to ensure that required procedures are being implemented to a high standard.

With more formal management and proactive action the risk of water damage incidents can be reduced dramatically without significant expenditure.

Meet the authors

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APPENDIX

**SAMPLE
WATER DAMAGE
CHECKLIST**

	SUBJECT	YES/NO	ACTION
1.	A responsible person has been appointed to manage the water damage risk		
2.	A competent person has been appointed to assist in the management of water damage risk		
3.	A documented Water Damage Prevention Plan is in place		
4.	System design and selection has been risk assessed		
5.	Design features have been considered and incorporated if favourable or eliminated if unfavourable		
6.	Competent contractors have been appointed work on plumbing and heating services		
7.	Competence of individuals has been checked and qualifications, training and experience verified		
8.	A Quality Control Procedure has been put in place for the testing and commissioning of the distribution systems		
9.	Appropriate mitigation measures are in place to detect escape of water and ensure prompt services isolation		
10.	Emergency Response Procedures are in place, documented and subject to regular testing		
11.	Where possible temporary water supplies, systems and pumps are isolated when the site is unattended		
12.	Works have been sequenced to reduce the likelihood of weather related damage		
13.	The risk of damage from weather related causes has been assessed and appropriate strategies, mitigation and emergency response procedures put in place		
14.	The Water Management Plan is regularly reviewed by the project team to ensure all risks have been identified and appropriate mitigation is in place		