



# TRICEL

GENERATIONS OF INNOVATION

# GRP Sectional Cold Water Storage Tanks in Healthcare Infrastructure

Compliance, Water Hygiene, and Long-Term  
Asset Performance  
2026 Edition

White Paper | May 2026

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# Executive Summary



Cold water storage infrastructure plays a critical operational role across healthcare estates in the United Kingdom. Hospitals, laboratories, care facilities, and specialist treatment centres rely on stored potable water to support clinical operations, hygiene management, sanitation, heating and cooling systems, and emergency resilience planning. Unlike many commercial environments, healthcare facilities operate within conditions where interruptions to water supply, failures in water hygiene management, or infrastructure deterioration may directly affect patient safety and operational continuity.

As healthcare estates continue to modernise ageing infrastructure while responding to increasing compliance obligations and operational pressures, specification decisions relating to cold water storage systems have become increasingly important. Water storage infrastructure is no longer viewed solely as a background building service component. Instead, it forms part of wider resilience, infection prevention, and asset management strategies across healthcare environments.

GRP (Glass Reinforced Plastic) cold water storage tanks are widely specified within healthcare infrastructure due to their corrosion resistance, hygienic characteristics, modular construction capabilities, and suitability for constrained plant room environments. Their use is particularly common within refurbishment projects, rooftop installations, and facilities where long-term maintenance accessibility and operational continuity are important considerations.

This whitepaper examines the engineering, compliance, and operational considerations associated with GRP cold water storage tanks in healthcare applications. It explores the relationship between water hygiene management, infrastructure resilience, material selection, and long-term asset performance within hospitals and healthcare estates.

The paper also examines the regulatory environment influencing healthcare water systems in the UK, including the Water Supply (Water Fittings) Regulations 1999, ACoP L8, HSG274 Part 2, and BS EN 13280, alongside broader NHS estate considerations relating to resilience planning and lifecycle infrastructure management.

The paper explores:

- healthcare water hygiene risks
- Legionella control obligations
- compliance with UK regulations and standards
- specification considerations for healthcare applications
- lifecycle performance and maintenance planning
- comparative analysis of GRP against alternative materials
- future resilience considerations for ageing healthcare infrastructure

The guidance is intended to support consulting engineers, NHS estates teams, water hygiene specialists, M&E consultants, contractors, and procurement stakeholders involved in healthcare water infrastructure projects.

### **Key reference standards:**

BS EN 13280:2001 · Water Supply (Water Fittings) Regulations 1999 · ACoP L8 · HSG274 Part 2 · BS 8558 · HTM 04-01 · Kiwa approval frameworks · CIBSE Guide G · Approved Document G · BS EN 12845 (where sprinkler reserve storage applies)

### **Who this is for:**

NHS estates managers · Consulting engineers · Public health engineers · M&E consultants · Water hygiene specialists · Healthcare contractors · Facilities managers · NHS procurement teams · Building services engineers · Asset management teams · Healthcare infrastructure consultants · Hospital redevelopment teams

### **Jurisdiction**

Primary: United Kingdom — England & Wales, Scotland, and Northern Ireland. Principles broadly applicable internationally; always verify local requirements.

- Cold water storage infrastructure is a critical operational component within healthcare estates and directly supports resilience, hygiene management, and continuity of care.
- Healthcare water systems operate under increased scrutiny due to Legionella risk, vulnerable occupants, and strict operational continuity requirements.
- Water stagnation, low turnover, excessive water age, and poor temperature control can increase microbiological risk within stored water systems.
- GRP cold water storage tanks are widely specified in healthcare projects due to their corrosion resistance, modular construction, low structural weight, and suitability for constrained plant room environments.
- Sectional GRP systems are particularly beneficial in refurbishment projects where restricted access limits the installation of large pre-formed tanks.
- Healthcare water infrastructure should be designed with long-term maintainability in mind, including inspection access, compartmentalisation, and cleaning practicality.
- Oversized tanks may improve resilience during supply interruptions but can also increase stagnation and turnover-related water hygiene risks.
- Compartmentalised tank arrangements can support phased maintenance and reduce operational disruption within occupied healthcare facilities.
- Key UK guidance and standards influencing healthcare water storage include BS EN 13280, ACoP L8, HSG274 Part 2, BS 8558, HTM 04-01, and the Water Supply (Water Fittings) Regulations 1999.
- Lifecycle performance and whole-life operational cost are increasingly important considerations within NHS infrastructure planning and healthcare estate modernisation programmes.
- Many healthcare refurbishment projects face challenges associated with ageing infrastructure, restricted plant access, limited shutdown windows, and phased operational upgrades.
- Effective healthcare water hygiene management depends not only on material selection, but also on system design, turnover management, accessibility, inspection regimes, and operational maintenance practices.

## About This Guide and Its Author

This whitepaper was written by Tricel Water, a UK manufacturer of GRP water storage tanks with direct experience supplying and installing cold water storage systems in multi-storey commercial, residential, healthcare, and industrial buildings.

Tricel Water manufactures sectional and one-piece GRP cisterns covering capacities from 1,000 litres to 4.6 million litres. Products are manufactured to BS EN 13280, the European standard for GRP cisterns and sectional tanks for above-ground cold water storage, and carry approval under Regulation 4(1)(a) for potable water contact. The company's sectional tank range is designed for installation in plant rooms accessed through standard doorways, and installation is carried out by Tricel site crews or approved installers.

The guidance in this document draws on the regulatory sources and industry standards listed in the References section. It has been written to be accurate and useful to anyone involved in specifying, installing, or maintaining cold water storage systems in multi-storey buildings – regardless of which manufacturer's products are ultimately specified. Where design decisions or sizing calculations are discussed, readers should engage a suitably qualified engineer; this guide does not constitute engineering advice.

Readers seeking product-specific information – capacity tables, dimensional data, configuration options, or a project quotation – should visit [www.tricelwater.co.uk](http://www.tricelwater.co.uk) or contact the Tricel Water technical team on +44 (0)1934 314 079.

### LEGAL DISCLAIMER AND NOTES

This document is provided for guidance purposes only. It does not constitute legal, regulatory, or engineering advice. Readers should satisfy themselves that the standards and regulatory requirements referenced in this document are current at the time of their project, as all standards and regulations are subject to amendment, revision, and withdrawal. Regulatory requirements that are described in this document reflect the position in England and Wales as of April 2026 unless otherwise stated. Scotland and Northern Ireland operate under different but broadly equivalent regulatory frameworks in several areas; specifiers in those jurisdictions should confirm applicable requirements with the relevant authorities.

Nothing in this document relieves the specifier, designer, or building owner of the obligation to comply with applicable statutory requirements, British Standards, and sector-specific guidance documents. Tricel Water UK has taken reasonable care in preparing this document but does not warrant the accuracy or completeness of the information it contains. Tricel Water UK accepts no liability for any loss or damage arising from reliance on this document.

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# 1. Introduction



Cold water storage systems rarely attract attention within healthcare environments unless something goes wrong. Yet across hospitals, care facilities, laboratories, and specialist treatment buildings, stored potable water supports essential operations that depend on reliability, hygiene control, and continuity of supply.

In many healthcare estates, water infrastructure operates continuously with limited tolerance for failure. Planned shutdowns are often difficult to coordinate, particularly in occupied facilities where clinical activity, sterilisation processes, catering operations, and infection prevention procedures continue around the clock. As a result, cold water storage systems form part of a wider operational resilience strategy rather than simply a building services component.

This has become increasingly important as many healthcare organisations continue to manage ageing infrastructure originally designed under different operational assumptions and regulatory expectations. Across parts of the NHS estate, legacy water systems remain in service while facilities simultaneously attempt to strengthen Legionella management procedures, modernise plant areas, improve resilience, and reduce long-term maintenance liabilities.

These objectives do not always align neatly. Increasing storage capacity may improve resilience during supply interruptions, but excessive storage can also increase water age and stagnation risk. Likewise, many older plant rooms were never designed around modern maintenance access expectations, while replacement projects are frequently undertaken within live healthcare environments where shutdown windows, structural limitations, and restricted installation access influence engineering decisions.

Against this backdrop, GRP (Glass Reinforced Plastic) cold water storage tanks have become widely established within UK healthcare infrastructure projects due to their corrosion resistance, modular assembly, maintainability, and installation flexibility within constrained environments.

This paper examines the role of GRP cold water storage tanks within healthcare infrastructure, focusing on water hygiene management, long-term asset performance, and the practical realities associated with healthcare refurbishment and infrastructure modernisation projects.

# 2. The Role of Cold Water Storage in Healthcare Facilities

## 2.1 Operational Dependency on Stored Water

Within healthcare buildings, potable water infrastructure supports far more than standard domestic consumption. Hospitals and healthcare campuses depend on stored water systems to support clinical hygiene, sanitation, catering, sterilisation equipment, cooling systems, laboratories, and emergency resilience arrangements. In larger acute hospitals, interruptions to water systems can rapidly create operational consequences extending well beyond inconvenience.



## 2.2 Healthcare Resilience Requirements

This is one of the reasons healthcare estates often maintain significant cold water storage capacity. Unlike many commercial office environments, hospitals may need to maintain operations during localised supply interruptions, emergency maintenance works, or infrastructure failures. Stored water therefore forms part of wider continuity planning.

At the same time, healthcare water systems operate under increased scrutiny from a hygiene and risk-management perspective. Water quality concerns within healthcare environments carry greater significance because occupants may include vulnerable or immunocompromised individuals. Consequently, infrastructure decisions surrounding storage systems are closely linked to infection prevention and water hygiene strategies.

## 2.3 Balancing Resilience and Water Hygiene

The challenge for designers and estates teams is that resilience and hygiene management can sometimes pull in different directions.

Large storage volumes may provide operational security during interruptions. However, oversized tanks can also reduce turnover rates and increase water age, particularly in buildings with fluctuating occupancy or changing demand profiles. In practice, this means healthcare storage systems often require more careful balancing than systems used in conventional commercial buildings.

This issue has become more noticeable in parts of the healthcare estate where operational patterns have evolved over time. Some facilities now occupy buildings originally designed around historic demand assumptions that no longer reflect current usage. Departments may have been repurposed, occupancy levels altered, or infrastructure partially upgraded in phases over many years. As a result, existing water storage arrangements do not always align with present-day operational requirements or hygiene expectations.

# 2. The Role of Cold Water Storage in Healthcare Facilities



For consulting engineers and estates managers, the discussion is therefore no longer simply about “how much storage is required”. Increasingly, the conversation centres around how storage systems behave operationally over time, how maintainable they are within live healthcare environments, and whether they support modern water hygiene management practices.

## **Key Engineering Consideration**

### **Resilience and Water Hygiene Must Be Balanced**

Increasing storage capacity may improve resilience during supply interruptions, but excessive storage can also increase water age, stagnation risk, and turnover-related hygiene challenges.

# 3. Water Hygiene Risks and Operational Pressures

## 3.1 Legionella Risk in Healthcare Environments

Legionella management remains one of the defining considerations within healthcare water infrastructure. While Legionella risks exist across many building types, the consequences within healthcare environments can be substantially more serious due to the vulnerability of building occupants.

The relationship between cold water storage systems and Legionella control is well understood within the industry. Conditions that may support microbiological growth include stagnation, elevated temperatures, low turnover, dead zones within pipework, and biofilm accumulation on internal surfaces. Poorly managed storage infrastructure can contribute to several of these conditions simultaneously. Legionella bacteria can proliferate within water systems at temperatures between approximately 20°C and 45°C, with growth occurring most rapidly at around 37°C; ACoP L8 accordingly requires cold water to be stored and distributed at or below 20°C to prevent conditions in which proliferation can occur.

## 3.2 Operational Challenges in Existing Healthcare Estates

In older hospitals, plant rooms are frequently constrained by historical layouts, structural limitations, and decades of phased modifications. Pipework routes may have evolved incrementally over time. Access arrangements can be restricted. In some cases, tanks installed many years ago remain operational in areas where replacement access would now be extremely difficult without significant building disruption.

This creates practical challenges for inspection, cleaning, and ongoing maintenance. Many estates teams are therefore required to balance ideal water hygiene management practices against operational realities within live clinical environments. Draining an entire storage system for inspection may not always be straightforward where isolation affects occupied wards, specialist departments, or high-dependency areas. Even relatively minor maintenance works may require careful coordination with infection prevention teams and clinical operations staff.

## 3.3 Designing for Maintainability

Modern healthcare storage specifications increasingly emphasise maintainability and accessibility during the design stage rather than relying solely on reactive operational management later.

Tank turnover is another area that has received greater attention in recent years. Historically, some facilities favoured large storage reserves as a precautionary resilience measure. More recent approaches tend to place greater emphasis on achieving appropriate turnover rates and avoiding excessive water age.

# 3. Water Hygiene Risks and Operational Pressures

This does not necessarily mean minimising storage capacity at all costs. Rather, it reflects a broader recognition that resilience and water hygiene must be considered together rather than independently.

Temperature control also remains an important factor. Cold water systems installed within overheated plant areas or exposed rooftop environments may experience unwanted heat gain, particularly during warmer periods or within poorly ventilated service spaces. While insulation strategies can help mitigate this issue, real-world performance depends heavily on installation quality and ongoing maintenance condition rather than specification alone.

In practice, water hygiene management within healthcare infrastructure depends less on any single component and more on how the overall system performs operationally over time.

## 3.4 Healthcare Water Hygiene Risk Table

Risk Area	Potential Consequence	Mitigation Strategy
Low turnover	Stagnation and bacterial growth	Correct sizing and demand analysis
Poor insulation	Elevated water temperatures	Thermal insulation specification
Restricted access	Inadequate cleaning	Adequate access hatch design
Internal corrosion	Contamination risk	Corrosion-resistant materials
Dead zones	Biofilm development	Internal division and flow management

### Low Turnover Can Increase Legionella Risk

Poor turnover, elevated temperatures, and stagnation can create conditions favourable for microbiological growth within stored water systems, particularly in ageing healthcare estates with changing occupancy patterns.

# 4. Why GRP Tanks Are Commonly Specified in Healthcare Projects

## 4.1 Corrosion Resistance and Long-Term Durability

The widespread use of GRP cold water storage tanks within healthcare infrastructure is largely the result of practical operational considerations rather than marketing preference or short-term procurement trends.

One of the primary reasons many healthcare projects favour GRP systems is the reduced exposure to corrosion-related deterioration compared with traditional metallic tanks.

In older steel installations, long-term corrosion management can become increasingly difficult, particularly in ageing plant rooms where access for inspection or coating repair is limited. Estates teams responsible for maintaining legacy infrastructure are often familiar with the operational disruption associated with ongoing remedial works on deteriorating metallic systems.

GRP systems avoid many of these issues because the material itself is not vulnerable to oxidation in the same way as steel. From a long-term asset management perspective, this can simplify maintenance planning and reduce some of the lifecycle concerns associated with corrosion management.

### Corrosion-Related Maintenance Can Become Increasingly Disruptive Over Time

Ageing metallic systems may require repeated remedial intervention, particularly around seams, joints, and coating systems in restricted plant environments.

## 4.2 Modular Construction and Installation Flexibility

The modular nature of sectional GRP systems is another significant advantage within healthcare refurbishment projects.

Many hospital buildings were never designed around modern replacement access requirements. Existing tanks may be located within rooftop enclosures, restricted plant rooms, or internal service areas that cannot accommodate large prefabricated replacements without major structural intervention. In these situations, sectional GRP systems can often be transported through constrained access routes and assembled in situ with substantially less disruption. This becomes particularly important within live healthcare environments where large-scale structural works may be impractical or operationally disruptive.



# 4. Why GRP Tanks Are Commonly Specified in Healthcare Projects

## 4.3 Structural Weight Advantages

Weight reduction also influences specification decisions. Compared with concrete systems, GRP tanks are considerably lighter, which may simplify rooftop installations and reduce structural strengthening requirements during refurbishment projects. In some cases, structural loading constraints effectively eliminate heavier alternatives during early design stages.

### Structural Considerations

Tank Weight Can Influence Refurbishment Feasibility

The lower structural weight of GRP systems may reduce strengthening requirements during rooftop or plant room refurbishment projects where loading constraints exist.

## 4.4 Maintainability and Operational Practicality

Healthcare projects also increasingly prioritise maintainability. Estates teams are not simply evaluating how a system performs during commissioning, but how practical it will be to inspect, clean, isolate, and maintain over the next twenty or thirty years while the facility remains operational.

This is one of the reasons modern healthcare specifications frequently focus on access arrangements, compartmentalisation, inspection capability, and operational flexibility alongside traditional performance criteria.



# 5. Regulatory and Compliance Framework



## 5.1 Water Supply (Water Fittings) Regulations 1999

Cold water storage systems within healthcare facilities operate within a broad regulatory and guidance framework intended to protect water quality and reduce public health risk.

In the UK, the Water Supply (Water Fittings) Regulations 1999 establish legal requirements relating to

contamination prevention, material suitability, and appropriate installation practices. Regulation 4 is particularly significant because it requires water fittings to be suitable for their intended use and of appropriate quality and standard.

In practical terms, this influences product selection, certification requirements, and specification decisions throughout healthcare projects.

## 5.2 Regulation 4 Requirements

Regulation 4 is particularly relevant in healthcare environments because potable water systems must demonstrate suitability for long-term use within operationally sensitive facilities.

The regulation influences considerations such as:

- approved materials
- potable water compatibility
- contamination prevention
- installation quality
- system suitability
- long-term operational integrity

In healthcare projects, compliance considerations are often integrated into broader estates governance and water safety procedures rather than treated as isolated technical requirements.

## 5.3 Backflow Protection and Category 5 Fluid Risk

Schedule 1 of the Water Supply (Water Fittings) Regulations 1999 places specific obligations on the protection of stored potable water from contamination through backflow. In healthcare settings, these obligations are more demanding than in standard commercial applications because stored water serving clinical areas is subject to Category 5 fluid risk classification – the highest category defined under the Regulations.

Category 5 represents a serious health hazard. In practice, this classification applies wherever downstream outlets may bring stored water into contact with pathogens,

### Compliance Alone Does Not Guarantee Good Long-Term Performance

A technically compliant installation may still create operational difficulties if inspection access, turnover management, or maintenance practicality are not adequately considered during design.

# 5. Regulatory and Compliance Framework

body fluids, or other substances capable of causing illness. Cisterns serving general ward areas, clinical hygiene facilities, treatment rooms, or similar spaces are routinely assigned Category 5 status.

Category 5 risk requires a Type AB air gap at the cistern inlet. A Type AB air gap incorporates a raised float valve housing with a screened spillover weir positioned above the maximum stored water level. This physical separation prevents any backflow of stored water into the mains supply under all downstream pressure conditions. A standard Type AG air gap, which is appropriate for Categories 1 to 4, does not provide sufficient protection for Category 5 applications and must not be specified in healthcare cold water storage.

The AB air gap is a statutory requirement for healthcare cistern installations. It is not discretionary.

Key specification and maintenance considerations:

- The AB air gap inlet arrangement must be specified at the design stage and confirmed as correctly installed during commissioning.
- Routine maintenance inspections should confirm that the float valve housing and screened spillover weir remain intact and correctly positioned relative to the maximum water level.
- Any modification to the inlet that compromises the air gap – including the addition of a direct inlet connection or the removal of the weir housing – constitutes a breach of the Regulations.
- The air gap type, classification, and installation details should be recorded in the building O&M manual and referenced in the water safety risk assessment.

Specifiers should confirm the correct air gap classification with the manufacturer and, where there is any doubt, with the relevant water undertaker. The WRAS Water Regulations Guide provides detailed guidance on fluid categories and appropriate backflow prevention devices.

## 5.4 ACoP L8 and HSG274 Part 2

Alongside statutory regulations, healthcare estates must also consider operational guidance relating to Legionella management. Health and Safety Executive ACoP L8 and HSG274 Part 2 continue to shape how healthcare organisations approach risk management within stored water systems.

Importantly, these documents influence far more than maintenance procedures alone. Their principles increasingly affect infrastructure design decisions from the outset, including:

# 5. Regulatory and Compliance Framework

- turnover considerations
- compartmentalisation strategies
- accessibility requirements
- inspection capability
- insulation approaches
- operational monitoring arrangements

## 5.5 HTM 04-01 and NHS Water Safety Guidance

HTM 04-01 (Health Technical Memorandum 04-01: Safe Water in Healthcare Premises) is the primary NHS guidance document for the design, installation, commissioning, and operational management of water systems in healthcare buildings in England. Equivalent documents apply in Scotland (SHTM 04-01) and Northern Ireland (DHSSPS guidance). Appendix E summarises the applicable guidance by jurisdiction.

HTM 04-01 does not carry the same quasi-legal status as ACoP L8, but it represents the accepted standard of practice for NHS estates and is routinely referenced in enforcement proceedings and litigation involving healthcare water safety. NHS trusts are expected to follow it, and departures from its requirements require documented justification.

### Storage sizing

HTM 04-01 requires that cold water storage capacity is determined on the basis of a building-specific demand assessment that accounts for all clinical and operational functions the system must serve. It does not endorse the use of generic industry sizing rules or historic occupancy assumptions as a substitute for proper analysis.

The guidance explicitly identifies excessive water age – which arises when storage capacity is disproportionate to actual operational demand – as a factor that can increase microbiological risk within stored water systems. This directly links the sizing decision to the water hygiene risk assessment: a tank that is oversized relative to demand creates stagnation conditions that cannot be fully resolved through maintenance alone.

For this reason, healthcare projects increasingly require project-specific demand analysis rather than conservative precautionary oversizing. Acute hospitals, mental health facilities, outpatient centres, and care homes have materially different demand profiles, and storage should be sized to reflect the actual operational use of each facility.

# 5. Regulatory and Compliance Framework

## Compartmentalisation

HTM 04-01 recognises that full system shutdowns for routine inspection and cleaning are operationally impractical in most occupied healthcare facilities. It supports, and in effect expects, divided tank arrangements that allow one section to remain in service while another is isolated for maintenance.

For acute hospitals and other facilities where continuous water supply is essential to clinical operations, a minimum of two compartments is the established standard. The guidance does not prescribe compartment sizing, but the arrangement should provide sufficient reserve in each section to sustain operations for the duration of planned maintenance on the other.

## Water Safety Plans

HTM 04-01 requires healthcare organisations to prepare and maintain a Water Safety Plan (WSP) covering all water systems on the premises. The cold water storage infrastructure is a defined element of the WSP and should be documented to include: tank capacity and configuration; maintenance schedules; inspection records; cleaning and disinfection records; microbiological monitoring results; and any remedial actions taken following inspection findings.

The Responsible Person appointed under ACoP L8 must be identified within the WSP, together with a clear description of the roles and responsibilities of all parties involved in operating and maintaining the water system – including specialist contractors.

## Competence requirements

HTM 04-01 requires that design, installation, commissioning, and maintenance work on healthcare water systems is carried out or supervised by persons with appropriate competence in healthcare water engineering. This extends to the specification and installation of cold water storage infrastructure. Consultants and contractors engaged on healthcare projects should be able to demonstrate relevant training and experience, and this should be confirmed by the procuring organisation before appointment.

## Relationship with ACoP L8

HTM 04-01 and ACoP L8 address the same underlying risk but at different levels of detail and with different legal weight. ACoP L8 establishes the legal and managerial framework applicable to all building types. HTM 04-01 interprets and extends those requirements specifically for healthcare premises, adding requirements for Water Safety Plans, competence standards, and documentation that go beyond ACoP L8 alone. NHS estates teams should apply both documents together. Neither is sufficient in isolation.

# 5. Regulatory and Compliance Framework



## 5.6 WRAS and Kiwa Approval Considerations

Healthcare specifications frequently reference WRAS-approved products and recognised potable water certification frameworks such as Kiwa approval schemes. These approvals can help demonstrate suitability for use with wholesome water and may form part of consultant or trust-specific specification requirements.

## 5.7 Compliance vs Long-Term Operational Performance

However, real-world healthcare projects rarely rely on a single standard in isolation. NHS estates teams, consulting engineers, infection prevention specialists, and water hygiene contractors often work within layered compliance environments where multiple guidance documents, local trust requirements, and operational policies overlap.

In practice, the challenge is not usually understanding that compliance obligations exist. The greater challenge is designing systems that remain maintainable and operationally workable within complex live healthcare environments over long periods of time.

That distinction is important because a technically compliant installation at commissioning does not automatically guarantee good long-term operational performance if inspection access is poor, turnover is inadequate, or maintenance procedures become impractical in occupied facilities.

For this reason, many healthcare projects now place greater emphasis on designing for maintainability and operational realism rather than focusing solely on initial compliance at handover stage.

### **Water Infrastructure Is Increasingly Viewed as a Resilience Asset**

Healthcare organisations are increasingly treating cold water storage systems as part of wider operational resilience and continuity planning strategies rather than isolated building services components.

# 6. Specification Considerations for Healthcare Water Storage Systems

## 6.1 Capacity Sizing and Operational Demand

The specification of cold water storage systems within healthcare environments typically involves a wider range of operational considerations than those encountered in standard commercial projects. While basic storage calculations remain important, healthcare projects often require a more detailed assessment of how infrastructure will function under real operational conditions over long periods of continuous use.

In practice, the most effective healthcare water storage systems are usually those that balance resilience, maintainability, hygiene management, and operational practicality rather than focusing excessively on any single design objective.

Storage sizing within healthcare facilities is rarely straightforward. Demand profiles can vary significantly depending on building type, occupancy patterns, clinical activity, and operational scheduling.

Acute hospitals may experience continuous demand across twenty-four-hour operating periods, while outpatient facilities and specialist treatment buildings may operate with more variable usage patterns throughout the day. Laboratories, sterilisation departments, catering facilities, and cooling systems may also place highly specific demands on water infrastructure that fluctuate independently of general domestic consumption.

Historically, some healthcare facilities adopted relatively large storage reserves as part of broader resilience planning strategies. While operational resilience remains important, more recent approaches increasingly recognise the need to avoid excessive stored water age where possible.

Oversized storage systems can contribute to low turnover, stagnation, and thermal instability, particularly in facilities where operational demand has reduced over time or where parts of buildings are no longer used in the same way they were originally designed.

This issue is increasingly relevant within ageing healthcare estates where operational patterns have evolved incrementally over several decades. In some buildings, departments have been repurposed, occupancy reduced, or infrastructure partially altered without corresponding redesign of original storage arrangements.

As a result, healthcare projects increasingly favour building-specific demand analysis rather than relying heavily on historic assumptions or broad rule-of-thumb calculations.

# 6. Specification Considerations for Healthcare Water Storage Systems

## 6.2 Technical Specification Table

Specification Area	Healthcare Consideration
Tank turnover	Minimise stagnation
Access hatch design	Enable safe inspection
Internal compartments	Support redundancy
Insulation	Reduce heat gain
Support structure	Verify loading capacity
Water quality	Maintain potable standards

### Specification Priority

#### Tank Sizing Should Reflect Actual Operational Demand

Healthcare water storage systems increasingly require project-specific demand analysis rather than oversized precautionary storage arrangements that may increase

## 6.3 Compartmentalisation and Redundancy

Operational continuity remains a major consideration within healthcare infrastructure. In many facilities, fully isolating a cold water storage system for inspection or cleaning may be operationally disruptive and difficult to coordinate.

For this reason, compartmentalised storage arrangements are commonly specified within healthcare projects. Divided tanks or multi-section configurations can allow one section to remain operational while maintenance activities are undertaken on another compartment.

This approach can provide several operational advantages:

- reduced disruption during maintenance
- improved resilience during faults or repairs
- phased cleaning capability
- greater operational flexibility
- reduced dependency on temporary supply arrangements

# 6. Specification Considerations for Healthcare Water Storage Systems

The level of redundancy required will depend on the criticality of the facility and the operational consequences associated with system downtime. Large acute hospitals generally require more robust resilience strategies than smaller outpatient facilities or administrative healthcare buildings.

## Compartmentalisation

### Divided Tank Arrangements Support Operational Continuity

Compartmentalised systems can allow maintenance or cleaning to take place on one section while another remains operational, reducing disruption within occupied

## 6.4 Access and Long-Term Maintainability

Maintainability has become an increasingly important consideration within healthcare engineering projects, particularly as estates teams attempt to manage ageing infrastructure with limited operational shutdown opportunities.

A storage system that is technically compliant at installation stage may still create significant long-term operational difficulties if routine inspection and cleaning procedures become impractical.

Access arrangements therefore play an important role in healthcare tank specification. Consideration is typically given to:

- internal inspection access
- safe cleaning access
- float valve maintenance
- overflow inspection
- insulation inspection
- sampling arrangements
- confined-space considerations

### Restricted Access Often Becomes a Long-Term Operational Problem

Many maintenance challenges within healthcare estates arise not because systems fail technically, but because surrounding plant infrastructure restricts safe and practical access.

This becomes particularly important in older hospitals where plant areas may already be heavily congested with mechanical and electrical services infrastructure.

In practice, some of the most difficult maintenance situations occur not because equipment itself has failed, but because surrounding access constraints make otherwise routine maintenance activities difficult to perform safely or efficiently.

Healthcare refurbishment projects frequently encounter plant rooms where replacement access is severely restricted. In these situations, sectional GRP systems often provide a practical advantage because they can be assembled within constrained spaces that would not accommodate large pre-formed alternatives.

# 6. Specification Considerations for Healthcare Water Storage Systems

## 6.5 Confined Space Entry Requirements

Where access hatches allow personnel to enter the tank interior for inspection, cleaning, or maintenance, the tank constitutes a confined space as defined under the Confined Spaces Regulations 1997. These Regulations apply regardless of the size of the space or the familiarity of the task.

The Regulations require duty holders to:

- avoid entry into confined spaces where any task can practicably be carried out from outside
- where entry cannot be avoided, follow a safe system of work based on prior risk assessment
- put in place adequate rescue arrangements before any person enters, without relying on the emergency services as the primary rescue provision

In healthcare environments, confined-space entry procedures must be formally prepared and approved by the relevant responsible persons before any internal tank inspection or cleaning takes place. The procedure should address: written risk assessment; a permit-to-entry system; atmospheric testing where residual cleaning chemicals or other hazards are present; communication arrangements; and the provision of rescue equipment and trained rescue personnel stationed outside the space during entry.

These obligations apply to every entry, including routine visual inspections. They cannot be disapplied on the basis that the entry is brief or that the space is familiar to the operative.

Confined-space procedures should be documented in the building O&M manual and incorporated into the Water Safety Plan required under HTM 04-01. Responsibility for ensuring compliance rests with the duty holder – typically the employing organisation or the organisation in control of the premises – and not with the tank manufacturer or the water hygiene contractor.

The Health and Safety Executive publishes the Approved Code of Practice and guidance for confined-space working in L101 (Safe Work in Confined Spaces). This document provides detailed requirements for safe systems of work, rescue arrangements, and training standards.

# 6. Specification Considerations for Healthcare Water Storage Systems

## 6.6 Thermal Performance and Insulation

Cold water temperature control remains closely linked to water hygiene management strategies.

Plant rooms within healthcare buildings may contain significant heat-generating equipment, including pumps, calorifiers, HVAC systems, and electrical infrastructure. Older facilities may also have limited ventilation capability within service areas, particularly where infrastructure has evolved incrementally over time.

As a result, cold water storage systems may be exposed to unwanted heat gain if insulation design or installation quality is inadequate.

Roof-mounted systems can face similar challenges during warmer weather conditions, particularly where solar exposure is significant.

In healthcare environments, insulation strategies are therefore typically intended not only to reduce energy losses, but also to support water hygiene objectives by limiting temperature fluctuation within stored water systems.

However, actual thermal performance depends heavily on installation quality and ongoing maintenance condition. Damaged insulation, poorly sealed access arrangements, or deteriorating vapour barriers can significantly reduce long-term effectiveness.

## 6.7 Overflow and Inlet Screening

Cold water storage cisterns must be fitted with screened overflows and screened air inlets to prevent the ingress of insects, vermin, dust, and airborne contamination into the stored water. This requirement applies to all potable water storage cisterns and is set out in Schedule 1 of the Water Supply (Water Fittings) Regulations 1999. In healthcare settings, the consequences of contamination from an unscreened or damaged opening carry direct patient safety implications.

### Overflow arrangements

The overflow pipe must be fitted with a durable screen at its termination point, sized and constructed to prevent entry by insects and small vermin while permitting unrestricted flow during overflow conditions. A blocked overflow screen is a common finding during routine water hygiene inspections. Where the screen is obstructed, the overflow may be prevented from functioning correctly, creating a risk of tank overflow and the loss of the air gap.

# 6. Specification Considerations for Healthcare Water Storage Systems

The overflow should discharge to a visible location, typically above a trapped drain or tundish, so that sustained overflow can be observed and investigated. Where the overflow is routed directly to a concealed drain without any visual indication of flow, float valve failure or inlet pressure faults may go undetected for extended periods. Healthcare specifications should require visible overflow discharge wherever plant room layout permits.

## **Lid and air inlet integrity**

The cistern lid must close fully without gaps at joints or panel intersections. All air inlet openings must be protected by screens of a mesh size sufficient to exclude insects. Joints between lid panels, and between the lid perimeter and the tank wall, should be inspected at each maintenance visit and resealed where deterioration is identified.

In older plant rooms and certain rooftop installations, rodent activity has been documented as a contamination source in cisterns where lid integrity had degraded. This risk is not specific to any tank material and requires ongoing attention throughout the operational life of the installation.

## **Inspection requirements**

The condition of overflow screens, lid joints, and air inlet arrangements should be assessed and recorded at each planned inspection as part of the water hygiene management programme required under ACoP L8 and HTM 04-01. Defects should be remediated promptly and the corrective action recorded. Inspection findings relating to screening integrity should be included in the water safety risk assessment review.

# 7. Sector Considerations: Healthcare Facility Types

The principles governing cold water storage specification – compliance with ACoP L8, appropriate sizing, maintainability, water hygiene management, and long-term asset performance – apply across all healthcare settings. However, the operational context in which those principles must be applied differs considerably between facility types.

Demand profiles, occupant vulnerability, resilience requirements, maintenance window availability, and the regulatory environment all vary in ways that affect practical specification decisions. A storage arrangement that is appropriate for a 500-bed acute hospital is unlikely to be appropriate for a care home or a community diagnostic centre, and vice versa.

The sections below describe the principal characteristics of the main healthcare facility types encountered in UK estates work, and the specification implications that follow from those characteristics.

## **7.1 Acute Hospitals**

Acute hospitals represent the most demanding environment for cold water storage specification in terms of operational complexity, resilience requirements, and the consequences of water hygiene failure.

Operational pattern and demand

Acute hospitals operate continuously, twenty-four hours a day, every day of the year. Cold water demand arises from multiple clinical and operational functions simultaneously: inpatient wards, intensive care and high-dependency units, operating theatres, sterile services departments, catering, laboratories, clinical hygiene, and building services. These functions operate on different demand cycles and cannot easily be consolidated into a single demand profile. Acute hospitals cannot generally reduce demand or defer operational activity to accommodate planned maintenance on water infrastructure.

### **Occupant vulnerability**

Patients in acute hospitals represent some of the most vulnerable occupants of any building type in the UK. Post-surgical patients, those receiving immunosuppressive treatment, transplant recipients, neonates, and elderly patients in poor general health all face significantly elevated risk if exposed to waterborne pathogens, including Legionella. The consequence of water hygiene failure in an acute hospital is not comparable to a commercial building.

### **Resilience requirements**

A minimum of two compartments is standard practice for acute hospital cold water storage, allowing one section to remain in service during maintenance or cleaning of

# 7. Sector Considerations: Healthcare Facility Types



the other. For facilities with critical-dependency departments – intensive care, theatres, sterile services – the resilience design should be assessed against the specific operational consequences of supply interruption rather than applying a generic approach.

Storage sizing should reflect actual operational demand. Oversized systems create water age problems that are difficult to resolve in a continuously occupied facility where full drainage for corrective action is operationally disruptive.

## **Maintenance access**

Planned shutdowns for inspection or cleaning require careful co-ordination with infection prevention teams, clinical operations, and facilities management. Maintenance activities that would take a few hours in a commercial building may require days of planning in a live acute hospital. Tank design should support phased maintenance – allowing one section to be isolated and drained without affecting supply to the rest of the building.

## **Estates management**

Larger acute hospitals typically have dedicated NHS estates teams with water hygiene expertise. The Responsible Person under ACoP L8 is usually a qualified member of the estates function. Water Safety Plans are standard, and Legionella monitoring programmes are generally well established.

Primary guidance: HTM 04-01 Part A; ACoP L8; HSG274 Part 2; BS EN 13280; Water Supply (Water Fittings) Regulations 1999.

## **7.2 Mental Health Facilities**

Mental health facilities present a distinct set of specification considerations that are not always well understood by specifiers working primarily in acute or commercial environments.

### **Operational pattern and demand**

Acute psychiatric wards operate on a continuous basis. Demand patterns are broadly residential in character – significantly more predictable than an acute general hospital – though facilities with intensive psychiatric care or psychiatric intensive care unit (PICU) functions may have more complex requirements. Some mental health facilities include day services or outpatient clinics that operate during daytime hours only, creating a degree of demand variability.

# 7. Sector Considerations: Healthcare Facility Types

## Ligature risk and design implications

This is a specification consideration specific to mental health environments and one that is often overlooked in water storage and plant room design. NHS guidance (HBN 03-01, Adult Acute Mental Health Units) requires that environments within patient-accessible areas minimise ligature risk – that is, they should not present features to which a patient could attach a cord or ligature.

This requirement can affect the design and positioning of pipework, access hatches, valve arrangements, and plant room entry points where these are within, or accessible from, patient areas. In practice, most cold water storage plant will be in areas not directly accessible to patients, but this must be confirmed at design stage. Any plant room access point or water infrastructure component within patient areas, or accessible from corridors or communal spaces on mental health wards, should be reviewed against ligature risk requirements. Access hatches with exposed fittings, and pipework with exposed brackets or fixings, may require guarding or reconfiguration.

Plant rooms adjacent to secure or detained patient areas should be designed so that access for maintenance does not require operatives to pass through clinical areas unaccompanied, or create security risks.

## Maintenance window availability

Maintenance window availability in mental health facilities is generally somewhat greater than in acute general hospitals, because the absence of operating theatres, sterile services, and large catering operations reduces the number of functions that depend on continuous cold water supply. However, fully isolating the cold water supply to occupied wards – including those with detained patients – requires careful planning and cannot be undertaken without clinical oversight.

Primary guidance: HTM 04-01; ACoP L8; HSG274 Part 2; HBN 03-01 (for ligature risk considerations).

## 7.3 Community Hospitals and Intermediate Care Facilities

Community hospitals occupy a middle ground between acute hospital complexity and care home simplicity. They typically provide lower-acuity clinical services – rehabilitation, step-down care, outpatient services, minor procedures, and day case activity – without the operating theatres, intensive care, or sterile services departments of an acute hospital.

## Operational pattern and demand

Demand profiles in community hospitals are more predictable and, in many cases, lower in total volume than acute hospitals. Inpatient wards may operate continuously

# 7. Sector Considerations: Healthcare Facility Types

but the absence of high-demand departments such as sterile services and acute catering reduces overall consumption. Day case and outpatient departments may operate during standard working hours only, creating periods of lower overnight demand.

This variability requires careful attention during sizing. A storage system sized for peak day-case activity may create stagnation conditions overnight and at weekends when demand is substantially lower. Turnover management and building-specific demand analysis are important for this facility type.

## Resilience requirements

While community hospitals do not generally support the same level of clinically critical activity as acute hospitals, they remain healthcare facilities with occupant vulnerability and continuity obligations. A minimum of two compartments is still advisable for inpatient facilities, though the sizing of each compartment should reflect the actual demand profile rather than defaulting to acute hospital standards.

## Estates management

Many community hospitals are managed under outsourced facilities management arrangements rather than by dedicated NHS in-house estates teams. This can affect the continuity and technical depth of water hygiene management, particularly where FM contract transitions occur. Specifiers should ensure that Water Safety Plans and maintenance documentation are sufficiently clear and accessible for operatives who may not have a strong background in healthcare water engineering.

Primary guidance: HTM 04-01; ACoP L8; HSG274 Part 2.

## 7.4 Care Homes and Residential Care Facilities

Care homes are regulated healthcare settings with a residential character. They are subject to CQC regulation in England (with equivalent bodies in Scotland, Wales, and Northern Ireland) and must comply with ACoP L8 and, where applicable, HTM 04-01 guidance on water safety.

## Operational pattern and demand

Demand in care homes is largely residential: washing, bathing, sanitation, laundry, and catering. Some facilities include clinical functions – sluicing, wound care, clinical hygiene – that add to water demand but do not typically reach the scale of hospital clinical departments. Demand is broadly continuous but follows predictable daily patterns, with peaks in the morning and evening.

# 7. Sector Considerations: Healthcare Facility Types

## **Occupant vulnerability**

Care home residents are among the highest-risk groups for Legionella-related illness. The majority are elderly, and many have conditions – chronic lung disease, diabetes, immunosuppression, or general frailty – that significantly increase both susceptibility and severity of illness. The consequences of a Legionella event in a care home have been demonstrated in documented outbreaks to be severe. Water hygiene management in care homes should be treated with the same rigour as in acute hospitals, despite the lower operational complexity of the facility.

## **Storage sizing and turnover**

Care homes are typically small buildings with relatively modest storage volumes. The risk of oversizing is significant in this setting: a tank sized for theoretical peak demand in a facility with stable, predictable occupancy may achieve inadequate turnover, particularly if demand falls during periods of reduced occupancy. Storage should be sized to achieve adequate daily turnover under normal operational conditions.

## **Scalding risk**

Care homes face a particular design tension between Legionella control and scalding prevention that is less acute in hospitals. Hot water systems must be maintained at temperatures that control Legionella growth, but residents – particularly those with dementia, reduced sensitivity, or limited ability to react to heat – are at risk of scalding from hot water at the point of use. Thermostatic mixing valves (TMVs) at point of use are the standard mitigation, and their maintenance must be incorporated into the water safety programme. While this is a hot water system consideration rather than a cold water storage issue directly, specifiers of cold water storage in care homes should be aware that the overall water system design involves this tension, and that the cold water storage specification is one element of a wider system.

## **Estates management**

Care homes frequently have limited in-house technical expertise. Maintenance is often contracted to external providers, and the Responsible Person under ACoP L8 may not have a strong background in water hygiene. This places greater importance on clear documentation, accessible maintenance procedures, and tank designs that support straightforward inspection and cleaning without specialist knowledge.

Primary guidance: ACoP L8; HSG274 Part 2; Care Quality Commission fundamental standards; HTM 04-01 principles (where applicable).

# 7. Sector Considerations: Healthcare Facility Types

## **7.5 Laboratories and Diagnostic Facilities**

NHS clinical laboratories – pathology, haematology, microbiology, biochemistry, and diagnostic imaging departments – have specific water infrastructure characteristics that differ from standard clinical ward environments.

### **Operational pattern and demand**

Many NHS clinical laboratories operate on a continuous or near-continuous basis, with out-of-hours emergency diagnostic services running alongside standard daytime workload. Demand for potable cold water includes standard staff and welfare uses as well as process uses – autoclaves, laboratory glasswashers, equipment cooling, and emergency eyewash installations. Some of these uses are high-volume and intermittent, creating demand spikes that differ from the relatively steady demand profile of ward areas.

### **Water quality requirements**

Laboratories typically require both potable cold water (for welfare, general use, and some equipment) and purified water (for analytical processes, haemodialysis water production where applicable, and certain laboratory instruments). Purified water systems are fed from the potable cold water supply but treated through dedicated purification equipment. Cold water storage specification should account for the fact that the potable supply is the feedstock for these downstream treatment processes, and that any degradation in potable water quality – whether from contamination, temperature excursion, or stagnation – can affect downstream water quality and, in clinical diagnostic settings, test results.

### **Environmental monitoring**

Clinical laboratories are subject to environmental monitoring requirements, which in some settings include microbiological sampling of water used in laboratory processes. This reinforces the need for effective Legionella control and potable water hygiene management as part of the wider laboratory quality system.

### **Resilience**

Many laboratory functions cannot be suspended without affecting clinical diagnostic services that support patient care elsewhere in the hospital. Supply interruptions can delay test results and clinical decision-making. Storage sizing and compartmentalisation should reflect this dependency.

Primary guidance: HTM 04-01; ACoP L8; HSG274 Part 2; ISO 15189 (medical laboratory quality requirements, where applicable to water quality management).

# 7. Sector Considerations: Healthcare Facility Types

## 7.6 Summary Comparison Table

The table below summarises the principal specification characteristics for each facility type. All entries are indicative; project-specific conditions must always be assessed by a suitably qualified engineer.

Characteristic	Acute Hospital	Mental Health Facility	Community Hospital	Care Home	Laboratory
Operational pattern	Continuous, 24/7	Continuous (wards); variable (day services)	Continuous (wards); daytime (day case)	Continuous, residential pattern	Continuous or near-continuous
Occupant vulnerability	Very high	High	Moderate to high	Very high	Low to moderate (staff primarily)
Consequence of Legionella event	Severe	Severe	Moderate to severe	Severe	Moderate
Typical storage volume	Large (50,000–200,000+ litres)	Moderate (10,000–50,000 litres)	Small to moderate (5,000–30,000 litres)	Small (2,000–15,000 litres)	Variable
Resilience requirement	High; minimum two compartments	Moderate to high	Moderate	Moderate	High for critical diagnostic functions
Maintenance window	Very limited	Limited	Moderate	Moderate	Limited for continuous functions
Shutdown complexity	High; multi-department co-ordination	Moderate; clinical and security co-ordination	Moderate	Lower	Moderate to high

# 7. Sector Considerations: Healthcare Facility Types

Characteristic	Acute Hospital	Mental Health Facility	Community Hospital	Care Home	Laboratory
Ligature risk consideration	No	Yes – affects plant access and fittings in patient zones	No	No	No
Dedicated estates team	Usually	Variable	Often outsourced	Usually outsourced	Usually part of hospital estates
Primary guidance	HTM 04-01; ACoP L8; HSG274 Pt 2	HTM 04-01; ACoP L8; HBN 03-01	HTM 04-01; ACoP L8	ACoP L8; HSG274 Pt 2; CQC standards	HTM 04-01; ACoP L8; ISO 15189

## 7.7 Selecting the Right Approach for the Facility Type

The distinctions between facility types described above have direct consequences for specification decisions. A storage system specified using acute hospital parameters for a care home will typically be oversized, creating turnover and water age problems. A system specified using care home assumptions for an acute hospital will almost certainly be inadequate in resilience and may not support the maintenance regime required.

The starting point for any healthcare water storage specification should be a clear understanding of the facility type, its occupancy pattern, its demand profile, and the clinical consequences of supply interruption or water hygiene failure. Generic sizing rules and standard configurations are a starting point for analysis, not a substitute for it.

Where a single building accommodates more than one facility type – for example, a combined acute hospital and clinical laboratory, or a care home with a day centre – the storage system should be designed to meet the most demanding requirement applying to the building as a whole, while ensuring that the arrangement does not create unnecessary water age risk for the lower-demand elements of the facility.

# 8. Lifecycle Performance and Asset Management

## 8.1 Whole-Life Asset Management

Healthcare organisations increasingly assess infrastructure investment through a whole-life asset management perspective rather than focusing solely on initial capital expenditure.

This reflects growing recognition that long-term maintenance costs, operational disruption, and lifecycle deterioration can ultimately have greater financial and operational consequences than procurement cost alone.

Within water storage infrastructure, this has led to greater emphasis on maintainability, inspection accessibility, and long-term operational reliability.

### Long-Term Operational Cost Extends Beyond Procurement

Inspection access, operational disruption, maintenance frequency, and refurbishment practicality can significantly influence infrastructure cost over the lifecycle of the asset.

## 8.2 Inspection and Monitoring Requirements

old water storage systems within healthcare facilities generally operate under planned inspection and monitoring regimes as part of wider water hygiene management programmes.

Routine inspections may include assessment of:

- internal cleanliness
- structural condition
- insulation integrity
- evidence of contamination
- overflow condition
- lid and hatch integrity
- temperature performance
- microbiological risk indicators

The practicality of undertaking these inspections is strongly influenced by original design decisions. Systems that are difficult to access safely may create long-term operational challenges for estates teams and water hygiene contractors.

This is one of the reasons modern healthcare projects increasingly place greater emphasis on inspection practicality during early design stages.

# 8. Lifecycle Performance and Asset Management



## 8.3 Cleaning and Disinfection Planning

Periodic cleaning and disinfection remain standard components of healthcare water hygiene management procedures.

In operational healthcare environments, however, cleaning activities can become logistically complex. Shutdown coordination may involve multiple departments, infection prevention teams, clinical operations staff, and external contractors. The larger and less flexible the infrastructure arrangement, the more operationally disruptive these activities can become.

Tank design can therefore significantly influence long-term maintenance efficiency. Compartmentalised systems may simplify phased maintenance activities. Accessible internal layouts may reduce cleaning difficulty. Smooth internal surfaces can assist with inspection and contamination identification.

These considerations may appear relatively minor during procurement stages but often become much more significant over the operational life of the system.

### Maintenance Planning

#### Small Design Decisions Can Create Long-Term Operational Consequences

Access layouts, inspection arrangements, and compartmentalisation strategies often become significantly more important once systems enter long-term operational

## 8.4 Material Durability and Corrosion Management

Corrosion management remains one of the primary long-term maintenance concerns associated with older metallic storage systems.

In ageing healthcare estates, steel tanks may require repeated coating repair, structural assessment, and remedial maintenance over time. Areas around seams, joints, and welds can become particularly vulnerable as systems age.

Beyond the direct maintenance cost, such works may also create operational disruption where systems require isolation or access scaffolding within occupied facilities.

GRP systems avoid many oxidation-related deterioration mechanisms associated with metallic structures. While no infrastructure material is entirely maintenance-free, the reduced exposure to corrosion-related degradation is one of the reasons many healthcare refurbishment projects favour GRP systems during replacement programmes.

# 7. Lifecycle Performance and Asset Management

From an estates management perspective, the appeal is often less about theoretical material performance and more about reducing long-term operational intervention within difficult-to-access healthcare environments.

## **8.5 Refurbishment and Replacement Planning**

Many NHS facilities now operate within estates containing infrastructure of widely varying ages and conditions. Water systems installed decades apart may coexist within the same building complex, often following years of phased modifications and operational adaptations.

This creates ongoing challenges for long-term infrastructure planning.

Replacement projects are frequently undertaken in stages to minimise disruption to live clinical operations. In these situations, installation flexibility becomes a major practical consideration.

Sectional GRP systems are commonly selected for refurbishment programmes because they can often be introduced into restricted plant areas with less structural disruption than alternative systems requiring large crane lifts or significant access modifications.



# 9.GRP Compared with Alternative Storage Materials

The selection of water storage materials within healthcare infrastructure depends on project-specific operational, structural, and maintenance considerations. No single material is universally appropriate for all applications.

However, different materials create different long-term operational implications, particularly within healthcare environments where maintainability and hygiene management remain critical concerns.

## Material Choice Influences Long-Term Operational Burden

Different storage materials create different maintenance, inspection, and refurbishment challenges over the operational life of healthcare infrastructure.

### 9.1 GRP Comparison Table

Material	Corrosion Resistance	Hygiene Performance	Weight	Installation Flexibility	Maintenance Burden
GRP	High	High	Low	High	Moderate
Steel	Moderate	Moderate	Moderate	Moderate	Higher
Concrete	High structural durability	Requires lining	Very High	Limited	Moderate
Polyethylene	Good	Good	Low	Limited for larger systems	Moderate

### 9.2 GRP and Steel Systems

Steel tanks continue to be used across parts of the infrastructure sector due to their structural strength and familiarity within large-scale engineering applications.

Within healthcare environments, however, long-term corrosion management can become increasingly problematic, particularly in ageing plant rooms where maintenance access is constrained.

Protective coatings and galvanised finishes inevitably require ongoing condition monitoring and remedial intervention over time. In practice, many estates teams managing older steel systems become familiar with recurring maintenance cycles

# 8.GRP Compared with Alternative Storage Materials



involving coating degradation, localised corrosion, and difficult repair access around seams and joints.

This does not necessarily make steel unsuitable, but it does influence long-term maintenance planning and operational cost considerations. GRP systems are often viewed favourably within refurbishment projects because they avoid many of these corrosion-related maintenance issues while also offering lower structural loading and greater installation flexibility.

## 9.3 GRP and Concrete Systems

Concrete water storage structures may provide excellent structural durability in certain large-scale infrastructure applications. However, within healthcare projects they can present practical limitations relating to installation complexity, structural loading, and refurbishment adaptability.

Concrete systems are substantially heavier than GRP alternatives and may require more significant structural support arrangements. In refurbishment environments, this can become a major constraint.

Concrete potable water systems may also require specialist internal lining arrangements to support water quality management over long operational periods. In practice, healthcare projects involving restricted plant access or phased installation programmes often favour lighter modular systems that can be introduced with less structural intervention.

## 9.4 GRP and Polyethylene Systems

Polyethylene tanks are commonly used within smaller commercial or domestic applications due to their lightweight construction and relatively straightforward installation.

However, larger healthcare applications may exceed the practical capacity range of certain polyethylene systems. Large one-piece tanks may also present installation difficulties within constrained hospital environments where access routes are limited. Sectional GRP systems are often advantageous in these situations because they can be assembled within plant areas that would not accommodate large pre-formed structures.

# 10. Future Pressures on Healthcare Water Infrastructure

## 10.1 Ageing Healthcare Estates

Healthcare estates across the UK are facing increasing pressure to modernise ageing infrastructure while maintaining operational continuity and controlling long-term costs. Water storage systems form part of this wider challenge.

Many hospitals continue to operate with infrastructure originally designed under very different assumptions regarding occupancy, resilience, and water hygiene management. In some facilities, systems installed decades ago remain operational despite significant changes in building use and regulatory expectations.

## 10.2 Increasing Focus on Resilience Planning

Recent years have reinforced the importance of maintaining operational continuity during supply interruptions, infrastructure failures, and emergency conditions. As a result, resilience is now considered more explicitly within infrastructure decision-making than it may have been historically.

This does not simply mean increasing storage volumes. More commonly, it involves creating systems that are operationally flexible, maintainable, and capable of supporting phased maintenance activities without widespread disruption.

## 10.3 Long-Term Asset Management Strategies

There is growing awareness of the relationship between infrastructure condition and long-term operational efficiency. Healthcare estates teams are increasingly attempting to reduce reactive maintenance burdens and move towards more predictable lifecycle asset management strategies.

Environmental considerations are also becoming more prominent within healthcare infrastructure planning, although patient safety and resilience remain the overriding priorities. Improved insulation performance, reduced maintenance intervention, and refurbishment rather than complete structural reconstruction may all contribute to broader sustainability objectives over the lifecycle of the asset.

For water storage systems, this places greater emphasis on:

- maintainability
- inspection access
- durability
- refurbishment practicality
- long-term operational reliability
- insulation performance
- maintenance intervention

# 11. Case Study: GRP Sectional Tank Replacement – University Hospital Crosshouse, Kilmarnock

## **Background**

University Hospital Crosshouse is a large district general hospital in Kilmarnock, Scotland, operated by NHS Ayrshire & Arran. Originally built in 1978, the facility provides a wide range of acute services across 645 inpatient beds, with an additional dedicated maternity unit of 51 beds that includes a neonatal intensive care unit and paediatric services. As a continuously occupied acute hospital serving one of Scotland's larger health board areas, it represents one of the more demanding environments for water storage infrastructure replacement.

## **The Challenge**

The hospital required removal of its existing water storage tanks and installation of new GRP sectional tanks to serve its cold water supply infrastructure. The project had to comply with the Scottish Health Technical Memorandum SHTM 04-01, the Scottish equivalent of HTM 04-01, which governs safe water management in NHS Scotland premises. Two constraints shaped the engineering approach throughout.

First, the project had to be completed without any interruption to the hospital's cold water supply. The site operates continuously, with clinical activity, catering, infection prevention procedures, and maternity and neonatal services all dependent on uninterrupted water availability. A conventional sequential removal and replacement programme carried unacceptable operational risk. Second, a foundation audit carried out before installation confirmed that the existing base required modification before it could support the new tanks. This introduced a structural works element that had to be completed within the project timeline without extending the overall programme or affecting supply continuity.

## **The Solution**

Tricel Water UK supplied and installed two GRP sectional tanks, each measuring 12 m × 9 m × 2 m, providing a combined nominal capacity of 216,000 litres. The tanks were supplied as WRAS-approved products suitable for potable water storage and were specified to meet SHTM requirements.

The project was delivered in close coordination with the main contractor, BBESL Glasgow.

# 11. Case Study: GRP Sectional Tank Replacement – University Hospital Crosshouse, Kilmarnock

Tricel's sales, manufacturing, logistics, and site installation teams worked to a programme aligned with the hospital's operational constraints, ensuring that delivery and installation sequencing maintained supply throughout. The foundation modifications identified during the pre-installation audit were incorporated into the programme without extending the overall timeline.

Installation was completed within two weeks.

## **Why GRP**

The sectional GRP format addressed several of the practical constraints inherent in replacing tanks within an established acute hospital site. Panels were transported to the external tank location and assembled in situ, avoiding the need for large-scale crane lifts or structural opening works that would have caused greater site disruption. The material's corrosion resistance removes the need for protective coatings and the associated periodic inspection and remediation cycle, which is a relevant consideration over the expected operational lifespan of the installation within an NHS estate.

## **Compliance**

The project was delivered to SHTM 04-01 and WRAS approval requirements. SHTM 04-01 is Scotland's primary water safety guidance for NHS premises and sets equivalent requirements to HTM 04-01 in England in relation to water system design, Legionella risk management, Water Safety Plans, and maintenance standards. All work was carried out and supervised to the competence standards the guidance requires.

## **Key Observations**

This project illustrates several of the principles discussed elsewhere in this paper. The requirement for zero supply interruption in a continuously occupied acute facility drove the project sequencing from the outset, demonstrating why compartmentalised or phased replacement strategies are standard practice rather than a preference in this environment. The pre-installation foundation audit also reflects the importance of early structural assessment in refurbishment projects, where existing bases may not be adequate for new tank configurations without modification. Neither the foundation works nor the logistical complexity of a live acute hospital site extended the programme beyond two weeks, a practical demonstration of what well-coordinated GRP sectional tank replacement can achieve in a constrained healthcare setting.

# 11. Case Study: GRP Sectional Tank Replacement – University Hospital Crosshouse, Kilmarnock

Parameter	Detail
Client	NHS Ayrshire & Arran
Facility	University Hospital Crosshouse, Kilmarnock
Contractor	BBESL Glasgow
Supplier / Installer	Tricel (Nicholson Plastics)
Tank dimensions	12 m × 9 m × 2 m per tank
Nominal capacity	216,000 litres (two tanks combined)
Tank type	GRP sectional
Compliance	SHTM 04-01; WRAS-approved
Installation duration	Two weeks
Disruption to supply	None

# 12. Conclusion



Cold water storage infrastructure remains one of the most operationally important but often overlooked components within healthcare estates.

Hospitals, laboratories, care facilities, and specialist treatment buildings depend on reliable stored water systems to support clinical operations, hygiene management, and operational continuity. Failures within these systems can rapidly create operational disruption with potentially serious consequences.

At the same time, healthcare estates face increasing pressure to modernise ageing infrastructure while strengthening water hygiene management procedures and improving long-term resilience.

Within this environment, the specification of cold water storage systems requires more than simple capacity calculations or product selection exercises. Effective healthcare water infrastructure depends on careful consideration of operational realities, maintenance practicality, resilience planning, hygiene management, and long-term asset performance.

GRP cold water storage tanks have become widely established within healthcare projects because they address many of the practical challenges encountered within modern healthcare infrastructure. Their resistance to corrosion, modular installation flexibility, reduced structural loading, and suitability for constrained refurbishment environments make them particularly well suited to complex operational estates. However, successful long-term performance depends on more than material selection alone.

Storage sizing, turnover management, compartmentalisation, inspection access, insulation quality, and operational maintenance procedures all play important roles in determining how effectively healthcare water systems perform over time.

As healthcare organisations continue to modernise infrastructure and strengthen resilience planning, cold water storage systems are likely to remain closely linked to wider discussions surrounding operational continuity, public health protection, and long-term estate management across the UK healthcare sector.

# 13. References and Technical Resources



## **UK Regulations and Guidance**

Water Supply (Water Fittings) Regulations 1999

Primary UK legislation governing the design, installation, and suitability of water fittings intended to protect wholesome water supplies from contamination, waste, misuse, and incorrect installation practices.

Publisher: UK Government / DEFRA

Suggested reference format:

Water Supply (Water Fittings) Regulations 1999, SI 1999 No. 1148.

## **ACoP L8 – Legionnaires’ Disease: The Control of Legionella Bacteria in Water Systems**

Primary guidance document issued by Health and Safety Executive outlining duty-holder responsibilities for Legionella risk management within water systems.

Publisher: HSE

Suggested reference format:

Health and Safety Executive (2013). Legionnaires’ Disease: The Control of Legionella Bacteria in Water Systems (ACoP L8). HSE Books.

## **HSG274 Part 2 – The Control of Legionella Bacteria in Hot and Cold Water Systems**

Technical guidance supporting ACoP L8, focusing specifically on operational management of hot and cold water systems.

Publisher: HSE

Suggested reference format:

Health and Safety Executive (2014). HSG274 Part 2: The Control of Legionella Bacteria in Hot and Cold Water Systems.

## **BS EN 13280**

European Standard relating to the design and performance of GRP cisterns intended for potable water storage applications.

Publisher: British Standards Institution

Suggested reference format:

BS EN 13280:2001. Specification for Glass Reinforced Thermosetting Plastics (GRP) Cisterns of One-piece and Sectional Construction for the Storage, Above Ground, of Cold Potable Water.

# 13. References and Technical Resources



## **BS 8558**

Code of practice for the design, installation, testing, and maintenance of services supplying water for domestic use within buildings.

Publisher: BSI

Suggested reference format:

BS 8558:2015. Guide to the Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic Use within Buildings and Their Curtilages.

## **HTM 04-01 – Safe Water in Healthcare Premises**

NHS guidance relating to water safety and healthcare water system management.

Publisher: UK Department of Health and Social Care / NHS

Suggested reference format:

Department of Health (2016). Health Technical Memorandum 04-01: Safe Water in Healthcare Premises.

## **Additional Industry Resources**

CIBSE Guide G – Public Health and Plumbing Engineering

Provides engineering guidance relating to water demand calculations, storage sizing methodologies, and plumbing infrastructure design.

Publisher: Chartered Institution of Building Services Engineers

## **WRAS Guidance and Product Approval**

WRAS approval schemes provide evidence of product suitability for use in contact with wholesome water under UK regulations.

Publisher: Water Regulations Advisory Scheme

## **Kiwa Water Certification**

Independent testing and certification body frequently referenced in relation to Regulation 4 compliance and potable water suitability.

Publisher: Kiwa

## Frequently Asked Questions

### Sectional GRP Cold Water Tanks in UK Healthcare Infrastructure

#### **Q1. Why is water stagnation a risk in hospitals?**

Water stagnation can create conditions that support microbiological growth within stored water systems. In healthcare environments, this is particularly important because hospitals often contain vulnerable occupants, including elderly patients and immunocompromised individuals.

Stagnation may occur where water turnover is low, storage capacity is oversized relative to demand, or parts of a building experience intermittent use. In older healthcare estates, changing occupancy patterns and phased building modifications can sometimes create areas of low water movement that were not anticipated in the original design. From an operational perspective, stagnation is rarely caused by a single issue alone. It is more commonly the result of how the wider system performs over time.

#### **Q2. How does stored water temperature affect Legionella control?**

Legionella bacteria can proliferate within water systems at temperatures between approximately 20°C and 45°C, with growth occurring most rapidly at around 37°C. ACoP L8 accordingly requires cold water to be stored and distributed at or below 20°C. Where stored water temperatures rise above this threshold – whether through heat gain from adjacent plant, solar exposure, or inadequate insulation – conditions become progressively more favourable for bacterial growth, increasing operational risk if systems are poorly managed.

In healthcare environments, temperature management is influenced by several factors, including:

- plant room temperatures
- insulation performance
- solar exposure
- pipework routing
- turnover rates
- surrounding mechanical infrastructure

Maintaining stable cold water temperatures is therefore an important part of wider water hygiene management strategies.

#### **Q3. Why are dead legs problematic in healthcare water systems?**

Dead legs are sections of pipework where little or no water movement occurs. These areas can allow water to stagnate for prolonged periods, increasing the potential for microbiological growth and biofilm development. In healthcare facilities, dead legs may develop over time where departments are repurposed, fixtures removed, or infrastructure altered incrementally during refurbishment works.

Managing legacy pipework arrangements is often one of the more difficult challenges within older hospital estates.

#### **Q4. How do healthcare water systems differ from commercial buildings?**

Healthcare water systems are generally more operationally sensitive than standard commercial systems because they support clinical functions, infection prevention procedures, and vulnerable building occupants.

Hospitals also tend to operate continuously, with limited tolerance for shutdowns or service interruption.

## Frequently Asked Questions

### Sectional GRP Cold Water Tanks in UK Healthcare Infrastructure

As a result, healthcare water systems often require greater emphasis on:resilience

- maintainability
- compartmentalisation
- inspection capability
- water hygiene management
- operational continuity

The complexity of healthcare estates also means that water systems frequently evolve over decades through phased upgrades and refurbishment works.

#### **Q5. Why are sectional GRP tanks commonly used in plant rooms?**

Many healthcare buildings contain restricted plant areas that cannot accommodate large pre-formed storage tanks without major structural alteration.

Sectional GRP systems can be transported into constrained spaces in smaller components and assembled on site. This makes them particularly suitable for refurbishment projects within operational healthcare facilities where access routes may be limited.

In practice, installation flexibility is often one of the main reasons sectional systems are specified in older hospitals.

#### **Q6. What does ACoP L8 require for cold water storage tanks?**

ACoP L8 requires duty holders to: carry out a written Legionella risk assessment of all water systems including cold water storage; implement a written control scheme covering inspection, cleaning, temperature monitoring, and corrective actions; appoint a competent Responsible Person; and maintain records for a minimum of five years. For cold water storage tanks specifically, ACoP L8 requires stored water to be maintained at or below 20°C, stagnation to be minimised through adequate turnover, and tanks to be inspected and cleaned at defined frequencies. Failure to comply with ACoP L8 is taken as evidence of non-compliance with the Health and Safety at Work etc. Act 1974 in enforcement proceedings.

#### **Q7. What are the structural advantages of GRP tanks?**

GRP tanks are generally lighter than concrete alternatives and may impose lower structural loading requirements during refurbishment or rooftop installation projects. This can simplify structural coordination and reduce the extent of strengthening works required in certain buildings. The modular nature of sectional systems can also provide greater flexibility where crane access or lifting capacity is restricted.

#### **Q8. Are GRP tanks suitable for rooftop healthcare installations?**

In many cases, yes. GRP systems are commonly used in rooftop healthcare applications because of their comparatively low weight and modular construction.

However, rooftop suitability still depends on several project-specific factors, including:

- structural loading capacity
- wind loading considerations

## Frequently Asked Questions

### Sectional GRP Cold Water Tanks in UK Healthcare Infrastructure

- access constraints
- insulation requirements
- maintenance access
- plant room coordination

Each installation should therefore be assessed individually as part of the wider engineering design process.

#### **Q10. When is LPCB certification required for a GRP cold water tank?**

LPCB (Loss Prevention Certification Board) certification is required whenever a cold water storage tank serves a fixed automatic sprinkler system designed to BS EN 12845. The certification, issued under LPS 1276, confirms that the tank meets the structural and material requirements for a firefighting water reserve. LPCB certification and Regulation 4 compliance (Kiwa certification) are separate; a tank serving combined potable and firefighting storage must hold both. Current LPCB status can be verified at [redbooklive.com](http://redbooklive.com).

#### **Q11. How are GRP tanks insulated?**

GRP tanks are typically insulated using external insulation layers designed to reduce heat gain and support cold water temperature stability. The effectiveness of insulation depends not only on specification thickness, but also on installation quality, vapour sealing, continuity around access points, and long-term maintenance condition. In healthcare environments, insulation performance is closely linked to water hygiene management objectives.

#### **Q12. What does Regulation 4 mean in practice?**

Regulation 4 forms part of the Water Supply (Water Fittings) Regulations 1999 and requires water fittings to be suitable for their intended purpose and of appropriate quality and standard.

In practical healthcare applications, this influences:

- material selection
- product approval
- installation standards
- potable water suitability
- certification requirements

Compliance is typically considered alongside broader healthcare water hygiene obligations and project-specific specification requirements.

#### **Q13. Does a healthcare water tank require WRAS/Kiwa approval?**

WRAS/Kiwa approval is commonly specified because it helps demonstrate suitability for use with wholesome water under UK water regulations.

While not every component necessarily requires WRAS approval specifically, healthcare projects frequently favour products and materials with recognised potable water certification due to the operational sensitivity of healthcare environments.

Specification requirements may also vary depending on local trust standards and consultant requirements.

## Frequently Asked Questions

### Sectional GRP Cold Water Tanks in UK Healthcare Infrastructure

#### **Q14. What is the relationship between ACoP L8 and HSG274?**

ACoP L8 establishes the legal and managerial framework relating to Legionella risk management, while HSG274 provides more detailed technical guidance on practical implementation within water systems.

In practice, healthcare organisations typically use both documents together as part of wider water hygiene management strategies.

The two documents are complementary rather than interchangeable.

#### **Q15. Does BS EN 13280 apply to sectional GRP tanks?**

Yes. BS EN 13280 relates to GRP cisterns used for above-ground cold potable water storage applications, including sectional construction systems.

The standard addresses performance and construction considerations relevant to potable water storage infrastructure.

#### **Q16. How long do GRP cold water tanks typically last?**

Operational lifespan depends on several factors, including:

- installation quality
- operating conditions
- maintenance standards
- environmental exposure
- inspection regimes

In practice, GRP systems are often selected because they avoid many corrosion-related deterioration mechanisms associated with metallic alternatives.

However, long-term performance should still be assessed through planned inspection and asset management programmes.

#### **Q17. How frequently should healthcare cold water tanks be cleaned?**

Cleaning frequency depends on risk assessments, inspection findings, operational conditions, and organisational water hygiene procedures.

Healthcare facilities generally operate under planned cleaning and disinfection regimes as part of wider Legionella control programmes.

There is no universally fixed cleaning interval suitable for every healthcare facility.

#### **Q18. Can healthcare tanks be replaced without shutting down the building?**

In many cases, yes, although replacement works often require carefully planned phased installation strategies.

Approaches may include:

- temporary supply arrangements
- compartmentalised systems
- staged isolation
- out-of-hours shutdown windows
- phased commissioning

The practicality of replacement depends heavily on the existing infrastructure arrangement and operational sensitivity of the facility.

## Frequently Asked Questions

### Sectional GRP Cold Water Tanks in UK Healthcare Infrastructure

#### **Q19. Why are compartmentalised tanks used in hospitals?**

Compartmentalised systems allow maintenance, inspection, or cleaning to be carried out on one section of a tank while another section remains operational. This can reduce disruption to clinical operations and improve operational resilience within occupied healthcare facilities.

In practice, compartmentalisation is often specified because full system shutdowns can be difficult to coordinate in live hospital environments.

#### **Q20. How do NHS estates approach water resilience?**

NHS estates teams increasingly view water infrastructure as part of wider operational resilience planning rather than simply a building services requirement. This may involve consideration of:

- storage continuity
- redundancy
- phased maintenance capability
- emergency supply planning
- operational flexibility
- long-term infrastructure reliability

The exact approach varies between facilities depending on operational criticality and estate condition.

#### **Q21. What challenges exist in older hospital plant rooms?**

Older hospital plant areas frequently contain:

- restricted access routes
- low ceiling clearances
- congested services
- ageing infrastructure
- limited maintenance space
- phased historical modifications

These conditions can complicate inspection, replacement, and refurbishment works significantly.

In some hospitals, access constraints become one of the main engineering drivers influencing tank replacement strategy.

#### **Q22. What are common issues during healthcare refurbishment projects?**

Healthcare refurbishment projects often face operational challenges relating to:

- maintaining live services
- restricted shutdown windows
- infection prevention requirements
- structural limitations
- constrained access
- legacy infrastructure coordination
- phased replacement planning

Unlike many commercial projects, healthcare refurbishment work frequently takes place within continuously occupied operational environments.

## Frequently Asked Questions

### Sectional GRP Cold Water Tanks in UK Healthcare Infrastructure

#### **Q23. How is cold water storage capacity calculated?**

Storage capacity is generally determined using building-specific demand analysis combined with operational resilience considerations.

Factors may include:

- occupancy
- clinical activity
- demand profiles
- continuity planning
- turnover objectives
- emergency reserve requirements

Modern healthcare projects increasingly avoid relying solely on historic assumptions or generic sizing rules.

#### **Q24. What affects tank turnover rates?**

Turnover rates are influenced by:

- storage capacity
- operational demand
- occupancy patterns
- system configuration
- building usage
- seasonal variation

Changes in departmental use or occupancy over time can significantly affect turnover performance within older healthcare facilities.

#### **Q25. Why is whole-life cost important in healthcare infrastructure?**

Healthcare infrastructure is typically operated over very long periods, often within continuously occupied environments where maintenance disruption itself carries operational consequences.

As a result, infrastructure decisions increasingly consider:

- maintenance intervention frequency
- operational disruption
- inspection practicality
- refurbishment complexity
- replacement access
- long-term reliability

Systems with lower initial capital cost do not always provide the lowest operational cost over the full lifecycle of the asset.

#### **Q26. Can GRP systems reduce maintenance intervention?**

They can reduce certain types of maintenance associated with corrosion management, coating repair, and structural deterioration commonly encountered in ageing steel systems. However, all water storage infrastructure still requires planned inspection, cleaning, and operational monitoring throughout its service life. GRP should not be viewed as maintenance-free infrastructure.

## Glossary of GRP Cold Water Tanks in UK Healthcare Infrastructure Projects

TERM / ABBREVIATION	DEFINITION
<b>AB air gap</b>	Type AB air gap: provides Category 5 backflow protection by means of a raised float valve housing with a screened spillover weir above the maximum stored water level. Required in healthcare and other Category 5 risk applications.
<b>ACoP L8</b>	Approved Code of Practice: Legionnaires' Disease: The Control of Legionella Bacteria in Water Systems, 4th edition, 2013. Published by the HSE. Has quasi-legal status.
<b>AG air gap</b>	Type AG air gap: provides backflow protection against Categories 1–4 fluid risk. Standard screened inlet and overflow arrangement.
<b>Break tank</b>	A tank providing hydraulic separation between the incoming mains supply and a downstream system (typically a booster pump set). Prevents direct mains connection.
<b>BS EN 13280</b>	British Standard specifying requirements for above-ground GRP cold water storage tanks. Compliance is a prerequisite for Regulation 4 certification of GRP tanks.
<b>BS 6920</b>	Suitability of non-metallic products for use in contact with water intended for human consumption. The test standard used to assess Regulation 4 compliance for non-metallic products including GRP tanks. The basis of Kiwa certification for cold water storage products.
<b>BS 8558</b>	Guide to the design, installation, testing, and maintenance of services supplying water for domestic use within buildings.
<b>Category 5 fluid</b>	Fluid classification under the Water Supply (Water Fittings) Regulations 1999 representing the highest health hazard level. Requires AB air gap backflow protection.
<b>CIBSE</b>	Chartered Institution of Building Services Engineers. Publisher of Guide G (Public Health and Plumbing Engineering).
<b>COSHH</b>	Control of Substances Hazardous to Health Regulations 2002. Requires risk assessment and control of exposure to hazardous substances including cleaning chemicals.
<b>CWSC</b>	Cold Water Storage Cistern.
<b>EFB</b>	Externally Flanged Base. Base flanges external to tank footprint; tank elevated on beams or piers for complete drainage and base access.

## Glossary of GRP Cold Water Tanks in UK Infrastructure Projects

TERM / ABBREVIATION	DEFINITION
<b>GFS</b>	Glass Fused to Steel. Tank material using a glass coating fused to a steel panel substrate. Used for very large-capacity tanks above the practical range of sectional GRP.
<b>GRP</b>	Glass Reinforced Plastic. Composite material formed from glass fibre reinforcement embedded in a polymer resin matrix.
<b>HSG274</b>	Legionnaires' Disease: The Control of Legionella Bacteria in Water Systems. HSE technical guidance in three parts. Part 2 covers cold water storage systems.
<b>HTM 04-01</b>	NHS England Health Technical Memorandum: Safe Water in Healthcare Premises. Primary reference for water system design in NHS England buildings.
<b>IFB</b>	Internally Flanged Base. Base flanges internal to tank footprint; tank sits on a continuous flat floor slab.
<b>Legionella</b>	A type of bacteria that can proliferate in poorly managed water.
<b>LPCB</b>	Loss Prevention Certification Board. Issues certification for firefighting water storage tanks under LPS 1276.
<b>Regulation 4 compliance</b>	Compliance with Regulation 4(1)(a) of the Water Supply (Water Fittings) Regulations 1999, which requires that materials in contact with potable water are of an appropriate quality and standard. Demonstrated through third-party product certification to BS 6920, including Kiwa certification.
<b>Responsible Person</b>	The individual appointed under ACoP L8 with authority, competence, and resources to implement and manage the Legionella control programme for a building.
<b>Sectional tank</b>	A GRP cold water storage tank assembled on-site from individual bolted panels. No upper capacity limit constrained by panel size.
<b>Stagnation</b>	Low or absent water movement within a system, potentially increasing microbiological growth risk.

## Glossary of GRP Cold Water Tanks in UK Infrastructure Projects

TERM / ABBREVIATION	DEFINITION
<b>TIF</b>	Totally Internally Flanged. All flanges internal to footprint; tank can be positioned against two perpendicular walls.
<b>Turnover Rate</b>	The frequency at which stored water within a tank is replenished or replaced through normal operational demand.
<b>UKAS</b>	United Kingdom Accreditation Service. Accredits laboratories for microbiological and chemical water testing required for commissioning and Legionella sampling.
<b>Written control scheme</b>	Document required under ACoP L8 setting out how Legionella risk will be prevented or controlled in a building's water systems, including inspection schedules, monitoring requirements, and response procedures.

# Appendix A: Key Standards and Guidance Documents

All documents listed below should be obtained in their current edition at the time of specification. Standards are subject to revision, withdrawal, and replacement by BSI and other publishers. Verify current status before relying on any document for specification purposes.

Document	Publisher	Relevance
BS EN 13280:2001	BSI	Product standard for GRP tanks for above-ground cold potable water storage. Prerequisite for Regulation 4 certification.
Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148)	UK Government	Primary legislation governing water fittings in England and Wales. Requires appropriate quality and standard for materials in contact with potable water.
Water Supply (Water Fittings) (Scotland) Regulations 2014 (SSI 2014/317)	Scottish Government	Equivalent to 1999 Regulations for Scotland. Enforced by Scottish Water.
Water Supply (Water Fittings) Regulations (Northern Ireland) 2009 (SR 2009/75)	Northern Ireland Executive	Equivalent to 1999 Regulations for Northern Ireland. Enforced by NI Water.
WRAS Water Regulations Guide	WRAS (Water Regulations Advisory Scheme)	Comprehensive guidance on Water Supply (Water Fittings) Regulations 1999 compliance including fluid categories and backflow protection. Available from <a href="http://wras.co.uk">wras.co.uk</a> . Note: Regulation 4 compliance certification is also provided by Kiwa and other accredited bodies.

# Appendix A: Key Standards and Guidance Documents

All documents listed below should be obtained in their current edition at the time of specification. Standards are subject to revision, withdrawal, and replacement by BSI and other publishers. Verify current status before relying on any document for specification purposes.

Document	Publisher	Relevance
ACoP L8 – Legionnaires' Disease: The Control of Legionella Bacteria in Water Systems (4th edition, 2013)	HSE	Approved Code of Practice for Legionella control. Quasi-legal status. Primary reference for Responsible Person obligations.
HSG274 – Legionnaires' Disease, Parts 1–3 (Part 2 most relevant to cold water storage)	HSE	Technical guidance on Legionella control. Part 2 covers hot and cold water systems.
BS EN 12845:2015+A1:2019	BSI	Fixed firefighting systems: automatic sprinkler systems. Governs firefighting tank sizing and LPCB certification requirement.
BS 8558:2015	BSI	Guide to the design, installation, testing, and maintenance of services supplying water for domestic use. Covers commissioning and disinfection procedure.
Building Regulations Approved Document G (current edition)	MHCLG	Sanitation, hot water safety, and water efficiency for new buildings in England.

# Appendix B: Regulation 4 Compliance: Kiwa Certification and Verification

Regulation 4(1)(a) of the Water Supply (Water Fittings) Regulations 1999 requires that materials in contact with potable water are of an appropriate quality and standard. The accepted means of demonstrating this is independent third-party certification to BS 6920:2000. Tricel Water products carry Kiwa certification, which is recognised by UK water undertakers as evidence of Regulation 4 compliance.

Kiwa certification status can be verified at:

[kiwa.com/uk](http://kiwa.com/uk) – product certification search

To verify certification, you will need one or more of: the manufacturer's name; the product name or model reference; or the Kiwa certificate number (provided by the manufacturer on the product data sheet or quotation).

The search returns the certificate number, scope, and date. Key points for specifiers:

- Certification status must be checked at the time of specification, not at the time a previous project was completed. Certificates can lapse and can be withdrawn if a product or its manufacturing process changes.
- The certificate number must be recorded on specification documents and incorporated into the building O&M manual at handover. This is an ACoP L8 compliance record.
- If a manufacturer claims Regulation 4 compliance but certification cannot be independently verified, treat the product as unverified until the discrepancy is resolved in writing.
- Certification covers the product as tested – not necessarily all sizes or configurations in a range. Confirm that the certificate scope covers the specific tank size and configuration being procured.
- Other certification bodies (including those operating under the WRAS product approval scheme) also provide routes to Regulation 4 compliance; the same verification principles apply regardless of certifying body.



# Appendix C — Worked Capacity Calculation: Acute Hospital

This example is illustrative only. Hospital demand profiles vary considerably between facility types, occupancy levels, and clinical configurations. Specifiers must use demand data appropriate to their specific building, drawn from CIBSE Guide G, HTM 04-01, or measured consumption data, and should engage a suitably qualified engineer for all sizing decisions. This example does not constitute engineering advice.

## Project Scenario

A 350-bed acute district general hospital operating continuously on a 24/7 basis. The facility includes inpatient wards, an ITU, operating theatres, outpatient departments, a sterile services department, and an on-site catering kitchen. Existing steel tanks in the main plant room are being replaced as part of an estate refurbishment programme. Plant room access is via standard doorways. No new structural works are proposed; the existing slab must be assessed for any new loading.

## Step 1 — Identify Water-Consuming Functions

Unlike a commercial building, hospital cold water demand arises from multiple distinct clinical and operational functions, several of which operate independently of general ward occupancy. Functions to assess include:

- inpatient wards (bed-based demand)
- intensive therapy and high-dependency units (higher per-bed demand)
- operating theatres and procedure rooms
- outpatient and day-case departments
- sterile services department
- catering and kitchen facilities
- domestic and cleaning services
- building services (where cold-water fed)
- 

Each function should be assessed individually where metered data or fixture schedules are available. In the absence of measured data, CIBSE Guide G Section 2 provides indicative demand figures by building type and function.

# Appendix C — Worked Capacity Calculation: Acute Hospital

## Step 2 — Estimate Daily Cold Water Demand

Using CIBSE Guide G indicative figures for acute hospital buildings, cold water demand for inpatient areas is typically in the range of 200–250 litres per occupied bed per day.

For this example:

- 350 beds at 85% occupancy = 297 occupied beds
- At 225 litres per occupied bed per day:  $297 \times 225 = 66,825$  litres per day (inpatient areas)

Non-bed-based demand (theatres, outpatients, sterile services, catering) can account for a substantial proportion of total hospital consumption. For a typical acute hospital of this size, an additional allowance of approximately 30–40% above the inpatient bed-based figure is a reasonable planning assumption where detailed fixture data is unavailable.

- At 35% additional:  $66,825 \times 1.35 =$  approximately 90,200 litres per day

Round to 90,000 litres per day for sizing purposes.

Where metered consumption data is available from the existing building or a comparable facility, this should be used in preference to indicative figures.

## Step 3 — Select Storage Duration

HTM 04-01 and standard NHS estates practice support a minimum of 24-hour storage for acute hospitals, in recognition of the operational consequences of supply interruption. For facilities with critical-dependency areas (ITU, theatres, sterile services), the estates team should consider whether a longer effective reserve is warranted for those zones, assessed against the local resilience risk and mains supply reliability.

For this example: 24-hour reserve = 90,000 litres total storage.

## Step 4 — Compartmentalisation

A single undivided 90,000-litre tank serving an acute hospital carries significant operational risk. Any isolation for maintenance, inspection, or cleaning would require interruption to the cold water supply across the building — which is generally impractical in an occupied facility.

Standard practice for acute healthcare projects is to divide storage into a minimum of two equal compartments. This allows one section to remain in service while the other is isolated.

- Two compartments, each 45,000 litres
- Each compartment provides approximately 12 hours of supply at full demand — sufficient to complete planned maintenance on the other section in most circumstances without resorting to temporary supply arrangements

# Appendix C — Worked Capacity Calculation Example

This arrangement also supports the phased cleaning and disinfection requirements of ACoP L8 and HTM 04-01 without requiring a full facility shutdown.

## Step 5 — Turnover Analysis

At 90,000 litres per day total consumption, the full storage volume turns over approximately every 24 hours under continuous operation.

A significant advantage of hospital environments over commercial buildings is that demand is broadly continuous, including weekends and bank holidays. The stagnation risk associated with extended low-demand periods — which is a design concern for office buildings and outpatient-only facilities — is substantially lower in an acute hospital operating at consistent occupancy.

The written control scheme (required under ACoP L8) should nonetheless identify areas with variable demand profiles — such as outpatient suites or training facilities — and specify appropriate monitoring intervals for those zones.

ACoP L8 requires stored cold water to be maintained at or below 20°C.

## Step 6 — Temperature Management and Insulation

Hospital plant rooms frequently contain heat-generating equipment: pumps, calorifiers, heat exchangers, and distribution pipework. Ambient temperatures in older plant rooms can significantly exceed 20°C, particularly in summer or where ventilation is poor.

Insulated GRP panels are appropriate for this environment. However, the insulation specification must be confirmed by the design engineer as appropriate to the measured ambient conditions — not selected from standard product data alone. Key variables to assess:

- measured plant room ambient temperature across seasons
- proximity and heat output of adjacent mechanical equipment
- ventilation provision and air change rates
- whether the installation is roof-mounted (solar gain) or internal

Damaged, poorly sealed, or poorly maintained insulation can substantially reduce thermal performance. The maintenance plan should include periodic inspection of insulation continuity, particularly around access hatches and penetrations.

## Step 7 — Configuration and Dimensions

Target: two compartments, each 45,000 litres.

One possible configuration per compartment (for illustration only — manufacturer to confirm actual usable capacity):

- Internal dimensions: 5.0m × 3.0m × 3.0m (L × W × D)
- Nominal volume: 45,000 litres

# Appendix C — Worked Capacity Calculation Example

The specifier should confirm usable capacity with the manufacturer, accounting for:

- minimum water level above the outlet fitting (typically 100–150mm)
- maximum water level at float valve shut-off
- geometric volume within those operational limits

The two compartments may be configured side by side with a shared dividing wall where plant room geometry permits, reducing the overall footprint. Access clearance – typically a minimum of 600mm on all sides requiring maintenance access – must be maintained around the assembled tank.

Access via standard doorways: sectional GRP panels are appropriate. Panel dimensions should be confirmed against the measured access route before specification.

## Step 8 — Structural Assessment

Each filled compartment:

- 45,000 litres = 45,000 kg
- Footprint: 5.0m × 3.0m = 15m<sup>2</sup>
- Floor loading (water only):  $45,000 / 15 = 3,000 \text{ kg/m}^2$  (approximately 29.4 kN/m<sup>2</sup>)

This load substantially exceeds standard imposed floor loadings for commercial construction. In a refurbishment project replacing existing tanks, the structural engineer must confirm that the existing slab was designed for comparable loading, and assess its current condition before approving the new installation. If the new tank configuration changes the load distribution, or if the slab condition has deteriorated, strengthening works may be required.

Add tank self-weight to the above calculation when confirmed by the manufacturer. For roof-mounted installations, wind loading calculations must also be carried out. This is a specialist structural input and is outside the scope of this guidance.

## Step 9 — Access and Inspection Provision

Each compartment requires, as a minimum:

- at least one access hatch of sufficient size for safe confined-space entry, positioned to allow inspection of all internal surfaces
- float valve access for maintenance without full tank isolation
- screened overflow with inspection access
- drain point to allow complete emptying for cleaning
- a cold water sampling point at a representative location

For a two-compartment arrangement, access to both compartments must be maintained independently – including when one is in service – to allow inspection or sampling of the isolated section.

# Appendix C – Worked Capacity Calculation Example

Entry into any confined space must be managed in accordance with the Confined Spaces Regulations 1997. A confined-space entry procedure, including rescue provision, must be prepared before any internal inspection takes place. This requirement should be specified in the maintenance plan and the building O&M manual.

## Step 10 – Summary Table

Parameter	Value
Facility type	350-bed acute hospital
Estimated daily cold water demand	~90,000 litres/day
Storage duration	24 hours
Total storage volume	90,000 litres
Number of compartments	2
Volume per compartment	45,000 litres
Indicative dimensions per compartment	5.0m × 3.0m × 3.0m
Floor loading per compartment (water only)	~3,000 kg/m <sup>2</sup> (~29.4 kN/m <sup>2</sup> )
Turnover period (full demand)	~24 hours
Maximum stored water temperature	≤20°C (ACoP L8)
Installation method	Sectional GRP via standard doorways
Key standards	ACoP L8, HSG274 Pt 2, HTM 04-01, BS EN 13280, Water Supply (Water Fittings) Regulations 1999

A structural engineer must confirm floor loading capacity before finalising the tank configuration. Demand figures used in this example are indicative only; building-specific demand analysis drawing on measured data or CIBSE Guide G fixture schedules should be carried out by a suitably qualified engineer. Consult HTM 04-01 for NHS-specific requirements.

# Appendix D – GRP vs Alternative Tank Materials: Detailed Comparison

Criterion	Sectional GRP	Galvanised steel	Glass fused to steel (GFS)	Stainless steel	HDPE/PE
Corrosion resistance	Excellent – does not corrode	Moderate – zinc coating degrades; corrosion risk at edges and damage points	Excellent – glass coating resists corrosion	Excellent	Good – not applicable for corrosion
Internal surface	Smooth, non-porous – low biofilm risk	Can corrode and pit – elevated biofilm and particulate risk over time	Smooth glass surface	Smooth	Smooth, but prone to scratching
Regulation 4 compliance	Yes – Kiwa certified (standard)	Yes – third-party certified	Yes – third-party certified	Yes – third-party certified	Yes for suitable grades
BS EN 13280 compliance	Yes – designed to this standard	No – different standard applies	No – different standard applies	No	No
On-site assembly	Yes – panels delivered through standard doorways	Yes – panels deliverable	Yes – large panels; specialist installation	Generally site-welded; specialist	One-piece or welded
Practical capacity range	1,000 L – 2M+ L	Any	100,000 L+	Any	Up to ~50,000 L practical
Thermal performance	Better than steel; insulated panels available	Poor uninsulated – requires separate insulation	As steel	As steel	Moderate

# Appendix D – GRP vs Alternative Tank Materials: Detailed Comparison

Criterion	Sectional GRP	Galvanised steel	Glass fused to steel (GFS)	Stainless steel	HDPE/PE
Capital cost	Moderate to high	Low to moderate	High at applicable scale	High	Low to moderate
Maintenance cost (30-year)	Low – no coating maintenance; panel repair possible	Moderate to high – coating maintenance; relining programme likely	Low at applicable scale	Low	Moderate
Service life (maintained)	25–30+ years	15–25 years (coating dependent)	30+ years	30+ years	15–25 years

# Appendix E – Compliance Summary by UK Jurisdiction

Requirement	England & Wales	Scotland	Northern Ireland
Applicable water fittings legislation	SI 1999/1148	SSI 2014/317	SR 2009/75
Material suitability requirement	Same – Regulation 4 compliance – standard route	Same	Same
Backflow protection requirement	Schedule 1, SI 1999/1148	Schedule 1, SSI 2014/317 (equivalent)	SR 2009/75 Schedule 1 (equivalent)
Legionella control framework	ACoP L8 + HSG274 (HSE)	ACoP L8 + HSG274 (HSE) + Scottish Government guidance	ACoP L8 + HSG274 (HSENI guidance may apply)
Healthcare water guidance	HTM 04-01 (NHS England)	SHTM 04-01 (NHS Scotland)	DHSSPS guidance (Northern Ireland)
Building regulations	Approved Document G (MHCLG)	Building Standards Scotland (BSD)	Building Regulations (Northern Ireland)
Regulation 4 compliance	Yes	Yes	Yes

Note: the substantive technical requirements – material suitability, backflow protection arrangements, Legionella control obligations – are equivalent across all four UK jurisdictions. The legal instruments differ. Always cite the correct statutory instrument for the project jurisdiction in specification documents, design reports, and O&M manuals.



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