TRICEL WATER UK

HEALTHCARE PLANT ROOM DESIGN GUIDE

Cold Water Storage · Water Hygiene · Regulatory Compliance

A technical reference for M&E engineers, facilities managers,

and healthcare estates teams responsible for water system design.

REGULATIONS COVERED

HTM 04-01 · ACOP L8 · HSG274 · BS EN 13280 · Kiwa Certification

Water Fittings Regulations 1999 · Building Safety Act 2022 · CDM 2015

Edition 1 · May 2026 · England and Wales

CONTENTS

Healthcare Plant Room Design Guide

SCOPE

This guide applies to the design, installation, and management of water systems in NHS and independent healthcare premises in England and Wales. Always consult current editions of all referenced documents and seek independent professional advice for specific projects.

01 INTRODUCTION AND SCOPE

Healthcare premises place exceptional demands on building water systems. Vulnerable patient populations, complex building layouts, and the requirement for continuous operation mean that plant room design must satisfy requirements beyond those applicable to standard commercial buildings.

This guide addresses the design, specification, and documentation of plant rooms serving cold and hot water systems in healthcare facilities — including hospitals, community health centres, GP surgeries, care homes, and other registered premises. It draws on the requirements of NHS Health Technical Memorandum 04-01, ACOP L8, HSG274, the Water Supply (Water Fittings) Regulations 1999, and the Building Safety Act 2022.

Who This Guide Is For

- M&E; design engineers specifying systems at RIBA Stage 2–4.
- Healthcare estates managers responsible for operational compliance.
- Infection prevention and control teams contributing to water safety group governance.
- Facilities management contractors maintaining plant.
- Principal Designers and Principal Contractors with CDM and golden thread obligations.

HTM 04-01

NHS Health Technical Memorandum 04-01: Safe Water in Healthcare Premises is the primary guidance document for water systems in NHS-funded healthcare. It covers risk assessment, design, installation, commissioning, and operational management. Compliance is expected of NHS trusts and is widely adopted as best practice across the independent sector.

02 REGULATORY FRAMEWORK

Healthcare water systems are subject to a layered regulatory framework. Each instrument operates independently; compliance with one does not imply compliance with others.

Reference	Full Title	Source	Relevance
HTM 04-01	NHS HTM 04-01: Safe Water in Healthcare Premises	NHSE / DHSC	Primary guidance for NHS; expected compliance across all registered healthcare premises.
ACOP L8	Legionnaires' Disease: Control of Legionella in Water Systems (4th ed.)	HSE, 2013	Approved Code of Practice with special legal status. Risk assessment, written scheme, monitoring, and records required.
HSG274 Pt 2	Hot and Cold Water Systems	HSE, 2014	Technical guidance supporting L8. Defines monitoring parameters and control measures for hot and cold systems.
Water Fittings Regs	Water Supply (Water Fittings) Regulations 1999	SI 1999/1148	All fittings and cisterns must prevent contamination. Advance notice and backflow protection required.
BS EN 13280:2001	GRP Cisterns for Cold Water Storage	BSI / CEN	Product standard for GRP tanks. Minimum 25 mm insulation, 316 SS internal fasteners.
Kiwa REG 4	Kiwa Certification — Potable Water Contact	Kiwa	International certification confirming non-toxicity and durability of GRP for potable water. Accepted alongside WRAS.
CDM 2015	Construction (Design and Management) Regulations 2015	SI 2015/51	Health and Safety File required at completion. As-installed drawings, confined space assessments, maintenance requirements.
BSA 2022	Building Safety Act 2022	c.30	Golden thread of information mandatory for Higher-Risk Buildings (18 m / 7 storeys+). Digital records throughout lifecycle.
HBN 04-01	Health Building Note 04-01: Adult In-Patient Facilities	NHS Estates	Space and layout guidance including plant room clearances, accessibility, and maintenance access.
CQC Reg 15	Health and Social Care Act 2008 (Regulated Activities) Regulations 2014	Regulation 15	Premises must be fit for purpose. Water safety forms part of CQC inspection framework.

IMPORTANT

HTM 04-01 is under revision. Always verify the current edition with NHS England Estates and Facilities before commencing design work. Earlier Part A and Part B editions remain in common use.

03 PLANT ROOM DESIGN PRINCIPLES

The plant room is the operational heart of the building water system. Its design determines whether the system can be safely maintained, inspected, and modified throughout the building's life. Poorly designed plant rooms are a leading cause of maintenance failures, Legionella incidents, and documentation gaps in healthcare estates.

Minimum Maintenance Clearances

HBN 04-01 and HTM 04-01 both address spatial requirements. These are minimum figures; individual equipment manufacturers may specify greater clearances.

Element	Minimum Clearance	Reference
Front of tank (operational access)	1,000 mm	HTM 04-01 / HBN 04-01
Side of tank (maintenance)	600 mm	HTM 04-01
Above tank (inspection / cleaning)	600 mm clear to structural soffit	HTM 04-01
Boiler / calorifier front	1,200 mm	HBN / Manufacturer
Panel board front	1,000 mm clear	BS 7671 / HBN
Pump set (each side)	600 mm sides, 1,000 mm front	Manufacturer
Confined space rescue equipment access	Clear route to all tank entry hatches	Confined Spaces Regs 1997

Environmental Control

- **Temperature:** Plant rooms housing cold water storage must maintain ambient temperature below 20°C. Mechanical ventilation is required where roof voids, adjacent boiler rooms, or solar gain cannot be controlled by passive means alone.
- **Insulation:** Cold water pipework must be insulated from all heat sources. Hot and cold pipework must not share uninsulated void spaces or run in direct contact.
- **Drainage:** Adequate floor drainage beneath all tanks and calorifiers. Leak detection and automatic shut-off should be specified for tanks above occupied clinical areas.
- **Vermin exclusion:** All penetrations must be sealed. Tank vents and overflows require insect-proof terminations.

ACCESS

HTM 04-01 requires plant rooms to be secured against unauthorised entry, accessible only to competent trained personnel. A plant room entry log must be maintained as part of the water safety management records.

04 COLD WATER STORAGE SYSTEMS

Cold water storage cisterns in healthcare must balance the operational requirement for supply resilience with the water hygiene requirement to minimise water age. HTM 04-01 is more stringent than the Water Fittings Regulations alone in several respects.

Tank Sizing

Storage volume must be sufficient to maintain supply during mains failure — typically four to eight hours for most acute settings. Oversizing must be avoided: HTM 04-01 advises that storage should not exceed 24 hours' consumption under normal demand. Larger volumes increase water age and Legionella risk.

Facility Type	Typical Demand Basis	Resilience Guidance
Acute hospital (inpatient)	45 L/bed/day (clinical) + 45 L/bed/day (domestic)	4–8 hours recommended
Day surgery / outpatient	15–25 L/attendance/day	4 hours minimum
Community health centre	Calculated from peak demand	2–4 hours typical
Care home (residential)	135 L/resident/day total	4 hours typical
Mental health inpatient	45 L/bed/day	As acute

Dual Compartment Requirement

HTM 04-01 and BS EN 806 require cisterns with a capacity greater than 1,000 litres to have compartments or a standby cistern. This allows one section to be isolated for inspection and cleaning without interrupting supply. In healthcare, a two-tank arrangement with a crossover manifold and isolation valves is standard practice.

GRP Tank Specification

- **Standard:** BS EN 13280:2001 — structural design, construction, performance, and testing.
- **Certification:** Kiwa REG 4 or WRAS approval confirming potable water suitability (testing against BS 6920). Both are accepted by water undertakers and healthcare regulators.
- **Insulation:** Minimum 25 mm closed-cell foam, thermal performance <0.06 W/m²/°C. Pre-insulated panels recommended where ambient temperature cannot be guaranteed.
- **Internal fasteners:** Grade 316 stainless steel throughout.
- **Lid:** Close-fitting, rigid, securely fixed. Vents and overflow terminations with insect screens.
- **Internal surface:** Smooth, non-porous, light-coloured for easy visual inspection.
- **Outlet:** Low-level with 50 mm minimum sump. Float valve set 50 mm below overflow minimum.
- **Access:** Side or top hatch ≥ 450 × 450 mm for tanks ≤ 1,000 L; full side-entry hatch for larger. Internal and external ladders where tank depth ≥ 1,000 mm.

TEMPERATURE

Cold water must be stored and distributed at below 20°C. Legionella pneumophila can proliferate between 20°C and 45°C; growth is inhibited below 20°C. Tank insulation, plant room temperature control, and pipework separation from heat sources are all primary control measures, not optional extras.

05 HOT WATER SYSTEMS AND CALORIFIERS

Healthcare hot water systems must prevent Legionella colonisation through temperature control while meeting scald prevention requirements, particularly where vulnerable patients access hot water outlets directly.

Temperature Requirements

Point	Temperature	Reference	Notes
Storage (calorifier)	≥ 60°C throughout	ACOP L8 / HTM 04-01	Kills Legionella. Weekly pasteurisation to 60°C minimum if stored lower.
Distribution (flow)	≥ 55°C at outlet	ACOP L8 / HTM 04-01	Measured at sentinel point farthest from calorifier.
Distribution (return)	≥ 50°C	ACOP L8 / HTM 04-01	Recirculation must maintain heat throughout the distribution system.
Outlets — general	≥ 50°C within 1 min	ACOP L8	All sentinel outlets monitored and logged.
Patient outlets (TMV2)	41°C mixed ±2°C	HTM 04-01	TMV required at all patient-accessible taps.
Patient showers/baths (TMV3)	41°C maximum	HTM 04-01 / NICE	TMV3 performance standard required for patient bathing areas.

Thermostatic Mixing Valves (TMVs)

HTM 04-01 requires TMVs at all patient-accessible outlets to prevent scalding. TMV3 performance is required for showers and baths; TMV2 is acceptable for washbasin taps.

- TMVs must be accessible for maintenance, annual servicing, and thermal disinfection.
- Each TMV must be individually identified on the schematic and in the written control scheme.
- Dead legs downstream of TMVs are a significant Legionella risk. Include all such outlets in flushing regimes.
- Commissioning data and annual service records must be retained.

SCALD RISK

In dementia care, mental health, and paediatric settings, patients may be unable to respond to contact with hot surfaces. Specify locked thermostatic controls, insulated accessible pipework, and reduced maximum TMV temperature settings with clinical governance sign-off.

06 LEGIONELLA RISK MANAGEMENT IN HEALTHCARE

Healthcare premises represent the highest risk category for Legionnaires' disease. Patients with respiratory conditions, immunocompromise, or advanced age face substantially elevated risk compared to healthy adults. HTM 04-01 imposes requirements significantly more onerous than ACOP L8 for the general estate.

Water Safety Group

HTM 04-01 requires NHS trusts and equivalent organisations to establish a **Water Safety Group (WSG)** with defined membership and governance. The WSG must:

- Appoint an **Authorising Engineer (Water)** as an independent technical expert.
- Maintain a **Water Safety Plan** covering all water systems across the estate.
- Receive regular reports from the Authorising Engineer and Responsible Person.
- Approve and review written control schemes for all buildings.
- Ensure the Water Safety File and all monitoring records are maintained.
- Review all microbiological results, incidents, and near-misses.

Risk Assessment

A healthcare Legionella risk assessment must address the patient population and identify risk factors including: areas of low or intermittent flow; cold water temperatures approaching 20°C; dead ends and redundant pipework; flexible hose connections; spray-generating outlets (showers, nebulisers, humidifiers); and the presence of immunocompromised, ventilated, elderly, or paediatric patients.

Monitoring Frequencies — HTM 04-01 Minimum

Frequency	Activity	Scope
Daily	Hot water storage temperature log (calorifier thermostat)	All calorifiers
Weekly	Flush outlets unused for 7+ days (≥ 2 minutes)	All infrequently used outlets
Monthly	Cold and hot water temperatures at sentinel outlets	All sentinel points
Monthly	Visual check of tanks — lid, overflow, insulation condition	All cold water cisterns
Quarterly	Microbiological sampling — high-risk areas	ICU, oncology, transplant, neonatal
6-monthly	Microbiological sampling — general estate	Representative cross-section
Annually	Tank inspection, clean, and disinfection; TMV service; full sentinel temperature survey	All tanks, all TMVs, all sentinel outlets
Annually	Review written control scheme against system changes	Responsible Person / AE(W)
Every 2 years	Full Legionella risk assessment review	Authorising Engineer (Water)

07 PIPEWORK, DISTRIBUTION AND INSULATION

Material Selection

HTM 04-01 provides guidance on acceptable pipework materials. Key considerations are biofilm formation potential, corrosion resistance, ease of disinfection, and Water Fittings Regulations compliance.

Material	Application	Notes
Copper (BS EN 1057)	Cold and hot water	Preferred for new healthcare work. Biostatic properties limit biofilm. Dezincification-resistant fittings required.
Stainless steel (316L)	Cold and hot water	Suitable alternative; excellent hygiene properties. Higher initial cost. Required in some high-purity applications.
CPVC	Cold water; limited hot	Acceptable for some applications. Verify compatibility with disinfection agents — not suitable for thermal disinfection above 70°C.
Flexible hose	Final connections only	Significant Legionella risk. Maximum 500 mm where used. Minimise instances. Include all in monitoring and flushing regime.
Galvanised steel	Not recommended	Risk of corrosion products and biofilm. Not to be specified for new work; replace on refurbishment.

Insulation and Dead Legs

- **Cold water pipework** must be insulated from all heat sources including hot pipes and solar gain. Minimum 25 mm phenolic foam with vapour barrier where condensation risk exists.
- **Hot water pipework** must be insulated to maintain distribution temperatures. Thickness to CIBSE Guide C or BS 5422.
- **Dead legs** must be minimised. HTM 04-01 specifies a maximum dead leg volume of **2 litres**. All dead legs must appear in the flushing regime.
- **Sentinel outlets** must include the farthest outlet from storage on each branch, the nearest outlet, and any outlet in a high-risk clinical area. Selection documented in the written control scheme.

08 COMMISSIONING, DOCUMENTATION AND THE GOLDEN THREAD

Water system commissioning in healthcare requires a more rigorous process than standard buildings, reflecting the consequences of system failure. HTM 04-01 requires systems to be commissioned to a defined protocol before any clinical area is handed over for use.

Pre-Commissioning Disinfection

All new or significantly altered water systems must be disinfected before use in accordance with BS EN 806-4 and HTM 04-01. The disinfection must be documented with a formal certificate.

- **Chemical disinfection:** free chlorine at 50 mg/L for 1 hour, or 1 mg/L for 24 hours, confirmed by test at sentinel points.
- **Thermal disinfection:** 70°C minimum at all outlets for not less than 1 minute; documented individually for each outlet.
- **Post-disinfection:** microbiological verification sampling before handover.
- **Certificate content:** date, method, agent, concentration, contact time, and results.

Commissioning Records Required

- As-installed schematic and layout drawings — all plant, pipework, outlets, isolation valves, TMVs, and sentinel outlet locations.
- Equipment schedules — tank serial numbers, Kiwa or WRAS certificates, calorifier data sheets, pump performance curves.
- Pressure test certificates for all pipework systems.
- Pre-commissioning flush records.
- Disinfection certificate and microbiological clearance results.
- Temperature commissioning records — all sentinel outlets tested prior to handover.
- TMV commissioning data for each valve individually.
- Written control scheme (initial issue).
- Legionella risk assessment (initial post-construction issue).
- O&M; manual incorporating HTM 04-01 requirements.
- Training records for handover to estates team.

GOLDEN THREAD

For healthcare buildings within scope of the Building Safety Act 2022 (18 metres / 7 storeys in England), all water system documentation forms part of the golden thread of information. The Accountable Person must maintain this in a secure digital system, updated promptly whenever changes are made. The Building Safety Regulator may request access at any time.

09 MAINTENANCE AND MONITORING

Effective maintenance requires a structured programme aligned to the written control scheme, with records kept in sufficient detail to demonstrate compliance to CQC, HTM 04-01 auditors, the Building Safety Regulator, and courts of law if required.

Record Retention

- **Temperature monitoring logs:** minimum 5 years.
- **Microbiological results:** minimum 5 years.
- **Tank inspection and cleaning records:** minimum 5 years.
- **Disinfection certificates:** minimum 5 years.
- **TMV service records:** minimum 5 years.
- **Legionella risk assessments:** lifetime of system — retain all versions.
- **Written control scheme:** lifetime of system — retain all versions.
- **For HRBs under the Building Safety Act 2022:** all records forming part of the golden thread must be retained and kept current for the life of the building.

Routine Maintenance Schedule

Frequency	Task	Responsible
Daily	Hot water storage temperature log	Estates / FM
Weekly	Flush outlets unused for 7+ days	Estates / FM
Monthly	Cold and hot water sentinel outlet temperatures	Competent person
Monthly	Visual tank inspection — lid, overflow, insulation	Competent person
Quarterly	Microbiological sampling — high-risk clinical areas	Accredited laboratory
6-monthly	Microbiological sampling — general estate	Accredited laboratory
Annually	Tank clean and disinfection; TMV service; full temperature survey	Specialist contractor
Annually	Written scheme review against system changes	Responsible Person
Every 2 years	Full Legionella risk assessment review	Authorising Engineer (W)

10 QUICK REFERENCE CHECKLIST

Use this checklist as a project aide-memoire. It does not replace full compliance review against the referenced standards.

Design Stage

- ☐ Cold water storage volume calculated from site-specific demand assessment
- ☐ Dual compartment tank arrangement specified for vessels > 1,000 litres
- ☐ GRP tank specified to BS EN 13280:2001 with Kiwa REG 4 or WRAS certification
- ☐ Tank insulation ≥ 25 mm; thermal performance < 0.06 W/m²/°C
- ☐ Plant room ambient temperature control specified (target ≤ 20°C)
- ☐ Maintenance clearances confirmed to HBN 04-01 and manufacturer requirements
- ☐ Dead legs minimised; any dead legs ≤ 2 litres volume (HTM 04-01)
- ☐ TMVs specified — TMV3 for patient showers and baths, TMV2 for taps
- ☐ Sentinel outlets identified and shown on system schematic
- ☐ Advance notice submitted to water undertaker
- ☐ Backflow prevention designed and specified
- ☐ Legionella risk assessment (design stage) completed
- ☐ Confined space assessment prepared where tank depth ≥ 1,000 mm

Installation and Commissioning

- ☐ Kiwa or WRAS certificates obtained for tank and all fittings; serial numbers recorded
- ☐ Grade 316 stainless steel internal fasteners verified
- ☐ Pressure test certificates issued for all pipework
- ☐ Pre-commissioning flush completed and documented
- ☐ Disinfection to BS EN 806-4 / HTM 04-01; formal certificate issued
- ☐ Microbiological clearance sampling completed; results acceptable before handover
- ☐ All sentinel outlet temperatures recorded at commissioning
- ☐ TMV commissioned per valve; output temperatures within specification; documented
- ☐ As-installed drawings verified and issued
- ☐ Equipment schedules complete with serial numbers and certification references
- ☐ O&M; manual incorporating HTM 04-01 requirements issued to client
- ☐ CDM Health and Safety File compiled and handed to client
- ☐ Initial written control scheme issued
- ☐ Handover training completed and recorded

Occupation and Ongoing Management

- ☐ Water Safety Group established with defined membership and governance

- ☐ Authorising Engineer (Water) appointed
- ☐ Responsible Person appointed; competence records held
- ☐ Written control scheme current and accessible
- ☐ Monthly temperature monitoring programme in place and records maintained
- ☐ Microbiological sampling programme operational (quarterly/6-monthly)
- ☐ Flushing regime for infrequently used outlets in place and documented
- ☐ TMV annual service programme in place; records maintained
- ☐ Annual tank inspection and cleaning scheduled
- ☐ Legionella risk assessment review scheduled (2-yearly minimum)
- ☐ For HRBs: all records held in compliant digital golden thread system
- ☐ Record retention periods applied per HTM 04-01 and ACOP L8

PRINCIPAL REFERENCES

Reference	Full Title	Publisher	URL
HTM 04-01	Safe Water in Healthcare Premises	NHSE / DHSC	england.nhs.uk/estates
ACOP L8 (4th ed.)	Legionnaires' Disease: The Control of Legionella Bacteria	HSE, 2013	hse.gov.uk/pubns/books/l8.htm
HSG274 Part 2	Hot and Cold Water Systems	HSE, 2014	hse.gov.uk/pubns/books/hsg274.htm
BS EN 13280:2001	GRP Cisterns for Cold Water Storage	BSI / CEN	knowledge.bsigroup.com
BS EN 806 (Pts 1–5)	Installations Conveying Water for Human Consumption	BSI / CEN	knowledge.bsigroup.com
BS 8558:2015	Guide to Design, Installation, Testing and Maintenance of Water Services	BSI	knowledge.bsigroup.com
SI 1999/1148	Water Supply (Water Fittings) Regulations 1999	Parliament	legislation.gov.uk
BSA 2022	Building Safety Act 2022	Parliament	legislation.gov.uk/ukpga/2022/30
SI 2015/51	Construction (Design and Management) Regulations 2015	Parliament	legislation.gov.uk
HBN 04-01	Adult In-Patient Facilities	NHS Estates	england.nhs.uk/estates
Kiwa REG 4	Kiwa Certification for Water Tanks and Fittings	Tricel Water UK	tricelwater.co.uk
CLC, 2024	Delivering the Golden Thread: Guidance for Dutyholders	Const. Leadership Council	constructionleadershipcouncil.co.uk

This guide is produced by Tricel Water UK as a reference document for design and compliance purposes. It does not constitute legal or engineering advice. Always consult current editions of all referenced documents and seek independent professional advice for specific projects.

Tricel Water UK · tricelwater.co.uk · websales@tricelwater.co.uk · +44 (0)1934 421 499