



# TRICEL

GENERATIONS OF INNOVATION

# Water Storage as a Pillar of Resilience in CNI Data Centres

Complete Technical Guide | 2026 Edition

White Paper | February 2026

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## The Critical Challenge

Critical National Infrastructure (CNI) data centres supporting telecommunications, finance, healthcare, and government operations face an escalating resilience challenge: water-related cooling failures account for 23% of Tier III and IV outages, with downtime costs ranging from £4,000 to £300,000 per hour (Cost of Data Center Outages – [Ponemon Institute](#), 2023).

As climate variability increases and UK water stress intensifies, on-site water storage has transitioned from optional infrastructure to essential resilience equipment. Water storage systems provide thermal backup, support mechanical cooling infrastructure, and enhance site resilience against supply interruptions. This paper examines the role of on-site water storage in maintaining data centre uptime, explores regulatory requirements in the UK, and outlines sizing, risk management, and operational considerations for CNI operators.

## Key findings:

**Water-related failures** cause 23% of Tier III/IV data centre outages\*\*, with downtime costs ranging from £4,000 to £300,000 per hour, making on-site water storage essential infrastructure for operational continuity.

**Storage requirements vary by tier:** Tier III facilities need 700–1,140 m<sup>3</sup> (24–48h autonomy), whilst Tier IV facilities require 1,140–3,300 m<sup>3</sup> (48–120h autonomy), including fire suppression reserves per BS EN 12845:2015.

**Investment delivers rapid payback:** Systems costing £400,000–£1,000,000 achieve 1.9–2.3 year ROI through avoided downtime, with a single 8-hour outage (£400,000 cost) justifying complete system investment.

**UK regulatory compliance is mandatory:** Six regulations require documented testing (HSE L8, BS 8558:2015 – British Standard for water supply system design and maintenance), with non-compliance penalties ranging from £5,000 fines to £20,000 fines plus criminal prosecution.

**GRP tanks offer optimal performance:** 25–30 year lifespan, zero corrosion maintenance, modular installation (weekend deployment possible), and competitive cost (£200–400/m<sup>3</sup>) make glass-reinforced plastic the preferred material for CNI applications.

**Climate adaptation is critical:** The 2022 UK drought demonstrated mains water vulnerability; operators should implement 20–30% capacity buffers, rainwater harvesting (offsetting 15–30% consumption), and review requirements every 3–5 year

This comprehensive 40-page technical guide provides data centre operators, facilities managers, and mechanical & electrical engineers with the detailed methodology, regulatory framework, and implementation strategies required to specify, install, and maintain water storage systems that ensure operational continuity.

Calculate Your Exact Requirements . Use our online

Water Storage Sizing  
Calculator

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# 1. Understanding Data Centre Resilience

## 1.1. What Makes a Data Centre Resilient?

Data centre resilience is the ability to maintain continuous operation during disruptive events, such as:

- Power outages
- Supply chain interruptions
- Cooling system failures
- Water main breaks
- Environmental disasters

Effective resilience planning requires layered redundancy—across power, data, security, and utilities. Water storage ensures that critical systems can function independently of external water sources for a predefined duration.

## 1.2 What is Water Storage in Data Centre Infrastructure?

Water storage refers to on-site tanks or reservoirs holding potable or non-potable water for cooling systems, fire suppression, and auxiliary services. In CNI data centres, cooling typically accounts for 30–40% of total energy consumption, and water is often the heat transfer medium in chillers, evaporative coolers, and direct liquid cooling loops.

Storage capacity is measured in cubic metres (m<sup>3</sup>) or litres. A 1 MW data centre using evaporative cooling may consume 25–100 m<sup>3</sup> of water per day, depending on ambient conditions and system efficiency.

## 1.3 Purpose and Scope of This Guide

This technical guide provides Critical National Infrastructure data centre operators with comprehensive, actionable guidance for specifying, implementing, and maintaining water storage systems that ensure operational resilience. The document addresses the complete lifecycle from initial risk assessment through long-term maintenance, enabling informed decision-making at every stage.

### Primary Objectives

Technical Foundation – Present evidence-based sizing methodologies, regulatory requirements, and implementation processes grounded in UK standards (BS 8558:2015, BS EN 12845:2015, HSE L8) and industry best practices. The guide synthesizes complex technical requirements into practical decision frameworks.

## Quick Answer

What is Water Storage in Data Centre Infrastructure?

Water storage systems are on-site tanks holding 100–5,000 m<sup>3</sup> of water for cooling equipment, fire suppression, and emergency backup in mission-critical data centres. Capacity depends on facility tier, cooling system type, and required autonomy period (typically 24–120 hours).

# 1. Understanding Data Centre Resilience

**Economic Justification** – Demonstrate clear return on investment through avoided downtime costs, regulatory compliance, and insurance risk mitigation. Financial analysis tools enable business case development for capital expenditure approval.

**Risk Mitigation** – Identify single points of failure in water supply infrastructure and provide redundancy strategies, emergency protocols, and climate adaptation measures that protect against operational disruption.

**Regulatory Compliance** – Decode UK legislative requirements into actionable compliance checklists, testing schedules, and documentation templates that satisfy Water Industry Act 1991, Water Supply Regulations 1999, Building Regulations Part G, and health and safety obligations.

## 1.4 Who Should Read This Document

- Data Centre Operators and Facilities Managers responsible for day-to-day operations, maintenance scheduling, compliance documentation, and incident response.
- Mechanical & Electrical Engineers responsible for system design, integration with cooling infrastructure, technical specifications, and commissioning.
- Project Managers and Capital Planning responsible for project delivery, budget management, timeline coordination, and stakeholder communication.
- Compliance and Risk Officers responsible for regulatory adherence, audit preparation, risk assessment, and documentation.
- Procurement and Supply Chain responsible for supplier selection, contract negotiation, and quality assurance.
- Health, Safety, and Environment Teams responsible for HSE compliance, chemical management, and environmental reporting.
- Insurance Underwriters and Risk Assessors responsible for the evaluation of facility resilience for coverage and premium determination

# 2. Why Water Storage Matters for CNI Data Centres

## 2.1 Operational Continuity

CNI data centres support essential services including telecommunications, finance, healthcare, and government operations. Downtime costs range from £4,000 to £300,000 per hour, depending on criticality (Ponemon Institute, 2023). Water storage mitigates the following risks:

- Mains supply failure: Pipe bursts, planned maintenance, or contamination events can interrupt municipal water supply. On-site storage provides a buffer until supply is restored or alternative sources are activated.
- Peak demand management: Storage allows sites to draw water during off-peak periods, reducing reliance on grid infrastructure during high-demand hours.
- Emergency response: Adequate reserves support fire suppression systems and enable safe equipment shutdown if cooling fails.

## 2.2 Regulatory Compliance

UK CNI operators must comply with:

- Water Industry Act 1991: Governs water supply, quality, and conservation obligations.
- Water Supply (Water Fittings) Regulations 1999: Requires backflow prevention, contamination control, and efficient use of water fittings.
- Building Regulations Part G: Sets standards for water efficiency and storage hygiene in non-domestic buildings.
- BS 8558:2015: Code of practice for water-efficient water supply systems in buildings.

Non-compliance can result in enforcement notices, fines, or supply disconnection.

## Quick Answer

Why Water Storage Matters for CNI Data Centres?

Water storage prevents costly downtime (£4,000–£300,000/hour) by providing backup during mains supply failures, peak demand periods, and emergencies. It ensures regulatory compliance with UK water regulations and adapts to increasing climate-related supply risks.

# 2. Why Water Storage Matters for CNI Data Centres

Download the UK Compliance Audit Checklist

**Table 1 UK Regulatory Compliance Checklist**

Requirement	Regulation	Frequency	Responsible Party	Penalty for Non-Compliance
Water quality testing	BS 8558:2015	Quarterly	Facilities Manager	Enforcement notice
Legionella risk assessment	HSE L8	Regularly and where when there is reason to believe that the original risk assessment may no longer be valid	Competent Person	£20,000 fine + prosecution
Backflow prevention inspection	Water Supply Regs 1999	Annual	Qualified Plumber	Supply disconnection
Fire tank capacity verification	BS EN 12845:2015	Annual	Fire Engineer	Insurance void
Water efficiency audit	Building Regs Part G	Every 5 years	M&E Consultant	Local authority fine
Treatment chemical records	COSHH 2002	Continuous	HSE Officer	£5,000 fine

## 2.3 UK Compliance Requirements for Cooling and Fire Water Storage

### Quick Answer

UK data centres must ensure water storage systems prevent contamination, support safe and hygienic supply, and comply with plumbing and building control requirements. The core legal and standards framework typically includes the Water Supply (Water Fittings) Regulations 1999 (contamination and backflow control), Building Regulations (including Approved Document G in England), and health and safety duties relating to Legionella risk where applicable.

# 2. Why Water Storage Matters for CNI Data Centres

## **UK Regulatory Framework for Data Centre Water Storage (Backflow, Hygiene, and Fire Water Reserves)**

What this means in practice for data centres

For most UK data centre water storage installations (cooling make-up, break tanks, potable storage, fire storage), the practical compliance requirements generally fall into four buckets:

- Backflow prevention and contamination control
- Storage systems connected to mains water must include adequate backflow protection and be installed to prevent contamination returning to the supply.
- Building regulations and water efficiency / hygiene
- In England, Approved Document G provides guidance on sanitation, hot water safety, cold water supply, and water efficiency provisions under the Building Regulations. (Other UK nations have their own building standards frameworks.)
- Duty of care for water safety management
- Where stored water conditions can support bacterial growth (especially in warm, stagnant, or aerosol-generating systems), operators need an auditable water safety plan, roles and responsibilities, monitoring, and remedial actions.
- Fire protection water supply compliance (where sprinkler systems exist)
- Fire water storage is often driven by BS EN 12845 system design and insurer requirements (frequently via LPCB/LPS standards).

## **Legionella Compliance in Data Centres: Risk Assessment, Monitoring, and Records**

Quick Answer

Legionella compliance in data centres centres on risk assessment, system control measures, monitoring, and documented management procedures for hot and cold water systems and any systems that can generate aerosols (for example, cooling towers). HSE guidance emphasises ongoing monitoring of water temperatures and maintaining systems to reduce risk.

### **Data Centre relevant controls**

- Risk assessment and review: Must be reviewed regularly and whenever system use, layout, occupancy, or operating conditions change (rather than relying on a single fixed interval).
- Temperature control: HSE guidance highlights routine checks of hot and cold water temperatures at sentinel points to confirm controls are effective.
- System hygiene and stagnation control: Manage dead legs, low-use outlets, tank hygiene, and biofilm risk through flushing, cleaning, and maintenance routines.

# 2. Why Water Storage Matters for CNI Data Centres

- Where aerosol is present (notably cooling towers): Treat as higher risk; ensure a competent water treatment regime, monitoring, and record-keeping.

## **BS EN 12845 sprinkler tank sizing**

### Quick Answer

BS EN 12845 is the key standard used in the UK for automatic sprinkler system design, including water supplies. Tank capacity is determined by the hazard classification, design discharge density, hydraulically most demanding area, and required duration, rather than by building size alone. Insurers commonly require LPCB/LPS-aligned tank approvals and documentation of the available stored volume for sprinkler-only use.

- Sizing is outcome-based: required flow × required duration, based on hazard class and hydraulic calculations.
- Dedicated capacity and marking: multi-supply tanks must clearly indicate sprinkler-reserved capacity (i.e., not all stored water can be assumed available to sprinklers).
- Certification linkage: LPCB certification standards for sprinkler suction tanks (e.g., LPS 1276) specify requirements for tanks used in sprinkler systems and are routinely referenced by insurers and approval pathways.

## **UK Compliance Requirements for Cooling and Fire Water Storage**

Cooling and fire water storage systems in UK data centres must demonstrate:

- Backflow prevention and contamination control (Water Fittings Regulations)
- Legionella risk assessment and monitoring (HSE ACOP L8)
- Hygienic tank design and maintenance (BS 8558 guidance)
- Fire sprinkler water supply capacity (BS EN 12845)
- Certification of fire tanks where insurer required (e.g., LPCB)
- Inspection, testing, and record-keeping programmes
- Integration into site risk and resilience planning
- Approval from water authority / building control where applicable

## **2.4 Climate Adaptation**

The UK Environment Agency projects increased frequency of droughts and water stress events, particularly in the South East. The 2022 drought saw temporary use bans affecting commercial users in several regions. On-site storage reduces vulnerability to external supply constraints.

# 3. Sizing Methodology

## 3.1 Sizing Principles

Storage capacity depends on:

Cooling system type:

- Closed-loop chillers: Lower water consumption (makeup water for evaporation and blowdown only)
- Evaporative cooling towers: Higher consumption (1.2–1.8 litres per kWh of cooling)
- Direct liquid cooling: Moderate consumption with recirculation systems
- Redundancy requirements:
- Tier III data centres (N+1 redundancy): 24–48 hours of cooling water
- Tier IV data centres (2N or 2N+1 redundancy): 48–120 hours of cooling water

## 3.2 BS EN 12845 Fire Water Storage: How Sprinkler Tank Capacity Is Determined

BS EN 12845:2015+A1:2019 specifies water tank capacity for sprinkler systems based on building volume and risk category. A 5,000 m<sup>2</sup> data centre often requires hundreds of cubic metres, subject to hazard classification and hydraulic demand

- Site-specific factors:
- Distance to alternative water sources
- Vulnerability of local mains infrastructure
- Historical supply reliability data

## 3.3 Worked Example

Cooling load × hours × water use rate + fire reserve + buffer

A 10 MW Tier IV CNI data centre in London with evaporative cooling operates as follows:

- Cooling load: 4 MW (assuming 0.4 Power Usage Effectiveness for cooling)
- Water consumption: 1.5 litres per kWh × 4,000 kW × 24 hours = 144 m<sup>3</sup>/day
- Target resilience: 72 hours
- Required cooling water storage: 144 m<sup>3</sup>/day × 3 days = 432 m<sup>3</sup>
- Fire suppression reserve: 600 m<sup>3</sup>
- Total storage requirement: 1,032 m<sup>3</sup>
- This excludes potable water for welfare facilities and process uses.

## Quick Answer

How Much Water Storage Do CNI Data Centres Need?

Tier III data centres need 24–48 hours of cooling water (200–700 m<sup>3</sup>), while Tier IV facilities require 48–120 hours (500–2,100 m<sup>3</sup>). Add 400–800 m<sup>3</sup> for fire suppression. A 10 MW Tier IV facility typically needs 1,140–1,850 m<sup>3</sup> total storage.

[Request a Site-Specific Sizing Review](#)

# 3. Sizing Methodology

**Table 2: Water Storage Sizing Quick Reference**

Data Centre Tier	Power (MW)	Cooling Water (m <sup>3</sup> /day)	Fire Reserve (m <sup>3</sup> )	Recommended Storage (72h)	Total (m <sup>3</sup> )
Tier II, 1 MW	1	25-40	150-250	75-120	225-370
Tier III, 5 MW	5	100-180	400-600	300-540	700-1,140
Tier IV, 10 MW	10	180-350	600-800	540-1,050	1,140-1,850
Tier IV, 20 MW	20	350-700	800-1,200	1,050-2,100	1,850-3,300



# 4. Water Storage Tank Selection and Materials

## 4.1 Above Ground Tanks

Steel, fibreglass, or concrete tanks installed at ground level or on rooftops. Advantages include easier inspection and maintenance.

Disadvantages include space constraints and visual impact.

## 4.2 Below-Ground Cisterns

Buried tanks reduce site footprint and protect water from temperature fluctuations. Require excavation, waterproofing, and access provisions for inspection. Common in space-constrained urban sites.

## 4.3 Modular Systems

Prefabricated tank arrays allow incremental capacity expansion. Suitable for phased data centre build-outs.

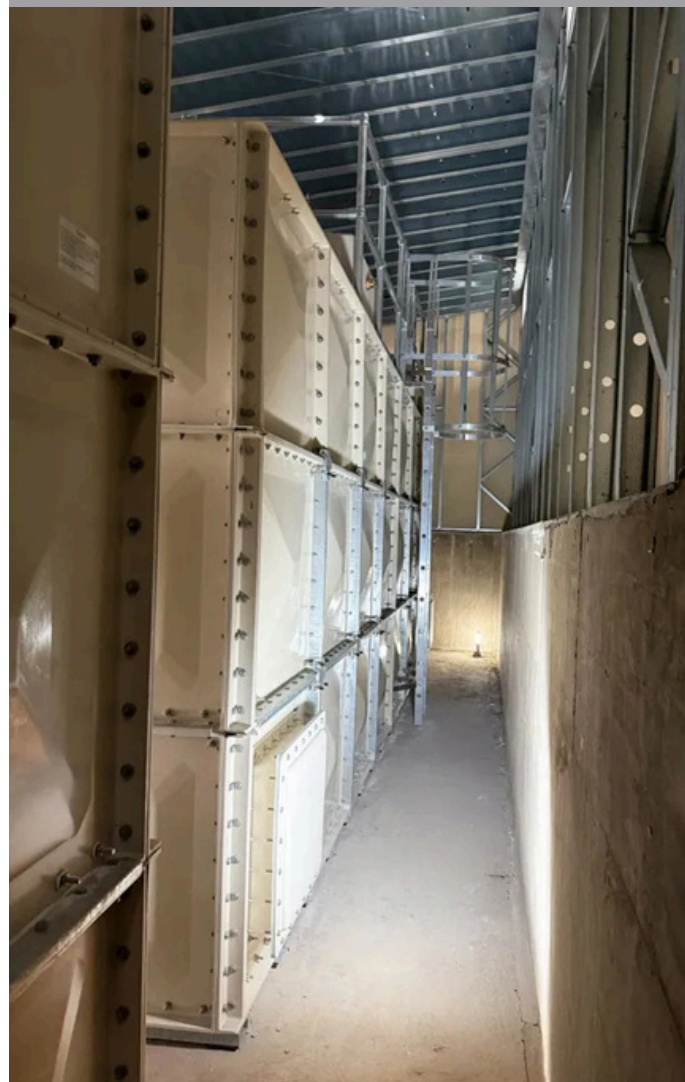
## 4.4 Rainwater Harvesting

Supplementary storage capturing roof runoff. UK rainfall averages 1,154 mm/year (Met Office), providing potential annual yield of 50–70% of roof area  $\times$  annual rainfall, minus losses. A 5,000 m<sup>2</sup> roof in Manchester (annual rainfall ~900 mm) could yield approximately 2,700–3,150 m<sup>3</sup>/year. Requires filtration and separate storage to prevent mains water contamination.

## Quick Answer

### Types of Water Storage System

Four main types exist: above-ground tanks (easy maintenance, visible), below-ground cisterns (space-efficient, protected), modular systems (expandable, fast installation), and rainwater harvesting (reduces mains dependency, requires filtration). GRP construction offers best balance of cost, lifespan, and maintenance.



# 4. Water Storage Tank Selection and Materials

**Table 3 Water Storage Tank Material Comparison**

Material	Lifespan (years)	Cost/m <sup>3</sup>	Corrosion Risk	Maintenance	Weight (kg/m <sup>3</sup> )	Best Application
GRP (Glass-Reinforced Plastic)	25-30	£200-400	None	Very low	15 to 25	Cooling water, fire suppression
Steel (coated)	15-20	£300-500	Medium	High	80 to 120	Short-term, high-pressure
Concrete	50+	£400-700	Low	Medium	2,400	Below-ground, large capacity
Stainless steel	30-40	£600-900	None	Low	65 to 90	Potable water, hygienic applications
HDPE	20-25	£150-300	None	Very low	10 to 18	Rainwater, non-potable

[Download Tank Selection Datasheets](#)

# 5. Integration with Cooling Infrastructure

## 5.1 Cooling Infrastructure and Water Dependency in Data Centres

Overview: Cooling as a Mission-Critical System

Data centre cooling infrastructure is designed to remove heat generated by IT equipment and supporting electrical systems. As server density and compute intensity increase, cooling systems must deliver consistent thermal control under normal operation and during abnormal conditions. In water-based cooling architectures, reliable access to cooling water is essential to maintaining uptime. Cooling infrastructure typically accounts for a significant proportion of non-IT energy use and represents one of the most critical dependencies within a data centre's resilience framework.

### Data Centre Cooling Infrastructure Types

Modern data centres deploy one or more of the following cooling approaches, often in hybrid configurations:

#### Air-cooled chillers

- Use ambient air for heat rejection. They eliminate water dependency but typically consume more electrical energy and may struggle at high ambient temperatures.

#### Water-cooled chillers with cooling towers

- Use water as the primary heat rejection medium. These systems offer higher thermal efficiency but depend on continuous water availability for makeup and blowdown.

#### Adiabatic and hybrid cooling systems

- Combine dry cooling with evaporative assistance during peak thermal conditions to improve efficiency while reducing total water consumption.
- Direct liquid cooling (DLC)
- Transfers heat directly from IT equipment into a liquid loop, reducing airflow requirements but still relying on secondary water systems for heat rejection.

In all water-assisted systems, on-site storage plays a key role in maintaining operational continuity.

### Adiabatic Cooling Systems and Storage Requirements

Adiabatic cooling systems use controlled evaporation to enhance heat rejection during periods of high ambient temperature. Water is sprayed or wetted across heat exchanger surfaces, lowering air temperature before it passes over cooling coils.

# 5. Integration with Cooling Infrastructure

## Key characteristics:

- Water consumption increases during peak temperature events
- Electrical efficiency improves compared with dry-only systems
- Cooling performance depends on water availability at critical times

Because adiabatic systems draw water intermittently but intensively, storage must be sized for peak demand, not average usage. Insufficient stored volume can force systems to revert to dry operation, increasing thermal risk and energy consumption precisely when cooling demand is highest.

On-site storage ensures adiabatic cooling remains available during:

- Heatwaves
- Temporary mains supply interruption
- Water pressure or flow constraints
- Emergency operational scenarios

## Cooling Tower Makeup Water Dependency

Cooling towers reject heat through evaporation, which inherently consumes water. As water evaporates, dissolved solids concentrate in the remaining circulating water. To control scaling and corrosion, a portion of this water is discharged as blowdown and replaced with fresh makeup water.

Makeup water demand is driven by:

- Cooling load (MW)
- Evaporation rate
- Cycles of concentration
- Ambient temperature and humidity

[Request Cooling Integration Design Support](#)

Without adequate makeup water, cooling tower efficiency deteriorates rapidly, increasing condenser temperatures and reducing cooling capacity. In extreme cases, chillers may trip to protect equipment, leading to service interruption.

On-site water storage provides:

- A buffer against sudden loss of mains supply
- Stable water chemistry control
- Time to implement contingency measures
- Protection against cascading thermal failure

## Integration with Water Storage Systems

Effective cooling infrastructure design integrates water storage as a functional component of the cooling system rather than a passive reserve utility.

# 5. Integration with Cooling Infrastructure

## **Best practice integration includes:**

- Dedicated storage volumes for cooling and fire suppression
- Automated makeup water supply from storage tanks
- Continuous level and flow monitoring via BMS
- Priority allocation of stored water to cooling systems during incidents
- Redundant tank configurations to avoid single points of failure

By treating stored water as part of the cooling system architecture, operators can maintain thermal stability even during external supply disruptions.

## **Implications for Resilience Planning**

Cooling infrastructure resilience depends not only on mechanical redundancy but also on water autonomy. Facilities with high-efficiency cooling systems but insufficient water storage remain vulnerable to disruption.

For CNI data centres, cooling water storage should be sized and designed to support:

- Peak thermal conditions
- Extended mains supply outages
- Planned maintenance activities
- Climate-driven variability in water availability

In this context, water storage functions as an enabling layer for cooling infrastructure reliability rather than a seconda

## **5.2 Closed-Loop Chillers**

Water storage supplies makeup water to replace evaporation losses (typically 2–5% of circulating volume per day). Tanks connect to the condenser water loop via automated fill valves with level monitoring.

## **5.3 Evaporative Cooling Towers**

Towers draw directly from storage tanks. Water treatment systems (chemical dosing, filtration) maintain water quality and prevent scaling, corrosion, and biological growth.

## **5.4 Direct Liquid Cooling**

Heat exchangers transfer thermal load to a secondary water loop. On-site storage supports the secondary loop and provides emergency cooling if primary systems fail.

# 5. Integration with Cooling Infrastructure

**Table 4 Cooling System Water Consumption Comparison**

Cooling Technology	Water Use (L/kWh)	Annual Water (10 MW)	Storage Requirement	Pros	Cons
Air-cooled chillers	0	0 m <sup>3</sup>	0 m <sup>3</sup>	No water dependency	High energy use, lower efficiency
Closed-loop water chillers	0.2-0.5	175-440 m <sup>3</sup>	50-150 m <sup>3</sup>	Low consumption	Requires cooling towers
Evaporative cooling towers	1.2-1.8	1,050-1,580 m <sup>3</sup>	400-700 m <sup>3</sup>	High efficiency	High water use
Hybrid (air + evaporative)	0.6-1.0	525-875 m <sup>3</sup>	200-350 m <sup>3</sup>	Balanced approach	Complex controls
Direct liquid cooling	0.3-0.7	260-615 m <sup>3</sup>	100-250 m <sup>3</sup>	Very efficient	High capital cost

\*Based on 8,760 annual operating hours, 4 MW cooling load

# 6. Water Quality and Treatment

## 6.1 Contamination Prevention

**Backflow prevention:** Type AA or AB air gaps per BS EN 1717:2000 prevent mains water contamination from stored water.

**Tank design:** Sealed lids, vermin screens, overflow pipes fitted with flap valves.

**Materials:** Food-grade or potable-water-approved linings to prevent leaching.

## 6.2 Treatment Requirements

Biocide dosing: Controls Legionella and biofilm.

Cooling towers operate at 20–37°C, an ideal range for bacterial growth. HSE Approved Code of Practice L8 requires risk assessments and monitoring.

**pH adjustment:** Maintains pH 6.5–8.5 to minimise corrosion and scaling.

**Filtration:** Removes particulates before water enters cooling systems.

**Testing frequency follows BS 8558:2015 and L8 guidance:** visual inspections monthly, microbiological tests quarterly, full risk assessments every two years.

## 6.3 Monitoring and Control

### Building Management Systems

Modern CNI data centres integrate water storage with BMS platforms. Monitored parameters include:

- Tank water level (ultrasonic or radar sensors)
- Flow rates (electromagnetic or turbine meters)
- Water quality (temperature, pH, conductivity, turbidity)
- Leak detection (moisture sensors at tank bases and pipe connections)
- Alarms trigger if levels fall below operational thresholds or quality parameters deviate.

## Quick Answer

Water Quality & Treatment?

Water storage requires: backflow prevention per BS EN 1717:2000, sealed tank design with vermin screens, food-grade linings, biocide dosing to control Legionella (HSE L8), pH adjustment (6.5–8.5 range), and filtration. Testing frequency: visual checks monthly, microbiological tests quarterly, full risk assessments every 2 years.

## Quick Answer

Monitoring & Control?

Building Management Systems (BMS) monitor: tank water levels (ultrasonic sensors), flow rates (electromagnetic meters), water quality (pH, conductivity, turbidity), and leak detection (moisture sensors). Predictive analytics identify trends for preventive maintenance before failures occur.

# 7. Economic Considerations

## 7.1 Capital Costs

- Above-ground tanks: £200–500 per m<sup>3</sup> installed
- Below-ground cisterns: £400–800 per m<sup>3</sup> installed (including excavation)
- Treatment systems: £20,000–100,000 depending on capacity
- Monitoring equipment: £10,000–30,000
- A 1,000 m<sup>3</sup> system might cost £400,000–£1,000,000 depending on site conditions and specification.

## 7.2 Operational Costs

- Water supply: £1.50–3.00 per m<sup>3</sup> (varies by region and supplier)
- Treatment chemicals: £5,000–15,000 per year
- Testing and compliance: £3,000–8,000 per year
- Maintenance: 2–5% of capital cost annually

## 7.3 Return on Investment

Avoided downtime is the primary financial benefit. For a data centre with £50,000/hour downtime cost, preventing a single 8-hour outage justifies a £400,000 investment in one event.

**Table 5 Water Storage Cost-Benefit Analysis**

Scenario	Storage Capacity	Capital Cost	Avoided Downtime (5 years)	ROI	Payback Period
Minimal (24h)	150 m <sup>3</sup>	£90,000	£200,000 (1 event)	122%	2.3 years
Standard (48h)	300 m <sup>3</sup>	£165,000	£400,000 (2 events)	142%	2.1 years
Enhanced (72h)	450 m <sup>3</sup>	£225,000	£600,000 (3 events)	167%	1.9 years
Maximum (120h)	750 m <sup>3</sup>	£350,000	£800,000 (4 events)	129%	2.2 years

Illustrative examples. Actual ROI varies by facility. Consult financial advisor  
Request Custom ROI Analysis: Our engineering team will model your facility's specific payback period. Contact: [websales@trichelwater.co.uk](mailto:websales@trichelwater.co.uk) | +44 (0)1934 314 079"

# 8. Tricel Water Solutions for Data Centre Applications

## Complete Product Range for Data Centres and CNI Applications

Tricel Water, an established manufacturer of water storage systems, provides purpose-designed solutions for data centre infrastructure. Their product range addresses the specific requirements of CNI facilities:

### 8.1 GRP SECTIONAL WATER STORAGE TANKS

- Capacity: 1,000 litres to 4.6 million litres
- Construction: 1m modular GRP panels
- Larger Tanks available on request

#### Panel Sizes:

- Metric panels: 1m modular format
- Available in half-panel increments (e.g., 6.65m × 4.65m × 2.5m height)
- Maximum height: 4m
- No restrictions on length or width

#### Capacity Examples (Metric Panels):

- 1.15m H × 1.15m L × 1m W = 1,000 litres (220 gallons)
- 2.15m H × 2.15m L × 2m W = 8,000 litres (1,760 gallons)
- 2.65m H × 2.65m L × 2.5m W = 14,375 litres (3,162 gallons)
- 4m H × 10m L × 10m W = 400,000 litres (88,000 gallons)

#### Configuration Types

##### Externally Flanged Base (EFB) Tanks:

- Manufactured for areas without space restrictions
- Built on raised supports
- Fully self-draining bases
- Ideal for maintenance and cleaning
- Easy access for joints and connections below tank

##### Internally Flanged Base (IFB) Tanks:

- Suited for areas with height or headroom restrictions
- Can be built on flat base or levelled steel beams
- Supports full weight of tank
- More compact vertical profile
- Ideal for confined spaces and rooftop installations



# 8. Tricel Water Solutions for Data Centre Applications

## **TIF (Tank In Frame) Tanks:**

- Space-saving design for plant rooms
- Can be installed as close as 25mm from wall
- Available in 500mm and 1000mm lateral panel increments
- L-shaped tank options for awkward spaces
- Twin compartment options available
- NSF approved
- Maximizes water storage capacity in restricted spaces

## **Format 30 Specification**

Tricel's heavy-duty sectional tank specification meeting Section 30 of UK Water By-laws

## **Features:**

- Heavy-duty panel covers
- Screened vents, overflows, warning pipes
- Roof panels and side walls insulated with CFC-free polyurethane foam
- Encapsulated insulation
- Suitable for indoor and outdoor use
- Storage of potable (drinking) water
- Prevents freezing and maintains water temperature below 20°C

## **Insulation Performance:**

- 25mm encapsulated polyurethane foam insulation
- Thermal performance: 0.85 w/m<sup>2</sup>°C
- Slows heat transfer (note: does not completely prevent heat loss/gain over extended periods)
- Tanks in boiler rooms may require additional base insulation

## **Certifications & Approvals**

- WRAS Regulation 4(1)a Approved: For potable water storage
- BS EN 13280: British and European standard for cold water storage tanks
- BS 7491 Part 3:1994: Glass fibre reinforced plastics cisterns specification
- BS 6700: Specifications for potable water installations
- ISO 9001: Quality management system



# 8. Tricel Water Solutions for Data Centre Applications

## Installation Features

- Delivered to site palletised
- Assembled by expert Tricel site crews
- Modular design enables confined-space installation (panels fit through standard doorways)
- Base levelling steels available
- Internal stainless steel stays (underwater components)
- Full range of connections and ancillary items

## Applications

- Data centres and server rooms
- Hospitals and healthcare facilities
- Hotels and commercial buildings
- Industrial facilities
- Schools and universities
- Shopping centres and retail
- Office buildings
- Manufacturing plants

## **8.2 ONE-PIECE WATER STORAGE TANKS (CISTERNS)**

Description: Pre-moulded single-unit GRP tanks for smaller capacity water storage needs.

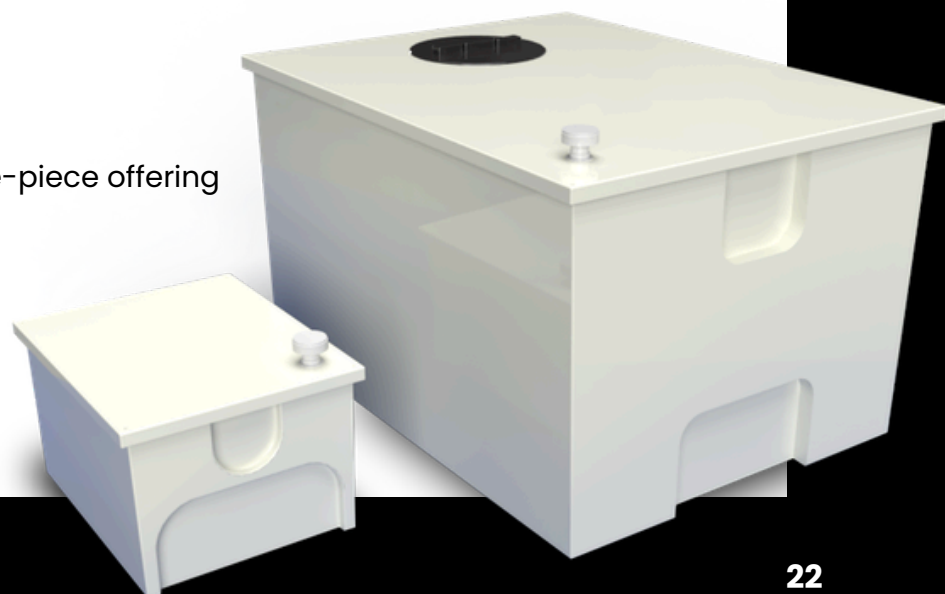
### Key Specifications

Capacity Range:

- Minimum: 45 litres
- Standard range: 45 to 6,000 litres
- Maximum (new addition): 16,000 litres
- Bespoke sizes available on request

### Popular Sizes:

- 682 litres (150 gallons) – Residential/small commercial
- 900 litres (198 gallons)
- 1,364 litres (300 gallons)
- 2,273 litres (500 gallons)
- 4,546 litres (1,000 gallons)
- 6,000 litres – NEW largest one-piece offering



# 8. Tricel Water Solutions for Data Centre Applications

## Construction Features

### Standard Configuration:

- Glass Reinforced Plastic (GRP) construction
- Premium glass-reinforced polyester resins
- Close-fitting sealed lid
- Internally flanged design
- Suitable for elevated supports or flat base installation
- Ivory colour as standard (custom colours available)

### Special Configurations

#### Twin Compartment Designs:

- Provides continuous water supply during maintenance
- One compartment operational while other undergoes cleaning
- Maintains supply continuity

#### Bespoke Tanks:

- Made to specific customer dimensions
- Available for unusual space requirements
- Quick turnaround on custom specifications

#### Two-Part Tanks:

- Designed for restricted access situations
- Assembled on-site
- Fits through standard doorways and service lifts
- Eliminates need for crane or large access openings

## Insulation Options:

- Uninsulated (standard)
- Insulated to Format 30 (25mm CFC-free polyurethane foam)
- Thermal performance: 0.85 w/m<sup>2</sup>°C
- Insulated versions meet Dublin Corporation requirements for Break Tanks

## Installation & Delivery

- Fast delivery: Stock tanks available within 2-3 working days
- Next day delivery available for standard models
- Nationwide delivery throughout UK and Ireland
- Economical alternative to sectional tanks where space permits
- Quick installation process
- Suitable for direct placement on concrete plinth, RSJ beams, or timber beams (base must be fully supported)

## Applications

- Domestic water storage
- Small commercial buildings
- Residential developments
- Hotels and guesthouses
- Care homes
- Schools
- Retail outlets
- Small industrial applications
- Break tank installations

## Certifications

- WRAS Approved for potable water
- BS EN ISO 9002:1994 Quality Assurance
- Complies with all relevant British Standards and Water Regulations
- Suitable for storing water up to 30°C
- Specialist resins available for mild and aggressive chemicals

# 8. Tricel Water Solutions for Data Centre Applications

## 8.3 FIRE SUPPRESSION WATER STORAGE TANKS

Specialized water storage tanks designed specifically for fire protection systems, including sprinkler systems and water mist suppression.

### A. LPCB APPROVED FIRE SPRINKLER TANKS

- Minimum: 135,000 litres (depending on hazard group)
- Maximum: Up to 1,300 m<sup>3</sup> (1,300,000 litres)
- Custom sizes available based on project requirements

### Certifications & Standards:

- LPCB Approved: Loss Prevention Certification Board certified
- LPS 1276 Issue 2.0: Fire sprinkler protection system standards
- LPS 1048-1: Sprinkler contractor approval scheme (UK & Ireland)
- BS EN 12845:2015+A1:2019: Fixed firefighting systems—automatic sprinkler systems
- BS 9251: Fire sprinkler systems for residential and domestic occupancies
- BS 5306 Part 2: Fire extinguishing installations and equipment—Sprinkler systems

### Hazard Group Classification:

Tanks are sized according to building hazard classification per BS EN 12845:

Light Hazard (LH):

Typical buildings: Hospitals, hotels, libraries, restaurants, schools, offices, data processing offices

Minimum capacity: 135,000–185,000 litres

### Ordinary Hazard Group 1 (OH1):

Typical buildings: Laboratories, laundries, car parks, leather goods factories, museums

Minimum capacity: 185,000+ litres

### Ordinary Hazard Group 2 (OH2):

Typical buildings: Broadcasting studios, railway stations, plant rooms, farm buildings

Minimum capacity: 185,000+ litres

### Ordinary Hazard Group 3 (OH3):

Typical buildings: Department stores, shopping centres, paper/cardboard factories, bookbinding

Minimum capacity: Variable based on floor area

### High Hazard:

Industrial facilities with flammable materials

Customized capacity calculations required

# 8. Tricel Water Solutions for Data Centre Applications

## Design Considerations

Tricel ensures each sprinkler tank is tailored based on:

- Building volume and floor area
- Occupancy type and fire risk classification
- Hydraulically most demanding area
- Required flow rate (L/min) and duration (typically 30–90 minutes)
- Hose reel and hydrant provisions
- Local fire authority requirements
- Insurance underwriter specifications

## Construction Features

- Corrosion-resistant for long-term reliability
- Modular panel assembly for confined spaces
- Minimal maintenance requirements
- Durable construction for harsh environments
- Ancillary items typically fitted:
  - Hydrostatic contents gauge (measures water level)
  - Pressure monitoring systems
  - Pump connection provisions
  - Test and drain connections
  - Overflow and vent arrangements

Other Tank Configurations include:  
FIRE PROTECTION MISTING TANKS  
COMBINED TANK AND PUMP SYSTEMS (CTPS)  
STORMWATER ATTENUATION SYSTEMS

## Applications

- Data centres and telecommunications facilities
- Hospitals and healthcare centres
- Hotels and residential buildings
- Commercial offices and banks
- Shopping centres and retail
- Schools and universities
- Industrial facilities
- Warehouses and distribution centres
- Museums and archiving centres

## Additional Resources

- Water tank calculators (online sizing tools)
- Technical specification sheets
- Installation manuals
- CAD drawings
- Capacity tables
- White papers
- Case studies and project references
- Product brochures (sectional tanks, one-piece tanks, fire suppression)
- Regulatory compliance guides



# 9. Case Study: Global Data Centre

## **Case Study: Process Water Storage Resilience in a Global Data Centre Environment**

### **Project Overview**

A large-scale global data centre facility in the South of England commissioned a process water storage installation to support critical cooling infrastructure. The project formed part of a wider capacity expansion programme driven by escalating digital storage demand and the corresponding need for resilient thermal management systems.

The installation was delivered by Tricel Water and centred on the supply and commissioning of sectional GRP water storage tanks designed specifically for continuous process cooling applications.

### **Infrastructure Context: Cooling as a Mission-Critical Function**

Data centres operate at extremely high thermal loads due to dense concentrations of servers, telecommunications hardware, and storage systems. As compute intensity rises, so too does reliance on mechanical and adiabatic cooling systems to maintain operational temperatures.

Cooling and power continuity therefore represent dual pillars of uptime assurance. Any interruption to cooling water availability can result in thermal escalation, hardware failure, and immediate service disruption.

To mitigate this risk, the facility deployed an adiabatic cooling strategy. This method uses evaporative processes to regulate temperature while reducing water and energy consumption compared with conventional cooling towers. Documented benefits include reduced electrical demand, lower operating costs, and decreased Legionella risk exposure.



# 9. Case Studies

## **System Design and Technical Configuration**

The installed solution comprised:

- Six hot-press sectional GRP water storage tanks
- Externally flanged sides and base construction
- Individual tank dimensions: 3.00 m × 3.00 m × 3.00 m
- Nominal capacity per tank: 27,000 litres
- Total installed storage capacity: 162,000 litres

The modular sectional format enabled installation within spatial and structural constraints while maintaining high volumetric capacity.

From an operational standpoint, the cooling system required only three tanks to maintain full process performance. The remaining three tanks were configured as contingency assets within a failover architecture.

## **Resilience Engineering: Built-In Redundancy**

This six-tank configuration reflects a deliberate resilience design model common in critical infrastructure environments:

- N+3 redundancy for process cooling supply
- Live operational tanks balanced against standby reserves
- Maintenance flexibility without system shutdown
- Emergency response buffering

Such redundancy ensures that storage failure, contamination events, or mechanical damage do not immediately translate into cooling loss.

## **Incident Event: Environmental Impact Stress Test**

Shortly after commissioning, the installation faced an unplanned environmental stress event. A severe storm uprooted a large tree which fell onto the tank array, causing significant structural damage to two units.

Despite the physical impact, cooling operations remained uninterrupted.

Because the system had been engineered with three standby tanks, sufficient storage and supply continuity were preserved while remedial works were undertaken. This incident provided a real-world validation of the redundancy model.

[Explore Similar Tricel Installations](#)

# 9. Case Studies

## **Operational Risk Avoidance**

For hyperscale and enterprise data centres, downtime carries exceptional financial and reputational exposure. In this facility's case, estimated revenue risk associated with service interruption was reported at up to £1 million per day, excluding secondary impacts such as contractual penalties or public incident disclosure. By maintaining uninterrupted cooling water supply, the storage infrastructure functioned as a protective buffer between physical asset damage and digital service failure.

## **Compliance and Water Quality Assurance**

All potable water storage elements supplied for the project were manufactured to recognised regulatory standards, including WRAS/Reg.4 approval, ensuring suitability for drinking water and broader commercial applications.

Standards compliance in data centre environments supports:

- Water hygiene assurance
- Regulatory alignment
- Risk reduction in dual-use storage systems
- Long-term asset certification

## **Engineering Outcomes**

Key delivery results included:

- High-capacity process water storage for continuous cooling
- Modular sectional design for constrained plant environments
- Integrated redundancy to Tier-aligned resilience principles
- Demonstrated operational continuity under storm damage conditions
- Reduced cooling system risk exposure

## **Strategic Relevance to CNI Data Centres**

This installation illustrates the structural role of water storage within Critical National Infrastructure digital facilities:

- Cooling continuity underpins compute availability
- Storage redundancy safeguards uptime
- On-site reserves mitigate environmental and mechanical risk
- Engineered capacity supports 24×7 thermal regulation

In resilience modelling terms, water storage operates not as passive infrastructure but as an active risk-control layer within the data centre's operational envelope.

# 10. Water Storage System Implementation

## Step-by-Step: Water Storage Implementation Guide

### Step 1: Conduct Water Risk Assessment

Assess mains supply reliability, climate vulnerability, and regulatory requirements. Review historical outages, water quality records, and local water stress indicators. Engage specialists to calculate worst-case scenarios.

### Step 2: Size Storage for Critical Loads

Calculate required capacity: cooling makeup water (L/hour), fire system flow rate (L/min), and duration of autonomy (24-120 hours). Use sizing formulas and add 10-15% buffer. Document calculations for compliance.

### Step 3: Select Tank Type and Location

Choose based on: available space (above/below ground), structural load capacity, access for installation and maintenance, proximity to cooling systems, and budget. Modular GRP tanks suit most retrofit applications.

### Step 4: Design Integration Systems

Plan connections to: cooling loops (makeup water), fire suppression (sprinklers/hydrants), BMS (monitoring), water treatment (filtration/dosing), and mains supply (backup feed). Include isolation valves and meters.

### Step 5: Specify Treatment and Monitoring

Design water treatment: filtration for cooling towers, chlorination for fire systems, and biocide dosing for Legionella control. Install sensors for level, flow, quality monitoring, and leak detection with BMS integration.

### Step 6: Obtain Approvals and Procure

Submit plans to building control, water authority, and fire authority for approval. Procure WRAS-approved tanks, certified treatment systems, and monitoring equipment. Verify supplier certifications and lead times.

### Step 7: Install and Commission

Complete structural work, tank installation, plumbing connections, treatment systems, controls integration, and pressure testing. Commission with full functional tests, water quality analysis, and operator training (typical duration: 4-12 weeks).

### Step 8: Establish Maintenance Programme

Implement schedule: weekly inspections, monthly testing, quarterly Legionella sampling, annual cleaning, biennial audits. Train staff on procedures, document all activities, and integrate into Business Continuity Plan.

Submit Project Drawings  
for Review

# 11. Recommendations for CNI Data Centre Operators

## Recommendations for CNI Data Centre Operators

1. Conduct a water resilience assessment: Quantify cooling water demand under normal and peak conditions. Identify single points of failure in supply infrastructure.
2. Size storage for site-specific risks: Account for local supply reliability, alternative sources, and regulatory requirements. Tier III sites should target 48–72 hours; Tier IV sites 72–120 hours.
3. Implement redundant systems: Use multiple tanks or segmented designs to avoid total capacity loss during maintenance or failure.
4. Integrate with BMS: Real-time monitoring enables rapid response to supply issues and supports predictive maintenance.
5. Maintain regulatory compliance: Schedule inspections per BS 8558:2015 and HSE L8. Engage water safety specialists for audits.
6. Explore supplementary sources: Rainwater harvesting and water reuse reduce mains dependency where economically viable.
7. Plan for climate change: Model storage requirements under drought scenarios. Review capacity every 3–5 years as climate projections evolve.

Obtain a Data Centre  
Project Quotation

# Conclusion

Water storage is a fundamental component of resilience in CNI data centres. Adequate reserves buffer against supply interruptions, support cooling infrastructure, and ensure compliance with UK regulations. Sizing, design, and integration decisions should reflect site-specific risks, cooling system characteristics, and operational criticality.

As climate variability increases and regulatory scrutiny intensifies, investment in water storage and efficiency measures will become increasingly necessary for operators seeking to maintain uptime and meet environmental obligations.

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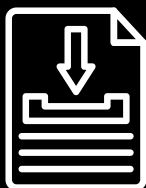
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## Disclaimer

*This whitepaper is provided for general guidance and information purposes only. It does not constitute engineering advice and should not be relied upon as the sole basis for design decisions. All installations must be designed by a suitably qualified engineer with reference to the current applicable standards, regulations, and site-specific conditions. The author accepts no liability for loss or damage arising from reliance on this document.*

Start Your Resilience Project Today and ensure full technical compliance from the outset. Share duty type, accreditation requirements, and installation details. We will align the design to relevant standards and include base levelling steels on sectional tank bases unless specified otherwise.



Downloads



Tank Sizing Calculator



+44 (0)1934 314 079

## Frequently Asked Questions

### **Q1: How much water storage does a CNI data centre need?**

The required water storage depends on your data centre tier and cooling system. Tier III facilities typically require 24-48 hours of cooling water (200-500 m<sup>3</sup>), while Tier IV facilities need 48-120 hours (500-1,500 m<sup>3</sup>). Add 400-800 m<sup>3</sup> for fire suppression in a 5,000 m<sup>2</sup> facility. A 10 MW Tier IV data centre with evaporative cooling would need approximately 1,000-1,850 m<sup>3</sup> total storage capacity.

### **Q2: What are the UK legal requirements for data centre water storage?**

UK data centres must comply with several regulations: Water Industry Act 1991 governs supply and quality; Water Supply (Water Fittings) Regulations 1999 requires backflow prevention and contamination control; Building Regulations Part G sets water efficiency standards; BS 8558:2015 provides design standards; and HSE L8 mandates Legionella risk assessments every 2 years. Non-compliance can result in fines up to £20,000, enforcement notices, or supply disconnection.

### **Q3: How do you calculate water storage tank size for a data centre?**

Follow this calculation: (1) Determine cooling load in MW; (2) Calculate daily water consumption: cooling load × 24 hours × water use rate (1.2-1.8 L/kWh for evaporative cooling); (3) Multiply by desired autonomy days (typically 2-5 days); (4) Add fire suppression reserve based on BS EN 12845:2015 (typically 400-800 m<sup>3</sup> for a standard facility); (5) Add 10-15% buffer for maintenance and peak demand. Total = (daily cooling water × autonomy days) + fire reserve + buffer.

### **Q4: What is the difference between potable and non-potable water storage?**

Potable water storage holds drinking-quality water meeting UK water quality regulations, requires WRAS-approved tanks with food-grade linings, and is used for welfare facilities and some cooling applications. Non-potable water storage holds treated or rainwater not suitable for drinking, can use standard industrial-grade tanks, and is used exclusively for cooling towers, fire suppression, and process water. Separate storage prevents cross-contamination and reduces treatment costs for non-potable applications.

### **Q5: How much does a data centre water storage system cost?**

Capital costs vary by size and type: above-ground GRP tanks cost £200-400/m<sup>3</sup>; below-ground cisterns cost £400-800/m<sup>3</sup> including excavation; complete 1,000 m<sup>3</sup> system costs £400,000-1,000,000. Annual operational costs include: water supply (£1.50-3.00/m<sup>3</sup>), treatment chemicals (£5,000-15,000), testing and compliance (£3,000-8,000), and maintenance (2-5% of capital cost). ROI typically achieved in 1.9-2.3 years through avoided downtime.

## Frequently Asked Questions

### **Q6: What maintenance is required for data centre water tanks?**

Regular maintenance includes: weekly visual inspections (15 minutes); daily automated level checks; monthly pH and turbidity testing (30 minutes); quarterly Legionella sampling (1 hour) per HSE L8; annual tank cleaning (2-4 days); annual backflow device testing (2 hours); monthly fire pump testing (1 hour); and biennial full system audits (1 week). All maintenance must be documented for compliance with BS 8558:2015 and Water Supply Regulations.

### **Q7: Can existing data centres retrofit water storage systems?**

Yes, retrofitting is feasible using modular GRP tank systems that can be installed with minimal disruption. Installation typically takes 1-2 weeks and can be completed during planned maintenance windows. Key considerations include: structural load assessment for rooftop installations, space availability (above or below ground), integration with existing cooling infrastructure, BMS connectivity, and compliance with current regulations. Tricel's sectional tanks are specifically designed for retrofit applications with restricted access.

### **Q8: How does climate change affect data centre water storage planning?**

Climate change increases water storage requirements through: more frequent droughts reducing mains water reliability (2022 UK drought affected multiple regions); higher ambient temperatures increasing cooling water consumption by 10-20%; water stress leading to stricter abstraction limits and use restrictions; and regulatory changes mandating greater resilience. Best practice: model storage under drought scenarios, review capacity every 3-5 years, implement rainwater harvesting (can offset 15-30% of consumption), and plan for 20% capacity buffer above current needs.

### **Q9: What certifications must water storage tanks have in the UK?**

Essential certifications include: WRAS (Water Regulations Advisory Scheme) approval for all tanks contacting potable water; BS EN 12845:2015+A1:2019 compliance for fire suppression tanks; LPCB (Loss Prevention Certification Board) approval for insurance requirements; NSF/ANSI 61 certification for drinking water contact; BBA (British Board of Agrément) approval for attenuation systems; and CE marking for construction products. Tricel tanks hold all relevant certifications for their intended applications.

## Frequently Asked Questions

### **Q10: How long does it take to install a water storage tank?**

Installation timeframes vary by type and size: modular GRP tanks (18–500 m<sup>3</sup>) take 3–10 days from delivery to commissioning; large sectional tanks (500–5,000 m<sup>3</sup>) require 2–4 weeks including assembly and testing; below-ground concrete cisterns need 6–12 weeks including excavation, construction, and backfill; complete turnkey systems with pumps, controls, and integration take 8–16 weeks from order to operation. Tricel's modular designs enable fastest installation, often completed over a single weekend shutdown.

### **Q11: Can rainwater be used in CNI data centres?**

Yes, rainwater harvesting is viable for non-potable cooling water. UK rainfall (average 1,154 mm/year) can yield 50–70% of roof area annually. A 5,000 m<sup>2</sup> roof yields approximately 2,900–4,000 m<sup>3</sup>/year, offsetting 20–30% of typical cooling water demand. Requirements include: multi-stage filtration to 100-micron level, separate storage from potable water, treatment with biocides for cooling tower use, automated mains water backup, and compliance with BS 8515:2009. Initial investment of £50,000–150,000 for complete system typically pays back in 5–8 years.

### **Q12: What happens if a water storage tank fails?**

Tank failure triggers emergency protocols: immediate switch to redundant tank (if installed); activation of emergency water delivery contracts (tankers provide 28 m<sup>3</sup>/trip); reduction of non-critical cooling loads; increase in air-cooled backup systems; and notification of facilities management and senior leadership. Prevention measures include: annual structural inspections, redundant tank configurations, continuous level monitoring with alarms, regular leak detection system tests, and maintaining emergency supplier contracts. Insurance requires documented maintenance and compliance with BS standards.

### **Q13: How do water storage requirements differ between Tier III and Tier IV data centres?**

Tier III facilities (N+1 redundancy) require: 24–48 hours cooling water autonomy (300–700 m<sup>3</sup> for 5 MW); single fire suppression reserve (400–600 m<sup>3</sup>); total storage typically 700–1,300 m<sup>3</sup>; acceptable to use single large tank with compartments. Tier IV facilities (2N or 2N+1 redundancy) require: 48–120 hours cooling water autonomy (600–2,100 m<sup>3</sup> for 5 MW); duplicate fire reserves (800–1,200 m<sup>3</sup>); total storage typically 1,400–3,300 m<sup>3</sup>; mandatory use of redundant tank systems with independent feeds. Tier IV design ensures maintenance can occur without capacity reduction.

## Frequently Asked Questions

### **Q14: What is the best material for data centre water storage tanks?**

GRP (glass-reinforced plastic) is optimal for most data centre applications due to: 25-30 year lifespan; no corrosion requiring zero coating maintenance; lightweight construction (15-25 kg/m<sup>3</sup>) reducing structural loads; modular assembly enabling confined space installation; food-grade epoxy coating preventing bacterial growth; and competitive cost (£200-400/m<sup>3</sup>). Alternative materials: stainless steel for potable water where hygiene is critical (£600-900/m<sup>3</sup>); concrete for very large below-ground installations (50+ year life); HDPE for rainwater collection (£150-300/m<sup>3</sup>). Tricel specialises in GRP tank manufacturing with over 60 years experience.

### **Q15: How does water storage integrate with Building Management Systems?**

Modern water storage integrates with BMS platforms through: ultrasonic or radar level sensors providing real-time capacity monitoring ( $\pm 1\%$  accuracy); electromagnetic flow meters tracking consumption and detecting leaks; water quality sensors measuring temperature, pH, conductivity, and turbidity; motorised valves enabling automated filling and isolation; pressure transducers monitoring pump performance; and moisture sensors detecting tank base leaks. Integration enables: automated low-level alarms, predictive maintenance through trend analysis, remote monitoring and control, integration with cooling system controls, and compliance reporting. Standard communication protocols include Modbus, BACnet, and SNMP.

### **Q16: What are the insurance implications of inadequate water storage?**

Insufficient water storage can result in: invalidated fire insurance if sprinkler reserves don't meet BS EN 12845:2015 requirements; increased premiums for business interruption cover (20-40% higher); denied downtime claims if operator didn't maintain adequate cooling reserves; mandatory risk assessments and remediation plans; and potential coverage exclusions for water-related incidents. Adequate storage demonstrates: reasonable care and due diligence; compliance with industry standards; investment in risk mitigation; and reduced actuarial risk. Insurance surveys typically require documented storage capacity calculations, maintenance records, and compliance certifications.

### **Q17: What is the average cost per cubic metre for data centre water storage in the UK?** Direct answer: £200-800/m<sup>3</sup>

### **Q18: How long does it take for water storage investment to pay for itself?**

Direct answer: 1.9-2.3 years ROI

### **Q19: What happens during a mains water supply failure without adequate storage?** Direct answer: Cascading failures within 2-6 hours

### **Q20: Can a data centre operate on 100% rainwater harvesting?** Direct answer: No, but 15-30% offset possible

### **Q21: What are the legal penalties for non-compliance with UK water storage regulations?** Direct answer: £5,000-£20,000 plus prosecution

# Glossary

## **Abstraction licence**

Legal permission to extract water from a surface water or groundwater source, issued by the Environment Agency in England.

## **Attenuation tank**

Storage system designed to temporarily hold stormwater runoff and release it at a controlled rate to prevent drainage infrastructure overload.

## **Backflow prevention**

Measures to prevent contaminated water from flowing back into the mains water supply. Includes air gaps and check valves.

## **BCP (Business Continuity Plan)**

Documented procedures to maintain or recover critical business functions during and after a disruptive event.

## **Biofilm**

Layer of microorganisms that adheres to surfaces in contact with water. Can harbour Legionella bacteria and reduce heat transfer efficiency in cooling systems.

## **Biocide**

Chemical agent used to control bacterial growth in cooling water systems.

## **Blowdown**

Process of removing a portion of water from a cooling system to control the concentration of dissolved solids and prevent scaling.

## **BMS (Building Management System)**

Computerised control system that monitors and manages building services including heating, ventilation, air conditioning, and water systems.

## **BS (British Standard)**

Technical specification or code of practice published by the British Standards Institution.

## **BS 8558:2015**

British Standard code of practice for water-efficient water supply systems in buildings.

## **BS EN 1717:2000**

British Standard specifying requirements for backflow prevention in water systems.

## **BS EN 12845:2015+A1:2019**

British Standard specifying requirements for fixed firefighting systems, including sprinkler system water storage.

## **Building Regulations Part G**

UK building regulations setting standards for sanitation, hot water safety, and water efficiency in buildings.

## **Capacity (storage)**

Volume of water that can be held in a tank or reservoir, measured in cubic metres (m<sup>3</sup>) or litres.

## **Chiller**

Refrigeration system that removes heat from water or air. In data centres, chillers cool water circulated to computer equipment or air handling units.

## **Closed-loop chiller**

Cooling system where the same water circulates continuously between the chiller and cooling load, with minimal makeup water required.

## **CNI (Critical National Infrastructure)**

Assets, systems, and networks essential for the functioning of society, economy, and government. Includes telecommunications, energy, finance, healthcare, and transport sectors.

## **Condensation**

Process by which water vapour transforms into liquid water when cooled.

## **Condenser water loop**

Secondary water circuit in a chiller system that transfers heat from the refrigerant to a cooling tower or other heat rejection device.

# Glossary

## **Contamination**

Introduction of harmful substances or microorganisms into water, rendering it unsuitable for its intended use.

## **Corrosion**

Gradual deterioration of materials, typically metals, through chemical or electrochemical reactions with their environment.

## **Downtime**

Period during which a system or facility is not operational.

## **Drought**

Extended period of below-average precipitation resulting in water shortage.

## **Evaporation**

Process by which liquid water transforms into water vapour. In cooling systems, evaporation removes heat from water.

## **Evaporative cooling**

Method of heat rejection where water is evaporated to remove thermal energy from a building or process.

## **Evaporative cooling tower**

Device that cools water by allowing a small portion to evaporate whilst air flows through the tower.

## **Filtration**

Process of removing particulate matter from water by passing it through a porous medium.

## **Fire suppression system**

Equipment designed to detect and extinguish fires, including sprinklers, hydrants, and water storage tanks.

## **First flush diverter**

Device in rainwater harvesting systems that diverts initial roof runoff, which contains the highest concentration of contaminants.

## **Geocellular units**

Modular plastic structures used for stormwater attenuation or storage, typically installed underground.

## **Greywater**

Wastewater from domestic activities such as washing, excluding toilet discharge. Can be treated and reused for non-potable purposes.

## **GRP (Glass-Reinforced Plastic)**

Composite material consisting of glass fibres embedded in a plastic resin matrix. Also known as fibreglass. Used in tank construction for its corrosion resistance and strength.

## **Heat exchanger**

Device that transfers thermal energy from one fluid to another without the fluids mixing.

## **Heat transfer medium**

Substance used to move thermal energy from one location to another. In data centres, water is commonly used.

## **HSE (Health and Safety Executive)**

UK regulatory body responsible for workplace health and safety.

## **Hydrant**

Water outlet connected to a pressurised water supply, used for firefighting.

## **Immersion cooling**

Method of cooling electronic components by submerging them in a thermally conductive but electrically insulating liquid.

## **L8**

HSE Approved Code of Practice for the control of Legionella bacteria in water systems.

# Glossary

## **Leaching**

Process by which soluble substances are dissolved and carried away from materials by water. Can contaminate stored water if unsuitable materials are used in tank construction.

## **Legionella**

Genus of bacteria that can cause Legionnaires' disease, a severe form of pneumonia. Grows in water systems maintained at temperatures between 20°C and 45°C.

## **LPCB (Loss Prevention Certification Board)**

Independent certification body that approves fire protection products and services.

## **Makeup water**

Fresh water added to a cooling system to replace water lost through evaporation, blowdown, or leakage.

## **Mains supply**

Municipal water supply delivered through underground pipes operated by water companies.

## **Modular system**

Storage solution composed of prefabricated units that can be assembled on-site and expanded incrementally.

## **N+1 redundancy**

System design where one additional component beyond the minimum required capacity is provided to maintain operation if one component fails.

## **NSF/ANSI 61**

North American standard certifying materials and components for contact with potable water.

## **Overflow pipe**

Outlet that allows excess water to discharge safely from a tank when capacity is exceeded, preventing structural damage.

## **pH**

Measure of water acidity or alkalinity on a scale of 0–14, where 7 is neutral, below 7 is acidic, and above 7 is alkaline.

## **Ponemon Institute**

Research organisation that conducts independent studies on data protection, information security, and data centre operations.

## **Potable water**

Water safe for human consumption, meeting quality standards set by drinking water regulations.

## **Power Usage Effectiveness (PUE)**

Metric expressing data centre energy efficiency. Calculated as total facility energy divided by IT equipment energy. Lower values indicate higher efficiency.

## **Predictive maintenance**

Maintenance strategy using data analysis to predict when equipment failure might occur, allowing intervention before breakdown.

## **Rainwater harvesting**

Collection and storage of rainwater from roof surfaces for subsequent use in non-potable applications.

## **Redundancy**

Provision of backup systems or components to maintain operation when primary systems fail.

## **Resilience**

Ability of a system to maintain operation or rapidly recover from disruptive events.

# Glossary

## **Reverse osmosis**

Filtration process that removes dissolved solids from water by applying pressure to force it through a semipermeable membrane.

## **Runoff**

Water from precipitation that flows over land surfaces rather than infiltrating into soil.

## **Scaling**

Deposit of minerals on heat transfer surfaces or pipes, reducing system efficiency and potentially causing blockages.

## **Sectional tank**

Storage tank assembled on-site from prefabricated panels. Allows installation in locations with restricted access.

## **Sprinkler system**

Fire suppression system that automatically discharges water through outlets activated by heat.

## **Tier III data centre**

Data centre classification with N+1 redundancy for all critical systems and ability to perform maintenance without shutdown. Target availability: 99.982% annually.

## **Tier IV data centre**

Data centre classification with 2N or 2N+1 redundancy for all critical systems and fault-tolerant design. Target availability: 99.995% annually.

## **Turbidity**

Measure of water clarity, indicating the presence of suspended particles. High turbidity suggests contamination or inadequate filtration.

## **Uptime**

Percentage of time a system or facility is operational and available for use.

## **Vermin screen**

Mesh or grille fitted to tank openings to prevent entry of rodents and insects.

## **Water fittings**

Pipes, taps, valves, and other components used to convey or control water within a building or facility.

## **Water Industry Act 1991**

UK legislation governing water supply, sewerage services, and the regulation of water companies.

## **Water Reuse Regulation (EU 2020/741)**

European Union regulation setting minimum quality requirements for reclaimed water used for agricultural irrigation. Retained in UK law post-Brexit.

## **Water stress**

Condition where water demand exceeds available supply during a specific period, or where poor quality restricts use.

## **Water Supply (Water Fittings) Regulations 1999**

UK regulations setting requirements for the design, installation, and maintenance of plumbing systems to prevent waste, contamination, and misuse of water.

## **WRAS (Water Regulations Advisory Scheme)**

UK scheme that approves products and fittings for use in potable water systems, ensuring compliance with water regulations.

## **2N redundancy**

System design providing double the minimum required capacity, with fully independent systems. If one complete system fails, an identical backup system maintains operation.

## **2N+1 redundancy**

System design providing double the minimum required capacity plus one additional component, offering higher reliability than 2N alone.



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