

M&E Specification for Water Leak Detection in Buildings

Purpose of this Document

This specification outlines the requirements for an advanced leak detection system to be incorporated into modern buildings. It is intended to guide main and M&E contractors in delivering a solution that addresses water management, risk mitigation, and regulatory compliance while supporting ESG objectives. The specified system must meet the following requirements.

1. Introduction

The leak detection solution must consist of the following core components, as illustrated in the accompanying schematic diagram [to be provided]:

- **(A)** In-line leak detection for monitoring the freshwater supply.
- **(B)** Point leak detection for targeted monitoring (e.g., beneath appliances, riser cupboards).
- **(C)** A local communications hub for system connectivity.
- **(D)** A centralised property management dashboard for monitoring and analytics.
- **(E)** A resident and managers mobile applications
- **(F)** Local and cloud-based APIs for integration with Building Management Systems (BMS).

The system must:

1. Detect both rapid water escapes and persistent low-flow leaks, including pinhole leaks, from freshwater supplies or appliances.
2. Automatically shut off the water flow upon detection of a leak.
3. Notify property managers or residents with real-time alerts.

The system must also include a secure, GDPR-compliant platform for remote access to system status, alerts, and consumption data. API integration with existing BMS or smart home systems must be supported.

2. Physical and Operational Requirements

2.1. In-line Leak Detection

- The leak detection unit must be positioned immediately downstream of the dwelling water meter and stopcock, positioned as indicated in the engineers' drawings (this may be in the riser cupboard, if applicable, or the dwelling itself).
- The device must be equipped with an ultrasonic flow meter, ensuring high precision detection capabilities, including low flows of 100 ml per minute or less.
- The device must be equipped with a pressure sensor.
- The device must be equipped with a water temperature sensor, and, preferably, with an ambient temperature sensor.
- Operating temperatures must range from 0°C to 70°C.
- The device should sustain operating pressures of up to 10 bar.
- The device must be able to shut off the water supply within 1 min if configured to do so.
- The device may be specified in WiFi or 868MHz variants, to suit building and operational needs.
- The device should support local communication options (e.g., Bluetooth) to allow users to read its status and water consumption via a mobile phone, even when operating offline (i.e., without Internet access).
- Dimensions should not exceed 250mm x 125mm x 100mm, allowing straightforward installation and maintenance in restricted spaces.

2.2. Point Leak with Temperature and Humidity Monitoring

- The leak detection unit must be positioned beneath areas at risk.
- The unit must be equipped with gold-plated contacts capable of detecting conductivity enabled by pooled water in the local area concerned.
- The unit must be equipped with temperature and humidity sensors.
- Operating temperatures must range from 0°C to 40°C.
- The unit should be equipped with a local sounder and flashing LEDs to provide an audible and visual alert when triggered.
- The unit shall be capable of reliable wireless communication over WiFi or 868MHz networks.
- The unit shall be battery powered with an in-use battery life of no less than 2 years.
- The unit shall be rated at IPX7 or better.
- The device must be able to provide a signal to the management platform within 1 min if configured to do so.
- Dimensions should not exceed 100mm x 100mm x 10mm, allowing straightforward installation and maintenance in areas of restricted height (e.g. beneath appliances).

2.3. Communications Hub

- The communications hub shall be designed to bridge local comms (WiFi or 868MHz) and building networks (using WiFi or wired ethernet).
- The unit may be mains-powered by means of a local switched-mode PSU unit or via PoE.
- The unit must be equipped with a status indicator light or display allowing an engineer or resident to determine if it is powered up and if it is connected to the platform.
- Operating temperatures must range from 0°C to 40°C.
- Dimensions should not exceed 100mm x 100mm x 30mm, allowing straightforward installation and maintenance in restricted spaces.

3. System Sensing and Detection Capabilities

In addition to measuring water flows, the system must provide the following capabilities:

- **Pressure Sensing:** The system must continuously monitor the water pressure and alert users to any loss of pressure from the supply network. It must also perform daily pressure tests to detect pinhole leaks and ensure the integrity of the water supply.
- **Temperature Sensing:** The system must monitor water and ambient temperatures, providing freeze alerts to prevent frost damage and protect property assets.
- **Legionella Risk Signaling:** The system must assess and flag potential Legionella risks by analysing telemetry data from temperature and flow sensors. This must support compliance with relevant health and safety standards.

4. Functional Components and Features

- **Certifications:** The in-line devices should be WRAS-approved and come with CE and UKCA declarations.
- **Power Supply:** For uninterrupted service, the in-line devices must use mains power with an option for battery backup. The battery backup must use commonly available batteries, such as AA, and not proprietary options.
- **Pipe Compatibility:** The in-dwelling device shall allow for the accommodation of pipe diameters between 15mm and 28mm, employing couplers if required.
- **Alerts:** Any alert from the device should be audible and visible for immediate attention.
- **Manual Override:** Manual override functionality shall be available with a prominent physical handle to bypass electronic operations, ensuring accessibility during power outages.
- **Remote Valve Operation:** Valve operation via remote control should remain unaffected by the position or potential obstruction of the manual override handle.

5. Connectivity and Remote Control

- The devices must be capable of forming part of a connected system that monitors the water flow, temperature, and pressure as well as the dwelling humidity, if required.
- The overall solution shall ensure comprehensive consumption data is presented and accessible through an online platform
- Authorised users should have access to disaggregated views of categories of appliances and their consumption of water.
- The solution shall allow property owners or managers to configure the system's shut off response – either through automatic action or the provision (and destination) of notifications.
- In scenarios where user responses are not received, the system should automatically call the resident or manager.

6. Offline Functionality

The in-dwelling system should provide a default shut-off function in an offline mode (i.e. with no connectivity to a BMS or the Internet), safeguarding assets even in the absence of internet connectivity. In such scenarios, the device will operate autonomously, ensuring consistent protection against potential leaks.

7. Platform Features

7.1 Core Functionality

- Mobile App and Web Admin Dashboards are both required.
- The platform shall clearly indicate the valve's state and allow remote operation.
- The platform shall provide an alert when backup batteries need replacement.
- The platform shall provide an alert if communication with devices is lost due to connectivity problems (e.g. WiFi is down).
- A robust API is required for integration with other management systems.
- The API shall enable integration for two-way connection to smart home setups and Building Management Systems.
- The platform must offer multi-layer user access controls, including administrative/resident privileges and guest or invited user roles.
- The platform shall provide functionality for a single user to oversee multiple properties from both the web dashboard and the mobile application.
- Admin users should have the provision to invite additional users to access and monitor property data.

- Enhanced security, incorporating two-factor authentication (2FA), shall be enabled to manage access to the web dashboard.
- The platform, whilst GDPR-compliant, shall allow for the retention of essential data, providing an audit trail for both pressure tests and Legionella risk alerts, maintained for a minimum of 30 days.
- Automated monthly reports on Legionella risk should be obtainable for the benefit of property administrators.
- Automated daily summaries of issues and risks should be configurable so that the facilities management team can receive them via email.
- An incident escalation pipeline must be capable of initiating multiple types of communication with residents and the facilities management team to ensure swift action. This must include, as a minimum, mobile app push notifications, text messages, emails, and automated phone calls.

7.2 Advanced Insights and Sustainability Features

- **Cost Monitoring:** The platform should provide authorised users with the ability to view water costs, with configurable settings to account for both fixed and variable pricing structures.
- **Carbon Footprint Estimation:** The platform should calculate and display the estimated carbon footprint associated with water usage, as measured by the in-line devices.
- **Data Export:** Administrators and authorised users must be able to export platform data (e.g., water consumption) in formats such as CSV files.
- **Benchmarking and Fair Usage:** Administrators must have the ability to set configurable 'fair usage' thresholds for residents. The platform must support benchmarking functionality to compare user consumption against these thresholds, encouraging water conservation.

8. Installation and Commissioning

Installation shall be performed during construction (after which the in-line device shall be protected against dust and mechanical damages) or retrofitted following the completion of all construction activities within the designated area (and thorough cleaning).

Post-installation commissioning per manufacturer guidelines is required to enable end-to-end communications and allow functional testing.

9. Upgrades and Warranty

- The system should support over-the-air firmware upgrades to all hardware devices, ensuring residents and managers can benefit from the latest features post-purchase.
- Extended warranty options must be available to ensure long-term reliability.