# Session 3

Paul McSoley

# Implementing Water Systems from Design to Installation

- Design Responsibility – Contractors perspective

- Avoiding common Water Regulations problems

- Design Issues impacting installation

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Silo
P1

# Design Responsibility Contractors perspective

BSRIA BG 6 is a framework for Building Services design.

It gives advice on the duties that the

- Building Services Designer
- The Architect
- The Principal Contractor
- The MEP Trade Contractor

Should be completing.

It is not a one sizes fits all for every procurement route and many problems consistently arise as a result.


Silo
P2

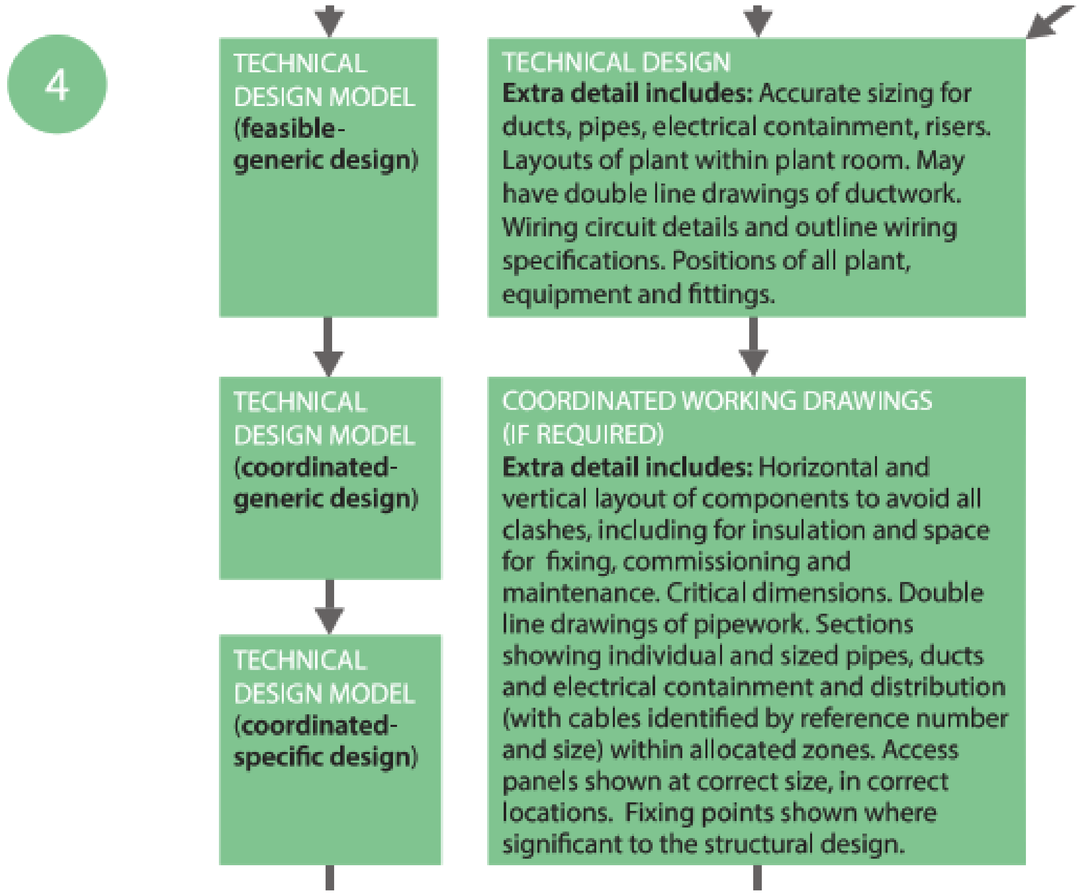
# Design Responsibility Contractors perspective

**Proforma 4a** covered the first part of building services technical design. The building services design advanced through detailed calculations or modelling to arrive at an engineering design and layout for each service from which coordination and installation were feasible. Where there was no building services contractor selected, the design used generic or typical components that could have been substituted during equipment procurement, or specified components where no such "equal or equivalent" substitution was permitted.

**Proforma 4b** covered the second part of building services technical design. The building services design was coordinated to remove all clashes. Where a building services contractor had been appointed, it was likely that the model and drawing deliverables from proforma 4b would have been omitted, that coordination took place using plant and components that were procured by the building services contractor, and that specialist design was incorporated at the same time. Where there was no building services contractor, coordination would have been in terms of specified or generic items.

**Proforma 4c** covered the third part of the building services technical design. The building services design was finalised, including details from specialists, and where changes occured the coordination of the design was checked. BSRIA's view was that if proforma 4c activities were allocated to the building services consultant then these almost certainly occurred after the building services contractor had been appointed, even if earlier proforma activities didn't.

BG 6 changes



# Design Responsibility Contractors perspective

| | Public health design |
|---|---|
| 4.7.1 | Finalise detailed design calculations for all public health services being included in the technical design in accordance with recognised national standards. |
| 4.7.2 | Determine detailed pipe sizes and routes for gravity and pumped drainage systems. |
| 4.7.3 | Determine final positions of cast-in drainage gullies ensuring coordination with structural design and final mechanical plant locations. |
| 4.7.4 | Finalise vent termination locations to coordinate around final AHU and air vent intake positions. |
| 4.7.5 | Determine final power, BMS and Controls interface requirements from equipment. |
| 4.7.6 | Coordinate all surface water domestic and waste water pipework rodding eye locations with other services, structural and architectural elements to ensure suitable maintenance access can be provided. |
| 4.7.7 | Verify storm water discharge flow rate satisfies planning and statutory authority requirements including SuDS. |
| 4.7.8 | Determine detailed routing of pipework and drainage to/from risers. |
| 4.7.9 | Carry out detailed design of pipework gradients for builders' work and coordination. |
| 4.7.10 | Modify distribution systems and equipment capacities as may be required based on coordination of procured equipment (4.3.25). |
| 4.7.11 | Make allowance for anchors, guides and provision for movement of services and systems due to thermal expansion and contraction and building movement. |
| 4.7.12 | Select and confirm location of fire collars and any other fire-stopping for public health systems. |
| 4.7.13 | Check all surface water, domestic and waste drainage discharge flow rates with external civils interface package. |
| 4.7.14 | Check all utility interface details (locations, pipe sizes and invert levels) with civils package to ensure internal and external services coordinate. |
| 4.7.15 | Design review. |

So what about

- Valve types?
- Equipment schedule?
- Plant Schedules?
- Sanitaryware?
- Actually what is Sanitaryware? It is defined by the Contract normally – don't assume what it is.
- What about materials?
- What about acoustics?

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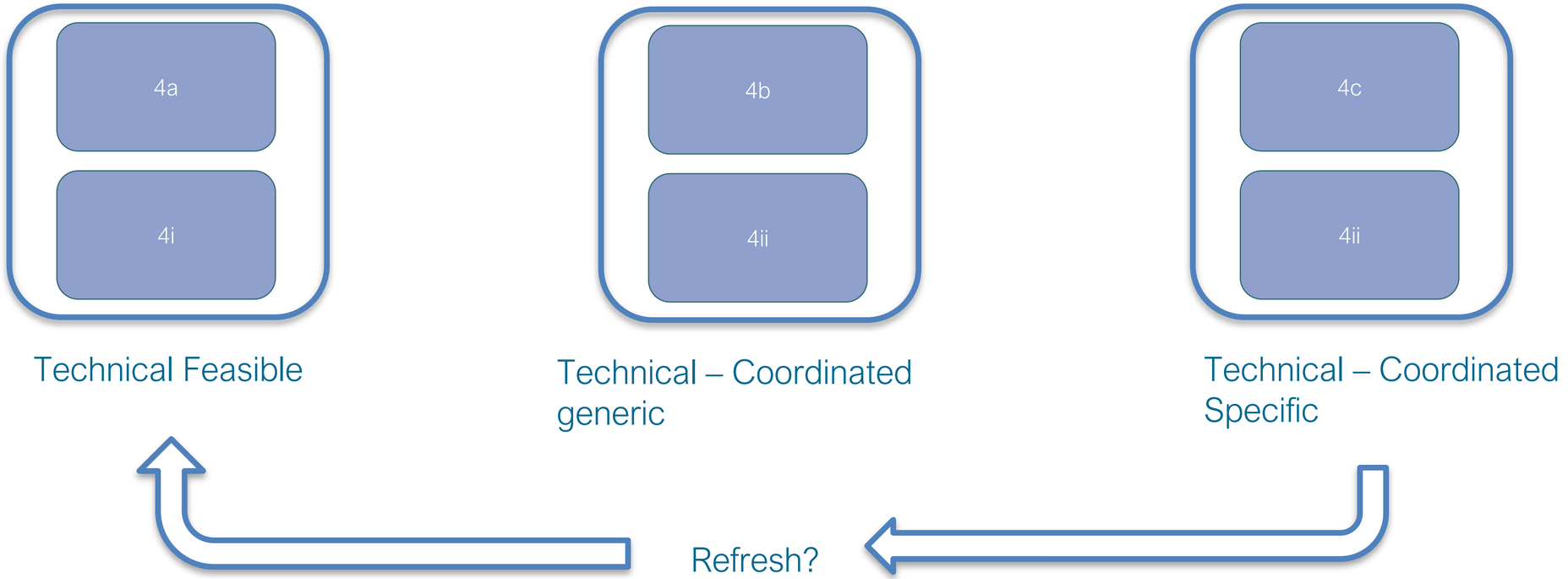
# Design Responsibility Contractors perspective

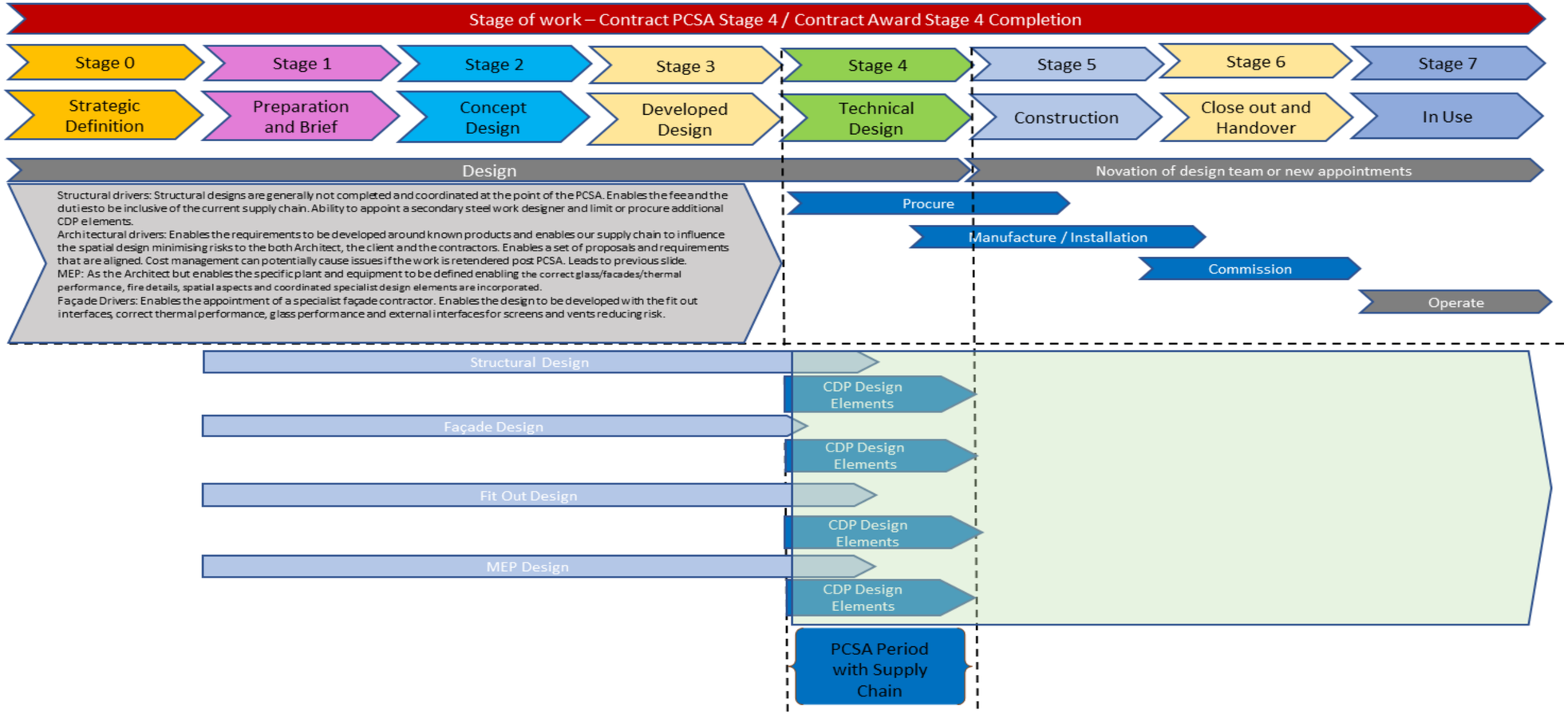
JCT D&B example – 2.11

- *The Contractor shall be fully responsible and liable for the entire design of the Works including, without limitation, all design contained in the Employer's Requirements, the Contractor's Proposals, any Change issued by the Employer and/or any drawings or documents*
- *Whether such design is carried out at any time by the Contractor, the Contractor's Persons, any Novated Consultants and/or any Key Sub-Contractors.*
- *The Contractor shall be deemed to have verified all information contained in, referred to and/or reasonably inferred from the Employer's Requirements and the Contractor's Proposals.*
- *The Employer makes no representation or warranty as to the adequacy, accuracy or completeness of the whole or any part of the Employer's Requirements and the Contractor shall be deemed to have not relied upon any representation by or on behalf of the Employer under or in connection with the same*

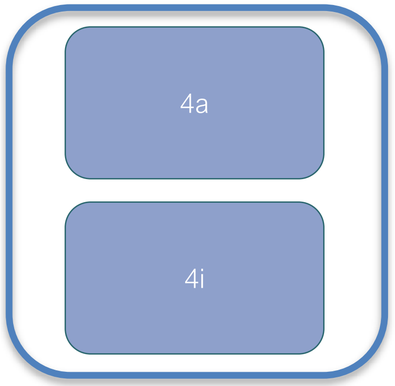
# Design Responsibility Contractors perspective



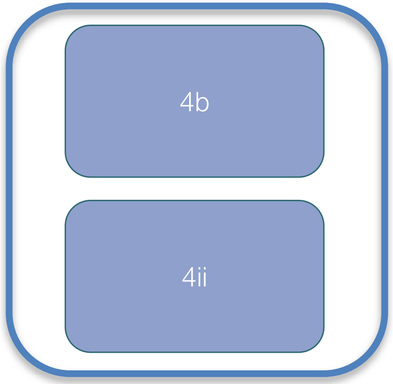
# Design Responsibility Contractors perspective



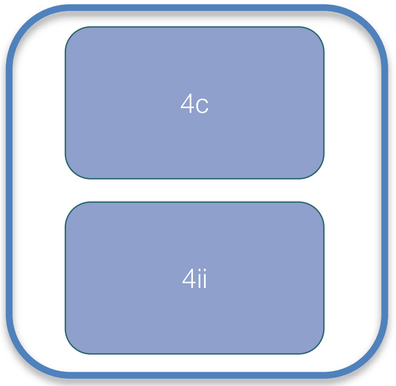
# Design Responsibility Contractors perspective




Technical Feasible



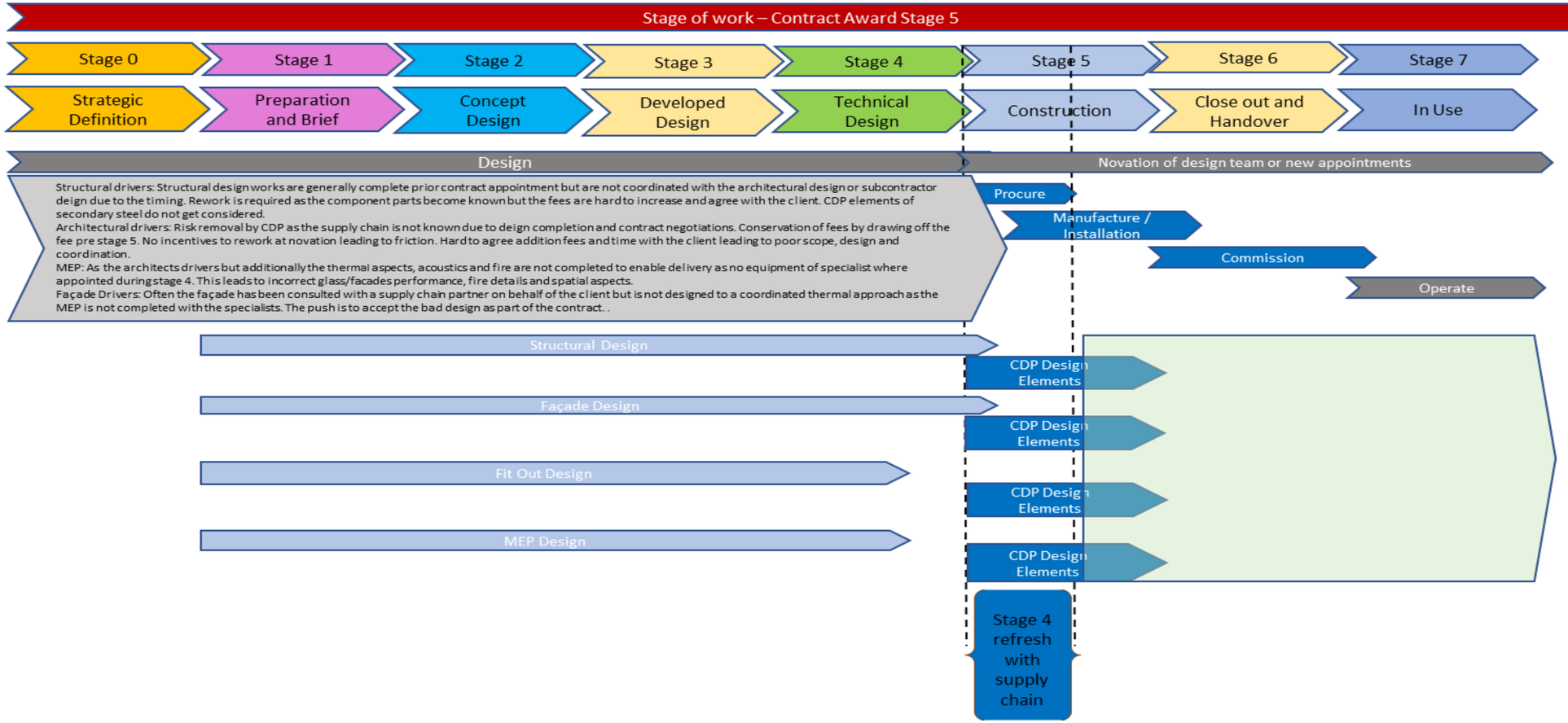

Technical – Coordinated generic




Technical – Coordinated Specific

No Refresh?

# Design Responsibility Contractors perspective

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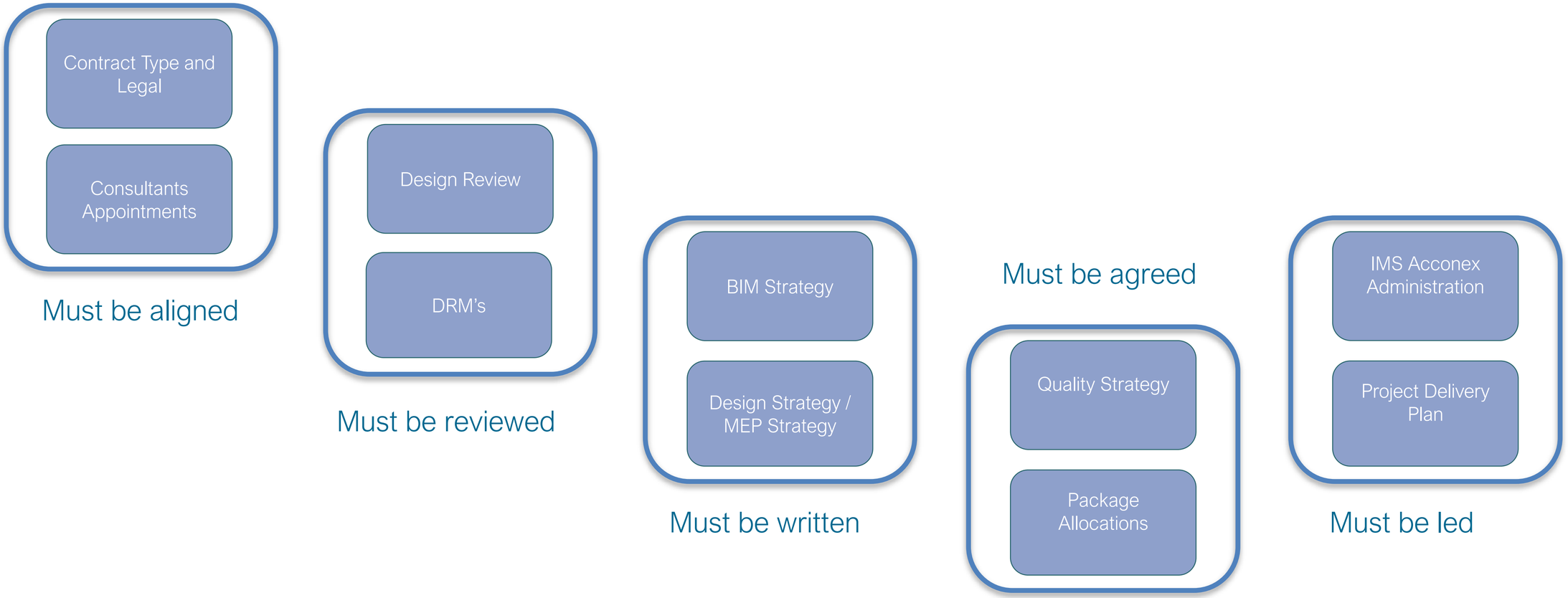
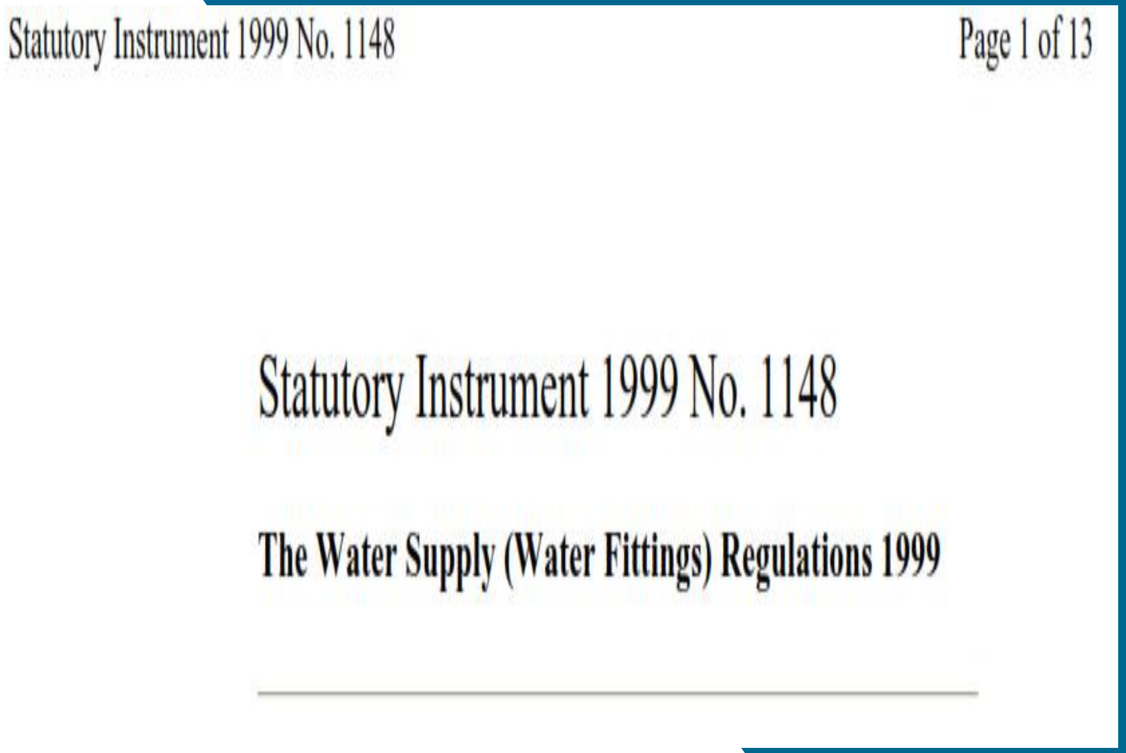
# Design Responsibility Contractors perspective



# Avoiding common Water Regulations problems

- The knowledge of the various design team members on what WRAS means to them
- Knowledge of actual contamination risks
- Knowledge of potential contamination risks
- Knowledge of the various fluid risk categories which vary by each sector
- Knowledge of how these are applied
- Knowledge of how to select
- Knowledge of who is responsible to select
- Knowledge of IRN’s
- Knowledge of markings
- Knowledge of how to notify the water undertake
- Knowledge of how to manage the process

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Silo C03

# Avoiding common Water Regulations problems

Actual Contamination

- Materials and Substances which are not suitable for contact with Drinking water Redundant Branches or Dead Legs Sections of pipework installed for future use
- Reversal in flow of Pumps
- The Environment in which in the Plumbing system is placed Cross Connections between different Plumbing systems

Potential

- Outlets from Taps
- Submerged Water Outlets
- Hose Union Taps and Hose Pipes
- Cross Connected Overflow Pipes
- Water Expanding causing a reversal of Flow

# Avoiding common Water Regulations problems

Water Regulation Approval Scheme.

- Is an advisory board that contains an online directory of any fittings that have been tested to meet the requirements of The Water Supply (Water Fittings) Regulations 1999.
- It should be noted that a WRAS certificate does not guarantee approval!!
- Each WRAS certificate should be checked against the online Directory at Water Regulations Approval Scheme Ltd - Approvals Directory (wrasapprovals.co.uk)
- Within each product search you will note that there Installation Requirements Notes (IRNs)
- Each IRN gives a specific requirement for the compliance of the material or equipment tested.
- IRN’s are on top of the manufacturers guidance. This must also be checked for orientation, fixings and supports.

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C04

# Avoiding common Water Regulations problems

Schedule 2 is the requirements in detail.  This where the Water Regulations Approval Scheme (WRAS) comes in to being.  It sets out the following areas of works.

- Interpretations
- Materials
- Requirements
- Design
- Cross Connection
- Backflow
- Cold Water Services
- Hot Water Services
- WC Flushing and Urinals
- Bath’s / Basins / Shower Taps
- Washing Machines etc.
- Water for use Outside

WRAS guides are there to ensure that we comply with the requirements and, as long as we have followed them, most water undertakers will be very good with us all if we do have any problems.

# Avoiding common Water Regulations problems

**Water Fittings and Materials Directory**

WRAS

WRAS Approval Number: 1312347

R001 R415

Range of booster sets incorporating verticle pumps, lever operated spherical valves, stainless steel transducers, non-return valves (not suitable for backflow prevention) and copper manifold. The cistern incorporates a type AB airgap. Maximum working pressure 10.0 bar. Maximum operating temperature 80°C.

Size: 1 ¼" BSP (F)

Model: HYDRO GTI - S 1 x CM 3-4 HYDRO GTI - S 1 x CM 3-5 HYDRO GTI - S 1 x CM 3-6 HYDRO GTI - S 1 x CM 5-2 HYDRO GTI - S 1 x CM 5-3 HYDRO GTI - S 1 x CM 5-4 HYDRO GTI - S 1 x CM 5-5 HYDRO GTI - S 1 x CM 5-6 HYDRO GTI - S 2 x CM 3-4 HYDRO GTI - S 2 x CM 3-5 HYDRO GTI - S 2 x CM 3-6 HYDRO GTI - S 2 x CM 5-2 HYDRO GTI - S 2 x CM 5-3 HYDRO GTI - S 2 x CM 5-4 HYDRO GTI - S 2 x CM 5-5 HYDRO GTI - S 2 x CM 5-6 HYDRO GTI - E 1 x CME 3-3 HYDRO GTI - E 1 x CME 3-4 HYDRO GTI - E 1 x CME 3-5 HYDRO GTI - E 1 x CME 3-6 HYDRO GTI - E 1 x CME 3-7 HYDRO GTI - E 1 x CME 3-8 HYDRO GTI - E 1 x CME 3-9 HYDRO GTI - E 1 x CME 5-2 HYDRO GTI - E 1 x CME 5-3 HYDRO GTI - E 1 x CME 5-4 HYDRO GTI - E 1 x CME 5-5 HYDRO GTI - E 1 x CME 5-6 HYDRO GTI - E 1 x CME 5-7 HYDRO GTI - E 1 x CME 5-8 HYDRO GTI - E 2 x CME 3-2 HYDRO GTI - E 2 x CME 3-5 HYDRO GTI - E 2 x CME 5-4 HYDRO GTI - E 2 x CME 5-6 HYDRO GTI - E 2 x CME 5-8

Marking: 'Grundfos', Flamco Ltd', type, model, max pressure, address and other technical data on adhesive label

Note:

Proviso:

Manufacturer:

Factor: Grundfos Holdings A/S Poul Due Jensens Vej 7, DK-8850 Bjerringbro, Denmark

## Example IRN R415

Notification should be given in writing of the proposed installation of this fitting to the local Water Supplier prior to its installation. The appliance shall not be installed until consent is given by the Water Supplier in line with Regulation 5 of the Water Supply (Water Fittings) Regulations 1999 or the Water Supply (Water Fittings) Regulations (northern Ireland) 2009, or Byelaw 5 of the Water Bylaws 2004, Scotland.

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# Avoiding common Water Regulations problems

**WRAS Approval Number: 1812707** — **Approved Product**

Single hole, single outlet (swivel) combination tap assembly (chromium plated brass), incorporating a ceramic cartridge headwork and single lever operating member. The spout outlet incorporates a plastic aerator which also incorporates a stainless-steel strainer. Maximum working pressure 10.0 bar. Maximum operating temperature 60°C.

- **Section:** 0470 Combination Tap Assemblies
- **Section Subtitle:** Single hole, metal, single outlet, swivel. Taps used in high risk installations, such as kitchen sinks, are considered to be a fluid category 5 risk. Backflow protection is usually provided in the form of an AUK3 tap gap. Where an AUK3 tap gap cannot be maintained, for example where the tap gap is compromised as a result of:- • the tap being lowered in any way; • adjustment to the spout which reduces the distance between the tap outlet and spillover level of the sink; • or the operation of a pull out hose attachment; alternative fluid category 5 backflow protection is required.
- **WRAS Approval Number:** 1812707
- **Expiry date:** 31/12/2023
- **Size:** Stainless steel braided EPDM lined flexible inlet hose assemblies incorporating ½" captive nut end connections
- **Marking:** Acrysil Group (parent of Homestyle) logo on rear of body.
- **Installation Requirements** R001 R006 R010
- **Model**
  HS205W
- **Factor:** Homestyle Products Ltd View All Listings by this Company


Taps – First check the markings are present. In this case the client had requested the mark be placed out of sight!  - Then Check the IRN's

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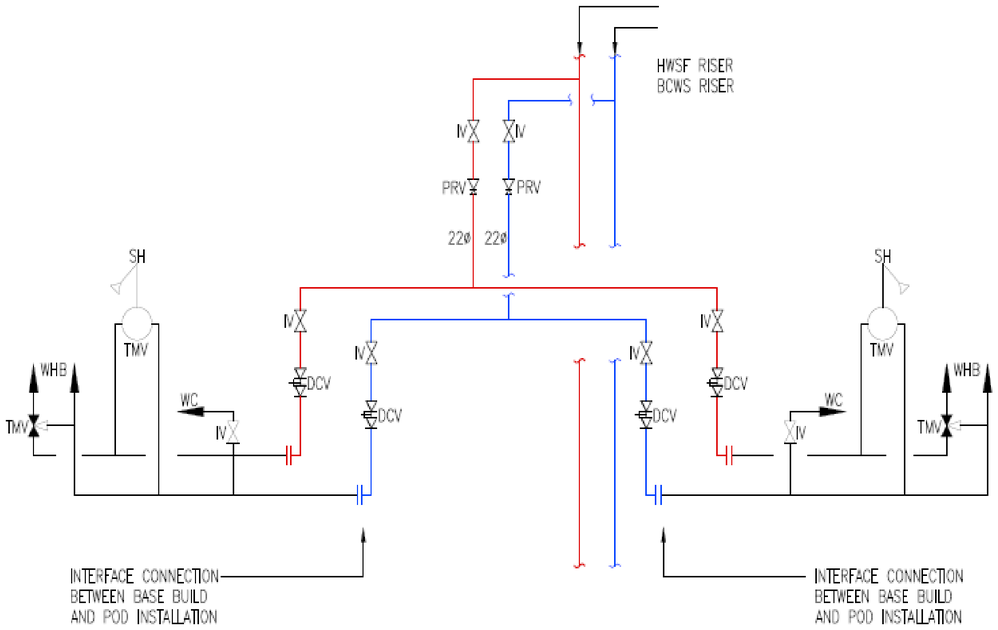
# Avoiding common Water Regulations problems

IRN R001 - See text of entry for Installation Requirements or Notes. Basically, check the sheet for proviso's and installed as the manufacturer intended.

IRN R006 - If this tap or combination tap is installed so that its base is no lower than the spill over level of the receiving vessel (for example, a sink or washbasin), a Type AUK3 air gap is achieved which permits installation of the tap in any premises where backflow protection up to Fluid Category 5 is required at the tap.

IRN R010 - Water supplies shall be at reasonably balanced pressures from a common source (e.g. hot and cold supplies both from the same storage or both from a supply pipe). Where the fitting is supplied from unbalanced supplies (e.g. hot and cold supplies from separate sources) an 'Approved' single check valve or some other no less effective backflow prevention device shall be fitted immediately upstream of both hot and cold water inlets.

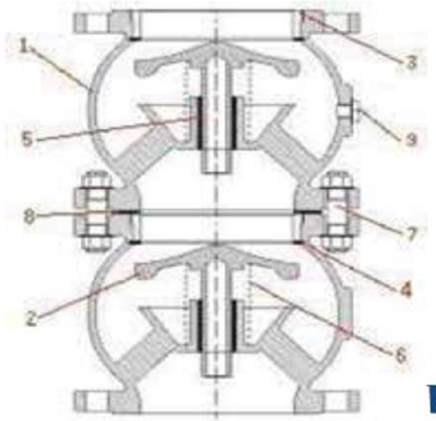


# Avoiding common Water Regulations problems

## Non-Return Valve

**11XS Double Non-Return Valve**

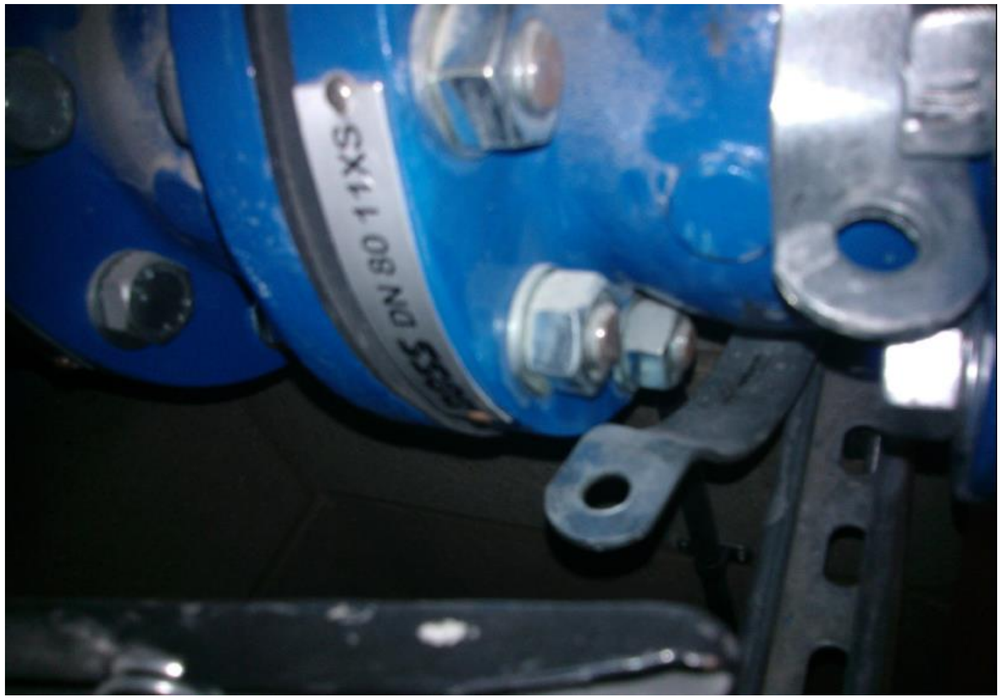
Dimensions




WRAS APPROVED PRODUCT

**11XS Double Non-Return Valve**

| Size DN | Length mm | Diameter mm | Weight kg | Product Code |
|---|---|---|---|---|
| 50 | 205 | 165 | 12 | 36700203 |
| 65 | 245 | 185 | 15 | 36700214 |
| 80 | 265 | 200 | 20.5 | 36700225 |




Example of  Whole Site Protection, Gone Wrong. - Then Check the IRN’s

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# Avoiding common Water Regulations problems

WRAS Approval Number: 1802361 Approved Product

Range of non-return valves housed within a blue epoxy coated flanged ductile iron body. Maximum working pressure 16.0 bar. Cold water use only.

- **Section:** 2185 Valves (?section=2185)
- **Section Subtitle:** Non-return, spring loaded, resilient trim. Devices listed under this heading do not provide sufficient protection against backflow to meet the requirements of The Water Supply (Water Fittings) Regulations 1999 (England and Wales), The Water Supply (Water Fittings) (Scotland) Byelaws 2014 or The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009. For this purpose reference should be made to `Backflow Prevention Devices`.
- **WRAS Approval Number:** 1802361
- **Expiry date:** 28/02/2023
- **Size:** DN50, DN65, DN80, DN100, DN125, DN150, DN200 & DN250.
- **Marking:** Boss, size & model on data plate on body.
- **Installation Requirements** R001 (/approvals/testing-requirements/installation_requirements/irn_r001)
- **Model**
  BOSS 11XS range
- **Manufacturer:** BSS Industrial View All Listings by this Company (?company=11764)

# Avoiding common Water Regulations problems

**WRAS Approval Number: 1702078** — **Approved Product**

Range of one piece GRP, pre-insulated, cold water storage cisterns and covers. Cisterns can be supplied with a wholesome water kit, consisting of a screened vent, screened warning pipe and screened overflow pipe and can also be supplied with an inlet valve. Cold water use only.

- **Section:** 0120 Cisterns Storing Water for Domestic Purposes
- **Section Subtitle:** Drinking, washing, cooking and sanitary. Cisterns in this section comprise units, which, where detailed, include all the essential items identified in Schedule 2. Section 7, Paragraph 4, of the Water Supply (Water Fittings) Regulations 1999. Where these items are not detailed in the directory entry, these will need to be included at point of installation, in order to fully comply with Schedule 2. Section 7, Paragraph 4, of the Water Supply (Water Fittings) Regulations 1999.
- **WRAS Approval Number:** 1702078
- **Expiry date:** 28/02/2022
- **Size:** 16 - 10700 litres
- **Marking:** Dewey waters, contact details, capacity, date of manufacture (DD/MM/YY) and product info on metallic label on body
- **Installation Requirements** R001 R270 R280 R350
- **Model**
  Dewey waters one piece GRP cold water storage cisterns and covers
- **Manufacturer:** Dewey Waters Limited View All Listings by this Company

## Example of GRP Tanks - Then Check the IRN’s

# Avoiding common Water Regulations problems

Example of GRP Tanks

IRN R270 - Every storage cistern, except one supplying water to the primary circuit of a heating system, shall be fitted with a servicing valve on the outlet pipe (s).

IRN R280 - A servicing valve shall be installed on the supply to the fitting in a readily accessible location.

IRN R350 - Float-controlled valves or equivalent inlet devices should be securely and rigidly attached to the cistern and installed so that the valve closes when the level of the water is not less than 25 mm below the overflowing level of the cistern.  Where the cistern is fitted with an approved alternative to a warning pipe, such as an indicator instrument or visual or audible alarm, the inlet valve is to close when the water level is not less that 50 mm below the overflowing level of the cistern.

So what does the Certificate Cover?

# Avoiding common Water Regulations problems

## EQUILIBRIUM PATTERN FLOATVALVES 49

901

### FEATURES

- Designed to minimise the effect of changing water pressures.
- Size range from ½" to 1" available in Brass with 1¼" to 6" available in Bronze (Gunmetal).
- Smoothly controlled closure ensures a fast quiet shut off.
- Line pressure assists closing thus reducing the length of lever required.
- One size of seat and one size of ball float suits any working pressure up to 14 bar or the maximum recommended (detailed below).
- Recommended for temperatures from 0-85°C

## Water Fittings and Materials Directory

WRAS

R001 R280 R390

WRAS Approval Number: 1305028

`901` range of equilibrium float valves with brass or gunmetal bodies and EPDM seals. Maximum working pressure 10.0 bar. Cold water use only.

Size: 901 Brass ½" - 1" BSP. 901 Gunmetal 1¼" - 6" BSP.

Model: 901 range.

Marking: 901 Brass (½" - 1"): Pegler, 901 & England on body. 901 Gunmetal (1¼" - 6"): Pegler, 901, size & England on body.

Note: Unless there is a suitable backflow prevention device (for example, a double check valve) immediately upstream of the float valve, BS 1212: Part 1 float valves are not acceptable in a WC cistern or in any other location where any part of the valve may be submerged when the overflow pipe is in operation.

Proviso:

Manufacturer:

Factor: Pegler Yorkshire Group Ltd Haigh Park Road Stourton Leeds

+44 (0) 113 2701104 +44 (0) 113 2715275 www.pegleryorkshire.co.uk

This the requirements for the float valve - Then Check the IRN’s

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# Avoiding common Water Regulations problems

IRN R001 - See text of entry for Installation Requirements or Notes.
Basically, check the sheet for proviso's and installed as the manufacturer intended.

IRN R280 - A servicing valve shall be installed on the supply to the fitting in a readily accessible location.

IRN R390 - An inlet strainer or line strainer shall be provided at the inlet

But also note: Unless there is a suitable backflow prevention device (for example, a double check valve) immediately upstream of the float valve, BS 1212: Part 1 float valves are not acceptable in a WC cistern or in any other location where any part of the valve may be submerged when the overflow pipe is in operation!

If we are in doubt add the Double Check Valves.


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# Avoiding common Water Regulations problems

**WRAS Approval Number: 1905322** — **Approved Product**

Range of automatic air venting valves with plastic bodies, EPDM seals and plastic floats. Maximum working pressure 6.0 bar. Maximum operating temperature 99°C.

- **Section:** 1980 Valves
- **Section Subtitle:** Air venting. Fittings in this section are suitable for above ground installations only.
- **WRAS Approval Number:** 1905322
- **Expiry date:** 31/05/2024
- **Note:** For non-wholesome water use only.
- **Size:** See Models
- **Marking:** Caleffi logo on cap
- **Installation Requirements** R001 R535
- **Model**

  20mm bayonet manifold connection: 49513.

  20mm manifold connection: C502600 CST, C502601 CST, C502602 CST & C502603 OTM.

  3/8" BSP (M): C502630 CST, C502630 OEM, C502633 CST, C502637 CST & C502638 CST.

  ½" BSP (M): C502640 CST & C502643 CST.
- **Manufacturer:** Caleffi S.p.A View All Listings by this Company

## Example of Dead Legs

## Then Check the IRN's

**WRAS Approval Number: 1905705** — **Approved Product**

Range of UV disinfection units with stainless steel bodies, PTFE plates and quartz sleeves. Maximum working pressure 16.0 bar. Cold water use only.

- **Section:** 2411 Disinfection Equipment
- **WRAS Approval Number:** 1905705
- **Expiry date:** 31/05/2024
- **Size:** See model
- **Marking:** GOODWATER, MODEL, TUCANA, DATE DD/MM/YY, UV DISINFECTION UNIT & EMAIL ADDRESS ON ADHESIVE LABEL ON BODY
- **Installation Requirements** R001 R150 R170
- **Model**

  Threaded models:
  VSL-1, VSL-2, VSL-3: 1" BSP (Male)
  VSL-4, VSL-5: 1 ½" BSP (Male)
  VSL-6, VSL-7, VSL-8 2" BSP (Male)
  VSL-9: 2 ½" BSP (Male)
  VSL-10: 3" BSP (Male)

  Flanged models:
  VML-100, VML-200: DN100 flanged connection
  D100, D150: DN150 flanged connection
- **Factor:** Goodwater Ltd. View All Listings by this Company

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# Avoiding common Water Regulations problems

IRN R001 - See text of entry for Installation Requirements or Notes.
Basically, check the sheet for proviso's and installed as the manufacturer intended.

IRN R150 - An 'Approved' single check valve or some other no less effective backflow prevention device providing backflow prevention protection to at least fluid category two shall be fitted at the point of connection(s) between the water supply and the fitting or appliance.

IRN R170 - Water Undertakers cannot be responsible for the quality of water passed from these fittings.

IRN R535 - The length of connecting pipework to this fitting should be kept to a minimum in order to prevent stagnation.

- UV filters and Micron filters always have Bypasses.
- These must be installed units that are removable and are hung on the way next to the equipment.
- The Connection to the isolation points must be as close to the flow as possible. i.e. the transition of the isolation connection.

The Water Undertaker will read all these and check.

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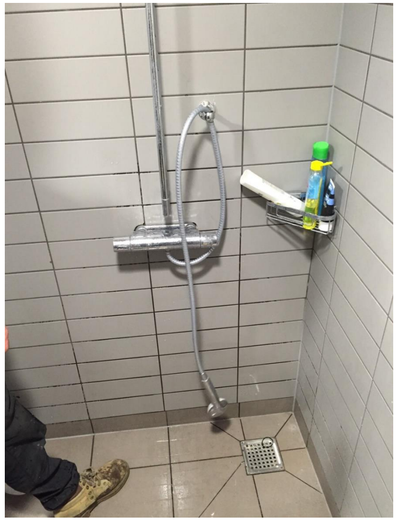
# Avoiding common Water Regulations problems



# Avoiding common Water Regulations problems

Remember that there are two types of back flow

- Back siphonage
- Backpressure
- AA and AB air Gaps will comply with Category 5 risks
- RPZ valves will comply with Category 4 risks - They have to inspect them yearly!!
- Double check valves will comply with Category 3 risks
- Single check valves will comply with Category 2 risks

**We need to look at systems from a pressure and connection point of view.** After all, all the water that enters a project from the mains will fill everything by a connection.

We must ensure that ourselves, our engineers, clients and consultants understand that compliance can lead to prosecution and sometimes the main equipment or point of use equipment they require is not allowed.

# Design Responsibility Contractors perspective

Generally we are experiencing problems with HWS flow and return circuits.

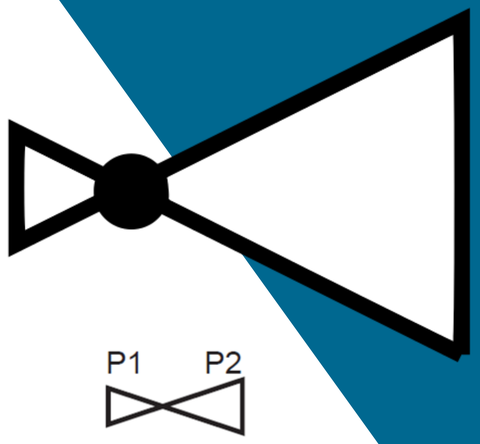
The main issues we have found are the incorrect location of the PRV devices on the design drawings.

Note: There will be many other things that you may see on the next drawings, but please don't call them all out!

Where the responsibility for design was being transferred from the client to the Principal Contractor and was unclearly defined, the PRV issue was not identified at tender.

When the Principal Contractor passed the drawings to an MEP Trade contactor and the design responsibility was again not clear, the MEP Trade Contractor was not verifying the design.

The MEP Trade Contractor once appointed installed the drawings.




Silo
C05

# Avoiding common PRV issues

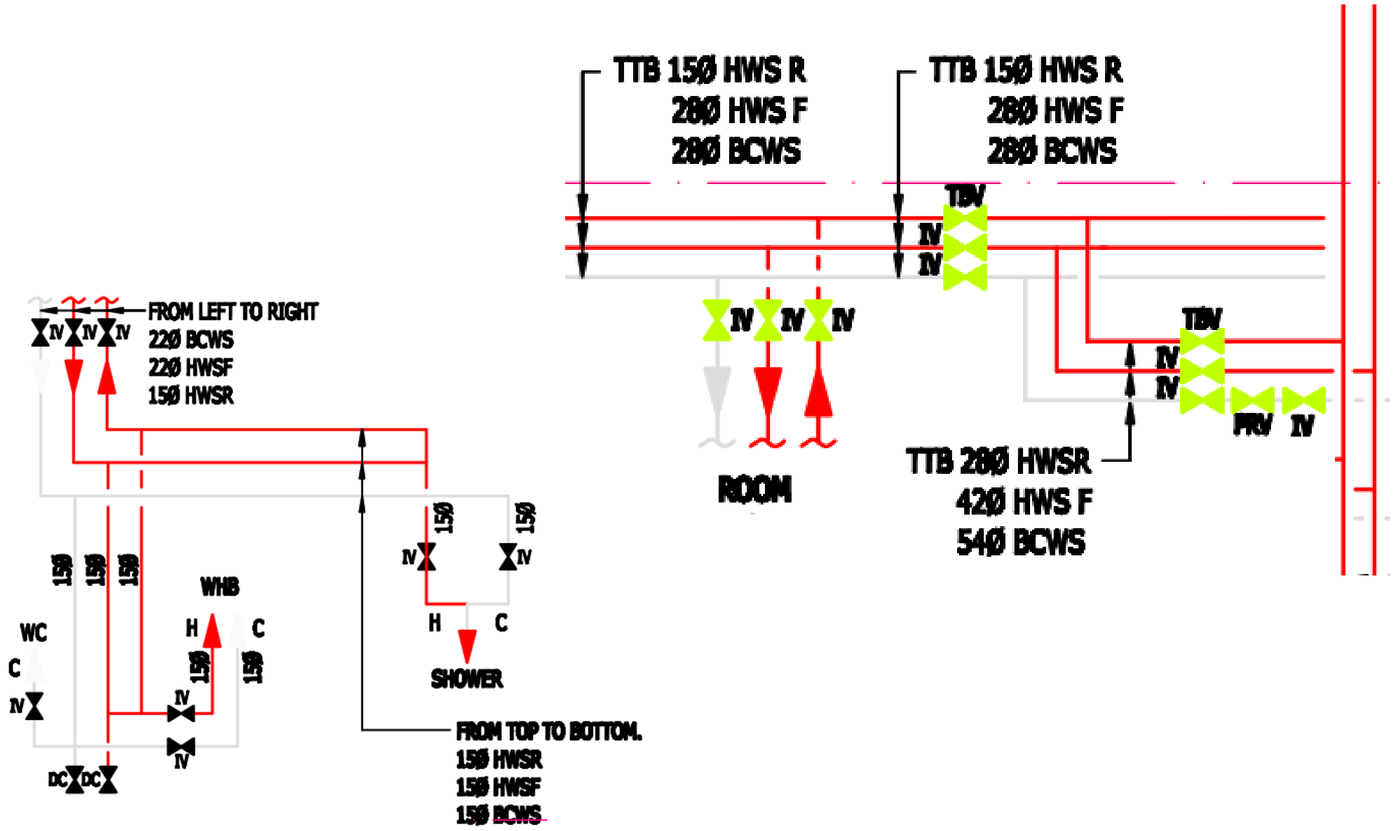
How the defect notification came about.

- Insufficient Hot temperatures at outlet in a disabled toilet
- The boiler does not work
- There is a problem with the TMV's
- The kitchen cannot clean the dishes as the water is too cold.

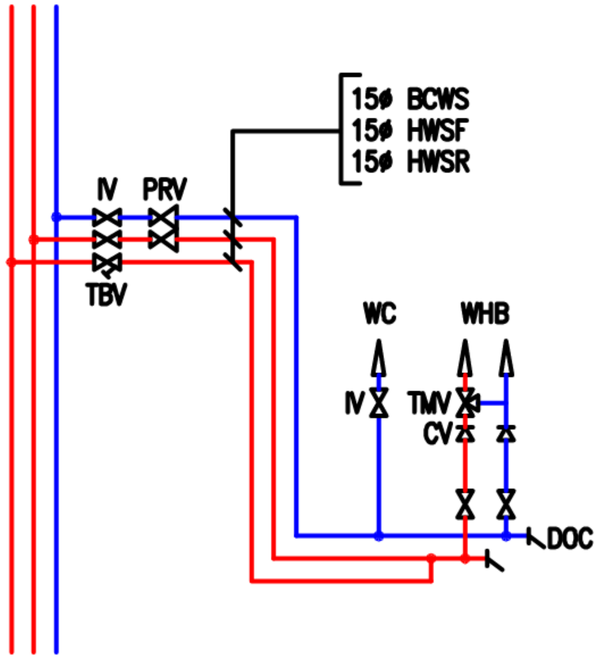
The maintenance staff in the building were reporting issues – had not worked out what was actually wrong.

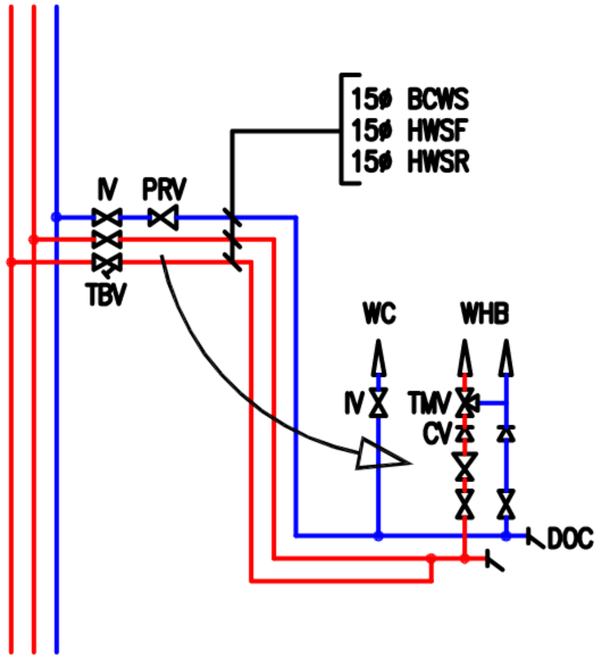
At level 1 - the pressure on the return due to height was greater than the pressure of the PRV setting.

The flow was 28mm and the return was 15mm.



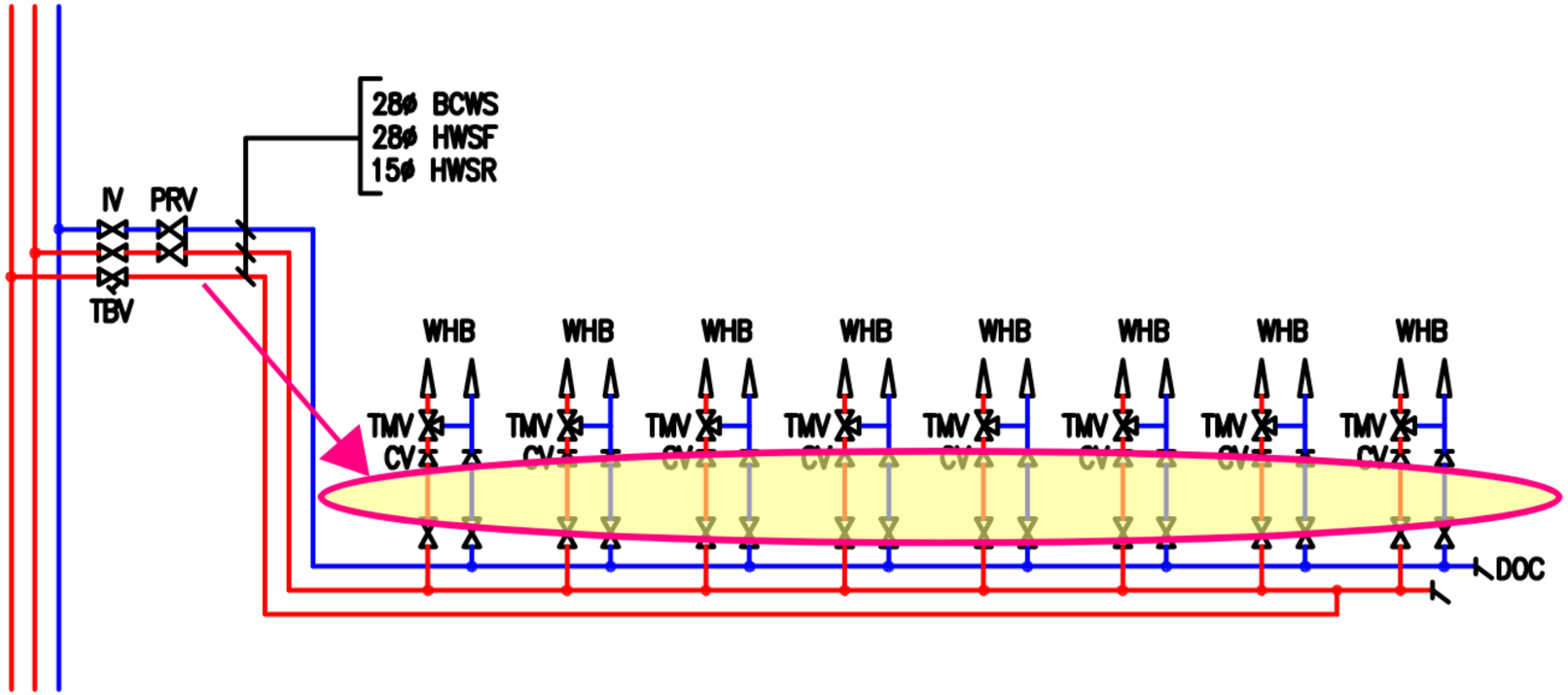
# Avoiding common PRV issues




Ensure that the PRV's are installed downstream of the secondary return connections.

# Avoiding common PRV issues




Install all PRV's in line with the manufacturers recommendations.

And in line with the IRN's as they will be WRAS approved!

Ensure that there is at least 5 pipe diameters of straight after the PRV before any other  fitting is added.

# Avoiding common HIU flow issues HWS

Generally - experiencing high temperatures of cold water at the outlets.  Falling outside the guidance in L8 and HSE274

Experiencing hot water not reaching the required temperature. Falling outside the guidance in L8 and HSE274.

So what is going on?

- We did some in depth analysis on a few different projects
- Residential developments with HIU's were where we were seeing the problem.
- Designers had not considered actually occupancy.

We looked at

- Core temperatures for the boosted cold water
- The length of cold water pipe run from the core
- The flow restrictor device on the outlets

Silo
C06

| Pipe Size mm | Volume Litres/Linear Metre |
|---|---|
| 22 | 0.31 |
| 28 | 0.54 |
| 15 | 0.15 |

**Water efficiency of new dwellings**

**36.**—(1) The potential consumption of wholesome water by persons occupying a new dwelling must not exceed the requirement in paragraph (2).

(2) The requirement referred to in paragraph (1) is either—
(a) 125 litres per person per day; or
(b) in a case to which paragraph (3) applies, the optional requirement of 110 litres per person per day,

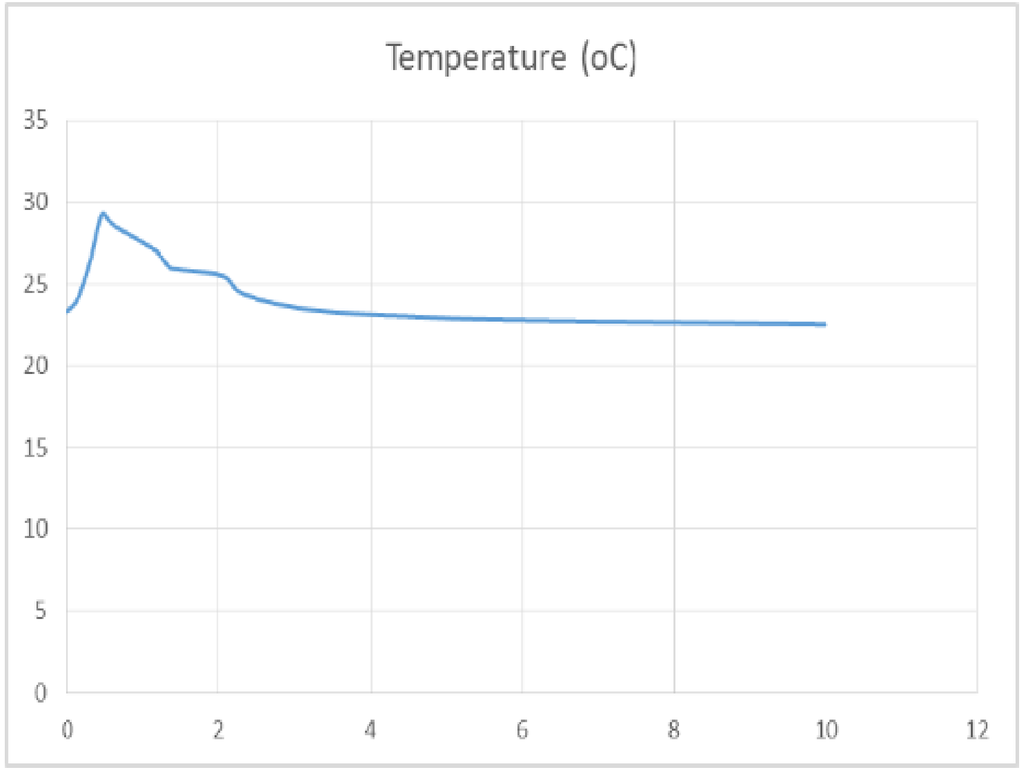
as measured in either case in accordance with a methodology approved by the Secretary of State.

(3) This paragraph applies where the planning permission under which the building work is carried out—
(a) specifies the optional requirement in paragraph (2)(b); and
(b) makes it a condition that that requirement must be complied with.

# Avoiding common HIU flow issues

The core temperatures for the boosted cold water - What we found example cold 1

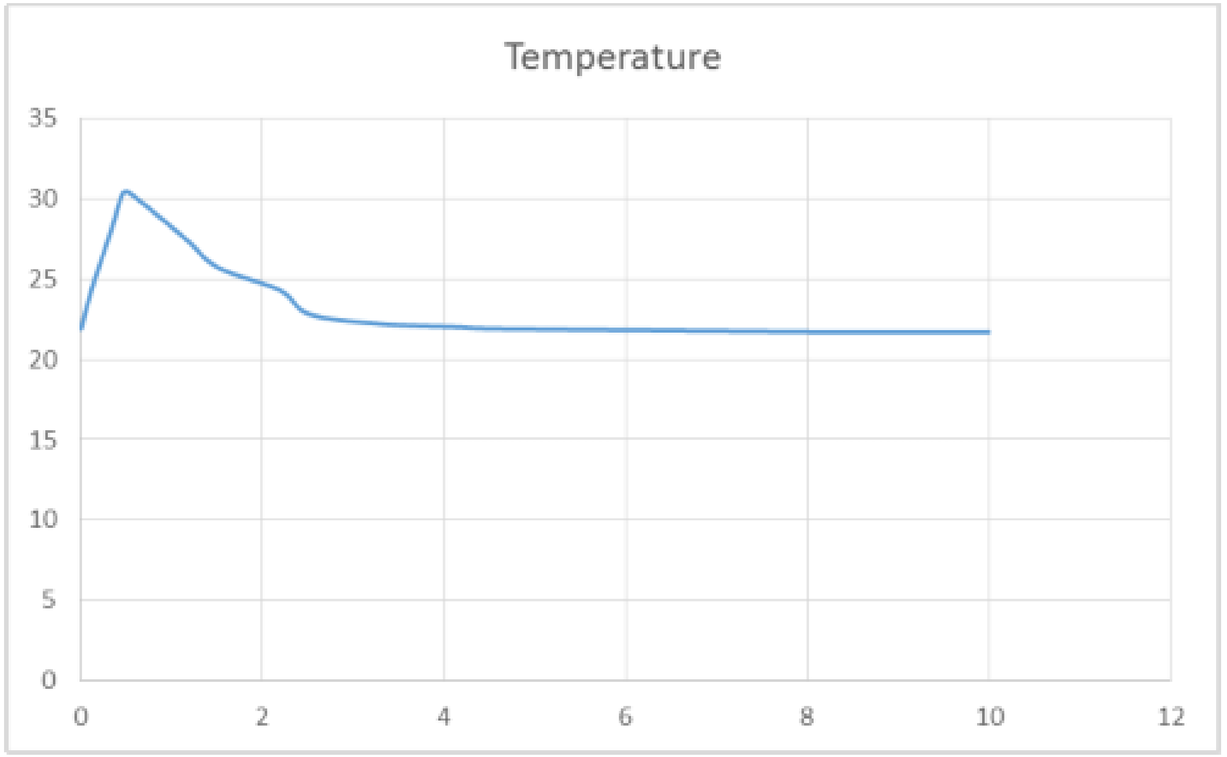
| Apartment | Time | Temperature |
|---|---|---|
| *32.04* | *00.00* | *23.3* |
| *32.04* | **0.14** | **24.1** |
| *32.04* | **0.31** | **26.6** |
| *32.04* | **0.45** | **29.2** |
| *32.04* | **0.59** | **28.6** |
| *32.04* | **1.15** | **27** |
| *32.04* | **1.36** | **26** |
| *32.04* | **1.45** | **25.9** |
| *32.04* | **2.05** | **25.5** |
| *32.04* | **2.31** | **24.4** |
| *32.04* | **3.06** | **23.5** |
| *32.04* | **4.03** | **23.1** |
| *32.04* | **4.55** | **23** |
| *32.04* | **5.57** | **22.8** |
| *32.04* | **10.00** | **22.5** |



# Avoiding common HIU flow issues

The core temperatures for the boosted cold water - What we found example cold 2

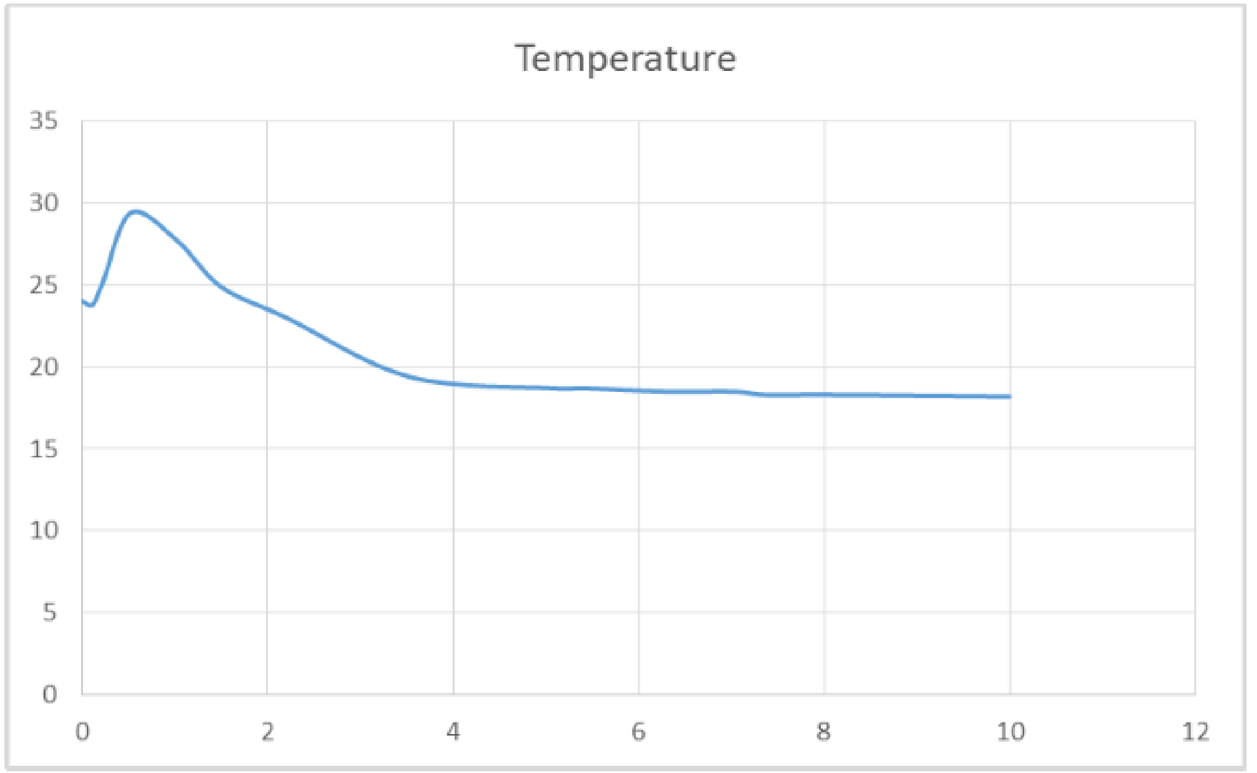
| Apartment | Time | Temperature |
|---|---|---|
| *18.04* | *00.00* | *21.9* |
| *18.04* | 0.12 | 24.4 |
| *18.04* | 0.32 | 27.8 |
| *18.04* | 0.45 | 30.2 |
| *18.04* | 0.52 | 30.4 |
| *18.04* | 1.15 | 27.5 |
| *18.04* | 1.51 | 25.7 |
| *18.04* | 2.19 | 24.3 |
| *18.04* | 2.52 | 22.8 |
| *18.04* | 3.30 | 22.2 |
| *18.04* | 4.17 | 22. |
| *18.04* | 4.57 | 21.9 |
| *18.04* | 8..33 | 21.7 |
| *18.04* | 8.40 | 21.7 |
| *18.04* | 10.00 | 21.7 |



# Avoiding common HIU flow issues

The core temperatures for the boosted cold water - What we found example cold 3

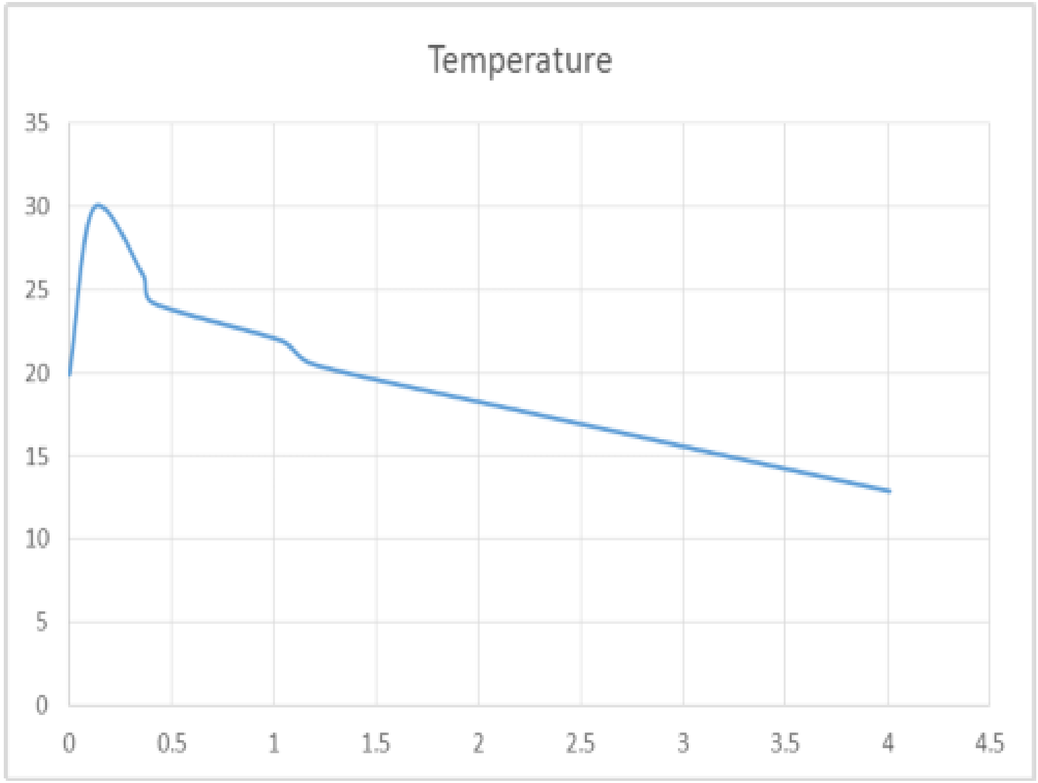
| Apartment | Time | Temperature |
|---|---|---|
| *11.04* | *00.00* | *24* |
| *11.04* | 0.11 | 23.8 |
| *11.04* | 0.22 | 25.2 |
| *11.04* | 0.52 | 29.4 |
| *11.04* | 1.02 | 27.7 |
| *11.04* | 1.49 | 24.9 |
| *11.04* | 2.20 | 23 |
| *11.04* | 3.53 | 19.4 |
| *11.04* | 5.08 | 18.7 |
| *11.04* | 5.42 | 18.7 |
| *11.04* | 6.30 | 18.5 |
| *11.04* | 703 | 18.5 |
| *11.04* | 7.37 | 18.3 |
| *11.04* | 8.09 | 18.3 |
| *11.04* | 10.00 | 18.2 |



# Avoiding common HIU flow issues

The core temperatures for the boosted cold water - What we found example cold 4

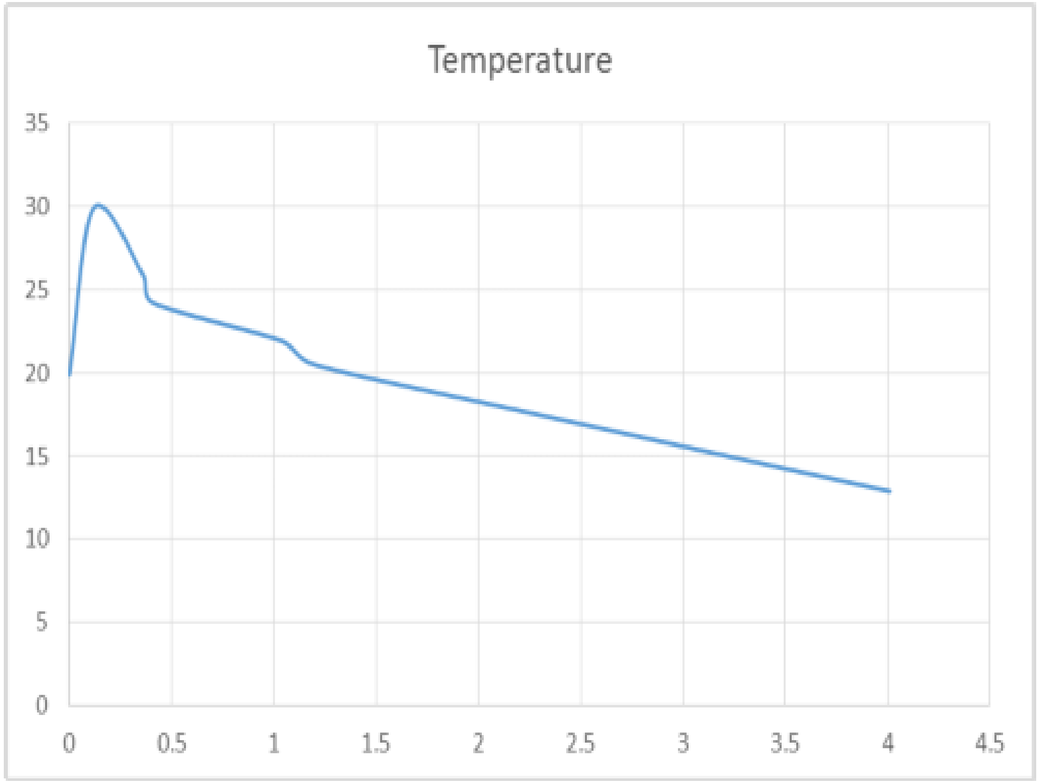
| Apartment | Time | Temperature |
|---|---|---|
| *Level 7* | *00.00* | *19.9* |
| *Level 7* | **0.12** | **29.9** |
| *Level 7* | **0.36** | **25.9** |
| *Level 7* | **0.41** | **24.2** |
| *Level 7* | **1.04** | **21.9** |
| *Level 7* | **1.20** | **20.5** |
| *Level 7* | **2.25** | **17.6** |
| *Level 7* | **4.01** | **12.9** |



# Avoiding common HIU flow issues

The core temperatures for the boosted cold water - What we found example cold 5

| Apartment | Time | Temperature |
|---|---|---|
| *Level 7* | *00.00* | *19.9* |
| *Level 7* | **0.12** | **29.9** |
| *Level 7* | **0.36** | **25.9** |
| *Level 7* | **0.41** | **24.2** |
| *Level 7* | **1.04** | **21.9** |
| *Level 7* | **1.20** | **20.5** |
| *Level 7* | **2.25** | **17.6** |
| *Level 7* | **4.01** | **12.9** |



# Avoiding common HIU flow issues

The core temperatures for the boosted cold water - What we found flow rates vs pipe length and size

- The furthest riser to apartment is around 30 metres to the furthest outlets.
- Pipe sizes were 22mm copper. Storage is therefore 0.31 litres a meter.

| Pipe Size mm | Volume Litres/Linear Metre |
|---|---|
| 22 | 0.31 |
| 28 | 0.54 |
| 15 | 0.15 |

Silo C07

| Installation Type | Unit of measure | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day |
|---|---|---|---|---|---|---|---|
| Is a dual or single flush WC specified? | | Dual | | Dual | | Dual | |
| WC | Full flush volume | 4 | 5.84 | 4.5 | 6.57 | 6 | 8.76 |
| | Part flush volume | 2.6 | 7.70 | 3 | 8.88 | 3 | 8.88 |
| Taps (excluding kitchen and external taps) | Flow rate (litres / minute) | 5 | 9.48 | 5 | 9.48 | 5 | 9.48 |
| Are both a Bath & Shower Present? | | Bath & Shower | | Bath & Shower | | Bath & Shower | |
| Bath | Capacity to overflow | 149 | 16.39 | 185 | 20.35 | 160 | 17.60 |
| Shower | Flow rate (litres / minute) | 8 | 34.96 | 8 | 34.96 | 6 | 26.22 |
| Kitchen sink taps | Flow rate (litres / minute) | 6 | 13.00 | 6 | 13.00 | 6 | 13.00 |
| Has a washing machine been specified? | | No | | No | | Yes | |
| Washing Machine | Litres / kg | | 17.16 | | 17.16 | 13.1 | 27.51 |
| Has a dishwasher been specified? | | No | | No | | Yes | |
| Dishwasher | Litres / place setting | | 4.50 | | 4.50 | 0.95 | 3.42 |
| Has a waste disposal unit been specified? | | No | 0.00 | No | 0.00 | No | 0.00 |
| Water Softener | Litres / person / day | | 0.00 | | 0.00 | | 0.00 |

# Avoiding common HIU flow issues

So! a 6 l/m tap should pull the riser though within about 1min 30 seconds. When you view the results you can see this is correct. Noting that the pipe sizes are larger on route to the apartments. Which will make the case worst. We could not measure these lengths.

The other problem was the MEP Designer had cooling within the cores. They had done the due diligence on the Thermal Modelling.

The cooling was not functional at the time issue have been reported for two reasons. Some units where not fully commissioned and the occupation of the apartments had either not commenced or they were to be left uncopied, the client had no intention to use the cooling system.

Cost vs service charge regain can be the problem here. It's a design occupation issue that every designer should agree and define with the client. We should not just be passing on risk in a D&B world!

This is not confined to this one undefined project and we see the decision for large pipe work sizes within apartments with low flow outlets often.  We should all consider that this problem will continue to occur if its not explained from the outset.

# Avoiding common HIU flow issues CWS

Generally we are experience low temperatures of hot water at the outlets that fall outside the guidance in L8 and HSE274

So what is going on?

- We did some in depth analysis on a few different (other!) projects and the residential developments with HIU's were where we were seeing the problem.
- Designers had not considered actually occupancy. i.e. high end where the floors are no necessarily occupied.

We looked at

- The HIU types
- The length of pipe run from the HIU to the outlets
- The flow restrictor device on the outlets

| Pipe Size mm | Volume Litres/Linear Metre |
|---|---|
| 22 | 0.31 |
| 28 | 0.54 |
| 15 | 0.15 |

**Water efficiency of new dwellings**

**36.**—(1) The potential consumption of wholesome water by persons occupying a new dwelling must not exceed the requirement in paragraph (2).

(2) The requirement referred to in paragraph (1) is either—
(a) 125 litres per person per day; or
(b) in a case to which paragraph (3) applies, the optional requirement of 110 litres per person per day,

as measured in either case in accordance with a methodology approved by the Secretary of State.

(3) This paragraph applies where the planning permission under which the building work is carried out—
(a) specifies the optional requirement in paragraph (2)(b); and
(b) makes it a condition that that requirement must be complied with.

# Avoiding common HIU flow issues

What we found example - hot water - The HIU was BESA approved and had a stay warm function.

The pipework for the hot water - 24 metres in length. We actually did not know from the As Builts what size the pipework was, other than it was copper. The fault was initially blamed on the HIU.

| Flowrate (l/m) | Flowrate (l/s) | Pipe Dia (mm) | Pipe Length (m) | Velocity (Copper Table X @ 75C used as unknown) (m/s) | Time (Sec) |
|---|---|---|---|---|---|
| 5 | 0.08 | 22 | 18 | 0.25 | 72.00 |
| 5 | 0.08 | 28 | 2.9 | 0.15 | 19.33 |
| | | | | Total time | 91.33 |
| | | | | | |
| 6 | 0.10 | 22 | 18 | 0.35 | 51.43 |
| 6 | 0.10 | 28 | 2.9 | 0.2 | 14.50 |
| | | | | Total time | 65.93 |

- Initial findings by test on site verified the pipe work was actually instructed bigger for the tenants use.

| Flowrate (l/m) | Flowrate (l/s) | Pipe Dia (mm) | Pipe Length (m) | Velocity (Copper Table X @ 75C used as unknown) (m/s) | Time (Sec) |
|---|---|---|---|---|---|
| 10 | 0.166667 | 22 | 18 | 0.5 | 36.00 |
| 10 | 0.166667 | 28 | 2.9 | 0.3 | 9.67 |
| | | | | Total time | 45.67 |
| | | | | | |
| 12 | 0.2 | 22 | 18 | 0.6 | 30 |
| 12 | 0.2 | 28 | 2.9 | 0.4 | 7.25 |
| | | | | Total time | 37.25 |

- The final solution - some flexibility allowed on the flow restrictors.
- Changed up to 10 litres per minute.
- But if everything is at the limit, you will have to change the pipework sizes down! Trace heating? In a Net Carbon Zero World?

CIBSE

THE SOCIETY OF PUBLIC HEALTH ENGINEERS

# Avoiding common HIU flow issues

- Check the outlet flow rates that are being used for planning under AD G and ensure that you are aware of the flow rate setting of all the fittings.

- Don’t allow clients to insist of pipe work sizes for user flexibility that will prevent the volume of stored water far exceeding the devices ability to deliver temperatures that meet the guidance. I refer only here to L8 and not other guidance for instantaneous as this is covered in the conference separately.

- Keep a clear line on responsibility for how the outlets flow rates and pipe sizes are being contractually passed over in design consultant novation's or fresh designer appointments.

- This is not confined to this one defined project and we see the decision for large pipe work sizes within apartments with low flow outlets often.

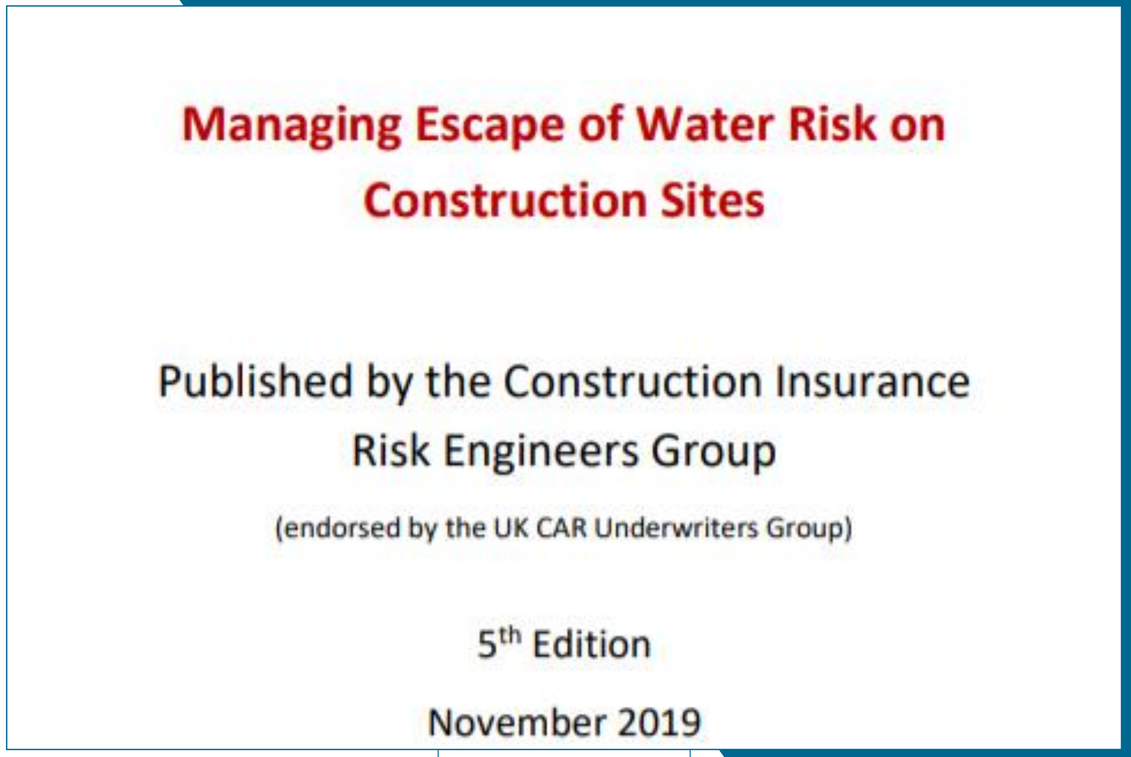
- Don’t blame the HIU straight away.  We should all consider that this problem will continue to occur if its not explained from the outset.

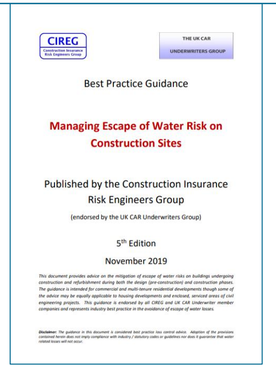
# Water Management Planning

- CIREG best practice guidance ‘Managing Escape of Water Risk on Construction Sites published November 2019
- CIREG is made up of representatives from major insurers and risk management companies
- In recent years, the insurance industry has reported substantial increases in major escapes of water during construction

Silo C08

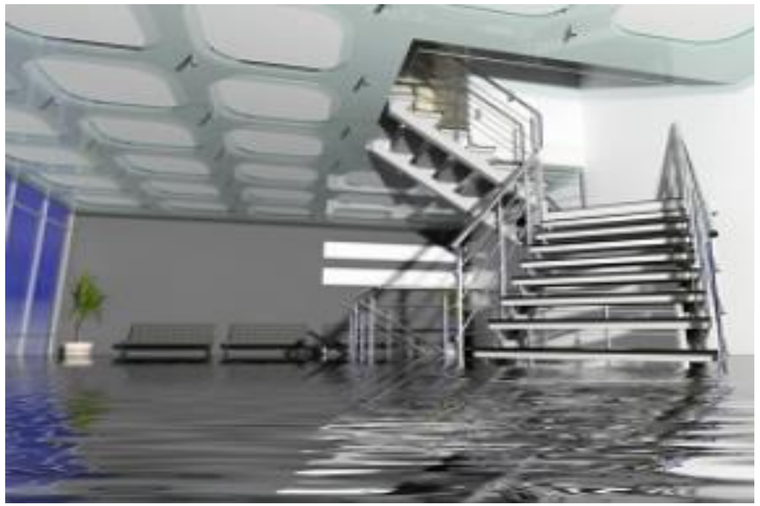
Silo C09



# Water Management Planning

Flooded Office



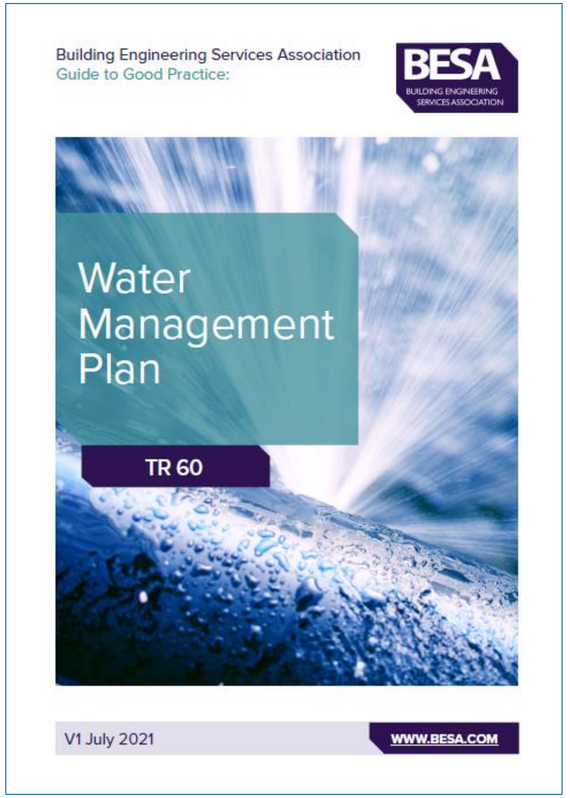
Another Flooded Office

Another Flood!

# Water Management Planning

## Construction and installation

- Design standards, guides and good practice
- Good management of materials storage
- Supports & fixings
- Valve labelling
- Installation quality  (*really important……)*
- Filling and pressure testing
- Temporary isolations
- Cold weather provisions



# Water Management Planning

## Emergency Response, Recovery and Adaption

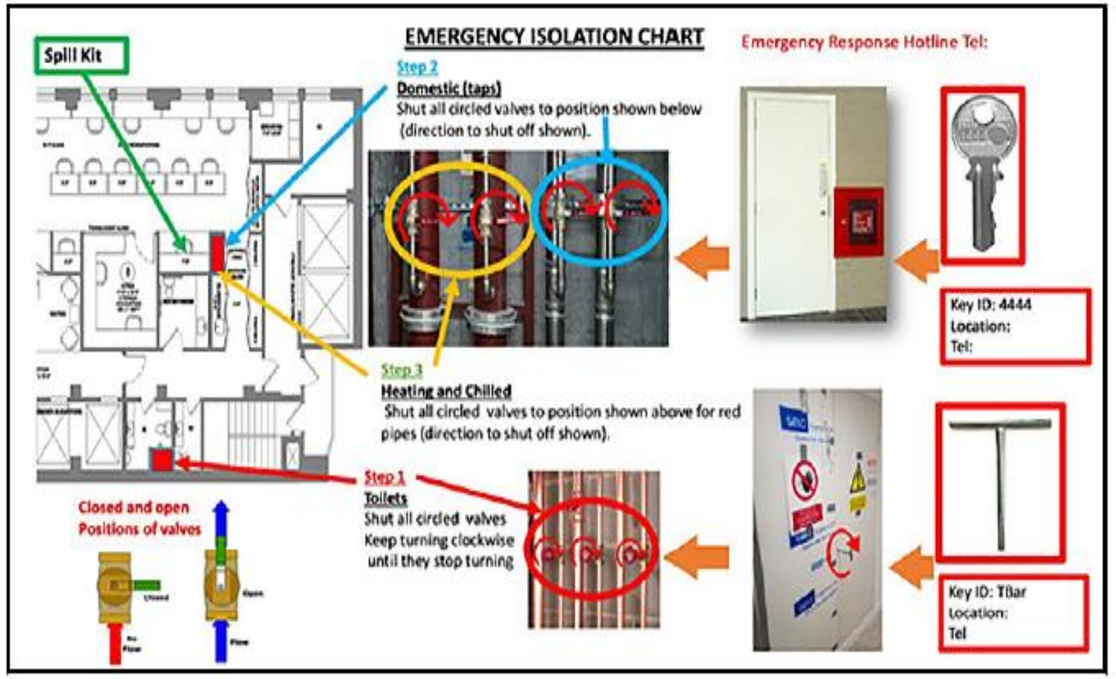
- Emergency procedures clearly defined
- Contact details kept up to date and displayed
- Incident actions list
- Emergency response flow chart

# Water Management Planning

## Management, Quality and Competence

**Water management plan should be project specific and include:**

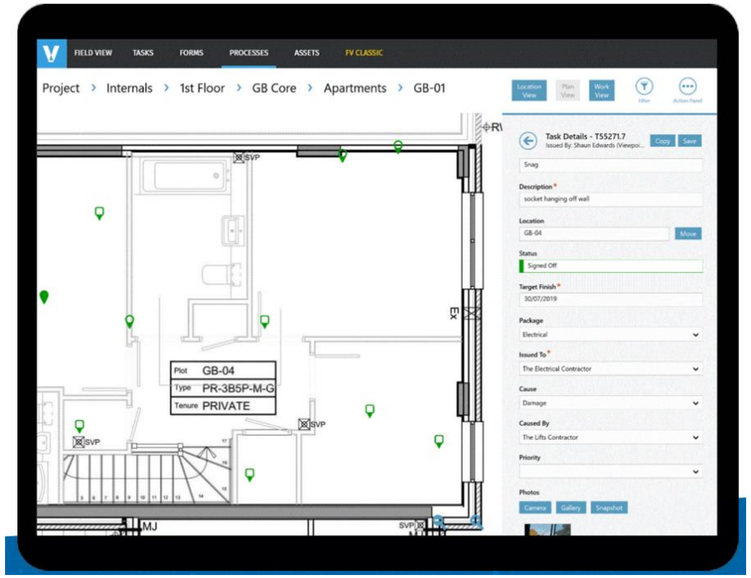
- Risk registers
- Emergency response plan (including drawings around the site)
- Personnel details
- Leak detection, shut off and alarm facilities
- Quality management controls and training provisions
- Water work permit system



# Water Management Planning

## Management, Quality and Competence

- Void closure hold points in all installers quality management systems
- Use only competent contractors
- Operatives competence and qualifications should be evidenced
- Pipework manufacturer specific training critical




WIAPS

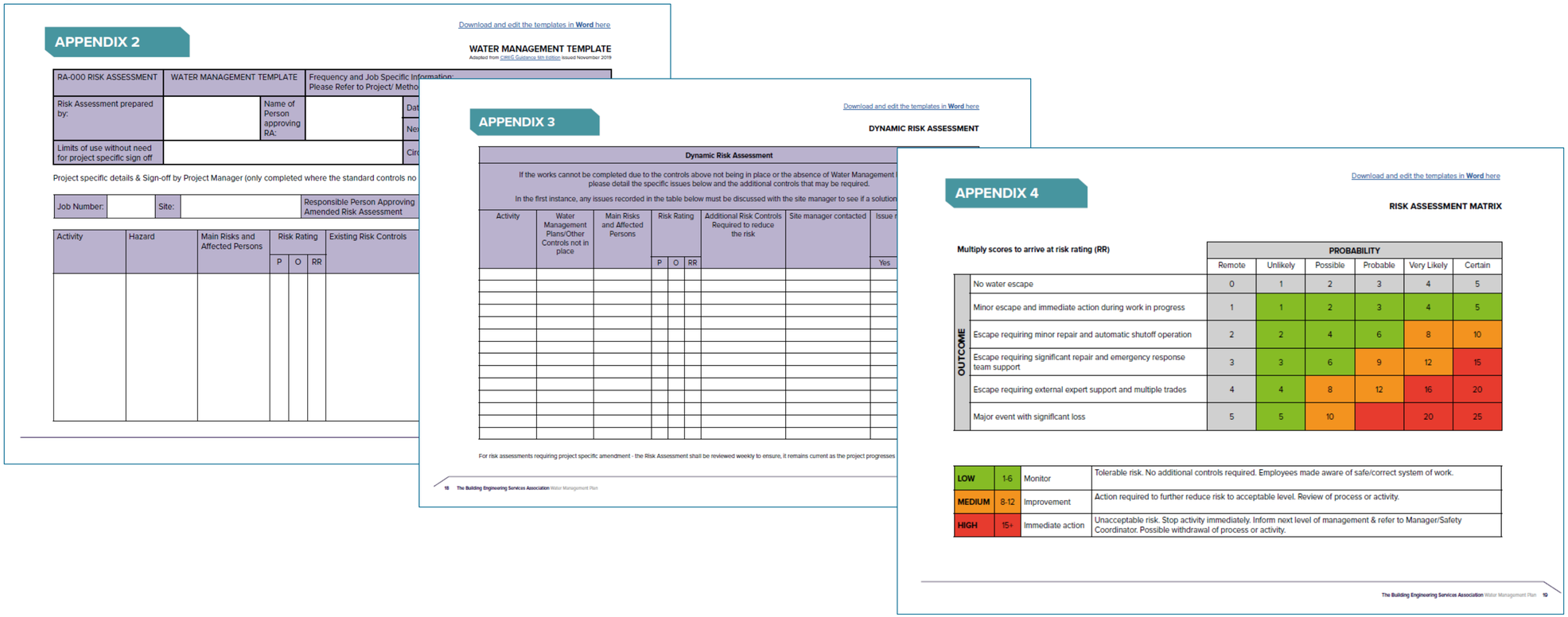
WATER INDUSTRY APPROVED PLUMBERS' SCHEME

CIBSE

THE SOCIETY OF PUBLIC HEALTH ENGINEERS

# Water Management Planning

## Management, Quality and Competence



APPENDIX 2

Download and edit the templates in **Word** here

WATER MANAGEMENT TEMPLATE

Adapted from CIBSE Guidance 5th Edition issued November 2019

| RA-000 RISK ASSESSMENT | WATER MANAGEMENT TEMPLATE | Frequency and Job Specific Information: Please Refer to Project/ Metho |
|---|---|---|
| Risk Assessment prepared by: | Name of Person approving RA: | Dat / Ne / Cir |
| Limits of use without need for project specific sign off | | |

Project specific details & Sign-off by Project Manager (only completed where the standard controls no

| Job Number: | | Site: | | Responsible Person Approving Amended Risk Assessment |
|---|---|---|---|---|

| Activity | Hazard | Main Risks and Affected Persons | Risk Rating | | | Existing Risk Controls |
|---|---|---|---|---|---|---|
| | | | P | O | RR | |
| | | | | | | |

APPENDIX 3

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DYNAMIC RISK ASSESSMENT

**Dynamic Risk Assessment**

If the works cannot be completed due to the controls above not being in place or the absence of Water Management please detail the specific issues below and the additional controls that may be required.

In the first instance, any issues recorded in the table below must be discussed with the site manager to see if a solution

| Activity | Water Management Plans/Other Controls not in place | Main Risks and Affected Persons | Risk Rating | | | Additional Risk Controls Required to reduce the risk | Site manager contacted | Issue r |
|---|---|---|---|---|---|---|---|---|
| | | | P | O | RR | | | Yes |
| | | | | | | | | |

For risk assessments requiring project specific amendment - the Risk Assessment shall be reviewed weekly to ensure, it remains current as the project progresses

18 The Building Engineering Services Association Water Management Plan

APPENDIX 4

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RISK ASSESSMENT MATRIX

**Multiply scores to arrive at risk rating (RR)**

| OUTCOME | PROBABILITY | | | | | |
|---|---|---|---|---|---|---|
| | Remote | Unlikely | Possible | Probable | Very Likely | Certain |
| No water escape | 0 | 1 | 2 | 3 | 4 | 5 |
| Minor escape and immediate action during work in progress | 1 | 1 | 2 | 3 | 4 | 5 |
| Escape requiring minor repair and automatic shutoff operation | 2 | 2 | 4 | 6 | 8 | 10 |
| Escape requiring significant repair and emergency response team support | 3 | 3 | 6 | 9 | 12 | 15 |
| Escape requiring external expert support and multiple trades | 4 | 4 | 8 | 12 | 16 | 20 |
| Major event with significant loss | 5 | 5 | 10 | | 20 | 25 |

| | | | |
|---|---|---|---|
| **LOW** | 1-6 | Monitor | Tolerable risk. No additional controls required. Employees made aware of safe/correct system of work. |
| **MEDIUM** | 8-12 | Improvement | Action required to further reduce risk to acceptable level. Review of process or activity. |
| **HIGH** | 15+ | Immediate action | Unacceptable risk. Stop activity immediately. Inform next level of management & refer to Manager/Safety Coordinator. Possible withdrawal of process or activity. |

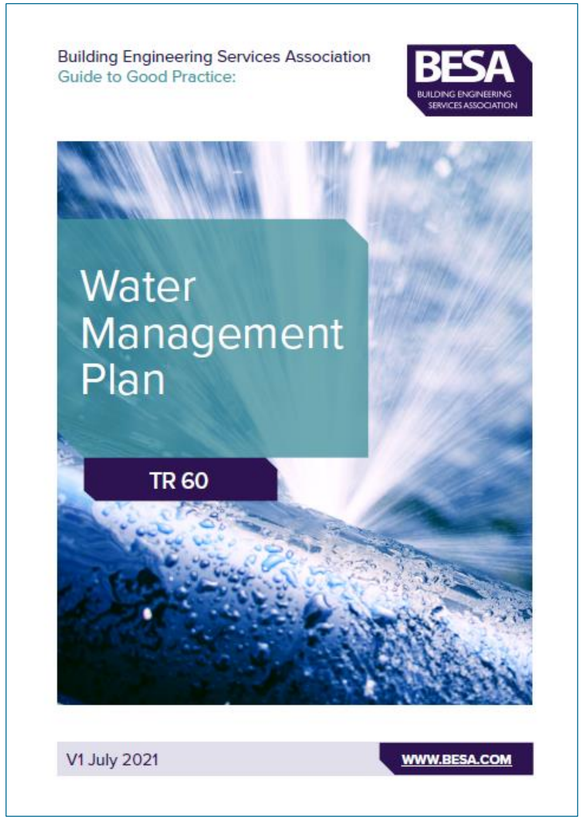
The Building Engineering Services Association Water Management Plan 19

# Water Management Planning

## TR60 – Water Management Plan

www.thebesa.com/knowledge/shop/products/

Feedback is appreciated



# Implementing Water Systems from Design to Installation

Thank You for Listening

Paul McSoley | Mace | Technical Compliance

Sanjay Modasia | JA Brooks | SoPHE Contractors' Working Group

Laurence Seymour | Imtech | Contractor Design

Will Pit | Laing O'Rourke | BESA Technical Chair