

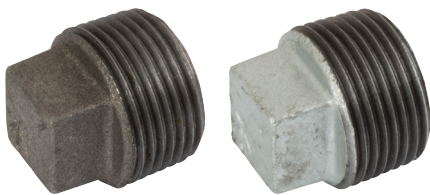
Malleable Iron Fittings

Plain Plug Hollow (291)



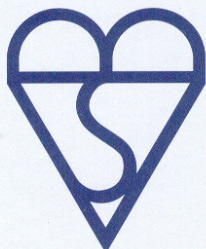
Part Number		Size		Dimensions (mm)	
Black	Galvanised	Inch	mm	A	B
K-MI291-14N	K-MI291-14	?	?	?	?
K-MI291-38N	K-MI291-38	?	?	?	?
K-MI291-12N	K-MI291-12	1/2	15	14.2	9.7
K-MI291-34N	K-MI291-34	3/4	20	16	11.2
K-MI291-11N	K-MI291-11	1	25	19.1	12.7
K-MI291-114N	K-MI291-114	1.1/4	32	20.3	14.2
K-MI291-112N	K-MI291-112	1.1/2	40	21.1	15.8
K-MI291-2N	K-MI291-2	2	50	22.4	17.3
K-MI291-212N	K-MI291-212	2.1/2	65	26	13
K-MI291-3N	K-MI291-3	3	80	28.7	20.3
K-MI291-4N	K-MI291-4	4	100	30.0	21.8

Plain Plug Solid (291S)



Part Number		Size		Dimensions (mm)	
Black	Galvanised	Inch	mm	A	B
K-MI291S-14N	K-MI291S-14	?	?	?	?
K-MI291S-38N	K-MI291S-38	?	?	?	?
K-MI291S-12N	K-MI291S-12	1/2	15	14.2	9.7
K-MI291S-34N	K-MI291S-34	3/4	20	16	11.2
K-MI291S-11N	K-MI291S-11	1	25	19.1	12.7
K-MI291S-114N	K-MI291S-114	1.1/4	32	20.3	14.2
K-MI291S-112N	K-MI291S-112	1.1/2	40	21.1	15.8
K-MI291S-2N	K-MI291S-2	2	50	22.4	17.3
K-MI291S-212N	K-MI291S-212	2.1/2	65	26	13
K-MI291S-3N	K-MI291S-3	3	80	28.7	20.3
K-MI291S-4N	K-MI291S-4	4	100	30.0	21.8

K I T E M A R K L I C E N C E



No. KM 67015

BSI hereby grants to:

Jinan Meide Casting Co., Ltd.
No. 3 Nanmen Road
Pingyin
Jinan
250400
China

In respect of:

BS 143 & 1256/BS EN 10242

Malleable cast iron and cast copper alloy threaded pipe fittings

the right and Licence to use the Kitemark in accordance with the Kitemark Licence Conditions of Contract governing the use of the Kitemark, as may be updated from time to time by BSI, and as approved by the Registrar under the Trade Marks Act 1994 (the "Conditions"). All defined terms in this Licence shall have the same meaning as in the Conditions.

The Kitemark is authorized to be affixed to the Product(s), manufactured at, or provided from, the address above and in conformity with the Standard(s) detailed on the following pages.

For and on behalf of BSI:

Anne Boyd, Divisional Director, Product Services Operations



First granted: **20 Mar 2003**

Date: **29 Apr 2003**

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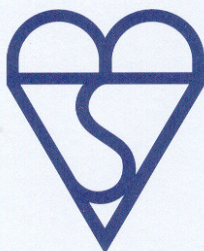
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K I T E M A R K L I C E N C E



No. KM 67015

Jinan Meide Casting Co., Ltd.

Jinan

BS EN 10242, BS 143 & BS 1256 - Malleable cast iron and cast copper alloy threaded pipe fittings

BLACK FIGURE NO.	GALVANIZED FIGURE NO.	DESCRIPTION	FITTING SIZE (INCHES)
TS140	TS140G	HEX BUSH M & F REDUCING	$\frac{1}{4} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{1}{8}$, $\frac{1}{2} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{4}$, $\frac{3}{4} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{2}$, $1 \times \frac{1}{4}$, $1 \times \frac{3}{8}$, $1 \times \frac{1}{2}$, $1 \times \frac{3}{4}$, $1 \times \frac{1}{4} \times \frac{1}{2}$, $1 \times \frac{1}{4} \times \frac{3}{4}$, $1 \times \frac{1}{4} \times 1$, $1 \times \frac{1}{2} \times \frac{1}{2}$, $1 \times \frac{1}{2} \times \frac{3}{4}$, $1 \times \frac{1}{2} \times 1$, $1 \times \frac{1}{2} \times 1 \frac{1}{4}$, $2 \times \frac{1}{2}$, $2 \times \frac{3}{4}$, 2×1 , $2 \times 1 \frac{1}{4}$, $2 \times 1 \frac{1}{2}$, $2 \times \frac{1}{2} \times 1 \frac{1}{2}$, $2 \times \frac{1}{2} \times 2$, 3×2 , $3 \times 2 \frac{1}{2}$, $\frac{1}{2}$, 4×2 , 4×3 .
TS144	TS144G	HEX NIPPLE	$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 , $1 \frac{1}{4}$, $1 \frac{1}{2}$, 2 .
TS145	TS145G	HEX NIPPLE M. REDUCING	$\frac{1}{4} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{2}$, $1 \times \frac{1}{2}$, $1 \times \frac{3}{4}$, $1 \times \frac{1}{4} \times 1$, $1 \times \frac{1}{2} \times 1$, $1 \times \frac{1}{2} \times 1 \frac{1}{4}$, $2 \times 1 \frac{1}{2}$.
TS147	TS147G	PLUG (PLAIN HOLLOW)	$\frac{1}{2}$, $\frac{3}{4}$, 1 , $1 \frac{1}{4}$, $1 \frac{1}{2}$, 2 , $2 \frac{1}{2}$, 3 , 4 .
TS148	TS148G	PLUG (PLAIN SOLID)	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 , $1 \frac{1}{4}$, $1 \frac{1}{2}$, 2 .

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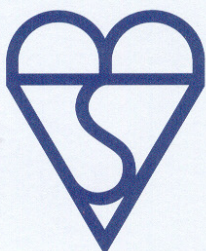
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BLACK FIGURE NO.	GALVANIZED FIGURE NO.	DESCRIPTION	FITTING SIZE (INCHES)
TS149	TS149G	RECESSED PLUG	$\frac{1}{2}$, $\frac{3}{4}$, 1, 1.1/4, 1.1/2, 2.
TS150	TS150G	BACKNUT	$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1.1/4, 1.1/2, 2.
TS151	TS151G	ELBOW 90° F.EQUAL	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1.1/4, 1.1/2, 2, 2.1/2, 3, 4.
TS151	TS151G	ELBOW 90° F.REDUCING	$\frac{1}{2} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{2}$, $1 \times \frac{1}{2}$, $1 \times \frac{3}{4}$, $1.1/4 \times \frac{1}{2}$, $1.1/4 \times \frac{3}{4}$, $1.1/4 \times 1$.
TS152	TS152 G	ELBOW 90° M & F EQUAL	$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1.1/4, 1.1/2, 2.
TS155	TS155 G	ELBOW 45° F. EQUAL	$\frac{1}{2}$, $\frac{3}{4}$, 1, 1.1/4, 1.1/2, 2.
TS156	TS156 G	ELBOW 45° M & F EQUAL	$\frac{1}{2}$, $\frac{3}{4}$, 1, 1.1/4, 1.1/2, 2.

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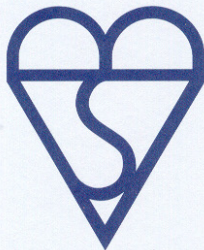
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BLACK FIGURE NO.	GALVANIZED FIGURE NO.	DESCRIPTION	FITTING SIZE (INCHES)
TS161	TS161G	TEE 90° F.EQUAL	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4.
TS161	TS161G	TEE 90° REDUCING ON BRANCH	$\frac{1}{2} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{4}$, $\frac{3}{4} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{2}$, $1 \times \frac{1}{4}$, $1 \times \frac{3}{8}$, $1 \times \frac{1}{2}$, $1 \times \frac{3}{4}$, $1\frac{1}{4} \times \frac{1}{2}$, $1\frac{1}{4} \times \frac{3}{4}$, $1\frac{1}{4} \times 1$, $1\frac{1}{2} \times \frac{1}{2}$, $1\frac{1}{2} \times \frac{3}{4}$, $1\frac{1}{2} \times 1$, $1\frac{1}{2} \times 1\frac{1}{4}$, $2 \times \frac{1}{2}$, $2 \times \frac{3}{4}$, 2×1 , $2 \times 1\frac{1}{4}$, $2 \times 1\frac{1}{2}$, $2\frac{1}{2} \times \frac{1}{2}$, $2\frac{1}{2} \times \frac{3}{4}$, $2\frac{1}{2} \times 1$, $2\frac{1}{2} \times 1\frac{1}{4}$, $2\frac{1}{2} \times 1\frac{1}{2}$, $2\frac{1}{2} \times 2$.
TS161	TS161G	TEE 90° REDUCING ON RUN	$\frac{1}{2} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{3}{8}$, $\frac{3}{4} \times \frac{1}{2}$, $1 \times \frac{1}{2}$, $1 \times \frac{3}{4}$, 1×1 , $1\frac{1}{4} \times \frac{1}{2}$, $1\frac{1}{4} \times \frac{3}{4}$, $1\frac{1}{4} \times 1$, $1\frac{1}{2} \times \frac{1}{2}$, $1\frac{1}{2} \times \frac{3}{4}$, $1\frac{1}{2} \times 1$, $1\frac{1}{2} \times 1\frac{1}{4}$, 2×1 , $2 \times 1\frac{1}{2}$, $2\frac{1}{2} \times 1$, $2\frac{1}{2} \times 1\frac{1}{2}$.
TS161	TS161G	TEE 90° REDUCING ON BRANCH & RUN	$\frac{3}{4} \times \frac{1}{2}$, $1 \times \frac{3}{4}$, 1×1 , $1\frac{1}{4} \times \frac{1}{2}$, $1\frac{1}{4} \times \frac{3}{4}$, $1\frac{1}{4} \times 1$, $1\frac{1}{2} \times \frac{1}{2}$, $1\frac{1}{2} \times \frac{3}{4}$, $1\frac{1}{2} \times 1$, $1\frac{1}{2} \times 1\frac{1}{4}$, 2×1 , $2 \times 1\frac{1}{2}$, $2\frac{1}{2} \times 1$, $2\frac{1}{2} \times 1\frac{1}{2}$.
TS161	TS161G	TEE 90° INCREASING ON BRANCH	$\frac{1}{2} \times \frac{3}{4}$, $\frac{3}{4} \times 1$, $2 \times 2\frac{1}{2}$.

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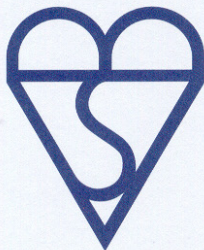
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BLACK FIGURE NO.	GALVANIZED FIGURE NO.	DESCRIPTION	FITTING SIZE (INCHES)
TS171	TS171G	CROSS 90° F.EQUAL	1/2, 3/4, 1, 1 1/4, 1 1/2, 2.
TS176	TS176G	SOCKET F. EQUAL	1/8, 1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2.
TS179	TS179G	SOCKET F. REDUCING	3/8x1/4, 1/2x1/4, 1/2x3/8, 3/4x1/4, 3/4x3/8, 3/4x1/2, 1x1/4, 1x3/8, 1x1/2, 1x3/4, 1 1/4x1/2, 1 1/4x3/4, 1 1/2x1, 1 1/2x1 1/2, 1 1/2x3/4, 1 1/2x1, 1 1/2x1 1/4, 2x1/2, 2x3/4, 2x1, 2x1 1/4, 2x1 1/2.
TS185	TS185G	CAP	1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2.
TS191	TS191G	LONG SWEEP BEND 90° M.EQUAL	1/2, 3/4, 1, 1 1/4, 1 1/2, 2.
TS192	TS192G	SHORT BEND 90° M & F EQUAL	1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2.

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BLACK FIGURE NO.	GALVANIZED FIGURE NO.	DESCRIPTION	FITTING SIZE (INCHES)
TS193	TS193G	SHORT BEND 90° F.EQUAL	1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3.
TS199	TS199G	PITCHER TEE 90° F.EQUAL	1/2, 3/4, 1, 1 1/4, 1 1/2, 2.
TS256	TS256G	UNION SPHERICAL/TAPER SEAT IRON TO IRON F.EQUAL	1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2 1/2, 3, 4.
TS257	TS257G	UNION SPHERICAL SEAT IRON TO IRON M & F EQUAL	1/2, 3/4, 1, 1 1/4, 1 1/2, 2.
TS271	TS271G	UNION SPHERICAL SEAT BRONZE TO IRON	1/2, 3/4, 1, 1 1/4, 1 1/2, 2.

Manufactured under a quality system assessment to: **ISO 9001: 2000 Quality Management Systems**

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PS0270202JAP

**PREVENTION OF
CONTAMINATION AND
WASTE OF DRINKING WATER
SUPPLIES**

AUGUST 2002

Water and Waste Water Treatment Works

*Information for
anyone installing,
modifying or
maintaining
plumbing
installations*

WRAS
Water Regulations Advisory Scheme



Prepared and Approved on behalf of
the UK Water Suppliers by the
Water Regulations Advisory Scheme
Technical Committee

Water and Waste Water Treatment Works

PREVENTION OF CONTAMINATION
AND WASTE OF DRINKING
WATER SUPPLIES

PAGE	
2	Introduction
3	Scope of this Guide
4	Applying the Regulations
4	Notification and Consent
6	Risks of Contamination and its Prevention
7	Identification of Pipes and Fittings
7	Backflow Prevention
10	Typical Backflow Prevention Arrangements and Devices
12	Hose Union Connections
12	Operating Procedures and Training
13	Requirements for Water Fittings
13	Installation Requirements
14	Water Efficiency and Conservation
15	Points to remember
16	Further Information and Advice
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1. Introduction

Drinking water supplies to Water and Waste Water treatment works, like supplies to other industrial process plants which use chemicals or materials that are harmful to human health, are at risk of being accidentally contaminated by backflow or cross connection with other fluids. Preventing contamination is imperative to protect the health of the staff on the site and of others supplied with drinking water from the same system. Plumbing systems, appliances and process equipment which require water supplies must be installed correctly. This can be more difficult in these types of works because of their complexity.

For many years, water supply byelaws were used to protect the quality and avoid waste of public water supplies. These byelaws were replaced in England and Wales on the 1 July 1999 by the Water Supply (Water

Fittings) Regulations (1999), and on the 4 April 2000 in Scotland by the Byelaws 2000. The Regulations and Byelaws 2000 are technically similar and references to 'the regulations' in this Installation Guide refer to both. When the Water Regulations in Northern Ireland are updated, the same technical requirements will apply throughout the whole of the UK.

The regulations apply to Water and Waste Water treatment works just as they do to all other premises which are connected to the public water supply system. The Water Suppliers have been given the duty to enforce the regulations. They do so by the notification and consent process (see Section 4) and by inspection of plumbing installations in new and existing premises.

Legal duty to comply. People who install or use fittings, appliances or equipment which are part of the water supply systems at Water and Waste Water treatment works have a legal duty to comply with the regulations or they risk committing a criminal offence. Where the sites are operated by, or on behalf of, statutory water or sewerage undertakings, an additional reason to fully comply with the regulations is the effect which a contamination incident would have upon public confidence in the undertaking and, where appropriate, its authority to enforce the regulations upon others.

2. *Scope of this Guide*

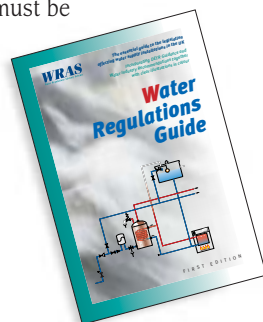
This Guide is intended as an aid to those who are responsible for designing new installations or for modifying or maintaining existing systems. It summarises the requirements of the regulations as they apply to Water and Waste Water treatment works, especially regarding prior notification and consent for proposed installations, prevention of contamination and prevention of damage and waste of water due to the effects of freezing.

This Guide promotes good practice for compliance with, and enforcement of, the regulations, it encourages water conservation and supports efforts to establish common interpretation of the regulations and installation requirements for water supply systems in Water and Waste Water Treatment Works.

The purposes of the Regulations are to prevent:

**CONTAMINATION,
WASTE, MISUSE AND
UNDUE CONSUMPTION
AND ERRONEOUS
MEASUREMENT OF
THE WATER SUPPLY**

The **Water Regulations Guide**, published by WRAS, provides general guidance on how to meet the requirements of the Regulations. It is used throughout the Water Supply Industry and provides the information on which this summary is based. For a comprehensive understanding of the regulations, reference to the Guide must be made.



Some Useful Definitions

WATER FITTINGS

'Water fittings' includes all pipes, pipe fittings, joints, valves, cisterns, appliances and equipment which form the water supply system in premises or are connected to it. The supply pipe is included i.e. that part of the underground service pipe, connecting the premises to the water main, which is owned by and is the responsibility of the premises owner.

WHOLESOME WATER

Water supplied by the Water Supplier of suitable quality for drinking purposes.

CONTAMINATION

Contamination includes any reduction in aesthetic, chemical or biological quality of the water due to raising its temperature or the introduction of polluting substances – whether it is harmful to health or not.

BACKFLOW

Backflow is defined as 'flow in a direction contrary to the intended normal direction of flow'.

CROSS-CONNECTION

Any connection between the water supply system containing wholesome water supplied by the Water Supplier and pipes, fittings or equipment containing any other water.

PERMEATION

Permeation occurs when a substance penetrates the material of which a pipe is made and contaminates the water within the pipe.

3. Applying the Regulations

The regulations apply to all types of premises and to all **water fittings** (see 'Definitions'), which are supplied, or are to be supplied, with water from the public supply. The regulations apply downstream from the beginning of the **supply pipe** (see 'Definitions').

The regulations do not apply to equipment which is not connected and is not intended to be connected, to water supplied by a public water supplier. The regulations do not apply to premises without a public water supply connection (e.g. those with a private water supply only).

Purposes of the regulations. The main purposes of the regulations are to prevent the waste, misuse, undue consumption and contamination of public water supplies. All owners or occupiers of premises and sites which are connected to the public water mains have a legal duty to comply with the regulations. Equally importantly, by following these requirements, they will protect their water supplies from contamination, prevent waste of water (and avoid wasting money where supplies are paid for by means of a water meter) and ensure they have reliable and robust plumbing systems which will give good service.

4. Notification and Consent

What must be notified? Regulation/Byelaw 5 requires that the local Water Supplier must be notified in advance for most types of plumbing installations and anyone installing or using the installation without the Water Supplier's consent could be committing a criminal offence.

Notification and consent are legally required for the installation of water fittings in water and waste water treatment plants, just as they are for other types of premises. This applies whether or not the treatment works is owned or operated by the same organisation as the enforcement authority (the local Water Supplier).

Consent is required for installation of fittings in new premises and buildings, for extensions or alterations of water systems in existing non-domestic premises, where

there is a material change of use of the premises and for the installation of specified items **including:**

- a pump or booster drawing more than 12 litres per minute,
- a water treatment unit which produces a wastewater discharge or which requires the use of water for regeneration or cleaning,
- equipment incorporating reverse osmosis,
- a reduced pressure zone (RPZ) valve or other mechanical device for backflow protection against a fluid which is in Fluid Category 4 or 5.

Who notifies? Notification can be made to the local Water Supplier by the premises owner or operator, the installer or someone acting on their behalf (e.g. consultant, designer or contractor). It is stressed that **the installer** commits an offence if installation starts without consent and **the user** commits an offence if the installation is used without consent.



Notification details. The notification details required are:

- the name and address of the person giving notice and, if different, the name and address of the person to whom the consent should be sent.
- description of the proposed work or any significant change of use of the premises.
- location of the premises and their use or intended use.
- a plan of those parts of the premises which relate to the proposed work and a diagram showing the pipework and fittings to be installed.
- the plumbing contractor's name and address, if an Approved Contractor is to do the work.

Consent. The Water Supplier has ten working days in which to either refuse consent or to grant it, with conditions if necessary. Any conditions attached to the consent must be complied with.

If no response is made within ten working days, consent is deemed to have been granted and the work can start, but the design and installation of the work must fully comply with the regulations.

5. Risks of Contamination and its Prevention

High risk premises. Many of the same risks occur in Water and Waste Water Treatment Works as occur in other industrial premises, but the presence of microbiological and chemical contaminants (e.g. untreated ('raw') water and sewage), effluents, sludges and treatment chemicals, results in the assessment of these works as being in the highest contamination risk category for premises – Fluid Category 5. As such they should be inspected for their compliance at regular intervals by the regulations enforcement authority (the Water Supplier).



Risks of contamination arise from:

cross connection of fittings and equipment containing contaminated fluids with the plumbing system which is used to provide drinking water and the supply pipe connected to the water main. Precautions include proper design and installation, provision of adequate backflow prevention devices and marking of pipes and fittings.

use of treated effluent for process purposes at Waste Water treatment works, especially where it is supplied via hydrants or washouts. Adequate labelling of pipes etc., authorised work procedures and adequate training of operators will reduce the risk.

temporary connection of pumps, boosters etc. to transfer wastes and chemicals. Great care is needed to avoid cross connection or back-pressurisation of systems conveying wholesome water. Clear labelling of pipes and fittings, authorised work procedures, adequate training of operators and compliance with the requirements for backflow protection devices will reduce the risk.

supply pipes in contaminated land can become contaminated by ingress of pollutants through cracks or leaks in pipes or joints. Supply pipes must not be laid in grossly contaminated land. Permeation of contaminants into drinking water can occur if plastic pipes are laid in ground which is contaminated with hydrocarbons or organic chemicals such as diesel or heating fuel, petrol, lubricating oil or paint thinners. Plastic pipes should not be laid where these contaminants could occur, but if this is unavoidable, a suitable pipe material must be selected to withstand permeation and it must be installed so that there are no underground joints on the pipe. (See WRAS [Information and Guidance Note No. 9-04-03: The selection of materials for water supply pipes in contaminated land](#)).

6. Identification of Pipes and Fittings

Water draw off points. All water draw off points supplied with cold water that is not wholesome should be clearly distinguished from drinking water taps. This can be by appropriately labelling either the outlets which are suitable for drinking or those which are not e.g. ‘Drinking Water’ or ‘NOT drinking water’ or ‘Effluent’. Draw off points located in domestic dwellings are not subject to this requirement.

Filling points provided for drinking water bowsters should be clearly labelled.

Colour coding pipes etc. All pipes, cisterns, and control valves conveying or containing water that is not wholesome must be readily distinguished from other pipes or fittings used with wholesome water. This may be achieved using pigmented materials, or colour-coding using paint or labels, in accordance with BS 1710: ‘Identification of pipelines and services’. (see Table 1). Above ground pipes should be labelled at junctions and at both sides of valves, service appliances and bulkheads.

Blue polythene water supply pipe must not be used under any circumstances to convey anything other than wholesome drinking water, nor must it be used to form ducts for conveying pipes with any other fluids or cables.

7. Backflow Prevention

Backflow prevention devices. Backflow protection is required by the regulations to protect every water fitting which supplies water for domestic purposes. Suitable backflow prevention devices are defined by regulations and are described in the Water Regulations Guide. Examples are given in Section 8.

All mechanical backflow prevention devices can fail and therefore need planned inspection and maintenance or replacement.

Categorising backflow risks. An assessment is required of the risk of contamination by backflow for each water fitting or appliance that contains water or other liquids and is connected to the plumbing system. The regulations define five levels of contamination risk, called Fluid Categories, based upon the nature and concentration of contaminants (see Table 2: Definitions of Fluid Categories). The fluid category should be assessed on the highest level of risk to which the water fitting is exposed. For each fluid category, the regulations define a range of backflow prevention devices which provide an appropriate level of protection.

FLUID	UNDER GROUND	ABOVE GROUND
Wholesome (Drinking) Water	Blue	Green – Blue – Green
Reclaimed Water	Black	Green – Black – Green
Effluent	Black	Black
Chemical Dosing	Violet	Violet
Fire Fighting	Blue	Green – Red – Green

Table 1: Colour coding for pipework

See the WRAS Information and Guidance Note No. 9-02-05 ‘Marking and Identification of Pipework for Reclaimed (Greywater) Systems’ for more information.

FLUID CATEGORY 1
Wholesome water supplied by a water undertaker and meeting the quality requirements for drinking water.
FLUID CATEGORY 2
Water which would be in fluid category 1 except that its aesthetic quality is impaired owing to:– <i>a change in its temperature, or the presence of substances or organisms causing a change in its taste, odour or appearance, including water in a hot water distribution system.</i>
FLUID CATEGORY 3
Fluid which represents a slight health hazard because of the concentration of substances of low toxicity, including any fluid which contains:– <i>ethylene glycol, copper sulphate solution or similar chemical additives; or sodium hypochlorite (chlorox and common disinfectants).</i>
FLUID CATEGORY 4
Fluid which represents a significant health hazard because of the concentration of toxic substances, including any fluid which contains:– <i>chemical, carcinogenic substances; or pesticides (including insecticides and herbicides); or environmental organisms of potential health significance.</i>
FLUID CATEGORY 5
Fluid representing a serious health hazard because of the concentration of pathogenic organisms, radioactive or very toxic substances, including any fluid which contains:– <i>faecal material or other human waste; or butchery or other animal waste; or pathogens from any other source.</i>

Table 2: Definitions of Fluid Categories

Whole-site and zone protection. In addition to point of use protection, it is strongly recommended that Water and Waste Water treatment plants should be provided with secondary backflow protection. Using a simple non-return valve or a more sophisticated reduced pressure zone (RPZ) valve, for example, on the supply pipe at the boundary of the site provides **whole-site backflow protection** to the water main and other users supplied from it. Where there is significant use of water supplies for domestic purposes on the site, e.g. domestic dwellings or food production in canteens, **zone backflow protection** is recommended as an additional safeguard against backflow from particular areas of activity or higher risk (Figure 1).

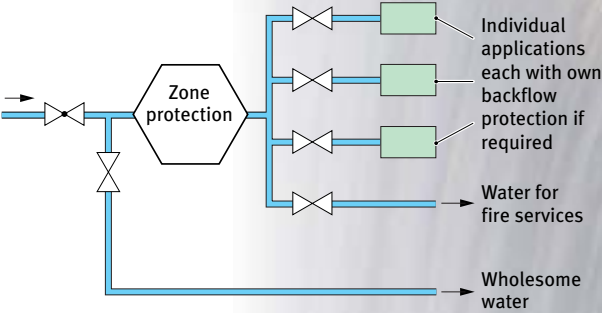


Figure 1: Principle of zone backflow protection

Examples of backflow risks. Many of the situations that are regarded as high risk are commonly found in Water and Waste Water treatment works and are included in the list of examples. This list is representative only and should not be regarded as exhaustive. Further information is available from the regulations enforcement staff of the local Water Supplier about the fluid category for a particular application. A list of contact details for all Regulations enforcement staff can be found on the Scheme's website (see page 16). The decision about any particular fluid category relies upon a risk assessment, which should take into account any site-specific circumstances and should be confirmed with the Water Supplier.

EXAMPLES OF RISKS		
<i>Equipment and Location</i>		<i>Fluid Category</i>
DOMESTIC		
1 Water Heaters – point of use		2
2 Wash basins, baths and showers – normal domestic use		3
3 Central heating primary circuit – all domestic premises & non-domestic premises with output up to 45kW; 150,000 Btu/h.		3
4 Cisterns (flushing)		3
5 Cisterns – Feed & Expansion		4/3*
6 WCs and urinals		5
7 Sinks		5
OFFICES LABORATORIES DEPOTS		
8 Water coolers, dispensing machines – no added ingredients		2
9 Vending, dispensing machines with CO ₂ gas or ingredients		3
10 Air conditioning – no additives		2
11 Air conditioning – additives		3
12 Dishwashing – catering		4
13 Washing machine – catering		4
14 Washing machine – protective clothing		5/4*
15 Food preparation equipment		5/4/3*
16 Laboratories		5
17 Vehicle washing		5
18 Make-up water, ornamental ponds, fountains		5
FIRE FIGHTING		
19 Fire sprinkler systems – no additives		2
20 Fire hose reels (<i>but see Note 1</i>)	(5)	3/2*
21 Fire hydrants – above ground outlets (<i>but see Note 1</i>)	(5)	2
22 Fire sprinkler systems – with additives		4
PLANT		
23 Steam raising plant		3
24 Water softening plant (salt regeneration)		3
25 Cisterns – storage for various purposes		5/4/3*
26 Hose union taps		5/4/3*
27 Water quality sampling equipment		5/4/3*
28 Treatment chemical dilution		5/4/3*
29 Chemical contact tank		5/4/3*
30 Safety showers		5/4
31 Screen/filter washing		5
32 Sludge pump seals		5
33 Effluent/recycled/reclaimed water		5

<i>Equipment and Location</i>	<i>Fluid Category</i>
IRRIGATION	
34 Irrigation systems – fixed heads 150mm above ground; no additives	3
35 Irrigation system – pop-up sprinklers or permeable ‘seep hoses’; no greater risk than domestic garden	4
36 Hose union taps – grounds watering	5/4/3*
37 Irrigation system – at or below ground, with or without additives; greater than risk of domestic garden	5
* <i>The Fluid Category is dependent on local circumstances and should be confirmed by the Water Supplier.</i>	
Note 1: The Fluid Category should be assessed on the most serious potential contaminant. For example, if a fire hose reel is sited where it cannot reach other contaminants, it is rated as a fluid category 2 risk. If the outlet is capable of being immersed in a drain it is rated as a fluid category 5 risk and must be protected accordingly.	



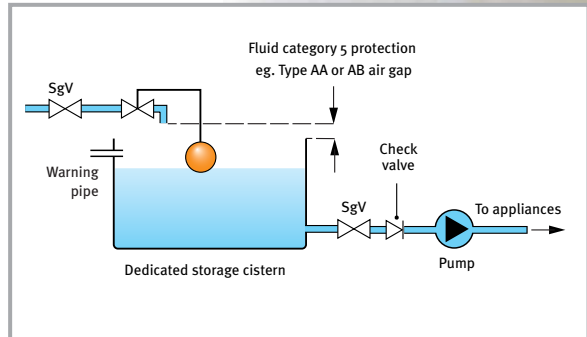
8. Typical Backflow Prevention Arrangements and Devices

Fluid Category 5 risk:

Fed from storage via a Type AA, AB or AD air gap (Fig.2)

SgV = Servicing valve

Figure 2: Category five protection via an air gap



To increase the water pressure, a booster pump can be fitted on the distributing pipes from cisterns incorporating appropriate air gaps, but consent from the Water Supplier is required if the flow is likely to be greater than 12 litres/minute.

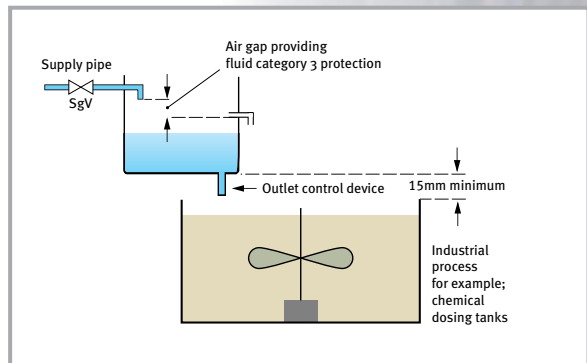
An interposed cistern (Fig.3) also provides fluid category 5 protection and may be suitable for a gravity-fed supply of make-up water for chemical dilution.

Where the public water supply is used in conjunction with water from other sources (e.g. reclaimed water) it must be protected by an appropriate air gap. An acceptable arrangement is shown (Fig.4).

Fluid Category 5 risk:

Fed from storage via an interposed cistern (Fig.3)

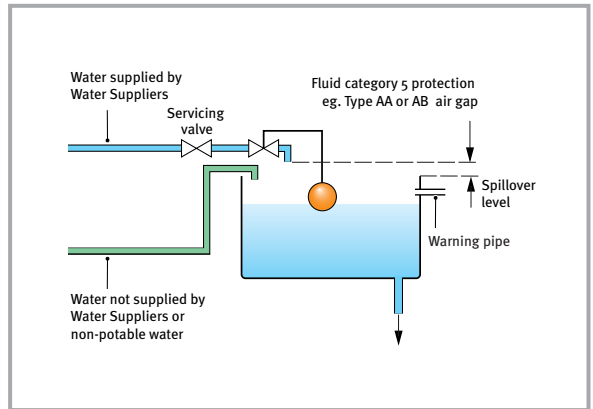
Figure 3: Use of an interposed cistern



Fluid Category 5 risk:

Separation of supplies from different origins

Figure 4: Separation of mains-supplied and other water supplies.



Fluid Category 4 risk:

Examples of devices include the Type AF air gap (Fig. 5), the Type BA device (reduced pressure zone valve), and a Type DB pipe interrupter with atmospheric vent and moving element.

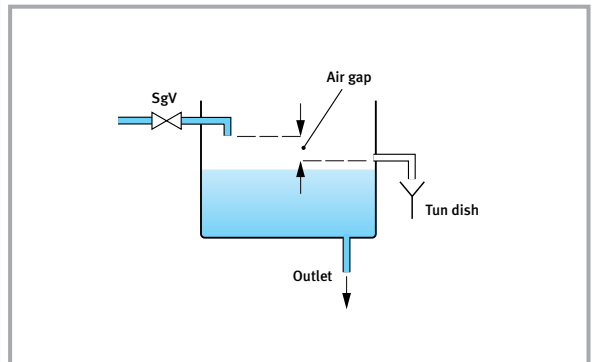


Figure 5: Type AF Air Gap

The air gap must be the greater of 20mm or twice the inlet diameter. The overflow must suitably sized for the appropriate type of air gap; eg. for an AF air gap, an overflow of cross-sectional area of four times that of the inlet pipe.

9. Hose Union Connections

Backflow protection is required for all hoses connected to the water supply system because of the backflow risk resulting from immersing the outlet of the hose in a contaminated fluid. In the Government Guidance to the regulations a hose union tap connected to a hose fitted with automatic self-closing flow control and used in domestic premises is given as an example of fluid category three, and in non-domestic premises as fluid category five. In practice, the level of protection required is determined by the potential use and contamination risk. Where a hose represents no more risk than occurs in a domestic garden e.g. its location and use is only for watering the grounds of the Water or Wastewater treatment works, it can be acceptable to require only fluid three protection (e.g. a double check valve). Where the risks are greater, a higher



level of protection is required. The backflow requirements for the installation of hose union connections apply whether or not a hose is actually connected.

To reduce the risk of backflow, an air gap should be maintained at all times at the outlet end of the hose, *ie.* if the hose is left unattended, the outlet must not be allowed to become submerged. A self-closing trigger-operated flow control device on the outlet of the hose will further reduce the risk of backflow and of the waste of water.

To prevent damage from freezing, backflow protection for hose union connections using mechanical devices, if permitted, should be adequately insulated or otherwise protected, for example by being installed within the thermal envelope of a building.

10. Operating Procedures and Training

Water and Waste Water treatment works' operators are recommended to ensure that their staff, and those of any contractors who from time to time work on the site, are given a general familiarisation with the potential causes of contamination and the measures adopted to prevent it. This should enable them to appreciate the importance of consistently using the correct procedures and equipment.

The development and use of suitable **operating procedures**, which reduce the risk of contamination by avoiding the creation of possible backflow or cross-connection situations, have an important part to play in regulations compliance (see Section 5 Risks of contamination and its prevention).

Operators of Water and Waste Water treatment works are recommended to develop and adopt suitable operating procedures. Where procedures are developed, all staff must be adequately trained in their use. This includes the staff of contractors who may undertake work on the sites either regularly or on a one-off basis.

11. Requirements for Water Fittings

Requirements. Regulations require that every water fitting shall be of an appropriate quality and standard and suitable for the circumstances in which it is used. In Water and Waste Water treatment works all water fittings, which includes appliances or equipment which are connected to, or are to be connected to, water from the public supply, must meet the regulations' requirements for water fittings. To do so, they must comply with either

- *relevant British or harmonised European Standards or*
- *equivalent standards of other European nations or European Technical Approvals or*
- *the UK Regulators' Specification.*

The installer or user may be required to provide the Water Supplier with proof of compliance.

WRAS Approved Products. Where manufacturers have submitted materials, fittings or appliances to the voluntary WRAS approval scheme, those which meet the requirements of the Regulators' Specification are approved by the Water Supply Industry and are endorsed as WRAS Approved Products. Provided they are installed in accordance with the regulations and any approval conditions, they can be accepted as complying without the need for further testing.

WRAS Approved Products are listed in the Water Fittings and Materials Directory, published by WRAS. The Directory also includes fittings which have the BSI 'Kitemark', indicating that they have been manufactured in accordance with relevant British Standards, and hence comply with the regulations.

Regulation 25 Approval. In the production and distribution of public drinking water supplies, materials in contact with treated or untreated water which is to be used for drinking are required to satisfy Regulation 25 of the Water Supply (Water Quality) Regulations 1989*. One method of satisfying Regulation 25 is for these materials to be approved for the purpose by the Secretary of State, which differs from the WRAS Approval scheme. For more information about Regulation 25 Approval, see the Drinking Water Inspectorate website (www.dwi.gov.uk/cpp/index.htm) or contact DWI. For completeness, the current list of materials approved by the Secretary of State under Regulation 25 is included in the WRAS Water Fittings and Materials Directory.

12. Installation Requirements

Regulations require that water fittings must be installed 'in a workmanlike manner' and define this as being in accordance with either relevant British Standards (e.g. BS 6700: 'Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages'), or a specification approved by the Regulator, or a method of installation approved by the Water Supplier.

The WRAS Water Regulations Guide gives examples of methods which are approved by Water Suppliers. WRAS publishes a Water Industry 'Approved Installation Method' for the correct use of fluxes and solders for making capillary joints with copper fittings (WRAS AIM No. 9-04-02 'Solders and Fluxes'), available from WRAS or the WRAS website.



*New Water Quality Regulations were approved in 2000, but include similar requirements for materials approvals to be brought in at a later date.

13. Water Efficiency and Conservation

By using water wisely, Water and Waste Water treatment works will benefit from reduced water usage. Short term measures involving simple housekeeping and longer-term modifications to the plumbing system can result in significant savings.

Short Term

Check water-using appliances

- Ensure that taps and float operated valves are not dripping.
- Ensure that hand basins are fitted with plugs, unless low volume spray taps are installed.
- Reduce the capacity of pre-regulations (9 or 7.5 litre) WC flushing cisterns to an effective minimum by placing a displacement object in the cistern.
- Adjust the frequency of flushes of automatic flushing urinals to a minimum.

Check for leaks

- Monitor water consumption regularly and investigate unexplained increases in consumption, in case it is caused by leaks in underground pipes or internal plumbing.

Long Term

By conducting a water audit, areas can be identified where new technology can be considered. Passive controls can assist in the management of plumbing systems.

Areas for improvement include:

Automatic control

- Infra-red sensors provide automatic flow control to urinals and wash basin taps.

WC flushing cisterns

- Dual flush mechanisms for WC cisterns.
- Alternative flushing methods, *ie.* electronic or pneumatic drop valves

Urinal flushing controls

- Timed and hydraulically operated flushing controls stop the flushing action at night and during periods when the buildings are vacated.

Self closing and spray taps

- Self closing taps, correctly adjusted for length of operating time, conserve water.
- Spray taps reduce consumption – install the self-closing or manually operated type.

Pressure reducing valves

- Pressure reducing valves will reduce flow and losses by leakage.

Waterless urinals

- Modifications to urinal traps enable urinals to operate with a chemical substitute instead of water.

Reclaimed water systems

- ‘Grey water systems’ re-use water from hand-basins and showers, after suitable storage and treatment, for other uses such as toilet flushing.
- Rainwater can be treated and used for irrigation or toilet flushing. Mains water top-up connections to storage cisterns must have backflow protection.
- WRAS publishes an Information and Guidance Note on Reclaimed Water Systems (IGN No. 9-02-04).

‘Hot’ water run-off

Reduce the volume of cold water run to waste before hot water arrives at the tap by:

- Careful attention to pipework design to keep pipe runs short.
- Lag hot water pipes to retain heat (and as a precaution against frost damage).
- Replace central water heaters by point-of-use heaters located close to appliances.

14. Points to Remember

Backflow to the mains or to the domestic water system may be harmful to health.



1.

Ensure that the location of the stop-valve is known for isolating the water supplied to each dedicated work area and that there is free access to each valve.



2.

Ensure that staff are aware of the drinking water distribution system and all its outlets within the site.



3.

No pipe or fitting shall be installed in ground contaminated or likely to be contaminated by faecal matter or effluent.



4.

Plastics pipes and fittings shall not be used in ground contaminated or likely to be contaminated by hydrocarbons, (diesel fuel or petrol).



5.

The use of new lead pipe or lead fittings in contact with drinking water is now prohibited. Care should be taken to ensure that where solders are used, they are approved and are marked lead free, or that compression fittings are used for drinking water installations.



6.

Ensure that the location of the water meter and its controlling stop-tap is widely known. Also, check the meter reading regularly, high readings can indicate a burst or leaking pipe or wastage.



7.

Float-operated valves to BS1212 Part 2,3 or 4 or those valves that are WRAS Approved Products are required for cisterns and they must have a servicing valve on the supply side of the valve.



8.

Pipes located in roof spaces or plumbing ducts need to be insulated for frost protection and heat ingress. Pre-formed pipe insulation should be used. Extra insulation will be required to delay freezing from unusually prolonged low temperatures.



9.

All drinking water supplies must be from a mains water supply or from a cistern installed in accordance with BS 7181:1989 'Specification for storage cisterns up to 500 litre actual capacity for water supply for domestic purposes.'



15. Further Information and Advice

The regulations staff of each Water Supplier will respond positively to regulations enquiries about existing and intended plumbing installations. Contact details for each Water Supplier are available on the WRAS website.

The Water Regulations Advisory Scheme will also advise on general regulations' issues.

Copies of all WRAS advisory leaflets can be read and printed out free of charge from the WRAS website (www.wras.co.uk). The website also has details of the Water Regulations Guide and the Water Fittings and Materials Directory and recent Water Industry interpretations of regulations.

16. Addresses

The Water Regulations Advisory Scheme
30 Fern Close,
Pen-y-Fan Industrial Estate,
Oakdale, Gwent NP11 3EH
Tel: 01495 248454
Fax: 01495 249234
e-mail: info@wras.co.uk
Website: www.wras.co.uk

'Regulation 25 Approval'

The Committee on Products and Processes,
Dr. Toks Ogunbiyi,
The Drinking Water Inspectorate,
Floor 2/E5, Ashdown House,
123 Victoria Street,
London SW1E 6OE

Other Water Supply Installation
Guides published:

Agricultural Premises
Holiday and Residential Parks