TEST CODE SHEET

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**1. TYPE OF TEST(S)**

Accelerated ageing.

**2. BYELAW REQUIREMENT FOR FITTINGS (SEE APPLICATION LIST BELOW)**

Byelaw 52

Every water fitting shall be constructed of materials, the nature, the strength and thickness of which ..... will prevent, so far as is reasonably practicable, damage from - (a) any external load; (b) vibration, stress; (c) internal water pressure; (d) internal... temperatures....

Byelaw 53

Every water fitting which ..... (c) is embedded in any wall or solid floors; or (d) is enclosed in any chase or duct; or (e) is in any other position which is inaccessible, or to which access is difficult; shall be - (i) constructed to withstand without bursting, buckling, fracture or leaking an internal hydraulic pressure twice that to which it would normally be subject.....

**3. BRITISH STANDARDS OR WATER SPECIFICATION, DEEMED TO SATISFY BYELAW REQUIREMENTS**

(See Water Supply Byelaw Guide)

3.1 Fittings with 'kitemarks' which are deemed to satisfy the requirements of byelaws are listed in the directory.

**4. TEST PROCEDURE**

Note Unless otherwise stated the temperature of the test fluid shall be 20 ± 10°C.

4.1 Tests applicable to the following:-

**PLASTIC PIPES AND FITTINGS**
- compatible - plastics pipe, for use continuously in contact with hot water.

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**(A) THERMOPLASTIC PIPES AND ASSOCIATED FITTINGS FOR HOT AND COLD WATER DOMESTIC PURPOSES AND HEATING INSTALLATIONS IN BUILDINGS** (Derived from BS 7291 Pt 1, 2, 3 & 4)

PRINCIPLE

An assembly of pipes and fittings is subjected to thermal cycling by the passage of water at a elevated pressure and inspected during and after test to ensure no leakage.

(a) cyclic testing under the conditions given in table 5 for the applicable class of pipe, fittings or joint, where each temperature change from hot to cold water and vice versa shall be effected within 1 min;

(b) on completion of the test schedule in accordance with (a), application of an internal pressure of not less than 20 bar at 15 ± 5°C for not less than 15 min.

APPARATUS

The apparatus shall be capable of alternately circulating hot and cold water through the test assembly, regulating the water pressure and of measuring the water temperature at the inlet and outlet from the test assembly as given in Table 5. The equipment shall be capable of effecting each change between hot and cold sources within -0, +60 seconds.

TEST METHOD

TEST ASSEMBLY

The assembly shall consist of pipe and fittings joined and clipped in accordance with the manufacturers recommended instructions. Where a range of fittings is available the assembly shall comprise a representative selection of sizes and configurations manufactured or recommended by the manufacturer and arranged so that the sizes under test increase sequentially in the direction of flow, for example as shown in fig 2.

(i) **Systems using rigid pipes**

The test assembly shall be in accordance with figure 2 where:

(a) the free length of vertical pipes shall be at least 2 m;

(b) the free length of horizontal pipes shall be at least 3 m;

(c) the total number of fittings shall be not less than 20 and shall include one or more of each of the following types of fittings.

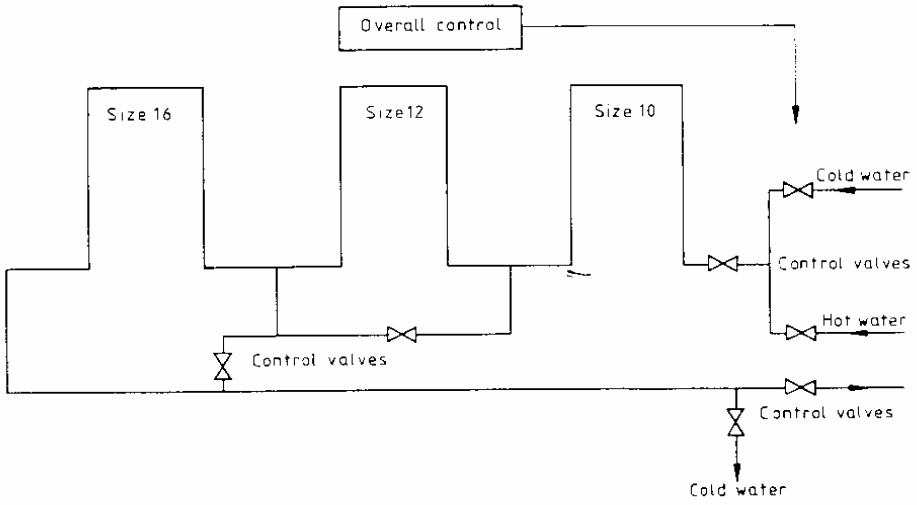
(1) straight connector;

(2) 90° elbow;

(3) 90° tee;

(4) plastic to metal transition fitting.

If a manufacturer recommends a particular installation practice, for example an expansion loop, bend clip or cold bend, it shall be included in the test.




NOTE 2. Free length of vertical pipes is at least 2 m.
NOTE 3. Free length of horizontal pipe is at least 3 m.

**Figure 2. Test assembly for systems based on rigid pipes**

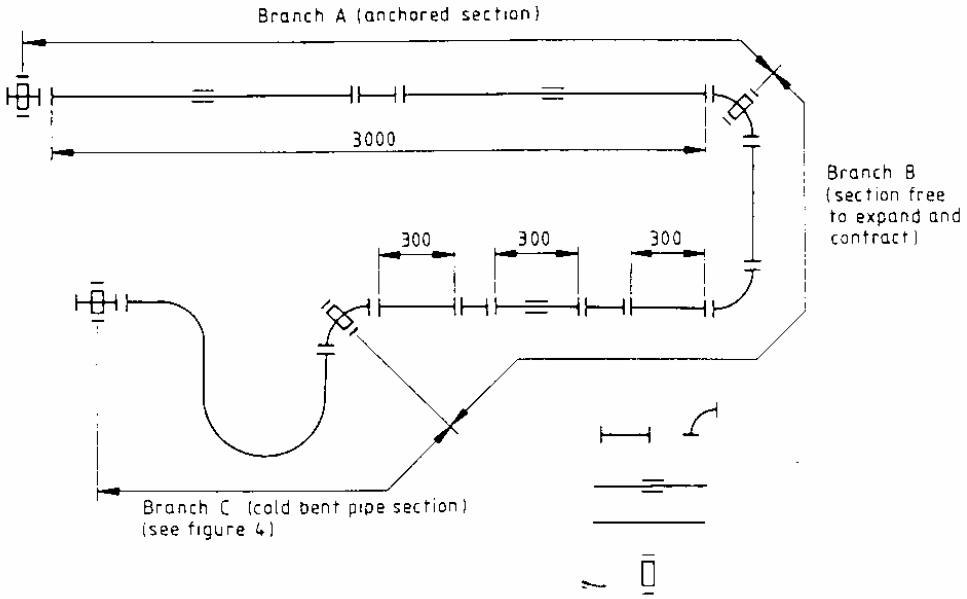
(ii) **Systems using flexible pipes**

The test assembly shall include:

(a) at least one pair of pre-stressed pipes linked by a straight connector, incorporated in accordance with Figure 3 (see branch A) and stressed in accordance with section pre-stressing within this document, where the free length of each such combination shall be 3 m ± 5mm,

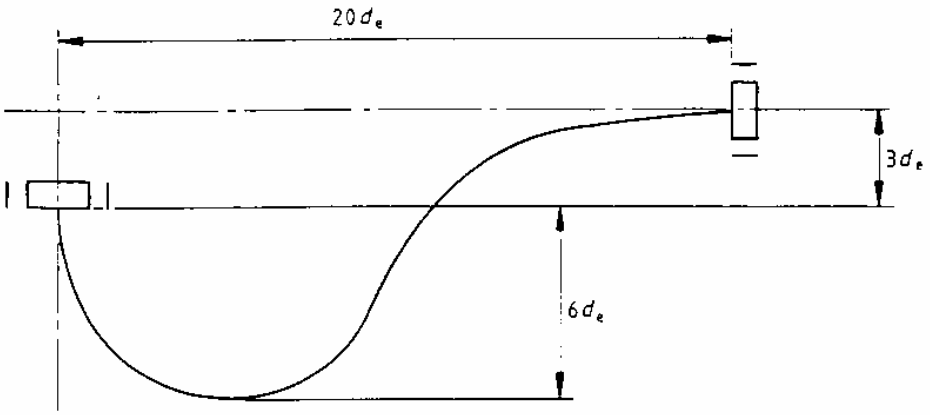
(b) at least two straight pipes each free to move when incorporated in accordance with figure 3 (see branch B) and each having a free length of 300 ± 5mm;

(c) at least one bent pipe, in accordance with figure 4, with each supported only by its ends when incorporated in accordance with figure 3 such that the free length of the pipe lies in the range $27d_e$ to $28d_e$ is the nominal outside diameter of the pipe.




All dimensions are in millimetres.

**Figure 3. Test assembly for systems based on flexible pipes**




NOTE. Free length of pipe is $27d_e$ to $28d_e$ where $d_e$ is the outside diameter of the pipe.

**Figure 4. Configuration of bent flexible pipes for thermal cycle testing**

(iv) **Pre-Stressing**

Subject the test pieces to be pre-stressed to a sustained force. This force is calculated as follows;

$$\text{Load (kg)} = \frac{\textit{Cross-sectional area x Tensile stress}}{\textit{Gravity.}}$$

Where; Cross-sectional area is in $mm^2$.
Gravity = 9.812 $m/s^2$

(Note: This is not applicable to PVC pipes or composite pipe systems.

Tensile Strength = OC -↘TE
OC = Coefficient of Thermal Expansion (supplied by manufacturer)
↘T = Temperature Difference (K)
E = Modulas of Elasticity (MPa) supplied by manufacturer

**Procedure**

Prepare the assembly for testing and prime it with water so that all air is excluded. See laboratory and setting up procedures 1-50-77.

In the case of flexible piping, subject the test pieces to be pre-stressed (see systems using flexible pipes and Figure 3) to a sustained tensile stress equivalent to that induced by contraction if subjected to a temperature drop of 20°C.

Subject the assembly to the passage of the specified cycles of hot and cold water at the pressures, temperatures and durations applicable to the class of the pipe and/or fittings under test (see principle and table 5). Perform any desired tightening or adjustment of joints within the first 5 cycles. Control the flow rate of the circulating water such that the measured temperature drop on the hot cycle from the inlet to the outlet of the test assembly does not exceed 5°C.

**Table 5. Thermal cycling test schedule**

| Class | Hot water | | Cold water | | Pressure | Number of cycles |
|---|---|---|---|---|---|---|
| | Inlet temperature | Duration | Inlet temperature | Duration | | |
| W | °C<br>83 ± 2<br>100 ± 2<br>83 ± 2 | min<br>20<br>20<br>20 | °C<br>15 ± 5<br>15 ± 5<br>15 ± 5 | min<br>10<br>10<br>10 | bar<br>3.5-0/+0.3<br>3.5-0/+0.3<br>3.5-0/+0.3 | <br>5000<br>1000<br>5000 |
| H | 83 ± 2<br>100 ± 2<br>95 ± 2 | 20<br>20<br>20 | 15 ± 5<br>15 ± 5<br>15 ± 5 | 10<br>10<br>10 | 6.0-0/+0.3<br>6.0-0/+0.3<br>6.0-0/+0.3 | 5000<br>1000<br>5000 |
| S | 83 ± 2<br>114 ± 2<br>105 ± 2 | 20<br>20<br>20 | 15 ± 5<br>15 ± 5<br>15 ± 5 | 10<br>10<br>10 | 6.0-0/+0.3<br>3.5-0/+0.3<br>3.5-0/+0.3 | 5000<br>1000<br>5000 |

## 5. ACCEPTANCE CRITERIA

Upon completion of the Test inspect all joints and pipes for signs of leakage. No leakage of the assembly shall have taken place. The assembly shall then be subjected to an internal pressure of not less than 20 bar at 15 ± 5°C for not less than 15 min without leakage.