

Penstocks for use in water and other liquid flow applications — Specification

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Committees responsible for this British Standard

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- British Chemical Engineering Contractors Association
- BSI Testing Product Certification
- BVAA — British Valve and Actuator Association
- CMF — Cast Metals Federation
- Ductile Iron Producers Association
- Energy Industries Council
- Institution of Mechanical Engineers
- Pipeline Industries Guild
- SBWWI — Society of British Water and Wastewater Industries
- Water UK

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Foreword

This British Standard has been prepared under the authority of Technical Committee PSE/7 by Subcommittee PSE/7/3. It supersedes BS 7775:1995, which is withdrawn.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

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1 Scope

This standard specifies the design and performance criteria for penstocks for use in waste water, water supply and other liquid flow applications. This standard also sets out the requirements for packaging and installation of penstocks.

Annex A sets out information to be supplied by the purchaser for the correct supply of a penstock.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 449-2, *Specification for the use of structural steel in building — Part 2: Metric units.*

BS 4618 (all parts), *Recommendations for the presentation of plastics design data.*

BS 5950-2, *Structural use of steelwork in building — Part 2: Specification for materials, fabrication and erection — Rolled and welded sections.*

BS 6920-1, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water — Specification.*

BS EN 287-1, *Qualification test of welders — Fusion welding — Part 1: Steels.*

BS EN 287-2, *Approval testing of welders for fusion welding — Part 2: Aluminium and its alloys.*

BS EN 288 (all parts), *Specification and approval of welding procedures for metallic materials.*

BS EN 1011-1, *Welding — Recommendations for welding of metallic materials — General guidance for arc welding.*

BS EN 1011-2, *Welding — Recommendations for welding of metallic materials — Arc welding of ferritic steels.*

BS EN 1074-1, *Valves for water supply — Fitness for purpose requirements and appropriate verification tests — Part 1: General requirements.*

BS EN 1418, *Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials.*

BS EN 1561:1997, *Founding — Grey cast irons.*

BS EN 1563:1997, *Founding — Spheroidal graphite cast iron.*

BS EN 10088-3:1995, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes.*

BS EN ISO 15614-8, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 8: Welding of tubes to tube-plate joints.*

BS EN ISO 9000, *Quality management systems — Fundamentals and vocabulary.*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1 Equipment

3.1.1

penstock

piece of equipment used to isolate and/or control the flow or level of a liquid consisting of a sliding door moving over the aperture in a frame which is secured on to a structure

3.1.2

penstock aperture

opening in the penstock frame for the passage of liquids

NOTE 1 See Figure 1.

NOTE 2 For rectangular penstocks the width refers to the horizontal aperture dimension and the height refers to the vertical aperture dimension; aperture size is always the width dimension followed by the height.

3.1.3

penstock door

obturator retained within the frame which is opened or closed by **operating equipment** to expose or obscure the frame aperture to isolate and/or control the flow or level of a liquid

NOTE See Figure 2.

3.1.4

penstock frame

means of fixing the penstock to a structure and retaining the door for the range of movement between the open and closed positions

NOTE See Figure 2.

3.1.5

seal

material fitted between the frame and the door to minimize leakage

NOTE 1 See Clause 5.

NOTE 2 The material can be either rigid (i.e. metal to metal) or resilient.

3.1.6 Stems

3.1.6.1

stem

means of raising and lowering the penstock door

NOTE There are two basic options for stems, given in 3.1.6.2 and 3.1.6.3.

3.1.6.2

non-rising stem

stem in which the rotation of the threaded stem in the operating nut, located in the top of the door, moves the door up or down the stem

3.1.6.3

rising stem

stem in which the rotation of the operating nut, located in the operating equipment, or the operation of a hydraulic or pneumatic cylinder raises or lowers the stem to which the door is connected by a stem block

3.1.7

wedging device

pressure device

component which forces the door and frame together

NOTE See Figure 2.

3.1.8**yoke**

integral or separate cross-member at the top of the frame sides and/or door guides of a penstock

NOTE See Figure 2.

3.1.9**door guide**

component which may be secured to, or be an integral part of, the penstock frame for the purpose of retaining/guiding the door during operation and when in the fully open position

3.1.10**operating equipment**

means, integral with the penstock, of opening and closing the door manually or by power operation

3.2 General**3.2.1****leakage**

liquid passing between the door and frame sealing faces of a penstock with the door in the fully closed position

3.2.2**coping**

top surface of a wall or channel wall

NOTE See Figure 2.

3.2.3**floor**

overhead operating level

NOTE See Figure 2.

3.2.4**invert**

bottom surface of the frame or aperture

NOTE See Figure 1.

3.2.5**soffit**

under surface of the top of the frame aperture

NOTE See Figure 1.

3.2.6**outreach**

dimension measured from the mounting face of the penstock frame to the centre line of a stem, not making any allowance for sealing material between the frame and the wall

NOTE See Figure 1.

3.3 Thrust types**3.3.1****thrust**

operating force required to open and close the penstock door

3.3.2**direct thrust**

thrust transmitted from the operating equipment directly to the penstock frame **yoke**

3.3.3**remote thrust**

thrust transmitted from the operating equipment to the structure remote from the penstock