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**Agrément
Certificate
No 95/3125**
Third issue*

Designated by Government
to issue
European Technical
Approvals

ENSIGN SANITARY PIPEWORK, DRAINAGE AND SEWERAGE SYSTEM

Système d'égouts
Abwassersystem

Product




• THIS CERTIFICATE REPLACES CERTIFICATE No 91/2700 AND RELATES TO THE ENSIGN SYSTEM, A CAST IRON SANITARY PIPEWORK, DRAINAGE AND SEWERAGE SYSTEM, THE COMPONENTS OF WHICH ARE REFERRED TO IN THE ACCOMPANYING DETAIL SHEETS.

• The system is for use in domestic, commercial and public buildings in accordance with BS EN 12056-2 : 2000, BS EN 752-1 : 1996, BS EN 752-2 : 1997, BS EN 752-3 : 1997 and BS EN 752-4 : 1998 for the conveyance of rainwater, domestic drainage and sewage as is permitted to be discharged into public sewers

continued

Building Regulations — Detail Sheet 1

1 The Building Regulations 2000 (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of drainage systems with the Building Regulations. In the opinion of the BBA, the Ensign Sanitary Pipework, Drainage and Sewerage System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement:	B3	Internal fire spread (structure)
Comment:		See section 10 of Detail Sheet 3.
Requirement:	E1	Airborne sound (walls)
Comment:		See section 11 of Detail Sheet 3.
Requirement:	H1(1)	Foul water drainage
Comment:		The Ensign system will convey the flow of foul or surface water and minimise the risk of blockages or leakage.
Requirement:	H3	Rainwater drainage
Comment:		The system is acceptable. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).

continued

by the Water Industry Act 1991, and sewage as is permitted and defined by the Sewerage (Scotland) Act 1968 and the Water and Sewerage Services (Northern Ireland) Order 1973.

- This Certificate does not cover the use of any of the products for untreated trade effluent.

These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information to specific systems.

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2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, the Ensign Sanitary Pipework, Drainage and Sewerage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:		The system complies with the requirements of this Standard. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).
Regulation:	12	Structural fire precautions
Standards:	D5.1 and D5.2	Service openings
Comment:		See section 10 of Detail Sheet 3.
Regulations:	19 and 20	Resistance to transmission of sound
Standard:	H2.1	Airborne sound
Comment:		See section 11 of Detail Sheet 3.
Regulation:	24	Drainage and sanitary facilities
Standard:	M2.1	Drainage system
Standard:	M2.5	Discharges from a drainage system
Comment:		The Ensign system will contribute to satisfying these Technical Standards. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).

3 The Building Regulations (Northern Ireland) 1994 (as amended)



In the opinion of the BBA, the Ensign Sanitary Pipework, Drainage and Sewerage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).
Regulation:	E6	Internal fire spread — Structure
Comment:		See section 10 of Detail Sheet 3.
Regulation:	G2	Separating walls and separating floors
Comment:		See section 11 of Detail Sheet 3.
Regulation:	N2	Drainage systems
Comment:		The system is acceptable. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).
Regulation:	N3	Sanitary pipework
Comment:		The system is acceptable. (See <i>Design Data</i> parts of Detail Sheets 3 and 4).

Bibliography

BS EN 752 *Drain and sewer systems outside buildings*
BS EN 752-1 : 1996 *Generalities and definitions*
BS EN 752-2 : 1997 *Performance requirements*
BS EN 752-3 : 1997 *Planning*
BS EN 752-4 : 1998 *Hydraulic design and environmental considerations*

BS EN 12056 *Gravity Drainage Systems inside Buildings*
BS EN 12056-2 : 2000 *Sanitary pipework, layout and calculation*

Conditions of Certification

4 Conditions

4.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

4.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

4.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

4.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

4.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, the Ensign Sanitary Pipework, Drainage and Sewerage System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 95/3125 is accordingly awarded to Saint-Gobain Pipelines plc.

On behalf of the British Board of Agrément

Date of Third issue: 12th February 2001

A handwritten signature in black ink, appearing to read 'P. C. Newson', is written over a light grey background.

Chief Executive

**Original Certificate issued 10th May 1995, with a Second issue 28th August 1997. This revised version issued to include change of Certificate holder's name, reference to the revised national Building Regulations and associated text and new Conditions of Certification.*

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For information about Agrément Certificate validity and scope, tel: Hotline 01923 665400, or check the BBA website.



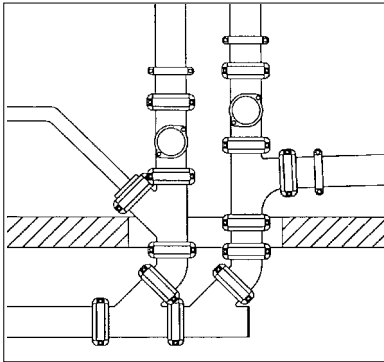
Saint-Gobain Pipelines plc

Certificate No 95/3125

**ENSIGN SANITARY PIPEWORK,
DRAINAGE AND SEWERAGE SYSTEM**

DETAIL SHEET 2
Fourth issue*

Product



• THIS DETAIL SHEET LISTS THE COMPONENTS WHICH MAY BE SUPPLIED WITH THE ENSIGN SYSTEM.

• The BBA has assessed each of the components as suitable for their intended purpose.

This Detail Sheet must be read in conjunction with Detail Sheet 1, which gives the product's position regarding the Building Regulations and Statutory Instruments and the Conditions of Certification, and Detail Sheets 3 and 4 which relate to the product applications.

Component	Range of sizes (mm)	Application
Sanitary Pipe	50–300	Above ground
Drainage Pipe	100, 150, 200, 250, 300	Below ground
Couplings	50, 70	Above ground
Couplings	100, 150, 200, 250, 300	Above and below ground
Brackets	50, 70	Above ground
Brackets	100, 150, 200	Above and below ground
88° Short Radius Bends	50, 300	Above ground
69° Short Radius Bends	50–150	Above ground
45° Short Radius Bends	50, 70, 125	Above ground
45° Short Radius Bends	100, 150, 200, 250, 300	Above and below ground
30° Short Radius Bends	50, 70, 125	Above ground
30° Short Radius Bends	100, 150	Above and below ground
15° Short Radius Bends	50, 70	Above ground
15° Short Radius Bends	100, 150	Above and below ground
88° Long Radius Bends	100	Above and below ground
22° Long Radius Bends	100	Above and below ground
45° Medium Radius Bend	100, 150	Above and below ground
88° Short Radius Bend with access	100	Above ground
88° Long Radius Bend with access	100	Above and below ground
88° Long Tail Bend	100	Above ground
45° Long Tail Bend	100	Above and below ground
88° Long Radius Bend with Heel Rest	100, 150	Below ground
Branches at 45°	100 x 100, 150 x 100, 150 x 150, 250 x 250, 300 x 300,	Above and below ground
Branches at 45°	200 x 100, 200 x 150, 200 x 200	Above and below ground
Branches at 45°	50 x 50, 70 x 50, 70 x 70, 100 x 50, 100 x 70, 125 x 70,	Above ground
	125 x 100, 125 x 125, 150 x 70, 150 x 125	
88° radius branch	70 x 70, 100 x 50, 100 x 70	Above ground
88° radius branch with access	70 x 70, 100 x 50, 100 x 70	Above ground
Branches at 88° Radius Curve	100 x 100, 150 x 100, 150 x 150	Above and below ground
Branches at 88° Radius Curve with access	100 x 100, 150 x 100, 150 x 150	Above and below ground
Branches at 88°	50 x 50, 70 x 50, 70 x 70, 100 x 50, 100 x 70, 100 x 100,	Above ground
	125 x 100, 125 x 125, 150 x 100, 150 x 125, 150 x 150,	
	200 x 200, 250 x 250, 300 x 300	
Branches at 69°	50 x 50, 70 x 50, 70 x 70, 100 x 50, 100 x 70	Above ground
Branches at 69°	100 x 100, 150 x 100	Above and below ground
Double Branches at 88°	100 x 100	Above ground
Double Branches at 88° Radius Curve	100 x 100	Above and below ground
Double Branches at 69°	100 x 100, 200 x 200	Above and below ground
Double Branches at 45°	100 x 100, 150 x 150, 200 x 200	Above and below ground
Long Tail Branch at 88°	100	Above ground
Long Tail Corner Branch at 88°	100 x 100	Above ground
Corner Branch at 88°	100 x 100	Above ground
Access Pipe round door	50, 70	Above ground
Access Pipe round door	100, 150	Above and below ground
Access Pipe rectangular access	100, 150, 200, 250, 300	Above and below ground
Access Pipe rectangular access	125	Above ground
Offsets at 75 mm	100	Above ground
Offsets at 130 mm	50, 70, 100, 125	Above ground

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Taper Pipes	70 x 50, 100 x 50, 100 x 70, 125 x 70, 125 x 50, 125 x 100, 150 x 70, 150 x 125, 200 x 125, 150 x 50	Above ground
Taper Pipes	150 x 100, 200 x 100, 200 x 150, 250 x 100, 250 x 150, 250 x 200, 300 x 150, 300 x 200, 300 x 250	Above and below ground
P-Trap plain	100	Above and below ground
P-Trap with access	50, 70	Above ground
P-Trap with access	100, 150	Above and below ground
Branch Trap	100, 70	Above ground
Roof connectors for asphalt	50, 100, 150	Above ground
Roof connectors for felt	100	Above ground
Blank Ends plain	50, 70, 125	Above ground
Blank Ends plain	100, 150, 200, 250, 300	Above and below ground
Blank Ends tapped 2" BSPT	70	Above ground
Blank Ends tapped 2" BSPT	100, 150	Above and below ground
Push-fit connection	100	Above ground
Transitional Connector	100	Above and below ground
Transition Pipe to Supersleve	100, 150	Below ground
Expansion Plug	70	Above ground
Expansion Plug	100, 150	Above and below ground
Stack Support Pipes and Brackets	70, 100, 125, 150, 200, 250, 300	Above ground
Boss Pipes single	50, 70, 100, 150	Above ground
Boss Pipes opposed	100	Above ground
Boss Pipes at 90°	100	Above ground
Puddle Flanges	100, 150, 200	Above and below ground
Multi-clamp for membrane	200	Above and below ground
Bellmouth Gully Inlets	100, 150	Below ground
Associated Covers and Gratings	200 dia	Below ground
Inspection Chambers	100 x 100, 150 x 100, 150 x 150	Below ground
(2-part) Couplings (with continuity)	50, 70, 100, 125, 150, 200, 250, 300	Above ground
(2-part) Couplings (without continuity)	100, 150, 200, 250, 300	Below ground
Soil Manifold	100	Above ground
Large Radius Bend x 88°	150	Above and below ground
Stack Support Brackets for Pipes	70, 100, 125, 150, 200, 250, 300	Above ground
Double Branch x 45°	150 x 100	Above and below ground
Taper Pipes	125 x 50, 150 x 50	Above ground
Branches, Single Radius Curve x 88°	200 x 200, 200 x 150	Above and below ground
Short Radius Bends x 69°	200	Above ground
Short Radius Bends x 30°	200	Above ground
Short Radius Bends x 22°	200	Above ground
Short Radius Bends x 15°	200	Above ground
Short Radius Bends x 15°	125	Above ground
Short Radius Bends x 88° Door Back	70	Above ground
Short Radius Bends x 88° Door Back	150	Above ground
Double Branches x 70°	200 x 200, 200 x 150	Above and below ground
Long Tailed Double Bends x 88°	70, 100	Above ground
Double Radius Branches x 88°	150 x 100, 200 x 150	Above ground
Air Pipe x 135°	100	Above ground
Push-fit Sockets Plain	50, 70, 100, 150	Above ground
Push-fit Sockets (eared)	50, 70, 100, 150	Above ground
Push-fit Sockets (slip)	50, 70, 100, 150	Above ground
Expansion Connector	100, 150	Above ground



On behalf of the British Board of Agrément

Date of Fourth issue: 12th February 2001

Chief Executive

**This Detail Sheet was issued on 10th May 1995, with Second and Third issues following. This version issued to include change of Certificate holder's name and additions to the product range.*



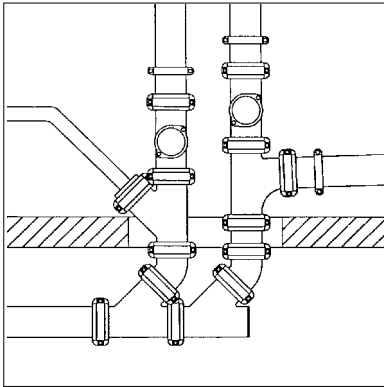
Saint-Gobain Pipelines plc

Certificate No 95/3125

**ENSIGN SANITARY PIPEWORK SYSTEM,
PIPES, COUPLINGS AND FITTINGS**

DETAIL SHEET 3
Third issue*

Product



• THIS DETAIL SHEET RELATES TO THE ENSIGN CAST IRON SANITARY PIPEWORK SYSTEM, PIPES, COUPLINGS AND FITTINGS FOR ABOVE GROUND APPLICATIONS.

• The products are installed easily and joints will remain watertight under all normal service conditions.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the products' position regarding the Building Regulations and the Conditions of Certification. The components referred to in this Detail Sheet are listed in Detail Sheet 2.

Technical Specification

1 Description

1.1 The Ensign Sanitary Pipework System, Pipes, Couplings and Fittings comprises cast iron pipes, couplings, fittings and other accessories. The dimensions given in Table 1 comply with those given in BS EN 877 : 1999. The pipes are spun cast without sockets and are normally supplied in 3 m lengths. The coupling consists of a ductile iron, two-piece band with a captive type WC elastomeric seal to BS EN 681-1 : 1996.

Table 1 Dimensions of pipes and fittings

Nominal diameter (mm)	Outside diameter (mm)	Pipes: nominal wall thickness (mm)	Minimum wall thickness (mm)	Weight per 3-metre length (kg)	Fittings: nominal wall thickness (mm)	Minimum wall thickness (mm)
50	60-59	3.5	3.0	12.5	3.5	3.0
75	85-82	3.5	3.0	18.2	3.5	3.0
100	112-109	3.5	3.0	24.3	3.5	3.0
125	137-133	4.0	3.5	34.3	4.0	3.5
150	162-158	4.0	3.5	40.9	4.0	3.5
200	212.5-207.7	5.0	4.0	67.4	5.0	4.0
250	276.5-271.5	5.5	4.5	97.9	5.5	4.5
300	328.5-323.5	6.0	5.0	126.8	6.0	5.0

1.2 The pipe and fittings are coated internally and externally with epoxy or acrylic paint (see Table 2).

Table 2 Coating thickness

	Coating	Average thickness of coating (µm)
Pipe		
internal	ochre epoxy	130
external	red acrylic paint	40
Fitting		
internal	red epoxy	150
external	red epoxy	70

1.3 Continuous quality control is exercised during manufacture to maintain product quality and includes:

pipes

visual checks
dimensional checks
temperature cycling test

fittings

visual checks
dimensional checks.

2 Delivery and site handling

2.1 Each pipe length is marked with the manufacturer's trademark, the nominal diameter and a code indicating date of manufacture. Fittings are marked with the manufacturer's trade mark and the nominal diameter.

2.2 Normal care is required in handling to prevent damage.

3 General



3.1 Ensign cast iron pipes, cast iron fittings and other accessories are satisfactory for use in domestic, commercial and public buildings in accordance with BS EN 12056-2 : 2000 for the conveyance of surface water and domestic sewage as is permitted to be discharged into public sewers by the Water Industry Act 1991, and surface water and sewage as is permitted and defined by the Sewerage (Scotland) Act 1968 and the Water and Sewerage Services (Northern Ireland) Order 1973.

3.2 The pipe is coated externally with red acrylic and internally with epoxy. The fittings are coated internally and externally with an epoxy coating. A finish coat should be applied to provide protection for external use.

4 Strength



4.1 Ensign cast iron pipes, cast iron fittings and other accessories will have adequate resistance to the forms of loading associated with installation and normal service conditions.

4.2 The products should be protected from impacts, for example, from heavy vehicles such as fork-lift trucks used on commercial premises.

5 Performance of joints



5.1 The joints will not be adversely affected by thermal movement when correctly made.

5.2 The joints will remain watertight under conditions of pipeline movement in excess of those expected to occur in normal good drainage practice.

6 Flow characteristics



6.1 A system comprising Ensign cast iron pipes and fittings (including swept entry branches and other accessories) will have satisfactory flow characteristics. Non-swept branch connections are restricted in accordance with BS EN 12056-2 : 2000, clause 6.3.2.5.1.

6.2 Offsets in the wet portion of a discharge stack should be avoided. However, if the S-bend offsets are to be fitted in this position, large radius bends should be used (see BS EN 12056-2 : 2000). A ventilation stack may be necessary above and below the offset.

7 Resistance to chemicals



The products will be unaffected by those types and quantities of chemicals likely to be found in the effluents defined in the Front Sheets of this Certificate.

8 Resistance to elevated temperatures



The products have adequate resistance to the temperatures likely to occur in the effluents defined in the Front Sheets of this Certificate.

9 Maintenance

Sections of the system can be removed easily and replaced. Access must be provided in accordance with BS EN 12056-2 : 2000.

10 Properties in relation to fire



10.1 Ensign cast iron pipes and fittings are non-combustible and therefore do not require a proprietary sealing system.

10.2 The regulations concerning the prevention of fire spread by fire-stopping, etc (listed in Detail Sheet 1) must be taken into account at this stage.

11 Noise



In common with all types of pipe materials, where Ensign pipe penetrates a floor or wall separating habitable rooms, it should be in an enclosure to limit sound transmission.

12 Durability



When used within the conditions and recommendations given in this Detail Sheet, the products will have a serviceable life equivalent to conventional cast iron sanitary pipework systems. When used externally the pipe should be painted regularly to prevent surface oxidation.

Installation

13 Procedure

13.1 Installation should be in accordance with BS EN 12056-2 : 2000 and the manufacturer's technical guide.

13.2 Joints are made by slackening the bolts on the coupling, removing the bolts from one side and removing the gasket. The gasket is placed over the end of the pipe or fitting, ensuring the central register is against the spigot edge. The second pipe or fitting is pushed into the gasket, again ensuring that the spigot is abutted against the central register. The coupling is loosely assembled around the gasket and the bolts tightened to a final torque setting of between 20 Nm and 35 Nm.

13.3 Pipes must be adequately supported at every connection and at a maximum spacing of two metres for horizontal pipe and three metres maximum for vertical pipe.

Technical Investigations

The following is a summary of the technical investigations carried out on the Ensign Sanitary Pipework System, Pipes, Couplings and Fittings.

14 Tests

Test data was supplied by CSTB to determine in accordance with the relevant clauses of BS EN 877 : 1999:

	Clause
Surface condition	5.1
External diameter and ovality	5.2.1/5.2.4
Wall thickness	5.2.2
Internal diameter of pipes	5.2.3
Straightness of pipes	5.2.5
End faces	5.2.6
Length of pipes	5.2.7
Lengths of fittings and sealing zone	5.2.7
Angle of fittings	5.2.8
Masses	5.3
Tensile strength	5.4
Brinell hardness	5.5
Ring crush strength of pipes	5.6
Internal coatings:	
resistance to salt spray	5.7.2.1
resistance to waste water	5.7.2.2
chemical resistance	5.7.2.3
dry coating thickness	5.7.2.4
adhesion	5.7.2.5
resistance to hot water	5.7.2.6
resistance to temperature cycling	5.7.2.7
External coatings:	
dry coating thickness	5.7.3.4
adhesion	5.7.3.5
Watertightness under different conditions	5.8.4/5.8.5
Airtightness	5.8.6
Temperature resistance	5.8.7
Marking	5.11

15 Other investigations

15.1 An evaluation of data was made to assess:

- system design
- resistance to chemicals
- practicability of installation
- suitability of materials
- effect of crossflow
- quality of castings
- effect of elevated temperature on pressure-tightness of joints
- flame resistance.

15.2 Roughness values for clean pipes, and associated flow capacities.

15.3 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BS EN 681 *Elastomeric seals. Material requirements for pipe joint seals used in water and drainage applications*

BS EN 681-1 : 1996 *Vulcanized rubber*

BS EN 877 : 1999 *Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance*

BS EN 12056 *Gravity Drainage Systems inside Buildings*

BS EN 12056-2 : 2000 *Sanitary pipework, layout and calculation*



On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. Q. Newman'.

Date of Third issue: 12th February 2001

Chief Executive

*Original Detail Sheet issued 10th May 1995, with a Second issue 28th August 1997. This revised version issued to include change of Certificate holder's name, reference to the revised national Building Regulations and associated text, revised product range and test data.

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For information about Agrément Certificate validity and scope, tel: Hotline 01923 665400, or check the BBA website.



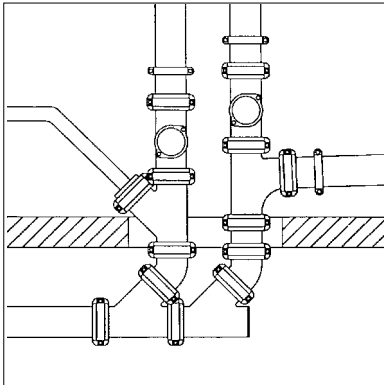
Saint-Gobain Pipelines plc

Certificate No 95/3125

ENSIGN DRAINAGE AND SEWERAGE SYSTEM, PIPES, COUPLINGS AND FITTINGS

DETAIL SHEET 4
Third issue*

Product



• THIS DETAIL SHEET RELATES TO THE ENSIGN CAST IRON DRAINAGE AND SEWERAGE SYSTEM, PIPES, COUPLINGS AND FITTINGS FOR BELOW GROUND APPLICATIONS.

• The products are installed easily and will remain watertight under all normal service conditions.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the products' position regarding the Building Regulations and the Conditions of Certification. The components referred to in this Detail Sheet are listed in Detail Sheet 2.

Technical Specification

1 Description

1.1 The Ensign drainage and sewerage system comprises cast iron pipes, couplings, fittings and chambers. The dimensions given in Table 1 comply with those given in BS EN 877 : 1999. The pipe is spun cast without sockets in 3 m lengths. The dimensions are given in Table 1.

Table 1 Dimensions of pipes

Nominal diameter	Outside diameter	Pipes: nominal wall thickness	Minimum wall thickness	Weight per 3-metre length	Fittings: nominal wall thickness	Minimum wall thickness
(mm)	(mm)	(mm)	(mm)	(kg)	(mm)	(mm)
100	112-109	3.5	3.0	24.3	3.5	3.0
150	162-158	4.0	3.5	40.9	4.0	3.5
200	212.5-207.7	5.0	4.0	67.4	5.0	4.0
250	276.5-271.5	5.5	4.5	97.9	5.5	4.5
300	328.5-323.5	6.0	5.0	126.8	6.0	5.0

1.2 The Ensign pipes have an external coating of zinc (130 gm^{-2}) covered by an average $40 \mu\text{m}$ thick grey acrylic-based paint and an internal coating of two layers of an average $250 \mu\text{m}$ thick ochre epoxy. The fittings have an internal and external $150 \mu\text{m}$ grey epoxy coating.

1.3 Continuous quality control is exercised during manufacture including visual and dimensional checks, spectrographic analysis, tensile strength, ring crush strength and coating thickness.

2 Delivery and site handling

2.1 Each pipe length is marked with the manufacturer's trademark, the nominal diameter and

a code indicating the date of manufacture. The fittings are marked with angle and nominal diameter.

2.2 The pipes are supplied in bundles according to diameter. The pipes and fittings should be stacked in a place where they will not constitute an obstacle on site and where they are protected from damage.

Design Data

3 General

The Ensign Drainage and Sewerage System, Pipes, Couplings and Fittings have been assessed for use in domestic underground drains and public and private sewers for the conveyance, by combined or separate systems, of surface water and domestic sewage, as is permitted to be discharged into public sewers by the Water Industry Act 1991 and surface water and sewage as is permitted and defined by the Sewerage (Scotland) Act 1968 and the Water and Sewerage Services (Northern Ireland) Order 1973.

4 Strength

4.1 Ensign pipes and fittings have adequate strength for use in situations when pipe to BS EN 877 : 1999 is suitable.

4.2 The products should be protected from impacts, for example from heavy vehicles such as fork-lift trucks, used on commercial premises.

5 Performance of joints

5.1 The joints will not be adversely affected by thermal expansion or contraction when correctly made.

5.2 The joints will remain tight under conditions of pipeline movement in excess of those expected to occur in normal good drainage practice.

6 Flow characteristics



The products will have normal flow characteristics associated with cast iron underground drainage and sewerage systems.

7 Resistance to chemicals



The products will be unaffected by those types and quantities of chemicals likely to be found in effluents defined in section 3 of this Detail Sheet.

8 Resistance to elevated temperatures



The products have adequate resistance to the temperatures likely to be found in domestic sewage in situations when pipe to BS EN 877 : 1999 is suitable.

9 Practicability of installation



The products are installed easily under normal site conditions.

10 Rodding and cleaning



Drains and sewers incorporating the product can be maintained using jetting equipment, or rodded using conventional flexible drain rods. Toothed root cutters, as used with some mechanical cleaning systems, could damage the internal coatings and should not be used.

11 Durability



When used within the conditions and recommendations given in this Detail Sheet, the protective coatings of the Ensign pipes and fittings will facilitate a serviceable life equivalent to conventional cast iron drainage systems with bitumen-based or coal-tar-based coatings.

Installation

12 General

Installation must be in accordance with the manufacturer's technical guide and, where appropriate, BS EN 752-1 : 1996, BS EN 752-2 : 1997, BS EN 752-3 : 1997, BS EN 752-4 : 1998 and BS EN 1610 : 1998.

13 Procedure

13.1 Joints are made by slackening the bolts on the coupling, removing the bolts from one side and removing the gasket. The gasket is placed over the end of the pipe or fitting, ensuring the central register is against the spigot edge. The second pipe or fitting is pushed into the gasket, again ensuring that the spigot is abutted against the

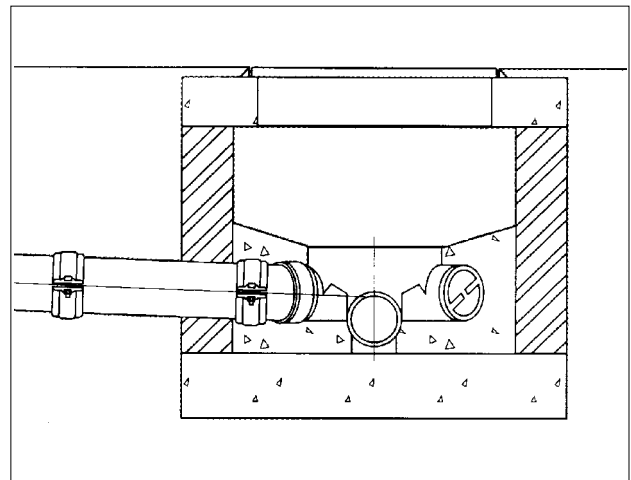
central register. The coupling is loosely assembled around the gasket and the bolts tightened to a final torque setting of between 20 Nm and 35 Nm.

13.2 Pipes can be cut to length on site with a circular saw or abrasive disc cutter. Before jointing, the cut ends should be thoroughly cleaned and deburred.

13.3 Where Ensign pipes and fittings are to be laid at less than 1.2 metres below the wearing surfaces of roads or less than 1.0 metre below road formation level, protection should be provided against loads other than final backfill and wheel loading or impact, eg site construction traffic, the possibility of subsequent building works or agricultural activities, the erection of fences, or from other mechanical damage.

13.4 A typical installation of an Ensign chamber base within a brickwork chamber is shown in Figure 1. The chamber base must be installed in the horizontal position and bedded on a 50 mm thick concrete base. The chamber base should be bedded into position while the concrete is still wet, so that it takes the shape of the chamber base.

Figure 1 Ensign chamber base installation detail



13.5 The outlets of the chamber base are then jointed to Ensign pipe using the appropriate Ensign coupling.

13.6 Backfilling can be carried out using selected site material which should be placed and consolidated around the system. Fine-grained soils with grains less than 25 mm and clay soils free from lumps greater than 75 mm can be placed directly into the trench. With composite soils containing larger grains of gravel it may be necessary to import the bedding material. During backfilling, the chamber base should be covered to prevent the ingress of foreign matter into the drain or sewer.

13.7 Where necessary, the bedding should be compacted using light machinery which should not cause significant disturbance to the pipeline. The requirement for controlled compacting will depend on the soil type, backfill type and depth of cover.

Technical Investigations

The following is a summary of the technical investigations carried out on the Ensign Drainage and Sewerage System, Pipes, Couplings and Fittings.

14 Tests

Test data was supplied by CSTB to determine in accordance with the relevant clauses of BS EN 877 : 1999:

	Clause
Surface condition	5.1
External diameter and ovality	5.2.1/5.2.4
Wall thickness	5.2.2
Internal diameter of pipes	5.2.3
Straightness of pipes	5.2.5
End faces	5.2.6
Length of pipes	5.2.7
Lengths of fittings and sealing zone	5.2.7
Angle of fittings	5.2.8
Masses	5.3
Tensile strength	5.4
Brinell hardness	5.5
Ring crush strength of pipes	5.6
Internal coatings:	
resistance to salt spray	5.7.2.1
resistance to waste water	5.7.2.2
chemical resistance	5.7.2.3
dry coating thickness	5.7.2.4
adhesion	5.7.2.5
resistance to hot water	5.7.2.6
resistance to temperature cycling	5.7.2.7
External coatings:	
buried systems	5.9.2
Watertightness under different conditions	5.8.4/5.8.5
Airtightness	5.8.6
Temperature resistance	5.8.7
Marking	5.11

15 Other investigations

15.1 An evaluation of data was made to assess:

- system design
- resistance to chemicals
- practicability of installation
- suitability of materials
- effect of crossflow
- quality of castings
- flame resistance
- compatibility with other paints.

15.2 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BS EN 752 *Drain and sewer systems outside buildings*

BS EN 752-1 : 1996 *Generalities and definitions*

BS EN 752-2 : 1997 *Performance requirements*

BS EN 752-3 : 1997 *Planning*

BS EN 752-4 : 1998 *Hydraulic design and environmental considerations*

BS EN 877 : 1999 *Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance*

BS EN 1610 : 1998 *Construction and testing of drains and sewers*



On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. Q. Newson'.

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Chief Executive

*Original Detail Sheet issued 10th May 1995, with a Second issue 28th August 1997, this revised version issued to include change of Certificate holder's name, reference to the revised national Building Regulations and associated text, revised product range and test data.

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