

Contents

Product ranges	2
Why specify cast iron above ground	3
Why specify cast iron below ground	12
Why specify Ensign & EEZI-FIT	13

Section 1 15
Pipes and Fittings –
Above Ground



Section 2 39
Pipes and Fittings –
Below Ground



Section 3 51
VortX – Floor, Shower
and Roof Drains



Section 4 65
Couplings – Technical



Section 5 75
Brackets – Technical



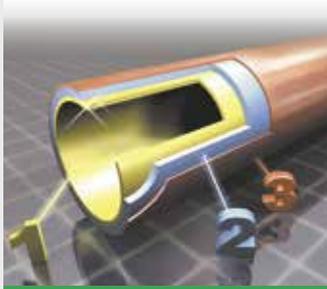
Section 6 81
Connections – Technical



Section 7 93
Buried Drainage –
Technical



Section 8 103
Technical Specifications



Section 9 111
CAD & BIM





Product ranges

Other soil and drain products manufactured by Saint-Gobain PAM UK:

EPAMS

A complete siphonic rainwater system, consisting of steel siphonic roof outlets and cast iron pipework to BS EN 877 and BBA Approved Cert No. 06/4328.

Timesaver – above ground

Above ground range Kitemarked to BS 416 Part 2. Pipes and fittings 50-150mm in diameter, black coated. Includes a range of push-fit couplings with traditional socket appearance and 1.8m (6ft) pipes – the ideal solution for external soil stacks, on conservation/heritage buildings.

Timesaver – below ground

The below ground range is Kitemarked to BS 437. Pipes and fittings 100-225mm in diameter, black coated. Range includes many fittings of traditional British Standard design-gullies, raising pieces, traps, inspection chambers and anti-flooding valves – the extra section thickness provides superior strength, making Timesaver the ideal solution for under-building drainage.

Classical

The Classical range of traditional cast iron rainwater and gutter systems manufactured in accordance with BS 460. Range offers eight gutter profiles and circular, square and rectangular downpipe systems, supplied in a black primer coat.

Classical Plus

Classical cast iron rainwater systems supplied in a factory applied finish coat for immediate installation. Supplied black as standard, further colours have been introduced – for example blue, green, red, light/dark brown and grey on a made to order basis.

Classical Express

A unique cast iron gutter system in 125mm true half round profile which is installed using simple jointing clips. Higher flow capacity available in Primer and Plus finish.

Technical Advisory Service

In support of Saint-Gobain PAM UK extensive manufacturing resources, an advisory service department is available to customers to provide technical assistance and guidance on soil and drain installations.

Telephone Technical Helpline: **01952 262529**

Email: **technical.soildrain.uk.pam@saint-gobain.com**

Website: **www.saint-gobain-pam.co.uk**

The soil and drain and rainwater sections contain all the product literature for the soil and drain brands Ensign, Timesaver, EPAMS, VortX and Classical including downloadable Ensign CAD drawings.

New BIM ready Product Library

Available to download from the website is the latest BIM ready, fully integrated parametric library of cast iron products from PAM (see page 113).



Why specify cast iron above ground

Fire safety and comfort

The following two concepts are applied as regards to fire safety: reaction to fire and fire resistance.

Reaction to fire

For drainage systems, safety in case of fire is the only essential safety requirement.

Ensign and EEZI-FIT cast iron drainage systems are manufactured to a harmonised European standard BS EN 877 and as such, since July 2013 are required to be CE marked by law. The CE mark, whilst not a quality standard, is a self declaration of product performance with the exception of reaction to fire which requires a mandatory certificate by independent testing at a recognised fire testing centre. A summary of the Declaration of Performance (DoP) for the Ensign and EEZI-FIT ranges is shown on page 107 or available from our website www.saint-gobain-pam.co.uk.

The Ensign and EEZI-FIT ranges were tested at the Warrington Fire Research Centre to the requirements of BS EN 13501-1 incorporating: BS EN 1182, BS EN 1716, BS EN 13823 and achieved the following results under Euroclass classification:

- Cast iron as a material is classified A1
- BS EN 877 dictates the test is carried out as a system (pipes, fittings and accessories including elastomer gaskets and coatings). As a result it achieved the highest possible rating:
 - o classification: A2-s1, d0
 - o Category A – reserved for non-combustible materials
 - o S1 = lowest smoke, d0 = no droplets

To support the CE mark Saint-Gobain PAM UK cast iron drainage systems are the only systems to carry the BS Kitemark to the product standard:

- Compliance with all 27 clauses of the standard
- Periodically audited by BSI
- Ultimate quality guarantee

Many buildings are not protected enough against fire hazards. It means that fire can spread rapidly, destroy the building in a short time and, more importantly, jeopardise the lives of the occupants. When a fire breaks out, the first objective is to slow down its spreading both horizontally and vertically. Drainage systems should be selected so that they resist the passage of fire and do not feed it.

Fire resistance

It is a construction component's ability to withstand fire for a given period of time and to retain its serviceability in the event of fire. If a fire breaks out, it is essential to prevent any early collapse of the structure, and then to limit the extent of the damage, so as to ensure that occupants can be evacuated and/or the belongings will be protected.

Compartmental principles

Fire Safety Regulation for buildings is based on compartmental principle. Within a building, a compartment is a fire rated space designed to stop fire spreading for a given period of time.

Above ground drainage systems as part of the building services (unless in a protected shaft), will pass through the separating wall/floor and as such must comply with the following:

- Building Regulations Approved Doc B
- Section 10: Protection of openings and fire stopping
- 10.5 openings for pipes in conjunction with Table 14

Euroclasses		
A1	–	–
A2	s1	d0
A2	s1	d1
A2	s2 s3	
B	s1 s2 s3	d0 d1
C	s1 s2 s3	d0 d1
D	s1 s2 s3	d0 d1

Classes other than E-d2 and F

Sub-Class SMOKE production

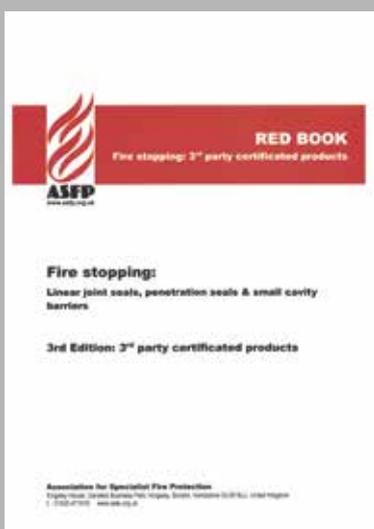
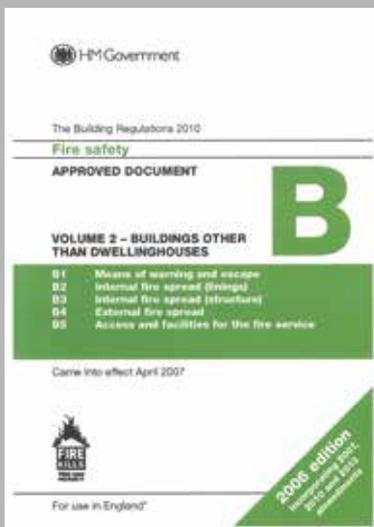
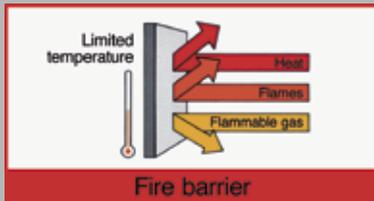
s1 : Low smoke production
s2 : Medium smoke production
s3 : High smoke production

FLAMING DROPLETS

sub-classification

d0 : No flaming droplets
d1 : Flaming droplets that persist for less than 10 seconds
d2 : Flaming droplets





Why specify cast iron above ground

Fire safety and comfort

Waste water drainage systems and fire stopping requirements

Drainage systems passing through structures designed to withstand fire, should not provide open breaches. For a given time, specified in the applicable regulations, they should not allow the passage of fire, smoke, heat or combustion products from one compartment to the other.

For plastics, the fire-stopping rule consists in “plugging the hole”. This function is ensured by the fire collars recommended by the manufacturers. Plastic materials which are highly sensitive to heat will not withstand the fire, and will not remain in place, even in the case of a contained fire.

As shown by the “Burning Question” laboratory tests in Germany, if the fire collars are not activated (particularly when installed under the fire compartment) they could pose a potential risk for fire to spread downwards in a multi-storey building. If the plastic type material (e.g. HDPE and Polypropylene) is exposed to fire, it results in molten droplets.

Saint-Gobain PAM's solutions

Ensign and EEZI-FIT systems compliance Building Regs Doc B:

- Alternative A – non-combustible material
- Maximum nominal internal diameter up to 160mm
- 10.6 – provide a propriety sealing system which has been shown by testing to maintain the fire resistance of the wall, floor or cavity barrier

Fire-stopping:

- 10.17b – all pipes openings should be:
 - o Kept to as few as possible; and
 - o Kept as small as practicable; and
 - o Fire-stopped
- 10.19 – proprietary fire-stopping and sealing systems (including those designed for service penetrations) which have been shown by test to maintain the fire resistance of the wall/floor include:
 - o Cement mortar
 - o Gypsum-based plaster

Saint-Gobain PAM has carried out a series of tests at CTICM test laboratories in Metz – France on their cast iron systems, in order to offer recommendations to achieve levels of insulation rating.

Cast iron systems with the floor/wall penetration sealed with standard mortar will provide:

- 4 hours integrity – E240
- Insulation – EI90, EI120
 - o 100mm diameter in excess of 120 minutes (2 hours)
 - o 150mm diameter in excess of 90 minutes (1.5 hours)
- Consult ASFP Red book for approved mortar products

Considerations for building design – to insurers

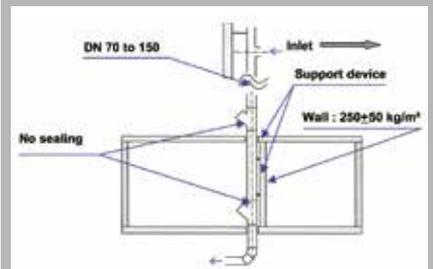
A report published to insurers entitled “Modern Methods of Construction and Fire Protection Considerations” by the FPA (Fire Protection Association) detail design guidance.

Some objectives noted from Table 1:

- To minimise the effect of fire on the business
- To limit the effect of business interruption
- To allow a business to be trading within 24 hours of a fire

Some essential principles

	Cast Iron
• Use building materials which will not a make significant contribution to a fire at any stage of its growth	✓
• Design a buildings structure to have a resistance to collapse or excessive deflection in the event of a fire	✓
• Construct a building in such a way as to minimise the extent of fire and smoke damage in the event of fire	✓



Pipe internal diameter (mm)	70-80	100-125	150
Upper flow rate (l/s)	1	4	8

Why specify cast iron above ground

Acoustics

Noise in buildings is considered to be detrimental to health and the quality of life. Efforts have been made in the last 30 years to attenuate the sounds coming from the street, worsening the perception of the sounds emitted within the buildings. Heat insulation policies aiming at reducing energy consumption will also heighten these perceptions.

Among the priority criteria in the comparative performances of drainage materials, acoustic performance is considered to be second only to fire safety: cast iron pipe systems have intrinsic acoustic properties. Owing to its density and the development in accessories equipment, they offer outstanding performances.

Pipe systems and equipment noise

Noise emitted by waste water pipe systems is classified under the regulation in the equipment noises.

Noise originating from pipe systems is due to the sound energy produced by water/air turbulence, but mostly by the mechanical effect of the water-flow on the internal pipe walls.

FOCUS

Noise and regulations requirements

Noise is an energy affecting air pressure and is transmitted through vibration. Sound is measured in decibels (dB) using a nonlinear scale. For noise from equipment apperals, the following categories are identified and measured:

- **Airborne noise:** air vibrations that are propagated. In the case of waste water pipe systems, this noise is mainly heard in the room where the pipe is located. When a material is dense and thick, the pipe walls prevent air transmission; as is the case with cast iron which offers intrinsic acoustic properties
- **Structure-borne noise:** vibration of a building's structure. This noise will be noticed in rooms adjacent to the pipe. When the noise produced in a pipe is not transmitted by the air, the residual noise is transmitted by structural vibrations. Whilst the mass of the cast iron limits the vibratory level, the junctions and fixing to the building will propagate noise. Objective: dampen the vibrations at the connections with the solid structure

BS EN 14366:2004

A new standard introduced to provide manufacturers of all drainage materials with a simple testing criteria (see diagram left). The results recorded should be comparable and allow the specifier to make a more informed choice.

Ensign was the first UK drainage system to be tested to this new European Standard, carried out on the complete range of Ensign bracketry, providing independent assessed results. EEZI-FIT has also been tested.

Conclusion of tests

All brackets within the Ensign range meet the requirements of BS 8233*. For exceptionally low levels of acoustic performance, the standard ductile iron bracket fitted with an acoustic dampener should be used (see table on page 6).

Comparing systems

Please note: When comparing Ensign and EEZI-FIT to alternative systems – ensure comparing the same flow rate, and number or brackets used in the tests (e.g. 2). For vertical stacks, Ensign often requires only one bracket per 3 metres, therefore acoustic performance will be even better in this instance.

*BS8233 – Code of Practice 'Sound Insulation and Noise Reduction for Buildings'.



Why specify cast iron above ground

Acoustics

Saint-Gobain PAM's solutions

Vibrations transmitted to the building structure are dampened by installing "sound absorbers" and by combining:

- Couplings equipped with elastomer sealing gaskets, which reduce metal to metal contact, and prevent the transmission of vibrations
- If required, rubber lined insulating brackets or for exceptional performance ductile iron brackets fitted with acoustic dampeners

Saint-Gobain PAM conducted a series of comparative tests on airborne and structure-borne noises in installation conditions, described by standard BS EN 14366 at the *Fraunhofer Institute for Building Physics* in Stuttgart.

As all manufacturers of waste water pipe systems apply the standard test protocol, it allows building project managers to compare their results.

Test results for the PAM pipe systems, in accordance with standard BS EN 14366 carried out on 100mm diameter pipes:

Waste water systems Ensign and EEZI-FIT – (100mm diameter) wall density 220kg/m ²						
Flow rate l/s	AIRBORNE SOUND			STRUCTURE-BORNE SOUND		
	2.0	4.0	8.0	2.0	4.0	8.0
Ensign pipework fitted with two brackets – iron bracket EF048	45	48	54	27	32	34
Iron bracket fitted with acoustic dampener EF048AD	45	47	54	5	11	19
Ensign EEZI-FIT system fitted with two brackets – iron bracket EF048	45	48	51	23	28	36
Iron bracket and dampener EF048D	45	48	51	4	9	17

For test results on 150mm Ensign or further details on the tests, please contact Mike Rawlings on 01952 262502, or email mike.rawlings@saint-gobain.com

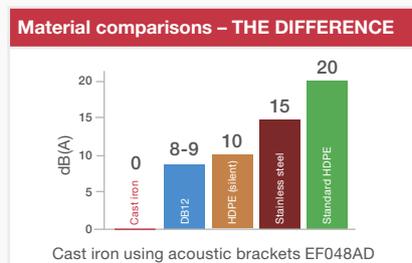
For installation guidance on acoustic dampeners see page 80.

FOCUS

Ensign and EEZI-FIT cast iron silences its rivals

This exceptionally low level of noise transmission outperforms any other material by up to 10dB(A) for structure-borne noise and 4-5dB(A) for airborne noise.

To put this into perspective, 4-5dB(A) equates to noise x 2, or a plasterboard supplier quotes "in order to increase the sound insulation of a solid partition wall by 4-5dB(A) the mass must be doubled".



Ensign avoids the hidden costs

When comparing costs of drainage materials, we have always stressed the need to factor in the total installed costs – when it comes to acoustic performance it becomes even more important. Specifying Ensign means there is significantly more opportunity to save money on acoustic insulation and, more importantly, all other systems require a significantly greater amount of insulation to match the performance of Ensign.



Why specify cast iron above ground

Robustness and mechanical strength

Pipe system components must withstand hazards before they reach the job site, such as accidental impact before and during installation, during storage, handling and transit. In service, outdoor exposed pipes may be damaged by accidental impacts or vandalism.

Impact strength and crush resistance

Cast iron is well-known for its robustness. The quality of PAM products is ensured by careful control of both metal composition and manufacturing process. The spinning of pipes in the De Lavaud process, followed by heat treatment, gives these products outstanding mechanical properties.

Key mechanical characteristics required by the standard EN 877 are controlled by three tests, carried out on pipes when coming out of the heat treatment furnace to assess tensile strength, ring crush resistance and hardness. In addition, operators have opted to maintain a further test which gives a good indication of the quality of heat treatment: the guillotine impact test.

FOCUS

De Lavaud process

In this process, a constant flow of molten metal at a perfectly controlled temperature and composition is gradually input into a steel mould rotating at high speed. The external wall of the mould is cooled by circulating water and the evenly distributed molten metal cools on contact with the wall before extraction.

The process is characterised by its quick cooling that gives a finer solidification and thus, a more homogeneous metallurgical structure.

Heat treatment

The spun pipes are placed and rotated in a heat treatment furnace at 950°C and then gradually cooled again. This step is essential to the process as it transforms the cast iron's metallurgical structure. The reduction of iron carbides and the increase of ferrite content considerably improve the mechanical properties of cast iron and reduce its surface hardness. The graphite of the cast iron resulting from the Saint-Gobain PAM process forms clustered graphite, halfway between lamellar and ductile iron.

The pipes	PAM pipes	BS EN 877
Tensile Strength on samples in MPa (average value)	300	200 min
Ring Crush Strength in MPa (average value, DN100 pipes)	470	350 min
Brinnell Surface Hardness in HB degree (average value)	205	260 max

These results demonstrate:

- Greater resistance to impact
- Greater resistance to crushing
- Easier to cut on site, making it easier to install than other cast iron systems



Why specify cast iron above ground

Longevity

There are two elements of an above ground drainage system that should be designed and specified to last the lifetime of the building:

1. The internal rainwater pipes
2. The soil discharge stacks

Even when a building is modernised every 15 or 20 years, these elements along with the structure, will likely remain. If the toilet or kitchen area is refurbished, the branch discharge pipes will often be renewed and therefore it may be appropriate to specify other materials for that element.

But if the main stacks are to be specified to last the lifetime of a building, perhaps 50-70 years or more, the appropriate material is cast iron, for it is one of few materials you can reasonably fit and forget, as recognised by specifiers on many of the PFI-type projects.

Ageing behaviour

As components that are integrated in buildings, waste water and rainwater drainage systems must remain in a serviceable condition over the long term in spite of adverse operating conditions. 'Ageing' refers to any gradual, irreversible change in a material's structure and/or composition, liable to affect its behaviour or serviceability. When a material is selected, the stability of its properties ensures operational reliability over time.

Stability of cast iron mechanical properties

The ageing of a material may be due to its own instability, to environment or chemical stresses, to mechanical strains, or a combination of any of those causes.

It is an established fact that cast iron offers long service, owing in particular to the stability of its mechanical properties over time.

Cast iron is not sensitive to thermal ageing:

- Its mechanical strength remains stable
- Its thermal expansion is very low compared to plastics
- Cast iron pipe systems are not liable to creep at operating temperatures

Cast iron does not deform under mechanical strain:

- Its ring stiffness (cold measurement) around 70 MPa is not affected by temperature and is 8 times that of PVC pipes, particularly appreciated for buried pipework
- Its longitudinal stiffness, which eases bracketing and protects water stream in horizontal sections, remains intact. Its Young modulus of elasticity is ranking from 80 to 120 GPa vs 2 to 5 GPa for PVC
- Cast iron's tensile strength is 8 times greater than that of PVC: 200 MPa vs 50 (residual resistance, 50 years according to the standards). This property is of utmost importance in case of network overloading

The properties of cast iron ensure the stability of systems and long lasting operational safety.



Why specify cast iron above ground

Resistance to thermal expansion

Most solids expand when they are heated and are liable to elongate under temperature increase. For pipe systems made of materials that are subjected to high levels of thermal expansion, precautions have to be taken at design stage.

Cast iron, which expands very little, does not require specific bracketing nor expansion collars. It makes the specifiers' design work easier and avoids extra cost at installation stage.

Thermal expansion coefficient of cast iron and other materials

The thermal expansion coefficient for cast iron – $0.01\text{mm/m}/^\circ\text{C}$ – is very low and very similar to that of steel and concrete; the building and the pipe systems will move and will expand together. For cast iron, the bracketing system is designed to only carry the weight of the pipe and its content, which simplifies the design of the network. Plastic pipes expand considerably with increasing temperature. Their bracketing system must be designed and adapted accordingly, as it can deeply affect the stability of a pipework and its performances over time.

Thermal expansion of plastics

To allow expansion without damaging the drainage network, plastic pipe systems demand specific accessories – expansion collars or joints, brackets allowing axial movement, in general one of the two described.

If these precautions were not taken, expansion could be absorbed by the pipework and cause distortion.

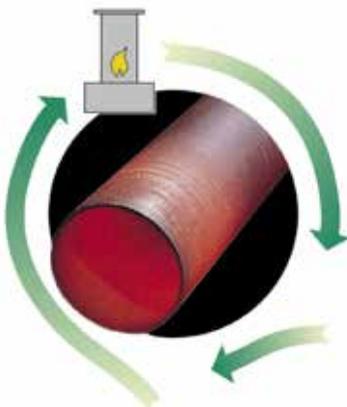
Cast iron can do without these expensive accessories. It makes the design work easier and decreases the risk of mistakes at installation stage.

The properties of cast iron pipe systems are also valuable for engineering structures such as bridges where important expansions have to be carefully addressed to secure the construction project.

Thermal expansion of cast iron and other materials for a temperature rise of 50°C and 10m

Thermal expansion coefficient

$0.0104\text{mm}/^\circ\text{C}\cdot\text{m} \rightarrow 5.2\text{mm}$	Cast iron		
$0.07\text{mm}/^\circ\text{C}\cdot\text{m} \rightarrow 35\text{mm}$	PVC		7 times more
$0.150\text{mm}/^\circ\text{C}\cdot\text{m} \rightarrow 75\text{mm}$	PP		14 times more
$0.02\text{mm}/^\circ\text{C}\cdot\text{m} \rightarrow 100\text{mm}$	HDPE		19 times more



Why specify cast iron above ground

Internal pressure resistance

Internal overpressure in drainage networks rarely occurs and is always accidental. Thrust efforts in the overloaded sections have to be addressed to guarantee both water tightness and mechanical stability.

As the robust cast iron components can address any pressure hazard, then the couplings will be submitted to the strain. The quality of the couplings and their careful selection according to their field of use will prevent misalignment or disconnection of the pipework.

Pressure resistance of couplings

- Low-pressure mechanical or push-fit (EEZI-FIT) couplings:
Waste water drainage systems – which differ from rainwater drainage systems as regards pressure – are connected to sanitary appliances installed on each storey which may serve as outlets in case of accidental overloading (due to blockages, for example).
The pressures that occur cannot therefore exceed the pressure corresponding to the height of one storey, i.e. about 0.3 bars.
The couplings we describe as “standard” are perfectly suitable for this common type of application
- High-pressure mechanical couplings:
In some rare cases, a waste water drainage system may pass through a number of storeys without any outlet and there could be a risk of overloading (blockage due to operation or saturation of the sewer main).
The pressure resistance required to ensure that these systems remain leaktight and stable in such cases calls for high-pressure couplings able to withstand a pressure up to 10 bars

FOCUS

Specific points of the pipework:

Some specific points on a pipe system may be subjected to thrust loads due to changes of direction and gradient, branches and plugs. To avoid any risk of disconnection or slippage of the pipe components, these loads must be addressed and the sections at risk must be anchored:

- A section of pipe may be held between two fixed points, by using ductile iron brackets for example
- Alternatively, a self-anchoring coupling or an ordinary coupling anchored with a grip collar can be used – see page 74

For full installation details, see the coupling section, page 65.

Environment

100% recyclable indefinitely without losing any of its properties

Cast iron is made from recycled raw materials and so saves natural resources. Unlike plastics, it can be completely and systematically recycled at the end of its life through processes that are not harmful to the environment.

PAM pipe systems can be recycled without any deterioration of their properties, so they can be reused for exactly the same purpose. In other words, a pipe can be recycled as pipe. Owing to the stability of their mechanical properties, it is currently considered that the service life of PAM cast iron pipe systems is twice that of alternative products made of plastic materials.

Nothing is wasted: everything is recycled

Cast iron pipe systems are based on the principle of modular ranges of removable components. Their mechanical assemblies are reversible. You can change your mind today or even tomorrow. When pipe systems are disassembled or modified, these components can be reused.



Why specify cast iron above ground

Environment Standard BS EN ISO 14001:2004

Saint-Gobain PAM UK manufacturing sites including Sinclair, at Telford, have been awarded the 'Manufacturing to Environmental Standards' accreditation BS EN ISO 14001:2004 which was developed to help manufacturers maintain and improve their management of environmental responsibilities and assist them in ensuring compliance with environmental laws and regulations. Saint-Gobain PAM UK operates Integrated Pollution and Preventative Control (IPPC) regulations and have implemented comprehensive environmental management systems throughout the manufacturing sites.

Quality assurance

BS EN ISO 9001:2008 – Registered No: FM12908

The Ensign System is manufactured under the BS EN ISO 9001: 2008 Quality Assurance Scheme. Continual checks made throughout the year by the BSI inspectorate, ensure that the set standards are maintained.

Product certification

BS EN 877:1999 Kitemark KM51733

Ensign is the only cast iron system to be tested and awarded Kitemark approval to the product standard in the UK. (See scope below). Ensign EEZI-FIT has been included in Kitemark certificate KM51733 for sanitary gravity applications and 0.5 bar (accidental static water pressure) performance.

BS EN 14366:2004

Ensign and EEZI-FIT have been tested to the criteria laid down in BS EN 14366:2004. Laboratory measurement of noise from waste water installations at the IBP laboratory in Stuttgart. A number of test reports are available.

Summary of applicable standards

STANDARDS

European Standard BS EN 877:1999

This Product Standard applies to cast iron pipework elements used for the construction, normally as gravity pipe systems, of discharge systems for buildings and of drains. The range of nominal diameters extends from DN40 to DN600 inclusive. This standard specifies the requirements for the materials, dimensions and tolerances, mechanical properties, appearance and standard coatings for cast iron pipes, fittings and accessories. It also indicates performance specifications for all components, including joints. It covers, above ground soil, waste, rainwater and buried systems and performance requirements in these applications.

Product Standards

ISO 6594: International standard for socketless drainage systems in cast iron.

BS EN 681/ISO 4633: Specification for elastomeric seals for joints in pipework and pipelines.

Codes of Practice Standards

BS EN 12056-2: Code of practice for gravity drainage systems inside buildings – sanitary pipework.

BS EN 12056-3: Code of practice for gravity drainage systems inside buildings – for drainage of roofs.

BS EN 752-1: Code of practice for drain and sewer systems outside buildings.



Why specify cast iron below ground

Fit/forget drainage

Cast iron is often referred to as fit and forget material – impervious to degradation by UV light and most mechanical damage, including aggressive or careless maintenance. With a track record measured in centuries, cast iron is the only proven lifetime choice. Prestigious projects worldwide utilise cast iron systems, including multi-storey commercial and residential developments, retail parks, hospitals, schools, car parks and prisons, as prime examples.

Risk assessment – damage to buried pipe

To decide which of the three main types of material for below building use is appropriate, cast iron, vitrified clay and plastic, it is necessary to carry out a risk analysis. Most engineers would agree that the risk of settlement, sheer pressure and over zealous maintenance methods are potential problems more likely to take a clay or plastic system out of operation than a cast iron one. It can bridge major voids caused by settlement, resist sheer pressures and successfully take the internal knocks from the rodding.

Hazard	Vit clay	Plastic	Cast iron
Settlement	High risk	Med risk	Low risk
Sheer pressure	High risk	Low risk	Low risk
Rodding damage	Med risk	High risk	Low risk

Courtesy of GTA

The cost of failure

It is accepted that cast iron drainage systems will be least likely to fail in any situation. In order to establish when the use of cast iron drainage is most appropriate for any given application, it is best to consider the relative seriousness of the consequences arising from failure. Here a table has been compiled illustrating how such consequences may be compared under a series of different considerations.

Considerations	House or small commercial	Hospital or commercial/residential	Retail store
People affected	Few	Many	Many
Potential losses	Low	High	High
Repair type	Cut in-situ slab or divert pipe	Cut RC slab	Cut RC slab
Consequences	Disturbance Noise Hygiene	Disturbance Noise Hygiene	Disturbance Noise Hygiene
Cost	Low	High	High

Courtesy of GTA

Ground movement

The demand for building land has resulted in the greater use of made-up land or other locations that may be subject to ground movement. Cast iron below ground offers greater resistance to such movement, and is less likely to fail in unfavourable conditions.

Less embedment

In areas where ground disturbance or extra loading is likely, other drainage materials may need additional protection, for example a covering concrete slab or a concrete surround. Cast iron needs no additional protection in most circumstances, saving time, labour and materials in construction (see page 96).

Why specify Ensign



Red coated

Internal/external rainwater system
Soil and waste system
Suspended drainage system



Grey coated

Buried drainage system
Bridge drainage



Complete pipe system

Ensign fully meets the requirements of Product Standard BS EN 877 providing the complete drainage solution to a building needs. Ensign is an above and below ground drainage system, transporting fluid waste, through the building, out and beyond.

Ductile iron couplings with electrical continuity

The Ensign systems are jointed by unique two piece ductile iron couplings, that are high performance, quick and easy to install. For above ground applications, the coupling design incorporates iron 'nibs' which will provide built in electrical continuity. Couplings destined for below ground use do not include this continuity feature. The coupling naturally meets the requirements of BS EN 877, fully satisfying the requirements of IEE Regulations. The couplings incorporate a set screw design utilising hexagonal socket cap screws reducing the threat of wanton dismantling of couplings by vandals.

Push-fit drain couplings

Cast iron push-fit joints, that utilise two EPDM rubber gaskets, simplifying installation, providing a flexible alternative to mechanical couplings, when there is opportunity for fast pipe laying (i.e. long straight runs). (See page 72).

Ductile iron brackets

Included within the range is an all purpose ductile iron bracket, versatile and lightweight, the bracket incorporates an elongated slot at the fixing point allowing adjustment without dismantling the pipe system.

Quietest drainage system

Ensign has been tested to the new standard BS EN 14366:2004 (laboratory measurement of noise from water waste systems) and has achieved exceptionally low levels recording 11dB(A) at 4 litres/second for structure-borne measurement and 47dB(A) for airborne measurement, when installed using the ductile iron bracket fitted with the acoustic dampener. Ensign is the quietest cast iron system and as a material is quieter than the best plastic system by up to 10dB(A) and up to 20dB(A) quieter than standard HDPE for structure-borne noise. All materials, twinwall PVC, HDPE, and stainless steel require substantial insulation to match the performance of Ensign (see pages 5 and 6).

Easy access for maintenance

The Ensign system contains an extensive range of access fittings, providing ease of maintenance at vital points in the stack to relieve any blockages which may occur. The access door is contoured, specifically designed not to obstruct the flow of waste within the pipe system.

Economical connections to waste pipes

Ensign provides a number of alternative methods to connect to plastic and copper waste, including 'compression fit' boss pipes, that utilise 'O' ring rubber compression gaskets to connect to waste pipes without the need for conventional threaded male adaptors.

Also the popular multi-waste manifold which accommodates up to three waste pipes from various sources such as bath, bidets, and showers to one internal point (see photo to the left). Now available in 100 and 150mm diameters.

Superior internal coating for pipes

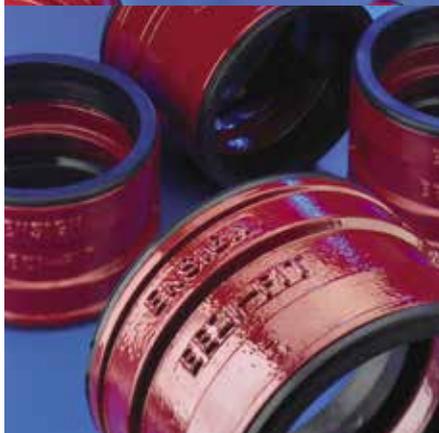
Ensign pipes for above and below ground applications, are now internally lined with a new two part epoxy (ochre in colour). The coating has been developed to provide greater performance against exposure to aggressive substances or high temperature waste, far exceeding the requirements stipulated in BS EN 877 (see coating – page 108). The epoxy coated fittings match the performance of the pipes.

Lightweight

The Ensign system is considerably lighter in weight compared to previous cast iron systems making it much easier to handle, whilst retaining the inherent strength qualities of cast iron. The system has been designed to comply with European above and below ground applications, which have been well proven over many years.

Superior cast iron pipes

Ensign pipes are manufactured using the De Lavaud process which undergoes a rapid cooling stage followed by a specific dual heat treatment process which significantly improves its mechanical and impact resistant properties, and makes the pipes easier to cut.



Why specify Ensign

Flexible system

The Ensign systems consist of pipes and fittings from 50-600mm diameter for above ground applications, and 100, 150-600mm diameter for below ground. Ensign can be connected by cast iron mechanical joints or push-fit joints, for above and below ground applications. Allowing total interchangeability, making Ensign the most versatile cast iron system on the market.

Cost effective

Independent research involving on-site measurement studies to BS 3138, resulted in the calculation of labour constants for the BS EN 877 systems, such as Ensign, considerably lower to those quoted in the price guides for many years.

These labour constants are reflected in the leading price guides (such as Spons, Griffiths etc), identifying the fact that it is actually quicker to install cast iron systems like Ensign than UPVC solvent weld systems a fact confirmed in the labour hours/charge calculations.

With the additional savings on fire collars, sound insulation, bracketing, expansion joints, on-site damage, and longevity of the system, cast iron has never been so competitive against lesser materials – 'cutting the price of quality'.

New Ensign EEZI-FIT

Push-fit assembly

All the benefits of cast iron with the advantages of push-fit assembly. The system utilises a new gasket design that makes jointing simple, and completed in seconds. (Electrical continuity can be accommodated – see page 68).

Compatibility with Ensign

EEZI-FIT connects to standard Ensign double spigot pipe and is fully compatible with all Ensign plain ended fittings. The installation of an Ensign mechanical joint positioned in the system can allow dismantling for future retrofit.

New connections to waste

The EEZI-FIT range includes many options to connect to waste pipes, providing even greater system flexibility, branches, single and double radius curve with four boss options, and short boss pipes with single option to three boss positions.

A new manifold connector with 2 x 50mm waste connections with an extended spigot which avoids the need for a joint in the floor slab, to further ease installation.

Ideal for flats and apartments

Ensign EEZI-FIT is the ideal system for flats and apartments where the main stack will unlikely change in time, and the specification will demand a high level of acoustic performance and fire safety.

Ease of installation

Ensign EEZI-FIT provides opportunities for the installer to improve installation time, and also reduce time allocated for testing the stacks after completion.

Applications

EEZI-FIT is intended for use for gravity above ground sanitary applications in accordance with BS EN 12056 (0.5 bar performance).

Acoustic performance

EEZI-FIT has been tested to BS EN 14366 criteria and recorded acoustic levels even lower than Ensign, 4dB(A) at 2 l/s and 9dB(A) at 4 l/s. The acoustic difference between Ensign EEZI-FIT and standard HDPE and plastic is massive, and can only strengthen the case for using EEZI-FIT in flats/apartments where acoustic performance is so important (see table on page 6).