

MATERIAL STANDARD

FOR

WATER SUPPLY

AND

SEWERAGE EQUIPMENT

ORIGINAL EDITION

MARCH 1996

This standard specification is reviewed and updated by the relevant technical committee on Jul. 2001(1) and Oct. 2012(2). The approved modifications are included in the present issue of IPS.

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

Standards and Research department

No.17, Street14, North kheradmand

Karimkhan Avenue, Tehran, Iran .

Postal Code- 1585886851

Tel: 88810459-60 & 66153055

Fax: 88810462

Email: Standards@ nioc.ir

GENERAL DEFINITIONS

Throughout this Standard the following definitions shall apply.

COMPANY :

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER :

Means the "Company" where this standard is a part of direct purchaser order by the "Company", and the "Contractor" where this Standard is a part of contract document.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR :

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR :

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the "Company" rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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1. SCOPE

This Standard is the minimum requirement and deals with the material specification of pipes and fittings that are used for water supply and sewerage systems in residential areas of industrial projects including such auxiliary items as manhole covers and frames, step irons, ladders and other components, with due consideration to the fact that commonly used pipes and fittings in watersupply and sewerage projects of municipalities and water distribution authorities or organizations are mostly produced by local manufacturing firms based on BSI or DIN standards and in compliance with the recommendations given in Publication No. 128, dated 1993 Plan and Budget Organization.

Note 1:

This standard specification is reviewed and updated by the relevant technical committee on July 2001. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No 148 on July 2001. These modifications are included in the present issue of IPS.

Note 2:

This standard specification is reviewed and updated by the relevant technical committee on Oct. 2012. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No 374 on Oct. 2012. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

BSI (BRITISH STANDARDS INSTITUTION)

BS 65: 1991	"Specification for Vitrified Clay Pipes, Fittings and Ducts, Also Flexib Mechanical Joints for Use Solely with Surface Water Pipes and Fittings"
BS 143 & 1256: 2006	"Specification for Malleable Cast Iron and Cast Copper Alloy Threaded Pipe Fittings"
BS 416-1: 1990	"Discharge and Ventilating Pipes and Fittings, Sand-Cast or Spun in Cast Iron Part 1 Specification for Spigot and Socket Systems"
BS 437: 2008	"Specification for Cast Iron Drain Pipes, Fittings and their Joints for Socketed and Socketless Systems"
BS 460: 2002+A2:2007	"Cast Iron Rainwater Goods Specifications"
BS EN 512: 1995+ A: 2001	"Fiber-Cement Products- Pressure Pipes and Joints"
BS EN 545: 2010	"Ductile Iron Pipes, Fittings, Accessories and their Joints for Water Pipelines- Requirements and Test Methods"
BS EN 588-1: 1997	"Fibre-Cement Pipes for Sewers and Drains – Part 1: Pipes, Joints and Fittings for Gravity Systems"
BS EN 777.1: 2011	"Specification for Masonry Units Part 1: Clay Masonry Units"

BS EN 10224: 2002	“Non-Alloy Steel Tubes and Fittings for the Conveyance of Water an Aqueous Liquids- Including Water for Human Consumption Technical Delivery Conditions”
BS EN 10346: 2009	“Continuously Hot – Dip Coated Steel Flat Products- Technical Delivery Conditions”
BS 1169: 1953	“Rubber Sealing Rings for Domestic Preserving Jars for Fruit and Vegetables”
BS EN 13101: 2002	“Steps for Under Ground man Entry Chambers”
BS EN ISO 1461: 2009	“Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles-Specifications and Test Methods(ISO1461:2009)”
BS 3506: 1969	"Specifications for Unplasticized PVC Pipe for Industrial Uses"
BS 4211: 2005 + A1: 2008	“Specification for Permanently Fixed Ladders”
BS 4622: 1970	"Specifications for Gray Iron Pipes and Fittings"
BS 4660: 2000	“Thermoplastics Ancillary Fittings of Nominal Sizes 110 and 160 for below Ground Gravity Drainage and Sewerage”
BS 4942: 1981	"Short Link Chain for Lifting Purposes"
BS EN 1401-1: 2009	“Plastic Piping Systems for Non-Pressure Underground Drainage and Sewerage Unplasticized Poly (Viny1 Chloride) (PVC-U) Part 1: Specification for Pipes, Fittings and the System”
BS EN 1917: 2002	“Concrete Manholes and Inspection Chambers, Unreinforced, Steel Fibre and Reinforced”
BS EN 877: 1999 + A1: 2006	“Cast Iron Pipes and Fittings, their Joints and Accessories for the Evacuation of Water form Buildings Requirements, Test Methods and Quality Assurance”
DIN	(DEUTSCHES INSTITUT FÜR NORMUNG E.V.)
DIN 1230: 1986	"Vitrified Clayware for Sewers"
DIN 4032: 1981	"Concrete Pipes and Fittings"
DIN 19534: Pt. 1: 1979	"Pipes and Fittings of Unplasticized Rigid PVC with Plug Socket for Sewerage Pipes and Lines"
ISO	(INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)
ISO 49: 1997	“Malleable Cast Iron Fittings Threaded to ISO 7-1”
ISO 4435: 1991	“Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipes and Fittings for Buried Drainage and Sewerage Systems Specifications”
ISO 6708: 1995	“Pipework Components Definition and Selection of DN (Nominal Size)”
ISO 7186 : 2011	"Ductile Iron Products for Sewage Applications"
ISO 8283-1: 1991	“Plastics Pipes and Fittings Dimensions of Sockets and Spigots for Discharge Systems Inside Buildings” Part 1: Unplasticized Polycvinyle Chloride (PVC-U) and Chlorinated Polycvinyl Chlorid (PVC-C)

ISIRI (INSTITUTE OF STANDARDS AND INDUSTRIAL RESEARCH OF IRAN)

- Publication No. 422: 1968 "Standard Steel Tubes, Thicknesses"
- Publication No. 423: 1987 "Steel Tubes Suitable for Screwing in Accordance with ISO Recommendation R7"

PBO (PLAN AND BUDGET ORGANIZATION)

- Publication No. 128: 1993 "Hot and Cold Water Service Lines in Buildings", Clauses 2.1-General and 2.2-Pipework

Note:

This publication is only part of the engineering service lines that has been issued under Publication No. 128. The complementary publications when issued needs to be studied and as required the text of this IPS standard be updated to be in accord with PBO regulations.

BHRC (BUILDING AND HOUSING RESEARCH CENTER)

- BHRC Report No. 122: 1987 "Plumbing Systems in Building"

IPS (IRANIAN PETROLEUM STANDARDS)

- [IPS-E-CE-380](#) "Engineering Standard for Sewerage and Surface Water Drainage System"
- [IPS-M-PI-110](#) "Material and Equipment Standard for Valves"
- [IPS-M-PI-190](#) "Material and Equipment Standard for Line Pipes"
- IPS-D-CE-141 "Industrial Stair & Handrail Typical Details all Process Unit"
- IPS-D-CE-250 "Brick Sanitary Manholes"
- IPS-D-CE-251 "Concrete Sanitary Manholes"
- IPS-D-CE-252 "Manhole Covers & Frames Heavy Gray Cast Iron 600 Diameter"

3. DEFINITIONS AND TERMINOLOGY

Nominal size (DN):

A numerical designation of size that is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

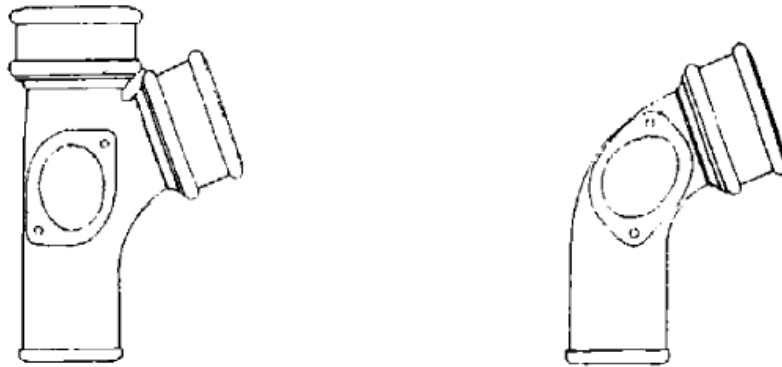
Notes:

- 1) Nominal size is designated by the letters DN followed by the appropriate number.
- 2) This definition is identical to ISO 6708.
- 3) The relationship between fitting size and nominal size is given hereunder for reference purposes.

Designation Thread Size	of	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Nominal Size (DN)		6	8	10	15	20	25	32	40	50	65	80	100	125	150

Right hand fitting

A bend or branch which is so constructed that, when it is viewed with the spigot downwards and with the access door facing the observer, the socket of the bend or the arm of the branch projects to the right (see Fig. 1).



Right hand branch

Right hand bend

RIGHT HAND FITTINGS

Fig. 1

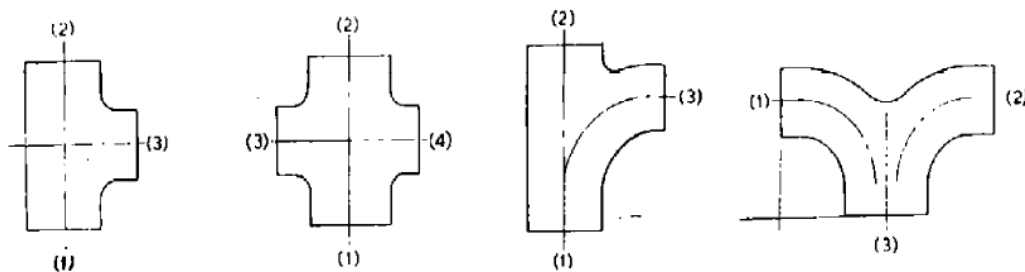
Terms relating to pressures and dimensions of pipes

For definition of technical words such as nominal pressure, nominal diameter or nominal size etc., used in DIN, BS and ISO Standards refer to Clauses 2.1.2 and 2.2.1.4 of Plan and Budget Organizations "Publication No. 128".

Designation of fitting size (see also Table 1 of Appendix A)

a) Equal fittings

Equal fittings where all outlets are the same size shall be specified by that one size, irrespective of the number of outlets (see Fig. 2).



a)

b)

c)

d)

Note:

The method of specifying outlets is in accordance with method (b) in ISO 49.

METHOD OF SPECIFYING OUTLETS OF FITTINGS HAVING MORE THAN TWO OUTLETS

Fig. 2

b) Unequal fittings

Unequal fittings shall be specified by the sizes of each outlet, the sequence being dependent upon the number of outlets, as follows:

a) for fittings having two outlets: the larger outlet shall be specified first;

b) for fittings having more than two outlets: these shall be specified in accordance with the sequence given in Fig. 2, e.g. a female reducing tee, Type B1 of Table A.1 of Appendix A, having thread sizes of 1½ for outlet (1), 1 for outlet (2) and 1½ for outlet (3) shall have the fitting size designation of 1½ × 1 × 1½;

c) tees Type B1 and pitcher tees Type E1 with equal outlets on the run and an increasing or reducing outlet on the branch shall be specified by stating the size of the run followed by the size of the branch, e.g. a female reducing tee Type B1 having thread sizes of 1½ for outlet (1), 1½ for outlet (2) and 1 for outlet (3) shall have the fitting size designation of 1½ × 1.

4. UNITS

This Standard is based on International System of Units (SI), as per [IPS-E-GN-100](#) except where otherwise specified.

5. NON-PRESSURE PIPELINE COMPONENTS**5.1 General**

General specification for non-pressure pipeline components including pipes, bends, "P" or "S" traps, branches and ancillaries such as manhole covers and frames, gullies, ladders, step irons, etc. that are used in sewerage or drainage systems should comply with the requirements of this Standard.

5.2 Rigid and Semi-Flexible Pipes

Whatever selection is made, pipes should have adequate strength to meet loading requirements, be sufficiently robust to withstand site handling and be sufficiently durable to remain watertight for the anticipated life of the system.

The various pipes and their application as recommended in BS standards are quoted hereunder as well as in Tables 1 and 2, moreover, the compatible standards in DIN, ISO and ISIRI are also given in Table 1.

5.2.1 Fiber-Cement pipes

The asbestos-cement pipes and fittings with flexible joints for use in gravity sewers or drains should comply with BS EN 588-1 which specifies the strength classification for pipe diameters from DN 100 to DN 2500, in pipe lengths of 3, 4 and 5 m.

The asbestos cement pipes and flexible joints used in force mains (rising mains) should comply with BS EN 512, which specifies the hydrostatic classification for pipe diameters from DN 50 to DN 2500 in pipe lengths of 3, 4 and 5 m. Asbestos-cement bends are available for diameters up to DN 225. Cast iron fittings are also available.

5.2.2 Spigot and socket clay pipes

Vitrified or salt glazed clay pipes and fittings for use with gravity flow under atmospheric pressure should comply with BS 65. They are available in nominal diameters from DN 75 to DN 1000, and in lengths up to 3.0 m. The following classifications of pipes are available:

a) normal, i.e., suitable for all drains and sewers;

- b) surface water;
- c) perforated, suitable for soakaway land drains;
- d) extra chemically resistant.

Use of vitrified clay pipes for drainage of sanitary wastewater within curtilage of buildings and in sewers in the size range of DN 150 to 300 is highly recommended when the residential town is not within the earthquake zone and moreover when they be manufactured locally.

5.2.3 Concrete pipes

Precast concrete pipes and fittings of circular cross section for the conveyance of sewage or surface water under gravity, should comply with the appropriate Part of BS 5911.

BS 5911: Part 1 specifies requirements for flexibly jointed pipes in nominal diameters DN 150 to DN 3000 in standard lengths 0.45 m to 5 m (3 m for pipes DN 600), in three strength classes for sewage or surface water. For reinforced concrete pipes refer to of [IPS-M-PI-190](#).

5.2.4 Spigot and socket gray cast-iron pipes and fittings

For non-pressure pipelines cast iron pipes and fittings should comply with BS 437 and BS 4622 respectively (see Table 1 for compatible acceptable standards). These pipes are manufactured in the size range DN 50 to DN 225; BS 437 makes provision for centrifugally cast pipes with flexible joints in lengths up to 5.5 m. Flexible joints for these pipes should comply with BS 6087.

Pressure pipes and fittings with flexible or flanged joints should comply with BS 4622. Pipes with flexible joints are normally available in 5.5 m lengths and those with flanged joints in 4 m lengths.

Fittings complying with BS 437 can be jointed directly to BS 4622 pipes with lead caulked joints in the smaller diameters (DN 100 and DN 150 only).

Note:

These pipes are suitable for below ground sewers and drains.

5.2.5 Cast iron spigot and socket soil, waste and ventilating pipes and fittings

Cast iron spigot and socket soil, waste and ventilating pipes (sand cast and spun) and fittings (for above ground use) should comply with BS 416: 1973 (inclusive of latest amendments) manufactured in the size range of DN 50 to 150 with type A sockets only.

Note:

These pipes may be used as rainwater pipes when a heavier grade of pipe than that specified in BS 460 is required.

5.2.6 Rainwater pipes and goods

Cast iron rainwater pipes and goods shall be manufactured by the sand cast or spun process with type A sockets only DN 50 to DN 150 complying with BS 460.

Note:

Locally made "Polika" plastic pipes are also suitable for drainage of rainwater providing the pipes are not exposed.

5.2.7 Corrugated metal pipes (semi-flexible)

For helically corrugated pipes, in sizes from DN 150 to DN 1500 made from galvanized steel sheet and in lengths from 6 m to 9 m having bituminous coating, refer to BS EN 10142.

5.2.8 Ductile iron pipes (semi-flexible)

Ductile iron pipes and fittings should comply with BS 4772 and are manufactured in a range from DN 80 to DN 1600.

Ductile iron pipes with flexible joints are manufactured in nominal lengths of 5.5 m for DN 80 to DN 800 inclusive and nominal lengths of 8 m for DN 900 to DN 1600 inclusive. Ductile iron pipes are suitable for both pressure and nonpressure applications.

Commentary:

Pipework within pumping stations is usually of ductile gray iron and the pipe joints are mostly flanged. Pipe joints for use below ground should preferably be of the flexible type. If flanges are used on buried pipes the fastenings should be specially protected.

5.2.9 Ancillaries

5.2.9.1 Step irons or ladder rungs

Step irons fixed in deep brick and concrete manholes should be fabricated from $\phi 20$ round bars in accordance with standard drawing Nos. IPS-D-CE-250 and IPS-D-CE-251 respectively and be galvanized before installation. For more information refer to BS 1247.

TABLE 1 - PIPES USED IN NON-PRESSURE PIPELINES

BS Standard are chosen as base.	RIGID PIPES						FLEXIBLE PIPES					REMARKS
	Fiber		clay	concrete	Gray cast iron		Ductile Iron	steel	Unplaseleised pvc			
More or less compatible standards	BS EN 588-1	BS EN 512	BS 65	BS 5911 Part+100	BS 416 BS 437 BS 460	BS 4622	BS 4772	BS 534	BS 4660 (130&160dn)	BS 5481 (280to 630 dn)	BS 3506	BS 486 ram be used in pressure mains also.
	ISO 881		---	---	---	---	ISO 7186	---	ISO 8283 ISO 4435	Iso 161.1	---	
	Din 19 moq pts 1.2.4.3		Din 1230	Din 4032	Din 19572	---	---	Din 1530	Din19534 (100to 600 dn)		---	
Nominal size	Nominal bore	Nominal bore	Nominal bore	Nominal bore	Nominal bore	Nominal bore	Nominal bore	Outside diameter	Outside diameter	Outside diameter	Min Outside diameter	The diameter Nominal(dn)of this table relets to BS std. only.
Dn 75	mm ---	mm 75	mm ---	mm ---	mm 75	mm 80	mm 80	mm 76.1 88.9	mm ---	mm ---		The smallest Mombral size accepted on industries pipes is dn100
100	100	100	---	---	100	100	100	114.3	110	---	114.1	
125	125	---	---	---	---	---	---	139.7	---	---	140.0	
150	150	150	150	150	150	150	150	168.3	160	---	168.0	
175	175	---	---	---	---	---	---	193.7	---	---	193.5	
200	200	200	---	---	---	200	200	219.1	---	200	218.0	
235	225	225	125	225	225	---	---	244.5	---	---	244.1	
250	250	250	---	---	---	250	250	273.0	---	250	273.6	
300	300	300	300	300	---	300	300	323.9	---	315	323.4	

Notes:

- 1) Pipes in diameters greater than 300 are available in many of these materials. Refer to respective subclauses of 5.2 .
- 2) Most of the pipes listed are manufactured locally.

TABLE 2 - CHEMICAL RESISTANCE OF MATERIALS (for general guidance)

Group	BS No.	MATERIAL. AND APPLICATIONS	NORMAL DOMESTIC SEWAGE	TRADE EFFLUENT						
				At normal Temperature		Organic solvents	Containing oil and fats		Soil environment Containing	
				acids	alkalis		vegetable	mineral	sulphates	Acids
Ceramics	65,1169 771-1	Clayware pipes and fittings	A	S	S	S	S	S	S	S
		Bricks and blocks of fired Brick- earth,clay or shale.	A	S	S	S	S	S	S	S
Concrete	5911	Concrete: Ordinary Portland cement		E	A	A	E	A	E	E
		Sulphate-resisting Portland cement.		E	A	A	E	A	A	A
Fiber Cement	BS EN 588-1	Fiber cement pipes, joints And fittings (gravity)for Sewerage and drainage	A	E	A	A	E	A	A	E
Metals	534 437 4772	Steel pipes and fittings	A	E	A	A	A	A	E	E
		Gray iron pipes and fittings (gravity) ductile iron pipes and fittings	A	E	A	A	A	A	E	E
Plastics	4660 5481 3506	U PVC Gravity drain and Sewer pressure	A	A	S	E	A	A	S	S
Joining Materials as Specified by Pipe supplier To meet the Commentary Reduierments	<p>Commentary :</p> <p>Pipes and joints should remains sufficiently watertight to preveal ingress of groun water and egress of effluent when subjected to ground Movement and settlement.</p> <p>Flexible joints are generally available for the range of materials used for drainage and they can accommodate angulardeflections , sail Displacement and draw within the joint. They are designed to resist abeat loads without loss of watertightnese .where rigid joins are required They can be made by caulking metal or corepound or by working a cement morcar into the joints.by bolted flanges or by welding, the pipes together. care should be taken on such jointing operations not to disturb the gradient of the line or the contauly of the bore.</p>									
Coatings (refer to ips E – TP – 270)	<p>Commentary:</p> <p>The coating most commonly applided to metal pipes do not necessary provide adequats protection against all types of corrosion.soecically Deslgned coatings may be required for protection against concentrations or acids.alkalls, sulphates and other aggressive chemicals likely to be Encountered in the ground and in liquid carrbed</p>									
<p>A = normally suitable E = need exper 1 advice , each case to be considered on its own merite. S = specially suitable.</p>										

Note:

It is important to take account of quantities and concentrations of all types of chemical likely to be encountered.

5.2.9.2 Manhole covers and frames

Gray cast iron manhole covers and frames should be cast in accordance with standard drawings No. IPS-D-CE-252 sheet 1 for heavy-weight and sheet 2 for light-weight cover and frame, applicable in both brick or concrete manholes, as chosen and required.

5.2.9.3 Safety chains (for sewage pumphouse)

Safety chains should be made of low carbon steel or of stainless steel, 10 mm nominal size, short-link, smooth welded chain to BS 4942: Part 2. When made of low carbon steel they should be protected by hot dip galvanizing in accordance with BS 729.

5.2.9.4 Ladders (for sewage pumphouse)

Fixed ladders should meet the dimensional requirements of BS 4211 except that stringers should be not less than 65 mm × 20 mm in section and rungs 25 mm in diameter. When made of low carbon steel they should be protected by hot dip galvanizing in accordance with BS 729.

For rise and tread dimensions, stringer and landing details refer to the specific engineering, drawing and IPS-D-CE-141 for guidance only.

5.2.9.5 Handrails and handholds (in sewage pumphouse)

Handrails and handholds should be at least 25 mm in diameter. Low carbon steel tubes can be used for fabrication at shop. They should be protected by hot dip galvanizing in accordance with BS 729, before assembly.

5.2.9.6 Gullies

Gullies should comply with BS 65, BS 437 or BS 5911: Part 2 as appropriate. A gully usually incorporates trap, or a sump, or both, to retain detritus. The top should be fitted with either a grating or sealed cover. Connections should be made below the grating or cover. Gullies may be specially designed to suit selected locations and the volume and nature of the flow.

For engineering and constructional details refer to IPS-D-CE-232.

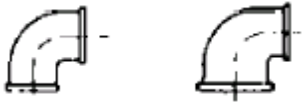









5.2.9.7 Valves (see also Clause 12.4 of [IPS-E-CE-380](#))

For general information about valves refer to [IPS-M-PI-110](#).

APPENDICES

**APPENDIX A
INDEX OF PIPE FITTINGS**

TABLE A.1 - INDEX OF FITTING TYPES, SYMBOLS AND INDEX TO TABLES

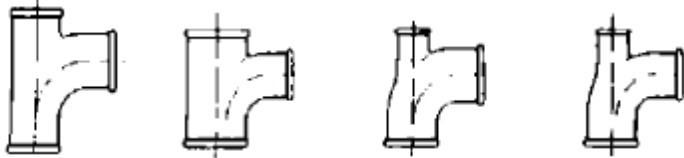


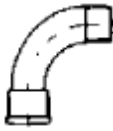





Type	Description	Symbol			
A	Elbows				
	Pipe ends	Female-equal	Female-reducing	Male and Female-equal	Male and Female-reducing
	Table No.	9	10	9	10
A	Elbows				
	Pipe ends	Female- equal			
	Table No.	11		11	
B	Tees				
	Pipe ends	Female - equal	Female-reducing	Female-increasing	Female-reducing
	Table No.	9	12	12	13
C	Crosses				
	Pipe ends	Female - equal			
	Table No.	9			
D	Bends				
	Pipe ends	Female - equal	Male and Female -equal	Male - equal	
	Table No.	14	14	14	
D	45° Bends				
	Pipe ends	Male and Female -equal			
	Table No.	15			

* Pipe ends of fitting outlets.

** Table Nos. of BS 143 and 1256:2006.


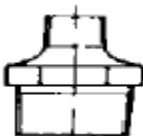






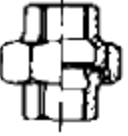
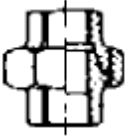
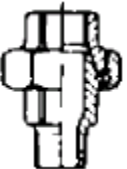


(to be continued)

APPENDIX A - TABLE A.1 (continued)

Type	Description	Symbol			
E	Pitcher tees	E1 			
	Pipe ends	Female-equal	Female-reducing		
	Table No.	14	16		
E	Twin elbows	E2 			
	Pipe ends	Female - equal			
	Table No.	14			
G	Long sweep bends	G1 	G4 		
	Pipe ends	Female-equal	Male and Female-equal		
	Table No.	17	17		
kb	Return bends	Kb1 			
	Pipe ends	Female-equal			
	Table No.	18			
M	Sockets	M2 		M3 	M4 
	Pipe ends	Female-equal	Female-reducing	Female-reducing	Male and Female-reducing
	Table No.	19	19	19	19
N	Bushes	N4 			
	Pattern	I	II	III	
	Table No.	20	20	20	

(to be continued)

APPENDIX A - TABLE A.1 (continued)

Type	Description	Symbol		
N	Hexagon nipples	N8		
				
	Pipe ends	Male-equal		Male-reducing
	Table No.	21		21
P	Backnuts	P4		
				
	Table No.	22		
T	Gape	T1	T2	
				
	Pattern	Hexagon	Round	
	Table No.	23	23	
T	Plugs	T8	T9	T11
				
	Pattern	Plain	Beaded	Countersunk
	Table No.	23	23	23
U	Unions	U1	U11	U12
				
	Ends-pattern	Female -flat seat	Female-taper seat	Male and Female-taper seat
	Table No.	21	24	24
UA	Elbow unions	UA11	UA12	
				
	Ends-pattern	Female-taper seat	Male and Female-taper seat	
	Table No.	25	25	