THAI MALLEABLE IRON AND STEEL CO.,LTD.

HIGH GRADE PIPE FITTINGS

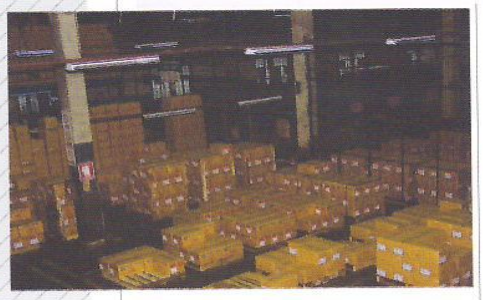
Proudly Serving the World

Ordering Information

Ordering Standard TM Pipe fittings

Please provide the following information when you order TM brand pipe fittings :

- Figure number, name and nominal size;
- Type of thread;
- Black or galvanized; and
- Quantity.



Specification of Nominal Size of TM Standard Pipe Fittings

To avoid confusion, the nominal size of different types of pipe fittings are designated as below :

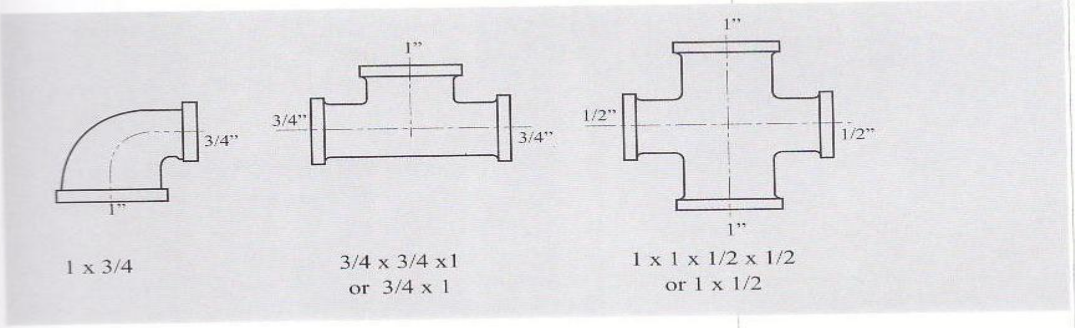
- Irrespective of the number of outlets, equal fittings (where all outlets are of the same size) are referred to by that one size;
- For unequal fittings with two, three or four outlets :

2 outlets : the larger diameter comes first, and the smaller second;

3 outlets : the larger diameter of the two on the same line comes first, the smaller second, and the remaining diameter is third;

4 outlets : the largest diameter comes first followed by the one on the same line, then the larger one of the remaining two and the last one fourth.

Please refer to the following figures as examples :



1 x 3/4 | 3/4 x 3/4 x1 or 3/4 x 1 | 1 x 1 x 1/2 x 1/2 or 1 x 1/2

Ordering Non-standard Items

As our special services to customer, we encourage you to create your own fittings with your best imagination.

Please provide us the following information when you need non-standard pipe fittings :

1) Detailed specifications, such as materials, dimensions, dimensional tolerance, and other technical specifications;
2) Usage and application conditions;
3) Standards or regulations to be applied for manufacturing the ordered items;
4) Quantity required, and prospect of the demand if possible; and
5) Samples, drafts if possible.

Features of TM Pipe Fittings

a) Standards

TM fittings are produced in accordance with the following national or international standards depending on customers' requirements:

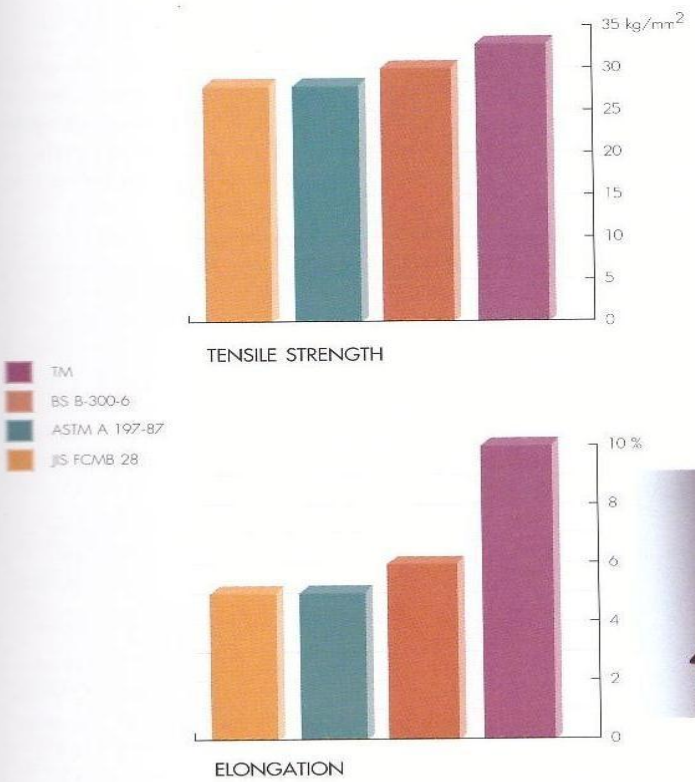
- **American standards:**
  - * ASME B16.3-1998
    Malleable Iron Threaded Fittings
  - * ASME B16.39-1986
    Malleable Iron Threaded Pipe Unions
  - * ASME B16.14-1991
    Ferrous Pipe Plugs, Bushings,and Locknuts with Pipe Threads
  - * ANSI/ASME B1.20.1-1983
    PIPE THREADS, GENERAL PURPOSE (INCH)
- **British standards:**
  - * BS143 & 1256 : 2000
    Threaded pipe fittings in malleable cast iron and cast copper alloy
  - * BS 21 : 1985
    Pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)

  BS EN 10242 : 2002
  Threaded pipe fittings in malleable cast iron
- **ISO standards:**
  - * ISO 49 : 1994
    Malleable cast iron fittings threaded to ISO 7-1
  - * ISO 7/1-1994
    Pipe threads where pressure- tight joints are made on the threads-Part 1: Dimensions, tolerances and designation

b) Material

TM fittings are manufactured of black heart malleable iron (the microstructure is shown on below picture). Our iron is melted and refined in electric induction furnaces, and annealed with extreme care.

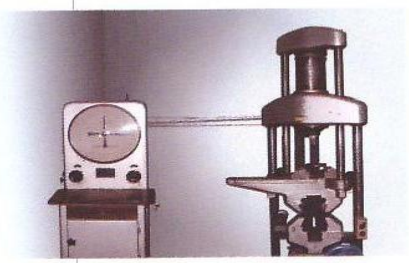
Microstructure of TM Black Heart Malleable Cast Iron (X 100)



TM malleable iron has mechanical properties superior to those specified by various national / international standards for pipe fittings.

This superiority is shown by the following two figures, in which the tensile strength and elongation of TM malleable iron are compared with the specifications specified in some national standards.

{ Figures of Comparison of Tensile Strength and Elongation }



C) Coating

TM fttings are available either galvanized or black. Galvanized fittings have an average coating thickness of 86 micrometers or average coatings weight of 610 g/m² or higher.

D) Applications

TM fittings are suitable to be used either for steam,air, water,gas and oil pipes or for many other fluids.

The recommended working pressure under specified temperatures are rated as follows :

Constituents of Internal Fluid	Maximum Working Pressure
Steam, Air, Gas and Oil at 300°C	10 kg/cm²
Steam, Air, Gas, Oil and water at 200°C	14 kg/cm²
Water Non-shock at 120°C	20 kg/cm²

Distance and Tolerances

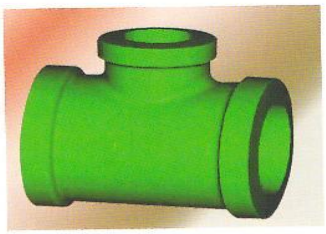
The important dimensions of TM pipe fittings are shown in the tables on page 14 to 37. Except where stated as minimum dimensions, tolerances on face-to-face, face-to-centre and centre-to-centre dimensions shall be in accordance with below table.

Dimension (mm)	≤ 30	> 30 ≤ 50	> 50 ≤ 75	> 75 ≤ 100	> 100 ≤ 150	> 150 ≤ 200	> 200
Tolerance. (mm)	± 1.5	± 2.0	± 2.5	± 3.0	± 3.5	± 4.0	± 5.0

End Shapes and Threads

The end shapes of TM pipe fittings are illustrated on page 14 (for BS EN standard) and page 15 (for American standard). Our Company manufactures quality pipe fittings with different end-shapes, mainly banded, but also beaded or plain, which are supplied upon our customers' preference.

TM pipe fittings are tapped according to BS 21 (1985) or ANSI / ASME B1.20.1 (1983) or ISO 7/1 standards, upon the customers' specifications and requirements. Threads can also be machined following German standard (DIN 2999 : 1983) whenever requested by our customers. All the threads are chamfered to assist assembling and avoid "cross threading".



Quality Management System and Certification

Thai Malleable Iron and Steel Co., Ltd. strictly follows internationally approved procedures for quality management control system, to ensure that our TM brand pipe fittings are manufactured to the very highest standards.

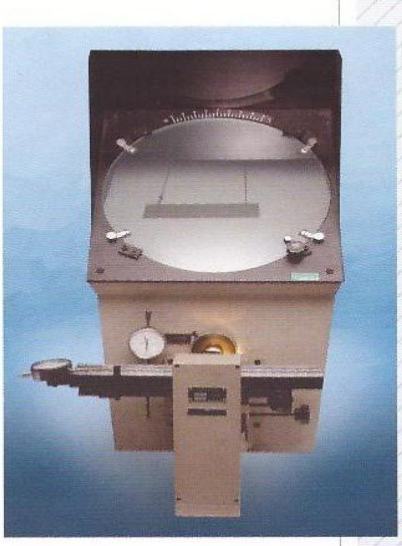
All of our products for sale within Thailand satisfy the Thai Industrial Standard Institute certification (TISI). In recognition of our efforts to continually improve and strengthen our already well established quality control procedures, we were granted ISO 9001:2000. Further more we have achieved rigorous inspections and examinations from the British Standards Institution (BSI) and awarded Kitemark for our pipe fittings

While ISO9001:2000 recognizes the excellence of a manufacturer's quality control system, the BSI Kitemark standard compliance goes an important step further to recognize the excellence of the actual manufactured products.

TM brand pipe fittings are critically inspected at every stage of the manufacturing process, starting from the supply of raw materials right up to the packaging of the finished products, to ensure that we achieve a consistent quality level, which our customers worldwide are able to rely upon.

Our extensive list of products will satisfy a very wide range of applications.

Our well-managed production process and strict quality control procedures are coupled with our on-time delivery schedule and our very friendly customer service, to ensure TM brand pipe fittings will satisfy the most discerning of customers.



FLOW CHART OF QUALITY CONTROL

V.I.-Visual Inspection

Air Testing

Packaging

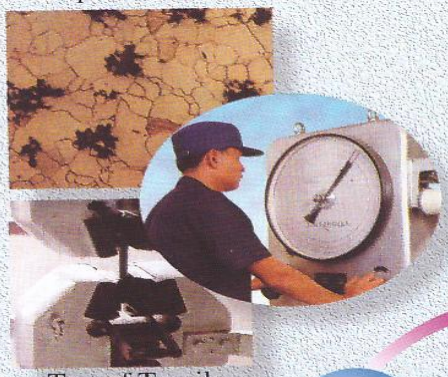
V.I.

Thickness Test & V.I.

Threading

Alignment Inspection

Microstructure Inspection



Galvanizing

V.I.

Cleaning

Gauge Inspection

Test of Tensile Strength and Elongation

Grinding

Heat Treatment

V.I.

Blasting

V.I.

Test of Chemical Composition

Casting

Melting

Raw Materials

List of TM Pipe Fittings

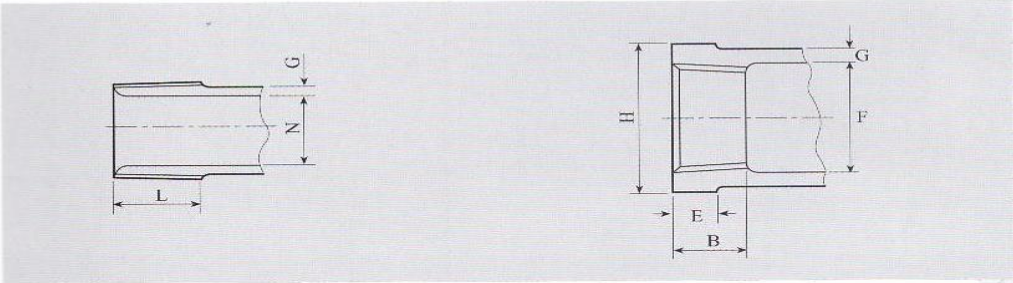
FIG. NO.	NAME	ABBRE-VIATION	NOMINAL SIZE (inch)	PAGE
102	Elbows, Banded, Equal	BL	1/8 - 8	16
112	Elbows, Banded, Reducing	BRL	1/4 - 6	16
122	Elbows, 45°, Banded	BL 45°	1/8 - 6	17
132	Street Elbows, Banded, Equal	SL	1/8 - 6	17
142	Street Elbows, Banded, Reducing	BRSL	1/2 - 2	17
152	Street Elbows, 45°, Banded	SL 45°	1/8 - 4	18
161	Side Outlet Elbows	SOL	1/4 - 2	18
202	Tees, Banded, Equal	BT	1/8 - 8	18
212	Tees, Banded, Reducing	BRT	1/4 - 6	19
222	Service Tees, Banded, Equal	BST	1/4 - 6	21
231	Side Outlet Tees	SOT	1/2 - 2	22
242	45° Y-Branches, Banded, EquaI	BY 45°	3/8 - 4	22
302	Crosses, Banded, Equal	BCR	1/8 - 6	22
312	Crosses, Banded, Reducing	BRCR	3/4 - 4	22
402	Sockets, Banded, with Ribs	BS	1/8 - 8	23
412	Sockets,Banded, Reducing, with Ribs	BRS	1/4 - 6	23
421	Sockets, Full Thread, Plain, without Ribs	FTS	1/4 - 6	24
432	Sockets, Banded, M&F	BSX	3/8 - 2	24
442	Sockets, Banded, Reducing, M&F	BRSX	3/8 - 2	24
452	Sockets, Banded, Reducing, Eccentric	BRSE	3/4 - 6	25

Dimensions Specification

FIG. NO.	NAME	ABBRE-VIATION	NOMINAL SIZE (inch)	PAGE
502	Caps, Banded	BCA	1/8 - 8	25
600	Unions, Gasket Type,Flat Seat (without gasket)	UN	1/8 - 6	26
610	Unions, Gasket Type, Flat Seat,M&F (without gasket)	UNX	1/4 - 3	26
620	Unions, Taper Seat, Iron to Iron	UNT	1/8 - 6	26
630	Unions, Taper Seat, Iron to Iron, M&F	UNTX	1/4 - 3	26
640	Unions, Conical Joint, Brass to Iron Seat	UNBR	1/8 - 6	27
653	Unions, Elbows, Flat Seat	UE	3/8 - 2	27
663	Unions, Elbows, Flat Seat, M&F	UEX	1/4 - 2	27
673	Unions, Elbows, Taper Seat	UET	1/4 - 2	27
683	Unions, Elbows, Taper Seat, M&F	UETX	1/4 - 2	28
703	Short Bends, Banded	SB F/F	1/4 - 2	28
713	Short Bends, Banded, M&F	SB M/F	1/4 - 4	28
722	Long Sweep Bends, Banded	BE F/F	1/4 - 4	28
732	Long Sweep Bends, Banded, 45°	BE F/F 45°	1/4 - 3	29
742	Long Sweep Bends, Banded, M&F	BE M/F	1/8 - 6	29
752	Long Sweep Bends, Banded, 45°, M&F	BE M/F 45°	1/4 - 3	29
760	Long Sweep Bends,Male	BE M/M	1/8 - 4	29
900	Round Flanges, without Bolt Hole	RF	1/2 - 6	30
901	Round Flanges, with Bolt Holes to Table D (BS 10)	RFH BS10	1/2 - 6	30

FIG. NO.	NAME	ABBRE-VIATION	NOMINAL SIZE (inch)	PAGE
902	Round Flanges, with Bolt Holes to PN 16 (BS 4504)	RFH PN 16	1/2 - 6	30
903	Circular Flanges, with Bolt Holes to PN 16 (BS 4504)	CF PN 16	3/8 - 8	31
904	Circular Flanges, with Bolt Holes to PN 25 (BS 4504)	CF PN 25	3/8 - 8	31
905	Circular Flanges, with Bolt Holes to PN 40 (BS 4504)	CF PN 40	3/8 - 8	31
906	Floor Flanges	FF	1/4 - 2	32
907	Oval Flanges	OF	1/2 - 2	32
909	Gasket Type Flange Unions, with Bolts	FU	1/2 - 6	32
910	Locknuts	LN	1/8 - 6	32
920	Bushings	BU	1/4 - 8	33
921	Inside Head Bushings	IBU	1 - 8	34
930	Plugs	P	1/8 - 8	35
931	Solid Plugs	SP	1/8 - $3^1/_2$	35
933	Slotted Head Plugs	SHP	4 - 8	35
940	Hexagon Nipples, Equal	NI	1/8 - 6	36
941	Hexagon Nipples, Reducing	RNI	1/4 - 4	36
942	Long Screw Sets	LS	1/2 - 4	36
APPENDIX A-1	Compression Couplings, Regular Type	CCR	1/2 - 2	37
APPENDIX A-2	Compression Couplings, long Type	CCL	1/2 - 2	37

2) End Shapes and Threads for American Standard :



Nominal Size (inch)	Minimum Threads Length		Chamber Diameter F(mm)		Maximum Port Diameter Male End N (mm)	Minimum Wall Thickness G(mm)	Bands	
	Female B (mm)	Male L(mm)	Minimum	Maximum			Minimum Outside Diameter H(mm)	Minimum Width E(mm)
1/8	6.4	6.7	10.3	11.0	5.1	2.1	17.6	5.1
1/4	8.1	10.2	13.7	14.8	6.6	2.2	21.4	5.5
3/8	9.1	10.4	17.1	18.3	9.4	2.3	25.8	5.8
1/2	10.9	13.6	21.3	22.8	13.0	2.4	30.4	6.3
3/4	12.7	13.9	26.7	28.1	17.5	2.8	37.0	6.9
1	14.7	17.4	33.4	35.2	23.1	3.1	45.0	7.7
1 1/4	17.0	18.0	42.2	43.9	30.2	3.4	54.7	8.7
1 1/2	17.8	18.4	48.3	50.0	35.3	3.6	61.6	9.3
2	19.1	19.3	60.3	62.1	45.5	4.0	75.3	10.7
2 1/2	23.4	29.0	73.0	75.6	55.9	4.8	91.2	12.1
3	24.9	30.5	88.9	91.4	70.6	5.3	108.8	13.9
3 1/2	26.2	-	101.6	104.1	-	5.7	123.0	15.3
4	27.4	33.1	114.4	116.8	94.0	6.1	137.2	16.8
5	30.0	35.8	141.3	143.8	119.1	6.9	167.2	19.8
6	32.5	38.5	168.3	170.8	144.0	7.7	197.4	22.9
*8	37.3	43.8	219.1	221.6	190.0	8.4	246.0	24.8

*TM Specification

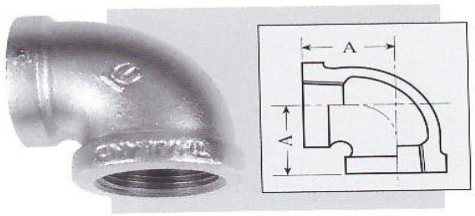
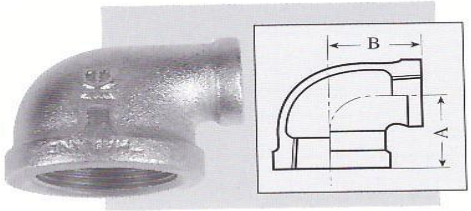


FIG. 102
Elbows, Banded, Equal (BL)

NOMINAL SIZE		A
mm	inch	mm
6	1/8	18
8	1/4	21
10	3/8	25
15	1/2	28
20	3/4	33
25	1	38
32	1¼	45
40	1½	50
50	2	58
65	2½	69
80	3	78
90	3½	87
100	4	96
125	5	115
150	6	131
200	8	163

FIG. 112
Elbows, Banded, Reducing (BRL)



NOMINAL SIZE		A	B	NOMINAL SIZE		A	B
mm	inch	mm	mm	mm	inch	mm	mm
8 x 6	1/4 x 1/8	19	19	50 x 20	2 x 3/4	41	50
10 x 6	3/8 x 1/8	21	22	50 x 25	2 x 1	44	50
10 x 8	3/8 x 1/4	22	23	50 x 32	2 x 1¼	48	53
15 x 8	1/2 x 1/4	25	25	50 x 40	2 x 1½	52	55
15 x 10	1/2 x 3/8	26	26	65 x 20	21/2 x 3/4	44	59
20 x 8	3/4 x 1/4	27	27	65 x 25	21/2 x 1	48	61
20 x 10	3/4 x 3/8	28	28	65 x 32	21/2 x 1¼	53	63
20 x 15	3/4 x 1/2	30	31	65 x 40	21/2 x 1½	55	64
25 x 10	1 x 3/8	30	32	65 x 50	21/2 x 2	61	66
25 x 15	1 x 1/2	32	34	80 x 20	3 x 3/4	49	67
25 x 20	1 x 3/4	35	36	80 x 32	3 x 1¼	55	69
32 x 15	1¼ x 1/2	34	39	80 x 40	3 x 1½	58	71
32 x 20	1¼ x 3/4	36	41	80 x 50	3 x 2	64	73
32 x 25	1¼ x 1	40	42	80 x 65	3 x 2½	72	76
40 x 15	1½ x 1/2	35	42	100 x 40	4 x 1½	63	86
40 x 20	1½ x 3/4	39	45	100 x 50	4 x 2	70	87
40 X 25	1½ x 1	42	46	100 x 65	4 x 2½	77	89
40 x 32	1½ x 1¼	46	48	100 x 80	4 x 3	84	91
50 x 15	2 x 1/2	38	48	150 x 100	6 x 4	105	125

NOMINAL SIZE		A	NOMINAL SIZE		A
mm	inch	mm	mm	inch	mm
6	1/8	16	50	2	43
8	1/4	19	65	2 1/2	50
10	3/8	20	80	3	55
15	1/2	22	90	3 1/2	61
20	3/4	25	100	4	66
25	1	28	125	5	78
32	1 1/4	33	150	6	88
40	1 1/2	36			

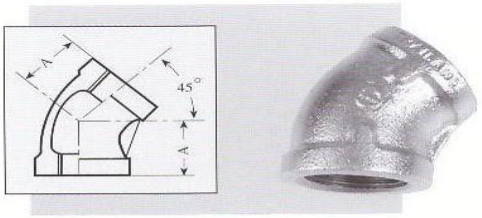


FIG.122
Elbow, 45°, Banded (BL45°)

NOMINAL SIZE		A	B	
			TM-ANSI	TM-ISO
mm	inch	mm	mm	mm
6	1/8	18	25	
8	1/4	21	29	
10	3/8	25	37	32
15	1/2	28	41	37
20	3/4	33	48	43
25	1	38	53	
32	1 1/4	45	61	
40	1 1/2	50	67	
50	2	58	83	74
65	2 1/2	69	98	88
80	3	78	115	98
100	4	96	145	118
125	5	115	174	-
150	6	131	204	-

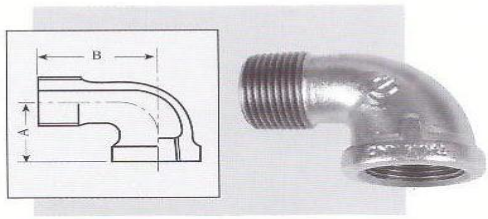


FIG. 132
Street Elbows, Banded,Equal (SL)

NOMINAL SIZE		A	B
mm	inch	mm	mm
15 x 10	1/2 x 3/8	26	33
20 x 15	3/4 x 1/2	30	40
25 x 15	1 x 1/2	32	51
25 x 20	1 x 3/4	35	46
32 x 25	1 1/4 x 1	40	56
40 x 2	1 1/2 x 1	42	66
40 x 32	1 1/2 x 1 1/4	46	68
50 x 40	2 x 1 1/2	52	75

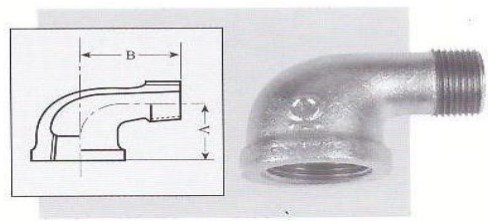


FIG. 142
Street Elbows, Banded, Reducing (BRSL)

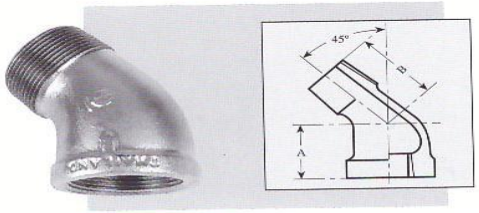


FIG. 152
Street Elbows 45°, Banded (SL45°)

NOMINAL SIZE		A	B
mm	inch	mm	mm
6	1/8	16	21
8	1/4	19	24
10	3/8	20	26
15	1/2	22	28
20	3/4	25	33
25	1	28	37
32	1 1/4	33	43
40	1 1/2	36	48
50	2	43	56
65	2 1/2	50	65
80	3	55	76
100	4	66	94

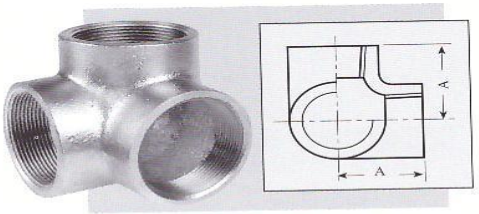


FIG. 161
Side Outlet Elbows (SOL)

NOMINAL SIZE		A
mm	inch	mm
8	1/4	21
10	3/8	25
15	1/2	28
20	3/4	33
25	1	38
32	1 1/4	45
40	1 1/2	50
50	2	58

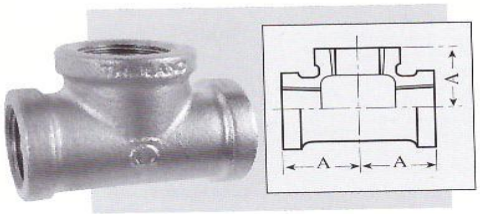


FIG.202
Tees, Banded, Equal (BT)

NOMINAL SIZE		A
mm	inch	mm
6	1/8	18
8	1/4	21
10	3/8	25
15	1/2	28
20	3/4	33
25	1	38
32	1 1/4	45
40	1 1/2	50
50	2	58
65	2 1/2	69
80	3	78
90	3 1/2	87
100	4	96
125	5	115
150	6	131
200	8	163

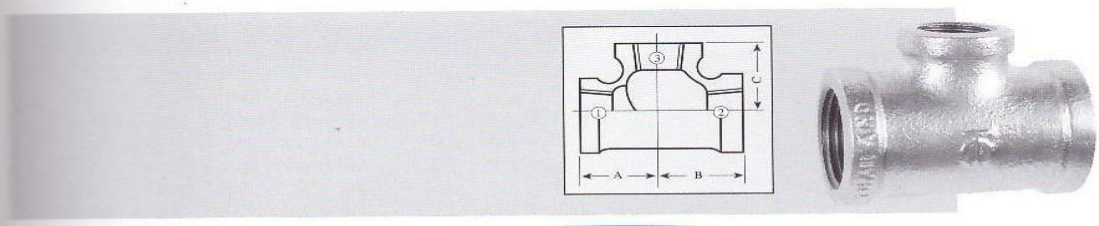


FIG.212
Tees, Banded, Reducing (BRT)

1) Reducing on the branch type

NOMINAL SIZE		A	B	C	NOMINAL SIZE		A	B	C
mm	inch	mm	mm	mm	mm	inch	mm	mm	mm
8 x 8 x 6	1/4 x 1/4 x 1/8	19	19	19	65 x 65 x 20	2½ x 2½ x 3/4	44	44	59
10 x 10 x 6	3/8 x 3/8 x 1/8	21	21	22	65 x 65 x 25	2½ x 2½ x 1	47	47	60
10 x 10 x 8	3/8 x 3/8 x 1/4	23	23	23	65 x 65 x 32	2½ x 2½ x 1¼	52	52	62
15 x 15 x 8	1/2 x 1/2 x 1/4	24	24	24	65 x 65 x 40	2½ x 2½ x 1½	55	55	63
15 x 15 x 10	1/2 x 1/2 x 3/8	26	26	26	65 x 65 x 50	2½ x 2½ x 2	61	61	66
20 x 20 x 8	3/4 x 3/4 x 1/4	26	26	27	80 x 80 x 15	3 x 3 x 1/2	51	51	68
20 x 20 x 10	3/4 x 3/4 x 3/8	28	28	28	80 x 80 x 20	3 x 3 x 3/4	51	51	68
20 x 20 x 15	3/4 x 3/4 x 1/2	30	30	31	80 x 80 x 25	3 x 3 x 1	51	51	67
25 x 25 x 8	1 x 1 x 1/4	28	28	31	80 x 80 x 32	3 x 3 x 1¼	55	55	70
25 x 25 x 10	1 x 1 x 3/8	30	30	32	80 x 80 x 40	3 x 3 x 1½	58	58	71
25 x 25 x 15	1 x 1 x 1/2	32	32	34	80 x 80 x 50	3 x 3 x 2	64	64	73
25 x 25 x 20	1 x 1 x 3/4	35	35	36	80 x 80 x 65	3 x 3 x 2½	72	72	76
32 x 32 x 10	1¼ x 1¼ x 3/8	33	33	36	100 x 100 x 15	4 x 4 x 1/2	50	50	79
32 x 32 x 15	1¼ x 1¼ x 1/2	34	34	38	100 x 100 x 25	4 x 4 x 1	56	56	81
32 x 32 x 20	1¼ x 1¼ x 3/4	36	36	41	100 x 100 x 32	4 x 4 x 1¼	61	61	83
32 x 32 x 25	1½ x 1½ x 1	40	40	42	100 x 100 x 40	4 x 4 x 1½	64	64	84
40 x 40 x 10	1½ x 1½ x 3/8	34	34	40	100 x 100 x 50	4 x 4 x 2	70	70	86
40 x 40 x 15	1½ x 1½ x 1/2	36	36	42	100 x 100 x 65	4 x 4 x 2½	77	77	89
40 x 40 x 20	1½ x 1½ x 3/4	38	38	44	100 x 100 x 80	4 x 4 x 3	84	84	92
40 x 40 x 25	1½ x 1½ x 1	42	42	46	125 x 125 x 80	5 x 5 x 3	87	87	107
40 x 40 x 32	1½ x 1½ x 1¼	46	46	48	150 x 150 x 25	6 x 6 x 1	64	64	110
50 x 50 x 10	2 x 2 x 3/8	37	37	46	150 x 150 x 32	6 x 6 x 1¼	67	67	113
50 x 50 x 15	2 x 2 x 1/2	38	38	48	150 x 150 x 40	6 x 6 x 1½	70	70	116
50 x 50 x 20	2 x 2 x 3/4	40	40	50	150 x 150 x 50	6 x 6 x 2	75	75	115
50 x 50 x 25	2 x 2 x 1	44	44	52	150 x 150 x 65	6 x 6 x 2½	86	86	118
50 x 50 x 32	2 x 2 x 1¼	48	48	54	150 x 150 x 80	6 x 6 x 3	92	92	121
50 x 50 x 40	2 x 2 x 1½	52	52	55	150 x 150 x 100	6 x 6 x 4	105	105	125
65 x 65 x 15	2½ x 2½ x 1/2	41	41	57					

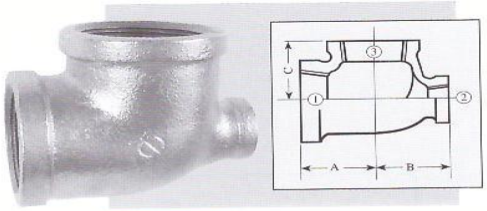


FIG.212
Tees, Banded, Reducing (BRT)

2) Reducing on the run and equal on the branch type

NOMINAL SIZE		A	B	C
mm	inch	mm	mm	mm
10 x 8 x 10	3/8 x 1/4 x 3/8	24	23	24
15 x 8 x 15	1/2 x 1/4 x 1/2	28	25	28
15 x 10 x 15	1/2 x 3/8 x 1/2	28	26	28
20 x 8 x 20	3/4 x 1/4 x 3/4	33	27	33
20 x 15 x 20	3/4 x 1/2 x 3/4	33	31	33
25 x 15 x 25	1 x 1/2 x 1	38	34	38
25 x 20 x 25	1 x 3/4 x 1	38	36	38
32 x 15 x 32	1 1/4 x 1/2 x 1 1/4	45	38	45
32 x 20 x 32	1 1/4 x 3/4 x 1 1/4	45	41	45
32 x 25 x 32	1 1/4 x 1 x 1 1/4	45	42	45
40 x 15 x 40	1 1/2 x 1/2 x 1 1/2	50	42	50
40 x 20 x 40	1 1/2 x 3/4 x 1 1/2	50	44	50
40 x 25 x 40	1 1/2 x 1 x 1 1/2	50	46	50
40 x 32 x 40	1 1/2 x 1 1/4 x 1 1/2	50	48	50
50 x 15 x 50	2 x 1/2 x 2	57	48	57
50 x 20 x 50	2 x 3/4 x 2	58	50	58
50 x 25 x 50	2 x 1 x 2	58	52	58
50 x 32 x 50	2 x 1 1/4 x 2	58	54	58
50 x 40 x 50	2 x 1 1/2 x 2	58	55	58
65 x 40 x 65	2 1/2 x 1 1/2 x 2 1/2	69	64	69
65 x 50 x 65	2 1/2 x 2 x 2 1/2	69	66	69
80 x 50 x 80	3 x 2 x 3	78	73	78
80 x 65 x 80	3 x 2 1/2 x 3	78	76	78
100 x 80 x 100	4 x 3 x 4	96	91	96

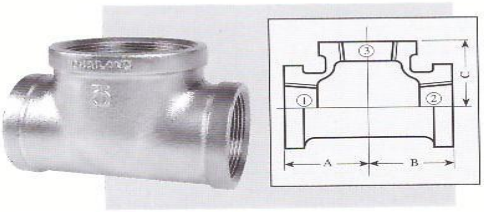


FIG.212
Tees, Banded, Reducing (BRT)

3) Increasing on the branch type

NOMINAL SIZE		A	B	C
mm	inch	mm	mm	mm
6 x 6 x 8	1/8 x 1/8 x 1/4	19	19	1
8 x 8 x 10	1/4 x 1/4 x 3/8	23	23	2
10 x 10 x 15	3/8 x 3/8 x 1/2	26	26	2
15 x 15 x 20	1/2 x 1/2 x 3/4	31	31	3
15 x 15 x 25	1/2 x 1/2 x 1	34	34	3
20 x 20 x 25	3/4 x 3/4 x 1	36	36	3
20 x 20 x 32	3/4 x 3/4 x 1 1/4	41	41	3
25 x 25 x 32	1 x 1 x 1 1/4	42	42	4
25 x 25 x 40	1 x 1 x 1 1/2	46	46	4
25 x 25 x 50	1 x 1 x 2	51	51	4
32 x 32 x 40	1 1/4 x 1 1/4 x 1 1/2	48	48	4
32 x 32 x 50	1 1/4 x 1 1/4 x 2	54	54	4
40 x 40 x 50	1 1/2 x 1 1/2 x 2	55	55	5
50 x 50 x 65	2 x 2 x 2 1/2	66	66	6
50 x 50 x 80	2 x 2 x 3	72	72	7
65 x 65 x 80	2 1/2 x 2 1/2 x 3	76	76	7
80 x 80 x 100	3 x 3 x 4	91	91	8

Reducing on the run and the branch type

NOMINAL SIZE		A	B	C
mm	inch	mm	mm	mm
10 x 8 x 8	3/8 x 1/4 x 1/4	22	21	23
20 x 10 x 10	3/4 x 3/8 x 3/8	28	24	29
20 x 15 x 10	3/4 x 1/2 x 3/8	28	26	28
20 x 15 x 15	3/4 x 1/2 x 1/2	30	28	31
25 x 15 x 15	1 x 1/2 x 1/2	32	28	34
25 x 15 x 20	1 x 1/2 x 3/4	35	31	36
25 x 20 x 15	1 x 3/4 x 1/2	32	30	34
25 x 20 x 20	1 x 3/4 x 3/4	35	33	36
32 x 15 x 15	1 1/4 x 1/2 x 1/2	34	27	38
32 x 15 x 20	1 1/4 x 1/2 x 3/4	37	30	40
32 x 15 x 25	1 1/4 x 1/2 x 1	40	35	42
32 x 20 x 15	1 1/4 x 3/4 x 1/2	34	29	38
32 x 20 x 20	1 1/4 x 3/4 x 3/4	36	33	41
32 x 20 x 25	1 1/4 x 3/4 x 1	40	36	42
32 x 25 x 15	1 1/4 x 1 x 1/2	34	32	38
32 x 25 x 20	1 1/4 x 1 x 3/4	36	35	41
32 x 25 x 25	1 1/4 x 1 x 1	40	38	42
40 x 25 x 25	1 1/2 x 1 x 1	42	38	46
40 x 32 x 15	1 1/2 x 1 1/4 x 1/2	36	34	42
40 x 32 x 20	1 1/2 x 1 1/4 x 3/4	38	36	44
40 x 32 x 25	1 1/2 x 1 1/4 x 1	42	40	46
40 x 32 x 32	1 1/2 x 1 1/4 x 1 1/4	46	45	48
50 x 25 x 40	2 x 1 x 1 1/2	51	46	55
50 x 32 x 32	2 x 1 1/4 x 1 1/4	48	45	54
60 x 32 x 40	2 x 1 1/4 x 1 1/2	52	48	55
50 x 40 x 20	2 x 1 1/2 x 3/4	40	38	50
50 x 40 x 25	2 x 1 1/2 x 1	44	42	52
50 x 40 x 32	2 x 1 1/2 x 1 1/4	48	46	54
50 x 40x 40	2 x 1 1/2 x 1 1/2	52	50	55
65 x 40 x 50	2 1/2 x 1 1/2 x 2	61	55	66
65 x 50 x 32	2 1/2 x 2 x 1 1/4	52	48	62
65 x 50 x 50	2 1/2 x 2 x 2	61	57	66
80 x 50 x 50	3 x 2 x 2	64	57	73
80 x 65 x 50	3 x 2 1/2 x 2	64	61	73
80 x 65 x 65	3 x 2 1/2 x 2 1/2	72	69	76

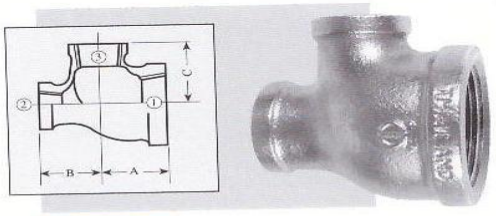


FIG.212
Tees, Banded, Reducing (BRT)

NOMINAL SIZE		A	B
mm	inch	mm	mm
8	1/4	21	30
10	3/8	24	37
15	1/2	28	41
20	3/4	33	48
25	1	38	54
32	1 1/4	44	62
40	1 1/2	49	68
50	2	57	83
65	2 1/2	69	98
80	3	78	115
100	4	96	145
125	5	114	174
150	6	130	204

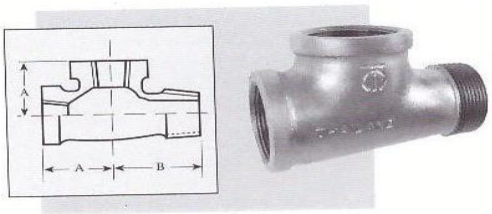


FIG.222
Service Tees, Banded, Equal (BST)

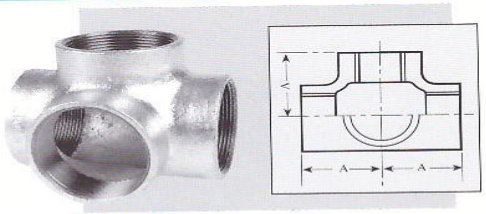


FIG.231
Side Outlet Tees (SOT)

NOMINAL SIZE		A
mm	inch	mm
15	1/2	28
20	3/4	33
25	1	38
32	1 1/4	45
40	1 1/2	50
50	2	58

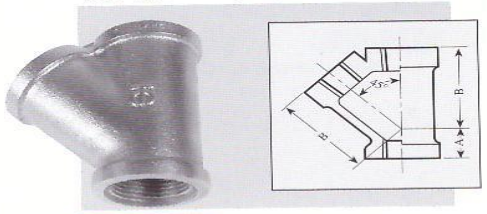


FIG.242
45° Y-Branches, Banded, Equal (BY45°)

NOMINAL SIZE		A	B
mm	inch	mm	mm
10	3/8	13	36
15	1/2	15	43
20	3/4	18	52
25	1	22	62
32	1 1/4	26	74
50	2	38	100
65	2 1/2	39	120
80	3	43	141
100	4	51	177

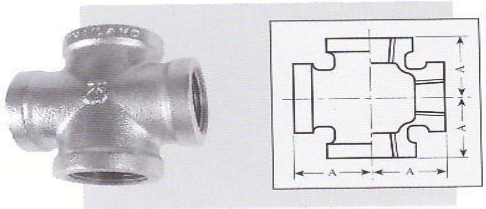


FIG.302
Crosses, Banded, Equal (BCR)

NOMINAL SIZE		A
mm	inch	mm
6	1/8	18
8	1/4	21
10	3/8	25
15	1/2	28
20	3/4	33
25	1	38
32	1 1/4	45
40	1 1/2	50
50	2	58
65	2 1/2	69
80	3	78
90	3 1/2	87
100	4	96
125	5	115
150	6	131

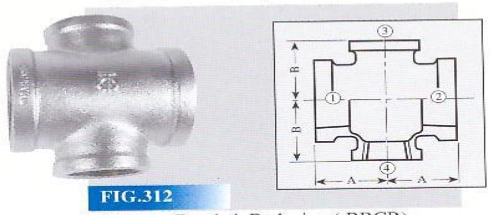


FIG.312
Crosses, Banded, Reducing (BRCR)

NOMINAL SIZE		A	B
mm	inch	mm	mm
20 x 20 x 15 x15	3/4 x 3/4 x 1/2 x 1/2	30	31
25 x 25 x 15 x 15	1 x 1 x 1/2 x 1/2	32	34
25 x 25 x 20 x 20	1 x 1 x 3/4 x 3/4	35	36
32 x 32 x 20 x 20	1 1/4 x 1 1/4 x 3/4 x 3/4	36	41
32 x 32 x 25 x 25	1 1/4 x 1 1/4 x 1 x 1	40	42
40 x 40 x 20 x 20	1 1/2 x 1 1/2 x 3/4 x 3/4	39	44
40 x 40 x 25 x 25	1 1/2 x 1 1/2 x 1 x 1	42	46
40 x 40 x 32 x 32	1 1/2 x 1 1/2 x 1 1/4 x 1 1/4	46	48
50 x 50 x 20 x 20	2 x 2 x 3/4 x 3/4	41	50
50 x 50 x 25 x 25	2 x 2 x 1 x 1	44	51
50 x 50 x 32 x 32	2 x 2 x 1 1/4 x 1 1/4	48	53

NOMINAL SIZE		A	B
mm	inch	mm	mm
50 x 50 x 40 x 40	2 x 2 x 1 1/2 x 1 1/2	52	55
65 x 65 x 25 x 25	2 1/2 x 2 1/2 x 1 x 1	48	60
65 x 65 x 50 x 50	2 1/2 x 2 1/2 x 2 x 2	61	66
80 x 80 x 50 x 50	3 x 3 x 2 x 2	64	73
100 x 100 x 25 x 25	4 x 4 x 1 x 1	56	81
100 x 100 x 32 x 32	4 x 4 x 1 1/4 x 1 1/4	61	83
100 x 100 x 40 x 40	4 x 4 x 1 1/2 x 1 1/2	64	84
100 x 100 x 50 x 50	4 x 4 x 2 x 2	70	86
100 x 100 x 65 x 65	4 x 4 x 2 1/2 x 2 1/2	77	89
100 x 100 x 80 x 80	4 x 4 x 3 x 3	84	92

NOMINAL SIZE		A
mm	inch	mm
6	1/8	25
8	1/4	27
10	3/8	30
15	1/2	36
20	3/4	39
25	1	45
32	1¼	50
40	1½	55
50	2	65
65	2½	74
80	3	80
100	4	94
125	5	109
150	6	120
200	8	125

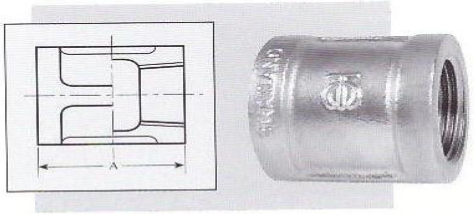


FIG.402
Sockets, Banded, With Ribs (BS)

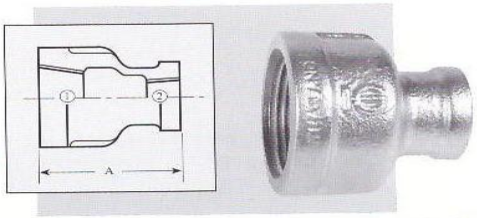


FIG.412
Sockets, Banded, Reducing, With Ribs (BRS)

NOMINAL SIZE		A		NOMINAL SIZE		A	
		TM-ANSI	TM-ISO			TM-ANSI	TM-ISO
mm	inch	mm	mm	mm	inch	mm	mm
8 x 6	1/4 x 1/8	26		65 x 25	2½ x 1	83	74
10 x 8	3/8 x 1/4	29		65 x 32	2½ x 1¼	83	74
15 x 6	1/2 x 1/8	34		65 x 40	2½ x 1½	83	74
15 x 8	1/2 x 1/4	34		65 x 50	2½ x 2	83	74
15 x 10	1/2 x 3/8	34		80 x 15	3 x 1/2	94	80
20 x 8	3/4 x 1/4	38		80 x 25	3 x 1	94	80
20 x 10	3/4 x 3/8	38		80 x 32	3 x 1¼	94	80
20 x 15	3/4 x 1/2	38		80 x 40	3 x 1½	94	80
25 x 8	1 x 1/4	44		80 x 50	3 x 2	94	80
25 x 10	1 x 3/8	44		80 x 65	3 x 2½	94	80
25 x 15	1 x 1/2	44		100 x 15	4 x 1/2	111	94
25 x 20	1 x 3/4	44		100 x 20	4 x 3/4	111	94
32 x 15	1¼ x 1/2	51		100 x 25	4 x 1	111	94
32 x 20	1¼ x 3/4	51		100 x 32	4 x 1¼	111	94
32 x 25	1¼ x 1	51		100 x 40	4 x 1½	111	94
4o x 15	1½ x 1/2	57		100 x 50	4 x 2	111	94
40 x 20	1½ x 3/4	57		100 x 65	4 x 2½	111	94
40 x 25	1½ x 1	57		100 x 80	4 x 3	111	94
40 x 32	1½ x 1¼	57		100 x 90	4 x 3½	111	94
50 x 8	2 x 1/4	71	65	125 x 50	5 x 2	-	109
50 x 10	2 x 3/8	71	65	125 x 65	5 x 2½	-	109
50 x 15	2 x 1/2	71	65	125 x 80	5 x 3	-	109
50 x 20	2 x 3/4	71	65	125 x 100	5 x 4	-	109
50 x 25	2 x 1	71	65	150 x 40	6 x 2	-	120
50 x 32	2 x 1¼	71	65	150 x 50	6 x 2½	-	120
50 x 40	2 x 1½	71	65	150 x 80	6 x 3	-	120
65 x 15	2½ x 1/2	83	74	150 x 100	6 x 4	-	120
65 x 20	2½ x 3/4	83	74	150 x 125	6 x 5	-	120

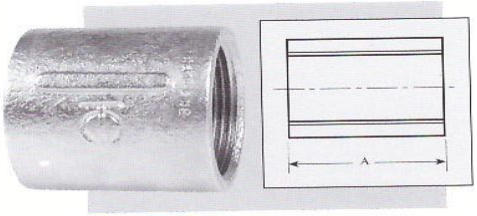


FIG.421
Sockets, Full Threads, Plain,Without Ribs (FTS)

NOMINAL SIZE		A
mm	inch	mm
8	1/4	27
10	3/8	30
15	1/2	35
20	3/4	39
25	1	44
32	1 1/4	50
40	1 1/2	55
50	2	65
65	2 1/2	74
80	3	80
100	4	94
125	5	109
150	6	120

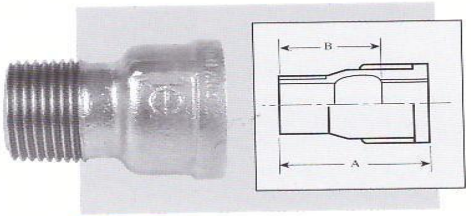


FIG.432
Sockets, Banded, M&F (BSX)

NOMINAL SIZE		A	B
mm	inch	mm	mm
10	3/8	35	25
15	1/2	43	30
20	3/4	48	33
25	1	55	38
32	1 1/4	60	41
40	1 1/2	63	44
50	2	70	46

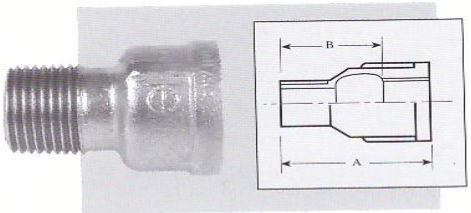


FIG.442
Sockets, Banded, Reducing, M&F (BRSX)

NOMINAL SIZE		A	B
mm	inch	mm	mm
10 x 8	3/8 x 1/4	35	25
15 x 8	1/2 x 1/4	43	30
15 x 10	1/2 x 3/8	43	30
20 x 10	3/4 x 3/8	48	33
20 x 15	3/4 x 1/2	48	33
25 x 15	1 x 1/2	55	38
25 x 20	1 x 3/4	55	38
32 x 20	1 1/4 x 3/4	60	41
32 x 25	1 1/4 x 1	60	41
40 x 25	1 1/2 x 1	63	44
40 x 32	1 1/2 x 1 1/4	63	44
50 x 32	2 x 1 1/4	70	46
50 x 40	2 x 1 1/2	70	46

NOMINAL SIZE		A	B
mm	inch	mm	mm
20 x 15	3/4 x 1/2	38	3
25 x 15	1 x 1/2	43	6
25 x 20	1 x 3/4	43	3
32 x 15	1¼ x 1/2	48	10.5
32 x 20	1¼ x 3/4	48	8
32 x 25	1¼ x 1	48	4
40 x 15	1½ x 1/2	52.5	13
40 x 20	1½ x 3/4	52.5	10
40 x 25	1½ x 1	52.5	7
40 x 32	1½ x 1¼	52.5	3
50 x 15	2 x 1/2	62.5	18.5
50 x 20	2 x 3/4	62.5	16
50 x 25	2 x 1	62.5	13
50 x 32	2 x 1¼	62.5	9
50 x 40	2 x 1½	62.5	6
65 x 25	2½ x 1	71.5	20
65 x 32	2½ x 1¼	71.5	16
65 x 40	2½ x 1½	71.5	14
65 x 50	2½ x 2	71.5	8
80 x 25	3 x 1	77	26.5
80 x 65	3 x 1½	77	19.5
80 x 50	3 x 2	77	14
80 x 65	3 x 2½	77	6.5
100 x 50	4 x 2	91	26.5
100 x 65	4 x 2½	91	19
100 x 80	4 x 3	91	12.5
125 x 100	5 x 4	105.5	13
150 x 80	6 x 3	116.5	38
150 x 100	6 x 4	116.5	25.5
150 x 125	6 x 5	116.5	13

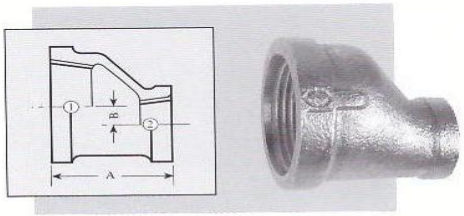


FIG.452
Sockets, Banded, Reducing, Eccentric (BRSE)

NOMINAL SIZE		A
mm	inch	mm
6	1/8	14
8	1/4	16
10	3/8	19
15	1/2	23
20	3/4	25
25	1	30
32	1¼	33
40	1½	34
50	2	37
65	2½	44
80	3	46
90	3½	49
100	4	53
125	5	59
150	6	65
200	8	80

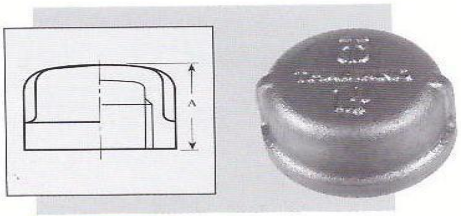


FIG.502
Caps, Banded (BCA)

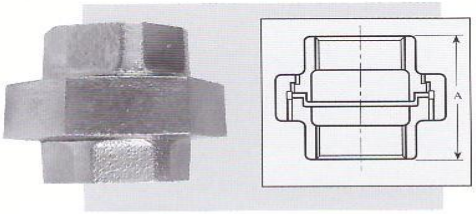


FIG.600
Union,Gasket Type, Flat Seat, [without gasket] (UN)

NOMINAL SIZE		A
inch	mm	mm
6	1/8	38
8	1/4	42
10	3/8	45
15	1/2	48
20	3/4	52
25	1	58
32	1 1/4	65
40	1 1/2	70
50	2	78
65	2 1/2	85
80	3	95
100	4	110
125	5	124
150	6	136

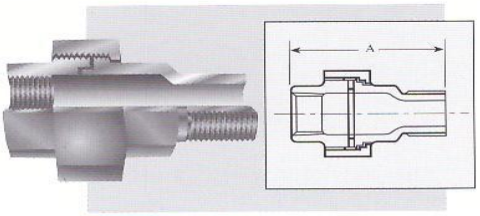


FIG.61O
Union,Gasket Type, Flat Seat, M&F, [without gasket] (UNX)

NOMINAL SIZE		A
inch	mm	mm
8	1/4	55
10	3/8	58
15	1/2	66
20	3/4	72
25	1	80
32	1 1/4	90
40	1 1/2	95
50	2	106
65	2 1/2	118
80	3	130

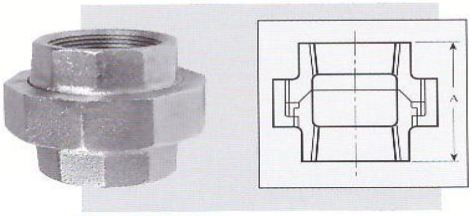


FIG.620
Union, Taper Seat,Iron to Iron (UNT)

NOMINAL SIZE		A
inch	mm	mm
6	1/8	38
8	1/4	42
10	3/8	45
15	1/2	48
20	3/4	52
25	1	58
32	1 1/4	65
40	1 1/2	70
50	2	78
65	2 1/2	85
80	3	95
100	4	110
125	5	124
150	6	136

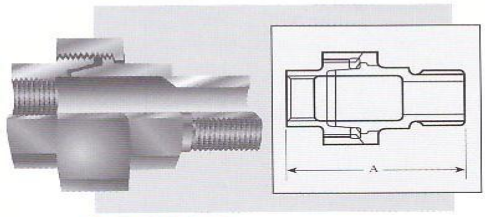


FIG.630
Unions, Taper Seat, Iron to Iron, M&F (UNTX)

NOMINAL SIZE		A
inch	mm	mm
8	1/4	55
10	3/8	58
15	1/2	66
20	3/4	72
25	1	80
32	1 1/4	90
40	1 1/2	95
50	2	106
65	2 1/2	118
80	3	130

NOMINAL S IZE		A(min.)	B (min.)	D (min.)
mm	inch	mm	mm	mm
6	1/8	32.0	23.6	7.6
8	1/4	36.6	28.0	8.1
10	3/8	41.0	32.0	9.1
15	1/2	43.7	37.0	11.0
20	3/4	49.5	43.5	12.7
25	1	52.5	52 6	14.7
32	1¼	57.5	63.5	17.0
40	1½	61.2	71.6	18.0
50	2	70.0	86.6	19.1
65	2½	82.0	104.6	23.5
80	3	89.0	120.7	25.0
100	4	98.0	152.5	27.5
125	5	124.0	188.0	33.0
150	6	136.0	219.0	37.0

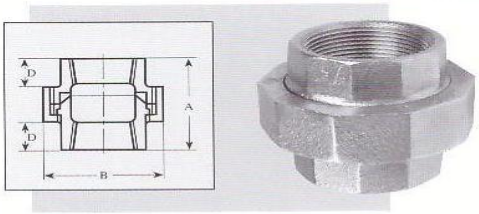


FIG.640
Unions, Conical Joint,Brass to Iron Seat (UNBR)

NOMINAL SIZE		A	C
mm	inch	mm	mm
10	3/8	52	25
15	1/2	58	28
20	3/4	62	33
25	1	72	38
32	1¼	82	45
40	1½	90	50
50	2	100	58

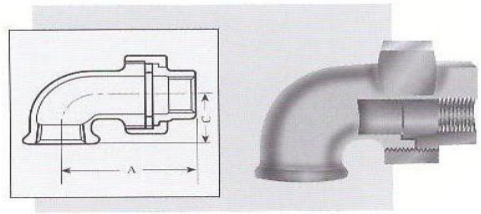


FIG.653
Union, Elbows, Flat Seat (UE)

NOMINAL SIZE		A	C
mm	inch	mm	mm
8	1/4	61	21
10	3/8	65	25
15	1/2	76	28
20	3/4	82	33
25	1	94	38
32	1¼	107	45
40	1½	115	50
50	2	128	58

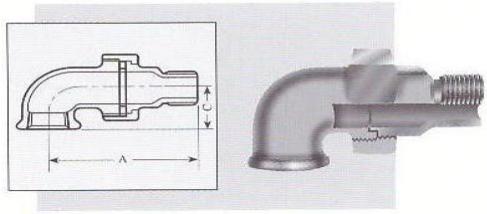


FIG.663
Union, Elbows, Flat Seat, M&F (UEX)

NOMINAL SIZE		A	C
mm	inch	mm	mm
8	1/4	48	21
10	3/8	52	25
15	1/2	58	28
20	3/4	62	33
25	1	72	38
32	1¼	82	45
40	1½	90	50
50	2	100	58

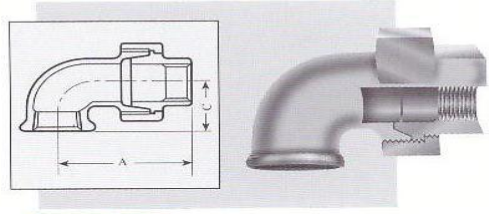


FIG.673
Union, Elbows, Taper Seat (UET)

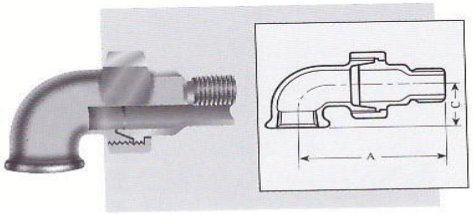


FIG.683
Union, Elbows, Taper Seat, M&F (UETX)

NOMINAL SIZE		A	C
mm	inch	mm	mm
8	1/4	61	21
10	3/8	65	25
15	1/2	76	28
20	3/4	82	33
25	1	94	38
32	1 1/4	107	45
40	1 1/2	115	50
50	2	128	58

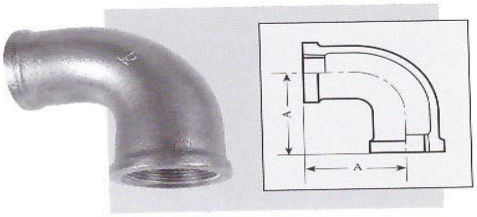


FIG.703
Short Bends, Banded (SB F/F)

NOMINAL SIZE		A
mm	inch	mm
8	1/4	30
10	3/8	36
15	1/2	45
20	3/4	50
25	1	63
32	1 1/4	76
40	1 1/2	85
50	2	102

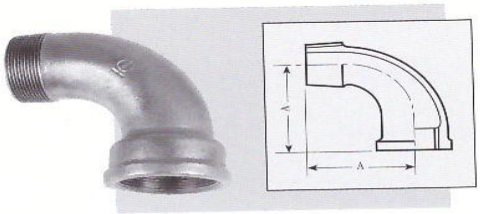


FIG.713
Short Bends, Banded, M&F (SB M/F)

NOMINAL SIZE		A
mm	inch	mm
8	1/4	30
10	3/8	36
15	1/2	45
20	3/4	50
25	1	63
32	1 1/4	76
40	1 1/2	85
50	2	102
65	2 1/2	114
80	3	127
100	4	165

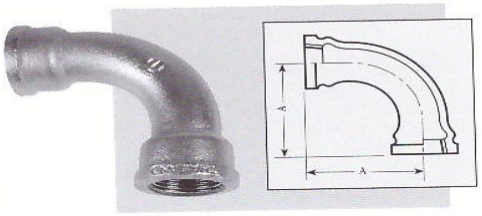


FIG.722
Long Sweep Bends, Banded (BE F/F)

NOMINAL SIZE		A
mm	inch	mm
8	1/4	40
10	3/8	48
15	1/2	55
20	3/4	69
25	1	85
32	1 1/4	105
40	1 1/2	116
50	2	140
65	2 1/2	176
80	3	205
100	4	260

NOMINAL SIZE		A
mm	inch	mm
8	1/4	26
10	3/8	30
15	1/2	36
20	3/4	43
25	1	51
32	1 1/4	64
40	1 1/2	68
50	2	81
65	2 1/2	99
80	3	113

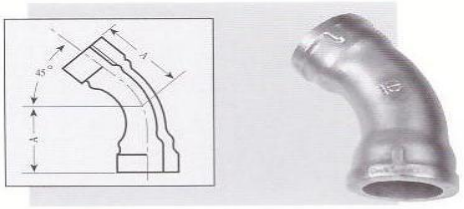


FIG.732
Long Sweep Bends,Banded, 45° (BE F/F 45°)

NOMINAL SIZE		A	B
mm	inch	mm	mm
6	1/8	35	32
8	1/4	40	36
10	3/8	48	42
15	1/2	55	48
20	3/4	69	60
25	1	85	75
32	1 1/4	105	95
40	1 1/2	116	105
50	2	140	130
65	2 1/2	176	165
80	3	205	190
100	4	260	245
125	5	318	318
150	6	375	375

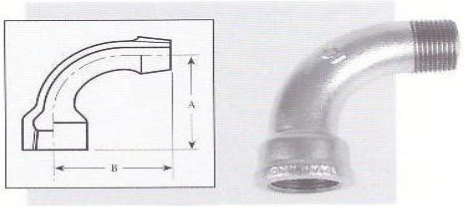


FIG.742
Long Sweep Bends, Banded, M&F (BE M/F)

NOMINAL SIZE		A	B
mm	inch	mm	mm
8	1/4	26	21
10	3/8	30	24
15	1/2	36	30
20	3/4	43	36
25	1	51	42
32	1 1/4	64	54
40	1 1/2	68	58
50	2	81	70
65	2 1/2	99	86
80	3	113	100

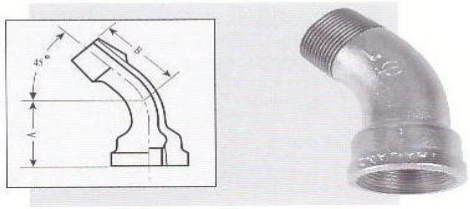


FIG.752
Long Sweep Bends, Banded, 45°, M&F (BE M/F 45°)

NOMINAL SIZE		A
mm	inch	mm
6	1/8	32
8	1/4	36
10	3/8	42
15	1/2	48
20	3/4	60
25	1	75
32	1 1/4	95
40	1 1/2	105
50	2	130
65	2 1/2	165
80	3	190
100	4	245

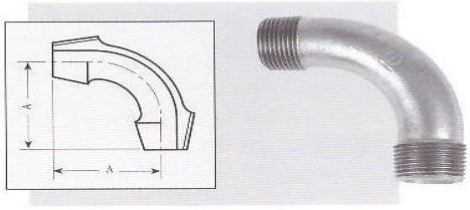


FIG.760
Long Sweep Bends,Male (BE M/M)

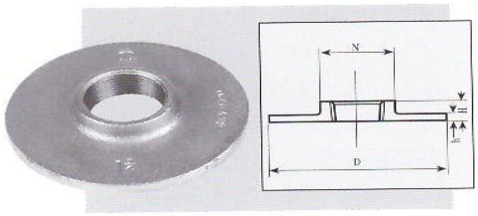


FIG.900

Round Flanges, without Bolt Holes (RF)

NOMINAL SIZE		D	N	H	h
mm	inch	mm	mm	mm	mm
15	1/2	95	27	12	5
20	3/4	102	32	14	5
25	1	114	41	16	5
32	1 1/4	120	50	18	6.5
40	1 1/2	133	56	19	6.5
50	2	152	69	21	8
65	2 1/2	165	86	24	8
80	3	184	99	26	9.5
100	4	216	127	30	9.5
125	5	254	154	32	13
150	6	280	182	35	13

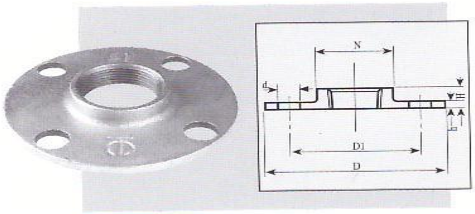


FIG.901

Round Flanges, with Bolt Holes to tableD (BS 10) (RFH BS 10)

NOMINAL SIZE		D	D1	N	BOLT HOLE		H	h
mm	inch	mm	mm	mm	d mm	No.	mm	mm
15	1/2	95	67	27	13	4	12	5
20	3/4	102	73	32	13	4	14	5
25	1	114	83	41	13	4	16	5
32	1 1/4	120	87	50	13	4	18	6.5
40	1 1/2	133	98	56	13	4	19	6.5
50	2	152	114	69	16	4	21	8
65	2 1/2	165	127	86	16	4	24	8
80	3	184	146	99	16	4	26	9.5
100	4	216	178	127	16	4	30	9.5
125	5	254	210	154	16	4	32	13
150	6	280	235	182	16	4	35	13

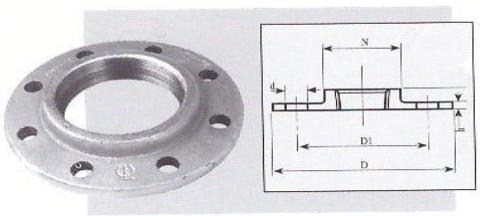


FIG.902

Round Flanges, with Bolt Holes to PN16 (BS 4504) (RFH PN16)

NOMINAL SIZE		D	D1	N	BOLT HOLE		h
mm	inch	mm	mm	mm	d mm	No.	mm
15	1/2	95	65	27	14	4	5
20	3/4	102	75	32	14	4	5
25	1	114	85	41	14	4	5
32	1 1/4	120	100	50	19	4	6.5
40	1 1/2	133	110	56	19	4	6.5
50	2	152	125	69	19	4	8
65	2 1/2	165	145	86	19	4	8
80	3	184	160	99	19	8	9.5
100	4	216	180	127	19	8	9.5
125	5	254	210	154	19	8	13
150	6	280	240	182	23	8	13

NOMINAL SIZE		D	D1	D2	BOLT HOLE		N	h	s
					d	No.			
mm	inch	mm	mm	mm	mm		mm	mm	mm
10	3/8	90	60	41	14	4	28	4	2
15	1/2	95	65	46	14	4	32	4	2
20	3/4	105	75	56	14	4	40	4	2
25	1	115	85	65	14	4	49	5	3
32	1 1/4	140	100	76	19	4	60	5	3
40	1 1/2	150	110	84	19	4	68	6	3
50	2	165	125	99	19	4	80	8	3
65	2 1/2	185	145	118	19	4	95	10	3
80	3	200	160	132	19	8	114	10	3
100	4	220	180	156	19	8	136	13	3
125	5	250	210	184	19	8	165	16	3
150	6	285	240	211	23	8	190	18	3
200	8	340	295	266	23	12	246	18	3

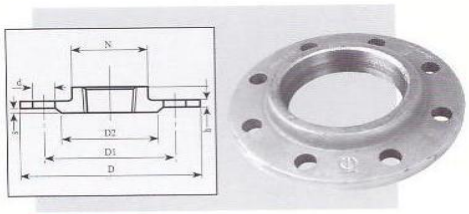


FIG.903
Circular Flanges, with Bolt Holes to PN16 (BS4504) (CF PN16)

NOMINAL SIZE		D	D1	D2	BOLT HOLE		N	h	s
					d	No.			
mm	inch	mm	mm	mm	mm		mm	mm	mm
10	3/8	90	60	41	14	4	28	10	2
15	1/2	95	65	46	14	4	32	10	2
20	3/4	105	75	56	14	4	40	12	2
25	1	115	85	65	14	4	50	12	3
32	1 1/4	140	100	76	19	4	60	12	3
40	1 1/2	150	110	84	19	4	70	12	3
50	2	165	125	99	19	4	84	14	3
65	2 1/2	185	145	118	19	8	104	16	3
80	3	200	160	132	19	8	120	18	3
100	4	235	190	156	23	8	142	18	3
125	5	270	220	184	28	8	162	20	3
150	6	300	250	211	28	8	192	22	3
200	8	360	310	274	28	12	252	24	3

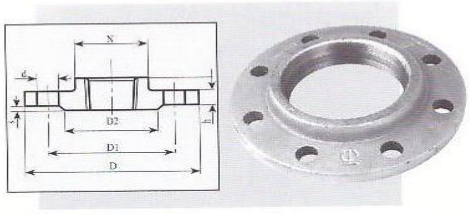


FIG.904
Circular Flanges, with Bolt Holes to PN25 (BS4504) (CF PN25)

NOMINAL SIZE		D	D1	D2	BOLT HOLE		N	h	s
					d	No.			
mm	inch	mm	mm	mm	mm		mm	mm	mm
10	3/8	90	60	41	14	4	28	10	2
15	1/2	95	65	46	14	4	32	10	2
20	3/4	105	75	56	14	4	40	12	2
25	1	115	85	65	14	4	50	12	3
32	1 1/4	140	100	76	19	4	60	12	3
40	1 1/2	150	110	84	19	4	70	12	3
50	2	165	125	99	19	4	84	14	3
65	2 1/2	185	145	118	19	8	104	16	3
80	3	200	160	132	19	8	120	18	3
100	4	235	190	156	23	8	142	18	3
125	5	270	220	184	28	8	162	20	3
150	6	300	250	211	28	8	192	22	3
200	8	375	320	284	31	12	254	28	3

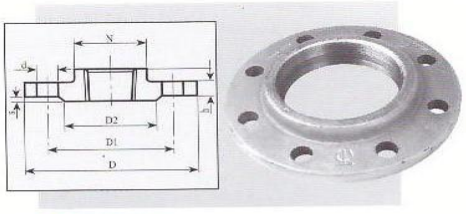


FIG.905
Circular Flanges, with Bolt Holes to PN40 (BS4504) (CF PN40)

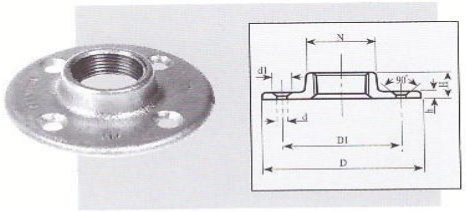


FIG.906
Floor Flanges (FF)

NOMINAL SIZE		D	D1	N	d1	d	No. of Holes	H	h
mm	inch	mm	mm	mm	mm	mm		mm	mm
8	1/4	72	51	23	12	6.4	4	12	5
10	3/8	72	51	25	12	6.4	4	13	5
15	1/2	75	51	27	12	6.4	4	15	5
20	3/4	85	63	34	12	6.4	4	15	5
25	1	93	69	41	13	7.5	4	19	5
32	1¼	101	77	50	15	7.5	4	22	6
40	1½	111	87	56	15	8	4	22	6
50	2	144	109	70	19	8	4	22	8

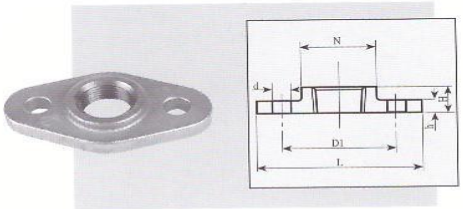


FIG.907
Oval Flanges (OF)

NOMINAL SIZE		L	D1	N	d	h	H
mm	inch	mm	mm	mm	mm	mm	mm
15	1/2	80	52	30	10	9	14
20	3/4	96	66	38	10	10	16
25	1	105	75	45	12	11	18
32	1¼	120	87	55	12	11	20
40	1½	133	95	62	12.5	12	21
50	2	150	112	75	16.5	13	28

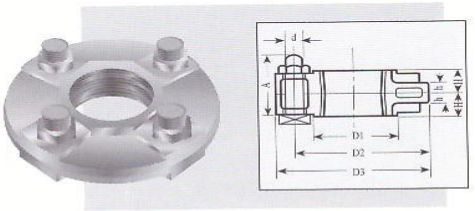


FIG.909
Gasket Type Flanges Unions, with Bolts (FU)

NOMINAL SIZE		D1	D2	D3	H	h	FOR BOLTS		
mm	inch	mm	mm	mm	mm	mm	A mm	d mm	No of Holes
15	1/2	27	48	73	13	6	42	10	3
20	3/4	33	54	79	15	6	42	10	3
25	1	41	62	87	17	8	42	10	4
32	1¼	50	76	107	19	9	58	12	4
40	1½	56	82	112	20	10	58	12	4
50	2	69	95	126	24	11	68	12	4
65	2½	86	118	155	27	12	77	16	4
80	3	99	131	168	30	13	77	16	4
90	3½	113	145	182	32	14	77	16	4
100	4	127	159	196	36	16	93	16	4
125	5	154	186	223	40	19	93	16	6
150	6	182	220	265	40	21	100	20	6

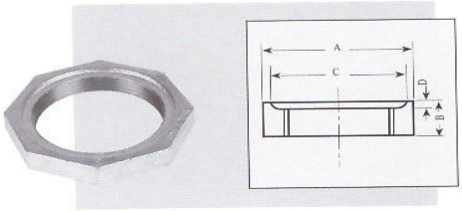


FIG.910
Locknuts (LN)

NOMINAL SIZE		A	B	C	D
mm	inch	mm	min	mm	mm
6	1/8	18.0	5.0	13.0	1.1
8	1/4	21.4	6.5	17.0	1.6
10	3/8	25.4	7.2	20.0	1.6
15	1/2	30.0	8.0	25.0	1.6
20	3/4	36.4	9.0	31.3	1.6
25	1	44.5	10.0	38.2	1.6
32	1¼	53.4	11.0	47.3	1.6
40	1½	60.0	12.0	54.0	1.6
50	2	73.2	13.5	67.0	2.3
65	2½	89.0	15.0	81.0	2.3
80	3	108.5	17.1	98.0	2.3
90	3½	123.0	18.6	111.3	3.3
100	4	137.0	20.4	127.0	3.3
125	5	157.0	25.0	147.0	3.3
150	6	192.0	30.0	182.0	3.3

NOMINAL SIZE		A	B	C
mm	inch	mm	mm	mm
8 x 6	1/4 x 1/8	11.2	16.3	20
10 x 6	3/8 x 1/8	12.2	17.3	20
10 x 8	3/8 x 1/4	12.2	17.3	20
15 x 6	1/2 x 1/8	14.4	22.1	24
15 x 8	1/2 x 1/4	14.4	22.1	24
15 x 10	1/2 x 3/8	14.4	22.1	24
20 x 6	3/4 x 1/8	16.0	29.3	26
20 x 8	3/4 x 1/4	16.0	29.3	26
20 x 10	3/4 x 3/8	16.0	29.3	26
20 x 15	3/4 x 1/2	16.0	29.3	26
25 x 6	1 x 1/8	19.1	-	29
25 x 8	1 x 1/4	19.1	-	29
25 x 10	1 x 3/8	19.1	-	29
25 x 15	1 x 1/2	19.1	36.1	29
25 x 20	1 x 3/4	19.1	36.1	29
32 x 8	1 1/4 x 1/4	20.4	-	31
32 x 10	1 1/4 x 3/8	20.4	-	31
32 x 15	1 1/4 x 1/2	20.4	-	31
32 x 20	1 1/4 x 3/4	20.4	45.0	31
32 x 25	1 1/4 x 1	20.4	45.0	31
40 x 8	1 1/2 x 1/4	21.1	-	31
40 x 10	1 1/2 x 3/8	21.1	-	31
40 x 15	1 1/2 x 1/2	21.1	-	31
40 x 20	1 1/2 x 3/4	21.1	-	31
40 x 25	1 1/2 x 1	21.1	51.0	31
40 x 32	1 1/2 x 1 1/4	21.1	51.0	31
50 x 8	2 x 1/4	22.4	-	35
50 x 10	2 x 3/8	22.4	-	35
50 x 15	2 x 1/2	22.4	-	35
50 x 20	2 x 3/4	22.4	-	35
50 x 25	2 x 1	22.4	-	35
50 x 32	2 x 1 1/4	22.4	63.0	35
50 x 40	2 x 1 1/2	22.4	63.0	35
65 x 15	2 1/2 x 1/2	27.2	-	40
65 x 20	2 1/2 x 3/4	27.2	-	40
65 x 25	2 1/2 x 1	27.2	-	40
65 x 32	2 1/2 x 1 1/4	27.2	-	40
65 x 40	2 1/2 x 1 1/2	27.2	68.1	40
65 x 50	2 1/2 x 2	27.2	76.0	40
80 x 15	3 x 1/2	29.0	-	44
80 x 20	3 x 3/4	29.0	-	44
80 x 25	3 x 1	29.0	-	44
80 x 32	3 x 1 1/4	29.0	-	44
80 x 40	3 x 1 1/2	29.0	-	44
80 x 50	3 x 2	29.0	83.4	44
80 x 65	3 x 2 1/2	29.0	98.1	44
90 x 25	3 1/2 x 1	30.0	-	47
90 x 32	3 1/2 x 1 1/4	30.0	-	47
90 x 40	3 1/2 x 1 1/2	30.0	-	47
90 x 50	3 1/2 x 2	30.0	-	47
90 x 65	3 1/2 x 2 1/2	30.0	98.1	47
90 x 80	3 1/2 x 3	30.0	117.4	47

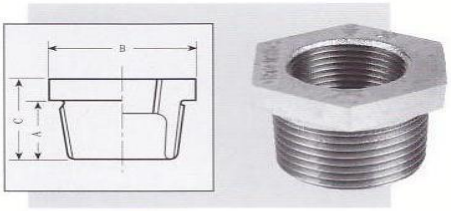


FIG.920
Bushings (BU)

NOMINAL SIZE		A	B	C
mm	inch	mm	mm	mm
100 x 15	4 x 1/2	31.0	-	51
100 x 20	4 x 3/4	31.0	120.0	51
100 x 25	4 x 1	31.0	-	51
100 x 32	4 x 1 1/4	31.0	-	51
100 x 40	4 x 1 1/2	31.0	-	51
100 x 50	4 x 2	31.0	-	51
100 x 65	4 x 2 1/2	31.0	-	51
100 x 80	4 x 3	31.0	117.4	51
100 x 90	4 x 3 1/2	31.0	132.1	51
125 x 50	5 x 2	33.3	-	-
125 x 65	5 x 2 1/2	33.3	-	-
125 x 80	5 x 3	33.3	-	-
125 x 90	5 x 3 1/2	33.3	132.1	-
125 x100	5 x 4	33.3	147.1	-
150 x 50	6 x 2	36.3	170.0	-
150 x 65	6 x 2 1/2	36.0	170.0	-
150 x 80	6 x 3	36.0	-	-
150 x 90	6 x 3 1/2	36.0	-	-
150 x100	6 x 4	36.0	-	-
150 x125	6 x 5	36.0	179.1	-
200 x 80	8 x 3	40.0	-	-
200 x 90	8 x 3 1/2	40.0	-	-
200 x100	8 x 4	40.0	-	-
200 x125	8 x 5	40.0	-	-
200 x150	8 x 6	40.0	210.3	-

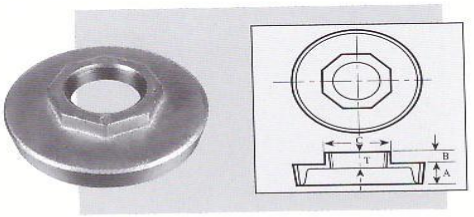


FIG.921
Inside Head Bushings (IBU)

NOMINAL SIZE		A	B	C	T
mm	inch	mm	mm	mm	mm
25 x 10	1 x 3/8	19.1	7.7	28.5	9.2
25 x. 8	1 x 1/4	19.1	7.7	28.5	8.2
25 x 6	1 x 1/8	19.1	7.7	28.5	6.4
32 x 15	1¼ x 1/2	20.4	8.7	34.1	11.0
32 x 10	1¼ x 3/8	20.4	8.7	28.5	9.2
32 x 8	1¼ x 1/4	20.4	8.7	28.5	8.2
40 x 20	1¼ x 3/4	20.4	8.7	41.4	12.7
40 x 15	1½ x 1/2	21.1	9.4	34.1	11.0
40 x 10	1½ x 3/8	21.1	9.4	28.5	9.2
40 x 8	1½ x 1/4	21.1	9.4	28.5	8.2
50 x 25	2 x 1	22.4	10.5	49.6	14.8
50 x 20	2 x 3/4	22.4	10.5	41.5	12.7
50 x 15	2 x 1/2	22.4	10.5	34.1	11.0
50 x 10	2 x 3/8	22.4	10.5	28.5	9.2
50 x 8	2 x 1/4	22.4	10.5	28.5	8.2
65 x 32	2½ x 1¼	27.2	11.2	60.8	17.1
65 x 25	2½ x 1	27.2	11.2	49.6	14.8
65 x 20	2½ x 3/4	27.2	11.2	41.5	12.7
65 x 15	2½ x 1/2	27.2	11.2	34.1	11.0
80 x 40	3 x 1½	29.0	12.2	68.1	17.8
80 x 32	3 x 1¼	29.0	12.2	60.8	17.1
80 x 25	3 x 1	29.0	12.2	49.6	14.8
80 x 20	3 x 3/4	29.0	12.2	41.5	12.7
80 x 15	3 x 1/2	29.0	12.2	34.1	11.0
90 x 50	3½ x 2	30.0	13.2	83.4	19.1
90 x 40	3½ x 1½	30.0	13.2	68.1	17.8
90 x 32	3½ x 1¼	30.0	13.2	60.8	17.1
90 x 25	3½ x 1	30.0	13.2	49.6	14.8
100 x 65	4 x 2½	31.0	15.3	98.1	23.4
100 x 50	4 x 2	31.0	15.3	83.4	19.1
100 x 40	4 x 1½	31.0	15.3	68.1	17.8
100 x 32	4 x 1¼	31.0	15.3	60.8	17.1
100 x 25	4 x 1	31.0	15.3	49.6	14.8
125 x 80	5 x 3	33.3	15.3	117.4	24.9
125 x 65	5 x 2½	33.3	15.3	98.1	23.4
125 x 50	5 x 2	33.3	15.3	83.4	19.1
150 x 100	6 x 4	36.0	19.1	147.1	27.5
150 x 90	6 x 3½	36.0	19.1	132.1	26.2
150 x 80	6 x 3	36.0	19.1	117.4	24.9
150 x 65	6 x 2½	36.0	19.1	98.1	23.4
150 x 50	6 x 2	36.0	19.1	83.4	19.1
200 x 125	8 x 5	40.0	21.1	179.1	30.0
200 x 100	8 x 4	40.0	21.1	147.1	27.5
200 x 90	8 x 3½	40.0	21.1	132.1	26.2
200 x 80	8 x 3	40.0	21.1	117.4	24.9

NOMINAL SIZE		A (min)		B
		TM-ANSI	TM-BSI	
mm	inch	mm	mm	mm
6	1/8	6.1	7	7.1
8	1/4	7.1	8	9.5
10	3/8	7.9	9	11.1
15	1/2	9.7	10	14.3
20	3/4	11.2	11	15.9
25	1	12.7	12	20.6
32	1¼	14.2	13	23.8
40	1½	15.8	14	28.6
50	2	17.3	15	33.3
65	2½	18.8	18	38.1
80	3	20.4	19	42.9
90	3½	21.9	21	47.6
100	4	25.4	22	59
125	5	25.4	25	68
150	6	31.8	28	78
200	8	35.1	-	-

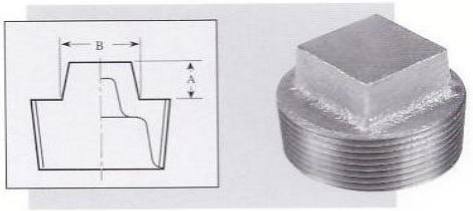


FIG.930
Plugs (P)

NOMINAL SIZE		A (min)		B
		TM-ANSI	TM-BSI	
mm	inch	mm	mm	mm
6	1/8	6.1	7	7.1
8	1/4	7.1	8	9.5
10	3/8	7.2	9	11.1
15	1/2	9.7	10	14.3
20	3/4	11.2	11	15.9
25	1	12.7	12	20.6
32	1¼	14.2	13	23.8
40	1½	15.8	14	28.6
50	2	17.3	15	33.3
65	2½	18.8	18	38.1
80	3	20.4	19	42.9
90	3½	21.9	21	47.6

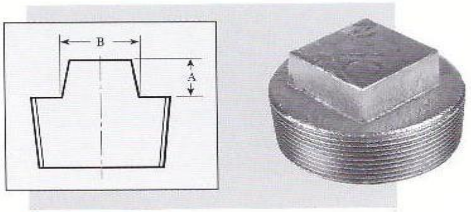


FIG.931
Solid Plugs(SP)

NOMINAL SIZE		A	D	E	G
mm	inch	mm	mm	mm	mm
100	4	31.0	25.4	22.4	9.4
125	5	33.3	25.4	22.4	11.7
150	6	35.6	31.8	31.8	13.2
200	8	39.9	35.1	38.1	16.8

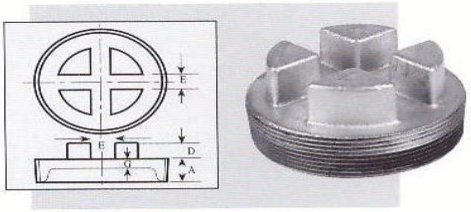


FIG.933
Slotted Head Plugs (SHP)

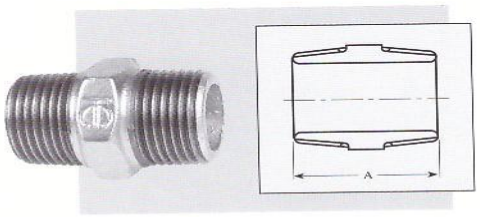


FIG.940
Hexagon Nipples, Equal (NI)

NOMINAL SIZE		A
inch	mm	mm
6	1/8	29
8	1/4	36
10	3/8	38
15	1/2	44
20	3/4	47
25	1	53
32	1 1/4	57
40	1 1/2	59
50	2	68
65	2 1/2	75
80	3	83
100	4	95
125	5	104
150	6	116

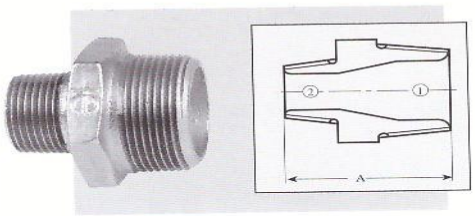


FIG.941
Hexagon Nipples,Reducing (RNI)

NOMINAL SIZE		A
mm	inch	mm
8 x 6	1/4 x 1/8	36
10 x 8	3/8 x 1/4	38
15 x 8	1/2 x 1/4	44
15 x 10	1/2 x 3/8	44
20 x 10	3/4 x 3/8	47
20 x 15	3/4 x 1/2	47
25 x 15	1 x 1/2	53
25 x 20	1 x 3/4	53
32 x 15	1 1/4 x 1/2	57
32 x 20	1 1/4 x 3/4	57
32 x 25	1 1/4 x 1	57
40 x 15	1 1/2 x 1/2	59
40 x 20	1 1/2 x 3/4	59
40 x 25	1 1/2 x 1	59
40 x 32	1 1/2 x 1 1/4	59
50 x 20	2 x 3/4	68
50 x 25	2 x 1	68
50 x 32	2 x 1 1/4	68
50 x 40	2 x 1 1/2	68
65 x 40	2 1/2 x 1 1/2	75
65 x 50	2 1/2 x 2	75
80 x 50	3 x 2	83
80 x 65	3 x 2 1/2	83
100 x 50	4 x 2	95
100 x 65	4 x 2 1/2	95
100 x 80	4 x 3	95

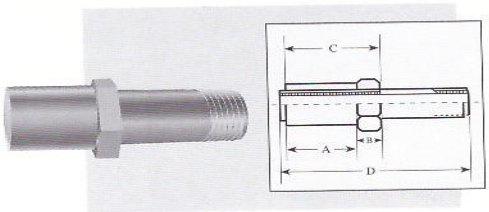
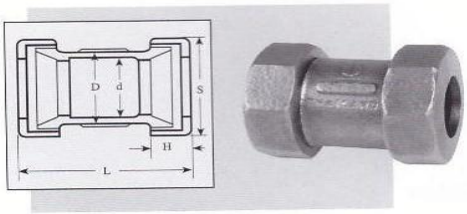


FIG.942
Long Screw Sets (LS)

NOMINAL SIZE		A	B	C	D
mm	inch	mm	mm	mm	mm
15	1/2	35	8	52	100
20	3/4	37	9	54	100
25	1	43	9.5	62	100
32	1 1/4	48	11	70	150
40	1 1/2	48	12	71	150
50	2	57	13	82	150
65	2 1/2	65	17	97	150
80	3	71	21	106	200
100	4	84	22	121	200

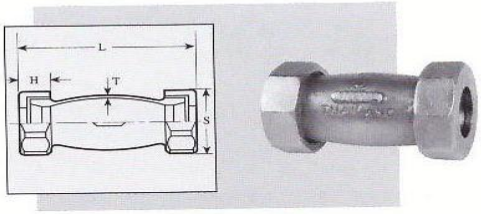
NOMINAL SIZE		BODY		NUTS			END TO END DIMENSION
		OUTSIDE	INSIDE	LENGTH ACROSS FLATS		WIDTH	
mm	inch	D	d	Oct.	Dec.	H	L
		mm	mm	mm	mm	mm	mm
15	1/2	34	22	42	-	15	67
20	3/4	41	28	49	-	16	72
25	1	48	35	57	-	17	79
32	1 1/4	56	43	-	67	18	85
40	1 1/2	64	49	-	73	18	90
50	2	76	61	-	86	19	99



APPENDIX A-1

Compression Couplings, Regular Type (CCR)

NOMINAL SIZE		T	NUTS			END TO END DIMENSION
			LENGTH ACROSS FLATS		WIDTH	
			Oct.	Dec.	H	L
mm	inch	mm	mm	mm	mm	mm
15	1/2	3	42	-	-	87
20	3/4	3	49	-	-	98
25	1	4	57	-	17	109
32	1 1/4	4	-	67	18	118
40	1 1/2	4.5	-	73	18	128
50	2	4.5	-	86	19	141



APPENDIX A-2

Compression Couplings, Long Type (CCL)

Regular and Long Type Compression Couplings:

Technical Specifications

***Application Conditions :**

1. Fluid : air,gas,oil and water.
2. Temperature : -10 °C to +60 °C.
3. Pressure : up to 10 kg/cm².

***Applicable Diameter of Pipes :**

NOMINAL SIZE		OUTSIDE DIAMETER OF PIPES		
			ALLOWANCE	
mm	inch	NOMINAL	mm	inch
15	1/2	1/2	21.2 - 22.2	0.83 - 0.87
20	3/4	3/4	26.7 - 27.7	1.05 - 1.09
25	1	1	33.5 - 34.5	1.32 - 1.36
32	1 1/4	1 1/4	42.2 - 43.2	1.66 - 1.70
40	1 1/2	1 1/2	48.1 - 49.1	1.89 - 1.93
50	2	2	60.0 - 61.0	2.36 - 2.40

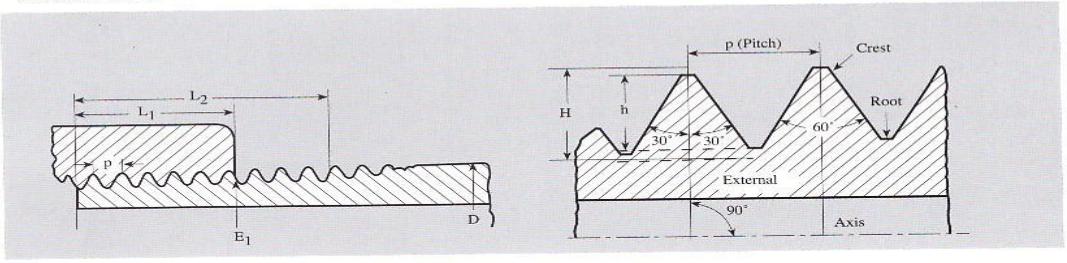
***Materials :**

- Body and Nut : Hot dipped galvanized malleable iron.
- Collar : Carbon steel or stainless steel.
- Packing : Rubber or EPDM.

APPENDIX B.

American Standard Pipe Threads

(Extracted from ANSI/ASME B1.20.1-1983)



The taper of thread is 1 in 16 or 0.75 in. per ft. measured on the diameter and along the axis. The crest and root of pipe threads are truncated a minimum of 0.033 p.

Taper Threads $H = 0.866025\ p$

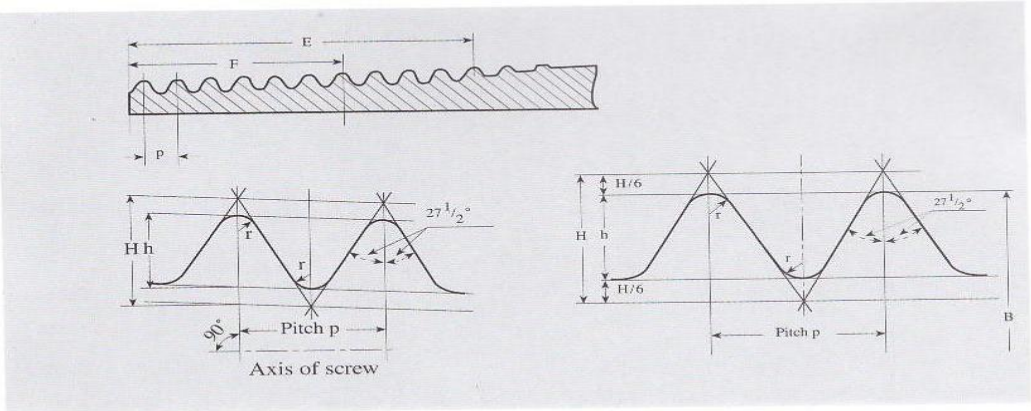
$h = 0.800000\ p$

(Unit : Inch)

Nominal Pipe Size (inch)	Outside Diameter of Pipe	Threads Per Inch	Pitch of Threads	Hand-tight Engagement		Effective Thread Length External	Depth of Thread
	D	n	P	L1	E1	L2	h
1/8	0.405	27	0.03704	0.1615	0.37360	0.2639	0.02963
1/4	0.540	18	0.05556	0.2278	0.49163	0.4018	0.04444
3/8	0.675	18	0.05556	0.240	0.62701	0.4078	0.04444
1/2	0.840	14	0.07143	0.320	0.77843	0.5337	0.05714
3/4	1.050	14	0.07143	0.339	0.98887	0.5457	0.05714
1	1.315	11½	0.08696	0.400	1.23863	0.6828	0.06957
1¼	1.660	11½	0.08696	0.420	1.58338	0.7068	0.06957
1½	1.900	11½	0.08696	0.420	1.82234	0.7235	0.06957
2	2.375	11½	0.08696	0.436	2.29627	0.7565	0.06957
2½	2.875	8	0.12500	0.682	2.76216	1.1375	0.10000
3	3.500	8	0.12500	0.766	3.38850	1.2000	0.10000
3½	4.000	8	0.12500	0.821	3.88881	1.2500	0.10000
4	4.500	8	0.12500	0.844	4.38712	1.3000	0.10000
5	5.563	8	0.12500	0.937	5.44929	1.4063	0.10000
6	6.625	8	0.12500	0.958	6.50597	1.5125	0.10000

APPENDIX C.

British Standard Pipe Threads
(Extracted from BS 21 : 1985)



H = 0.960237 p
h = 0.640327 p
r = 0.137278 p
Taper Threads

Taper Threads Taper 1 in 16 on dia.
(Shown exaggerated in diagram)
H = 0.960491 p
h = 0.640327 p
r = 0.137329 p
Parallel Threads

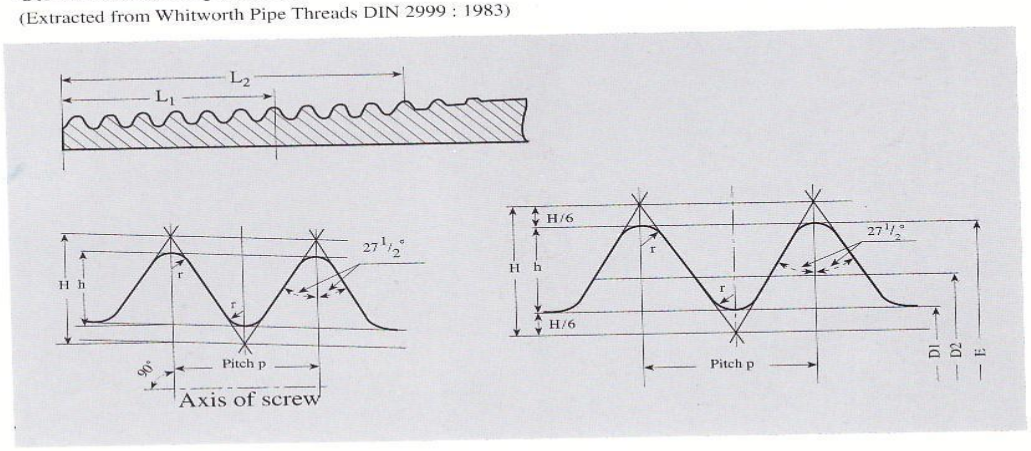
(Unit : Inch)

Nominal Bore of Pipe (inch)	Approximate Outside Diameter of Black Pipe	Number of Thread Per Inch	Pitch	Depth of Thread	Diameter Gauge Plane (gauge diameter)	Distance of Gauge Diameter from End (gauge length)	Length of Useful Thread
			P	h	B	F	E
1/8	0.400	28	0.03571	0.0229	0.383	0.1563	0.2545
1/4	0.538	19	0.05263	0.0337	0.518	0.2367	0.3814
3/8	0.676	19	0.05263	0.0337	0.656	0.2500	0.3947
1/2	0.847	14	0.07143	0.0457	0.825	0.3214	0.5178
3/4	1.063	14	0.07143	0.0457	1.041	0.3750	0.5714
1	1.336	11	0.09091	0.0582	1.309	0.4091	0.6591
1¼	1.677	11	0.09091	0.0582	1.650	0.5000	0.7500
1½	1.909	11	0.09091	0.0582	1.882	0.5000	0.7500
2	2.381	11	0.09091	0.0582	2.347	0.6250	0.9204
2½	2.996	11	0.09091	0.0582	2.960	0.6875	1.0511
3	3.499	11	0.09091	0.0582	3.460	0.8125	1.1761
3½	3.991	11	0.09091	0.0582	3.950	0.8750	1.2386
4	4.494	11	0.09091	0.0582	4.450	1.0000	1.4091
5	5.498	11	0.09091	0.0582	5.450	1.1250	1.5795
6	6.501	11	0.09091	0.0582	6.450	1.1250	1.5795

APPENDIX D.

German Standard Pipe Threads

(Extracted from Whitworth Pipe Threads DIN 2999 : 1983)



H = 0.960237 p
h = 0.640327 p
t = 0.137278 p
Taper 1 : 16
Taper Threads

H = 0.960491 p
h = 0.640327 p
t = 0.137329 p
Parallel Threads

(Unit : mm.)

Size of Thread	Nominal Width of the Tubes		Distance of the Measuring Plane	Thread Measures							Effective Length of Thread
				Outside Diameter	Flange Diameter	Core Diameter	Pitch	No.of Thread Per 1 in	Depth of Thread	Radius	
(inch)	(inch)	(mm)	L1	E	D2	D1	p	z	h	r	L2
R1/8	1/8	6	4.0	9.728	9.147	8.566	0.907	28	0.581	0.125	6.5
R1/4	1/4	8	6.0	13.157	12.301	11.445	1.337	19	0.856	0.184	9.7
R3/8	3/8	10	6.4	16.662	15.806	14.950	1.337	19	0.856	0.184	10.1
R1/2	1/2	15	8.2	20.955	19.793	18.631	1.814	14	1.162	0.249	13.2
R3/4	3/4	20	9.5	26.411	25.279	24.117	1.814	14	1.162	0.249	14.5
R1	1	25	10.4	33.249	31.770	30.291	2.309	11	1.479	0.317	16.8
R1 1/4	1 1/4	32	12.7	41.910	40.431	38.952	2.309	11	1.479	0.317	19.1
R1 1/2	1 1/2	40	12.7	47.803	46.324	44.845	2.309	11	1.479	0.317	19.1
R2	2	50	15.9	59.614	58.135	56.656	2.309	11	1.479	0.317	23.4
R2 1/2	2 1/2	65	17.5	75.184	73.705	72.226	2.309	11	1.479	0.317	26.7
R3	3	80	20.6	87.884	86.405	84.926	2.309	11	1.479	0.317	29.8
R3 1/2	3 1/2	90	22.2	100.330	98.851	97.372	2.309	11	1.479	0.317	31.4
R4	4	100	25.4	113.030	111.551	110.072	2.309	11	1.479	0.317	35.8
R5	5	125	28.6	138.430	136.951	135.472	2.309	11	1.479	0.317	40.1
R6	6	150	28.6	163.830	162.351	160.872	2.309	11	1.479	0.317	40.1