UDC 621·65-871 : 628·122

Indian Standard

SPECIFICATION FOR DEEP WELL HAND PUMPS

(First Revision)

1. Scope — Specifies the technical requirements for hand pumps for lifting water from wells from depths of 20 metres or more. These pumps shall be used for bores fitted with casing pipes of nominal diameters from 100 to 150 mm.

Note — These pumps should normally be used up to a depth of 50 m. Since below this depth the efforts put in may not give adequate results in terms of discharge of water.

2. Units — Refer IS : 5120 - 1977 'Technical requirements for rotodynamic special purpose pumps (*first revision*)'.

3. Nomenclature — As shown in Fig. 1. A brief description of some of the pump components is given below:

a) *Head Assembly* — The mechanism which is above the ground level and which operates the plunger.

b) *Cylinder Assembly* — This contains plunger, valves, etc, which lifts the water upward in each stroke.

c) *Connecting Rod* — This provides linkage between pump head and cylinder.

d) *Rising Pipe* — This carries water from cylinder to the water chamber.

4. Dimensions and Construction — *See* Fig. 2.

4.1 *Head Assembly* — *See* Fig. 3.

4.1.1 *Head assembly parts* — *See* Fig. 4.

4.2 *Handle Assembly* — *See* Fig. 5.

4.2.1 *Handle assembly parts* — *See* Fig. 6.

4.3 *Water Tank Assembly* — *See* Fig. 7.

4.3.1 *Water tank assembly parts* — *See* Fig. 8.

4.4 *Stand Assembly* — *See* Fig. 9.

4.4.1 *Stand assembly parts* — *See* Fig. 10.

4.5 *Connecting Rod* — *See* Fig. 11.

4.6 *Cylinder Assembly* — *See* Fig. 12.

4.6.1 *Cylinder assembly parts* — *See* Fig. 13.

5. General Requirements

5.1 The material, tolerances, etc, shall be as given in respective figures.

5.2 The bolts and nuts used for hand pump assembly shall conform to IS : 1367 - 1967 'Technical supply condition for threaded fasteners (*first revision*)'.

5.3 The washers shall conform to Type A of IS : 2016 - 1967 'Specification for plain washers (*first revision*)' or IS : 5370 - 1969 'Specification for plain washers with outside diameter ≈ 3 × inside diameter'.

5.4 The riser pipe holder welded in the storage tank shall be either forged or turned.

5.5 The riser pipe shall be of 32 mm nominal bore of medium grade conforming to IS : 1239 (Part I) - 1979 'Specification for mild steel tubes, tubulars and other wrought steel fittings : Part I Mild steel tubes (*fourth revision*)'. Each riser pipe shall be 3 m in length with a tolerance of $^{+0}_{-25}$ mm.

Pumps Sectional Committee, EDC 35; Hand Pumps Subcommittee, EDC 35 : 6 [Ref : Doc : EDC 35 (3697)]

Adopted 26 May 1982	© September 1982, ISI	Gr 9

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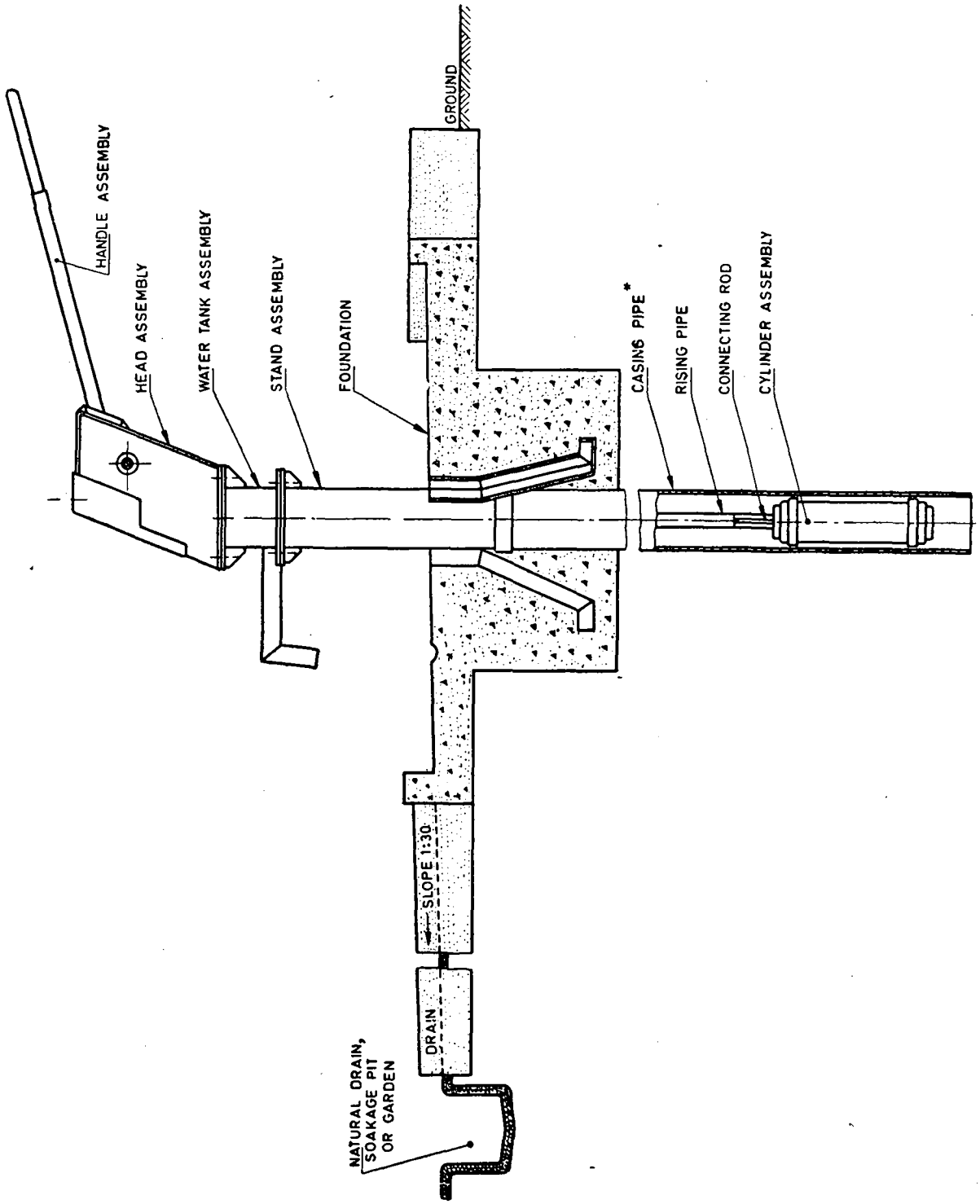
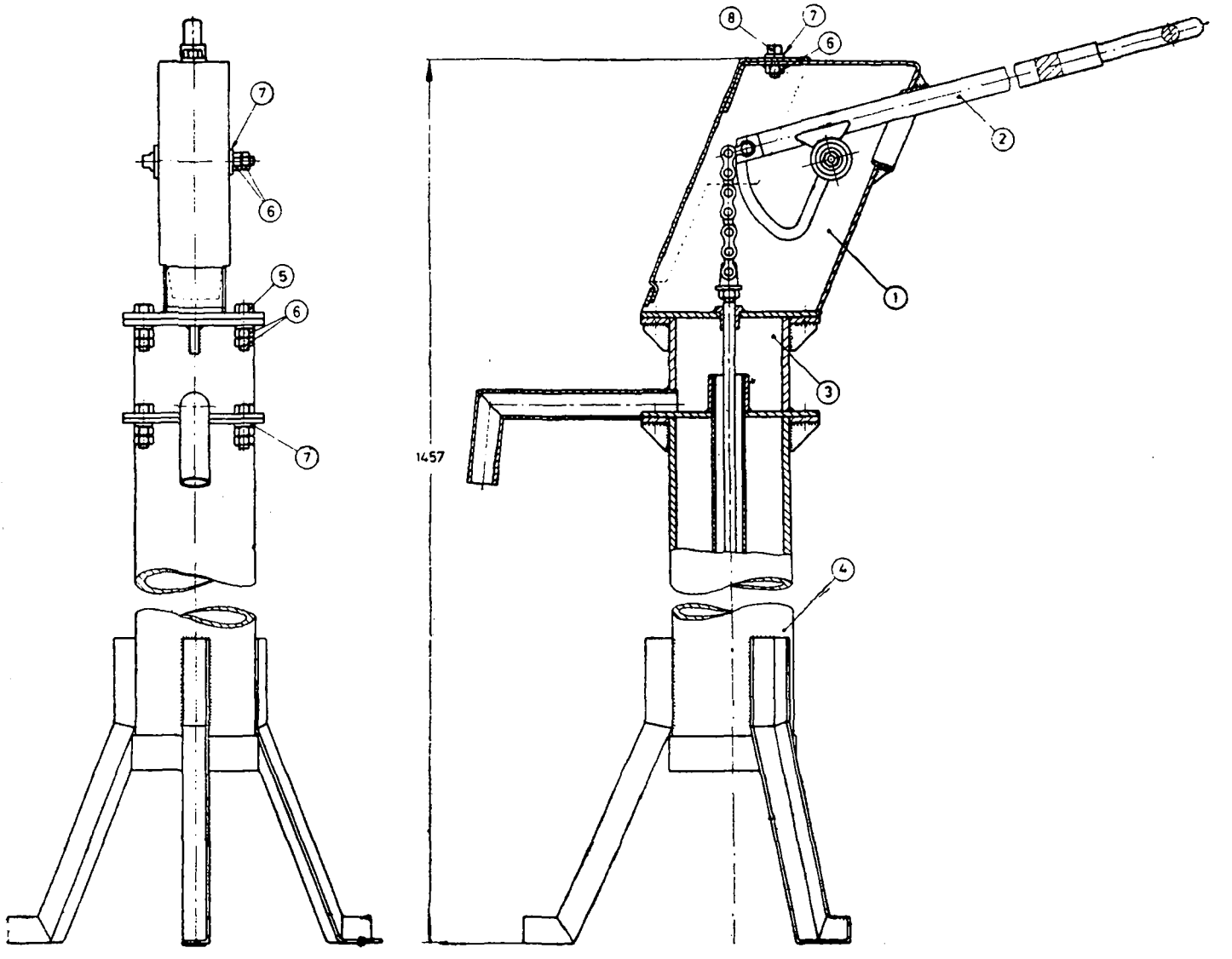


FIG. 1 NOMENCLATURE FOR DEEP WELL HAND PUMPS

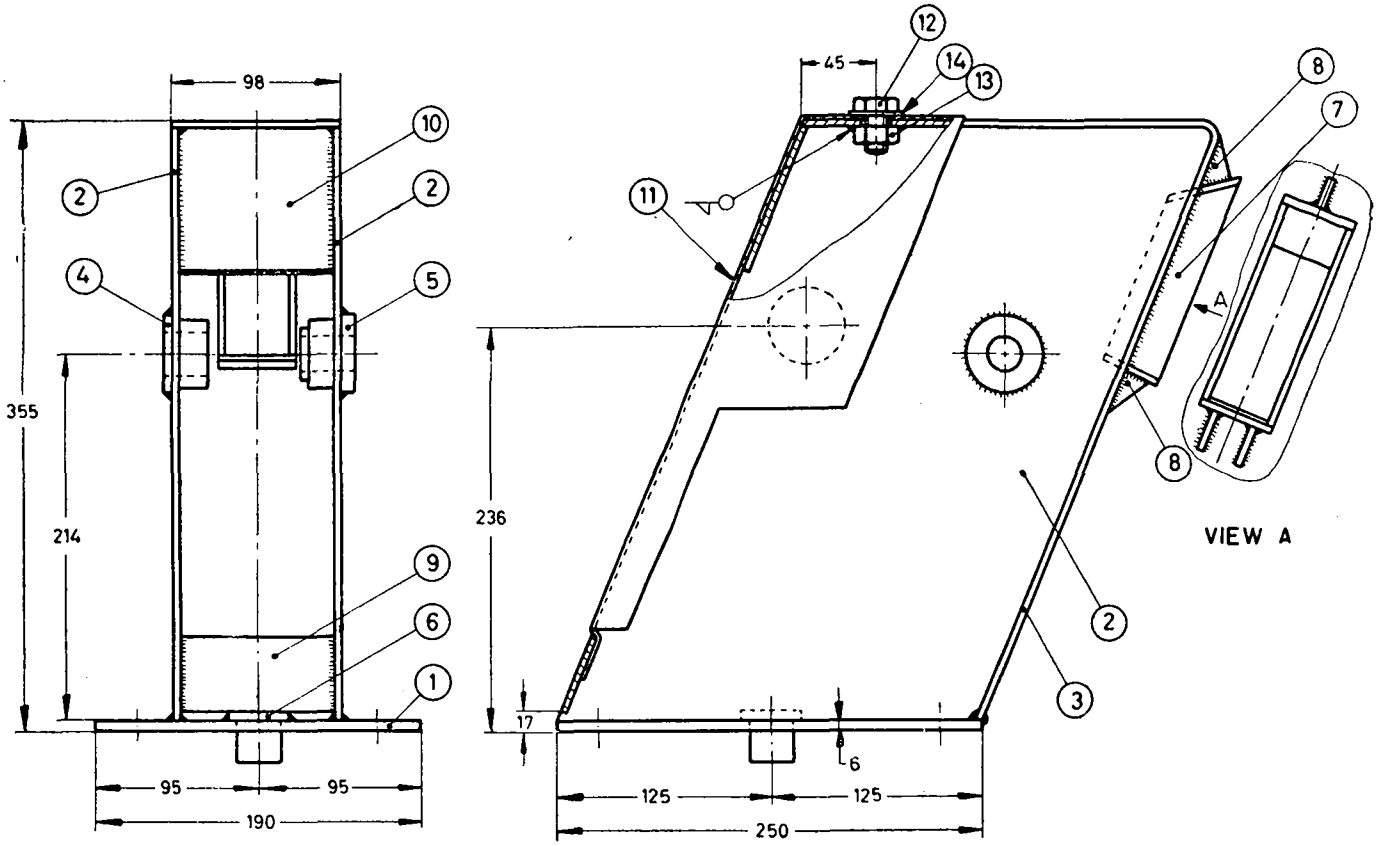
*Casing pipe is not required when the bore passes through rocks.



Part No.	No. Off	Description	Size
8	1	Hex bolt M 12 × 1·75 × 2J	IS : 1363-1967
7	10	Washer (one as per Fig. 6J)	To suit M 12
6	19	Hex nut	M 12
5	8	Hex bolt M 12 × 1·75 × 40	IS : 1363-1967
4	1	Stand assembly	—
3	1	Water tank assembly	—
2	1	Handle assembly	—
1	1	Head assembly	—

All dimensions in millimetres.

FIG. 2 DEEP WELL HAND PUMP



Part No.	No. Off	Description	Material
14	1	Washer	—
13	1	Hex nut-M 12	—
12	1	Hex bolt-M 12 × 1·75 P × 20 L	—
11	1	Front cover	IS : 513-1973, ORDINAY TYPE
10	1	Front top end plate	IS : 226 St42-S
9	1	Front bottom end plate	IS : 226 St42-S
8	3	Gusset plates	IS : 226 St42-S
7	1	Bracket	IS : 226 St42-S
6	1	Guide bush	IS : 226 St42-S
5	1	Axle bush (left)	IS : 226 St42-S
4	1	Axle bush (right)	IS : 226 St42-S
3	1	Back plate	IS : 226 St42-S
2	2	Side plate	IS : 226 St42-S
1	1	Pump head flange	IS : 226 St42-S

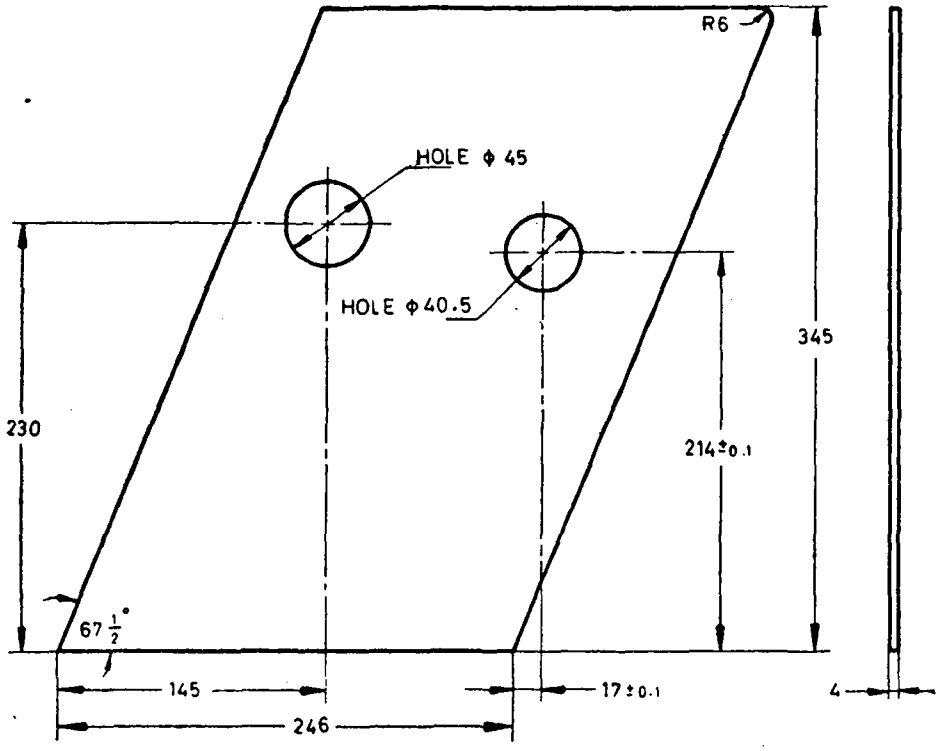
Note 1 — Inside fillet welding of side plates and back plate to the flange should be 3·2, *Min.*

Note 2 — Welding fillets in other places should be 4 mm, *Min.*

Note 3 — The side plate shall be welded inside and outside as shown in the drawing.

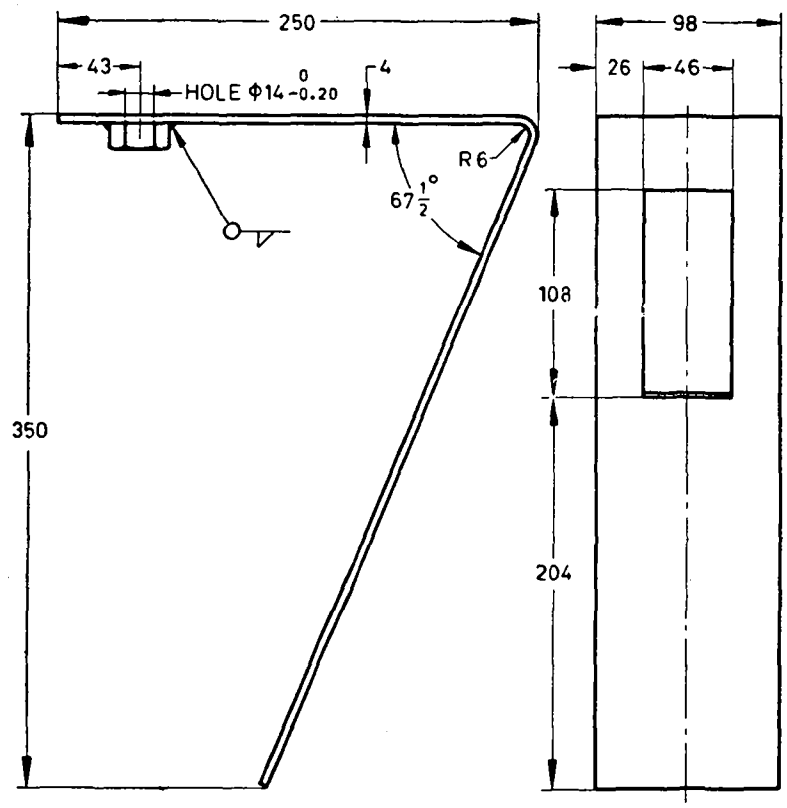
Note 4 — The head assembly shall be welded from inside and outside. The outside seal welding run shall be ground smooth.

FIG. 3 HEAD ASSEMBLY



Manufacturing tolerance to be ± 0·5 unless otherwise specified.

4A Side Plate

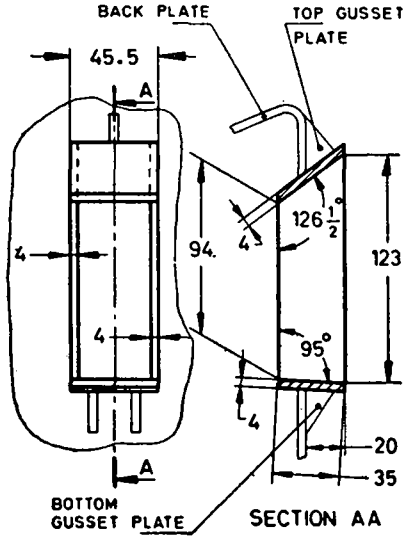


Manufacturing tolerance to be ± 0·5 unless otherwise specified.

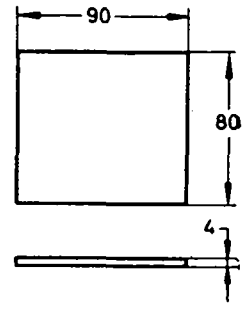
4B Back Plate

All dimensions in millimetres.

FIG. 4 HEAD ASSEMBLY PARTS — *Contd*

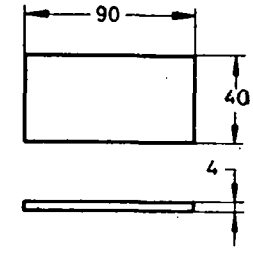


4C Bracket



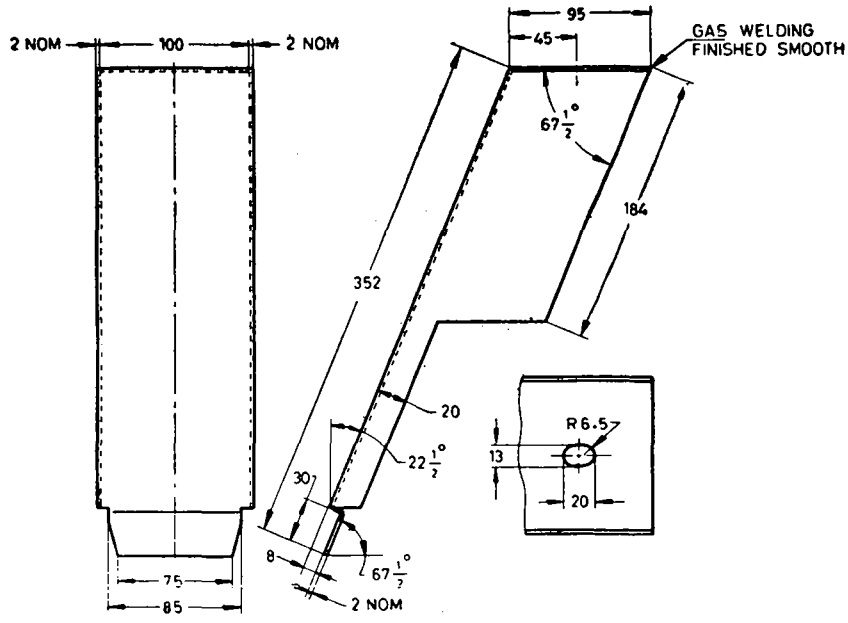
Manufacturing tolerance to be ± 0·1 unless otherwise specified.

4D Front Top End Plate



Manufacturing tolerance to be ± 0·1 unless otherwise specified.

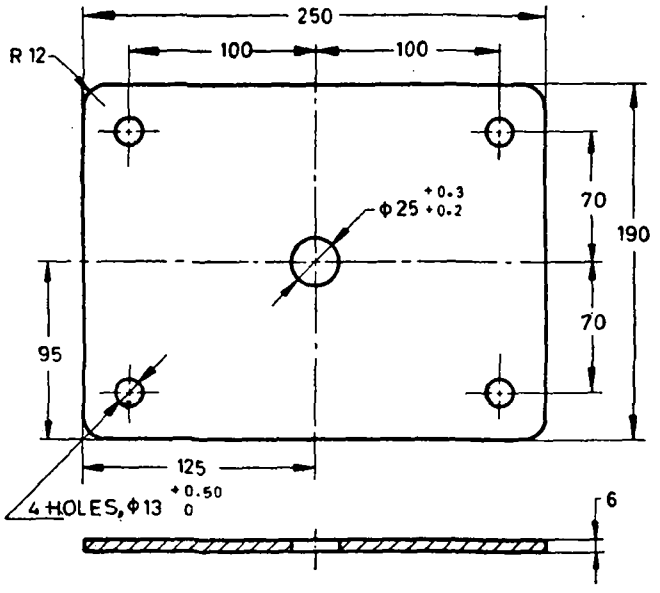
4E Front Bottom End Plate



4F Front Cover

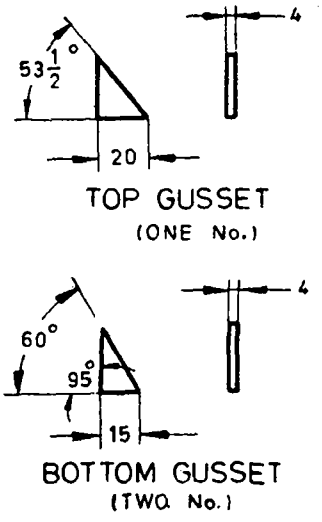
All dimensions in millimetres.

FIG. 4 HEAD ASSEMBLY PARTS — *Contd*

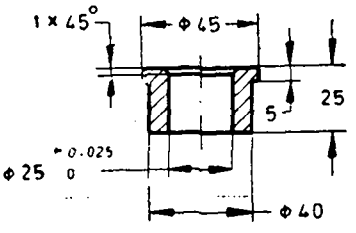


Manufacturing tolerance to be ± 0·5 unless otherwise specified.

4G Pump Head Flange

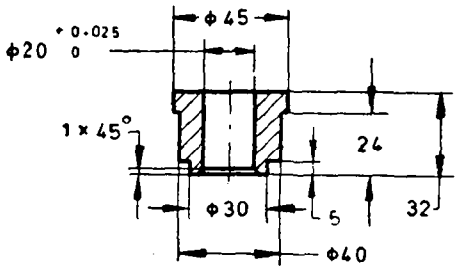


4H Gusset Plates



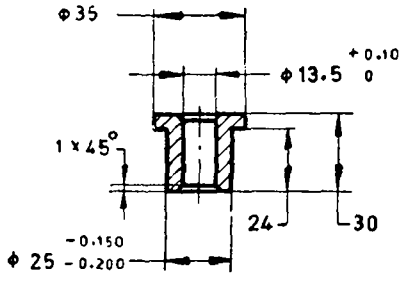
Manufacturing tolerance to be ± 0·1 unless otherwise specified.

4J Axle Bush (Right)



Manufacturing tolerance to be ± 0·1 unless otherwise specified.

4K Axle Bush (Left)

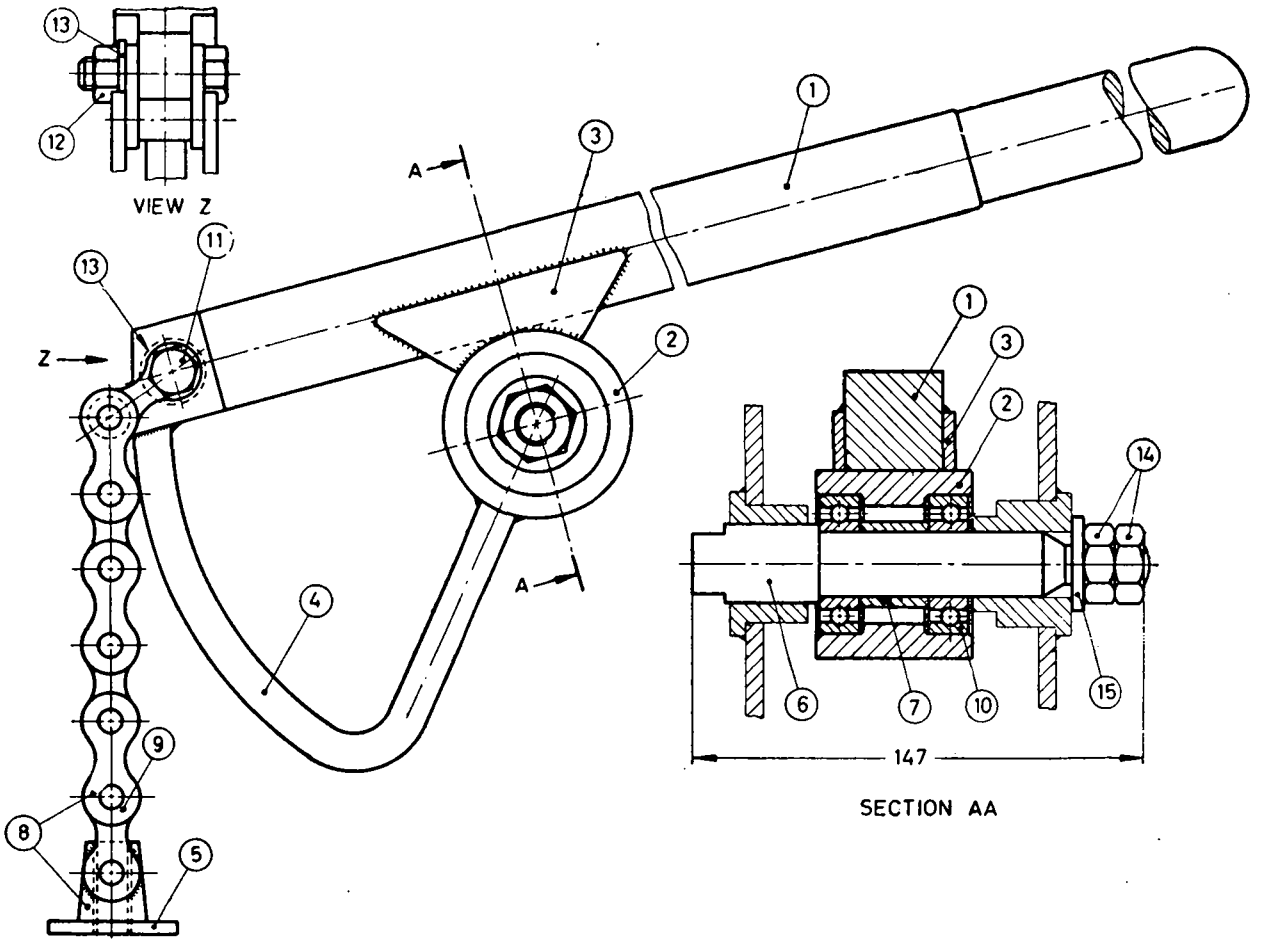


Manufacturing tolerance to be ± 0·1 unless otherwise specified.

4L Guide Bush

All dimensions in millimetres.

FIG. 4 HEAD ASSEMBLY PARTS

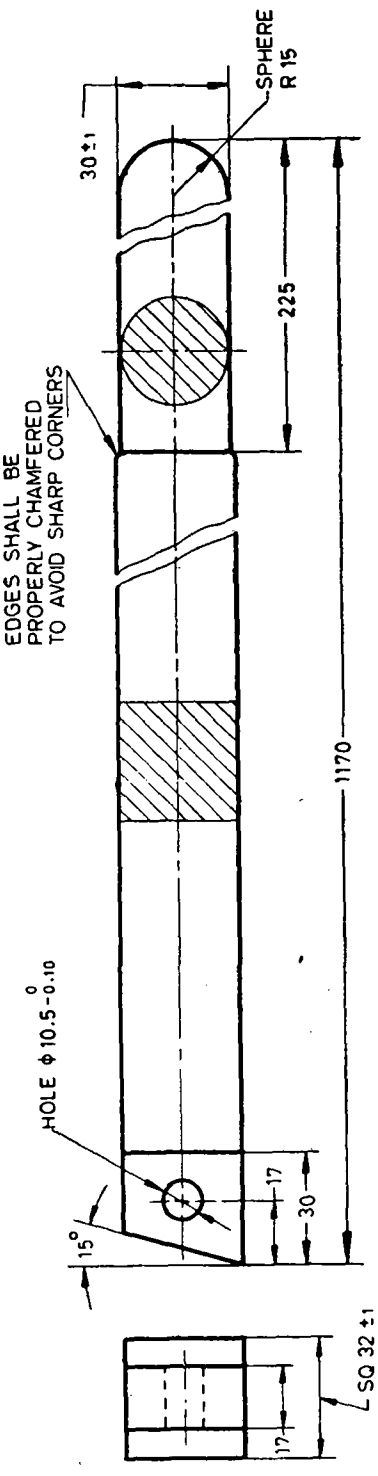


Part No.	No. Off	Description	Material
15	1	Washer (4 mm thick) — To suit M12	—
14	2	Hex nut — M12	—
13	1	Washer (2 mm thick) — To suit M10	Steel, Grade B (*see* IS : 2016-1967)
12	1	Hex nyloc nut — M10	—
11	1	Hex bolt M10 × 1·5 × 40 — IS : 1364-S-8·8	IS : 1364-1967
10	2	Bearing (shielded on one side)	IS : 6455-1972
9	1	Roller chain (25·4 mm pitch)	IS : 2403-1975
8	1	Chain with coupling	—
7	1	Spacer	IS : 226 St42-S
6	1	Handle axle	IS : 1570-1961—C35Mn75
5	1	Chain coupling	IS : 226 St42-S or class 2 of IS : 2004-1978
4	1	Roller chain guide	IS : 226 St42-S
3	2	Housing holder	IS : 226 St42-S
2	1	Bearing housing	IS : 226 St42-S
1	1	Handle bar	IS : 226 St42-S

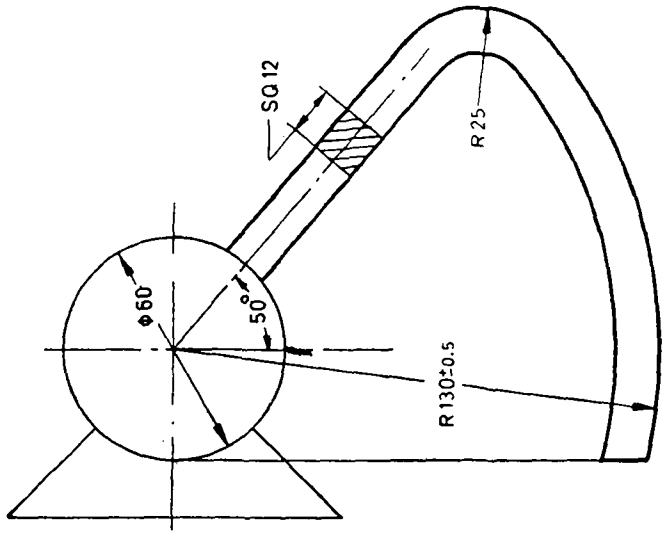
Note — Welding fillet will not be less than 6 mm at all places excepting for bearing holder where it shall not be less than 4 mm.

All dimensions in millimetres.

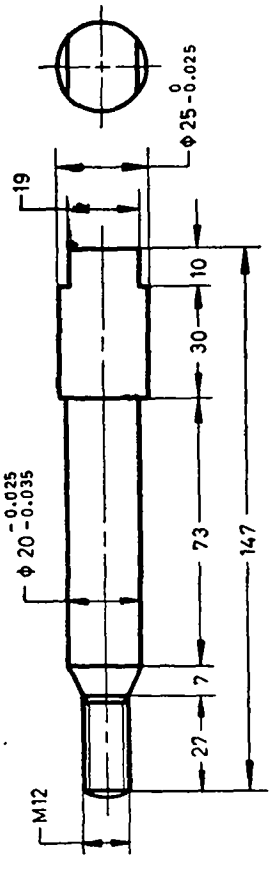
FIG. 5 HANDLE ASSEMBLY



6A Handle Bar



6C Roller Chain Guide

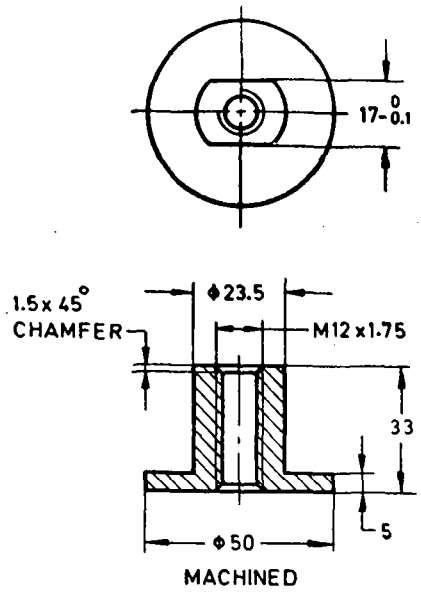


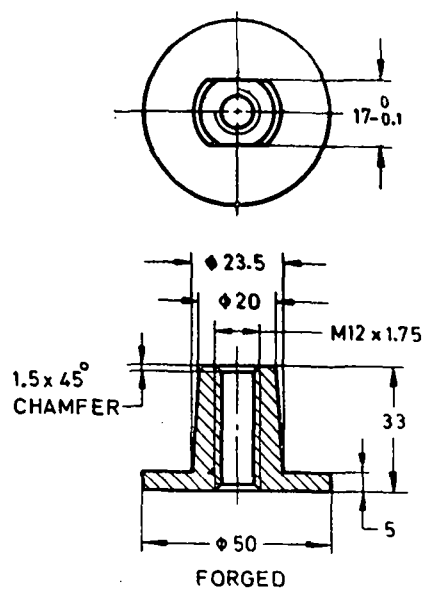
Manufacturing tolerance to be ± 0·1 unless otherwise specified.

6B Handle Axle

All dimensions in millimetres.

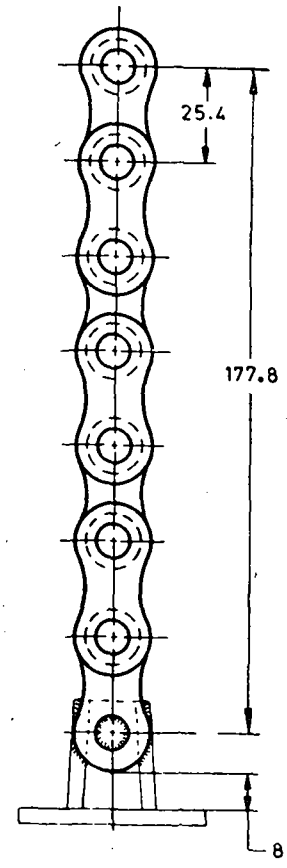
FIG. 6 HANDLE ASSEMBLY PARTS — *Contd*



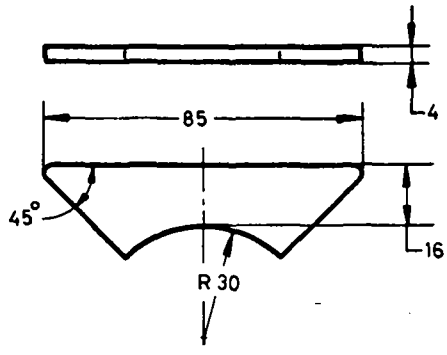


Manufacturing tolerance to be ± 0·1 unless otherwise specified.

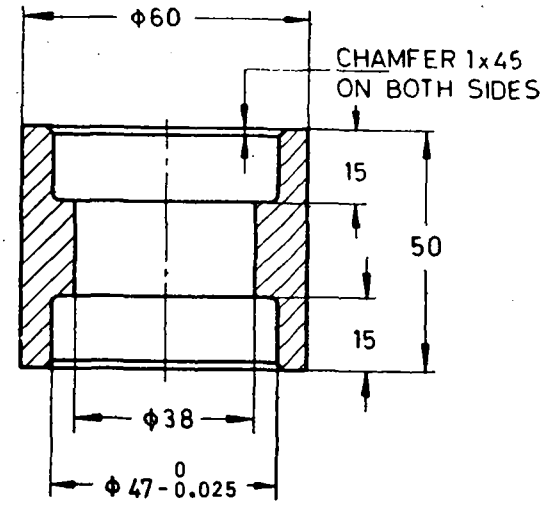
6D Chain Coupling



6E Chain with Coupling

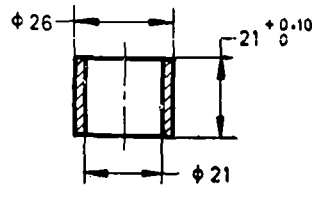


6F Housing Holder



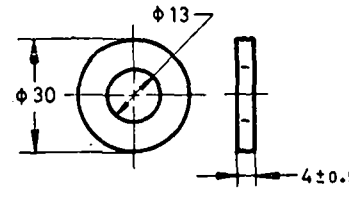
Manufacturing tolerance to be ± 0·1 unless otherwise specified.

6G Bearing Housing



Manufacturing tolerance to be ± 0·1 unless otherwise specified.

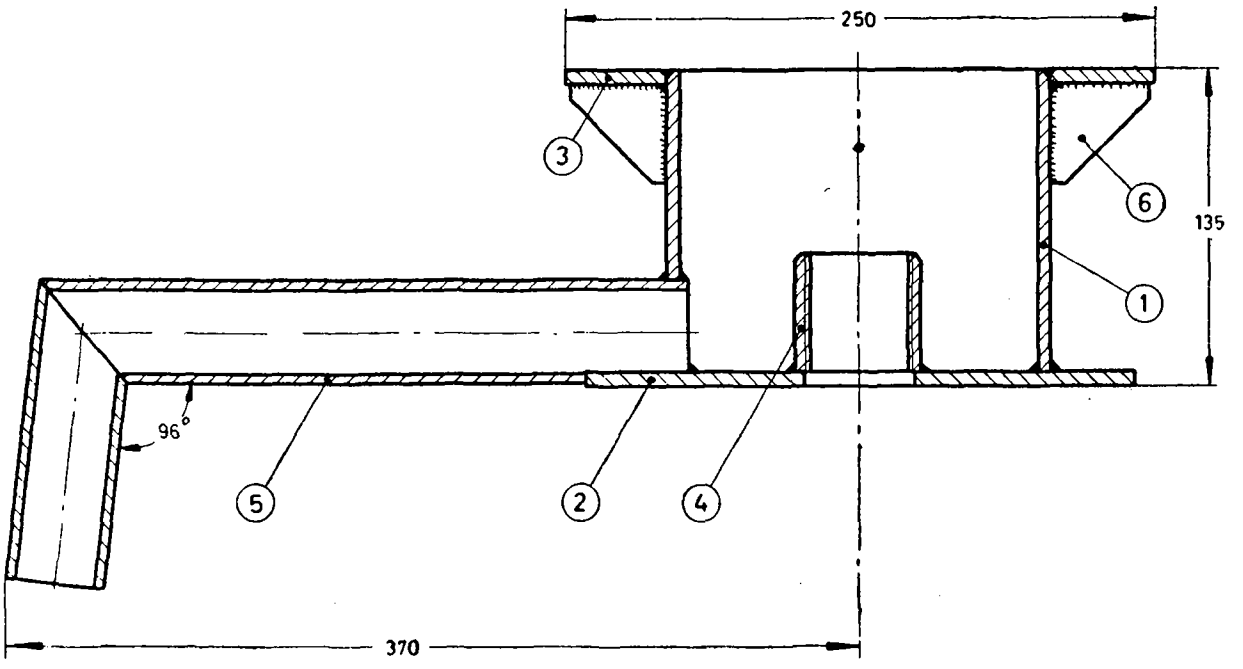
6H Spacer



6J Plate Washer

All dimensions in millimetres.

FIG. 6 HANDLE ASSEMBLY PARTS

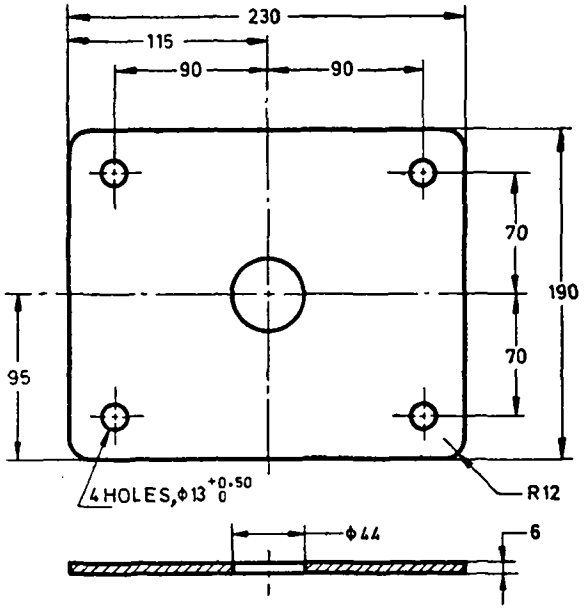


Part No.	No. Off	Description	Material
6	2	Gusset plate	IS : 226 St42-S
5	1	Spout (32 mmϕ N. B.—medium)	IS : 1239-1973
4	1	Riser pipe holder (32 mm coupling)	*
3	1	Tank top flange	IS : 226 St42-S
2	1	Tank bottom flange	IS : 226 St42-S
1	1	Tank pipe (150 mmϕ N. B.—medium)	IS : 1239-1973

Note 1 — Fillet size of weld at all places will be minimum 6 mm excepting spout where it shall not be less than 4 mm.
Note 2 — The component will be hot dip galvanized as per IS : 4759 - 1968.
Note 3 — One side of coupling to be faced.
Note 4 — Sealing run on the top flange to be ground smooth.
Note 5 — The riser pipe shall be (32 mm ϕ N. B. MEDIUM) 3 m $^{+0}_{-25}$ IS : 1239 - 1973.
*St42-S of IS : 226-1975 or Class 2 of IS : 2004-1978.

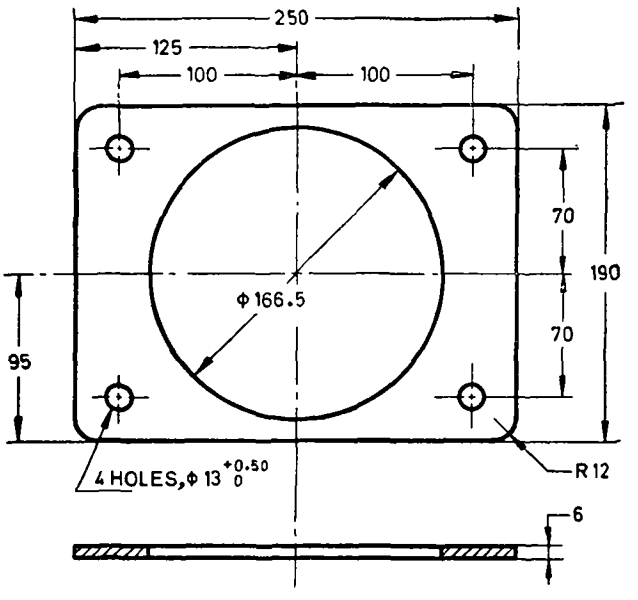
All dimensions in millimetres.

FIG. 7 WATER TANK ASSEMBLY



Manufacturing tolerance to be $\pm$ 0·5 unless otherwise specified

8A Tank Bottom Flange

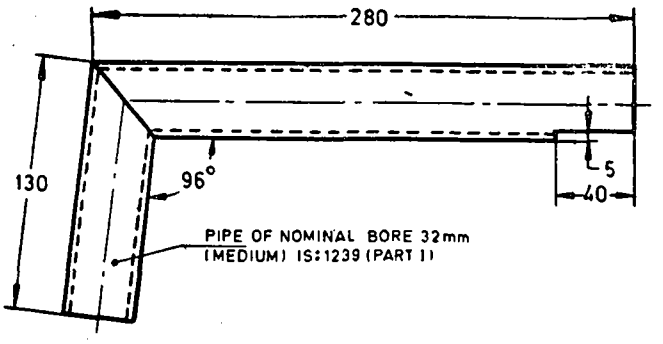


Manufacturing tolerance to be $\pm$ 0·5 unless otherwise specified

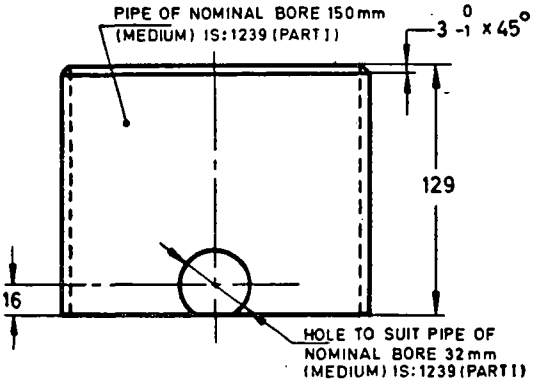
All dimensions in millimetres.

8B Tank Top Flange

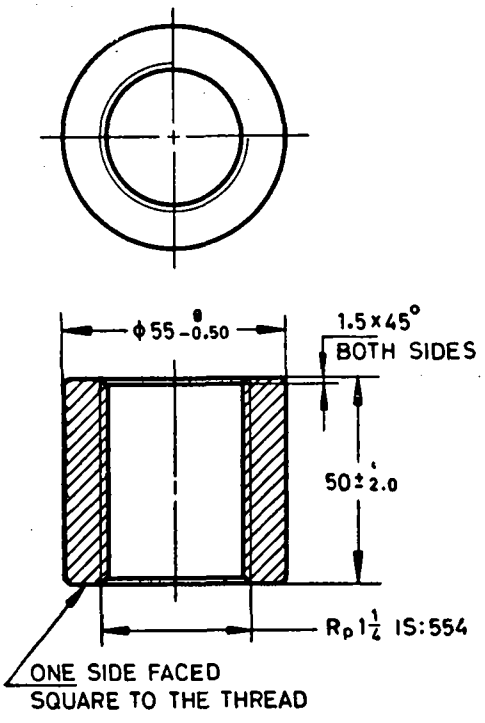
FIG. 8 WATER TANK ASSEMBLY PARTS — *Contd*

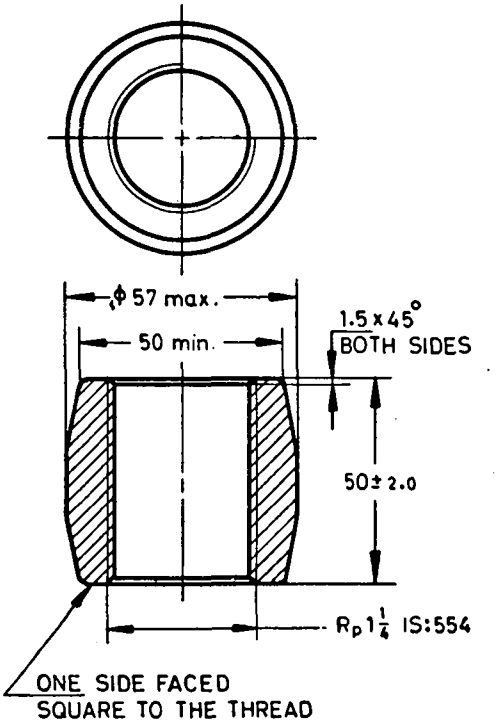


8C Spout



8D Tank Pipe



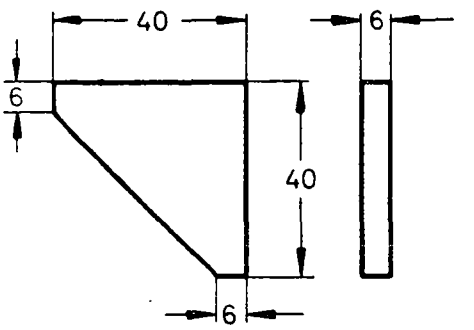


When machined from M. S. bar shall conform to IS : 226 St42-S

When forged shall conform to IS : 2004 Class 2

Manufacturing tolerance to be ± 0·1 unless otherwise specified.

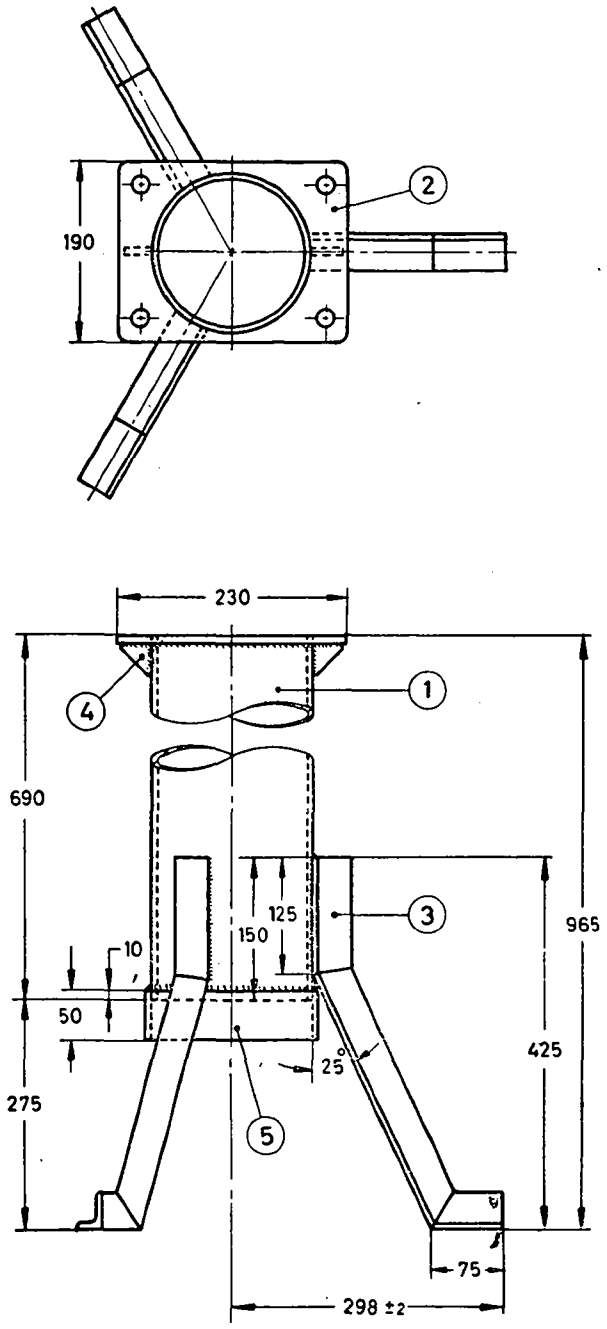
8E Riser Pipe Holder



8F Gusset Plate

All dimensions in millimetres.

FIG. 8 WATER TANK ASSEMBLY PARTS

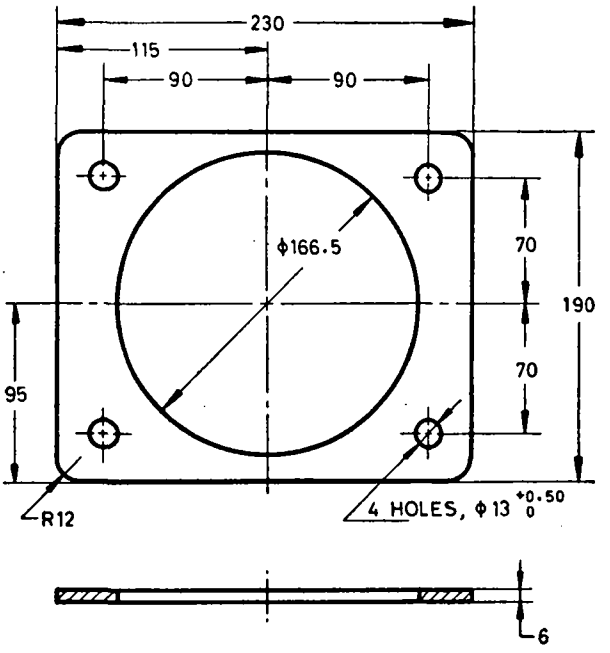


Part No.	No. Off	Description	Material
5	1	Collar	IS : 226 St42-S
4	2	Gusset plate	IS : 226 St42-S
3	3	Leg	IS : 808-1964
2	1	Stand flange	IS : 226 St42-S
1	1	Stand pipe (150 mm NB medium)	IS : 1239-1973

Note 1 — Welding fillets will be 6 mm minimum.
Note 2 — Both ends of the 150 mm nominal bore pipe should be faced on lathe.
Note 3 — Sealing welding run on flange to be ground smooth.
Note 4 — Collar shall be given a sealing welding run from inside.

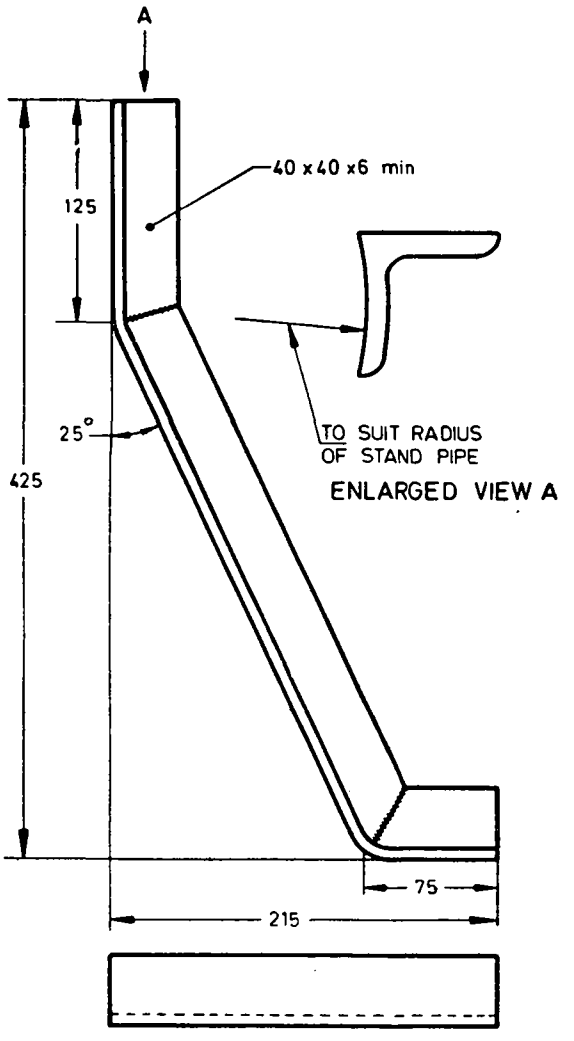
All dimensions in millimetres.

FIG. 9 STAND ASSEMBLY

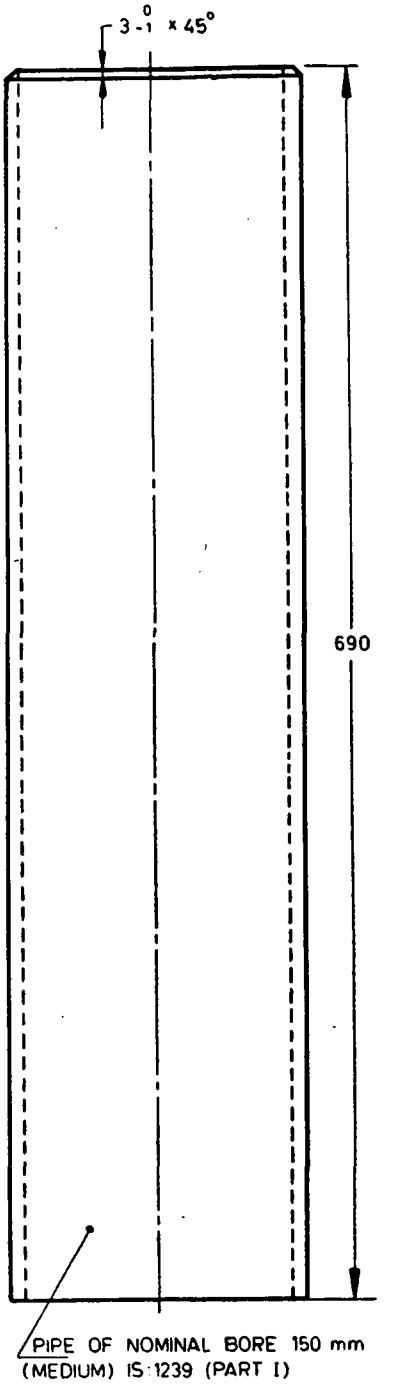


Manufacturing tolerance to be ± 0·5 unless otherwise specified.

10A Stand Flange



10C Leg

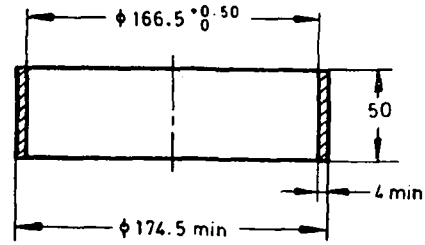


10B Stand Pipe

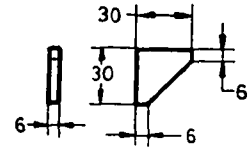
Note — Both ends to be faced square to the pipe O. D.

All dimensions in millimetres.

FIG. 10 STAND ASSEMBLY PARTS — *Contd*



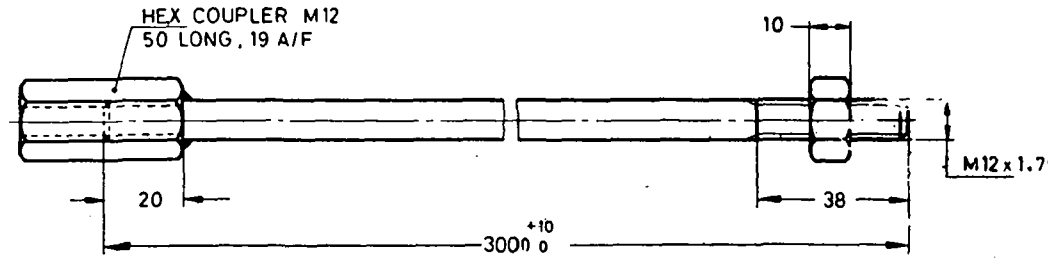
10D Collar



10E Gusset Plate

All dimensions in millimetres.

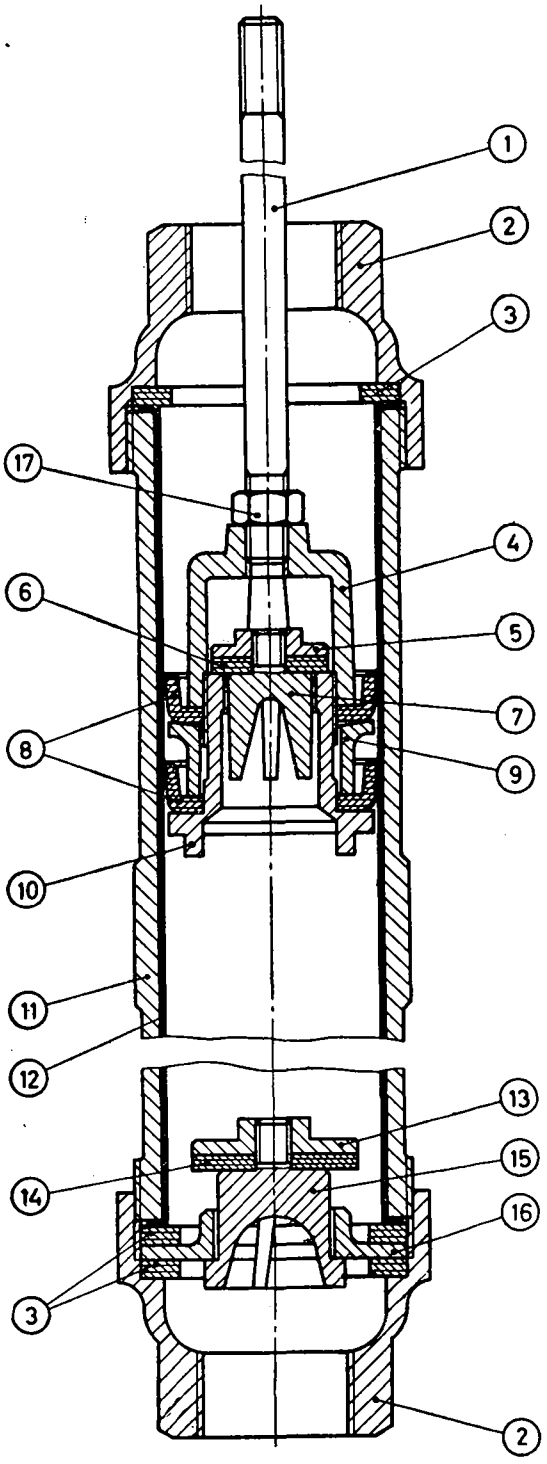
FIG. 10 STAND ASSEMBLY PARTS



Note — The tolerance of the thread shall conform to IS : 1367-1967 Class **6g** for bolts and **6h** for nuts.

All dimensions in millimetres.

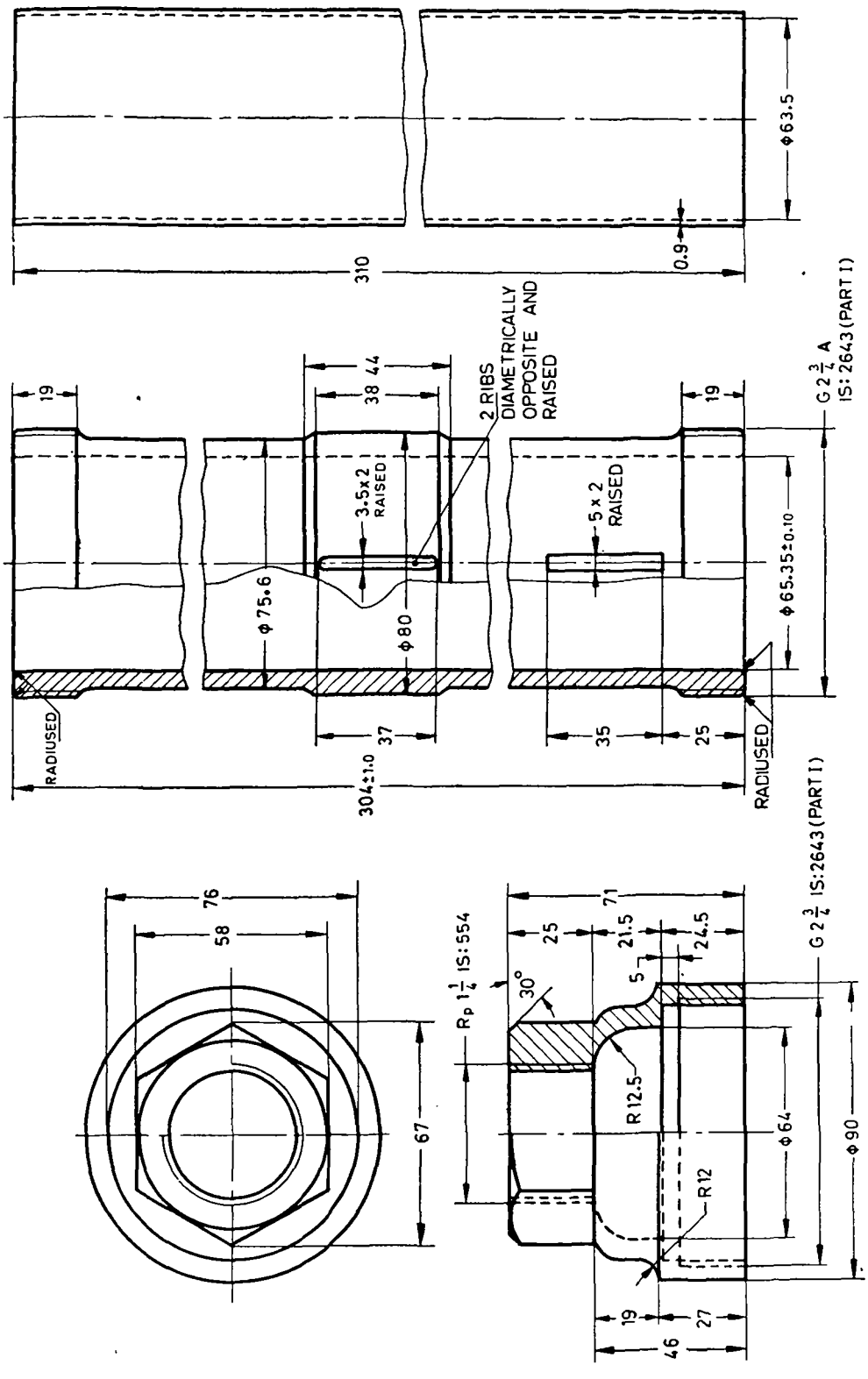
FIG. 11 CONNECTING ROD



Part No.	No Off	Description	Material
17	1	Hex nut M12—IS : 1363	Property Class 4 of IS : 1367-1967
16	1	Check valve seat	Grade 2 of IS : 318 - 1962
15	1	Check valve guide	Grade 2 of IS : 318 - 1962
14	1	Rubber seating	—
13	1	Rubber seat retainer	Grade 2 of IS : 318 - 1962
12	1	Brass liner	Alloy 1 of IS : 407 - 1966
11	1	Cylinder body	Grade FG200 of IS : 210 - 1978
10	1	Follower	Grade 2 of IS : 318 - 1962
9	1	Spacer	Grade 2 of IS : 318 - 1962
8	2	Pump bucket	IS : 1273 - 1958
7	1	Upper valve guide	Grade 2 of IS : 318 - 1962
6	1	Rubber seating	—
5	1	Upper valve seat	Grade 2 of IS : 318 - 1962
4	1	Plunger yoke body	Grade 2 of IS : 318 - 1962
3	3	Sealing ring	IS : 3020 - 1976
2	2	Reducer cap	Grade FG200 of IS : 210 - 1978
1	1	Plunger rod	Grade St42 of IS : 7270 - 1974

Note — As an alternate, metal components to Grade 2 of IS : 318-1962 of cylinder assembly shall be forged from Naval Brass conforming to IS : 6912 - 1973.

FIG. 12 CYLINDER ASSEMBLY



13B Cylinder Body

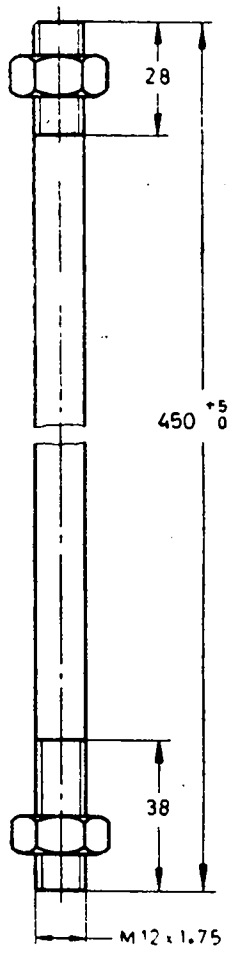
13A Reducer Cap

13C Brass Liner

Note — Half hard (Vickers 99-118) (99-118 HV).

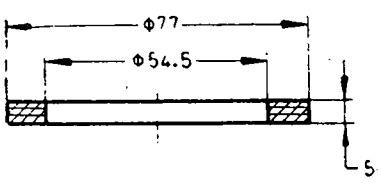
All dimensions in millimetres.

FIG. 13 CYLINDER ASSEMBLY PARTS — *Contd*

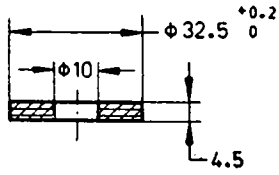


Note — Electro galvanizing as per Grade 3 of IS : 1573-1973.

13D Plunger Rod

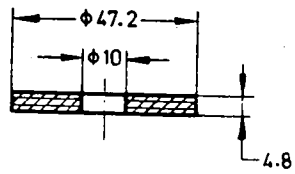


13E Sealing Ring



Shore hardness shall be 65 to 75.

13F Rubber Seating

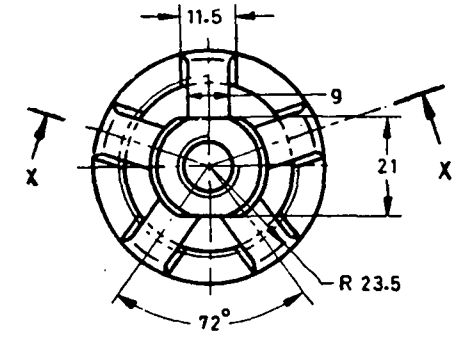


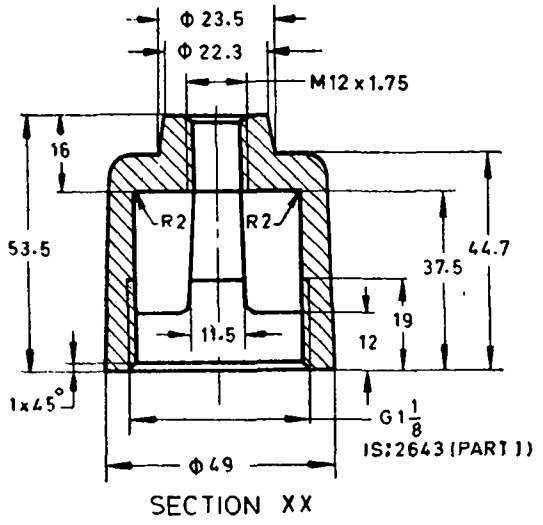
Shore hardness shall be 65 to 75.

13G Rubber Seating

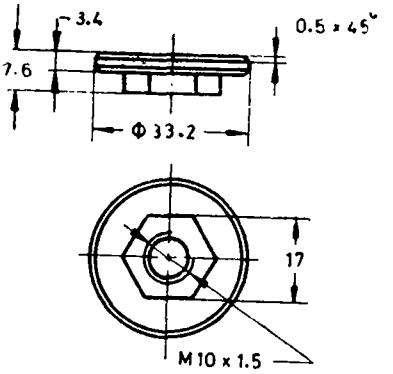
All dimensions in millimetres.

FIG. 13 CYLINDER ASSEMBLY PARTS — *Contd*

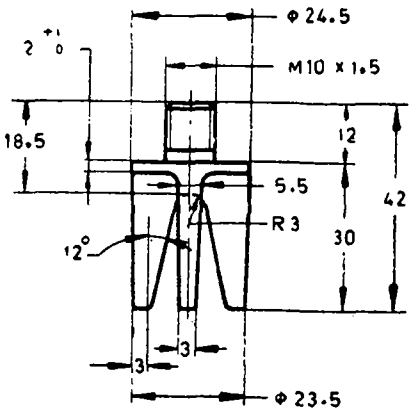


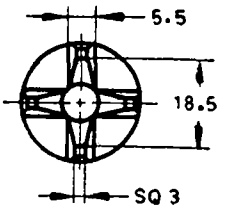


13H Plunger Yoke Body

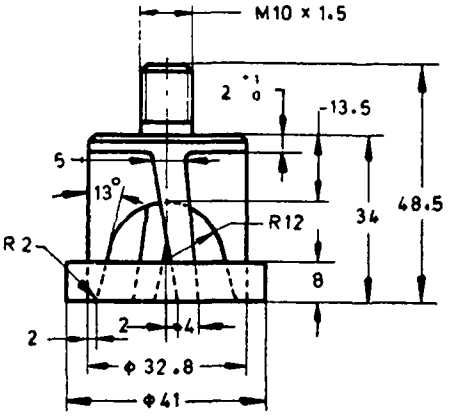


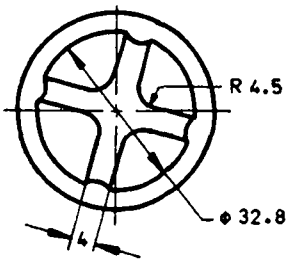
13J Upper Valve Seat





13K Upper Valve Guide



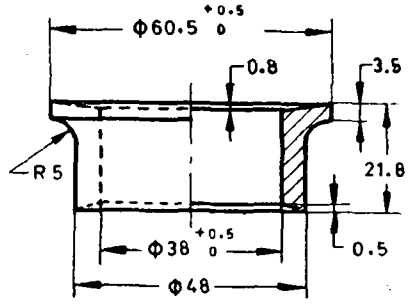


13L Check Valve Guide

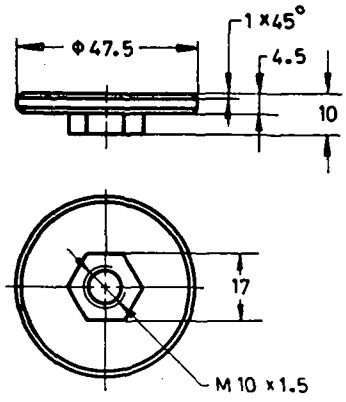
Note 1 — The hardness shall be 60 to 70 HB for all bronze components.

Note 2 — All bronze castings shall be free from lead segregation.

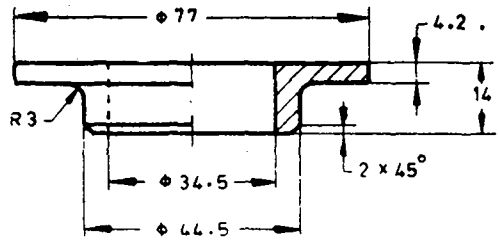
FIG. 13 CYLINDER ASSEMBLY PARTS — *Contd*



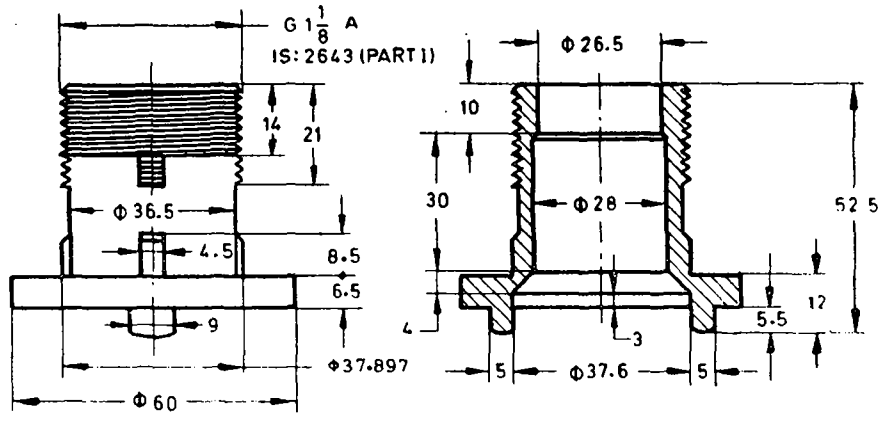
13M Spacer



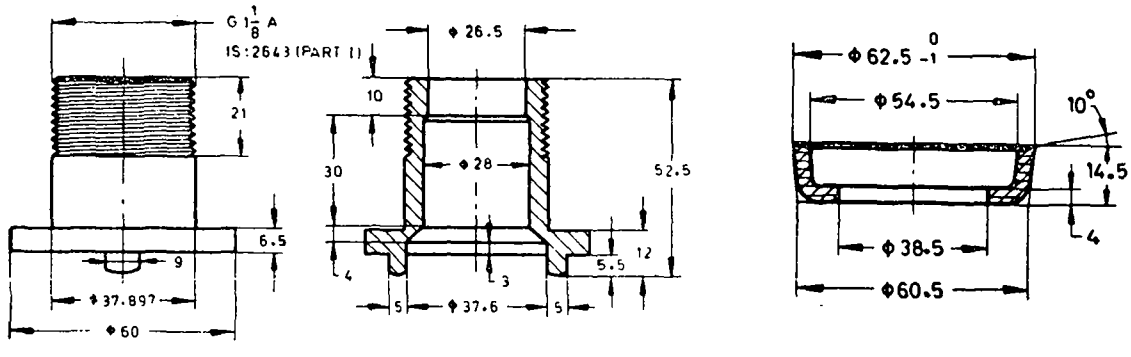
13N Rubber Seat Retainer



13P Check Valve Seat



13Q Follower



13Q Follower (Alternate Design)

13R Pump Bucket

Note 1 — The hardness shall be 60 to 70 HB for all bronze components.

Note 2 — All bronze castings shall be free from lead segregation.

All dimensions in millimetres.

FIG. 13 CYLINDER ASSEMBLY PARTS

5.6 The welding shall be done in accordance with IS : 823 - 1964 'Code of procedure for manual metal arc welding of mild steel '.

5.7 The castings shall conform to Grade FG 200 or higher of IS : 210 - 1978 'Specification for grey iron castings (*third revision*)'.

5.8 The bronze castings shall conform to Grade 2 of IS : 318 - 1962 'Specification for leaded tin bronze ingots and castings '.

5.9 The connecting rods shall conform to Grade St42 of IS : 7270 - 1974 'Specification for bright bars (standard quality) ' and surface finish to Grade 3 of IS : 7270 - 1974. The electrogalvanizing shall conform to classification No. FeZn25 of IS : 1573 - 1970 'Specification for electroplated coatings of zinc on iron and steel (*first revision*) '.

5.10 The steel plates/sheets, angle iron legs and square bars for fabrication of pump shall conform to designation Fe410-S (St 42-S) of IS 226 - 1975 'Specification for structural steel (standard quality) (*fifth revision*) ' or St42-1079 of IS : 1079 - 1973 'Specification for hot rolled carbon steel sheet and strip (*third revision*) ' and shall be of tested quality.

5.11 The following shall be electrogalvanized and passivated as per Grade 3 of IS : 1573 - 1970:

a) Connecting rod;

b) Plunger rod; and

c) All bolts, nuts and washers in the assembly excepting high tensile bolt.

5.12 The locking of upper valve seat and upper valve guide; and check valve guide with rubber seat retainer shall be done by means of punch locking.

6. Anti-Corrosive Treatment

6.0 The hand pumps shall be given any one of the anti-corrosive treatment as laid down in **6.1** and **6.2** below.

6.1 *Galvanizing* — The following assemblies shall be galvanized according to IS : 4759 - 1968 'Specification for hot-dip zinc coatings on structural steel and other allied products ':

a) Stand assembly,

b) Water tank assembly,

c) Head assembly, and

d) Handle assembly except the inside portion of bearing housing.

6.1.1 The galvanized assemblies shall be given chromate conversion coating as per IS : 9839-1981 'Specification for chromate conversion coatings on zinc electroplated and carbon zinc coating '.

6.2 *Painting* — The painting shall be done as specified below.

6.2.1 For surface preparation any one of the following methods shall be employed:

a) Sand-blasting or shot-blasting,

b) Phosphating to Class C (light weight) of IS : 3618 - 1966 'Specification for phosphate treatment of iron and steel for protection against corrosion '.

6.2.2 All interior surfaces shall be given two coats of red oxide primer containing not less than 16 percent zinc chromate. The red oxide primer shall conform to IS : 2074 - 1962 'Specification for ready mixed paint, red oxide-zinc chrome, priming '.

6.2.3 The exterior surfaces of mild steel and cast iron components shall be given the following treatment:

a) One coat of red oxide primer,

b) One coat of surfacer, and

c) Two coats of synthetic enamel paint, conforming to IS : 2932 - 1974 'Enamel, synthetic, exterior (a) undercoating, (b) finishing (*first revision*)'.

6.2.4 The inside of head assembly shall be painted with one coat each of epoxy primer and finish paint.

7. Testing

7.1 *Sampling* — Unless otherwise agreed to between the purchaser and the supplier, the procedure given in IS : 2500 (Part I) - 1973 'Sampling inspection tables : Part I Inspection by attributes and by count of defects (*first revision*) ' shall be followed for sampling inspection. For the characteristics given under **7.3,** the single sampling plan with inspection level III and AQL of one percent as given in Tables 1 and 2 of IS : 2500 (Part I) - 1973 shall be followed.

7.2 *Type Test* — Performance of the pump shall be checked after placing the cylinder at 50 metres below the ground level in a bore well, the yield of which shall not be less than 20 litres per minute. The pump shall be primed and test shall start only after getting continuous flow of water through the spout. The water shall then be collected in a container for forty continuous strokes to be completed in one minute and the discharge thus measured shall be not less than 12·0 litres.

7.3 *Visual and Dimensional Tests*

7.3.1 All the pumps shall be examined for finish and visual defects.

7.3.2 All dimensions of the assemblies shall be checked for conformance with the drawings.

7.3.3 The handle shall have reasonably good surface contact with the top and bottom portions of the bracket.

7.3.4 Coupler welding shall be checked for verticality. Plain round mandrel of 300 mm length shall be screwed to the water chamber coupling and the verticality shall be checked with the help of try square. For the entire length of the mandrel a maximum of 1 mm tilt may be allowed.

7.3.5 The flanges shall be reasonably flat to provide proper matching.

7.3.6 After putting the pump on perfect level over the platform, alignment of the rod with respect to the guide bush shall be checked as given below.

7.3.6.1 A rod of length 100 mm and diameter 12 mm shall be fitted to the coupler. The handle shall be raised and lowered gently. The rod shall pass through the guide bush freely.

7.3.7 The stroke of the pump shall be 100 $\pm$ 3 mm.

7.3.8 The connecting rod and plunger rod shall be examined for straightness and the formation of the threads. The coupler shall also be subjected to similar checks.

7.4 *Routine Tests* — Two complete pumps out of the batch selected shall be subjected to the following tests in addition to the tests in **7.3** above.

7.4.1 The pumps and cylinders shall be dismantled and all the components shall be checked in detail for dimensions as per the drawings.

7.4.2 The pump shall be placed in a barrel of 200 l water capacity. The barrel shall be fed with water at the rate of 20 l/min by means of suitable arrangement. The pump shall be primed and test shall start only after getting continuous flow of water through the spout. The water shall then be collected in a container for forty continuous strokes to be completed in one minute and the discharge thus measured shall not be less than 12·0 l.

7.5 *Criteria for Conformity* — The lot shall be considered conforming to the requirements of this specification if the pumps selected according to **7.1** and **7.3** satisfy the following requirements:

a) The number of pumps not meeting the requirements of a characteristic inspected under **7.3** does not exceed the corresponding acceptance number, and

b) Both the pumps inspected according to **7.4** meet the requirements given in **7.4.2**.

8. Guarantee — The pump and accessories shall be guaranteed for 12 months from the date of installation or 18 months from the date of supply whichever is earlier against bad workmanship/ bad material. The life of leather/rubber components shall, however, be guaranteed for only 6 months from the date of supply.

9. Marking

9.1 The pump head and cylinder shall be marked with the manufacturer's name/trade-mark and serial number.

9.2 *ISI Certification Marking* — Details available with the Indian Standards Institution.

10. Packing — Unless otherwise agreed to between the manufacturer and the purchaser, the packing shall be as under.

10.1 The cylinder shall be packed in wooden cases and net mass of each case shall not exceed 50 kg.

10.2 The pump head assembly shall be normally wrapped in paper or open ended polyethylene bags and straw/wood wool to withstand road transit.

10.3 The connecting rods shall be packed in bundles of 10 rods. Each bundle shall be wrapped in open ended polyethylene bag and then wrapped with two layers of hessian cloth.

10.4 The riser pipe shall be packed as laid down in IS : 4740 - 1979 'Code of practice for packing of steel tubes (*first revision*) '.

EXPLANATORY NOTE

A need for deep well hand pumps of proven design to ensure interchangeability of components, with prolonged life, requiring minimum possible maintenance, resulted, in initiation of work to bring out a standard on deep well hand pumps. As a result of combined efforts made in this direction by various government agencies and reputed manufacturers in this field, a standard on deep well hand pumps was first issued in 1979.

The present revision has been taken up in order to bring the standard in line with the current manufacturing practices. A number of modifications have been made in this version of the standard, the following of which are of specific importance:

a) The requirements of galvanizing have been incorporated so that the pumps are free of rust for longer period.

b) The 'performance tests' of original standard has been designated as the 'type test' in this revision and a new clause on 'routine tests' has also been included.

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