INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR DIAPHRAGM VALVES FOR CORROSIVE AND ERROSIVE FLUIDS** (FIRST REVISION) *Based on IS 11791:1986*	**IPSS:1-06-025-01** Formerly : IPSS:1-06-025-95

0. FOREWORD

0.1 This Inter Plant Standard prepared by the Standards Committee on Pipes, Fittings, Valves and Piping Layout, IPSS 1:6 with the active participation of the representatives of all the steel plants, associated organizations in the field and manufacturers & was adopted in September 2001.

0.2 In view of updating the Indian Standard & revision of sketches, this standard has been revised in September 2001.

0.3 In preparation of this standard, the help has been taken from IS 11791:1986 'Specification for Diaphragm type valves for general purposes' as regards dimensions, testing and inspection etc.

1. SCOPE

1.1 This Inter Plant standard covers the requirement of lined, flanged end Diaphragm valves for corrosive and errosive fluids such as slurry, chemical solutions, demineralized water, soft water and like.

1.2 It covers valves with flanged ends of nominal diameters DN 25 to DN 300 mm having valve body lined with elastomeric or plastic lining depending upon service requirements. Suggested materials of construction for body lining and diaphragm for various applications are listed in Table-2.

2. CLASSIFICATION

2.1 Two types of valves are covered in this specification :

a) Weir type seating – Type A (Fig-1)
b) Straight through passages – Type B (Fig-2)

Note: Figures are illustrative only and do not imply required design.

Weir Type is recommended for clear fluid and where throttling is required.

Straight Type is recommended where pressure drop is not permissible and where full flow is required to safe guard against choking (slurry).

2.2 Valves shall be straight pattern or right pattern where the axis of body and ports are at 90°, bodies with inside screw or outside screw, rising or non-rising stems.

3. NOMINAL DIAMETERS AND SIZES

3.1 The nominal diameter (DN) of flanged end lined valves shall be as follows :

25, 40, 50, 65*, 80, 100, 125*, 150, 200, 250 and 300.

* Non preferred sizes.

4. DIMENSIONS

4.1 Face to face and centre to centre dimensions of various types of lined valves of PN 1.0 and 1.6 are given in Table-1.

5. PRESSURE AND TEMPERATURE RATING

5.1 The actual service pressure/temperature rating of the lined diaphragm valves shall be limited to the pressure temperature rating of body or the diaphragm, whichever is lower and the same shall be as per recommendation of manufacturers. However, all the valves shall be suitable for continuous use at their PN designation upto 50°C temperature.

6. DESIGNATION

6.1 The diaphragm valve shall be designated by type, nominal diameter and pressure rating.

For example, a weir type diaphragm valve having a nominal diameter 250 and pressure rating of PN 1.0 shall be designated as :

"Diaphragm valve DN 250 type A, PN 1.0"

7. MATERIALS OF CONSTRUCTION

Sl No.	Component	Material	Specification	Remarks
1.	Body, bonnet and compressor	a) Grey cast iron	Gr. FG 200 of IS 210:1978	
		b) Stainless steel	AISI 304/AISI 316/AISI 316L	Upto 40 mm size only AISI 316L recommended for hydrochloric acid only
		c) Carbon steel	Gr. 2 of IS 2856:1979	
2.	Stem	Stainless steel	AISI 410	For general use
			316 L	Brine sol sulphuric acid HCL
3.	Stem nut	SG Cast iron	SG 42/12 of IS 1865:1991	
4.	Bolting	a) Carbon steel	Min tensile strength 390 m/sq mm.	
		b) Stainless steel	-- do --	For stainless steel body
5.	Diaphragm/ *Body lining	As per Table-2	As per Table-2	
6.	Hand wheel	Malleable cast iron	Gr. B of IS 2108:1977	

* No lining for stainless steel body.

8. OPERATION

8.1 All valves shall be capable of being operated by one of the appropriate deices as specified below :

i) Manual operation – The valves can be manually operated using hand-wheel. Hand-wheel shall close the valve by turning in clockwise direction when facing the wheel. Hand-wheel shall be marked with the word "open" or "close" with arrow to indicate direction of opening or closing. Alternatively, these markings may be shown on a plate secured below the hand-wheel.

ii) Actuator operation – The valve shall be designed to accept actuator of pneumatic, hydraulic and electric type depending on requirement to be indicated by the purchaser.

iii) All valves shall be provided with a indicator to show the open and close positions.

9. FLANGE ENDS

9.1 The end flanges of flanged valves shall be integral with the body and their dimensions shall be as per IS 6418:1971 'Cast iron and malleable cast iron flanges for general engineering purposes', unless otherwise specified by the purchaser. These shall be spot faced or back faced and shall be machine finished on the joint side. When noting particular is specified by the purchaser the flanges shall be supplied drilled and bolt holes shall be "off centres".

10. TESTING & INSPECTION

10.1 Pressure Tests

i) Shell Test (Hydrostatic) – Each assembled diaphragm valve in the full open or partly open position shall be subjected to hydrostatic shell test at a pressure of 1.5 times the maximum working pressure for a test duration of 5 minutes and there shall be no leakage when the pressure is applied to one end while other end is blanked. There shall be no air trapped within the valve when pressure is applied. The valve shall be tested before application of any paint.

ii) Seat Test (Hydrostatic) – The seat shall be hydrostatically tested at the maximum working pressure and the test duration of 5 minutes. Pressure shall be applied to each end successively the other being open to atmosphere. No visible leakage is permitted seat test.

10.2 **Lining Tests** – The lining shall be subjected to the following tests :

i) Spark test as per IS 4682 (Part 1):1994 – Routine test.

ii) Bonding test as per IS 4682 (Part 1):1994 – Type test.

10.3 **Test certificate** – The manufacturer shall issue test certificate confirming that the valves have been tested in accordance with this standard and starting the actual pressure and medium used in the test.

10.4 **Inspection** – If inspection is required, this shall be stated in the enquiry and order. The purchaser or his authorised representative shall have access to the manufacturer's works at all reasonable times to inspect assembled valves according to this order.

11. STORAGE / DESPATCH

11.1 Care should be taken that while storing / transportation the diaphragm shall be in non-stressed position.

12. INFORMATION TO BE SUPPLIED BY THE PURCHASER

12.1 The following information should be supplied by the purchaser in his enquiry or order :

i) Type and size

ii) Service condition e.g. nature of fluid conveyed, maximum and minimum working pressure and temperature

iii) Whether valves are to be used under vacuum condition

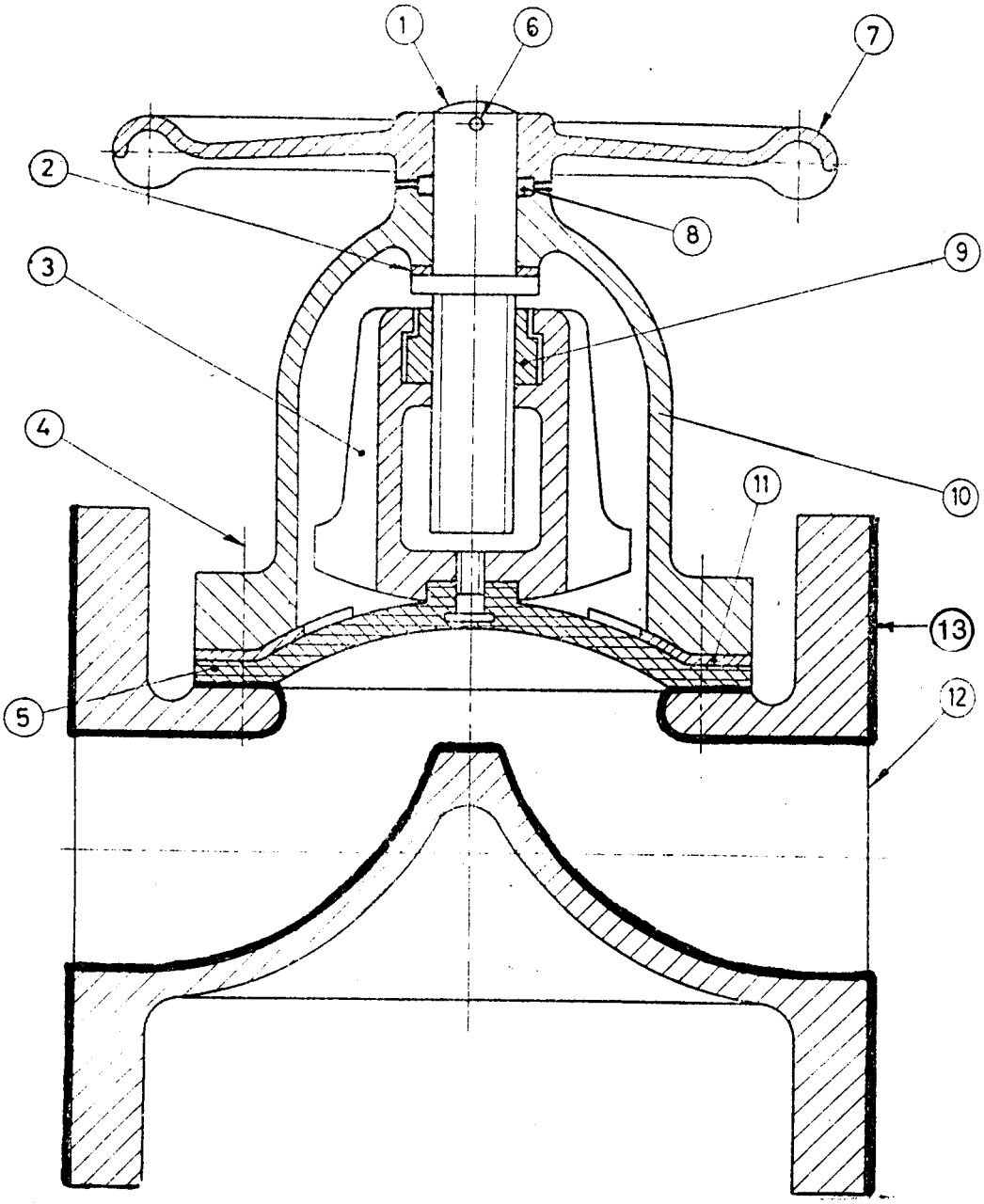
iv) Whether sealed bonnet valve is to be supplied

v) If actuator operation is required, type of actuator, maximum differential pressure across the valve, power source etc.

vi) Materials required for body & other components, body lining & diaphragm

vii) If specific materials are required for components (other than body, body lining and diaphragm)

viii) Any other specific requirement of purchaser.



Part No.	Name of Parts	Part No.	Name of Parts
1	Stem	7	Hand wheel
2	Washer (Taflon)	8	Washer
3	Compressor	9	Stem Nut
4	Studs and Nuts	10	Bonnet
5	Diaphragm	11	Finger plate
6	Pin	12	Body
		13	Body Lining

Fig-1 WIRE TYPE SEATING

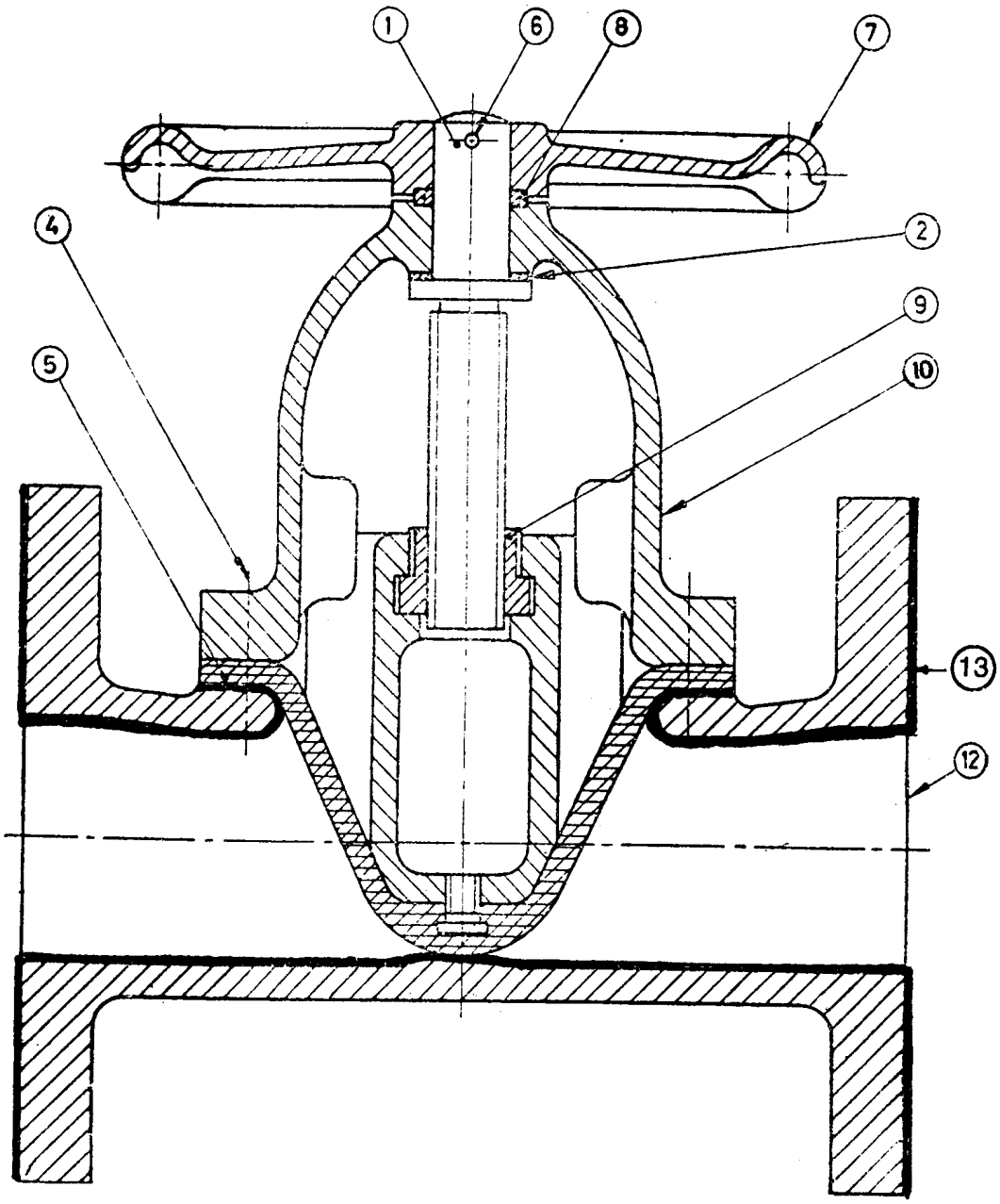


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Fig-2 STRAIGHT THROUGH PASSAGE

TABLE 1

END TO END AND CENTRE TO END DIMENSIONS FOR NOMINAL PRESSURE RATING OF PN 1.0 AND PN 1.6

(Ref clause 4.0 and Fig 3 & 4) (All dimensions in millimeters)

Nominal Diameter	End-to-End Dimension for Lined Valves (Fig 3)		Centre-to-End Dimension for Lined Valves (Fig 4)		Recommended Lining Thickness	
DN	L		E		F	
25	133	±1.0	86	76	3	+0.5
40	165		108	82	3	
50	199		134	99	4	
(65)	224		149	108	4	
80	262		182	131	4	
100	315		221	157	5	
(125)	366		259	183	5	
150	416		-	-	-	
200	531	±2.0	-	-	-	
250	645		-	-	-	
300	759		-	-	-	

( )Non preferred sizes

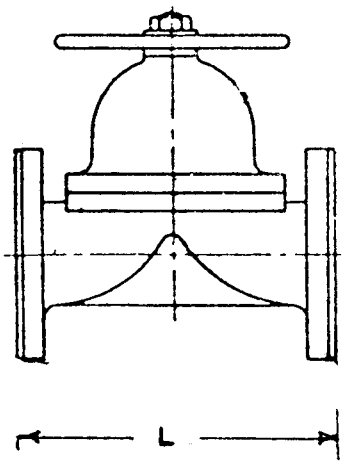

Fig-3
FACE TO FACE DIMENSIONS

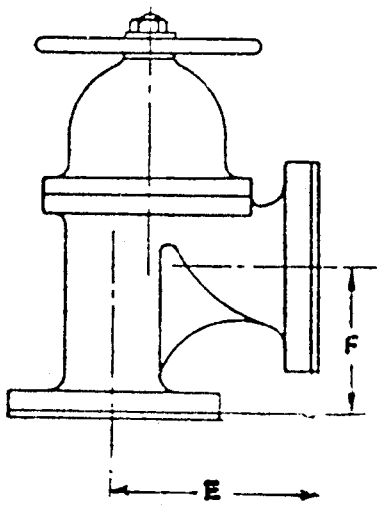

Fig-4
CENTRE TO FACE DIMENSIONS (SIZES 25 MM TO 125 MM)

TABLE 2

MATERIALS OF CONSTRUCTION FOR BODY LINING & DIAPHRAGM FOR VARIOUS APPLICATIONS

(Ref clause 1.2)

SL NO.	FLUID HANDLED	OPERATING TEMPERATURE oC	VALVE SIZE, mm	RECOMMENDED MATERIAL OF CONSTRUCTION	
				BODY LINING	DIAPHRAGM
1.	Soft water/DM water	Ambient	25 to 300	Natural rubber	Natural rubber
2.	Indl water containing suspended solids	5-50	25 to 150	Soft natural rubber	Natural rubber
3.	Brine solution	Ambient	25 to 100	Ebonite	Butyl rubber
4.	Brine water containing suspended solids	5-50	25 to 100	Neoprene	Neoprene
5.	Sulphuric acid Hydrochloric acid 80-99% 15-35% (1-14% & 36-80%)	5-80	25 to 150	CI unlined CI with Neoprene lining CI with butyl lining	Butyl PTFE with Neo back-up Butyl
6.	Hydrochloric acid	5-50	25 to 150	Ebonite	Butyl
7.	Alum	Ambient	25 to 50	Ebonite	Butyl
8.	Ammonium sulphate	5-60	25 to 150	Ebonite	Butyl
9.	Lithium bromide	5-30	25 to 50	Ebonite	Neoprene

No lining for stainless steel body.