INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR CAST STEEL NON-RETURN VALVES** (Swing & Lift Check type with flanged ends) *(First Revision)*	**IPSS:1-06-010-02**
	Corresponding IS does not exist	Formerly : IPSS:1-06-010-94

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 and established manufacturers of valves, was adopted in June 2002.

0.2 Inter Plant Standards for steel industry primarily aim at achieving rationalization and unification of parts and sub-assemblies used in steel plant equipment and accessories, and provide guidance in indenting stores or equipment for existing or new installations by individual steel plants. For exercising effective control on inventories, it is advisable to adopt procedure for installation as mentioned in this standard for the purpose of company standards of individual steel plants. It is not desirable to make deviations in technical requirements.

0.3 This IPSS Standard was first published in year 1994. Since then some Indian Standard appearing in this standard have been updated. Therefore, this IPSS Standard has been revised keeping in line with the revisions in IS.

0.4 In preparation of this standard, the assistance has been derived from the following :

i) ANSI B 16.10:1986 for face to face dimension
ii) API 600:1991 for wall thickness
iii) ANSI B 16.5:1988 only for thickness of flange
iv) API 598:1990 for testing of valve
v) IS 6392:1971 Steel pipe flanges (Amendment 1) for other flange dimension and drilling in the flanges.

1. SCOPE

1.1 This Inter Plant standard covers the requirement of cast steel non-return valves (swing & lift check type with flanged ends) used in steel plants for

conveying, oil, water and gases excluding oxygen. These valves are unidirectional and prevent the reversal of fluid flow.

2. MATERIAL

2.1 The material for the various components of valves shall be as per **Table-1** and **Table-2**.

3. DESIGN

3.1 General

3.1.1 The swing type non return valves recommended for horizontal as well as vertical installation, shall be mounted in such a way to close with downward flow.

3.1.2 The standard nomenclature for valve parts is shown in Fig.1 and Fig.2 which also illustrate some acceptable non-return valve features.

3.1.3 *Classification* – Cast steel non-return valves are classified according to nominal working pressure, nominal bore size and maximum allowable pressure at different working temperatures as specified below :

SL NO.	NOMINAL SIZE (DN)	NOMINAL WORKING PRESSURE (KG/CM^2g)	EQUIV. CLASS CONSI-DERED	HYDROTATIC TESTTING PRESSURE (KG/CM^2g)	
				BODY	SEAT
1.	50-600	16	300	24	16
2.	50-600	40	600	60	40
3.	50-300	64	1000	96	64

3.2 Body

3.2.1 Body shall be designed to minimize pressure loss as well as corrosive and erosive effects. Body ports shall be circular and be sound, smooth, leak proof and free from defects.

3.2.2 The wall of pressure portion of body shall not be drilled or pinned whereby it would reduce effective thickness of wall.

3.2.3 In the case of swing type, the full port area shall be maintained without pockets from the inlet port to the valve seat. On the outlet

side, the body shall be such contour that it allows sufficient swing of disc to give a flow area at least equal to full port area.

3.2.4 Suitable provision for stopping disc swing shall be made to prevent disc being getting stuck.

3.2.5 The face to face dimension for raised face flanged end swing type and life type non-return valves shall confirm with **Table-3**.

3.2.6 For raised face the gasket surface area shall have concentric or spiral serration finish of 125-500 uin.

3.2.7 Flange facing shall be machined to dimensions conforming with **Table-3**.

3.2.8 Auxiliary connections in the body, such as bypass, drains anti slam devices shall be furnished if specified in the purchase order and hence boss provisions shall be made conforming with IS 9625:1980.

3.3 **Cover**

3.3.1 Body cover connection shall be male and female.

3.3.2 In the case of lift type non-return valve piston guide shall be case integral with cover.

3.3.3 Tapping for lifting bolts or vent holes for piston guide in the case of lift check valves shall be so placed as to avoid reduction in effective wall thickness in the pressure containing portion.

3.4 **Disc**

3.4.1 The disc shall be of removable type.

3.4.2 In the case of swing type non-return valves the disc shall be secured to the hinge so as to allow self seating on the body seat ring.

3.4.3 In the case of lift type non-return valve the disc shall be integral with piston so as to guide for reseating on the body seat ring.

3.5 **Seat Ring**

3.5.1 Separate seat ring shall be provided in the body.

3.5.2 Seat ring shall be seal welded in the body (refer figure-1)

3.5.3 In the case of swing type non-return valve seat ring shall be inclined at an angle of approximately 5° from the vertical to facilitate closing to prevent chatter.

3.5.4 In the case of lift type non-return valve additional guide for disc in the seat ring is permitted. In such case the flow area through the seat ring shall not be less than 90% of full port area.

3.6 Hinge Pin/Disc Nut/Piston Guide Bush

3.6.1 Hinge pin, disc nut and piston guide bush shall be suitably secured to prevent loosening in service.

3.6.2 In case of lift type non-return valve piston guide bush shall permit the piston to travel upwards for a sufficient distance to provide adequate flow under the disc when in the highest position.

3.6.3 Piston guide bush shall be removeable and shall guide the piston throughout its entire travel.

3.7 Gasket

3.7.1 Body cover gasket shall be spiral wound metal gasket with asbestos filling.

3.7.2 Gasket shall be suitable for the pressure/temperature rating of the valve.

3.8 Bolting

3.8.1 Cover flange shall be bolted with stud having nuts on both the sides.

3.9 Operation

3.9.1 Both the swing and lift type check valve shall operate in horizontal lines with a slope (upward or downward) of 5° or less to the axis of the body ends.

3.9.2 Swing type check valves shall also be used in vertical lines with the flow in upward direction.

3.9.3 For smooth operation it is recommended to provide anti slam devices from size 300 mm and above.

If specified by the purchase or system requires then the anti slam devices like counterweight and dashpot shall be provided for other sizes also.

3.10 **By-pass**

3.10.1 If specified in the purchase order, an integral by-pass shall be provided.

3.10.2 The by-pass valve shall be a globe flanged end type, outside screw and yoke with rising stem and shall be of a class equal to or greater than that of the primary valve.

3.10.3 The by-pass valve stem shall have same orientation as the vertical axis of the primary valve.

4. TESTING AND INSPECTION

4.1 Testing - Testing of valve shall conform to API 598-1990 with following additional requirement :

a) The test duration shall be minimum 300 seconds.
b) The seat test shall also be carried out with 25% of the seat test pressure given in clause 3.1.3.

4.2 Inspection

4.2.1 When inspection by the purchaser is specified in the Purchase Order, the valve shall be inspected by the purchaser's inspector at the valve manufacturer's plant.

4.2.2 Unless additional inspection is specified in the purchaser order inspection by the purchaser shall be limited to the inspection of the assembled valve to assure compliance with the specifications of the standard.

5. DESIGNATION

Example – A cast steel non-return valve having a nominal size of 200 mm with a working pressure of 40 kg/cm^2 shall be designated as :

Cast steel swing check valve : CS-SCV 200-40, IPSS:1-06-010

OR

Cast steel lift check valve : CS-SCV 200-40, IPSS:1-06-010

6. MARKING

6.1 The valve shall be marked with the following informations :

i) An arrow indicating direction of the flow, manufacturer's name/trade mark, size, class & body material cast on body.

ii) IPSS No., and individual identification on non-corrosive plates firmly fitted on suitable place.

7. CERTIFICATION

7.1 The manufacturer shall issue the certificate for materials of construction, pressure tests and compliance to the standard.

8. GUARANTEE

8.1 Valves shall be warranted by the manufacturer against defective material, poor workmanship and improper design.

9. INORMATIONS TO BE PROVIDED BY THE MANUFACTURER

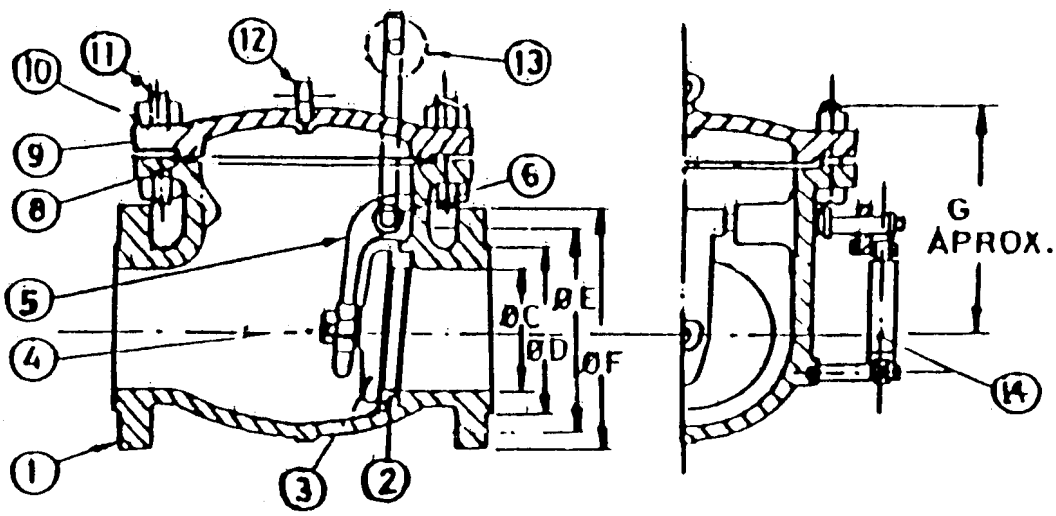
9.1 The manufacturer shall also provide the following additional information beside the data sheet indicating material of constructions and their composition :

i) Height from centre of the valve
ii) Weight of the valve
iii) Details of anti slam devices, if provided
iv) Pressure drop across the line.

10. INORMATION TO BE FURNISHED BY THE PURCHASER AT THE TIME OF ENQUIRY / ORDER

10.1 General Requirements

i) Type of valve .....Swing / Lift type
ii) Nominal size ..... mm
iii) Fluid handled .....
iv) Working pressure (kg/cm^2g) class .....
v) Max flow/normal flow .....
vi) Temperature of medium handled ..... °C
vii) Min differential pressure required for opening the valve - kg/cm^2g
viii) Bypass arrangement required YES / NO
ix) Purchaser's inspection required YES / NO
x) Anti slam devices required, if any YES / NO
Refer clause 3.9.3)
xi) Any other information.



COUNTER WEIGHT ARRANGEMENT DASHPOT ARRANGEMENT

ANTI SLAM DEVICES

TABLE – 1 (TO BE READ ALONG WITH SKETCHES SHOWN AT FIG-1)

MATERIALS SPECIFICATIONS FOR COMPONENTS OF SWING TYPE CHECK VALVE

SL NO.	VALVE COMPONENT	CONSTRUCTION REQUIRED	MATERIAL SPECIFICATION	REMARKS
1)	Body	Carbon steel	ASTM A-216 Grade WCB or equiv	Radiographic testing for class 600
2)	Seat ring	Seal welded	a) 13% Cromium steel similar to 12Cr13 of IS 1570 / ASTM A-216 WCB with 13%Cr facing (min thk 1.6 mm) b) stellite coating	Minimum hardness 300 HB, to be used for class 150 & 300. Minimum hardness 400 HB, to be used for all valves of class 600 and for class 150 & 300.
3)	Disc	Solid removable type	a) 13% Cromium steel similar to 12Cr13 of IS 1570 / ASTM A-216 WCB with 13%Cr facing (min thk 1.6 mm) b) Stellite coating	Hardness 50 HB < seat ring, to be used for class 150 & 300. Same as mentioned for seat ring above.
4)	Disc nut		12Cr13 of IS 1570 or equiv	
5)	Hinge		ASTM A-216 Grade WCB or equiv	
6)	Hinge pin		12Cr13 of IS 1570 or equiv	
7)	Bracket		ASTM A-216 Grade WCB or equiv	
8)	Gasket	Spiral wound	Compressed asbestos fibre reinforced with spiral wound SS-304 or equiv	
9)	Cover		ASTM A-216 Grade WCB or equiv	
10)	Cover stud nut		ASTM A-194 Grade 2H or equiv	
11)	Cover stud		ASTM A-193 Grade B7 or equiv	
12)	Lifting bolt	Forged	Carbon steel	
13)	Counter weight	Manufacturer's option		
14)	Dash pot	Manufacturer's option		

TABLE – 2 (TO BE READ ALONG WITH FIG-2)

MATERIALS SPECIFICATIONS FOR COMPONENTS OF LIFT CHECK VALVE

SL NO.	VALVE COMPONENT	CONSTRUCTION REQUIRED	MATERIAL SPECIFICATION	REMARKS
I	Body	Carbon steel	ASTM A-216 Grade WCB or equiv	Radiographic testing for class 600
II	Seat ring	Seal welded	a) 13% Cromium steel similar to 12Cr13 of IS 1570 / ASTM A-216 WCB with 13%Cr facing (min thk 1.6 mm) b) Stellite coating	Minimum hardness 300 HB, limited to applications. Minimum hardness 400 HB, to be used for all valves of class 600 and for class 150 & 300.
III.	Disc	Solid removable type	a) 13% Cromium steel similar to 12Cr13 of IS 1570 / ASTM A-216 WCB with 13%Cr facing (min thk 1.6 mm) b) Stellite coating	Hardness 50 HB < seat ring, limited to applications. Same as mentioned for seat ring above.
IV.	Piston guide bush		12Cr13 of IS 1570 or equiv	
V.	Piston		12Cr13 of IS 1570	
VI.	Piston guide		ASTM A-216 Grade WCB	Integral part of body cover
VII.	Body Gasket	Spiral wound	Compressed asbestos fibre reinforced with spiral wound SS-304 or equiv	
VIII.	Cover		ASTM A-216 Grade WCB	
IX	Cover stud nut		ASTM A-194 Grade 2H	
X	Cover stud		ASTM A-193 Grade B7	
XI	Lifting bolt	Forged	Carbon steel	

TABLE – 3 (TO BE READ ALONG WITH FIG-1 & 2)

CAST CARBON STEEL SWING CHECK AND LIFT CHECK VALVE WITH FLANGED ENDS

NOMINAL SIZE	FACE TO FACE INCLUDING RAISED FACE		FLANGED THICKNESS INCLUDING RAISED FACE	FLANGE DIAMETER	R.F. DIAMETER	R.F. HEIGHT	PITCH CIRCLE DIAMETER	NUMBER OF HOLES	HOLE DIAMETER
C	A		B	F	D	H	E	N	K
	SWING	LIFT							
PRESSURE CLASS : 300									
50	266.7	266.7	22.3	165	102	1.5	125	4	18
80	317.5	317.5	28.4	200	138	1.5	160	8	18
100	355.6	355.6	31.7	235	162	1.5	190	8	22
150	444.5	444.5	36.6	300	218	1.5	250	8	26
200	533.4	558.8	41.1	375	285	1.5	320	12	30
250	622.3	622.3	47.7	450	345	1.5	385	12	33
300	711.2	711.2	50.8	515	410	1.5	450	16	33
350	812.8	-	53.8	580	465	1.5	510	16	36
400	838.2	-	57.1	660	535	1.5	585	16	39
500	990.6	-	63.5	755	615	1.5	670	20	42
600	1143.0	-	69.8	890	735	1.5	795	20	48
PRESSURE CLASS : 600									
50	292.1	292.1	28.4	180	102	3	135	4	22
80	355.6	355.6	34.8	215	138	3	170	8	22
100	431.8	431.8	41.1	250	162	3	200	8	26
150	558.8	558.8	50.8	345	218	3	280	8	33
200	660.4	660.4	58.6	415	285	3	345	12	36
250	787.4	787.4	66.5	470	345	3	400	12	36
300	838.2	838.2	69.5	530	410	3	460	16	36

Note:

1. Ref Stds : ANSI B 16.10:1986 for face to face dimension, ANSI B 16.5:1988 for only flange thickness; IS 6392:1971 for other flange dimension and drilling in the flanges.
2. However, any changes in the latest revision (of corresponding changes) may be referred to.
3. All dimensions in mm.

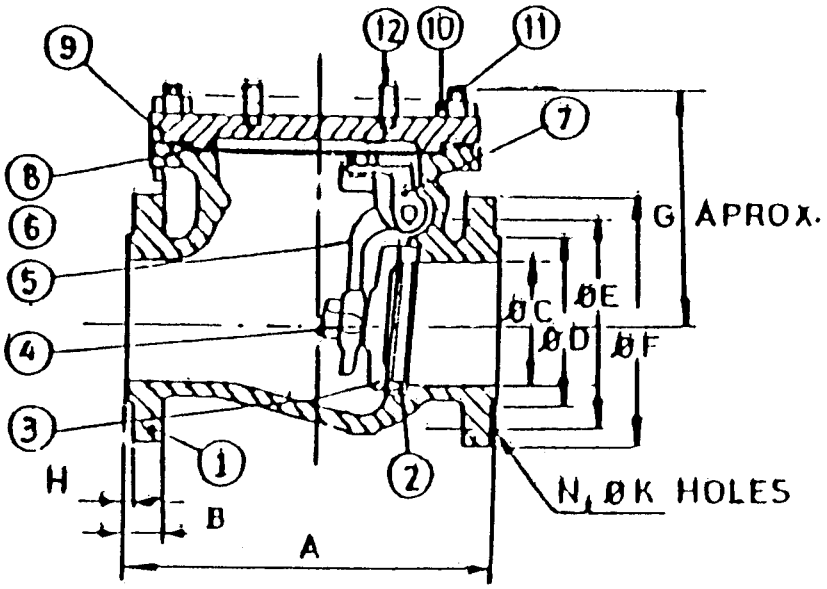


FIG. 1 SWING CHECK VALVE

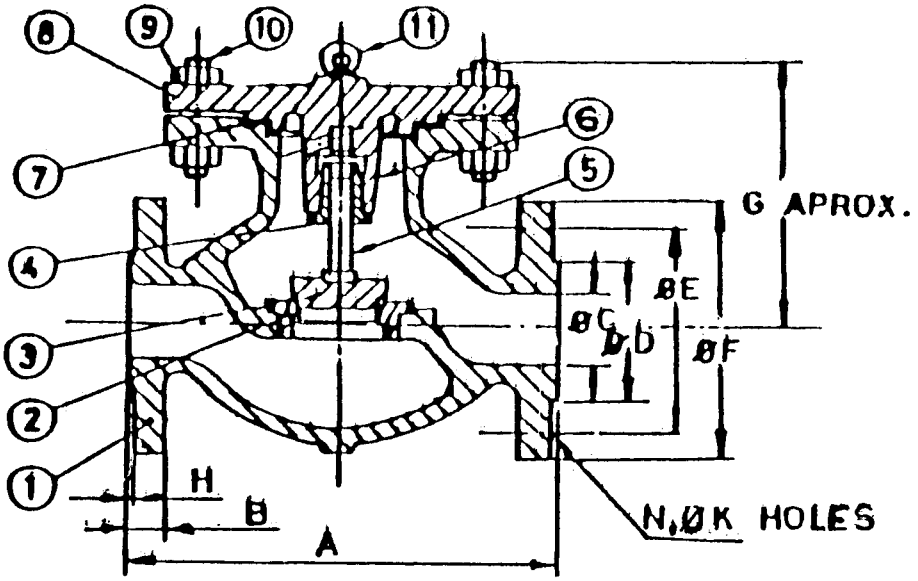


FIG. 2 LIFT CHECK VALVE