INTER PLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION OF GLAND COMPENSATORS**	**IPSS:1-06-041-08**
	No Corresponding Indian Standard exists	

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 gland compensators, was adopted as IPSS Standard in August 2008.

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 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 select a fewer number of sizes (or types) from among those mentioned in this standard for the purpose of company standards, of individual steel plants. It is not desirable to make deviations in technical requirements.

1. SCOPE

1.1 This Standard covers the guidelines for selection, manufacture, inspection and test procedures and other relevant details of gland compensators for steel plant piping application in water, slurry lines & Coke Oven Gas Lines. This standard is applicable to pipelines with working pressure upto 6 kgf/cm2 (Gauge).

2. DEFINITION

2.1 Compensator (Expansion Joint) is a device used to absorb dimensional changes such as caused by thermal expansion of pipeline.

2.2 Gland compensator is generally used where variation of skin temperature of pipe is upto 100 deg C and maximum temperature should not exceed 150 deg C and for services involving deposition of thicker condensate and /or solid particles.

2.3 Application as per following:

SERVICES	SIZE RANGE
Water, slurry line	DN 100-1600
Raw/Clean coke oven gas line- out door pipelines (upto operating pressure 2000mm WC)	DN 250- 2000

3. DESCRIPTION

3.1 **Compensator** – The gland type compensators are of welded construction and they are used in pipelines to take care of expansion of piping. Each compensator consists of two pieces of flanged steel pipes, one sliding within the other. The sealing arrangement consists of a flanged stuffing box formed at the end of the trigger-pipe packed with blue asbestos cords and provided with a steel wire ring. All the components are of steel construction. The compensators shall be complete with carbon steel companion flanges, bolts, nuts, gaskets & washers.

3.2 **Construction Features** – The gland compensator is a socket & spigot joint of welded construction. The joint is made water tight / air tight by asbestos graphite or chord graphite or Neoprene Rubber packing

materials of suitable size. The thickness of the packing material shall be slightly more than annular space between the spigot and the socket. The space shall be provided for tightening during operation. A stopper ring is provided inside the socket to function as a shoulder of the socket and shall be equal to the change in lengths to be accommodated with requisite safety margin.

3.2.1 Typical construction features are shown in Fig.1 & the corresponding dimensions are indicated in **Table-1**.

3.2.2 **Materials of Construction** – The materials of construction of gland compensators shall be as follows as indicated in Table-2.

TABLE - 2

SL NO.	DESCRIPTION	MATERIAL	STANDARD
1	Shell	Carbon Steel	IS 2062:1999
2	Ring	Carbon Steel	IS 2062:1999
3	Stopper	Carbon Steel	IS 2062:1999
4	Guide	Carbon Steel	IS 2062:1999
5	Flange	Carbon Steel	IS 2062:1999
6	Bolt & Nut	Carbon Steel	IS 1367 (Part 8):1992
7	a) Gasket/packing for slurry, Water-Line and for coke oven gas pipelines	Asbestos, Graphite chord	CAF as per IS:2712:1979, Grade W/1
	b) Gasket/packing for drinking Water-Line	Neoprene rubber	Shore hardness = 50.

4. TECHNICAL REQUIREMENT

4.1 Compensator shall be designed for maximum working pressure, temperature and movement as specified. Fig.1 is only for guidance for constructional features. The manufacturing drawing shall be developed based on the data / specification provided by the purchasers.

4.2 The compensator shall be complete with carbon steel companion flanges, bolts nuts gaskets & washers.

4.3 Radial clearance between moving members of compensators shall be within 2 to 3 mm when one member is rotating relative to another one through any angle.

4.4 Joints on the sliding surface of shells shall be ground flush with basic metal after welding.

4.5 In the assembled condition, all dimensions shall correspond to the approved manufacturing drawings. Moving parts shall turn freely relative to each other for any angle and displaced easily in longitudinal direction.

4.6 The dimensions of the flanges shall correspond to the relevant table of IS:6392-1971 or as specified by the purchaser for the maximum working pressure and temperature required.

4.7 Assembly for elements shall be carried out using proper devices so that correct relative location of such elements is ensured. Elements shall be kept fixed during welding by the use of clamps.

4.8 Welding of the shell joints over the summit side is essential for compensator of any size.

4.9 For arc welding, electrode shall be as per IS: 814-2004 & for gas welding, wire shall be as per IS: 1278-1972.

4.10 Plate cutting and chamfering shall be carried out by means of gas cutting with subsequent hand grinding. The chamfer shall be smooth and symmetrical about the pipe axis.

4.11 On the mating surfaces of the flanges, there shall be no blemishes, cracks, transversal and other defects reducing the strength of joints. Reverse side of flanges shall be smooth for normal fit of the bolt heads or nuts to the flanges.

4.12 Bolting shall be as per Table-2 of IS: 1363 (Part-3) – 1992.

4.13 The parts shall be assembled and the retaining rings shall be welded from both sides. During leakage test, all welded joints shall be covered with soap solution. Any leakage shall be eliminated by cutting out defective section and re-welding.

4.14 Compensator shall be painted after inspection & testing. The internal painting for compensator for coke oven gas lines shall be as per purchaser's requirement.

5. INSPECTION AND TESTING

5.1 Inspection & tests of the items shall be carried in presence of the purchaser / his authorized representative. Manufactured items shall be put up for inspection prior to painting.

5.2 Checking of the dimensions and details as per the sketches, drawings & specifications.

5.3 All the welded joints shall be checked by visual inspection and dye-penetration (DP Test) for detecting the following defects :

- Cracks that come out on the joint surface of basic metal located in the zone of thermal influence in welding.
- Welding fuse or cuts in spots where joint passes over the parent metal.
- Sponginess and porosity on the outer surface of the joint.
- Irregular width and height of a joint and its possible deviation from axis.

- Deviation from joint dimensions shown in the sketches or in the specification.
- Defective spots found by such inspection shall be chipped off and re-welded and tested again.

5.4 **Hydraulic Test** – For conducting hydraulic test each compensator shall be blanked at both ends. The compensator shall be hydraulically tested at least for 30 minutes at pressure 1.5 times the maximum working pressure. Any leakage through the gland is not permitted.

5.5 **Pneumatic Test** – Compensator for gas line shall be tested with compressed air to test for air tightness. Blind flanges provided for the test at both ends shall be connected with each other by special connecting bolts. The test pressure shall be 1.25 times of maximum working pressure or 0.2 kg/cm^2 gauge whichever is higher and shall be conducted for at least 30 minutes. The test results shall be considered satisfactory if the leakage value calculated by the following formula is within 2 per cent.

- Gas leakage value in percentage is given by the following formula:
  - Leakage in % = $100 [1 - (P_f \times T_S)/(P_s \times T_F)]$ where

P_f = absolute pressure (final) in kg/cm^2(a)

P_s = absolute pressure (start) in kg/cm^2(a)

T_f = absolute temperature (final) in ^oK

T_s = absolute temperature (start) in ^oK

6. TEST DOCUMENTS

6.1 The following documents shall be furnished to the purchasers during/after testing & inspection:

a) Material test certificates for the components,

b) Result of the DP test/kerosene test

c) Result of hydraulic test/pneumatic test.

d) Results of dimensional checks.