INTERPLANT STANDARD — STEEL INDUSTRY

IP SS

DESIGN PARAMETERS FOR STEEL TEEMING LADLES

IPSS : 2-01-001-81

CORRESPONDING INDIAN STANDARD NOT AVAILABLE

0. Foreword

0.1 Interplant standardization activity in steel industry is being pursued under the aegis of the Indian Standards Institution (ISI) and the Steel Authority of India Limited (SAIL). This Interplant Standard, prepared by the Working Group on Steel Plant Ladles and Rolling Stock, IPSS 2 : 1, with the active participation of the representatives of the steel plants, established manufacturers of ladles and reputed consulting organizations, was adopted by the Approval Committee on Design Parameters, IPSS 2, on 19 December 1981.

0.2 Interplant Standards on design parameters primarily aim at achieving rationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in their design activities.

0.3 This standard attempts at prescribing uniform overall dimensions and other parameters for design of steel teeming ladles so that the complementary equipment, such as the lifting beam or traverse of the EOT crane and the ladle cars could be designed in harmony. Broad guidance in material selection has also been given in this standard. However, for the details of manufacturing practices, including heat treatment and testing, good manufacturing practices and/or the relevant Indian Standards are applicable.

0.4 This standard is essentially futuristic in nature and as such the developments in technology have been incorporated in it, to the extent possible. Hence for new steel plants and in the expansion programmes of the existing steel plants, deviations from the stipulations of this standard are not desirable. However, if the present situation in any existing steel plants so demands, the designer may deviate from the stipulations of this standard with respect to the shape of the bottom (that is, using flat bottom, if necessary), and smaller sizes. The designer could also use the stopperless design in ladles which, though not covered in the standard, is the latest innovation in the design of teeming ladles.

---

1. Scope — This Interplant Standard covers the design parameters and related aspects of steel teeming ladles of 50 to 300-tonne capacities for serving open hearth furnaces, converters and electric arc furnaces installed in steel melting shops.

2. Dimensions — The dimensions of shell, stopper and tilting arrangements shall be as given in Tables 1, 2 and 3, respectively. For deciding tolerance on linear dimensions the 'coarse' class of deviation as stipulated in 'IS : 2102 (Part I)-1980 General tolerances for dimensions and form and position: Part I General tolerances for linear and angular dimensions (*second revision*)' shall apply.

Amendments issued (*to be filled up by the user department*):

No.	Date of Issue	No.	Date of Issue
1		3	
2		4	

UDC 621·746·32 : 669·18

TABLE 1 DIMENSIONS OF SHELL OF THE LADLE (READ WITH FIG. 1)

(*Clause* 2)

(All dimensions are in millimetres)

Nominal Capacity of Ladle in Tonnes	D	D_1	d	C	L (*Max*)	l	H	B	B_1	h	h_1 (*Max*)	h_2	H_1 (*Max*)	H_2 (*Max*)
50	2 620	2 310	250	3 050	3 330	180	3 200	2 870	1 100	880	1 050	300	4 000	3 400
60	2 730	2 310	250	3 200	3 480	180	3 300	2 970	1 100	930	1 050	930	4 100	3 500
70	2 960	2 310	280	3 350	3 640	180	3 400	3 120	1 200	1 000	1 050	300	4 200	3 600
90	3 070	2 758	305	3 620	3 960	220	3 550	3 400	1 300	1 200	1 100	450	4 370	3 770
110	3 400	2 758	390	3 900	4 275	220	3 770	3 660	1 500	1 250	1 170	450	4 600	4 000
130	3 600	3 100	390	4 300	4 695	240	3 800	4 060	1 600	1 300	1 200	530	4 640	4 040
175	3 670	3 100	420	4 400	4 810	240	4 690	4 160	1 800	1 650	1 260	530	5 540	5 000
220	4 000	3 376	430	4 500	4 920	250	4 875	4 250	1 980	1 675	1 350	600	5 600	5 000
250	4 265	3 785	450	4 900	5 330	250	4 790	4 600	1 980	1 690	1 550	600	5 670	5 070
270	4 350	3 785	470	5 000	5 460	280	4 965	4 680	1 980	1 820	1 550	600	5 740	5 250
300	4 400	3 785	470	5 000	5 460	280	5 320	4 720	1 980	1 840	1 650	600	6 200	5 600

TABLE 2 DIMENSIONS OF STOPPER ARRANGEMENTS (READ WITH FIG. 2)

(*Clause* 2)

(All dimensions are in millimetres)

Nominal Capacity of Ladle in Tonnes	*A*	*B*	*M* (*Max*)	d_1	d_2
50	1 660	150	2 500	219	M 48
60	1 615	150	2 500	219	M 48
70	1 725	150	2 600	219	M 48
90	1 900	200	2 500	219	M 48
110	2 060	200	2 500	219	M 56
130	2 100	200	2 700	219	M 56
175	2 300	200	4 100	219	M 56
220	2 360	200	4 100	219	M 56
250	2 490	200	4 560	219	M 56
270	2 530	200	4 810	219	M 56
300	2 560	200	4 810	219	M 56

TABLE 3 DIMENSIONS OF TILTING ARRANGEMENTS (READ WITH FIG. 3)

(*Clause* 2)

(All dimensions are in millimetres)

Nominal Capacity of Ladle in Tonnes	*K* (*Max*)	*b*	d_3
50	1 850	200	100
60	1 850	200	100
70	1 850	200	100
90	2 100	240	120
110	2 500	260	160
130	2 500	260	160
175	2 500	260	160
220	2 750	260	180
250	2 950	260	180
270	2 950	260	180
300	2 950	260	180

3. Materials — The material used for manufacturing different parts of the ladle shall be as follows:

a) Cylindrical shell and dished bottom — Steel St Gr 2A or St Gr 2B according to 'IS : 2002-1962 Specification for steel plates for boilers' or steel St 42-W according to 'IS : 2062-1980 Specification for structural steel (fusion welding quality) (*second revision*)'. However, in both these steels, the tensile strength shall be 48-52 kgf/mm^2 and the carbon content shall not be more than 0·20 percent

b) Trunion and trunion plate — Steel C20 or C30 according to 'IS : 1570 1961 Schedules for wrought steels for general engineering purposes'

c) Stopper rod and other components — Steel St 42-W according to IS : 2062-1969 or steel C20 according to IS : 1570-1961

Note — The manufacturer shall furnish test certificates for each forging of trunion and trunion plate to guarantee the mechanical properties, chemical composition and soundness of material.

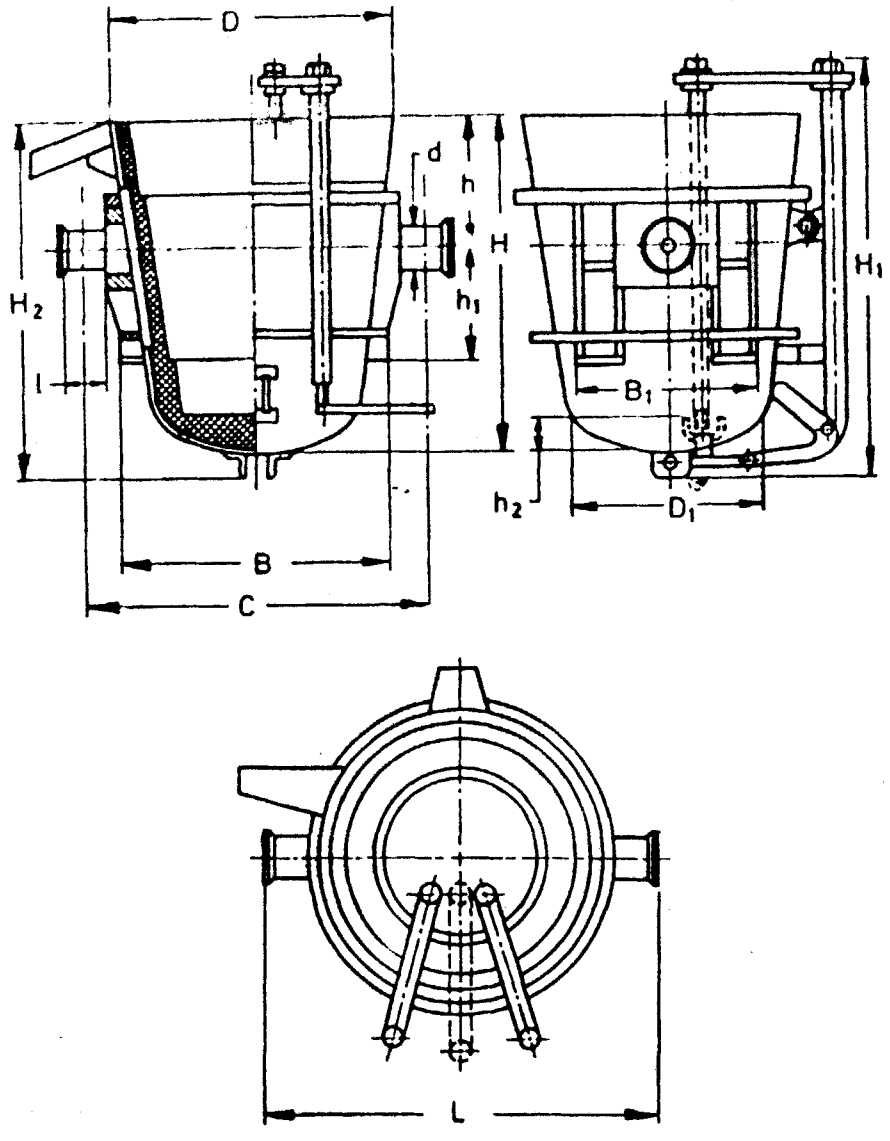

FIG. 1 STEEL TEEMING LADLE

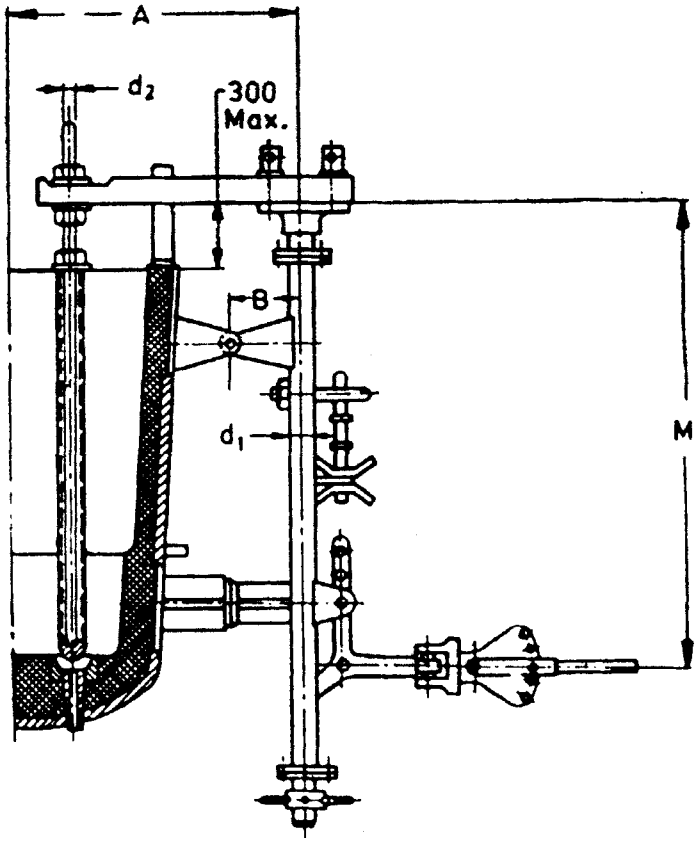

FIG. 2 STOPPER ARRANGEMENTS IN TEEMING LADLE

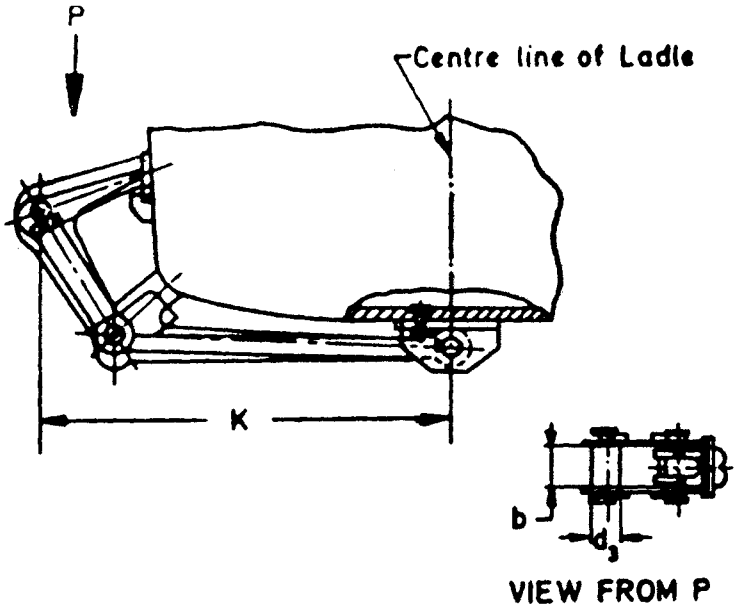

FIG. 3 TILTING ARRANGEMENTS IN TEEMING LADLE

4. Design and Construction

4.1 The ladle shall be designed so as to avoid all possible chances of accidents in various conditions of service.

4.2 The ladle shall be of all welded construction. Electrodes and welding methods selected for the welded joints shall be such that the strength of the welded joints is not less than that of the parent metal. All important joints shall be subjected to ultrasonic tests/radiographic examination.

4.3 The trunion shall be designed with a minimum factor of safety of 8. The trunion and the trunion plate shall be forged and annealed. Suitable provision of sleeving of the trunion may be made if so desired by the user.

4.4 The shell shall be designed for a maximum operating condition of 350°C; the refractory linings shall be designed accordingly.

Note — The delivery of the ladle may be in assembled or disassembled condition as agreed to between the purchaser and the manufacturer (depending upon the facilities of transportation).

Printed at Kapoor Art Press, New Delhi, India