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Government of India
Ministry of Industry
(Department of Industrial Development)
Central Boilers Board

New Delhi, the 14th October, 1999.

Notification

G.S.R. 345.- Whereas certain draft regulations, further to amend the Indian Boiler Regulations, 1950, were published, as required by sub-section (1) of section 31 of the Indian Boilers Act, 1923 (5 of 1923), at pages 1279 to 1288 in Part II, Section 3, Sub-section (i) of the Gazette of India, dated the 3rd July, 1999, vide notification of the Government of India in the Ministry of Industry (Department of Industrial Development) (Central Boilers Board) number G.S.R. 207, dated the 21st June, 1999 for inviting objections and suggestions from persons likely to be affected thereby till the expiry of forty-five days from the date on which copies of the Gazette containing the said notification were made available to the public;

And whereas the said Gazette was made available to the public on the 7th July, 1999;

And whereas no objections or suggestions were received within the specified period;

Now, therefore, in exercise of the powers conferred by section 28 of the Indian Boilers Act, 1923 (5 of 1923), the Central Boilers Board hereby makes the following regulations further to amend the Indian Boiler Regulations, 1950, namely:-

1. (1) These regulations may be called the Indian Boiler (Fourth Amendment) Regulations, 1999.
(2) They shall come into force on the date of their publication in the Official Gazette

2. In the Indian Boiler Regulations, 1950, for regulations 57, 58, 59, 60, 61, 62, 63 and 63A, the following regulations shall be substituted, namely : -

"57. General.- (a) These regulations cover electrically welded tubes made of steel and intended for boiler, super heater and heat exchanger

(b) The welded tubes conforming to other national or international standard which are known to be commonly used as being suitable for use as boiler, superheater and heat exchange tubes can also be used with the designation of the national or international standard, provided such materials are not specially prohibited by the regulations.

58. Material.- (a) Tubes shall be manufactured from steel produced by an open hearth, or electric process or any of the oxygen processes.

(b) Manufacture – The tube shall be made by electric resistance welding and heat treated as per the table given below. In case of cold finished tubes the heat treatment shall be done after the final cold finishing process.

Tube Grade	Heat treatment
WC 1	Normalized* or sub-critically annealed #
WC 2 & WC 3	Normalized*

* Temperature range 800 Deg.C to 940 Deg.C.
\# Temperature range 660 Deg.C to 720 Deg.C.

The tube shall be well finished and free from harmful defects. The external weld (flash) shall be removed completely i.e. flushed with outside surface. The internal weld upset shall be trimmed throughout the length of the tube so that the maximum height shall not exceed 0.25 mm.

(c) Chemical Composition.- Ladle analysis of the steel grades shall conform to the following requirements.

Tube Grade	C	Mn	Si	P	S
WC 1	0.16 max	0.30/0.70	0.35 max	0.040 max	0.040max
WC 2	0.17 max	0.40/0.80	0.10/0.35	0.035 max	0.035max
WC 3	0.12/0.18	0.90/1.20	0.10/0.35	0.035 max	0.035max

NOTE :1 WC1 grade may be fully killed, rimmed or semikilled.

NOTE: 2 For rimmed or semikilled steel, in case of grade WC1, the C max is 0.19%.

Where the temperature is below 400 Deg.C either rimming, semikilled or killed steel may be used. If rimming steel is used, the strips shall be rolled in single width, and not slit longitudinally.

The steel used for design steam temperature above 400 Deg. C shall be of fully killed type.

When ladle analysis is not available the analysis of sample tube selected at random may be used.

(d) Thickness . - The thickness of each tube excluding the weld shall conform to the permissible variation given below :

Permissible variation (in percent) in wall thickness.

Tube Grade	Wall thickness	Permissible variation Over	Under
WC1	3.2 mm and under	10	10
WC1	Over 3.2 mm	7.5	7.5
WC2 &WC3	All	10	10

The minimum thickness in the weld area shall not be less than that permitted in the body of the tubes.

(e) Diameter – The outside diameter of each tube measured at any position shall conform to the specified diameter within the limits of plus 0.75% and minus 0.75% with a minimum of 0.30 mm over and under.

(f) Length- Unless otherwise specified tube shall be supplied as random length. Where the length is specified as exact length or cut length, the permissible variation shall be + 6mm -0 mm for length up to and including 6 meters. For every 3 metre increase in length above 6 metres, the positive tolerance shall be increased by 1.5 mm with a maximum of 12 mm.

59(a) Flattening test.- (i) A section of the tube not less than 40 mm length shall be flattened cold between parallel plates. No cracks or breaks in the metal shall occur until the distance between the plates is less than the given by the following formula. Evidence of lamination or burnt material or incomplete penetration of the weld shall not develop during the testing.

$$H = \frac{(1 + e)\,t}{e + (t/D)}$$

Where t = Specified thickness of tube (in mm)
D = Specified outside diameter of tube (in mm)
e = Flattening test constant as given below :
0.10 for tube grade WC 1
0.07 for tube grades WC2 & WC3.

(ii) The weld shall be placed 90 degree from the line of direction of the applied force.

(iii) Superficial rupture as a result of minor surface imperfections shall not be cause for rejection.

(iv) Flattening test carried out in accordance with any other standard code may be accepted in which case the code adopted shall be specified.

(b) Flaring Test.- A section of tube of length equal to 1.5 times the outside diameter, but not less than 50 mm, shall stand being flared with a tool having 60 or 45 degree included angle until the tube at the mouth of the flare has expanded to the percentage given below without cracking

Tube Grade	% expansion in outside diameter D for a d/D of		
	0.6 and under	Over 0.6 to 0.8 including	Over 0.8
WC 1	12	15	19
WC2	12	15	19
WC3	10	12	17

d = inside diameter of tube.

60. Tensile Test.- (a) The tensile strength of the material cut from the finished tube shall conform to the following requirement.

Tube Grade	Yield strength Mpa(kgf/mm sq.) (Min)	Tensile strength Mpa(kgf/mm^2) (Min)	% Elongation+ (Min)
WC1	195 (19.9)	320/480 (32.6/49.0)	25
WC2	235 (24.0)	360/500 (36.7/51.00)	24
WC3	245 (25.0)	440/580 (44.9/59.2)	21

+ On gauge length $5.65\sqrt{A}$ where A is the initial cross sectional area of the specimen on the gauge length.

(b) Allowable permissible stress at elevated temperature. Allowable permissible stress as per the respective code shall be strictly followed.

61. **Hydraulic test.-(a)** Each tube shall be hydraulically tested at the makers' works and shall withstand a hydraulic pressure to one and half times, the design pressure, subject to a minimum of 1.00 kg/mm sq. and for tube OD larger than 101 mm outside diameter minimum of 0.8 kg/mm sq. However, the test pressure shall not be greater than the pressure calculated by the following formula.

$$P = \frac{2 S t}{D}$$

Where P = test pressure (in kg/mm sq.)
D = specified outside diameter of the tube
t = specified wall thickness
S = stress (in kgf/mm sq.) which shall be taken as 40% of the specified minimum tensile strength at room temperature.

(b) Notwithstanding anything contained in the above regulation, the hydraulic test at the maker's works may be dispensed with, provided that the tubes are subjected to non destructive testing by an appropriate method like Ultrasonic or Eddy current testing.

62. Test specimens.- (a) Test specimens required for the flattening and flaring test specified in regulations 59 (a) and 59 (b) shall be taken from the ends of finished tubes prior to up setting, swaging, expanding or other forming operations or being cut to length. They shall be smooth on the ends and free from burrs and flaws.

(**b)** If desirable and practicable, tensile test, may be carried out on full section of the tubes up to the capacity of the testing machine. For large size tubes, the tensile test specimen shall consist of strip cut longitudinally from the tube and not flattened between the gauge marks and further heat treated. The sides of the specimen shall be parallel between gauge marks.

(c) All specimens shall be tested at room temperature.

63. Number of tests.- (a) The test specified in regulations 59 and 60 shall be made on minimum 2 tubes for first 100 and 1 per 100 or part thereof for tubes over 100 number.

(b) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(c) If any one or more tests specified in these regulations fail, two further tests of the same kind may be made on two other tubes of the same batch. If any of these tests fails, the batch of the tubes represented may be given a further heat treatment and entire set of tests shall be repeated.

If the repeat tests are satisfactory the tubes shall be accepted. If any failure in the tests should occur the entire batch of the tubes shall be rejected.

63A(i) Material.- Material, tube grade and chemical composition for these tubes shall be in accordance with the appropriate clause of Regulation 58.

(ii) Manufacture.- Tube shall be manufactured as prescribed in Regulation 58(b) and subsequently cold drawn.

(iii)Tolerances.- Tolerance on thickness and outside diameter shall be as follows :

Thickness - Plus 7.5% minus 7.5%
Outside diameter Plus 0.5% minus 0.5%
(With a minimum of 0.10 mm over and under).

Tolerance on length shall be in accordance with Regulation 58(f).

(iv) Heat Treatment.- After final cold finishing the tubes shall be heat treated as follows :

Tubes Grade	Heat treatment
WC 1	Normalized* or sub-critically annealed#
WC 2, WC 3	Normalized*

The ends which are subjected to cold working operation shall be suitably normalized or sub-critically annealed as above.

*Temperature range 880 Deg.C to 940 Deg.C.
Temperature range 660 Deg.C to 720 Deg.C.

(v) Tests.- (a)Tensile Test. – This test shall be comply with the provision of Regulation 60.

(b) Flattening test.– This test shall comply with the provision of Regulation 59(a).

(c) Flaring test.– This shall comply with the provision of Regulation 59(b).

(vi) Hydraulic test.- This shall comply with the provision of Regulation 61.

(vii) Test specimens.-These shall comply with the provision of Regulation 62.

(viii) Number of tests.- These shall comply with the provisions of Regulation 63

(V. K. GOEL)
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Footnote:- The principal regulations were published in the Gazette of India vide S.O. 600, dated the 15th September, 1950 and subsequently amended vide notifications –

(i) G.S.R. 178, dated the 24th March, 1990;
(ii) G.S.R. 179, dated the 24th March, 1990;
(iii) G.S.R. 488, dated the 9th October, 1993;
(iv) G.S.R. 516 dated the 23rd October, 1993;
(v) G.S.R. 634 dated the 25th December, 1993;
(vi) G.S.R. 107 dated the 26th February, 1994;
Errata G.S.R. 223 dated the 14th May, 1994;
(vii) G.S.R. 250 dated the 4th June, 1994;
(viii) G.S.R. 402 dated the13th August, 1994;
(ix) G.S.R. 427 dated the 20th August, 1994;
(x) G.S.R. 562 dated the12th November, 1994;
(xi) G.S.R. 607 dated the10th December, 1994;
(xii) G.S.R. 83 dated the 25th February, 1995;
(xiii) G.S.R. 93 dated the 4th March, 1995;
(xiv) G.S.R. 488 dated the 9th November, 1996;
(xv) G.S.R. 582 dated the 28th December, 1996;
(xvi) G.S.R. 59 dated the 25th January, 1997;
(xvii) G.S.R. 117 dated the 1st March, 1997;
(xviii) G.S.R. 172 dated the 29th March, 1997.
(xix) G.S.R. 221 dated the 21st November, 1998.
(xx) G.S.R. 131 dated 1st May, 1999.
(xxi) G.S.R. 139 dated 8th May, 1999.
(xxii) G.S.R. 237 dated 31st July, 1999.

To

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