CHAPTER XIV

[Regulations prescribed under section 28(a) and section 28(aa)]

MINIATURE BOILERS

GENERAL

618. Scope.—This Chapter shall apply to the design, construction and testing of Miniature Boilers, for use in small establishments.

619. Definition.—In this Chapter the term 'miniature boiler' shall mean a boiler which does not exceed the following limits :—

Inside diameter of shell	..	408 mm. (16 in.)
Over-all length of outside to outside of heads at Centre	..	1071 mm. (42 in.)
Heating surface	..	1·85 sq. meter (20 sq. ft.)
Maximum allowable working pressure	..	2·11 kg/cm² (30 lb.sq./in.)

620. Extent to which variation from the standard conditions laid down in the preceding Chapters is permissible.—Considering the preculiar need in small establishments to adopt simple types of miniature boilers requiring easy operation, the following variations from the standard conditions laid down in the preceding Chapters are permitted subject to the conditions specified below, with due regard to the safety of the boilers and persons.

(1) **Materials.**—The materials used in the construction of such boilers shall, except as otherwise provided hereinafter, comply with the provisions made in Chapter II of these Regulations. Copper plates used in the construction of boiler parts, shall not be less than 3 mm. (1/8 in. thick). No boiler part exceeding 9832 cu. cm. (600 cu. in.) in volume shall be made of cast copper or bronze. Copper and bronze castings shall have a copper content not less than 90 per cent. and a thickness below 6 mm. (1/4″).

Steel plates used in the construction of boiler shall be of fire box or flange quality and the plates for shell or heads shall be not less than 6 mm. (1/4 in.) in thickness except that seamless shell shall be not less than 4·8 mm. (3/16 in.) in thickness. The heads used as tube sheets for tubes rolled in shall be at least 8 mm. (5/16″) in thickness.

Heads or parts of boilers when not exposed to direct impact of flame may be made of cast iron or malleable iron provided they comply with other requirements of these regulations. The allowable stress on cast iron or malleable iron shall be based on the tensile strength of the material with a factor of safety of not less than 4·5.

(2) **Design, construction, workmanship, the factor of safety and the method of computing the maximum allowable working pressure.**—(*a*) The construction, except where otherwise specified, be the same as those prescribed in the relevant provisions of the preceding Chapters of these Regulations. In the case of fusion welded boilers neither stress relieving nor radiography of welded joints is required except that if the tube ends are welded, the boiler shall be stress relieved. Allowable stress for copper plates and castings including bronze shall not exceed 551 kg./cm.² (7840 lbs./in.²).

reaming rivet holes and one at the hydraulic test. Every completed boiler of riveted construction shall be tested hydraulically to at least thrice the working pressure. In the case of a boiler of wholly or partly welded construction, the hydraulic test pressure shall be equal to three times the maximum allowable working pressure of the boiler. While subjected to this pressure the boiler shall be given a thorough hammer or impact test.

(4) **Certificate and Makers' Stamp.**—The certificate and Makers' stamp shall be in conformity with the provisons of Chapter I of these Regulations. But if owing to small size of the boiler all information cannot be visibly stamped on the boiler plate, Manufacturer's certificate accompanying the boiler shall contain the necessary details, but in all cases Makers' name, works number and the year of make must be stamped on the boiler.

621. Valves, Gauges, Fittings and Feed Supply.—(*a*) Every boiler shall be fitted with at least 3 brass wash-out plugs of not less than 25 mm. diameter (1 in.) which shall be screwed into the openings in the shells near the bottom. In boilers of the closed system type heated by removable internal electric heating elements, the openings for these elements when suitable for cleaning purposes may be substituted for wash-out openings. Boilers not exceeding 305 mm. (12 in.) internal diameter and having less than 9290 sq. cm. (10 sq. ft.) of heating surface may have two 25 mm. (1 in.) openings for cleaning one of which may be used for the attachment of the blow-off valve. These openings shall be opposite to each other wherever possible. All threaded openings in the boiler shall be provided with riveted or welded reinforcement, if necessary, to give four full threads therein.

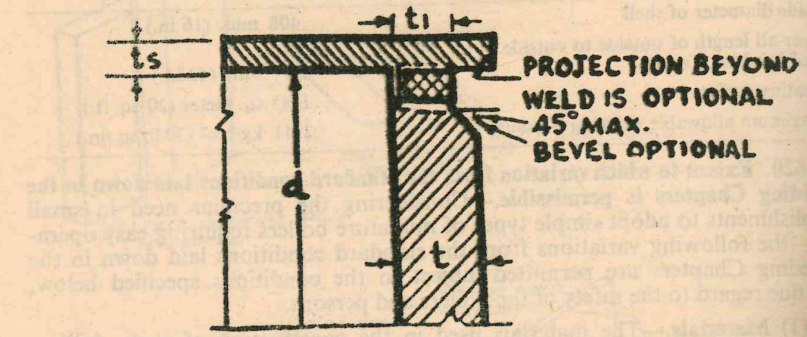
(*b*) Every boiler shall be provided with at least one feed pump or other feeding device except where it is connected with a water main carrying pressure not less than 1-1/2 times the boiler pressure to feed the boiler or where the steam generator is operated with no extraction of steam (closed system). In the latter case, in lieu of feeding device, a suitable connection or opening shall be provided to feed the generator. Such connection shall not be less than 13 mm. (1/2 in.) in diameter.

(*c*) Subject to the provisions as made in clauses (*i*), (*ii*), (*iii*) and (*iv*) of this sub-regulation, every boiler shall be fitted with necessary mountings and fittings as provided in Chapter VI of these Regulations, and they shall all be of substantial construction suitable for 7 kg./cm.^{2} (100 lb./sq. in.).

(*i*) The feed pipe shall be provided with a check valve and the feed water may be delivered to the boiler through the same opening in the shell as for the blow-off connection. The blow-off shall be fitted with a valve or cock in direct connection with the lowest water space practicable. When the boiler is under pressure, feed water shall not be introduced through the openings or connection used for the water column, the water gauge glass or the gauge cock. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

(*ii*) Every boiler shall be fitted with at least one glass water gauge for determining the water level, but in the case of boilers not exceeding 34 liters (7·5 gallons) capacity operated on the closed system, where there is insufficient space for the usual glass

(*b*) In such boilers, an unflanged steel flat tube plate may be inserted into the shell and welded for the entire thickness as shown in Figure XIV/1 with a fillet weld having a throat not less than 1-1/4 times the thickness of the shell or tube sheet whichever is smaller. The minimum thickness of unflanged welded tube sheets shall be 10 mm. (3/8 in.).



(XIV/1)

The temperature of the heating element of electrically heated steam boilers shall be so controlled that it will not exceed 650° C (1200° F).

(*c*) Tubes may be made of wrought iron, steel, drawn copper or drawn brass. Tube holes shall be drilled full size or they may be punched at least 13 mm. (1/2 in.) smaller in diameter than full size and then drilled, reamed or finished full size with a rotating cutter. The sharp edges of the tube holes shall be removed from both sides of the plate with a file or other tools.

All rivet holes shall be drilled full size with shells, but straps and ends bolted up into position or they may be punched not to exceed 3 mm. (1/8 in.) less than full diameter and then drilled or reamed to full diameter with shells but straps and ends bolted up into position. The finished holes must be true, clean and concentric. After drilling or reaming rivet holes, the plates and butt straps of longitudinal joints shall be separated, the burrs and chips removed, the plates and butt straps re-assembled metal to metal with pins fitting the holes and with tack bolts.

(3) **Inspection and Testing.**—Such boilers shall be subjected to inspection during construction and after completion by an Inspecting Authority. At least two inspections shall be made of boilers of riveted construction—one before

reaming rivet holes and one at the hydraulic test. Every completed boiler of riveted construction shall be tested hydraulically to at least thrice the working pressure. In the case of a boiler of wholly or partly welded construction, the hydraulic test pressure shall be equal to three times the maximum allowable working pressure of the boiler. While subjected to this pressure the boiler shall be given a thorough hammer or impact test.

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(*b*) Every boiler shall be provided with at least one feed pump or other feeding device except where it is connected with a water main carrying pressure not less than 1-1/2 times the boiler pressure to feed the boiler or where the steam generator is operated with no extraction of steam (closed system). In the latter case, in lieu of feeding device, a suitable connection or opening shall be provided to feed the generator. Such connection shall not be less than 13 mm. (1/2 in.) in diameter.

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(*ii*) Every boiler shall be fitted with at least one glass water gauge for determining the water level, but in the case of boilers not exceeding 34 liters (7·5 gallons) capacity operated on the closed system, where there is insufficient space for the usual glass

water gauge, water level indicators of any suitable type may be used.

(*iii*) The steam pressure gauge shall have its dial graduated to not less than 1-1/2 times the maximum allowable working pressure of the boiler.

(*iv*) Boilers of capacity not exceeding 34 liters (7·5 gallons) may be fitted with one safety valve. The safety valve shall preferably be of direct spring loaded type and the diameter of the valve shall not be less than 13 mm. (1/2 in.).

The minimum relieving capacity of the safety valve shall be determined on the basis of 14·6 kg./sq. meter (3 pounds per sq. ft.) per hour of heating surface and shall be sufficient to discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 per cent. above the maximum allowable working pressure. The safety valve shall be connected to the boiler independently of any other steam connections, without any unnecessary intervening pipe or fitting. Such intervening pipe or fitting if unavoidable shall be not longer than the corresponding face-to-face dimension of a tee fitting of the same diameter and the minimum opening there through shall be at least equal to the valve inlet. No valve of any description shall be placed between a safety valve and the boiler nor on the discharge pipe from the safety valve to the atmosphere.

(*d*) It is recommended that all boilers operated with gas or oil be provided with an automatic low-water fuel cutout and/or with an automatic fuel regulating governor controlled by the steam pressure. Such a governor used on gas fuel shall be so constructed that in the event of its failure, there can be no possibility of steam from the boiler entering the gas chamber of supply pipe.

The electrically heated boilers shall be effectively earthed with a lead of substantial cross section.

622. Fees.—Registration fee.—The fee required to accompany an application under sub-section (1) of section 7 of the Act shall be Rs. 30 per boiler.