

- e) Furnace components: the thickness of furnace components, e.g. ash drop-out tubes and fuel inlet connections, shall be calculated in accordance with sub-regulation (d) with a minimum thickness of 10 mm and a maximum thickness of 22 mm.
- f) Corrugated furnaces: The design pressure of corrugated furnaces shall be determined using the equation XII/28 but the thickness shall be not less than 10 mm and shall not exceed 22 mm. Calculated value of I and F for some of the corrugations are given in figure XII/94 for other shapes and sizes calculations need to be made from basic principles.

$P =$	$2FE_t (1 + \frac{0.1d}{L})$		Equation XII/28
	$S1 \text{ bd}$	$\frac{FWDu}{800I \{ 1 + \frac{5d(e-C)^3}{L(W)} \}}$	

- g) Tolerances and allowances:
The calculated wall thickness contains a fixed allowance of 0.75 mm for corrosion and wear. For corrugated furnaces, the calculated wall thickness shall be the minimum thickness of the finished furnace. For plain furnaces and reversal chambers, allowance shall be made to take account of any minus allowance shall be made to take account of any minus tolerances on the plate thickness.
- h) Out-of-roundness:

The percentage out-of-roundness is as follows:-

$u =$	$200 (d \text{ max} - d \text{ min})$
	$d \text{ max} + d \text{ min}$

This shall be included in the calculation as $u = 1.0$ for corrugated furnaces and $u = 1.5$ for plain furnaces.

- i) Stiffeners.
- (i) Stiffeners shall have second moment of areas not less than that given by the following equation.

$I_s =$	$pd^3 L$
	1.35×10^7

- (ii) If the stiffeners are made in sections from bar or plate, the abutting ends shall be prepared so as to ensure that full penetration welds are made.

The thickness of the stiffening ring shall be kept to the minimum required (for limiting dimensions (see figures XII/21 and XII/22)).

- (iii) Bowling hoops are considered as effective points of support. The
 -) minimum pitch of bowling hoop centres shall be not less than 500mm. If bowling hoops are used, the furnace thickness shall be calculated from sub-regulation (d). the dimensions of bowling hoops shall be in accordance with Figs. XII/95 (a),(b),(c) and their second moment of area determined from the tables given in these figures, shall be not less than required by sub-regulation (i).
 - (iv) If corrugated furnaces are equipped with several stiffeners, e.g.
 -) one on each corrugation or on each second corrugation, the cross-sectional area and the second moment of area of the stiffeners shall also be taken into consideration when using the equation XII/28. A height of not more than four times the furnace thickness shall be used for the calculation.
- j) Circular reversal chambers.

(i) The thickness of wrapper plates of cylindrical reversal chambers of horizontal multi-tubular boilers shall be calculated in accordance with the equations given in sub-regulation (d). The thickness shall be not greater than 35 mm and shall be not less than 10 mm.

However, the design temperature for reversal chamber wrapper plates shall be determined in accordance with the following equations: -

$$t = (ts + 2e_2) \text{ or } (ts + 50) \text{ whichever is greater.}$$

where,

t = Design temperature (in degree Centigrade)

ts = Saturation temperature of water (in degree Centigrade) at the design pressure, for both steam or hot water boilers.

e_2 = nominal plate thickness (in mm).

(ii) The thickness of access tubes shall be calculated in accordance with sub-regulation (d) with a minimum thickness of 10 mm.