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**Reinforcements of Openings**

Openings in the vessels are made first by making holes in the vessel. Nozzles are then welded around these holes. Holes cause a discontinuity in the vessel wall. Due to pressure or other loads a stress concentration is created near the holes, the maximum value of the stress being at the edge of the holes.

The stress concentration at the hole can be reduced by increasing the thickness of the vessel in the vicinity of the nozzle. This can be done either by providing additional thickness to the vessel wall itself near the nozzle or by use of a separate reinforcing plate attached to the vessel wall covering an area surrounding the hole.

All openings up to 5 cm in size can be left uncompensated.

**Inspection Openings**

Accessibility to the inside of a vessel is essential. Carrying out regular internal inspections is of importance to the safety and extended life of a vessel. Design as per codes requires inspection openings in all vessels subject to internal corrosion or having internal surfaces subject to erosion or mechanical abrasion so that these surfaces may be examined for defects. Actually, almost all pressure vessels are subject to some kind of interior corrosion, and its seriousness can be determined only by examining the inside of the vessel. IS-3133 specifies the requirements and dimensions of manhole and inspection openings for chemical process equipments.

The openings shall preferably be circular in shape, but if not circular they shall be elliptical or rectangular in that order of preference. Manholes shall be large enough to permit entry and the rescue of persons. In no case shall the size of clear opening be less than 450 mm across inside edges. Covers of the manholes are to be provided with hand-holds for easy opening. For vessels above 1000 mm diameter, the minimum manhole size shall be 500 mm. The maximum length of manhole shall be kept to practical minimum. The standard mole hole opening is 600 mm. Typical hand-hole openings are: 300, 250, 200, 100 mm.

Hand holds be preferably made from 20 mm diameter rods 150 mm long and with 80 mm projection. For heavy blind flanges weighing more than 10 kg consideration shall be given to the provision of suitable hinge/davit arrangement.