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PTT PUBLIC COMPANY LIMITED

GAS SEPARATION PLANT RAYONG

ENGINEERING STANDARD FOR

COLUMN INTERNAL

ES-20.04

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SECTION SUBJECT

1.0 SCOPE

This specification is a supplement to the requirement for pressure vessels (ES-20-02).

2.0 DESIGN

2.1 General

2.1.1 Similar parts shall be interchangeable.

2.1.2 The height of supporting elements shall not exceed 20% of the nominal tray distance.

2.1.3 Drain holes in liquid-tight trays (hole dia. 5 mm in inlet weir) and seal pans are required.

2.2 Loads and Deflections

Rectification trays and seal pans, etc. shall be designed to withstand the following loads.

2.2.1 Calming Section Trays shall be designed for a concentrated load of 100 kg (under conditions of erection and maintenance).

2.2.2 Coventional Downcomer tray shall be designed for a uniform load of 300 kg/m2 or for a load of liquid, at design temperature, corresponding to the load of half-filled downcomer, whichever is higher.

2.2.3 A maximum upward load of 2000 Pa (0.30 psi) at maximum working temperature evenly distributed over the entire fractionating tray surface.

2.2.4 Plates (eg. Chimney hoods, baffles, etc.) not under loads of liquid shall be designed for a uniform load of 80 kg/m2 on the basis of projected horizontal plane.

2.2.5 Supporting rings of column trays shall be capable to withstand an uniform live load of 450 kg/m2 plus dead load.

2.2.6 In case trays are mounted in the column during transport or prior to erection of the column the trays and downcomers shall be designed for the respective loads of transportation and erection.

2.2.7 Tray mountings shall be amply dimensioned for the transfer of loads to the supporting elements and column wall. They shall likewise prevent any dislocation of removable tray sections in case of shocks.

2.2.8 Admissible Deflection

For sieve trays and valve trays : 1 /800 of internal column diameter with maximum of 6 mm at the load stated under 2.2.1., both downward and upward deflection, no permanent deformation and/or damage shall occur.

All trays must be capable to withstand loads of liquid levels equal to nominal tray distance (if not otherwise stated in vessel specification), at design temperature, without becoming permanently deformed.

For downcomer walls And baffle plates : 3 mm at maximum height liquid in the downcomer, or respectively at maximum load acting on baffle plates

For supports:

Supports shall be capable to withstand the total weight of the parts to be supported under conditions of erection and operation, without exceeding the admissible loads and deflections of 1/ 800 x span.

The tray manufacture shall furnish calculation to demonstrate that the adequacy of their design to support the specified load and not exceed the specified deflections for service conditions.

2.2.9 Allowable Stresses

The max allowable stress is the lower values of the following:

- under operating conditions:

$$\frac{\text{min yield strength}}{1.5} \quad \text{or} \quad \frac{\text{min tensile strength}}{3}$$

- under conditions of erection:

$$\frac{\text{min yield strength}}{1.1} \quad \text{or} \quad \frac{\text{min tensile strength}}{2}$$

2.2.10 Deflection of Columns

The maximum deflection at the top of a vertical vessel shall not exceed 1/200 x height (measured from support level) under full wind load.

2.2.11 Levelness

The maximum allowable tilt of each layer of a structured shall be 0.3% of the column diameter , or 6 mm, whichever is the smaller.

2.2.12 Hydraulic Rating

The trays shall be designed for the service and performance conditions given on the process design date sheets for trays.

The hydraulic rating shall be the CONTRACTOR’s responsibility.

2.2.13 Beam

Minimum material thickness shall be 3 mm

To accommodate thermal expansion, slotted holes shall be used for mouting the beams onto the supports. The Manufacturer/Suppler of the internals shall specify the slot length on the basis of transient conditions, i.e., the maximum temperature difference that can occur between the column shell and the internals during startup or turndown. Unless otherwise specified, the difference between the maximum operating temperature and ambient shall be used for that calculation.

If a C-type beam with separation segments is used, each segment of the beam should be provided with a draining facility. Where draining of the segment is not possible, a drain hole of at least 12 mm (1/2 in) should be drilled in the bottom of the beam.

2.2.14 Corrosion Allowance

Major beams, support and parts welded to the vessel , if made from carbon steel, all those surfaces shall have corrosion allowance for each side as CA specified in vessel design data (in total equaling to two times of CA as specify in vessel design data)

All column internal shall be made from stainless steel, these will included but not limit to distributor, tray ,valve tray ,chimney tray ,tray clamp ,bolt ,nut and washer. In case of packing (structured, random, etc) will be applied, it shall be made from stainless steel.

2.2.15 The mass of any single piece of removable tray and manhole panel shall not exceed 35 kg when vessel diameter up to 1200 mm or 70 kg when vessel diameter over 1200 mm.

2.3 Constructional Details

2.3.1 All internal parts shall installed through vessel manholes.

2.3.2 The max bolt holes distance in joints and tray mountings shall not exceed 150 mm.

2.3.3 Metal-to-metal sealing is normally sufficient except otherwise specified or required by the tray manufacturer.

2.3.4 Trays shall be fastened to the supporting ring and down-comer bar by clamp bolt and washer, therefore no trays component shall be threaded.

Typical construction is as follows.

Tray floor/tray floor : Bolt/ Nut/ Washer

Tray floor/ supporting ring : Tray clamp/ Bolt/ Nut/ Washer

Down-comer bar/ Down-comer plate : Tray clamp/ Bolt/Nut/Washer

2.3.5 Internal bolting shall be double nuts, internal bolting with dome washer or spring washer may not requires double nuts, unless prior approval is given by PTT/CONSULTANT.

2.3.6 Stiffening plates shall first be screwed to the downcomer wall and then to the tray arranged below. (Here, pay attention that the measure as to the distance between downcomer wall and weir is observed).

2.3.7 Accumulator trays and distributor trays must be welded. Valve Trays, according to manufacturer's standard.

2.3.8 Tray manhole shall be aligned vertically and shall be removable from both above and below the tray.

2.3.9 Tray manhole shall be provided a minimum opening of 400 x 500 mm.

2.3.10 Tray manhole shall not be located in the down-comer area.

3. DRAWINGS

At least the following information shall be given on the drawings.

3.1 The total weight of trays and their fastening per column shall be indicated on the installation drawing, the individual weight on the drawing showing the tray as such.

3.2 For purposes of erection, each part must be clearly designated with a part number on the assembly drawing.

4.0 ADDITIONAL INSTRUCTION FOR TRAY MANUFACTURER

4.1 Tray manufacturer shall provide the assembly instruction of trays.

4.2 Tray manufacturer shall perform final inspection of trays after installation.

4.3 Tray manufacturer shall provide 10% , minimum 4 set per each size and each type additional tray assembly hardware to compensate for possible loss.

4.4 Tray manufacturer shall guarantee that the equipment, wholly process designed by them will meet the operating conditions specified.

4.5 Assembly of one of each tray type shall be trial assembled in the tray manufacturer's shop, to ensure that part are correctly details and that proper fit-up is obtains.