



Exploration & Production

## GENERAL SPECIFICATION

### PIPING VALVES VESSELS

#### GS EP PVV 202

**Standard drawings for accessories  
and equipment of vessels**

|      |       |                                            |
|------|-------|--------------------------------------------|
|      |       |                                            |
| 02   | 10/05 | Addition of "EP" root to GS identification |
| 01   | 10/03 | Change of Group name and logo              |
| 00   | 06/02 | First issue                                |
| Rev. | Date  | Notes                                      |

### List of Standards Drawings (SD)

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| SD EP PVV 203 | Vessels elliptical dished ends                            |
| SD EP PVV 204 | Standard lifting lug for apparatus                        |
| SD EP PVV 205 | Lugs and base ring for vertical apparatus                 |
| SD EP PVV 206 | Saddles for horizontal drums and tanks                    |
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| SD EP PVV 232 | Clad alloy vessel welding procedure                       |
| SD EP PVV 233 | Nozzles lining                                            |
| SD EP PVV 234 | Lined ring joint face                                     |
| SD EP PVV 301 | Spherical vessels tolerances                              |
| SD EP PVV 302 | Fire proofing supports for spherical vessels              |



## Exploration & Production

General Specification

Date: 10/05

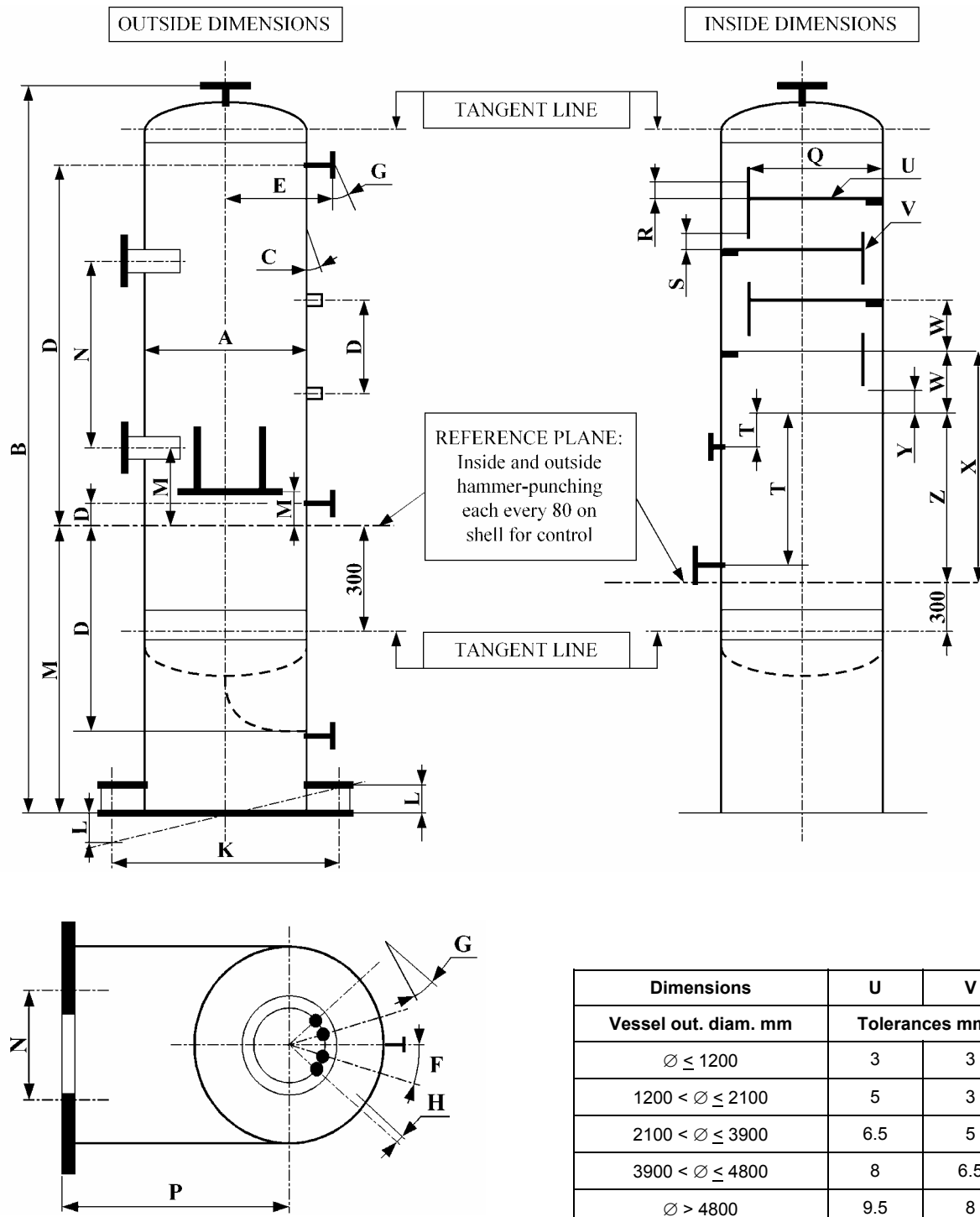
GS EP PVV 202

Rev: 02

| Reference     | Title                                    |
|---------------|------------------------------------------|
| SD EP PVV 303 | Insulation supports on spherical vessels |
| SD EP PVV 304 | Monorail davit and slide                 |
| SD EP PVV 305 | Platform and stairway                    |



| Standard Drawings          | SD EP PVV 201 |
|----------------------------|---------------|
| Pressure vessel tolerances | Rev.: 02      |
|                            | Date: 10/05   |





Exploration & Production

| Standard Drawings          | SD EP PVV 201 |
|----------------------------|---------------|
| Pressure vessel tolerances | Rev.: 02      |
|                            | Date: 10/05   |

### Tolerances on outside dimensions

- A - Out of roundness as permitted by code
- B - Tolerance on length:  $\pm 1.3 \text{ mm/m}$  (max: 13 mm)
- C - Rectitude of the generatrix: whatever part of a cylinder generatrix with 6.5 mm in length shall range within 2 x 6.5 mm spaced lines both parallel to the centreline
- D - Tolerance on elevations:  
For manholes:  $\pm 13 \text{ mm}$  for nozzles:  $\pm 6.5 \text{ mm}$  clearance between instrument branch connections:  $\pm 3 \text{ mm}$
- E - Flange faces projecting from shell:  
For manholes:  $\pm 6.5 \text{ mm}$   
For nozzles:  $\pm 5 \text{ mm}$
- F - Circumferential deviation between the theoretical axis and centreline of nozzles, manholes and supports shall not exceed  $\pm 3 \text{ mm}$  measured on shell
- G - Angle of flange face in ratio to the theoretical plane:  $\pm 1/2^\circ$
- H - Orientation of nozzle bolt holes:  $\pm 1.5 \text{ mm}$  measured on drilling circle
- K - Base ring drilling tolerance:  
Measured on perpendicular diameters:  $\pm 5 \text{ mm}$   
Measured on drilling circle between holes:  $\pm 5 \text{ mm}$
- L - Tolerance on base ring perpendicularity:  
 $K \leq 1.2 \text{ mm}$ :  $\pm 3 \text{ mm}$   
 $1.2 \text{ mm} < K \leq 1.2 \text{ mm}$ :  $\pm 5 \text{ mm}$   
 $K > 1.2 \text{ mm}$ :  $\pm 6.5 \text{ mm}$
- M - Tolerance on reference plane:  $^{+6.5}_{-0} \text{ mm}$
- N - Clearance between support bolt holes on horizontal vessels:  $\pm 3 \text{ mm}$
- P - Clearance between support setting level and horizontal vessel centreline:  $\pm 6.5 \text{ mm}$



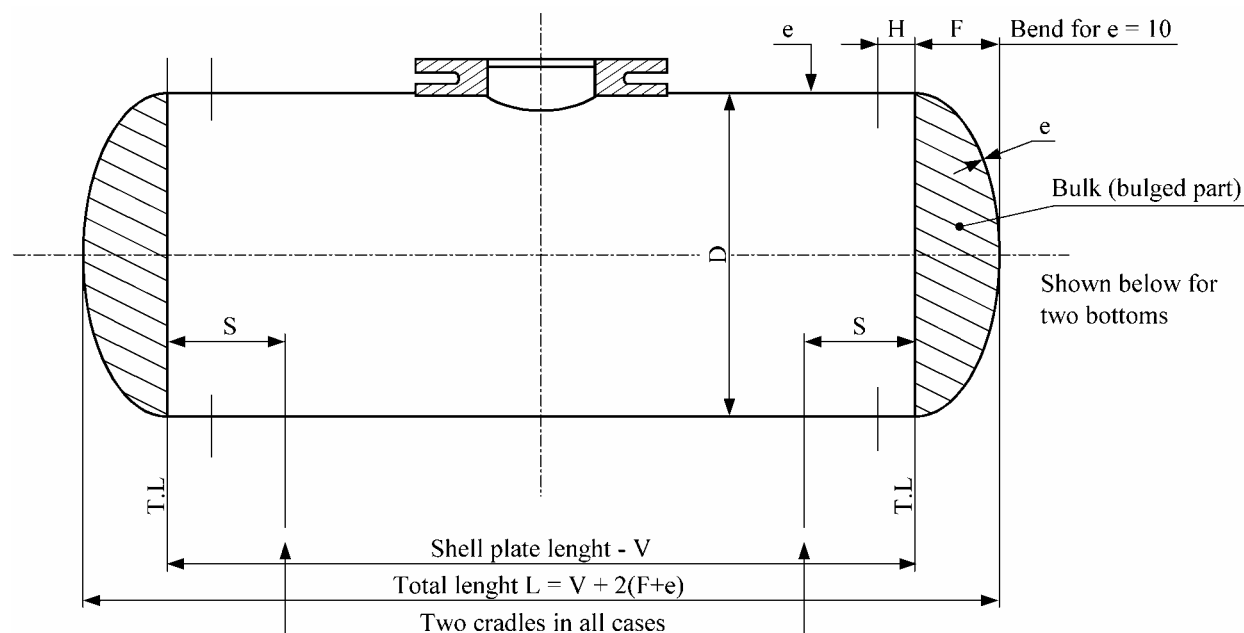
Exploration & Production

| Standard Drawings          | SD EP PVV 201 |
|----------------------------|---------------|
| Pressure vessel tolerances | Rev.: 02      |
|                            | Date: 10/05   |

### Tolerances on inside dimensions

- Q - Clearance from vessel inside wall to weir:  $\pm 6.5$  mm
- R - Height of fixed weir above tray supporting ring:  $\pm 3$  mm
- S - Clearance from bottom of down-flow plate to tray supporting ring:  $\pm 3$  mm
- T - Clearance from draw-off pan support to manhole or nozzle centreline when located in ratio to one another:  $\pm 3$  mm
- U - Maximum deviation of tray supporting from a plane parallel to reference plane: see table
- V - Maximum deviation of top of weir plate from a plane parallel to reference plane: see table
- W - Clearance between adjoining tray supports:  $\pm 3$  mm
- X - Clearance from one tray supporting to the reference plane:  $\pm 6.5$  mm
- Y - Clearance from bottom of down-flow plate to lower downcomer support:  $\pm 3$  mm
- Z - Clearance from any internal support to reference plane:  $\pm 6.5$  mm

| Standard Drawings                             | SD EP PVV 202 |
|-----------------------------------------------|---------------|
| Vessels dished ends with large knuckle radius | Rev.: 02      |
|                                               | Date: 10/05   |



| Nom. Capacity in liters | Ext. dia. D | Shell plate length V | Vol. for bottoms for e=10 | Shell plate volume for V=100 | S   | For e = 10 |                        |                              |
|-------------------------|-------------|----------------------|---------------------------|------------------------------|-----|------------|------------------------|------------------------------|
|                         |             |                      |                           |                              |     | Bend F     | Total weight with Hx50 | Shell plate weight for V=100 |
| 250                     | 500         | 1200                 | 30.6                      | 18                           | 240 | 126        | 198                    | 12                           |
| 300                     | 550         | 1400                 | 41                        | 22                           | 240 | 140        | 223                    | 13.5                         |
| 400                     | 600         |                      | 54                        | 26                           | 280 | 153        | 280                    | 14.5                         |
| 500                     | 650         | 1500                 | 68.8                      | 31                           | 280 | 166        | 308                    | 16                           |
| 600                     | 700         |                      | 86.6                      | 36                           | 300 | 179        | 354                    | 17                           |
| 700                     | 750         |                      | 107                       | 42                           | 300 | 192        | 382                    | 18                           |
| 800                     | 800         |                      | 131                       | 48                           | 300 | 205        | 418                    | 19.5                         |
| 1000                    | 850         | 1600                 | 157.4                     | 54                           | 300 | 219        | 475                    | 21                           |
|                         | 900         | 1500                 | 187.6                     | 61                           | 300 | 232        | 490                    | 22                           |
|                         | 950         | 1300                 | 222                       | 70                           | 300 | 245        | 483                    | 23                           |
| 1500                    | 1000        | 1800                 | 252                       | 75                           | 300 | 258        | 632                    | 24.5                         |
| 2000                    | 1100        | 1900                 | 347                       | 92                           | 350 | 284        | 745                    | 27                           |
| 2500                    | 1150        | 2100                 | 397                       | 100                          | 350 | 297        | 848                    | 28                           |
| 3000                    | 1200        | 2400                 | 453                       | 110                          | 350 | 310        | 988                    | 29                           |
| 3500                    | 1250        | 2600                 | 512                       | 120                          | 350 | 324        | 1095                   | 30.5                         |
| 4000                    | 1300        | 2800                 | 578                       | 130                          | 400 | 337        | 1215                   | 32                           |
| 4500                    | 1400        | 2600                 | 724                       | 150                          | 400 | 363        | 1265                   | 34                           |
| 5000                    | 1500        | 2600                 | 894                       | 170                          | 400 | 389        | 1385                   | 37                           |
| 6000                    | 1600        |                      | 1088                      | 195                          | 400 | 416        | 1502                   | 39                           |
| 7000                    | 1700        | 2800                 | 1306                      | 220                          | 400 | 442        | 1705                   | 42                           |
| 8000                    | 1800        |                      | 1554.4                    | 250                          | 400 | 468        | 1835                   | 44                           |
| 10000                   | 1900        | 3000                 | 1832                      | 280                          | 400 | 495        | 2055                   | 47                           |
| 12000                   | 2000        | 3400                 | 2139                      | 305                          | 400 | 521        | 2400                   | 49                           |
| 15000                   | 2100        | 3800                 | 2478                      | 340                          | 450 | 546        | 2760                   | 52                           |
|                         | 2150        | 3600                 | 2658                      | 355                          | 450 | 559        | 2735                   | 53                           |
| 18000                   | 2200        | 4200                 | 2854                      | 375                          | 450 | 572        | 3140                   | 54                           |
| 20000                   | 2300        |                      | 3266                      | 410                          | 450 | 599        | 3330                   | 56                           |
| 25000                   | 2400        | 5000                 | 3716                      | 445                          | 500 | 625        | 3990                   | 59                           |
| 30000                   | 2500        | 5400                 | 4202                      | 485                          | 500 | 652        | 4450                   | 61                           |
| 40000                   | 2600        | 6800                 | 4726                      | 520                          | 500 | 677        | 5550                   | 64                           |
| 50000                   | 2700        | 8000                 | 5300                      | 560                          | 500 | 703        | 6600                   | 66                           |
| 60000                   | 2800        | 9000                 | 5918                      | 605                          | 600 | 730        | 7570                   | 69                           |
| 70000                   | 2900        | 9600                 | 6576                      | 650                          | 600 | 756        | 8350                   | 71                           |
| 80000                   | 3000        | 10400                | 7332                      | 695                          | 600 | 782        | 9230                   | 74                           |

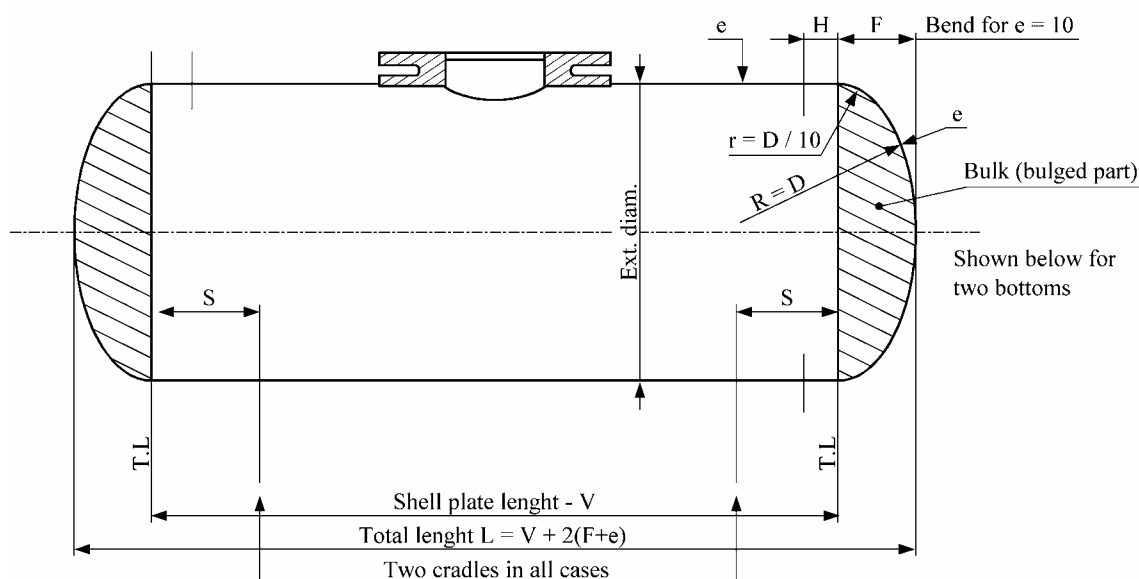
### Standard thicknesses and heights of corresponding edges

| Thickness e | 8  | 9 | 10 | 11 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | 28 | 32  | 35  | 40  |
|-------------|----|---|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|
| Height H    | 50 |   |    | 55 |    | 60 | 65 | 70 |    | 75 | 80 | 90 | 100 | 110 | 120 |

The bend are settled with formula:  $F = \frac{D - 2e}{3.8}$

For higher capacities make use of:  $S = 0.2 D$  nearly

| Standard Drawings              | SD EP PVV 203 |
|--------------------------------|---------------|
| Vessels elliptical dished ends | Rev.: 02      |
|                                | Date: 10/05   |



| Nom. Capacity in liters | Ext. dia. D | Shell plate length V | Vol. for bottoms for e=10 | Shell plate volume for V=100 | S   | For e = 10 |                        |                              |
|-------------------------|-------------|----------------------|---------------------------|------------------------------|-----|------------|------------------------|------------------------------|
|                         |             |                      |                           |                              |     | Bend F     | Total weight with Hx50 | Shell plate weight for V=100 |
| 250                     | 500         | 1200                 | 22                        | 18                           | 240 | 92         | 198                    | 12                           |
| 300                     | 550         | 1200                 | 30                        | 22                           | 240 | 102        | 223                    | 13.5                         |
| 400                     | 600         | 1400                 | 39                        | 26                           | 280 | 111        | 280                    | 14.5                         |
| 500                     | 650         | 1400                 | 50                        | 31                           | 280 | 121        | 308                    | 16                           |
| 600                     | 700         | 1500                 | 63                        | 36                           | 300 | 131        | 352                    | 17                           |
| 700                     | 750         | 1500                 | 78                        | 42                           | 300 | 140        | 382                    | 18.3                         |
| 800                     | 800         | 1500                 | 95                        | 48                           | 300 | 150        | 415                    | 19.5                         |
| 1000                    | 850         | 1600                 | 114                       | 54                           | 300 | 160        | 470                    | 21                           |
|                         | 900         | 1500                 | 136                       | 61                           | 300 | 169        | 480                    | 22                           |
|                         | 950         | 1300                 | 165                       | 70                           | 300 | 179        | 470                    | 23                           |
| 1200                    | 1000        | 1400                 | 187                       | 75                           | 300 | 189        | 530                    | 24.5                         |
| 1500                    | 1050        | 1600                 | 217                       | 83                           | 300 | 199        | 620                    | 25.5                         |
| 2000                    | 1100        | 1900                 | 250                       | 92                           | 350 | 208        | 740                    | 27                           |
| 2300                    | 1150        | 2100                 | 287                       | 100                          | 350 | 218        | 840                    | 28                           |
| 2500                    | 1200        |                      | 326                       | 110                          | 350 | 228        | 880                    | 29.3                         |
| 2800                    | 1250        |                      | 369                       | 120                          | 350 | 237        | 930                    | 30.5                         |
| 3000                    | 1300        |                      |                           |                              | 350 |            | 975                    |                              |
| 3500                    |             | 2400                 | 418                       | 130                          | 350 | 247        | 1070                   | 32                           |
| 4000                    |             | 2800                 |                           |                              | 400 |            | 1200                   |                              |
| 4500                    | 1400        | 2800                 | 521                       | 150                          | 400 | 266        | 1315                   | 34                           |
| 5000                    | 1500        | 2600                 |                           |                              | 400 |            | 1340                   |                              |
| 5500                    |             | 2800                 | 643                       | 170                          | 400 | 286        | 1415                   | 37                           |
| 6000                    |             | 3200                 |                           |                              | 400 |            | 1560                   |                              |
| 6500                    | 1700        | 2800                 | 782                       | 195                          | 400 | 305        | 1550                   | 39                           |
| 7000                    | 1800        | 2600                 | 940                       | 220                          | 400 | 324        | 1595                   | 42                           |
|                         |             |                      | 1120                      | 250                          | 400 | 344        | 1720                   | 44                           |
|                         |             | 2200                 |                           |                              | 400 |            | 1655                   |                              |
| 7500                    | 1900        | 2400                 | 1320                      | 280                          | 400 | 363        | 1745                   | 47                           |
|                         |             |                      |                           |                              | 400 |            |                        |                              |
| 8000                    | 1900        | 2600                 |                           |                              | 400 |            |                        |                              |
| 10000                   |             | 3200                 |                           |                              | 400 |            |                        |                              |
| 12000                   |             | 4000                 | 1320                      | 280                          | 400 | 363        | 2500                   |                              |
| 15000                   | 2000        | 5000                 |                           |                              | 400 |            | 2960                   |                              |
|                         |             | 2100                 | 4600                      | 1542                         | 305 | 400        | 383                    | 2950                         |
|                         |             | 2150                 | 4000                      | 1785                         | 340 | 450        | 402                    | 2820                         |
| 17000                   | 2150        | 4400                 | 1916                      | 355                          | 450 | 412        | 3120                   | 53                           |
|                         |             | 2200                 | 4200                      | 2060                         | 375 | 450        | 421                    | 3100                         |
|                         |             | 2300                 | 4000                      | 2350                         | 410 | 450        | 441                    | 3200                         |
| 18000                   | 2400        | 3800                 | 2670                      | 445                          | 500 | 460        | 3270                   | 59                           |
|                         |             | 3600                 |                           |                              | 500 |            | 3320                   |                              |
|                         |             | 4600                 |                           |                              | 500 |            | 3940                   |                              |
| 20000                   | 2500        | 5600                 | 3030                      | 485                          | 500 | 480        | 4550                   | 61                           |
| 25000                   |             | 7600                 |                           |                              | 500 |            | 5770                   |                              |
| 30000                   |             | 2600                 | 7200                      | 3355                         | 520 | 600        | 499                    | 5780                         |
| 40000                   | 2700        | 6600                 | 3815                      | 560                          | 600 | 518        | 5700                   | 66                           |
|                         |             | 2800                 | 6800                      | 4270                         | 605 | 600        | 538                    | 6080                         |
|                         |             | 2900                 | 6400                      | 4735                         | 650 | 600        | 557                    | 6070                         |
| 45000                   | 2500        | 9800                 |                           |                              | 600 |            | 7090                   |                              |
|                         |             | 2700                 | 8200                      |                              | 600 |            | 6740                   |                              |
|                         |             | 3000                 | 6400                      | 5240                         | 695 | 600        | 576                    | 6340                         |
| 50000                   | 3100        | 6800                 | 5760                      | 745                          | 700 | 596        | 6900                   | 76                           |
|                         |             | 3200                 | 7000                      | 6320                         | 795 | 700        | 615                    | 7370                         |
|                         |             | 3000                 | 8000                      |                              | 700 |            | 7500                   |                              |
| 60000                   | 3300        | 7600                 |                           |                              | 700 |            | 8150                   |                              |
|                         |             | 8800                 |                           |                              | 700 |            | 9100                   |                              |
|                         |             | 9400                 |                           |                              | 700 |            | 9900                   |                              |
| 70000                   | 3400        | 10400                |                           |                              | 700 |            | 10800                  |                              |
|                         |             |                      |                           |                              | 700 |            |                        |                              |
| 80000                   | 3400        |                      |                           |                              | 700 |            |                        |                              |
| 90000                   |             |                      |                           |                              | 700 |            |                        |                              |
| 100000                  |             |                      |                           |                              | 700 |            |                        |                              |

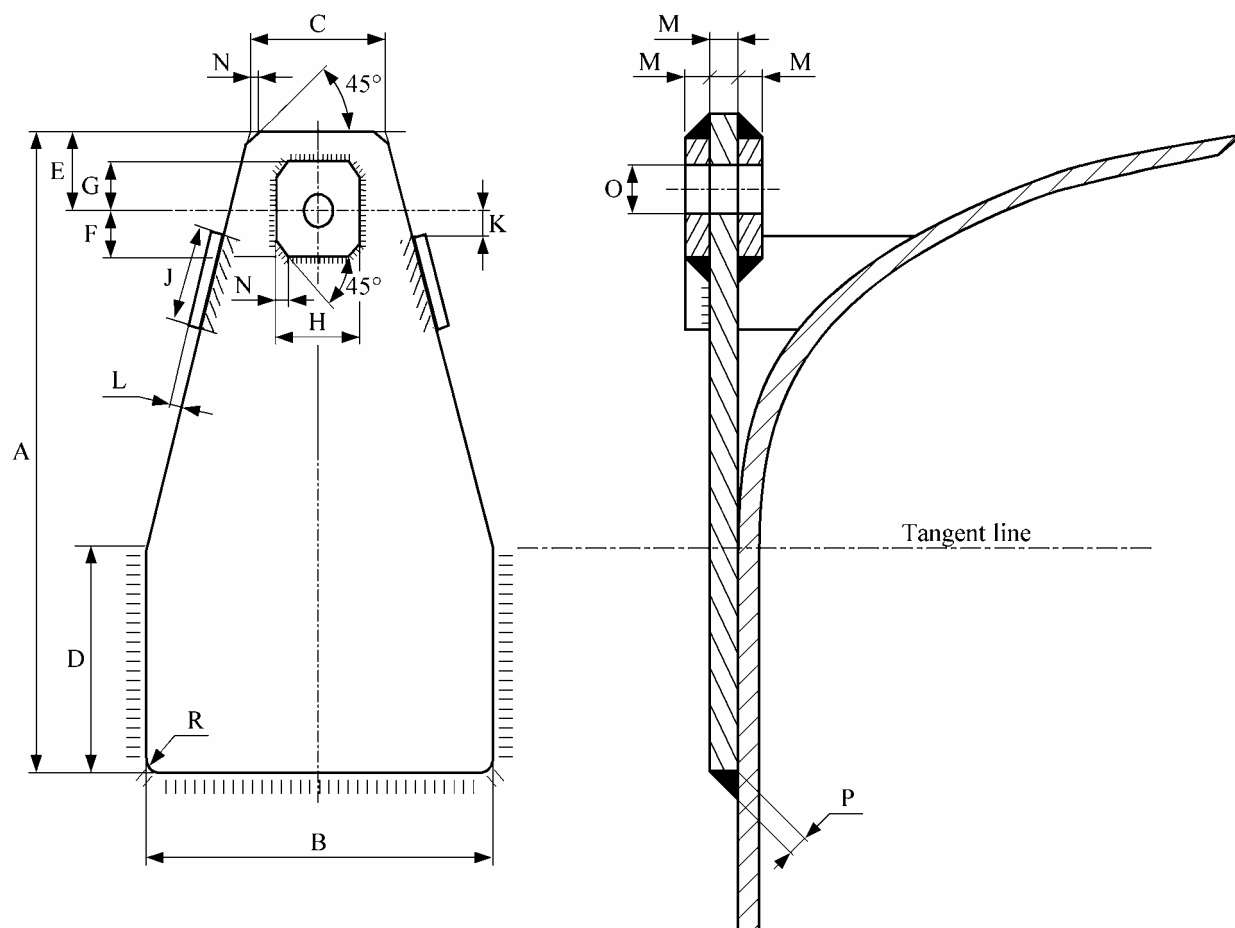
### Standard thicknesses and heights of corresponding edges

| Thickness e | 6  | 7 | 8 | 9  | 10 | 11 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | 28  | 32  | 35  | 40 |
|-------------|----|---|---|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|----|
| Height H    | 40 |   |   | 50 |    | 55 |    | 60 | 65 | 70 | 75 | 80 | 90 | 100 | 110 | 120 |    |

The bend are settled with formula:  $F = R - \sqrt{(R-r)^2 - (a-r)^2}$  or  $a = \frac{D-2e}{2}$

For higher capacities make use of:  $S = 0.2 D$  nearly

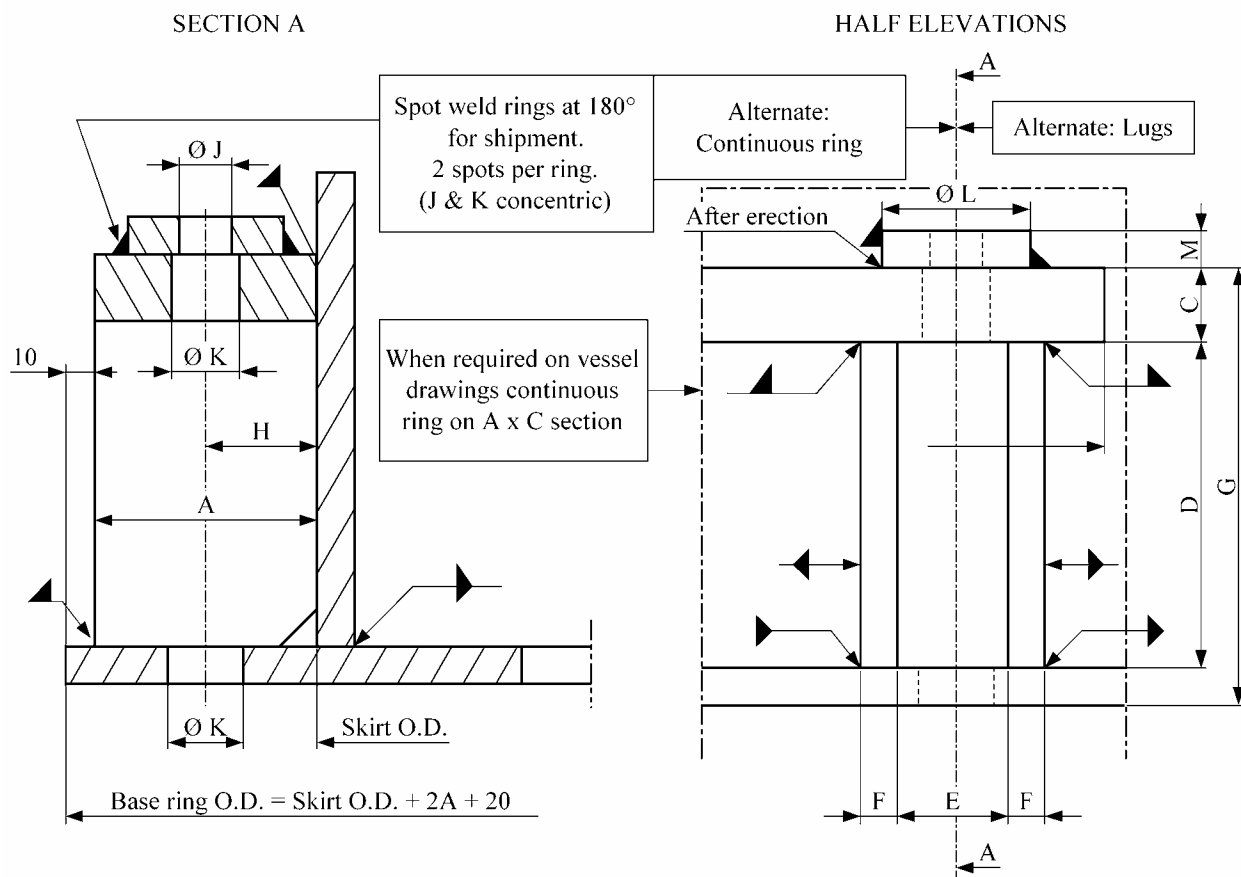
| Standard Drawings                  | SD EP PVV 204 |
|------------------------------------|---------------|
| Standard lifting lug for apparatus | Rev.: 02      |
|                                    | Date: 10/05   |



| Max. weight of vessel<br>in tons (for two lugs) | Dimensions in millimeters |     |     |     |     |     |     |     |     |     |    |    |    |     |    |    |
|-------------------------------------------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|-----|----|----|
|                                                 | A                         | B   | C   | D   | E   | F   | G   | H   | J   | K   | L  | M  | N  | O   | P  | R  |
| 20 ≤ 50                                         | 910                       | 450 | 175 | 260 | 120 | 85  | 105 | 150 | 250 | 60  | 10 | 20 | 20 | 75  | 12 | 35 |
| > 50 ≤ 100                                      | 1210                      | 600 | 240 | 350 | 160 | 130 | 145 | 210 | 350 | 105 | 10 | 25 | 25 | 100 | 15 | 40 |
| > 100 ≤ 150                                     | 1425                      | 750 | 300 | 430 | 200 | 160 | 185 | 270 | 450 | 135 | 12 | 30 | 25 | 130 | 15 | 45 |

**Note:** Material equivalent to vessel wall.

| Standard Drawings                         | SD EP PVV 205 |
|-------------------------------------------|---------------|
| Lugs and base ring for vertical apparatus | Rev.: 02      |
|                                           | Date: 10/05   |

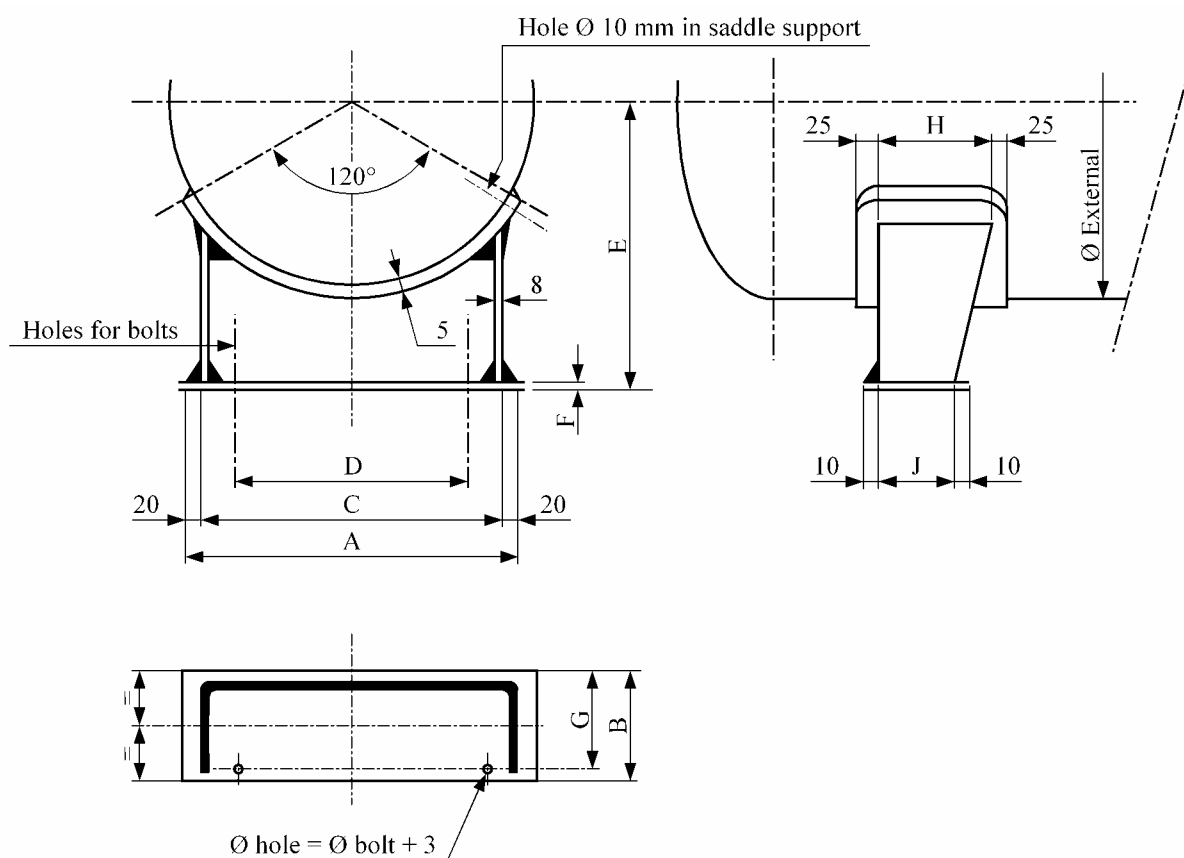


**Note:** Material: E.24.1 or E.26.1

In case of flat bottom vessel, the base ring is replaced by the vessel bottom plate.

| Bolt $\varnothing$ | A   | B   | C  | D   | E   | F  | G   | H  | J  | K  | L   | M  | Base ring dimen's | Weld seam thickness. | Weight per lug kg | Weight 2 flats AxFxD kg |
|--------------------|-----|-----|----|-----|-----|----|-----|----|----|----|-----|----|-------------------|----------------------|-------------------|-------------------------|
| 27                 | 100 | 120 | 20 | 148 | 70  | 10 | 180 | 55 | 30 | 41 | 55  | 12 | 12 x 200          | 10                   | 4.1               | 2.3                     |
| 30                 | 100 | 120 | 20 | 148 | 70  | 10 | 180 | 55 | 33 | 44 | 60  | 12 | 12 x 200          | 10                   | 4.1               | 2.3                     |
| 33                 | 100 | 120 | 25 | 155 | 70  | 10 | 200 | 55 | 36 | 47 | 65  | 20 | 20 x 200          | 10                   | 4.5               | 2.4                     |
| 36                 | 100 | 120 | 25 | 155 | 70  | 10 | 200 | 55 | 39 | 50 | 65  | 20 | 20 x 200          | 10                   | 4.5               | 2.4                     |
| 39                 | 120 | 140 | 40 | 185 | 80  | 16 | 250 | 65 | 42 | 53 | 75  | 25 | 25 x 250          | 10                   | 12                | 5.6                     |
| 42                 | 120 | 140 | 40 | 185 | 80  | 16 | 250 | 65 | 45 | 56 | 80  | 25 | 25 x 250          | 10                   | 12                | 5.6                     |
| 45                 | 120 | 140 | 40 | 185 | 80  | 16 | 250 | 65 | 48 | 59 | 85  | 25 | 25 x 250          | 12                   | 12                | 5.6                     |
| 48                 | 120 | 140 | 40 | 185 | 80  | 16 | 250 | 65 | 51 | 62 | 85  | 25 | 25 x 250          | 12                   | 12                | 5.6                     |
| 52                 | 140 | 170 | 40 | 285 | 100 | 20 | 350 | 75 | 55 | 66 | 100 | 25 | 25 x 300          | 12                   | 21.8              | 12.6                    |
| 56                 | 140 | 170 | 50 | 318 | 100 | 20 | 400 | 75 | 59 | 70 | 105 | 32 | 32 x 300          | 12                   | 22.6              | 14                      |
| 64                 | 140 | 170 | 50 | 318 | 100 | 20 | 400 | 75 | 67 | 78 | 105 | 32 | 32 x 300          | 12                   | 22.6              | 14                      |
| 72                 | 150 | 200 | 50 | 418 | 120 | 25 | 500 | 80 | 75 | 86 | 113 | 32 | 32 x 300          | 12                   | 35.5              | 24.6                    |

| Standard Drawings                      | SD EP PVV 206 |
|----------------------------------------|---------------|
| Saddles for horizontal drums and tanks | Rev.: 02      |
|                                        | Date: 10/05   |



| Size in millimeter |     |     |     |     |     |    |     |     |     |        | Support weight<br>in kg |  |
|--------------------|-----|-----|-----|-----|-----|----|-----|-----|-----|--------|-------------------------|--|
| Ø Ext              | A   | B   | C   | D   | E   | F  | G   | H   | J   | Ø Bolt |                         |  |
| 350                | 290 | 130 | 250 | 150 | 380 | 13 | 95  | 160 | 110 | 22     | 23                      |  |
| 400                | 330 |     | 290 | 190 | 405 |    |     |     |     |        | 25                      |  |
| 450                | 370 |     | 330 | 230 | 430 |    |     |     |     |        | 27                      |  |
| 500                | 390 | 170 | 350 | 250 | 455 |    | 125 | 200 | 150 |        | 30                      |  |
| 550                | 420 |     | 380 | 280 | 485 |    |     |     |     |        | 32                      |  |

**Note:**

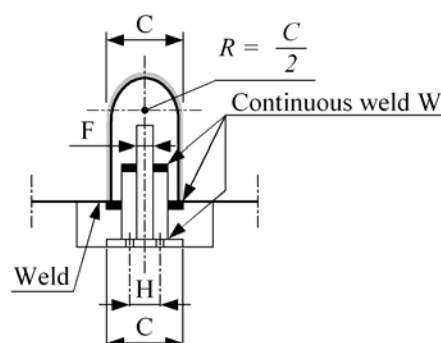
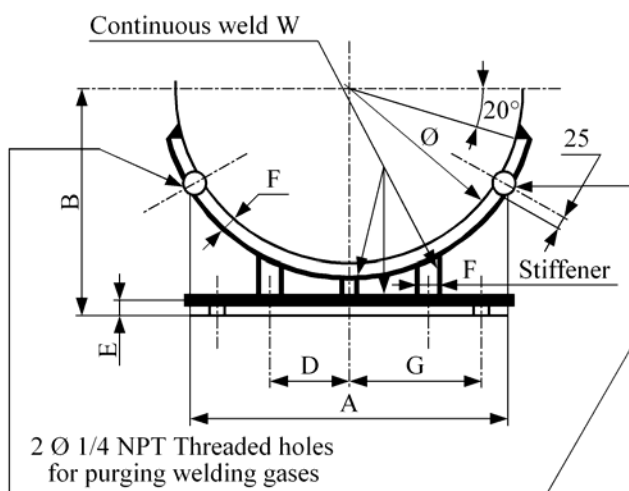
- For drums and tanks of an intermediate diameter take saddle size of immediate upper diameter
- These saddles are to weld on vessel (unceasing welding).

| Standard Drawings         | SD EP PVV 207 |
|---------------------------|---------------|
| Saddles welded on vessels | Rev.: 02      |
|                           | Date: 10/05   |

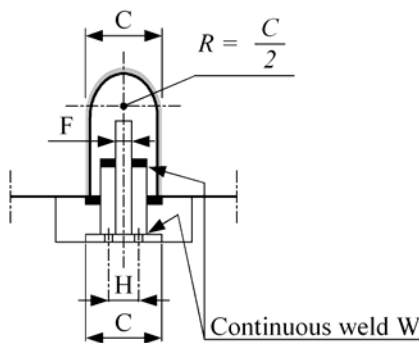
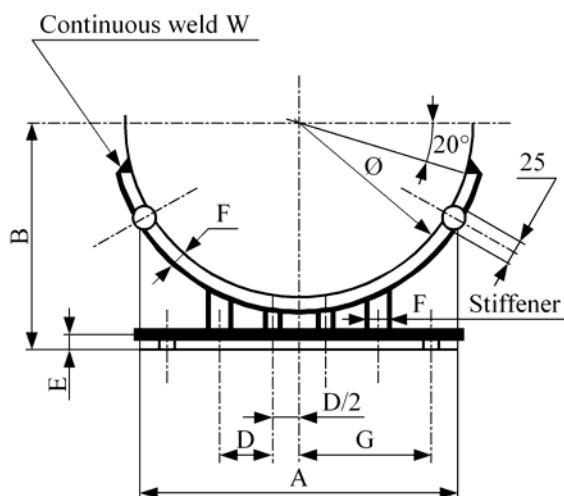
## Horizontal vessels

### Weld on saddles

Type: 1  $\varnothing \leq 1200$

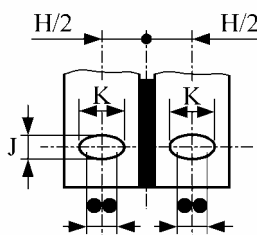


Type: 2  $\varnothing > 1200$



FOR WELDING SPECIFICATION  
SEE TYPE 1

### Ovalized holes detail



| Standard Drawings         | SD EP PVV 207 |
|---------------------------|---------------|
| Saddles welded on vessels | Rev.: 02      |
|                           | Date: 10/05   |

Weld sizes: W = 6 for  $\varnothing \leq 1700$

W = 10 for  $\varnothing \geq 1800$

| $\varnothing$ | A    | B    | C   | D    | E  | F  | G    | H   | Slotted Holes sizes |    | $\varnothing$ Bolts | Stiffeners sizes | Masse kg |
|---------------|------|------|-----|------|----|----|------|-----|---------------------|----|---------------------|------------------|----------|
|               |      |      |     |      |    |    |      |     | J                   | K  |                     |                  |          |
| 600           | 540  | 650  | 180 | 180  | 12 | 10 | 230  | 95  | 26                  | 40 | 20                  | 80 x 10          | 43       |
| 750           | 670  | 725  |     | 205  |    |    | 270  |     |                     |    |                     |                  | 52       |
| 900           | 800  | 800  |     | 280  |    |    | 340  |     |                     |    |                     |                  | 62       |
| 1000          | 890  | 850  |     | 295  |    |    | 370  |     |                     |    |                     |                  | 74       |
| 1200          | 1080 | 950  | 220 | 350  | 16 | 12 | 440  | 140 | 28                  | 45 | 22                  | 100 x 12         | 117      |
| 1400          | 1240 | 1050 |     | 305  |    |    | 540  |     |                     |    |                     |                  | 136      |
| 1500          | 1320 | 1100 |     | 325  |    |    | 575  |     |                     |    |                     |                  | 144      |
| 1700          | 1500 | 1200 |     | 365  |    |    | 650  |     |                     |    |                     |                  | 165      |
| 1800          | 1580 | 1250 |     | 390  |    |    | 690  |     |                     |    |                     |                  | 174      |
| 2000          | 1760 | 1350 |     | 440  |    |    | 770  |     |                     |    |                     |                  | 194      |
| 2100          | 1850 | 1400 | 250 | 475  | 20 | 16 | 820  | 150 |                     |    |                     | 110 x 16         | 289      |
| 2300          | 2020 | 1500 |     | 525  |    |    | 900  |     |                     |    |                     |                  | 316      |
| 2400          | 2110 | 1550 |     | 550  |    |    | 940  |     | 33                  | 50 | 27                  |                  | 332      |
| 2600          | 2280 | 1650 |     | 600  |    |    | 1020 |     |                     |    |                     |                  | 360      |
| 2700          | 2370 | 1700 | 300 | 620  |    |    | 1060 | 180 |                     |    |                     | 130 x 16         | 420      |
| 2900          | 2540 | 1800 |     | 670  |    |    | 1140 |     |                     |    |                     |                  | 452      |
| 3000          | 2630 | 1850 |     | 680  |    |    | 1170 |     |                     |    |                     |                  | 474      |
| 3200          | 2800 | 1950 | 350 | 720  |    |    | 1240 | 210 |                     |    |                     | 150 x 16         | 559      |
| 3400          | 2980 | 2050 |     | 780  |    |    | 1330 |     |                     |    |                     |                  | 604      |
| 3500          | 3080 | 2100 |     | 795  |    |    | 1360 |     |                     |    |                     |                  | 617      |
| 3700          | 3230 | 2200 |     | 840  |    |    | 1440 |     |                     |    |                     |                  | 658      |
| 3900          | 3420 | 2300 | 400 | 860  |    | 20 | 1500 | 230 |                     |    |                     | 170 x 20         | 897      |
| 4000          | 3500 | 2400 |     | 875  | 25 |    | 1530 |     | 36                  | 55 | 30                  |                  | 1004     |
| 4200          | 3680 | 2500 |     | 900  |    |    | 1600 |     |                     |    |                     |                  | 1060     |
| 4400          | 3850 | 2600 | 440 | 945  |    |    | 1670 | 250 |                     |    |                     | 190 x 20         | 1190     |
| 4500          | 3940 | 2650 |     | 960  |    |    | 1710 |     |                     |    |                     |                  | 1222     |
| 4700          | 4100 | 2750 |     | 980  |    |    | 1750 |     |                     |    |                     |                  | 1271     |
| 4900          | 4280 | 2850 |     | 990  |    |    | 1800 |     |                     |    |                     |                  | 1336     |
| 5000          | 4380 | 2900 |     | 1000 |    |    | 1840 |     |                     |    |                     |                  | 1344     |

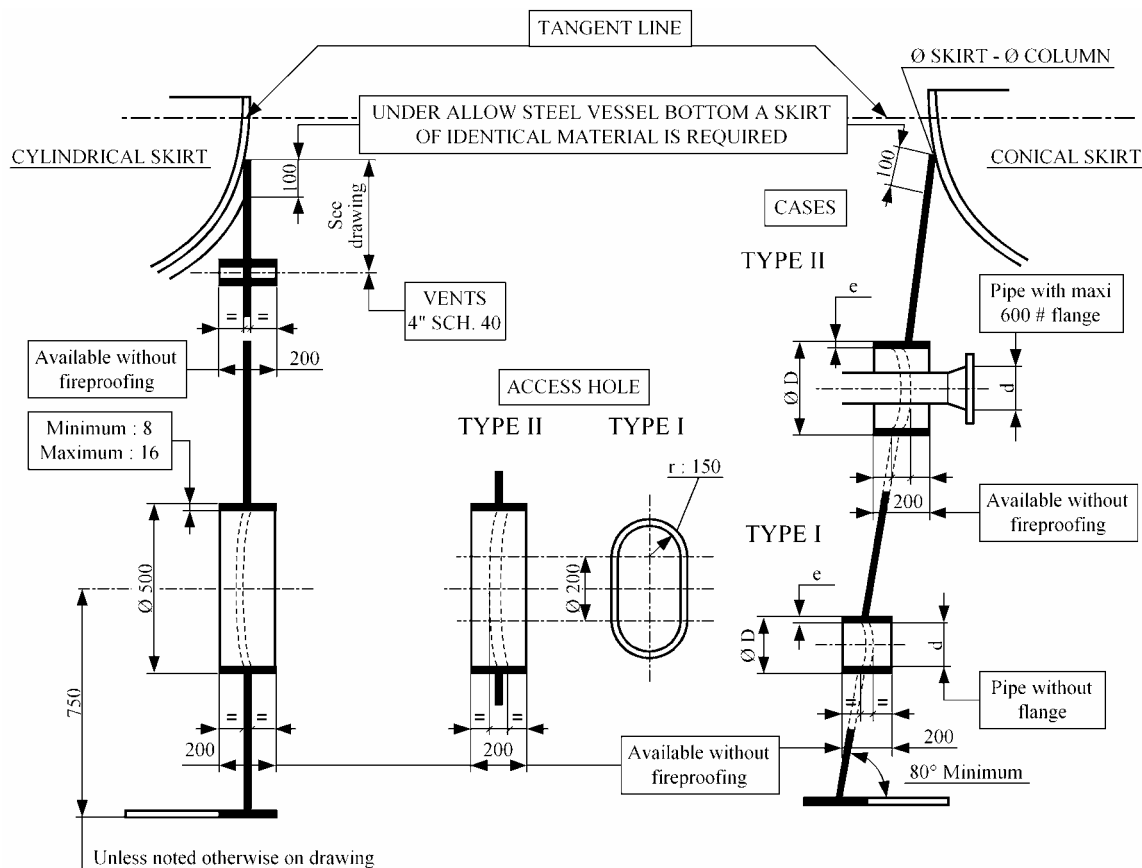
#### For each vessel

- 1 fixed saddle with 4 holes of diameter equal to bolts diameter + 6 mm
- 1 free saddle with 4 slotted holes (folio I)

All saddles are to be welded on vessel.

For vessels of an intermediate  $\varnothing$  select saddle dimensions of the next higher diameter.

| Standard Drawings               | SD EP PVV 208 |
|---------------------------------|---------------|
| Column skirt standard equipment | Rev.: 02      |
|                                 | Date: 10/05   |



**Note:** Details: vents, access hole, and cases are available for both skirt type.

| Vents                             |                                                |
|-----------------------------------|------------------------------------------------|
| Skirt outside diameter            | Quantity                                       |
| $500 \leq \varnothing \leq 950$   | 2 } Equally Spacer<br>3 }<br>4 }<br>6 }<br>8 } |
| $1000 \leq \varnothing \leq 3000$ |                                                |
| $3100 \leq \varnothing \leq 4000$ |                                                |
| $4200 \leq \varnothing \leq 5800$ |                                                |
| $6100 \leq \varnothing$           |                                                |

| Access hole                     |      |          |
|---------------------------------|------|----------|
| Skirt outside diameter          | Type | Quantity |
| $500 \leq \varnothing \leq 950$ | I    | 1        |
| $1000 \leq \varnothing$         | II   | 2 Equi.  |

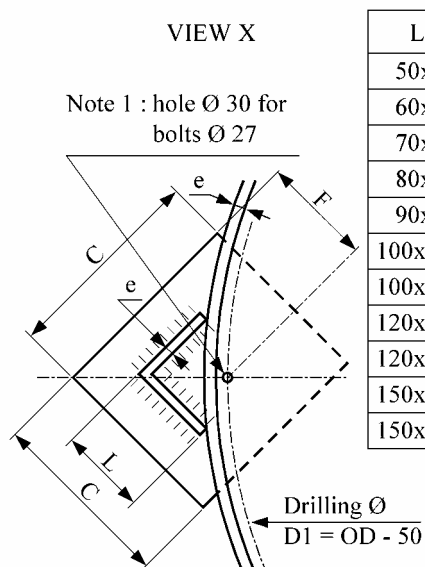
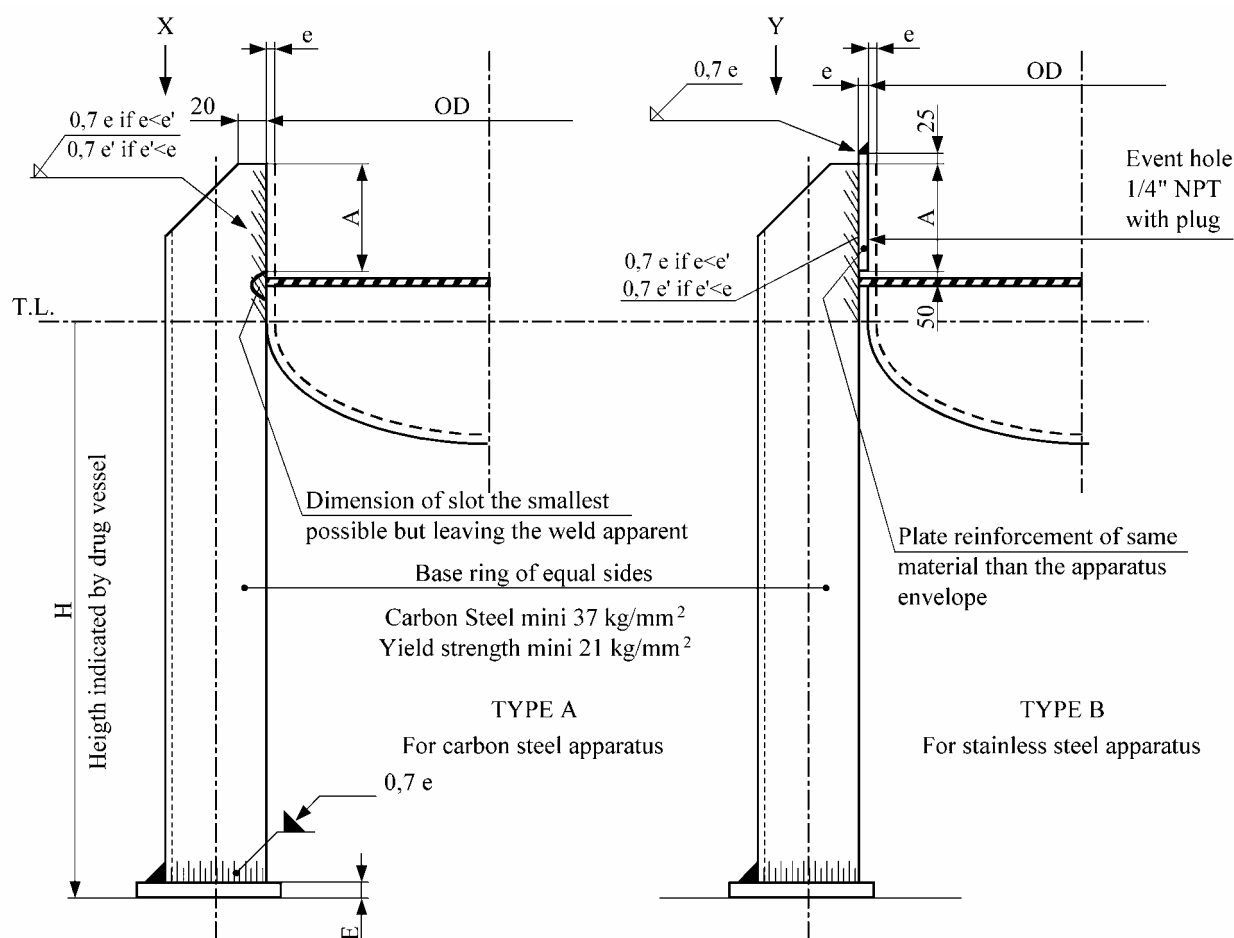
| Cases Type: I |             |        |
|---------------|-------------|--------|
| d             | D           | e      |
| 3/4"          | Tube 1 1/2" | SCH 40 |
| 1"            | Tube 1 1/2" | SCH 40 |
| 1 1/2"        | Tube 2 1/2" | SCH 40 |
| 2"            | Tube 3"     | SCH 40 |
| 3"            | Tube 4"     | SCH 40 |
| 4"            | Tube 6"     | SCH 40 |
| 6"            | Tube 8"     | SCH 40 |
| 8"            | Tube 10"    | SCH 40 |
| 10"           | Tube 12"    | SCH 40 |
| 12"           | 425 mm      | 13 mm  |
| 14"           | 460 mm      | 13 mm  |
| 16"           | 500 mm      | 13 mm  |
| 18"           | 560 mm      | 13 mm  |

| Cases Type: II |          |            |
|----------------|----------|------------|
| d              | D        | e          |
| 3/4"           | Tube 6"  | SCH 40     |
| 1"             | Tube 6"  | SCH 40     |
| 1 1/2"         | Tube 8"  | SCH 40     |
| 2"             | Tube 8"  | SCH 40     |
| 3"             | Tube 10" | SCH 40     |
| 4"             | Tube 12" | SCH 40     |
| 6"             | 400 mm   | Mini 8 mm  |
| 8"             | 460 mm   |            |
| 10"            | 550 mm   |            |
| 12"            | 610 mm   |            |
| 14"            | 650 mm   | Maxi 16 mm |
| 16"            | 750 mm   |            |
| 18"            | 800 mm   |            |

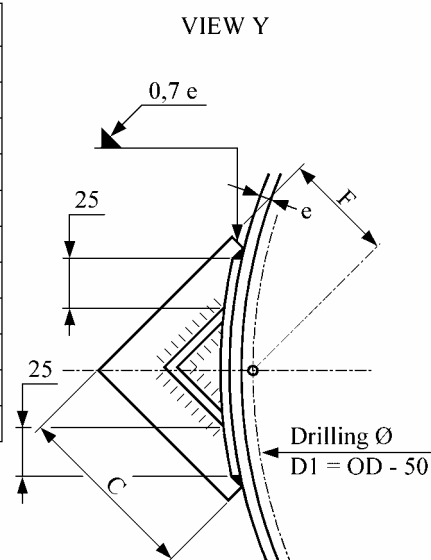
### Material:

- Skirt: ASTM A 283 grade C → unless noted otherwise
- Vents and cases: ASTM A 106 or A 53 → unless noted otherwise

| Standard Drawings        | SD EP PVV 209 |
|--------------------------|---------------|
| Legs for small apparatus | Rev.: 02      |
|                          | Date: 10/05   |



| Leg L      | A   | C <sup>(1)</sup> | e <sup>(1)</sup> | F   |
|------------|-----|------------------|------------------|-----|
| 50x50x5    | 100 | 100              | 10               | 68  |
| 60x60x6    | 150 | 110              | 12               | 73  |
| 70x70x7    | 150 | 130              | 14               | 83  |
| 80x80x8    | 200 | 150              | 16               | 93  |
| 90x90x9    | 200 | 170              | 18               | 103 |
| 100x100x10 | 250 | 200              | 20               | 118 |
| 100x100x14 | 250 | 200              | 22               | 118 |
| 120x120x12 | 250 | 230              | 24               | 133 |
| 120x120x14 | 300 | 250              | 26               | 143 |
| 150x150x15 | 300 | 300              | 28               | 168 |
| 150x150x18 | 350 | 300              | 30               | 168 |



**Note 1:** When the torque reaction under the effect of the wind (empty apparatus) or under seismic load (full apparatus) needs a more important anchoring, anchoring defined by this standard must be studied consequently.

| Standard Drawings        | SD EP PVV 209 |
|--------------------------|---------------|
| Legs for small apparatus | Rev.: 02      |
|                          | Date: 10/05   |

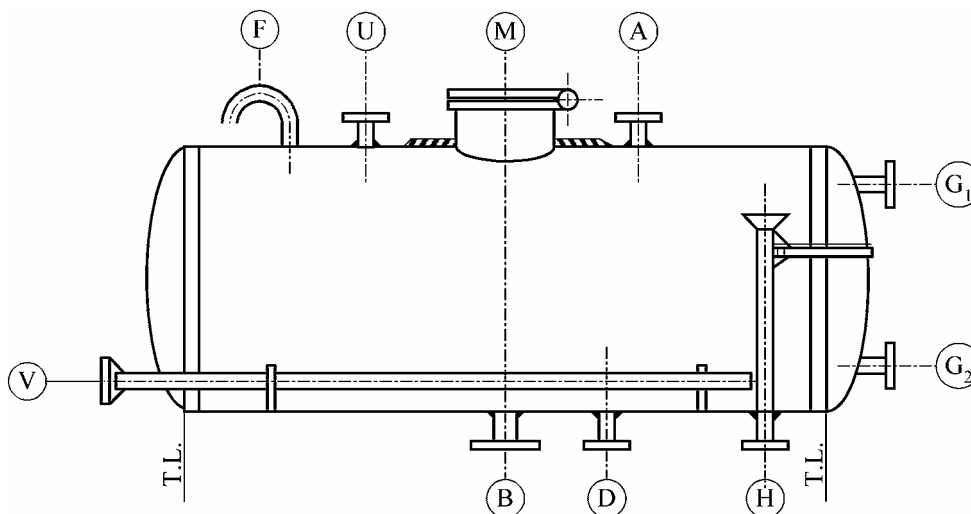
**Loading per foot (kg) (see notes)**

| Height (mm)    | 1000  | 1500  | 2000  | 2400  | 2500  | 2800  | 3000  | 3100  | 3500  | 4000  | 4500  | 4700  | 5000  | 5500  | 6000  |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 50 x 50 x 5    | 3800  | 1650  | 950   | (3)   |       |       |       |       |       |       |       |       |       |       |       |
| 60 x 60 x 6    | 6000  | 4500  | 2000  | 1350  | (3)   |       |       |       |       |       |       |       |       |       |       |
| 70 x 70 x 7    | 8900  | 7100  | 3600  | 2500  | 2300  | 1850  | (3)   |       |       |       |       |       |       |       |       |
| 80 x 80 x 8    | 12200 | 10000 | 8000  | 4200  | 3900  | 3100  | 2700  | 2500  | (3)   |       |       |       |       |       |       |
| 90 x 90 x 9    | 16000 | 13500 | 11300 | 6800  | 6400  | 5100  | 4400  | 4100  | 3800  | (3)   |       |       |       |       |       |
| 100 x 100 x 10 | 20000 | 17500 | 15000 | 13100 | 12500 | 7900  | 6700  | 6400  | 4100  | 3800  | (3)   |       |       |       |       |
| 100 x 100 x 14 | 27000 | 24000 | 20500 | 17900 | 17000 | 10800 | 9100  | 8700  | 6700  | 5400  | (3)   |       |       |       |       |
| 120 x 120 x 12 | 30000 | 27000 | 24000 | 21500 | 21000 | 19200 | 18000 | 12300 | 10300 | 7900  | 6100  | 5500  |       |       |       |
| 120 x 120 x 14 | 34500 | 31000 | 27500 | 24800 | 24000 | 22000 | 20500 | 14200 | 11900 | 9100  | 7000  | 6300  |       |       |       |
| 150 x 150 x 15 | 48000 | 45000 | 42000 | 38400 | 38000 | 35200 | 34000 | 33000 | 30000 | 20000 | 15000 | 13700 | 12300 | 10200 | 8500  |
| 150 x 150 x 18 | 57000 | 53400 | 49700 | 45500 | 45000 | 41600 | 40300 | 39000 | 35600 | 23600 | 17800 | 16200 | 14500 | 12000 | 10000 |

**Notes:**

- The table indicates the loading per foot according to the profiles and heights per loading, it is heard the sum of the following loads:
  - Actual weight of the apparatus
  - Weight of the fluid (with density > 1)
  - Forces and moments induced by piping
  - Compression due to the wind or seismic loads on the foot more solicits.
- The apparatuses will rest on 3 legs as a minimum, however a higher number could be adopted if necessary.
- In the table, loads not mentioned correspond to heights prohibited with the profile considered.
- The Manufacturer is entitled has to select higher profiles, if it considers it necessary to assume his responsibility.

| Standard Drawings   | SD EP PVV 210 |
|---------------------|---------------|
| Nozzles designation | Rev.: 02      |
|                     | Date: 10/05   |



|   |                             |
|---|-----------------------------|
| A | Main product inlet          |
| B | Main product outlet         |
| C | Condensate outlet           |
| D | Drain                       |
| E | Water inlet, outlet         |
| F | Vent                        |
| G | Level gage                  |
| H | Overflow                    |
| J | Auxiliary product inlet     |
| K | Auxiliary product outlet    |
| L | Level LI-LAH-LRC...         |
| M | Manhole                     |
| N | Handhole-Nozzle support     |
| P | Pressure connection         |
| R | To or from of exchanger     |
| S | Escape or safety valve      |
| T | Temperature connection      |
| U | Utility connection - Sample |
| V | Steam inlet                 |
| W | Spare connection            |

**Note:** When in the presence of several connections of same mark, indicate them as follows: A1, A2, ... An.

| Standard Drawings                                   | SD EP PVV 211 |
|-----------------------------------------------------|---------------|
| Minimum thickness of wall nozzles welded on vessels | Rev.: 02      |
|                                                     | Date: 10/05   |

**Minimum wall thickness of tubes for nozzles welded on vessels  
According to ASME section VIII & UG 45**

**Seamless tube nozzles**

| N.D.<br>(inches) | Thickness<br>STD as per<br>B 36-10M |              | Corrosion allowance and corresponding schedules |                 |             |                |              |                 |               |                |
|------------------|-------------------------------------|--------------|-------------------------------------------------|-----------------|-------------|----------------|--------------|-----------------|---------------|----------------|
|                  | mm<br>SCH                           | -12.5%<br>mm | 1 mm                                            | 1/16"<br>1.6 mm | 2 mm        | 1/8"<br>3.2 mm | 4 mm         | 3/16"<br>4.8 mm | 6 mm          | 1/4"<br>6.4 mm |
| 3/4              | 2.87<br>40                          | 2.51         | 3.51<br>160                                     | 4.1<br>160      | 4.51<br>160 | 5.71<br>XXS    | 6.51<br>XXS  | 7.31<br>XXS**   | 8.51          | 8.91           |
| 1                | 3.38<br>40                          | 2.96         | 3.96<br>80                                      | 4.56<br>160     | 4.96<br>160 | 6.16<br>XXS    | 6.96<br>XXS  | 7.76<br>XXS     | 8.96<br>XXS** | 9.36           |
| 1 1/2            | 3.68<br>40                          | 3.22         | 4.22<br>80                                      | 4.82<br>160     | 5.22<br>160 | 6.42<br>XXS    | 7.22<br>XXS  | 8.02<br>XXS     | 9.22<br>XXS** | 9.62<br>XXS**  |
| 2                | 3.91<br>40                          | 3.42         | 4.42<br>80                                      | 5.02<br>160     | 5.42<br>160 | 6.62<br>160    | 7.42<br>160  | 8.22<br>XXS     | 9.42<br>XXS   | 9.82<br>XXS**  |
| 3                | 5.49<br>40                          | 4.81         | 5.81<br>80                                      | 6.41<br>80      | 6.81<br>160 | 8.01<br>160    | 8.81<br>160  | 9.61<br>160     | 10.81<br>XXS  | 11.22<br>XXS   |
| 4                | 6.02<br>40                          | 5.27         | 6.27<br>80                                      | 6.87<br>80      | 7.27<br>80  | 8.47<br>120    | 9.27<br>120  | 10.07<br>160    | 11.27<br>160  | 11.67<br>160   |
| 6                | 7.11<br>40                          | 6.22         | 7.22<br>80                                      | 7.82<br>80      | 8.22<br>80  | 9.42<br>80     | 10.22<br>120 | 11.02<br>120    | 12.22<br>120  | 12.62<br>160   |
| 8                | 8.18<br>40                          | 7.17         | 8.17<br>60                                      | 8.77<br>60      | 9.17<br>80  | 10.37<br>80    | 11.17<br>100 | 11.97<br>100    | 13.17<br>100  | 13.57<br>120   |
| 10               | 9.27<br>40                          | 8.10         | 9.10<br>60                                      | 9.70<br>60      | 10.10<br>60 | 11.30<br>80    | 12.10<br>80  | 12.90<br>80     | 14.10<br>100  | 14.50<br>100   |
| 12               | 9.53<br>STD                         | 8.34         | 9.32<br>XS                                      | 9.92<br>XS      | 10.32<br>XS | 11.52<br>60    | 12.32<br>60  | 13.12<br>80     | 14.32<br>80   | 14.72<br>80    |
| 14               | 9.53<br>30                          | 8.34         | 9.32<br>40                                      | 9.92<br>XS      | 10.32<br>60 | 11.52<br>60    | 12.32<br>60  | 13.12<br>60     | 14.32<br>80   | 14.72<br>80    |
| 16               | 9.53<br>30                          | 8.34         | 9.32<br>40                                      | 9.92<br>40      | 10.32<br>40 | 11.52<br>60    | 12.32<br>60  | 13.12<br>60     | 14.32<br>60   | 14.72<br>80    |
| 18               | 9.53<br>STD                         | 8.34         | 9.32<br>30                                      | 9.92<br>XS      | 10.32<br>XS | 11.52<br>40    | 12.32<br>40  | 13.12<br>60     | 14.32<br>60   | 14.72<br>60    |
| 20               | 9.53<br>STD                         | 8.34         | 9.32<br>30                                      | 9.92<br>30      | 10.32<br>30 | 11.52<br>40    | 12.32<br>40  | 13.12<br>40     | 14.32<br>60   | 14.72<br>60    |
| 24               | 9.53<br>STD                         | 8.34         | 9.32<br>XS                                      | 9.92<br>XS      | 10.32<br>XS | 11.52<br>30    | 12.32<br>30  | 13.12<br>40     | 14.32<br>40   | 14.72<br>40    |
| 30               | 9.53<br>STD                         | 8.34         | 9.32<br>20                                      | 9.92<br>20      | 10.32<br>20 | 11.52<br>30    | 12.32<br>30  | 13.12<br>30     | 14.32<br>**30 | 14.72<br>**30  |

\* Maximum standard nominal thickness lower than ASME minimum thickness

\*\* Maximum standard nominal thickness lower than ASME minimum thickness for walls of which thickness is equal to nominal size reduced of 12.5% allowance.



Exploration & Production

| Standard Drawings                                   | SD EP PVV 211 |
|-----------------------------------------------------|---------------|
| Minimum thickness of wall nozzles welded on vessels | Rev.: 02      |
|                                                     | Date: 10/05   |

### Welded steel pipe nozzles $18" \leq ND \leq 42"$

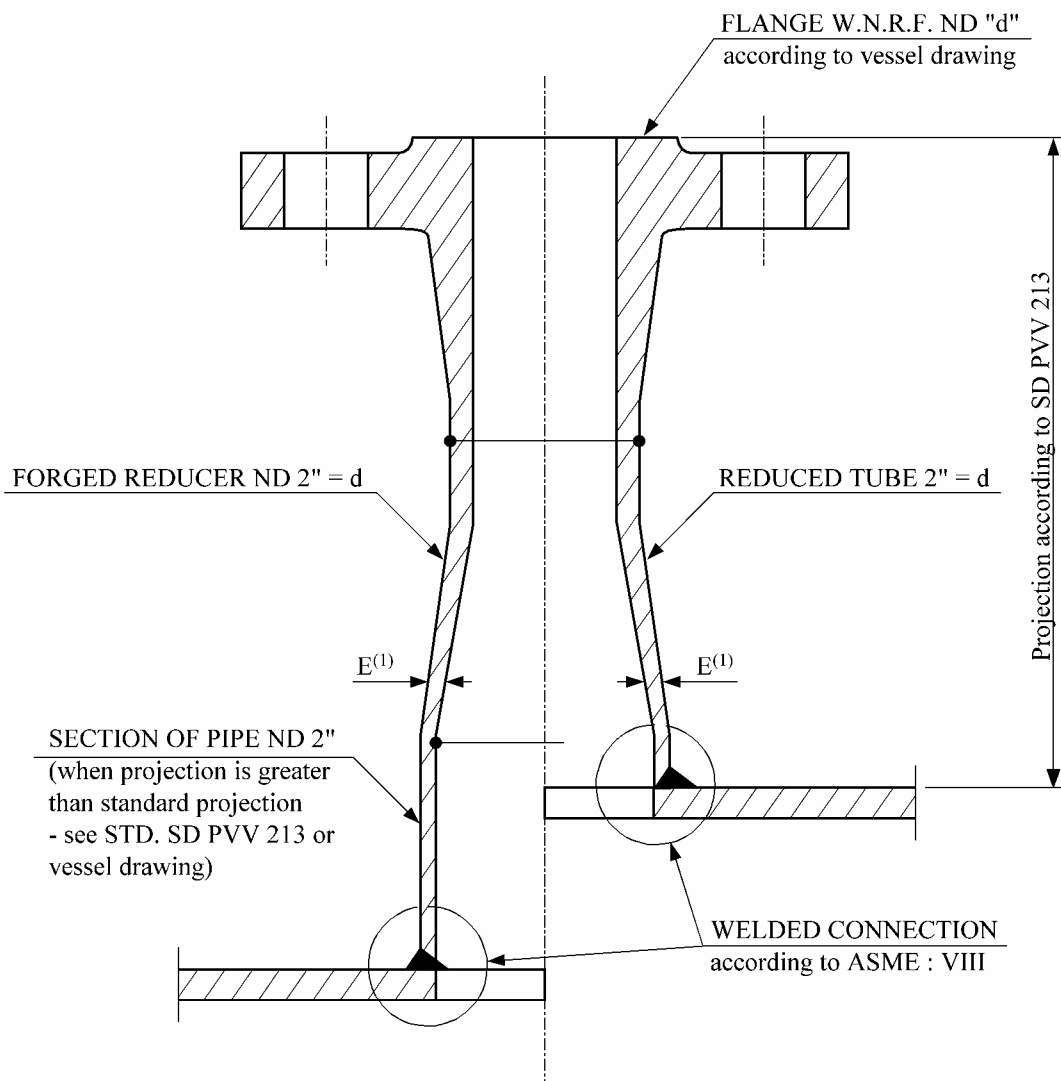
| Corrosion allowance                                  | inches |     |      | 1/16" |      | 1/8" |      | 3/16" |      | 1/4" |
|------------------------------------------------------|--------|-----|------|-------|------|------|------|-------|------|------|
|                                                      | mm     | 0   | 1    | 1.5   | 2    | 3.2  | 4    | 4.8   | 6    | 6.4  |
| Minimum thickness                                    | mm     | 9   | 10   | 10.6  | 11   | 12.2 | 13   | 13.8  | 15   | 15.4 |
| Minimum nominal thickness of steel plates to be used | mm     | 9.5 | 10.5 | 11.5  | 11.5 | 13   | 13.5 | 14.5  | 15.5 | 16   |

**Note:** The thickness value measured on pipe wall during the acceptance of the vessel shall be the greatest of the following values:

- Minimum thickness given by this standard
- Thickness calculated under pressure effect taking into account both joint efficiency and corrosion allowance.

However, the thickness shall be limited to that of the vessel wall on which the nozzle is welded, corrosion allowance inclusive.

| Standard Drawings         | SD EP PVV 212 |
|---------------------------|---------------|
| Nozzle DN < 2" on vessels | Rev.: 02      |
|                           | Date: 10/05   |



**Note (1):** E according to **STD SD EP PVV 211**