Agenda Item 650-1131

Title: Flanged roof nozzles larger than 12 inches

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Revision: 1

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Purpose: Addition to the existing table on flanged tank roof nozzles larger than 12" for tank accessories such as tank vents and emergency relief valves.

Source: Request by Thorsten Schaper (PROTEGO) based on project experience.

Impact: Neutral cost. Enables the selection of larger flanged tank roof nozzles as per ASME B16.5 and ASME B16.47.

Rationale: In chapter 5.7.6 – “Shell nozzles and flanges” the use of flanges NPS 1 1/2” to 24” as per ASME B16.5 and for flanges larger than 24” as per ASME B16.47 are mentioned. On the other hand, the sizes of flanged tank roof nozzles as per API 650, chapter 5.8.5.6 are limited from NPS 1 ½” to NPS 12” as per tables 5.14a/b. For some tank vents sizes larger than 12” are required e.g. for emergency relief valves as per so called fire case, see API 650, chapter 5.8.5.3. The required capacities are given in API 2000, chapter 3.3.3.3 and table 7 and table 8. Due to the lack of appropriate sizes for flanged roof nozzles provided in API 650 for these valves often nozzles as per API 650, chapter 5.8.4 “Roof manholes” are used. Figure 5.16 and tables 5.13a/b are referring. The therein shown flanges for roof manholes are different in strength and dimension from flanges as per ASME B16.5 class 150.
In practice there are issues known such as confusion during specification and execution of projects, but more important issues caused by significant high leak rates on emergency relief valves. This may become costly when operating tanks with nitrogen blanketing and may become problematical when critical products are stored.

Proposed Changes in API 650:

SECTION 5 – DESIGN

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5.8 Shell attachments and tank appurtenances

5.8.5 Roof Venting

- **5.8.5.6**

Flanged roof nozzles ~~shall~~ should conform to Figure 5.19 and Table 5.14a ~~and~~ or Table 5.14b. Slip-on flanges and weld neck flanges ~~shall conform~~ from NPS 1 ½" to NPS 24" should conform to the requirements of ASME B16.5 for Class 150 and for flanges larger than NPS 24" to the requirements of ASME B16.47 for Class 150. P~~p~~late-ring flanges should conform to all of the dimensional requirements for slip-on welding flanges with the exception that it is acceptable to omit the extended hub on the back of the slip-on or weld neck flanges. Raised face flanges should be provided for nozzles with attached piping. Flat face flanges should be provided for roof nozzles used for the mounting of tank accessories. Optional lighter flanges for roof nozzles as per Table 5.13a or Table 5.13b may be specified by the purchaser, (see table 3 of the tank data sheet).

Table 5.14a - Dimensions for Flanged Roof Nozzles (SI)

Dimensions in millimeter

Column 1	Column 2	Column 3	Column 4	Column 5
Nozzle NPS	**Outside Diameter of Pipe Neck**	**Diameter of Hole in Roof Plate or Reinforcing Plate D_p**	**Minimum Height of Nozzle H_r**	**Outside Diameter of Reinforcing Plate[a] D_R**
1½	48,3	50	150	125
2	60,3	65	150	175
3	88,9	92	150	225
4	114,3	120	150	275
6	168,3	170	150	375
8	219,1	225	150	450
10	273	280	200	550
12	323,8	330	200	600
14	355,6	359	220	700
16	406,4	410	220	800
18	457,2	460	240	900
20	508	511	250	1000
22	558,8	562	260	1100
24	609,6	613	270	1200
26	660,4	664	270	1300
28	711,2	714	270	1400
30	762	765	270	1500
32	812,8	816	290	1600
[a] Reinforcing plates are not required on nozzles NPS 6 or smaller but may be used if desired.				
[b] For nozzles larger than NPS 12", the need for local stiffening plates, in addition to reinforcement plates, shall be evaluated.				
Note See figure 5.19.				

Table 5.14b - Dimensions for Flanged Roof Nozzles (USC)

Dimensions in inches

Column 1	Column 2	Column 3	Column 4	Column 5
Nozzle NPS	**Outside Diameter of Pipe Neck**	**Diameter of Hole in Roof Plate or Reinforcing Plate D_P**	**Minimum Height of Nozzle H_r**	**Outside Diameter of Reinforcing Plate[a] D_R**
1½	1.900	2	6	5
2	2⅜	2½	6	7
3	3½	3⅝	6	9
4	4½	4⅝	6	11
6	6⅝	6¾	6	15
8	8⅝	8⅞	6	18
10	10¾	11	8	22
12	12¾	13	8	24
14	14	14 1/8	9	26
16	16	16 1/8	9	30
18	18	18 1/8	10	34
20	20	20 1/8	10	38
22	22	22 1/8	11	42
24	24	24 1/8	11	46
26	26	26 1/8	11	50
28	28	28 1/8	11	54
30	30	30 1/8	11	58
32	32	32 1/8	12	62

[a] Reinforcing plates are not required on nozzles NPS 6 or smaller but may be used if desired.

[b] For nozzles larger than NPS 12”, the need for local stiffening plates, in addition to reinforcement plates, shall be evaluated.

Note See figure 5.19.