

## Agenda Item: 650-771

<b>Title:</b>	<b>Shell height for FCO connection</b>
<b>Date:</b>	<b>June 19, 2013</b>
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<b>Purpose:</b>	To allow FCO connections to be installed in inserts
<b>Source:</b>	INQ-650-D11
<b>Revision:</b>	0
<b>Impact:</b>	Allowing for the option to install the FCO connection into a shell insert in lieu of into a full shell plate has the potential for time and cost savings.
<b>Rationale:</b>	To require the PWHT of the full shell plate for the installation of a small FCO connection is excessive.
<b>Proposal:</b>	Change 5.7.8.3 from “a shell plate “ to read “ a shell <u>or insert</u> plate ”.  In Fig 5.14, change wording “ shell plate in flush connection = td ” to read “ shell <u>or insert</u> plate in flush connection = td ”.

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**5.7.8 Flush-Type Shell Connections**

- **5.7.8.1** Tanks may have flush-type connections at the lower edge of the shell. Each connection may be made flush with the flat bottom under the following conditions (see Figure 5.14).
  - a) The shell uplift from the internal design and test pressures (see Annex F) and wind and earthquake loads (see Annex E) shall be counteracted so that no uplift will occur at the cylindrical-shell/flat-bottom junction.
  - b) The vertical or meridional membrane stress in the cylindrical shell at the top of the opening for the flush-type connection shall not exceed one-tenth of the circumferential design stress in the lowest shell course containing the opening.
  - c) The maximum width,  $b$ , of the flush-type connection opening in the cylindrical shell shall not exceed 900 mm (36 in.).
  - d) The maximum height,  $h$ , of the opening in the cylindrical shell shall not exceed 300 mm (12 in.).
  - e) The thickness,  $t_d$ , of the bottom-transition plate in the assembly shall be 13 mm (1/2 in.) minimum or, when specified, the same as the thickness of the tank annular plate.

**5.7.8.2** The details of the connection shall conform to those shown in Figure 5.14, and the dimensions of the connection shall conform to Table 5.12a and Table 5.12b and to the requirements of 5.7.8.3 through 5.7.8.11.

**Table 5.12a—Dimensions for Flush-Type Shell Connections (SI)**

Dimensions in millimeters

Class 150 Nominal Height of Flange Size	Height of Opening $h$	Width of Opening $b$	Arc Width of Shell Reinforcing Plate $W$	Upper Corner Radius of Opening $r_1$	Lower Corner Radius of Shell Reinforcing Plate $r_2$
8	200	200	950	OD of 8 NPS <sup>a</sup>	350
12	300	300	1300	OD of 12 NPS <sup>a</sup>	450
16	300	500	1600	150	450
18	300	550	1650	150	450
20	300	625	1725	150	450
24	300	900	2225	150	450

<sup>a</sup> For circular openings, this value will be 1/2 of the ID based on the nozzle neck specified.

NOTE See Figure 5.14.

shell or insert

**5.7.8.3** The reinforced connection shall be completely preassembled into a shell plate. The completed assembly, including the shell plate containing the connection, shall be thermally stress-relieved at a temperature of 600 °C to 650 °C (1100 °F to 1200 °F) for 1 hour per 25 mm (1 in.) of shell-plate thickness,  $t_d$  (see 5.7.4.1 and 5.7.4.2).

**5.7.8.4** The reinforcement for a flush-type shell connection shall meet the following requirements:

- a) The cross-sectional area of the reinforcement over the top of the connection shall not be less than  $K_1 h t / 2$  (see 5.7.7.4).
- b) The nominal thickness of the shell plate,  $t_d$ , for the flush-connection assembly shall be at least as thick as the adjacent shell plate nominal thickness,  $t$ , in the lowest shell course.
- c) The nominal thickness of the shell reinforcing plate shall be, as a minimum, the nominal thickness of the shell plate in the flush-connection assembly.

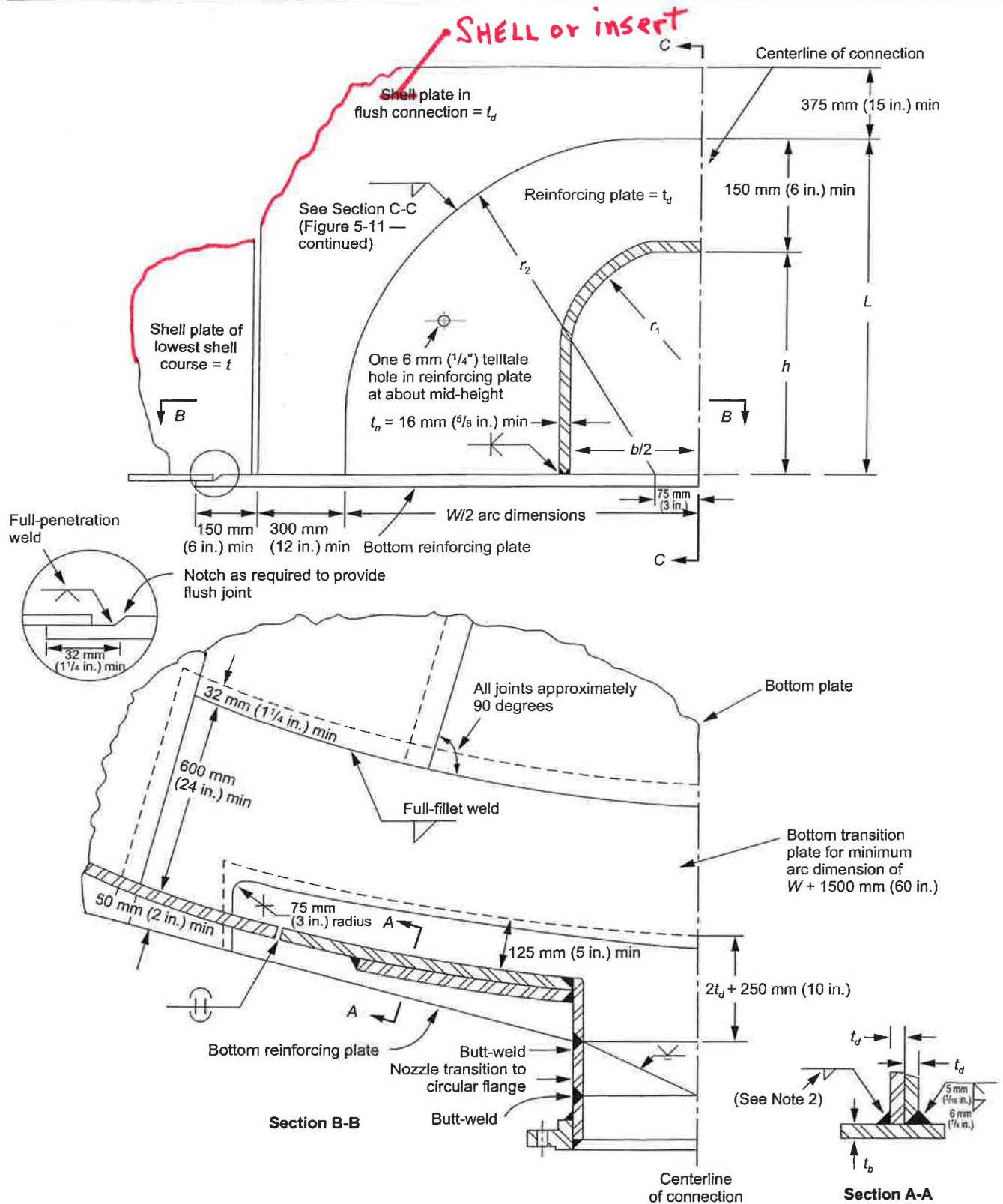


Figure 5.14—Flush-type Shell Connection