# Technical Inquiries for API Standard 650, *Welded Tanks for Oil Storage*

Last Updated August 2016. (New Additions for 2016 are Highlighted in Yellow)

**Important Note:** The API inquiry process is intended to help users understand the technical requirements in the standard without providing the intent, background, and technical basis. The posted interpretations (responses) to inquiries are based on the standard's edition/addendum in effect when the interpretation was prepared. Before applying any interpretation, always look for a later interpretation (if one exists). If there is a conflict between interpretations, use the latest interpretation. If there is a conflict between an interpretation and the current issue of the standard, use the current standard.

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| Multiple | Ed 12, Ad 0 | 650-2013-F8 | May ASTM A500 cold formed round structural tubing be substituted for ASTM A53 pipe for round structural members such as floating roof legs, for roof support columns, etc? | Yes – subject to the provisions of Para. 4.4, including 4.4.1.d. |
| 2 | 10th - Nov. 1998 | | Do the current rules in API 650 allow for a carbon steel tank to incorporate stainless steel components such as nozzles or an entire shell ring, provided all requirements of API 650 are followed for each of the particular material types (CS or SS) used in the structure? | No. For a carbon steel tank, API 650 does not allow the use of materials that do not comply with the specifications listed in Section 2. |
| 2.1 | 9th - May 1993 | | Does API 650 permit the substitution of Charpy impact testing in lieu of meeting specified chemistry requirements? | No. |
| 2.1.1 | 9th - May 1993 | | What API group number is A 36? | A 36 can be a Group I or Group II material, if it complies with the respective footnotes in Table 2-3 of API 650 |
| 2.2 | 10th - Nov. 1998 | 650-I-06/04 | 1: Does the 0.01 in. thickness tolerance specified for plate in API 650, 2.2.1.2.3 apply to carbon and stainless coil product?<br><br>2: When purchasing hot-rolled coil-processed steel for use as roof, shell, and/or bottom plate on a stainless tank, does the ASTM under-run tolerance apply? | 1: Yes. All requirements of the base document apply to an Appendix S tank unless specifically changed or waived by a statement in Appendix S. Refer to S.1.5.<br><br>2: The minimum of the ASTM tolerance or as specified in API 650, Sections 2.2.1.1, 2.2.1.2, or 2.2.1.3, shall apply. |
| 2.2.9 | 9th - May 1993 | | Referring to Section 2.2.9.3, does the phrase "experience or special local conditions justify another assumption" mean that a tank is permitted to be designed for temperatures higher than the specified 15°F above the lowest one-day mean ambient temperature of the locality if the stored product was "normally warmer" than this specified temperature? | No. The Section is referring to variations in local climatic conditions that might not show up on the isothermal charts. However, the document does not yet provide data for locations not covered in Figure 2-2, such as Alaska and Hawaii. |
| 2.2.9 | 9th - May 1993 | | Is it permissible to use Group I plates for a tank bottom, except for plates welded to the shell, for tanks with a -50°F design metal temperature? | API 650 only addresses toughness of bottom plates welded to the shell, per Section 2.2.9 or 2.2.10. |
| 2.2.9 Table 2-3 | 9th - May 1993 | | Does Table 2-3 only relate to plates that are to be heat-treated? | No. |
| 2.2.9 Table 2-3 | 9th - May 1993 | | Does API 650 require that all A 36 material be killed or semi-killed? | Yes, see Table 2-3, Note 2. |
| 2.2.9 | 10th - Nov. 1998 | 650-I-11/01 | Does API 650 require that the material used for the tank shell is of the same group that the material used for manhole reinforcement plates? | No, see Section 2.2.9.4. |
| 2.2.9 | 10th - Nov. 1998 | 650-I-49/02 | Does API 650 limit the thickness of Group I, Grade 250 steel plate to 25 mm (1 in.)? | No, however, API 650 does require that the material be impact tested, if the thickness is greater than that allowed by the exemption curve in Figure 2-1. |
| 2.2.9 | 10th - Nov. 1998 | 650-I-33/03 | Are roof materials required to meet the toughness requirements in 2.2.9? | No. Refer to 2.2.9.1. |
| 2.2.9 | 10th - Nov. 1998 | 650-I-44/03 | Does API 650 require manganese content between 0.8% and 1.2% for A 36 plate less than 0.75 in. to be classified as a Group II material? | Yes. Refer to Table 2-3b, Note 6. Otherwise, the plate would be classified as Group I. |
| 2.2.2a | 9th - May 1993 | | Referring to API 650, does A 36 plate material meet the requirements of Section 2.2.2.a? | Yes. However, the use of A 36 material also requires that other conditions, such as those described in Figure 2-1 and Table 2-3, and their notes, are met. |
| 2.2.2c | 9th - May 1993 | | Does the thickness limitation of 1 in. for A 283 Grade C plates specified in Section 2.2.2.c of API 650 apply to the type of plates used in construction of a tank, such as the thickness of the bottom reinforcing plate and bolting flange and cover plate for flush-type cleanout fittings in Table 3-12? | Yes. |
| 2.3.3 | 9th - May 1993 | | Should the M.3.2 yield strength reduction factor also be applied to the 0.426T and 0.472T terms of Section 2.3.3.1 when determining the allowable stress S? | Yes. |
| 2.5.2 | 10th - Nov. 1998 | 650-I-15/00 | 1: For nozzles made from pipe materials, does API 650, Section 2.5.2 require that seamless pipe be used for nozzles in shells made from Group I, II, III, or IIIA materials?<br><br>2: Does API 650, Section. 2.5.2 preclude the use of electric-resistance welded pipe meeting ASTM A 53, or electric-welded pipe meeting API 5L, for nozzles in shells made from Group IV, IVA, V, or VI materials, but allow use of electric-fusion-welded pipe nozzles made from ASTM A 671? | 1: Yes, unless ASTM A 671 pipe is used.<br><br>2: Yes. |

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| 2.7 | 9th - May 1993 | | Referring to API 650, Section 2.7, are bolt heads required to be marked according to ASME Section II, Part A for bolting? | No. Refer to the applicable ASTM bolt specification, which may or may not be identical to the parallel ASME bolt specification. |
| 3 | 9th - May 1993 | | Please furnish details on the maximum allowable tank diameter and height for tanks built in accordance with API 650. | The appropriate combination of tank diameter and height is a design consideration. There are several factors which influence this. API 650 does not cover an explanation of these factors. Please note the thickness limitations given in Section 2.2.2. |
| 3.1.3.5 | 10th - Nov. 1998 | 650-I-37/03 | Is it the intent of 3.1.3.5 to limit the maximum lap of a double welded lap joint to 2 in. and a single welded lap joint to 1 in. If not, is there a maximum lap requirement for single welded lap joint bottoms and roofs? Would this constraint, if any, also apply to bottom or roof repair or replacements governed by API 653. | No. |
| 3.1.3.5 | 10th - Nov. 1998 | 650-I-49/03 | 1: Section 3.1.3.5 of API 650 specifies minimum lap joint dimensions. Is there any limit on the maximum width of a lap joint?<br><br>2: Can a lap joint consisting of two (2) ¼ in. plates be lapped 3 in.? | 1: API Standard 650 does not address maximum lap.<br><br>2: Yes. Any lap that exceeds the minimum is acceptable. Refer to 3.1.3.5. |
| 3.1.5 | 9th - May 1993 | | What is the distance between vertical welds? | Please refer to API 650, Section 3.1.5.2.b and Section 3.7.3. |
| 3.1.5 Figure 3-3a | 9th - May 1993 | 650-I-24/98 | Referring to API 650, Section 3.1.5 and Figure 3-3a, is it permissible to lap roof plates with the inner (upper) plate lapping under the lower (outer) plate, to protect against the tank contents condensing in the lap joint on the underside of the roof? | Yes, the details shown represent the typical or most common details, but other details are also permitted. |
| 3.1.5.4 | 9th - May 1993 | | Referring to API 650, Section 3.1.5.4, is it required to make a full fillet lap seam weld (top side only) under the tank shell? | Yes. |
| 3.1.5.8 | 10th - Nov. 1998 | 650-I-52/02 | Referring to Section 3.1.5.4, for lap welded bottoms and roofs, are standard mill edge plates considered to be "reasonably square edged"? | Yes. |
| 3.1.5.8 | 10th - Nov. 1998 | 650-I-02/04 | 1: Referring to API Standard 650 3.1.5.8 (b) and Figure 3-20, is it mandatory to provide welding between the bottom-side of a wind girder plate/section and the tank shell if not specified by the purchaser?<br><br>2: Is it mandatory to seal-weld the bottom of the weld joints joining ring sections of the wind girder? | 1: This is a purchaser specified option for details a, b, c and e of Figure 3-20. It is required for detail d of Figure 3-20.<br><br>2: Section 3.1.5.8 (a) requires this to be a full-penetration butt-weld. |
| 3.1.5.9 | 10th - Nov. 1998 | 650-I-11/02 | Is there any allowance or provision to omit the top angle as required by API 650, 3.1.5.9e and 3.1.5.9f if we can show by calculation that the top compression area is sufficient. | No. |
| 3.2.4 | 9th - May 1993 | | Does API 650 cover the design of a tank for a design vacuum condition of 50 mm of water? | No. Per API 650 Section 3.2.4, the tank is limited to one in. of water vacuum (roughly 25 mm). If the tank must be designed for 50 mm water vacuum, then this is a special design which is not covered by API 650. |
| 3.2.4 | 9th - May 1993 | | Should the vacuum relief system set pressure be 25 mm of water if the required design vacuum condition is 50 mm of water? | API 650 does not cover the required setting for vacuum relieving systems. The vacuum relieving systems should be adequately sized to limit the partial vacuum to 1 in. of water vacuum (roughly 25 mm of water). Refer to API Std. 2000, Section 3.6.1.2. |
| 3.2.4 | 10th - Nov. 1998 | 650-I-20/03 | Can tanks that are designed to exceed 1 in. external pressure have an API nameplate? | Yes. API 650 does not contain design rules covering external pressure exceeding 1 in. water column. |
| 3.4 | 9th - May 1993 | | Is a repad allowed to go to the tank bottom and intersect the bottom at 90 degrees to the bottom? | Yes. |
| 3.4 | 10th - Nov. 1998 | | Is it acceptable for the primary (upper) bottom, of an API 650 Appendix I double-bottom tank to not project through the shell and to be attached only to the inside of the shell? | No. API 650, Section 3.4.2 requires the bottom plate project at least 25 mm (1 in.) outside the toe of the outer shell-to-bottom weld. Section 3.5.2 requires the annular plate project at least 50 mm (2 in.) outside the shell. Furthermore, Section 3.1.5.7 requires the bottom be welded to the shell on both sides of the shell. The only way this can be accomplished is with a shell projection. Figure I-4 illustrates an acceptable double-bottom installation. |
| 3.4.1 | 10th - Nov. 1998 | | Can a bottom rectangular plate, as described in API 650, Section 3.4.1, be smaller than 72 in. x 72 in.? | Yes, if the purchaser agrees to the reduced width. There is no requirement that the length be at least 72 in. |

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| 3.5 | 9th - May 1993 | | Does API 650 require that tank annular plates be the same material as the bottom shell course? | No. However, the annular plate material must meet the toughness requirement of Section 2.2.9. See Section 2.2.9 1 and Figure 2-1. |
| 3.5 | 9th - May 1993 | | Does API require an annular plate to be used if (1) bottom plates (1/2 in. nominal thickness) are butt welded and 100% radiographed, and (2) the bottom shell course material falls under Group IV or V, and (3) the materials are not Charpy tested? | The requirement to provide an annular plate depends upon the material group and the stress levels in the bottom shelf course. Refer to Section 3.5.1. The question cannot be answered without more information being provided. Bottom plate thickness, the NDE applied, and the material toughness are not factors in the decision. |
| 3.5 | 9th - May 1993 | | Does API 650 prohibit installing the bottom annular plates on top of the ¼ in. bottom plates? If allowed, this option would eliminate an area for water to collect causing corrosion. | Except for the flush-type cleanout connections (see Figures 3-11 and 3-12), there is no requirement that the bottom plate must lap above, or must lap under the annular plate. |
| 3.5.2 | 10th-add. 4 | 650-I-05/07 | Background : As per 3.5.2 minimum radial width of annular plate shall be<br>(1) 600 + 50 (outside projection) + 50 (lap joint) + 7 (shell thickness)<br>which is = 717 mm<br>(2) As per equation {215*tb/(H*G)^0.5} = {215*9/(7*1.04)^0.5} = 717 mm<br>Accordingly 800 mm radial width used. However, if we add outside projection+lap joint width+shell thickness (=107 mm) on calculated width, then it becomes 824 mm (717+107) which exceed the used width.<br>Question : Is projection outside the shell (as per 3.4.2) and lap joint width is required to be added when calculated as per equation given in 3.5.2? | pending |
| 3.5.2 | 10th - Nov. 1998 | 650-I-22/03 | Section 3.5.2 states the annular bottom plates shall have at least a 50 mm projection outside the shell. Is the reference point to calculate the projection located on the outside or inside diameter of the shell? | The reference point is on the outside diameter of the shell plate, as stated in 3.5.2. |
| 3.6 | 10th - Nov. 1998 | 650-I-02/03 | Does API 650 require same width and material for all shell courses? | No. |
| 3.6.1 | 9th - May 1993 | | If the calculated shell thickness is 1/8 in. and the specified corrosion allowance is 1/8 in., must the shell thickness be obtained by adding the 1/8 in. to the minimum thicknesses required by Section 3.6.1.1, which would be 1/8 plus 3/16 in., or can it be determined by adding the corrosion allowance to the computed required minimum thickness, in this case 1/8 in. plus 1/8 in.? | The minimum thickness requirements of Section 3.6.1.1 are primarily for fabricability. The corrosion allowance may be added to the computed shell minimum thickness, in this case, 1/4 in. total. |
| 3.6.1 | 10th - Nov. 1998 | 650-I-50/00 | 1: Referring to API 650, Section 3.6.1.2 and Section 3.1.5.2, is it permissible for the tank manufacturer, with or without the purchaser's consent, to seam weld two plates (circumferentially) then join the two with one vertical weld, thus intersecting the horizontal weld?<br><br>2: Is a shell course considered from one circumferential weld to the next circumferential weld, assuming 72 in. minimum width as stated in Section 3.6.1.2? | Reply 1: No. See 3.1.5.2b.<br><br>Reply 2: Yes. |
| 3.6.2<br>Table 3-2 | 9th - May 1993 | | A client has specified 6 crude oil tanks with an operating temperature of 70ºF - 100ºF and a design temperature of 300ºF and a material of construction of A 285 Grade C. Should the tanks be designed with the allowable stresses per Table 3-2 of API 650 or per Appendix M? | As specified, these tanks should be designed with allowable stresses per Table 3-2 since the application of Appendix M is based on maximum operating temperature and not design temperature. However, the client should be informed of the design basis and asked to clarify the large difference between the specified operating and design temperature. |
| 3.6.3 | 9th - May 1993 | | Referring to Section 3.6.3.2, is it required to add the depth of undercut (vertical seam 1/64 in., or horizontal seam 1/32 in.) to the calculated thickness? | No, as long as the undercut does not exceed the limits of Section 5.2.1.4. |
| 3.6.3 | 9th - May 1993 | | Does API 650 allow for overflows? | Overflows limiting "H" as defined in Section 3.6.3 are permitted. |
| 3.6.3 | 9th - May 1993 | | Does API 650 specify the maximum height to which a tank may be filled? | Yes. See definition of the term "H" in Section 3.6.3 and 5.3.5a. |
| 3.6.3.2 | 10th - Nov. 1998 | 650-I-21/02 | 1: In section 3.6.3.2, is the H for calculating $t_t$ the same value as H for the calculating $t_d$?<br><br>2: Is the value of H in 3.6.3.2 to be used for calculation of ts should be equal to the value of H for calculation of td?<br><br>3: Do the above mean that the value of H to be used for calculation of ts should be equal to the value of H for calculation of td? | 1: Yes.<br><br>2: Yes.<br><br>3: Yes. |

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| 3.6.4 | 10th - Nov. 1998 | | Is the variable design point method of shell design covered under API 650, Section 3.6.4, valid for tanks with variable corrosion allowance (i.e. different corrosion for each shell course)? | No. |
| 3.7 Table 3-6 | 10th - Nov. 1998 | | Are the dimensions for shell nozzles in Table 3-6 acceptable for shell manholes? | Yes, please refer to Figure 3-4A, footnote 6. |
| 3.7 | 10th - Nov. 1998 | 650-I-32/00 | Are square or rectangular manways allowed per API 650? If no, what specific section limits them? | Yes. See Figure 3-14 for roof manway requirements. |
| 3.7 | 9th - May 1993 | | Are shell openings for use as overflows a mandatory requirement according to API 650? | No. |
| 3.7 | 9th - May 1993 | | In the expression "R/t" is "t" the sum of thickness of the shell plus the thickness of the reinforcing pad around the opening? | No, "t" is the shell thickness only at the location of the shell opening. |
| 3.7 | 9th - May 1993 | | When the shell is reinforced, does the variable "2s" mean the diameter of the reinforcement pad at the opening in all the charts? | No, "2s" is the diameter of the opening rack. |
| 3.7 | 9th - May 1993 | | Does API 650 allow the use of 90 degree elbows between shell nozzles and the first flange? | No. Refer to Section 3.7.1.2 and 3.7.1.8 which indicate that the only alternate designs permitted are for nozzle reinforcing, with approval of the purchaser. These sections do not permit alternate designs in the basic nozzle configuration as proposed. |
| 3.7 Table 3-6 | 10th - Nov. 1998 | | Is there any limitation in the stored medium's height or tank diameter for using the thickness listed in Table 3-6? | No. |
| 3.7 Table 3-6 | 10th - Nov. 1998 | | The size of nozzles starts from 1 1/2 NPS in the "flanged fittings" category. Does this mean that "flanged fittings" smaller than 1 1/2 NPS are not allowed to be used and only "threaded fittings" are to be used? | No, but rules are not provided for "flanged fittings" smaller than 1 1/2 NPS in API 650. |
| 3.7 Table 3-6 | 10th - Nov. 1998 | | Does footnote (a) in Table 3-6, Column 3, allow the use of 2-inch Schedule 40 ASTM A 53 pipe for the thickness of a flanged nozzle pipe wall? | No. The minimum thickness of the pipe wall is to be as per Column 3 of of Table 3-6 which is schedule extra strong for the nozzle sizes where a thickness is shown. |
| 3.7 Figure 3-6 | 9th - May 1993 | | Referring to Fig. 3-6 details a, c, and e, are these details permitted for stress-relieved assemblies? | The rules for stress-relieving are independent of the rules in Figure 3-6, which are referenced by Section 3.7.3. The details may or may not be suitable for use in stress-relieved assemblies. Refer to Section 3.7.4 for stress-relieving requirements. |
| 3.7 Figure 3-9 | 9th - May 1993 | | Referring to Figure 3-9, Detail b, are alternate designs permitted, such as extending the neck such that the flange face is flush with the end of the neck? | No. Refer to the first sentence in Section 3.7.7.1. |
| 3.7 Figure 3-9 | 10th - Nov. 1998 | | Referring to Figure 3-9, is it permissible to provide these flush-type cleanouts without machining the bolting flanges? | Yes. |
| 3.7.1 | 9th - May 1993 | | Is the ASME Code, Section VIII, Div. 1 an acceptable alternative for the reinforcement of shell openings per Section 3.7.1.8 | No. |
| 3.7.1 Table 3-6 | 10th - Nov. 1998 | 650-I-38/02 | Does note c of API 650 Table 3-6 allow the customer to locate nozzles lower than allowed by the weld spacing requirements of 3.7.3? | No. |
| 3.7.1 Fig. 3-4B | 10th - Nov. 1998 | 650-I-37/00 | May a shell nozzle or manhole that otherwise complies with Figure 3-4B have its reinforcing plate welded to the nozzle neck with a full-penetration weld, in addition to the fillet weld in the same manner as API 620 Figure 3-8 Part 2 Panel m, if the purchaser has so approved as permitted by API 650 Section 3.7.1.8? | Yes. |
| 3.7.1 Fig. 3-4B | 10th - Nov. 1998 | 650-I-18/03 | The manhole or nozzle detail in Figure 3-4B of API 650 (details at the top of the page) show the fillet weld sizes as “A”. Where is the dimension for “A” found? | See Note 3 of Figure 3-4B and Table 3-7. |
| 3.7.1 | 10th - Nov. 1998 | 650-I-10/04 | Is API 620, Figure 5-8, Part 1, Panel d, an acceptable alternative reinforcement detail for larger than NPS 2 nozzles as allowed by API 650, Section 3.7.1.8? | No. Nozzle connections require full penetration welds between the shell and the nozzle neck. Refer to 3.7.2.1. |
| 3.7.1.8 | 10th - Nov. 1998 | 650-I-09/04 | 1: Section 3.7.1.8 states "Reinforcement of shell openings that comply with API Standard 620 are acceptable alternatives". When using API 620 to calculate nozzle reinforcement does the entire API 620 standard apply?<br><br>2: API 620 limits the design temperature to 250º F. Can the rules for nozzle reinforcement be used for designing nozzle reinforcement for an API 650 Appendix M tank with a design temperature greater than 250º F?<br><br>3: Can the rules for nozzle reinforcement in API 620 be used for designing nozzle reinforcement for a stainless steel API 650 Appendix S tank?<br><br>4: When designing nozzle reinforcement for an API 650 tank using the rules of API 620, should the allowable stresses of API 650 be used? | 1: No.<br><br>2: Yes.<br><br>3: Yes.<br><br>4: Yes. |

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| 3.7.1.8 | 10th - Nov. 1998 | 650-I-24/02 | 1: Does API 650 allow reinforcement to be located on the ID of the shell?<br><br>2: Does API 650 allow reinforcement to be located on the underside of the roof? | 1: Yes, if approved by the owner. Refer to 3.7.1.8.<br><br>2: No. Refer to 3.8.5.1 |
| 3.7.2<br>Table 3-4 | 9th - May 1993 | | 1: Is the thickness, T, in Table 3-4 the same as $t_{shell}$ for the thickness of the opening reinforcement?<br><br>2: Is the thickness "$t_n$" in Table 3-4 equal to T plus t? | 1: Yes.<br><br>2: No. In column 1, T and t are not considered to be a sum. |
| 3.7.2 | 9th - May 1993 | | Is a minimum repad required around all nozzles greater than 2" even if the area of the nozzle allowed as reinforcing (Section 3.7.2.3) is greater than the reinforcing required (Section 3.7.2.1)? | No, see Section 3.7.1.8. |
| 3.7.2 | 9th - May 1993 | | May shell opening reinforcement be determined either in accordance with Section 3.7.2.1 or, alternately, in accordance with Tables 3-8 and 3-9? | No, Section 3.7.2.1 requires that Tables 3-8 and 3-9 be used. However, alternate details satisfying the reinforcement requirements of Section 3.7.2.1 are allowed if the purchaser agrees to their use. |
| 3.7.2 | 10th - Nov. 1998 | 650-I-07/04 | Regarding Section 3.7.2 as it applies to Appendix F, when calculating the required shell thickness at the nozzle location is it necessary to use the joint efficiency factor that was used for calculating the required tank shell thickness? | No. |
| 3.7.3 | 9th - May 1993 | | Referring to API 650, Section 3.7.3, is it correct to conclude that the minimum distance between the periphery of a nozzle reinforcing plate and the shell-to-bottom weld (measured as toe-to-toe) is as follows:<br>1) For shell plate ½ in. or less, or for any stress-relieved shell plate thickness, the required distance is the greater of 3 inches or 2.5 times the shell thickness?<br><br>2) For shell plate greater than ½ in., with or without stress relief, the required distance is 10 inches? | 1. Yes.<br><br>2. No. The requirement for the case of shell plate greater than ½ in. with no stress relief is the greater of 10 inches or 8 times the weld size. For the case of shell plate greater than ½ in. with stress relief, the distance is 3 inches or 2.5 times the shell thickness. |
| 3.7.3 | 9th - May 1993 | | Regarding reinforcement for shell openings, is the total area of provided reinforcing equal to the sum of the reinforcing areas above and below the opening? | Yes, the areas are measured vertically, along the diameter of the opening, and must be within a distance above or below the horizontal centerline equal to the vertical dimension of the hole. |
| 3.7.3 | 9th - May 1993 | | Is the total area of required reinforcing equal to the product of the vertical diameter of the hole and the nominal plate thickness? | Yes, however, when calculations are made for the required thickness considering all design and hydrostatic test load conditions, the required thickness may be used in lieu of the nominal thickness. |
| 3.7.3 | 9th - May 1993 | | What is the distance between vertical welds? | Please refer to API 650, Section 3.1.5.2.b and Section 3.7.3. |
| 3.7.3 | 10th - Nov. 1998 | 650-I-07/02 | Given a 2 in. nominal bore non-reinforced nozzle in a non stress-relieved shell greater than 0.5 in. thickness. Are the minimum distances for: (1) the outer edge of nozzle attachment weld to center line of a shell butt weld, either vertical or horizontal, and (2) the toe-to-toe distance of the fillet to the shell-to-bottom weld, required to be 10 in. (or 8x weld thickness) and 3 in., respectively? | Yes, for new tanks, see API 650, sections 3.7.3.1, 3.7.3.3, and Figure 3-22. |
| 3.7.3 | 10th - Nov. 1998 | 650-I-11/04 | 1: Is the minimum size of a thickened insert $D_o$ as shown in Figure 3-4B?<br><br>2: Must the weld spacing given in 3.7.3 be applied to the dimension from the nozzle neck to the edge of the thickened insert so that in some cases the $D_o$ dimension in Figure 3-4B is not adequate for sizing a thickened insert? | 1: Yes.<br><br>2. No, the weld spacing in 3.7.3 applies from the periphery of the thickened insert to an adjacent shell butt weld as shown in Figure 3-4B and reference in Note 2. |
| 3.7.3.1 | 9th - May 1993 | | Based on API 650, Section 3.7.3.1(b) (shells greater than ½ in. thick), is the spacing dimension required to be the greater of 8x weld size or 6 inches from the toe or edge of welds in all cases shown in the attached figure? | Yes, assuming there is also no stress-relieving in this case. |
| 3.7.3.2 | 10th - Nov. 1998 | 650-I-19/99 | API 650, Section 3.7.3.2 decreases the required minimum spacing from the nozzle neck weld to the edge of reinforcing when stress-relieving of the periphery has been performed before welding the assembly to the adjacent shell joint, by reducing the spacing to 6 inches from vertical joints, or 3 inches from horizontal joints. Does this include the distance from the penetration weld (nozzle neck) to the shell-to-bottom weld if the reinforcing extends to the shell-to-bottom weld? | Section 3.7.3.2 does not define requirements for the distance from the nozzle neck weld to the edge of reinforcement. The spacing between the nozzle centerline and the edge of reinforcement, which is also the shell-to-bottom for this assumed tombstone-type detail, must meet the limits in Table 3-6, Column 9. |
| 3.7.3.2 | 9th - May 1993 | 650-I-19/99 | Based on API 650, Section 3.7.3.2 (shells greater than ½ in. or less or stress-relieved), would all the spacing dimensions in the attached sketch be the same (the greater of 3 inches or 2 ½ times the shell thickness from edge or toe of welds)? | Yes. |

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| 3.7.3.3 | 10th - Nov. 1998 | 650-I-19/99 | Referring to API 650, Section 3.7.3.3 and 3.7.3.1(a), if the thickened insert or reinforcing plate is detailed to extend the reinforcing to the bottom-to-shell joint, does the distance from the toe of the weld around the penetration (nozzle neck) to the shell-to-bottom weld still have to meet the minimum spacing of 8t or 10 inches from any butt-welded joint, including the bottom-to-corner weld? | No, these sections do not define requirements for the distance from the nozzle neck to the edge of reinforcing. However, the spacing between the nozzle centerline and the edge of reinforcing, which is also the shell-to-bottom for this assumed tombstone-type detail, must meet the limits in Table 3-6, Column 9. |
| 3.7.3.4 | 9th - May 1993 | | Does API 650 allow for nozzles to be installed in circumferential seams? | Yes, if the conditions specified in Section 3.7.3.4 are met, including purchaser and manufacturer agreement, and radiography requirements. |
| 3.7.4 | 9th - May 1993 | | Does API 650 require flush-type cleanout fittings to be stress-relieved as a complete assembly, when more than one manufacturer is involved in fabricating the components? | Yes. The contractual arrangements are not a factor. |
| 3.7.4 | 10th - Nov. 1998 | | When stress-relieving the assembly defined in API 650 Sections 3.7.4.1, 3.7.4.2, and 3.7.4.3, is it permissible to perform a local heat treatment that includes part of a shell plate, instead of the whole shell plate, i.e., the portion around the connection at full width of shell plate? | No, however, there is no rule against shortening the plate length circumferentially, prior to installation of the fitting or connection. |
| 3.7.4 | 10th - Nov. 1998 | 650-I-20/00 | Does API 650, Section 3.7.4, require that all flush-type cleanout fittings be stress-relieved? | Yes, except as permitted by A.8.2. |
| 3.7.4 | 10th - Nov. 1998 | 650-I-16/03 | 1: Does a cover plate that has no welding performed on it require PWHT when the nozzle assembly it attaches to requires PWHT?<br><br>2: Does API 650 specify the number and location of the thermocouples used to monitor the PWHT? | 1: No, see Section 3.7.4.<br><br>2: No, API 650 does not address this issue. |
| 3.7.4.1 | 9th - May 1993 | | Does API 650, Section 3.7.4.1, require stress-relieving of flush-type cleanout fittings only if the entire tank is stress-relieved? | No. Unless Appendix A applies, stress-relieving of flush-type cleanout fittings is required regardless of whether the entire tank is stress-relieved or not. |
| 3.7.4.1 | 9th - May 1993 | | Is there a conflict between API 650 Sections 3.7.4.1 and 3.7.4.3 and 3.7.7.3 and 3.7.8.3 regarding stress-relieving of flush-type cleanout fittings? | No. 3.7.4.1 and 3.7.4.3 cover the general rule; 3.7.7.3 and 3.7.8.3 cover a special situation that merits tighter stress-relieving requirements. Flush-type cleanout fittings are a complex weldment. |
| 3.7.4.1 | 10th - Nov. 1998 | | Referring to API 650, Section 3.7.4, must all flush-type cleanouts and flush-type shell connections be stress-relieved regardless of the material used, the nozzle diameter, or the thickness of the shell insert plate? | Yes, see Section 3.7.4.1. |
| 3.7.4.2 | 10th - Nov. 1998 | 650-I-53/99 | 1: Per API 650, Section 3.7.4.2, for shell openings over NPS 12, if insert plates are not used to reinforce the shell opening, is the shell thickness a factor in determining if PWHT of the assembly is required?<br><br>2: Regarding Section 3.7.4.2, is stress-relieving mandatory for the prefabricated assembly when the thickness of the thickened insert plate exceeds 1 in., irrespective of the shell opening size. | 1: Yes.<br><br>2: No. The requirement applies only to NPS 12 or larger connections. |
| 3.7.4.2 | 10th - Nov. 1998 | 650-I-17/01 | Does Section 3.7.4.2 of API 650, mean that stress-relieving of opening connections after welding the shell joints is prohibited? | Stress-relieving of the opening connections meting the conditions specified in 3.7.4.2 is required prior to installation of the assembly into the shell. |
| 3.7.4.3 | 9th - May 1993 | 650-I-41/98 | 1: Does API 650 require the stress-relieving of a pre-fabricated clean-out fitting, or a reinforced opening in a tank shell, be performed in one operation by enclosing the assembly in a furnace, or can the heat treatment be achieved by placing electric wire elements just around the welded joints of the assembly and providing insulation?<br><br>2: Does API 650 allow stress-relieving reinforced shell openings or clean-out shell fittings in position after installation using electric wire elements and insulation? | 1: The entire assembly, not just the welds, must be heated to the required temperature. The method for accomplishing this is not specified in API 650. Refer to Section 3.7.4 of API 650. Clean-out fitting assemblies, but not other reinforced connections, may alternatively be stress-relieved by heat treating the entire tank with the assembly installed in the tank.<br><br>2: No. Clean-out openings are required to be stress-relieved prior to installation in the tank or by heating the entire tank. Refer to Section 3.7.4. |
| 3.7.4.3 | 9th - May 1993 | | Referring to API 650, Section 3.7.4.3, is it acceptable to perform the required stress-relieving in a field fabrication shop, applying the heat locally? | The entire assembly has to be heated uniformly, not just the welds. API 650 does not specify the technique to be used to achieve this uniform heating, or where the stress-relieving is to be performed. |
| 3.7.4.3 | 10th - Nov. 1998 | | Referring to API 650, Section. 3.7.4.3, if the required reinforcing can all be placed in the nozzle neck, using internal and external projections as required, thereby eliminating any insert plate or reinforcing plate, is PWHT of the prefabricated opening connection assembly required? | Yes. |
| 3.7.4.3 | 10th - Nov. 1998 | 650-I-01/00 | Does API 650, Section 3.7.4.3, allow stress-relieving nozzles, as described therein, after installation in the shell, using locally applied heaters? | No. The heat treatment has to be performed prior to installation in the tank. |

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| 3.7.4.4 | 9th - May 1993 | | Does API 650, Section 3.7.4.4, require for the stated materials that the weld attaching a nozzle reinforcing plate to a shell plate be stress-relieved? | Yes, in addition, the nozzle-to-shell weld is to be stress-relieved also. |
| 3.7.4.1 & 3.7.4.2 | 10th - Nov. 1998 | 650-I-02/00 | 1. Referring to API 650, Section 3.7.4.2 and 3.7.4.3, is the thermal stress relief required to be performed in an enclosed furnace?<br><br>2. Does API 650, Section 3.7.4.2 and 3.7.4.3, allow stress-relieving nozzles, as described therein, using locally applied heaters? | 1: No, but the heat treatment must be performed prior to installation of the assembly into the shell.<br><br>2: Yes, however, the heat treatment has to be performed prior to installation into the tank. |
| 3.7.5 | 9th - May 1993 | | Does API 650 specify a minimum number and location for manholes and inspection openings in tanks? | No. |
| 3.7.6 | 10th - Nov. 1998 | | Does API 650 allow nozzle-type clean out fittings that are half above floor level and half below floor level to be replaced in an old tank or installed in a new tank? If so, what section permits them to be replaced? | No. |
| 3.7.6 Table 3-8 | 9th - May 1993 | | Are the shell nozzle heights governed by the weld spacing specified in column 9 of Table 3-8 or by Footnote (c)? | A spacing which is the greater of Column 9 or Footnote C applies. |
| 3.7.6 Table 3-8 | 9th - May 1993 | | Where conditions occur, such as the floor of the tank or another nozzle, is it permissible to use a recognized method such as AREA REPLACEMENT RULES to determine the required area and/or width of a repad -- rather than just applying the width of the repad listed in Table 3-8 of API 650 (without calculation)? The calculation would be certified by a Professional Engineer. | Yes. Refer to 3.7.2 and 3.7.1.2 of API 650. Purchaser agreement is required. |
| 3.7.6 Figure 3-5 | 9th - May 1993 | | In Figure 3-5, is the thickness (T) of the reinforcing plate equal to the shell thickness (t)? | Yes. |
| 3.7.6 Figure 3-5 | 9th - May 1993 | | Referring to Figure 3-5, is a butt-welded connection inside the tank an acceptable detail? | Yes. |
| 3.7.6.1 | 10th - Nov. 1998 | | Does Section 3.7.6.1, permit making a hot tapping connection on a blind flange on a nozzle in a tank? | No. Refer to 3.8.3 for rules on installing a nozzle in a cover plate in a new tank. Refer to API 653, Section 7.14, for rules and guidance on hot tapping in an in-service tank. |
| 3.7.7 | 10th - Nov. 1998 | 650-I-08/99 | Does a flush-type cleanout built to API 650 require a machined surface on either the bolting flange or the cover plate? | No. |
| 3.7.7 | 10th - Nov. 1998 | 650-I-01/04 | 1: When installing a flush-type cleanout fitting, is it mandatory to provide a bottom reinforcing plate width the as same as the annular plate width?<br><br>2: When an annular plate is provided, does API 650 permit provision of bottom reinforcing plate having lesser width than that of annular plate? | 1: Yes. Refer to Figure 3-9, Note 2.<br><br>2: No. Refer to Figure 3-9, Note 2. |
| 3.7.7 | 10th - Nov. 1998 | 650-I-53/02 | Are plate under-tolerances permitted in API 650, Table 3-10? | Yes. See Section 2.2.1.2.3. |
| 3.7.7 Figure 3-10 | 10th - Nov. 1998 | 650-I-13/00 | The width of the block out shown in detail “c” in Figure 3-10 is given as W + 300 mm (12 in.). For a 36 in. cleanout, would the width be 118 inches (W + 12 = 118 inches)? | Yes |
| 3.7.7.6 | 10th - Nov. 1998 | 650-I-56/02 | Do the minimum thicknesses listed in Table 3-10, and calculated by the equations in section 3.7.7.6 have a corrosion allowance? | No. See Section 3.3.2. |
| 3.7.8 Figure 3-11 | 10th - Nov. 1998 | 650-I-18/00 | Referencing Figure 3-11, does API 650 cover flush shell connections to be installed non-radially? | No. |
| 3.7.8 Figure 3-12 | 10th - Nov. 1998 | 650-I-18/00 | Referencing Figure 3-12, are flush-type shell connections smaller than 8 inches covered in API 650? | No. |
| 3.7.8 | 9th - May 1993 | | Should the corrosion allowance used on the shell plate be included in the required thickness of the reinforcing pad? | No. A corrosion allowance for an external reinforcing pad is not required unless specified by the purchaser. |
| 3.7.8 | 10th - Nov. 1998 | 650-I-52/00 | Does API Std. 650 allow an eccentric reducer to be installed between the nozzle neck and the flange of a flush-type fitting? | No. Refer to API Std. 650 Section 3.7.8.2. |
| 3.7.8 | 10th - Nov. 1998 | 650-I-14/02 | In determining the thickness of a cover plate and bolting flange in which product mixing equipment is installed, is there a conflict between 3.8.3.2 and 3.8.3.3. | No. |
| 3.7.8.11 | 10th-add. 4 | 650-I-02/07 | My question relates to radiographic examination of nozzle joints on tanks. In section 3.7.8.11 the clause states:<br>‘All longitudinal butt-welds in the nozzle neck and transition piece,..shall receive 100% radiographic examination (see 6.1)<br>In section 6.1.1 the clause states:<br>‘Radiographic inspection is not required for the following: welds in nozzle and manway necks made from plate’<br>Which phrase is correct or am I not interpreting correctly? Surely a manway neck made from plate would have a longitudinal butt weld? | Pending |

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| 3.8 | 10th - Nov. 1998 | 650-I-50/00 | Referring to API 650 Section 3.8, if the requirements of this section have been satisfied, is it permissible to make permanent attachments of any size, shape or thickness? | Yes. However, certain attachments (e.g. stiffening rings, per Section 3.9.4) are covered by specific rules that affect size, shape, or thickness. |
| 3.8.1 | 10th - Nov. 1998 | 650-I-53/00 | Referring to API 650, is magnetic particle testing applicable for inspecting permanent attachments to the shell and at temporary attachment removal areas, when the material group is of Group I (A 283, Grade C)? | No. See 3.8.1.2 and 5.2.3.5. |
| 3.8.1 | 10th - Nov. 1998 | 650-I-42/02 | Is radiography required for a circumferential weld in a nozzle between the tank shell and the flange? | API 650 does not require radiography of this weld. |
| 3.8.1 | 10th - Nov. 1998 | 650-I-45/03 | Does API 650 allow butt-welded connections without flanges outside the tank shell? | Yes. Refer to section 1.2 d. |
| 3.8.3.2 | 10th - Nov. 1998 | 650-I-51/00 | API 650, Section 3.8.3.2, requires mixer manway bolting flanges to be 40% thicker than the values shown in Table 3-3. Footnote b under Table 3-4 requires the minimum manway neck thickness to be the lesser of the flange thickness or the shell plate. Is it therefore required that the minimum neck thickness on a mixer manway be the lesser of 140% of the flange thickness value in Table 3-3 or the shell thickness? | No. |
| 3.8.4 Figure 3-13 | 10th - Nov. 1998 | | Does API 650, Figure 3-13 require the roof manhole neck to project below the bottom of the roof plate? | No. |
| 3.8.7 Figure 3-18 | 10th - Nov. 1998 | | In Figure 3-18, details b and e include the thickness of the stiffener in the width of the shell whereas detail c does not. Which is correct? | The thickness of the stiffener is to be included in the width of the shell. |
| 3.8.7.2 | 9th - May 1993 | | Referring to API 650, Section 3.8.7.2, is the "as-ordered thickness" equal to the "new condition" or the "corroded condition"? | The "new condition". |
| 3.8.10 | 9th - May 1993 | | Does API 650 require intermediate landings for spiral stairways? | No. |
| 3.9 | 9th - May 1993 | | Section 3.9 addresses the stiffening of open top tanks for wind loads. Does this mean that fixed roof tanks, such as cone, dome, and umbrella roof tanks, do not need to be stiffened for wind loads or should the same procedure be used for designing fixed roof tanks? | The top of a fixed roof tank does not require stiffening for wind loads, however, the tank shell must be checked to determine if an intermediate wind girder per Section 3.9.7 is required. |
| 3.9 | 9th - May 1993 | | If more than one intermediate wind girder is required, is the section modulus of the second intermediate wind girder based on the height between the second intermediate wind girder and the top wind girder, or should H1 be based on 1/2 the distance between adjacent wind girders/stiffeners where the bottom plate counts as the bottom stiffener? | To determine the section modulus of the second intermediate wind girder, first determine the transformed shell height equal to the distance between the fist wind girder and the top wind girder. Subtract this value from the total transformed shell height determined in Section 3.9.7.2. The remaining shell is then transposed to an actual shell height and this value is used for $H_1$ in the formula in Section 3.9.7.6. |
| 3.9 | 9th - May 1993 | | Does Section 3.9 of API 650 require intermediate wind girders for closed top tanks where required by Section 3.9.7? | Yes. Where required by 3.9.7, intermediate wind girders are required for closed top tanks as well as open top tanks. This requirement is not in conflict with Section 3.9.1 which deals only with the requirement for a top wind girder on open top tanks. |
| 3.9.1 | 9th - May 1993 | | Section 3.9.1 implies that the intermediate wind girders are not required for fixed roof tanks although the definition for $H_1$ in Section 3.9.7.1 and 3.9.7.6 implies otherwise? | Intermediate wind girders are required for fixed roof tanks if height of unstiffened shell exceeds $H_1$ as calculated by Section 3.9.7.1. |
| 3.9.2 | 9th - May 1993 | | Is it permissible to construct the top wind girder as a circular ring using flat plate components? | Yes, provided the requirements of Section 3.9.2 are met. |
| 3.9.6 | 10th - Nov. 1998 | 650-I-23/02 | Is there any upper limit for the number of intermediate wind girders in API 650? | No. |
| 3.9.6.1 | 9th - May 1993 | | In Section 3.9.6.1, the definition of $H_2$ implies that the modulus of the top wind girder is not reduced by providing the intermediate wind girder. Is this correct? | Yes. |
| 3.9.6.1 | 9th - May 1993 | | Reference 650 Section 3.9.6.1, is it permissible to use a double wind girder in lieu of a top wind girder on an open top tank? | The top wind girder must meet the requirements of API 650 Section 3.9.6. API does not restrict the details of construction. |
| 3.9.7 | 9th - May 1993 | | Must corrosion allowance be subtracted from t in the formula of 3.9.7.1 and 3.9.7.2? | No. |
| 3.9.7 | 9th - May 1993 | | Does API 650 require the tank supplier to meet the intermediate wind girder requirements of Section 3.9.7 for all fixed roof tanks? | Yes. |

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| 3.9.7 | 9th - May 1993 | | If more than one intermediate wind girder is required, is the section modulus of the second intermediate wind girder based on the height between the second intermediate wind girder and the top wind girder, or should H1 be based on 1/2 the distance between adjacent wind girders/stiffeners where the bottom plate counts as the bottom stiffener? | To determine the section modulus of the second intermediate wind girder, first determine the transformed shell height equal to the distance between the fist wind girder and the top wind girder. Subtract this value from the total transformed shell height determined in Section 3.9.7.2. The remaining shell is then transposed to an actual shell height and this value is used for $H_1$ in the formula in Section 3.9.7.6. |
| 3.9.7.1 | 10th-add.4 | 650-I-10/07 | The equation for H1 in Par. 3.9.7.1 does not provide a factor of safety against buckling. Correct? | Yes |
| 3.9.7.1 | 10th - Nov. 1998 | 650-I-37/02 | In Section 3.9.7.1, should footnote (a) be referred to when analyzing wind velocities other than 100 mph? | Yes. |
| 3.9.7.2 | 9th - May 1993 | | Referring to API 650, Section 3.9.7.2, is the "as-ordered thickness" equal to the "new condition" or the "corroded condition?" | The "new condition." |
| 3.9.7.6 | 10th - Nov. 1998 | 650-I-23/02 | 1: Does Section 3.9.6 apply only to open top tanks and Appendix G tanks?<br><br>2: Is it correct to consider length of shell 1.47×(D×t)0.5 specified in 3.9.7.6.2 on each side of the shell-ring attachment, resulting a total shell length of [2×1.47×(D×t)0.5 + (width of wind girder in contact with shell)]? | 1: Yes.<br><br>2: Yes. |
| 3.10 | 9th - May 1993 | | If the corrosion allowance plus the calculated thickness is less than 3/16 in. thick, must the corrosion allowance be added to the 3/16 in. minimum nominal roof thickness? | No. |
| 3.10 | 9th - May 1993 | | Does a 2% slope for a supported cone roof tank meet the requirements of API 650? | No. |
| 3.10 | 9th - May 1993 | | When designing a cone roof based on the formulas in API 650, are factors of safety included in the rules of API 650 or must they be considered separately by the tank designer? | The necessary and appropriate factors of safety are included inherently in the design rules of API 650. |
| 3.10 | 10th - Nov. 1998 | 650-I-52/99 | Is welding of the main roof support members to the roof plates allowed by the standard? | No, see API 650, Section 3.10.2.3, that states that roof plates of supported cone roofs shall not be attached to the supporting members. |
| 3.10 | 10th - Nov. 1998 | 650-I-10/00 | Does API 650 provide a way to obtain a frangible roof connection on a small tank describe as follows? - Diameter: 8 ft. - Height: 10 ft. - Cross sectional area of the roof-to-shell junction "A": larger than that allowed by the equation in Section 3.10. | No. You may wish to review Publication 937, Evaluation of Design Criteria for Storage Tanks with Frangible Roof Joints. |
| 3.10 | 10th - Nov. 1998 | | When installing girders and rafters in an existing tank, do they need to be installed in accordance with the latest edition of API Standard 650? | Yes, refer to API Standard 653, Section 9.11.1.2. |
| 3.10 | 10th - Nov. 1998 | | When not altering the roof rafters and framing of an existing tank, is it necessary to upgrade it to the current edition of API Standard 650? | Refer to API Standard 653 Section 4.2.2 |
| 3.10.1<br>3.10.2.3 | 10th - Nov. 1998 | 650-I-31/03 | Referring to 3.10.1(a) and 3.10.2.3, is it permissible by the code to locate rafters outside the tank over the roof plates? The rafters would hold the roof plates welded to its bottom flange instead of supporting the plate. | No, however, a committee agenda item has been approved that will change this requirement. Please refer to the next addendum of the standard. |
| 3.10.2.5 | 10th - Nov. 1998 | | What does API 650, Section 3.10.2.5 mean by the term "top angle"? | Angle refers to a steel angle structural shape - see the AISC "Manual of Steel Construction" or other similar publications. It is usually a 90 degree shape but can be other angles. The "top angle" is the structural angle, purchased or fabricated, that is located at the top of the shell - see Figure F-2 for examples. |
| 3.10.2.5 | 10th - Nov. 1998 | | Can the roof plate be attached to the top angle with a groove weld on top and a fillet weld on the inside? | No. |
| 3.10.2.5.1 | 10th - Nov. 1998 | | Refer to API 650, Section 3.10.2.5.1 and Figure F-2. Is the area "A" the crosshatched area in Figure F-2? | Yes. |
| 3.10.2.5.3 | 10th - Nov. 1998 | 650-I-15/02 | 1: Is the "W" in 3.10.2.5.3 referring to the same "W" in F.4.2?<br><br>2: Is the "A" in 3.10.2.5.3 referring to the same "A" in F.4.1 and cross-hatched area shown in Figure F-1? | 1: Yes.<br><br>2: Yes. |
| 3.10.2.7 | 9th - May 1993 | | Are roof support trusses which are welded to the shell acceptable? | API doesn't provide design detail attachment of roof trusses to the shell. Please refer to Section 3.10.2.7. |
| 3.10.3.3 | 10th-add.4 | 650-I-11/07 | The basic question remains as to whether Rafters are to be considered as “Other Compression Members” or not. | No |
| 3.10.5 | 9th - May 1993 | | In section 3.10.5 for self-supporting roofs, may the corrosion allowance be added to the minimum calculated thickness given by $t_{min}$ = D/400 sin Ø to arrive at a total minimum required thickness of 3/16 in. or greater? | Yes. |
| 3.10.5 | 9th - May 1993 | | If a self-supporting roof is stiffened by sections or rafters, as per the notes in Sections 3.10.5 and 3.10.6, and is supported only at the periphery, is this roof to be classified as a supported cone roof as per the definition of Section 3.10.1(a) and meet the requirements of Section 3.10.4? | No. |

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| 3.10.5 | 9th - May 1993 | 650-I-51/99 | In API 650, Section 3.10.5, is the calculated minimum thickness the actual required thickness that takes into account the span of unstiffened cone plates with a total load of 45 lbf/ft$^2$? | Yes, it is the minimum required thickness, exclusive of corrosion allowance, for the tank diameter and roof slope under consideration. It should be noted that the maximum allowable roof plate thickness limits the tank diameter as a function of the roof slope. |
| 3.10.5.2<br>3.10.6.2 | 10th - Nov. 1998 | 650-I-38/00 | Do the notes of Sections 3.10.5.2 and 3.10.6.2 include all the permissible participating area of the roof-to-shell junction of Figure F-2 to be included in the term “maximum cross-sectional area of the top angle”? | Yes. |
| 3.10.6 | 9th - May 1993 | | Referring to Section 3.10.6.2, is the equation given in this section the required area of the top angle acting as a tension ring? | Yes. |
| 3.10.6 | 10th - Nov. 1998 | 650-I-04/02 | Does Section 3.10.6, require full penetration welds if a dome roof is butt-welded? | This subject is not covered in API 650. |
| 3.10.8.3 | 10th-add. 4 | 650-I-03/07 | For a tank designed and built per API-650, Welded Steel Tanks for Oil Storage, 10th Edition, Addendum 3, 9/2003, Appendix F – Design of Tanks for Small Internal Pressures, the design conditions for F.2 – Venting is deleted. Since section F.2 is deleted, does section 3.10.8 –Tank Venting then apply?<br><br>If yes, for emergency venting (section 3.10.8.3) and for a tank equipped with pressure relief devices (not a weak roof-to-shell attachment), section 3.10.8.3 then refers to the requirements of API Standard 2000 for emergency venting. API 2000, section 4.5.1.1.4 states that under normal operating conditions, the maximum design pressure shall not be exceeded, but does not state the maximum pressure for emergency venting conditions. But this section of API-2000 also refers back Appendix F of API Standard 650, which now is deleted – section F.2.<br><br>The specific question is – For emergency (fire) venting conditions and for a tank built per API-650, Appendix F, can the design pressure be exceeded (as for example, API-620 allows for up to 20% above the maximum allowable working pressure under fire emergency conditions)? Why is section F.2 – Venting deleted from the API Standard 650? | Pending |
| 3.11 | 9th - May 1993 | | For tanks with anchorage required by API 650, Section 3.11 (overturning stability), is the shell thickness limited to 1/2 in.? | No, the requirements of Section 3.11 are independent of those in Section F.7. |
| 3.11 | 9th - May 1993 | | Are methods other than the one stated in Section 3.11 permitted to calculate wind loads, when specified by the purchaser for example, ASCE 7 or local building codes? | Yes, as long as the requirements of Section 3.11 are also met. |
| 3.11 | 9th - May 1993 | | Do the formulas for the relationship between wind moment, internal design pressure, and deadload resisting moment, given in Appendix F, supersede those given in Section 3.11, when designing a tank for small internal pressure using that appendix? | Yes. |
| 3.11 | 9th - May 1993 | | In designing a tank per API 650, is the customer specified corrosion allowance applicable to the anchor chairs and associated welds? | No, unless the purchaser states that the corrosion allowance also applies to external attachments. |
| 3.11 | 10th - Nov. 1998 | 650-I-06/01 | Does API allow the use of ISO 4354 for determination of wind speed? | No. |
| 3.11.1 | 9th - May 1993 | | Does the wind velocity (V) in Section 3.11.1 allow for the added loads associated with wind gusts, and if so, does it satisfy the requirements of ASCE 7-95? | The wind load or pressure in Section 3.11.1 is not in accordance with ASCE 7-95. For the basis of the wind load or pressure, see Section 3.9.7.1, Footnote (a). |
| 4.1.3 | 10th - Nov. 1998 | | 1: Does the phrase "To suit the curvature of the tank and the erection procedure" in 4.1.3, refer to the tolerances in 5.5.2, 5.5.3, and 5.5.4?<br><br>2: Is the tabulation provided in 4.1.3 related to tolerances of tank curvatures or is it meant to provide minimum wall thickness requirements for different diameter tanks or otherwise? | 1: No.<br><br>2: Neither. The use of the table in 4.1.3 is best explained with an example: “For tanks with a nominal plate thickness of, say, 9/16 in. thick, then diameters less than 120 ft. must be shaped (formed) to the required radius prior to installation in the tank.” |
| 4.2.1.1 | Ed 12, Ad 0 | 650-2013-F13 | 1. When plate is produced to a recognized national standard that is NOT explicitly listed in 4.2.2, 4.2.3, 4.2.4, or 4.2.5 but is SIMILAR to a listed standard, may the plate be used IN ALL RESPECTS as if it were produced to the listed standard?<br><br>2. When plate is used which is produced to a recognized national standard that is NOT explicitly listed in 4.2.2, 4.2.3, 4.2.4, or 4.2.5 but is SIMILAR to a listed standard, may that tank be certified as constructed in accordance with API 650? | 1. No. To be used in all respects as a listed graded, a steel must completely conform to that grade.<br><br>2. Yes, provided the steel conforms to and is used as one of the grades defined in Table 4-2 and discussed in 4.2.6; or conforms to Annex N requirements. |

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| 4.2.1.2 | Ed. 12 Ad 1 | INQ-650-D80 | 1. Per 4.2.1.2 can plate be ordered by edge thickness or by weight?<br><br>2. Regardless of the ordering method (edge thickness or weight) are all plates required to be ordered at thickness equal to or greater than design thickness or minimum permitted thickness?<br><br>3. Regardless of the ordering method (edge thickness or weight) are all plates required to be received at a thickness equal to or greater than design thickness or minimum permitted thickness minus the under-run tolerance of 0.01 inches? | 1. Yes<br><br>2. Yes<br><br>3. Yes |
| 4.2.10 | Ed 12, Ad 0 | 650-2013-F9 | Do the toughness rules of 4.2.10 apply to compression bars such as those shown in Figure F.2 details h, i and k? | No, 4.2.10.1 gives the list of components to which the rules of 4.2.10 apply. |
| 5 | 10th - Nov. 1998 | | Does the term erector, as used in API 650, mean the party that is responsible for field assembly will complete welds on the tanks during that assembly? | Yes. |
| 5.1.3.5 | 12th | 650-2014-F4 | 1: For a double-welded lap joint, if five times the nominal thickness (5xT) is larger than 50 mm, then may the lap be smaller than 5xT.<br>2: For a single-welded lap joint, if five times the nominal thickness (5xT) is larger than 25 mm, then may the lap be smaller than 5xT. | 1. Yes.<br><br>2. Yes. |
| 5.1.5.4.2 | Ed 11, Ad 3 | 650-2012-F5 | 1: Does API 650 require or permit weld spacing to be treated per API 653 guidelines?<br><br>2: Does API 650, 5.1.5.4.2, apply to additional welded-on bottom plates? | 1: No<br><br>2: No |
| 5.2.1 | 10th - Nov. 1998 | 650-I-50/02 | Are GMAW and FCAW welding allowed in API 650 Sections 5 and 7? | Yes. See Section 5.2.1.1. |
| 5.2.1 | 10th - Nov. 1998 | 650-I-13/03 | Are low-hydrogen electrodes required when manual welding tank shell plates that are Group IV materials and are 3/8 inch or less in thickness? | Yes. Section 5.2.1.10b requires all manual metal arc welds made on Groups IV-VI materials to be performed with low-hydrogen electrodes regardless of thickness. |
| 5.2.1 | 10th - Nov. 1998 | 650-I-04/04 | Can E-7024 electrodes be used to weld the shell-to-bottom weld when the thickness of the shell and bottom plates are both less than ½" and both materials are from Groups I-III? | Yes. Refer to API 650, Section 5.2.1.10 |
| Fig. 5.21, Detail D | Ed 12, Ad 0 | 650-2013-F11 | Is a weld required on the outside of the sump when made per detail D? | Yes. |
| 5.2.1.2 | 10th - Nov. 1998 | 650-I-39/02 | Background: API 650, Tenth Edition, Addendum 2, Section 5.2.1.2 states "No welding of any kind shall be performed when the surfaces of the parts to be welded are wet from rain, snow, or ice; when rain or snow is falling on such surfaces; or during periods of high winds unless the welder and the work are properly shielded. Also, no welding of any kind shall be performed when the temperature of the base metal is less than –20°C (0°F). When the temperature of the base metal is –20°C to 0°C (0°F to 32°F) or the thickness of the base metal is in excess of 32 mm (1 ¼ in.), the base metal within 75 mm (3 in.) of the place where the welding is to be started shall be heated to a temperature warm to the hand (see 5.2.3.4 for preheat requirements for shell plates over 38 mm (1 ½ in.) thick).<br><br>Question: Can a tank be constructed when the ambient air temperature is less than 0°F? | Yes, providing that the base metal temperature meets the requirements of section 5.2.1.2 |
| 5.2.1.10 | 10th - Nov. 1998 | 650-I-11/00 | 1: Does API 650 Section 5.2.1.10 require the use of low hydrogen electrodes when making manual horizontal welds between two shell plates when both plates are in Groups I-III, one plate is greater than 12.5 mm (0.5 in.) thick and the other plate is 12.5 mm (0.5 in.) thick or less?<br><br>2: Does API 650 Section 5.2.1.10 require the use of low hydrogen electrodes when making manual welds between the shell and bottom plates when both plates are in Groups I-III, the shell plate is greater than 12.5 mm (0.5 in.) thick and the tank bottom plate is 12.5 mm (0.5 in.) thick or less? | 1: Yes.<br><br>2: Yes. |
| 5.2.1.10 | 10th - Nov. 1998 | 650-I-12/03 | Does API 650, Section 5.2.2.2, require the completion of the shell seams of the tank before welding the bottom to shell joint? | No. Section 5.2.2.2 is addressing the joint in the bottom left un-welded to address shrinkage of the bottom plate welds. |
| 5.2.3 | 9th - May 1993 | | Referring to API 650, Section 5.2.3.5, does the referenced NDE (VT, MT, or UT apply to all attachments and shell welds, regardless of the applicable shell Group Number? | No, only Groups IV through VI are required to be examined. |
| 5.2.3 | 9th - May 1993 | | Does API 650 permit having both a shell plate underrun of 0.1 in. and the above weld undercuts on the same tank? | Yes. These allowances are independent of each other on API 650. |
| 5.2.3.2 | 10th - Nov. 1998 | 650-I-07/99 | Does API 650 permit tapering horizontal joint welds that exceed the allowable offset in Section 5.2.3.2? A taper of 4:1 in the weld metal is proposed. | No. |

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| 5.2.3.5 | 9th - May 1993 | | In API 650, Section 5.2.3.5, is the specified NDE (e.g. visual and magnetic particle examination) applicable only to attachments to shells containing Group IV, IVA, V, and VI material? | Yes. NDE for attachments to shells containing material other than Groups IV, IVA, V, and VI is covered in Section 5.3.2, which required visual examination of fillet welds. |
| 5.2.3.6 | 9th - May 1993 | | Do the requirements listed in Section 5.2.3.6 of API 650 apply to materials in all Groups? | Yes. |
| 5.2.4.1 | 10th - Nov. 1998 | 650-I-31/01 | Section 5.2.4.1 states in part, "The initial weld pass …" Does this mean the initial root pass? | Yes. |
| 5.3 | 10th - Nov. 1998 | | For tanks built to API 650 that are completely welded in a fabricator's facility, and with field installation consisting of another company setting and anchoring without performing any welds on the tanks, does the responsibility for the hydrostatic test rest with the fabricator or the installer? | API 650 covers field-assembled tanks, not shop-built tanks. See Section 1.1 of API 650. Appendix J of API 650 prescribes requirements for shop-built tanks, including testing and division of responsibility for same. |
| 5.3 | 10th - Nov. 1998 | 650-I-44/02 | Is radiography required for a circumferential weld in a nozzle between the tank shell and the flange? | API 650 does not require radiography of this weld. |
| 5.3.4 | 10th-add.4 | 650-I-12/07 | API 650, 10th edition, section 5.3.4 it is stated that after fabrication is completed of the tank, but before the hydro test, a pneumatic inspection of the reinforcement plates is required. Our Engineers often require that we add a reinforcement plate to the exterior of the tank for any attached lifting devices, be it lifting lug plates or trunions. Question: Does this section refer to only those reinforcement plates that are around an opening in the tank or does this also refer to all reinforcement plates attached to the tank?<br>The purpose of this pneumatic test is to test the welds of the pipe to the through the shell, and the reinforcement plate to shell to ensure that there is no leaking, correct? | Pending |
| 5.3.5 | 9th - May 1993 | | 1: Does 650 require a hydrostatic test before the tanks have been painted or primed (externally)?<br><br>2: If the tank is permitted to be primed externally before the hydrostatic test, is it mandatory to unprime the main welded joints or tank shells? | 1: No.<br><br>2: No. |
| 5.3.5 | 10th - Nov. 1998 | 650-I-16/04 | Does API 650 require a hydrostatic test before application of an internal coating? | No. API 650 does not address the sequence of coating. |
| 5.3.5 | 9th - May 1993 | | Is it mandatory to complete the entire tank erection, i.e. with floating roof, roof rolling ladder, roof seal, before the water test? | Yes. Refer to API 650, Section 5.3.5. |
| 5.3.5 | 10th - Nov. 1998 | 650-I-16/00 | Regarding the hydrotesting of a tank to be lined internally, does API 650 require the tank to be filled with water before and after the lining is installed, or only before the lining is installed, or only after the lining is installed? | API 650 does not cover this issue. |
| 5.3.5 | 10th - Nov. 1998 | 650-I-21/02 | Can the hydrostatic test level in 5.3.5a(3) differ from the level restricted by an internal floating roof as described in 3.6.3.2? | Yes. |
| 5.3.5 | 10th - Nov. 1998 | 650-I-04/03 | Is the inspection of the shell welds above the test water level required per API 650 section 5.3.5b regardless of which of the three options in 5.3.5a have been adopted? | Yes. Refer to the last sentence of 5.3.5a. |
| 5.3.5 | 10th - Nov. 1998 | 650-I-08/03 | Does API 650, Section 5.3.5, require that all welding on the shell be completed prior to the start of the hydrostatic test? | Section 5.3.5 was revised to allow the welding of non-structural, small attachments, after the hydrostatic test and shell attachments defined in 3.8.1.1, and roof appurtenances located 1 m (3 ft) above the water level. |
| 5.3.5 | 10th - Nov. 1998 | 650-I-14/03 | Does API 650 require the tank shell seams above the liquid level be examined as part of the requirements of Section 5.3.5b? | Yes. Section 5.3.5 requires that the joints above the liquid level be examined by one of the test methods outlined in Section 5.3.5b. |
| 5.3.6 | 10th - Nov. 1998 | 650-I-21/00 | Does API 650 require any additional testing beyond the hydrostatic (water) test specified in Section 5.3.5 for a tank designed for product with specific gravity greater than 1? | No. Section F.7.6 provides additional requirements for Appendix F tanks. The purchaser may require more stringent testing as a supplemental requirement. |
| 5.3.6<br>5.3.7 | 10th - Nov. 1998 | 650-I-22/00 | Referring to 5.3.5 and 5.3.6, is it permissible to weld insulation clips or pins, using a stud welding procedure, on a tank shell and/or roof after the hydrostatic test? | No. |
| 5.4.1 | 10th - Nov. 1998 | 650-I-48/99 | 1: If welds in a non-radiographed tank (e.g. per Appendix A) are examined by visual examination and determined to be defective, does API 650 permit the purchaser to then require radiographic examination of the welds?<br><br>2: For purchaser-specified NDE, if required to resolve a visual finding, what acceptance criteria applies? | 1: Section 5.4.1 requires that the purchaser's inspector approve the plan to resolve the problem. The ramifications of any upgrade to the NDE procedure originally required, such as radiographing the welds in this case, becomes a contractual matter.<br><br>2: This is a contractual matter not covered by API 650. |
| 5.4.2 | Ed 12, Ad 0 | ING-650-D64 | Does the projection of the bottom plate outside the shell in 5.4.2 apply to locations where anchor bolts exist? | Yes, the anchors should be located to assure the projection of the bottom outside the shell in 5.4.2. |
| 5.4.4 | 12th | 650-2013-F5 | Is the specified bottom slope requirement in 5.4.4 mandatory only before hydrotest? | Yes. |

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| 5.5 | 9th - May 1993 | 650-I-42/98 | Does API 650 specify tolerances for flatness/planeness (local deformations) for tank bottoms? | No. |
| 5.5 | 10th - Nov. 1998 | 650-I-24/00 | API 650 gives tolerances for plumbness & roundness but these are related to the tank shell. Are there any defined tolerances on the tank roof, such as on the rim space dimension? | No. |
| 5.5 | 10th - Nov. 1998 | 650-I-40/00 | For tanks built to API 650 and complying with Section 5.5 dimensional tolerances and subsequently commissioned, do the minimum requirements of API 650 with respect to plumbness, banding, etc., still apply after a tank has been placed in service? | No. API 650 covers the design and construction of new tanks. Any tolerance rules that might apply after the tank has been placed in service, typically API 653 plus any supplemental owner requirements, are to be determined by the local jurisdiction and the tank owner. See API 653, 1.1.1, Section 8, and 10.5.2, for further information and for some examples. |
| 5.5 | 10th - Nov. 1998 | 650-I-08/01 | Does the 10th Edition of API 650 specify tolerances for the elevation and orientation of shell nozzles? | No. |
| 5.5 | 10th - Nov. 1998 | 650-I-12/01 | Question 1: Does API-650 require that tolerances (plumbness/peaking bending/roundness) be checked after the construction of each shell course, rather than after the completion of the entire shell?<br><br>Question 2: If repairs are required to meet the specified tolerances, when must the repairs be made? | Reply 1: These tolerances must be measured by the purchaser's inspector at anytime prior to the water test. See Sections 4.2.3, 5.3.1.2, and 5.5.6.<br><br>Reply 2: API 650 does not address the timing of these repairs. |
| 5.5 | 10th - Nov. 1998 | 650-I-03/03 | 1: Do the requirements of API 650 Section 5.5 apply to tanks that have been completed but not hydrostatically tested?<br><br>2: Do the requirements of 5.5 apply to tanks that have been completed and hydrostatically tested?<br><br>3: During the floatation test required in C.4 and H.6, can the tank be rejected due to out of roundness or plumbness? | 1: Section 5.5.6 requires the dimensional tolerances in 5.5 be taken prior to the hydrostatic test; unless they are waived by the purchaser; see 5.5.1.<br><br>2: No. See 5.5.6.<br><br>3: No. See 5.5.6. |
| 5.5 | 10th - Nov. 1998 | 650-I-10/03 | 1: Are the requirements of API 650 Section 5.5 applicable to tanks that do not have a floating roof?<br><br>2: Do tanks without a floating roof meet the requirements of API 650 if the dimensional tolerances are outside the requirements of Section 5.5? | 1: Yes, unless waived by the purchaser. Refer to 5.5.1.<br><br>2: Only if the purchaser and manufacturer agree to waive the requirements. Refer to 5.5.1. |
| 5.5.1 | 10th - Nov. 1998 | 650-I-01/03 | Question 1: Does API 650, Section 5.5, require the plumbness readings be taken from the top of the tank to the bottom of the tank?<br><br>Question 2: Does API 650 require plumbness and flatness measurements for each course in accordance with ASTM A 6?<br><br>Question 3: When measuring flatness and waviness in accordance with ASTM A 6 for each plate in a course, should the values be additive? | Reply 1: Yes, the maximum out of plumbness for a tank shell is measured from the top of the tank to the bottom; see 5.5.2.<br><br>Reply 2: The out-of-plumbness for one shell course shall not exceed the requirements for flatness as defined in ASTM A 6 or A 20 as appropriate; see 5.5.2.<br><br>Reply 3: No. API 650 only requires individual readings be evaluated for a tank course; see 5.5.2. |
| 5.5.1 | 10th - Nov. 1998 | 650-I-07/01 | 1: Section 5.5.1, states that the tolerances as specified may be waived by [agreement between the purchaser and the manufacturer]. If a tank does not meet the specified tolerance with regards to one specific area such as the roundness but has met the tolerance in relation to plumbness and local deviation as well as all the testing requirements such as radiography and hydrotesting, can the manufacturer insist that the purchaser accept the tank?<br><br>2: Since Section 5.5.1 states that the purpose of the tolerances as specified is for appearance and to permit proper functioning of floating roofs, is it therefore correct to conclude that the purchaser has no right to refuse to accept a tank which has passed all tests required by API 650 but may have some out-of-tolerance in one or more areas? | 1: No. Agreement by both parties is required.<br><br>2: No. |
| 5.5.1 & 8.1.2.9 | Ed 12, Ad 1 | 650-2015-F7 | 1. If the bottom shell course material is not in one of the Groups mentioned in 5.5.1 (Groups IV, IVA, V or VI), may butt welded annular bottom plates still be used?<br><br>2. If butt welded annular plates are used when the bottom shell course material is not in one of the Groups mentioned in 5.5.1, then does 8.1.2.9 require radiographic examination of those butt joints? | 1. Yes. Butt welded annular plates are required for Groups IV, IVA, V or VI but no prohibition is stated for other materials.<br><br>2. No. Radiography is only required by 8.1.2.9 when the annular plates are required by 5.5.1 or M.4.1. |

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| 5.5.2 | 10th - Nov. 1998 | 650-I-11/03 | 1: Does API 650, Section 5.5.2 allow a tank to have a top course shell diameter diferent than the bottom shell course diameter?<br><br>2: Does API 650 allow a tank to be fabricated with a top course with a different shape than the bottom course? | 1: API 650 does not address this issue directly, but tanks that meet the tolerances in 5.5 are acceptable.<br><br>2: API 650 does not address this issue directly, but tanks meeting the tolerances in 5.5 are acceptable. Note: API 650, Section 5.5.3, only requires roundness measurements 1 ft above the bottom. |
| 5.5.3 | 10th - Nov. 1998 | 650-I-35/01 | Referring to Section 5.5.3 of API 650 for erection roundness, is the radius tolerance for an erected tank required to be the tolerance for the shaping of shell plates according to Section 4.1.3? | No. The tolerance in 5.5.3 applies to the erected tank, not the fabricated plates prior to erection. Note the titles of Sections 4 and 5. |
| 5.5.4 | 9th - May 1993 | | Please advise if API 650 permits accepting shell plate inward deformations of 2.3 in. magnitude, assuming the locations are away from vertical seams. | Local deviations are acceptable as long as they meet the requirements of Section 5.5.4.c. |
| 5.5.4 | 9th - May 1993 | | Referring to API 650, Section 5.5.4b, does the term "banding" apply to the fillet-welded joint between the bottom of the tank shell and the annular plates, i.e. the bottom corner weld? | No. |
| 5.5.5 | 9th - May 1993 | 650-I-29/97 | Do the slab tolerances in Section 5.5.5.2.c apply to a pie-shaped concrete slab that will be covered by a 2 in. layer of sand-bitumen mix? | No. However, the tolerances in 5.5.5.2 b and c would apply to the top of the sand-bitumen layer. |
| 5.6 | Ed 11, Ad 2 | INQ-650-D14 | Are the rules in 5.6 applicable to individual plates within a shell course so that plates of varied materials and varied thickness can coexist within the same shell course? | No. The 5.6 rules are written based on a calculated thickness for each shell course. Each plate used within a given course must meet or exceed the various material properties used to design the course in question. Paragraph 5.6 provides for only one calculated thickness per shell course regardless of material property variations from plate to plate within a course. |
| 5.6 | Ed 11, Ad 2 | INQ-650-D14 | Are the rules in 5.6 applicable to individual plates within a shell course so that plates of varied materials and varied thickness can coexist within the same shell course? | No. 5.6 rules are written based on a calculated thickness for each shell course. Each plate used within a given course must meet or exceed the various material properties used to design the course in question. Paragraph 5.6 provides for only one calculated thickness per shell course regardless of material property variations from plate to plate within a course. |
| 5.6.3.2 (and Annexes C and H) | 12th Ed, Ad 1 | INQ-650-D73 | When determining design liquid level for a tank that has a floating roof (either internal or external), does the design liquid level include the height of liquid displaced by the floating roof? | Yes, the design liquid level is the maximum liquid height with or without a floating roof. The added liquid height displaced by the floating roof must not extend above the design liquid level. |
| 5.6.4.5 | Ed 11, Ad 2 | INQ-650-D03 | Do the instructions in 5.6.4.5 related to tanks with ratios greater than 2.625 mean that those tanks have to use the same materials for the first and second ring? | No. The instructions in 5.6.4.5 are only applicable to the formulas in that paragraph. The material properties used for the first two rings in the formulas within 5.6.4.6 through 5.6.4.8 are not limited based on the instructions in 5.6.4.5. |
| 5.6.4.5 | Ed 11, Ad 2 | INQ-650-D03 | Do the instructions in 5.6.4.5 related to tanks with ratios greater than 2.625 mean that those tanks have to use the same materials for the first and second ring? | No. The instructions in 5.6.4.5 are only applicable to the formulas in that paragraph. The material properties used for the first two rings in the formulas within 5.6.4.6 through 5.6.4.8 are not limited based on the instructions in 5.6.4.5. |
| 5.7.1.4, Fig. 5-7 | ED 11, Ad 3 | INQ-650-D28 | Does API 650 allow the installation of a shell manhole size outside the range given in Table 5-4a or 5-4b (e.g. shell manhole with a diameter of 40 in.)? | Yes. Per note 6 of Figure 5-7a, shell nozzles shown in Figure 5-8 may be used as manways. |
| 5.7.2 | Ed 12, Ad 0 | INQ-650-D32 | 1: Does 5.7.2.3 allow elimination of reinforcement pads if they are not needed to achieve required reinforcement?<br><br>2: If a reinforced nozzle larger than NPS 2 with no reinforcement pad requires less than full penetration welds for | 1: Yes<br><br>2: Yes |
| 5.7.5, Fig. 5.7a | 12th | 650-D-034 | Does the statement in Note 9 of Figure 5.7a mean if a 36-in. ID manhole is being installed in a tank, the diameter of the reinforcing plate could be 72.75 in., even though the hole in the tank shell will be larger than a 36-in. OD hole? | Yes, with confirmation of reinforcement and weld space requirements of 5.7.2 and 5.7.3, respectively. |
| 5.8.4 | Ed 11 | INQ-650-D79 | Does API-650 5.8.4 provide rules for reinforcement of roof manways? | No, 5.8.4 provides considerations that may be used to design reinforcement that is appropriate but specific rules for this design are not provided. |
| 5.8.7, Table 5.16 | 11th, Ad 3 | 650-D-39 | Do the thickness values listed in column 5 of Tables 5.16a and 5.16b titled “Thickness of Plates in Sump” include a corrosion allowance? | No. |
| 5.10.2.6.d | Ed 11, Ad 2 | INQ-650-D02 | Are the roofs of anchored tanks required to be designed as a frangible joint meeting 5.10.2.6.a and the 3 times F.6 failure pressure specified in 5.12? | No. |

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| 5.10.2.6d | Ed 11, Ad 2 | INQ-650-D02 | Are the roofs of anchored tanks required to be designed as a frangible joint meeting 5.10.2.6.a and the 3 times F.6 failure pressure specified in 5.12? | No. Per 5.10.2.6.a the owner may specify if frangibility is required. Absent the owners specification the tank may or may not be designed with a frangible roof at the manufacturer's discretion. |
| 5.10.4.4 | Ed 12 | INQ-650-D29 | 1: Does the maximum allowable roof plate span "b" given in 5.10.4.4 refer to the largest circumferential span between any two adjacent rafters (typically at the outer limit of the rafters if radial oriented)?<br><br>2: Is it therefore true that the circumferential span from center of rafter to center of rafter shall not exceed "b" in 5.10.4.4 at any roof location for the applicable roof thickness used to calculate b? | 1: Yes.<br><br>2: Yes. |
| 5.10.5, F.5 | Ed 12, Ad 0 | INQ-650-D69 | For "self supporting conical roofs" designed to Annex F, shall the compression area be not less than the cross-sectional area calculated in 5.10.5 and F.5.1? | Yes, both areas must be calculated and the larger of the two areas must be the minimum used. |
| 5.11.2 | Ed 11, Ad 3 | INQ-650-D05 | 1: If anchors are required are any additional wind and pressure combinations required beyond those listed in Table 5.21a to address both conditions in 5.11.2?<br><br>2: Should the conditions in 5.11.2 form an additional load case required when the uplift from Table 5-21a is negative? | 1) No, Table 5-21a lists all conditions and combinations checked for anchor loads of anchored tank. The anchors must meet or exceed all conditions in Table 5-21a. When combining wind and pressure the factor applied to the pressure load can be adjusted as noted in note b of Figure 5-21a and 5-21b.<br><br>2: No, the largest uplift calculated in Table 5-21a shall be used to design anchor subject to the minimum anchor size and spacing required by 5.12.2 and 5.12.3 respectively. |
| 5.11.2 | Ed 11, Ad 2 | INQ-650-D09 | In 5.11.2 in the formula for $w_L$ is $H$ required to be 1/2 the design liquid height? | No, $H$ is the design liquid height. When used in the formula for overturning check the weight of 1/2 height is developed for $w_L$. |
| 5.11.2 | Ed 11, Ad 2 | INQ-650-D10 | Is the term $w_L$ in 5.11.2 the weight per unit length of tank circumference? | Yes. |
| 5.11.2 | Ed 11., Ad 3 | INQ-650-D05 | 1: If anchors are required, are any additional wind and pressure combinations required beyond those listed in Table 5.21a to address both conditions in 5.11.2?<br><br>2: Should the conditions in 5.11.2 form an additional load case required when the uplift from Table 5-21a is negative? | 1: No. Table 5-21a lists all conditions and combinations checked for anchor loads of anchored tank. The anchors must meet or exceed all conditions in Table 5-21a. When combining wind and pressure the factor applied to the pressure load can be adjusted as noted in note b of Figure 5-21a and 5-21b.<br><br>2: No. The largest uplift calculated in Table 5-21a shall be used to design anchor subject to the minimum anchor size and spacing required by 5.12.2 and 5.12.3 respectively. |
| 5.11.2 | Ed 11, Ad 2 | INQ-650-D09 | In 5.11.2 in the formula for $w_L$ is $H$ required to be 1/2 the design liquid height? | No. $H$ is the design liquid height. When used in the formula for overturning check, the weight of 1/2 height is developed for $w_L$. |
| 5.11.2 | Ed 11, Ad 2 | INQ-650-D10 | Is the term $w_L$ in 5.11.2 the weight per unit length of tank circumference? | Yes. |
| Fig. 5.19 | Ed 12 | INQ-650-D84 | Does the roof nozzle reinforcement thickness shown in Figure 5.19 represent the required reinforcement thickness for roof nozzles? | Yes, although per Note a in Table 5.14a and 5.14b the reinforcement plate is optional for NPS 6 or smaller. |
| 6 | 9th - May 1993 | | In API 650, what is the definition of a crack? | Refer to the acceptance standards for magnetic particle examination defined in Section 6.2.4. Also, Section 6.5.1 prohibits cracks, including surface cracks. Otherwise, there is no definition of a crack in API 650. |
| 6 | 9th - May 1993 | | Does API 650 allow the purchaser to require radiographic examination as a requirement for acceptance after fabrication on a tank that is not required to be radiographed per API 650 rules? | API 650 does not prohibit the purchaser from specifying additional requirements. These are contractual issues outside the scope of the document. |
| 6 | 10th - Nov. 1998 | 650-I-26/99 | Do the requirements of ASME Section V, Article 1 apply to personnel performing MT and PT inspections to comply with API 650? | No. API 650, Section. 6.2.3 and 6.4.3 state that the "manufacturer shall determine . . . . that the examiner meets the specified requirements." |

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| 6 | 10th - Nov. 1998 | 650-I-26/99 | 1: Can a “competent person” as arbitrarily determined by management perform the exam and evaluate results to comply with API 650?<br><br>2: If a “competent person” can be used, do we have to establish what constitutes said person in some documented form?<br><br>3: Is it the intent of API 650 to have qualified certified personnel in accordance with SNT-TC-1A or CP189 perform nondestructive examinations?<br><br>4: Since no personnel qualification is addressed for VT does this mean this inspection can be done by anyone? | 1: Yes, within the restrictions in Sections 6.2.3 and 6.4.3, respectively.<br><br>2: No, although good business practice would require that records be kept, especially since annual checks are required.<br><br>3: No, however qualification and certification as “generally outlined” in SNT-TC-1A is required for RT and UT work.<br><br>4: Yes. |
| 6.1.2 | 10th - Nov. 1998 | 650-I-51/02 | 1: When fabricating a group of tanks does API 650, Section 6.1.2, require a minimum of two spot radiographs at T-joints in each tank fabricated?<br><br>2: Does API 650, Section 6.1.2, require a spot radiograph of every vertical seam in the bottom shell course of all tanks fabricated? | 1: Yes. Refer to 6.1.2.2 and Figure 6-1. For tanks with wall thicknesses greater than 0.375 in., additional spot radiographs are required.<br><br>2: Yes. Refer to Section 6.1.2.2 and Figure 6-1. For tanks with wall thicknesses greater than 0.375 in., additional spot radiographs are required. |
| 6.1.2 | 10th - Nov. 1998 | 650-I-27/03 | For the purposes of determining radiographic requirements for tanks can tank shell plate thickness of 0.5 inch thickness be considered to be 0.375 inch thick as outlined in 6.1? | No. Refer to Section 6.1.2.2b. |
| 6.1.2 | 9th - May 1993 | | Are there inconsistencies in API 650, Section 6.1.2.2 and Figure 6-1, top panel, concerning the lengths of weld seams that must be shown in radiographs? | No. The top panel should be used with Section 6.1.2.2 (a). Section 6.1.2.2 (b) applies to the middle panel of Figure 6-1. Section 6.1.2.2 (c) applies to the bottom panel. |
| 6.1.2 | 10th - Nov. 1998 | 650-I-42/03 | Question 1: When annular plates are joined with single-welded butt joints, is one radiograph required at each of 50% of the total count of radial joints?<br><br>Question 2: When annular plates are joined with single-welded butt joints, is a radiograph required at each radial joint with the radiograph length covering 50% of the total length of the weld? | Reply 1: Yes. See Section 6.1.2.9 (b).<br><br>Reply 2: No. The 50% factor is applied to the number of joints, not the length of joint. See Section 6.1.2.9 (b). |
| 6.1.2.2 | 10th - Nov. 1998 | 650-I-34/03 | Do the requirements of API 650 section 6.1.2.2 apply to welds that will be in the vertical position when the tank is in service, but are made in the flat or horizontal position? | Yes. The requirements of 6.1.2.2 apply to welds that will be in the vertical position when the tank is in service. |
| 6.1.2.2 & Figure 6-1 | 10th - Nov. 1998 | | Referring to Section 6.1.2.2 and Figure 6-1, which thicknesses must be taken into consideration for radiographic examination of the intersections between vertical and horizontal welds? Should the design thicknesses or the nominal as-built thicknesses be used? | The nominal as-built thicknesses should be used. |
| 6.1.5 | 9th - May | | Does API 650 permit the use of radiography acceptance criteria per ASME Section VIII, Division 1, UW-52(c) when | No. The acceptance criterion is that specified in Section UW-51 |
| 6.1.7 | 10th - Nov. 1998 | 650-I-34/99 | Can a repair to a pin-hole leak in a weld in a stress-relieved flush-type-cleanout-opening reinforcement pad be made under API 650, Section 6.1.7, as directed in Section 5.4? | Yes. This type of repair would require approval of the purchaser. |
| 6.1.7.2 | 10th - Nov. 1998 | 650-I-10/02 | For repaired regions made after spot radiography detects defective welding, is it correct that according to 6.1.7.2 that only the original spot radiography requirements apply no matter the number of original spot and tracer radiographs taken? | Yes, because the post-repair inspection procedure is spot radiography as was the original inspection requirement. |
| 6.3.1 | 9th - May 1993 | | Referring to API 650, Section 6.3.1.2 and 6.3.3, is certification to ASNT SNT-TC-1A required for personnel performing radiographic and ultrasonic examinations but not for personnel performing vacuum testing, magnetic particle examination, and liquid penetrant examination? | For personnel performing radiographic and ultrasonic examination only, the manufacturer is required to certify that personnel who perform and evaluate examinations meet the requirements of certification as generally outlined in Level II or Level III of ASNT SNT-TC-1A. Refer to API 650, Section 6.1.3.2 and 6.3.3, respectively. |
| 7.2 | 9th - May 1993 | | For weld procedure qualification requiring impact testing, does API 650 allow the use of two thickness qualification ranges: 3/16 in. to 1/2 in., and 1/2 in. to 1-1/2 in., using 1/4 in. and 3/4 in. test piece thicknesses, respectively? | No. API defers to ASME Section IX for weld procedure requirements. The issue should be addressed to ASME, not API. |
| 7.2 | 10th - Nov. 1998 | 650-I-18/01 | Does API 650 allow substituting the rules in EN 288-3 for the rules in ASME Section IX for weld procedures? | No. See API 650, Section 7.2.1.1. |
| 7.2.2 | 10th - Nov. 1998 | 650-I-23/00 | Referring to 7.2.2, 2.2.8, and 2.2.9, for the fabrication and welding of shell nozzles made from pipe and forgings meeting toughness requirements of 2.5.5, is it mandatory to have impact tests on weld procedure qualifications for welding these components? | Yes, if these materials are welded to any of the components listed in 2.2.9.1 and the design metal temperature is below 20ºF. See 7.2.2.4. |

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| 7.2.3.2 | Ed 11, Ad 3 | 650-2013-F2 | 1: Does a 4:1 taper apply to an upper shell plate when its thickness is more than 3mm greater than the thickness of an adjacent lower shell plate?<br><br>2: Does a 4:1 taper apply to a lower shell plate when its thickness is more than 3mm greater than the thickness of an adjacent upper shell plate? | 1: Yes.<br><br>2: No. |
| 7.3.5 | 12th | 650-2013-F6 | Does API 650 require a hydrostatic test before application of an internal or external coating? | No. API 650 does not address the sequence of coating. |
| 7.3.6.2 | 12th | 650-2014-F5 | Is a permanent coating system included in the "foreign matter" that must be removed as part of preparing the tank for testing per 7.3.6.2, item 1. | No. |
| 7.5.5.2 | 12th Ed, Ad 1 | 650-2015-F1 | 1) Where 7.5.5.2(a) refers to levelness of top of ringwall, does this refer to top of the bare concrete?<br><br>2) If levelness of top of ringwall on bare concrete does not satisfy 7.5.5.2(a), may a tank manufacturer use shim and grout to fix levelness? | 1. Yes<br><br>2. Yes. API does restrict the means of fixing this situation. |
| 7.5.5.2 c | Ed 12, Ad 0 | 650-2014-F3 | Is there a required tolerance in section 7.5.5.2 on the design shape of the top surface of the remainder of the foundation inside of a concrete ringwall? | No. |
| 8.1 | 9th - May 1993 | | For a tank built to the 10th Edition, 1st Addendum, of API 650, is it acceptable to mark "Nov. 1998" in the Edition box and "X" in the "Revision No." box on the nameplate? | No. The marks should be the "month and year" of the Edition in the first box, and the number of the addendum revision in the second box (e.g. 0, 1, 2). |
| 8.1 | 10th - Nov. 1998 | 650-I-50/00 | If the nameplate is stamped "three courses 1/4 in. thick" and the manufacturer's required shell thickness calculations were done using six shell courses, are there three or six courses in the tank? | The number of courses relates to the number of circumferential welds. |
| 8.1.2.4 | Ed 11, Ad 2 | 650-2011-F1 | Considering that spot RT is taken for each thickness the welder is welding on a tank, is it still required to take additional RT for each thickness welded by the same welder for subsequent identical tank(s) on the same project? | Yes. Refer to Para. 8.1.2.4 |
| 8.3 | 10th - Nov. 1998 | 650-I-16/02 | Is it permissible to construct a tank within a tank and certify both tanks to API 650 Section 8.3? | Yes. |
| 9 | Ed 11, Ad 3 | 650-2012-F3 | Does API-650, 9.2.1.4 require the supplementary variables as defined in ASME Section IX to be mandatory for weld procedures and procedure qualification records for weld procedures that require impact testing by API-650 9.2.2? | Yes |
| 9 | ED 11 Ad 3 | 650-2012-F3 | Does API-650, 9.2.1.4, require the supplementary variables as defined in ASME Section IX to be mandatory for weld procedures and procedure qualification records for weld procedures that require impact testing by API-650 9.2.2? | Yes |
| 9.2.2.3 and 9.2.2.4 | Ed 11, Ad 3 | 650-2012-F4 | When materials are exempted from impact testing by Section 4, but impact testing for weld procedures only is required by 9.2.2.3 or 9.2.2.4, are supplementary essential variables still applicable to the production welding? | Yes, This is required by 9.2.1.4 and its reference to 9.2.2. |
| 9.2.2.3, 9.2.2.4 | Ed 11, Ad 3 | 650-2012-F4 | When materials are exempted from impact testing by Section 4, but impact testing for weld procedures only is required by 9.2.2.3 or 9.2.2.4, are supplementary essential variables still applicable to the production welding? | Yes. This is required by 9.2.1.4 and its reference to 9.2.2. |
| 9.2.2.4 | Ed 12, Ad 1 | 650-2015-F6 | If the DMT is below -7oC, but the DMT is warm enough to make all materials selected for all components listed in 4.2.10.1 exempt from impact testing according to Figure 4.1a , then does paragraph 9.2.2.4 require impact tests on weld procedure qualifications used for welding those components? | Yes, impact tests of the weld metal are required on the weld procedure qualifications. |
| A.1 | 9th - May 1993 | | What is the definition of small tank in Appendix A? | Small tanks are not defined in Appendix A. The scope of design which may be applied to relatively small tanks, if opted, is specified in A.1.1 through A.1.5. |
| B.3 | 10th - Nov. 1998 | 650-I-21/01 | Does API 650 require a sloped bottom or a sump? | No. See B.3.3 and B.3.4. |
| B.4.3 | 10th - Nov. 1998 | 650-I-46/02 | Does B.4.2.3 mean the lateral earth pressure on the outside face of the ringwall is not considered? | Yes. |
| C.3.1 | 10th - Nov. 1998 | 650-I-10/01 | Since there is so much variability in the computational methodology for computing the loads and deflections of floating roofs would it not be better for API to provide the computation methodology in Appendix C? | API attempts where possible to provide performance based criteria for design, which allows the owner/user the maximum flexibility. A prescriptive approach would limit this flexibility. |
| C.3.4.1 | 10th - Nov. 1998 | 650-I-10/01 | Does ten (10) in. of rainfall mean that when calculating the weight of water (load on the roof), the plan area of the tank shell times 10 in. of water is the volume that should be used to compute the load on the floating roof? | Yes. |
| C.3.6 | 10th-add. 4 | 650-I-09/07 | Is Paragraph "C.3.6 of API 650, COMPARTMENTS" applied to both Single and Double deck roof. | Yes. |
| C.3.6 | 9th - May 1993 | 650-I-29/97 | Referring to API 650, Appendix C, Section C.3.6, are continuous welds required to attach the upper edges of pontoon compartment dividers? | Yes. Stitch welding is not acceptable. |
| C.3.6 | Ed 12, Ad 1 | 650-2015-F5 | Does C.3.6 require welds on both sides of each radial and circumferential divider that form compartments? | No, The term "single-fillet welded" in C.3.6 refers to welding from one side. |

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| C.3.9 | 10th - Nov. 1998 | 650-I-12/02 | 1: Referring to Section C.3.9, Must the thermal in-breathing / out-breathing requirements as per API Standard 2000 also need to be considered during design of bleeder vents? (i.e. during deciding size and quantity of bleeder vents, so that there will not be any overstressing of roof deck or seal membrane).<br><br>2: If answer to Question 1 is yes, would it not be worthwhile to clarify the same appropriately in Section C.3.9 of API 650? | 1: No, C.3.9 does not require venting per API Std 2000.<br><br>2: No. |
| C.3.10.2 | 9th - May 1993 | | Does API 650 contain rules applicable to the design of the legs on floating roofs for the rainfall condition when the roof is supported on its legs? | Yes, see Section C.3.10.2 which specifies at least a 25 lbf/in.$^2$ load. Actual site conditions more severe than that are outside the scope of API 650 and thus become a contractual matter between the purchaser and manufacturer. |
| C.3.1.6 | 12th | 650-D-36 | Section C.3.1.6 is referring to API 2003. API RP 545 states it supersedes RP 2003. Should API-650 references to RP 2003 be replaced by RP 545 by users? | No. |
| E | 10th - Nov. 1998 | | Is vertical acceleration considered in API 650 Appendix E? | No. |
| E | 10th - Nov. 1998 | | If specified, should vertical earthquake acceleration be taken into consideration? | Yes. |
| E.3.3 | 9th - May 1993 | 650-I-26/02 | Is this moment in E.3.1 used to calculate number and diameter of anchor bolts? | Yes. |
| E.4.2 | 9th - May 1993 | 650-I-45/99 | Is the moment in E.3.1 supposed to be divided by 1.4 to get service load under seismic (Similar to UBC 97 chapter 16- Service load combination)? | No, the dimension is measured radially inward from the interior face of the shell to the end of the annular plate, defined as the inner edge of the annular plate. The extent of the overlap of the bottom plate on the annular plate is not a significant consideration. |
| E.4.2 | 10th - Nov. 1998 | 650-I-25/00 | Should the metric formula for calculating the width of the thicker plate under the shell in Section E.4.2 read: | Yes. |
| E.4.6.1 | Ed 12, Ad 1 | INQ-650-D74 | In E.4.6.1, for the condition of S1>0.6, does the standard require using the larger of the two Ai equations provided? | Yes, the Ai equation listed after the S1>0.6 criteria is a second check that may control at times but the larger value of the two shall be used. |
| E.4.6.1 | Ed 12, Ad 1 | INQ-650-D76 | Some factors in Annex E appear to vary from ASCE 7 factors. Do the ratio of these individual factors to ASCE 7 factors represent a variation from ASCE 7? | No, see E.1. |
| E.5.1 | 10th - Nov. 1998 | | Is the following revision to Section E.5.1 appropriate? "When M / [$D^2$ ($w_f$ + $w_L$)] is greater than 1.57 or when b/1000t (b/12t) is greater than Fa (see E.5.3), the tank is structurally unstable." | Yes. |
| Table 5.21a, Annex E | Ed 12, Ad 0 | INQ-650-D68 | If E.6.2.1.1.1 shows J<=0.785 but Table 5.21a still shows an anchor load for seismic only condition, are anchors required? | No. E.6.2.1.1.1 is used for seismic-only condition. If anchors are required, Table 5.21.a is then used to calculate anchor loads. |
| E.6 | 9th - May 1993 | | If a tank does not require anchorage for seismic stability alone but requires anchorage to prevent uplifting due to internal pressure, does the tank then have to be anchored for seismic stability? | Yes. If a tank is anchored, then the weight of the ring of fluid resting on the bottom plate next to the shell ($W_L$) is not able to resist the uplifting of the shell until the anchors yield or fail. The anchors have to be designed to take uplifting from the internal pressure in combination with the seismic moment. Note, Section E.6.2.3 allows an anchor tensile stress of (0.66)(1.33)$f_y$ for the combined loading. |
| E.6.1 | 9th - May 1993 | | Where anchorage is to be added using E.6.1, the lack of additional definition on the value of M implies the anchors must take the entire overturning moment without consideration of resistance provided by the contents. This presents an all or nothing choice between unanchored and anchored tanks that does not appear to be realistic. | When anchorage is required for seismic loadings, the anchors are to be designed to resist the total load since if the anchors failed during a seismic event, the tank would then act as an unanchored tank and would be unstable and thus prone to failure. |
| E.6.2.1 | Ed 12 Ad 1 | INQ-650-D81 | May a finite element analysis be used to override the requirements of E.6.2.1.1? | No. |

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| E.6.2.4 | ED 11, Ad 3 | INQ-650-D13 | 1: Are the allowable stress reduction factors listed in appendix M for shell plate applicable to allowable stresses used in E.6.2.4?<br><br>2: Are yield stresses that are referenced in E.6.2.4 required to be modified by reduction factors listed in appendix M when applicable? | 1: Yes.<br><br>2: Yes. |
| E.6.2.4 | ED 11, Ad 3 | INQ-650-D13 | 1: Are the allowable stress reduction factors listed in Annex M for shell plate applicable to allowable stresses used in E.6.2.4?<br><br>2: Are yield stresses that are referenced in E.6.2.4 required to be modified by reduction factors listed in Annex M when applicable? | 1: Yes.<br><br>2: Yes. |
| E.7.7 | Ed 12 Ad 1 | INQ-650-D83 | Does API-650 Annex E provide rules for the use of shear tabs to resist seismic shear forces? | No |
| E, E.2 | 10th-add.4 | 650-I-20/06 | In Appendix E, section E.2 Notation defines TL as the "Regional-dependent transition period for longer period ground motion, seconds" and section E.4.9.1 instructs the user that "TL shall be taken as the mapped value found in ASCE 7" Is this reference still valid? | Yes, this reference is still valid and the variable and maps are included in ASCE 7-05. |
| F | 10th - Nov. 1998 | | Is the minimum open area for the vent 50 $in.^2$ regardless of tank capacity? | Yes. |
| F | 10th - Nov. 1998 | | In the case of a cone roof tank, what is the setting pressure of normal vents for pressure and vacuum sides? | When vents are required per Section F.7.7 and H.6.2, they shall be sized to per API Standard 2000. |
| F | 9th - May 1993 | | Do the formulas for the relationship between wind moment, internal design pressure, and deadload resisting moment, given in Appendix F, supersede those given in Section 3.11, when designing a tank for small internal pressure using that appendix? | Yes. |
| F.1 | 10th - Nov. 1998 | 650-I-24/01 | 1: When F.1.2 applies, must the roof meet API 650 requirements?<br><br>2: When F.1.3 applies, must the roof meet API 620 requirements? | 1: Yes.<br><br>2: Yes. |
| F.1 | 10th - Nov. 1998 | 650-I-15/04 | If an internal pressure of 2 psi is specified, is this internal pressure considered in designing and determining shell thickness? | No. The internal gas pressure component need not be included in the calculation of shell thickness. |
| F.1.2 | 9th - May 1993 | | If a tank designed for internal pressure does not require anchors per Appendix F to prevent uplift due to internal pressure, but requires anchors for seismic forces per Appendix E, does Appendix F.7 apply? | No, per Appendix F.1.2, overturning stability with respect to seismic conditions shall be determined independently of internal pressure uplift. This also applies to the requirements for anchors. |
| F.1.2 | 10th - Nov. 1998 | 650-I-12/00 | Assume a tank is to be designed to API 650, Appendix F.1.2, (the internal pressure will be greater than the weight of the roof plates but less than the weight of the shell, roof and framing). In addition, assume anchors are to be added for some reason other than internal pressure, for example: seismic, wind, sliding, overturning or user mandated. Does the tank have to be designed to API 650 Section F.7? | No, only Sections F.2 through F.6 apply. Section 3.11 applies to anchors that resist wind overturning when specified by the purchaser. Appendix E applies to anchors provided for seismic. |
| F.4 | 9th - May 1993 | | In the calculation of maximum pressure "P" per F.4.1 and F.4.2, is the roof plate thickness "$t_h$" and the weight "W" to be used in the corroded condition, when the corrosion allowance is specified? | Yes, if specified by the purchaser. |
| F.4.1 | 10th-add. 4 | 650-I-08/07 | Appendix F - Design of Tanks For Small Internal Pressures<br>Section F.4 Maximum Design Pressure and Test Procedure<br>Paragraphs F.4.1 and F.4.2 Calculations for design pressure P and Pmax<br>Question: API Standard 650 Appendix F, paragraphs F.4.1 and F.4.2, provide formulas for calculating the design pressure "P" and the limiting design pressure "Pmax", which use the nominal roof thickness "th". It is my belief that the nominal roof thickness "th" used in the calculations should be determined by subtracting any corrosion allowance from the nominal or actual roof plate thickness. Is this correct? If the answer is yes, I recommend that the definition of "th" be revised to make it clear that corrosion allowance should not be included in the thickness used in the calculations. This has been a point of confusion on a tank re-rate, where the contract engineer was intending to use the full thickness of the roof plate in the design pressure calculation. The confusion stems from the use of the term "nominal thickness", which without any clarifiers would normally mean the original specified thickness in common inch fractions, without consideration of manufacturing tolerance or corrosion allowance. It is my contention that for any design pressure calculation, the assumption should be that the corrosion allowance has been used up and is no longer available, since the purpose of corrosion allowance is expected metal loss over time. My recommendation is that "th" be defined the same as the wording near the end of paragraph F.5.1 where it says the calculation for the required compression area at the roof-to-shell junction is based on the "nominal material thickness less any corrosion allowance". | Pending |
| F.4.1 | 9th - May 1993 | | Is "A" in the formula of F.4.1 the cross sectional area of the roof? | No. See definition in Section F.4.1 and the cross-hatched roof sections of Figure F-2 |

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| F.4.2 | **10th-add. 4** | 650-I-06/07 | Background: The revised calculations for wind increase the tank wind overturning moment, since a large vertical component is added for uplift. When used in Appendix F calculations for Pmax a negative number is produced.<br>Question:<br>Equation F.4.2 for the calculation of Pmax produces a negative number when the revised calculation of the wind moment (M) is performed in accordance with 3.2.1.f as the result of a large vertical component of wind now included as part of the overturning moment calculation. Can the vertical component of wind be deleted from the calculation of Pmax; or, if required, how is the negative number for Pmax to be interpreted? | pending |
| F.4.2 | 10th-add. 4 | 650-I-01/07 | In an unanchored tank, Does the Design Pressure have to be larger than the Maximum Design Pressure? | Yes |
| F.4.2 | 10th - Nov. 1998 | 650-I-15/02 | Does "W" in F.4.2 include the weight of the bottom of the tank? | No. |
| F.4.2 | 10th - Nov. 1998 | 650-I-30/03 | For an anchored tank, can the $P_{max}$ calculation in F.4.2 be exceeded by the design pressure of the tank? | Yes. |
| F.5.1 | 9th - May 1993 | | Can the area contributed by the welds be taken into account when computing the area required/available to resist the compressive forces per Appendix F, Section F.5.1? | Yes. |
| F.7 | 9th - May 1993 | | Is API 650 Section F.7 applicable to tanks with shell plates in excess of 1/2 in. nominal thickness? | No. |
| F.7 | 9th - May 1993 | | Can the forces produced by the internal pressure on the tank bottom be used to reduce the design forces for the anchor belts and ringwall used to anchor the tank against uplift? | No. |
| F.7 | 10th - Nov. 1998 | 650-I-14/04 | 1: Are dome and self-supporting cone roofs with knuckles in the manner of API 620 Section 5.12.3, permitted for tanks designed in accordance with API 650, Appendix F, Section F.7?<br><br>2: Do the design rules of API 650, Appendix F, Section F.7.2 apply to dome and self-supporting cone roofs with knuckles?<br><br>3: Does the calculated failure pressure of API 650, Appendix F, Section F.7c and Tables 3-21 apply to dome and self-supporting cone roofs with knuckles?<br><br>4: Do the expressions of API 650, Appendix F, Section F.4 referenced by Section F.6, in turn referred to by Section F.7c apply to dome and self-supporting cone roofs with knuckles for tanks to be marked in accordance with Section F.1.3 since the compression ring area is undefined for such configurations? | 1: Yes.<br><br>2: No.<br><br>3: No.<br><br>4: No. |
| F.7.1 | 9th - May 1993 | | If a tank has an internal design pressure, is that pressure added to the design liquid level when calculating the thickness of the shell plates? | Only if required by Appendix F Section F.7.1. |
| F.7.1 | 10th - Nov. 1998 | 650-I-25/03 | If internal pressure inside a tank does not exceed the weight of the shell, roof and attached framing, but exceeds the weight of the roof plates (Basic Design plus Appendix F.1 to F.6), must H be increased by the quantity P/12G? | No. |
| F.7.1 | Ed 11, Ad 2 | INQ-650-D08 | When adding the design pressure to the liquid level height per F.7.1, is it required to add 1.25 times the design pressure to the liquid height for the hydro test shell thickness calculation? | No. The design pressure is added to the liquid height for both the product and hydro test thickness calculation. The 1.25 factored increase in pressure for hydro pneumatic testing should not be applied to other sections of the standard where design pressure is used. |
| F.7.1 | ED 11, Ad 2 | INQ-650-D08 | When adding the design pressure to the liquid level height per F.7.1, is it required to add 1.25 times the design pressure to the liquid height for the hydro test shell thickness calculation? | No. The design pressure is added to the liquid height for both the product and hydro test thickness calculation. The 1.25 factored increase in pressure for hydro pneumatic testing should not be applied to other sections of the standard where design pressure is used. |
| F.7.3 | 9th - May 1993 | 650-I-18/98 | Does Appendix F of API 650 allow the use of plate flanges for roof manholes? | Yes, see Section 2.3.3 of API 620, which is referenced by API 650, Section F.7.3. |
| F.7.3 | 10th - Nov. 1998 | 650-I-39/00 | 1: Does the statement of Appendix F.7.3, “design and welding of roofs and the reinforcement and welding of roof manholes and nozzles shall be in accordance with API 620” mean among other things that the materials of construction, fracture toughness requirements, rules of API 620, Section 2.2.2, joint efficiencies, and inspection criteria of API 620 are to be used for F.1.3 steel roofs?<br><br>2: Does the requirement that design and welding of roofs in Appendix F.7.3 mean that the maximum design temperature for tanks in accordance with Appendix F.1.3 be no greater than 250ºF as required by API 620 Section 1.2.2? | 1: No.<br><br>2: No. |

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| F.7.5 | 10th - Nov. 1998 | 650-I-04/01 | Should uplift pressure used in computing the counterbalance forces produced by internal pressure be equal to 1.5 times the design pressure of the empty tank (minus any specified corrosion allowance) plus the uplift produced from the design wind velocity on the tank? | Yes. |
| Figure B-1 | 10th - Nov. 1998 | 650-I-17/00 | Does API 650 require the use of asphalt-impregnated fiberboard to level out concrete ringwall top surface irregularities? | No. It is the purchaser's or the tank manufacturer's option to include the use of asphalt impregnated board. Level tolerances for the concrete ringwall shall meet the requirements of API 650 Section 5.5.5.2 regardless if asphalt-impregnated board is used. |
| Figure F-2 | Ed 11, Ad 3 | INQ-650-D27 | Does the "or" in the width of participating roof plate shown in detail i of Figure F-2 allow selection of either value? | No. The first value shall be calculated, then limited by the calculated value following "or a maximum". |
| Figure F-2 | 9th - May 1993 | | In Appendix F, Figure F-2, can detail "a" be used without the angle if the contributing portions of the shell and roof provided enough data to carry the compression and tension forces? Also, are $R_c$ and $R_2$ to be in in. or ft for the calculation of the contributing lengths of the shell and roof? | No, API 650 specifies that for Figure F-1 detail "a" that a minimum angle size be used, see Section 3.1.5.4. $R_c$ and $R_2$ are in inches, see the footnote to F-2. |
| Figure F-2 | 9th - May 1993 | | Is "A" in Figure F-2, Details b and c a linear dimension that defines the width of the torodial plane through the top angle? | No, the dimension "A" in Figure F-1, Details b and c is not related to the "A" used in the equation in Section F.4.1 which is defined as the compression area. The dimension "A" and "B" in Figure F-2 details b and c are used to show that the roof plate must not be attached to the top roof angle outside of the neutral axis of the top angle, i.e. B<A. |
| Figure F-2 | 10th - Nov. 1998 | | Is the "A", "x", or "y" dimensions given in the AISC Manual of Steel Construction? | Yes. |
| Figure F-2 | 10th - Nov. 1998 | | In Detail h, can the roof plate be flat? | Yes. |
| Figure F-2 | 10th - Nov. 1998 | | If the length of the angle leg of the internal angle forming compression ring of a tank is 6.5 in. but the calculated $W_c$ is 5.247 in, can 6.5 in. be used for $W_c$ in calculating the participating area of the shell per Figure F-2, Detail c? | No. |
| Figure F-2 | 10th - Nov. 1998 | 650-I-26/01 | Is a roof that meets all the conditions for frangibility except that the top angle is butt-welded to the shell, but uses detail b or c of Figure F-2 of Appendix F, meet the condition for frangibility? | Yes. Note the following editorial correction; definition of "A" in F.4.1, the reference to Figure F-1 should be F-2). |
| Fig. F-2 | 12th | 650-D-38 | 1. In figure F-2, and specifically "detail I," are the weld details required as per the diagram?<br><br>2. Is the internal fillet weld of "detail i" from figure F-2 required to be implemented? | 1. Yes.<br><br>2. Yes. |
| Fig. F-2 | Ed 12, Ad 0 | INQ-650-D70 | 1. If additional elements are added to Figure F-2 details within defined participation limits can these areas be included as contributing to compression area?<br><br>2. In Figure F-2 detail b, can a plate lapped on the inside of the shell opposite the shown top angle be included as contributing compression area? | 1. No.<br><br>2. No, only the details shown in Figure F-2 can be included as contributing to the compression area. |
| Figure F-3 | Ed 11, Ad 3 | INQ-650-D22 | If the compression area available in the roof and shell is greater than the required compression area and the roof is butt welded, is it permissible to use Figure F-2, Detail h, without the horizontal bar on Annex J tanks? | No. Per F.3, the roof- to-shell details must conform to a listed detail in Figure F-2. |
| Figure I-5 | 9th - May 1993 | | Is the "shell support ring" in Figure I-5 an annular ring? | No. The ring of annular plates are defined in Section 3.5. The "shell support ring" in Figure 1-5 is a continuous support under the tank shell whose dimensions, but not material, are specified by the Figure. Alternative details or methods may be used if agreed upon by the tank owner and manufacturer. |
| G.4.2 | 9th - May 1993 | | Is it necessary to use the load due to changes of ambient temperature? | No, unless it would impact on the structural integrity of the roof. |
| General | 10th - Nov. 1998 | 650-I-17/03 | Background: The tank fabricator discovered during the tank design and review of the drawings that some of the tanks required additional emergency venting because they do not have frangible roofs. The tank fabricator/erector is working for the general contractor, who in turn is working for the owner. Please note that the tank fabricator fulfilled their obligations by providing the additional nozzle.<br><br>Question: Is it the responsibility of the owner or the general contractor to purchase the additional venting devices? | This responsibility is a contractual matter between the purchaser and manufacturer/fabricator/erector, and is outside the scope of API 650. |
| General | 10th - Nov. 1998 | | Is there a minimum diameter or height or volume for which new tanks constructed to API 650 apply? | No. |

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| General | 10th 3rd add. | 650-I-03/06 | 1: Is impact testing required for the welding of a 38 mm base material G40-21-38W for a design metal temperature of -36 C ?<br>2. If all of the tests required by API 650 were performed on a 0.75 inch test specimen except for the tensile test, which was performed on 1.5 inch plate, can a weld procedure specification be qualified by using two different plate thicknesses of identical material? | 1: Yes. Refer to sections 2.2.9.1, 7.2.2.3, and 7.2.2.4.<br>2: Yes |
| General | 10th - Add3 | 650-I-05/06 | Question: Does API 650 require ANST-TC-1A Level I or II qualification for Liquid Penetrant and Magnetic Particle examination? | No. |
| General | 10th Add3 | 650-I-06/06 | Does API Standard 650 specify whether a peaking measurement is to be taken on the interior or exterior of the shell? | No, refer to 5.5.4.a |
| General | 10th add 3 | 650-I-04/06 | 1. Are these configurations of above ground tanks, (flat bottom, crowned up, or sloped down or all) subject to sliding?<br>2. When considering sliding, is the correct comparison weight of tank (including bottom, shell, roof, structure, fittings, and appurtenances) multiplied by .4, compared to wind shear (area multiplied by wind force)? | 1. Yes<br>2. Yes, Refer to section 3.11.4 |
| General | 10th add 3 | 650-I-14/06 | API 620 gives clear guidelines regarding overpressure/pressure accumulation and that under Emergency Conditions you may exceed the M.A.W.P. by as much as 20% when sizing the Emergency relief valve. In API 650 only Normal Conditions are listed with no particular reference to the ERV and accumulation being allowed/disallowed to exceed the design pressure.<br>I am of the opinion that due to the fact that "Under Normal Conditions" leaves the actual setting of the ERV and it respective overpressure percentage, open to mis-interpretation for the following reasons:<br>1: The operation of the ERV is normally for fire conditions only.<br>2: Interpretation of API 650 Code in this manner leads one in the direction of having an ERV Set pressure + pressure accumulation in Excess of the M.A.W.P. as in the API 620 Code and for API 520 Spring loaded Safety Relief Valves.<br><br>Is this a correct reading of the Standard 650 with respect to ERV? | No. Refer to Section 3.10.8, Tank Venting |
| H | 10th - Nov. 1998 | 650-I-50/99 | 1: Does API 650 require that floating roof seals be installed prior to hydrotesting the tank?<br><br>2: Is a roof seal considered to be a major component of the tank? | 1: No.<br><br>2: API 650 does not use the term “major component”. |
| H.2.1 | 10th - Nov. 1998 | 650-I-38/02 | Is the reference to NFPA 11 found in footnote 20 under item H.2.1 meant to establish that non-perforated honeycomb floating roofs are the exclusively permitted type to be used if an H.2.2.f type floating roof is being considered? | No. The reference to NFPA 11 is solely related to the design of a fire suppression system (if used). |
| H.2.2(f) | Ed 12, Ad 1 | INQ-650-D75 | Does a hollow panel floating roof (ie. a sandwich panel with neither honeycomb nor closed cell foam core) meet API-650 H.2.2(f) ? | No. H.2.2(h) may be used for other roof designs not listed in H.2.2(a-g). |
| H.4.1.7 | 10th - Nov. 1998 | 650-I-38/02 | Per H.4.1.7 "Inspection openings shall be located above the liquid level and closed compartments shall be capable of being resealed in the field after periodic inspection (to prevent liquid or vapor entry)." In the case of floating roofs type H.2.2.f, does "inspection openings" refer to screwed couplings, test plug or similar devices, or is it implied by "inspection openings" the disassembling in the field of flotation modules? | Yes, "inspection openings" in H.4.1.7 refer to screwed couplings, test plugs or similar devices and not to the disassembling in the field of flotation modules. |
| H.4.2 | 10th - Nov. 1998 | 650-I-09/02 | Does H.4.2.2 require internal floating roofs be designed to support a uniform load of 500 lbf/in.2? | The 500 lb force is to be applied as a moving concentrated load over one square foot located anywhere on the roof. Refer to H.4.2.5 for distributed uniform loading. |
| H.4.7 | 10th - Nov. 1998 | 650-I-38/02 | Per H.4.1.7 "Inspection openings shall be located above the liquid level and closed compartments shall be capable of being resealed in the field after periodic inspection (to prevent liquid or vapor entry)." In the case of floating roofs type H.2.2.f, does "inspection openings" refer to screwed couplings, test plug or similar devices, or is it implied by "inspection openings" the disassembling in the field of flotation modules? | Yes, "inspection openings" in Section H.4.1.7 refers to screwed couplings, test plugs or similar devices and not to the disassembling in the field of flotation modules. |
| H.5.2 | 10th - Nov. 1998 | 650-I-19/04 | When an internal floating roof is used, is it acceptable for use of a P/V vent with no circulation venting, gas blanketing other means to insure that a combustible mixture does not develop between the fixed and floating roof? | No. |
| H.5.5.3 | Ed 11, Ad 3 | 650-2012-F2 | Is there an allowance for fewer than four inspection hatches on tanks of small diameter (i.e. 12' diameter)? | No. |
| H.5.5.3 | ED 11 Ad 3 | 650-2012-F2 | Is there an allowance for fewer than four inspection hatches on tanks of small diameter (e.g. 12' diameter)? | No. |
| I | 10th - Nov. 1998 | 650-I-39/99 | Is it acceptable for the primary (upper) bottom, of an API 650 Appendix I double-bottom tank to not project through the shell and to be attached only to the inside of the shell? | No. API 650, Section 3.4.2 requires the bottom plate project at least 25 mm (1 in.) outside the toe of the outer shell-to-bottom weld. Section 3.5.2 requires the annular plate project at least 50 mm (2 in.) outside the shell. Furthermore, Section 3.1.5.7 requires the bottom be welded to the shell on both sides of the shell. The only way this can be accomplished is with a shell projection. Figure I-4 illustrates an acceptable double-bottom installation. |

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| J.1 | 10th - Nov. 1998 | 650-I-20/01 | Does a tank with a diameter greater than 6 m and constructed with a lap-welded bottom meet the requirements of API 650 Appendix J. | No. |
| J.2 | 10th - Nov. 1998 | 650-I-05/02 | Referencing Appendix J, does the roof plate material have to meet the same toughness requirements as the shell plate on tanks located in -40ºF areas? (Assume F.7 is not applicable.) | This is not addressed in API 650. |
| J.3 | 10th - Nov. 1998 | 650-I-46/03 | Is thermal stress relieving required on a flush clean-out assembly installed in an API 650, Appendix J, shop-built tank? | Yes. All requirements of the base document apply to an Appendix J tank unless specifically changed or waived by a statement in Appendix J. Refer to Sections 3.7.4 and 3.7.8.3. |
| J.3.3 | 9th - May 1993 | | Is a shop-fabricated tank with a diameter of 11.4 ft. with 5 mm thick plate, acceptable per API 650 even though it does not meet J.3.3, but does meet all other requirements of API 650, including 3.6.1? | No. |
| J.3.8.2 | 10th-add. 4 | 650-I-07/07 | J.3.8.2 There shall be a minimum of two lugs on each tank. The location of the lugs shall be agreed upon by the purchaser and the manufacturer. The lugs shall preferably be located at the top of the tank, in pairs, 180 degrees apart.<br>J.3.8.3 Lugs and their attachment welds shall be designed to carry their share of the applied load (twice the empty weight of the tank) distributed in a reasonable manner and based on a safety factor of 4.<br>Is this intended to be twice or half the empty weight of the tank? | Pending |
| J, F | Ed 11, Ad 3 | INQ-650-D23 | 1: Can a tank built in accordance with Annex J and using a roof with a flanged cone or dome with a corner radius be designed for pressure in accordance with Annex F?<br><br>2: If the cone or dome is designed for internal and external pressure, does the corner radius need to be designed for either internal or external pressure? | 1: No. Per F.3, the roof to shell connection must meet a listed detail in Figure F-2.<br><br>2: See answer to Question 1. API 650 Annex F does not provide for use of a flanged or knuckled roof--to-shell connection for pressurized tanks. |
| K | 10th - Nov. 1998 | 650-I-22/01 | Does API 650 limit the height of the tank based on the requirements of Appendix K? | No. |
| L | 9th - May 1993 | | Does checking the box "no" on Line 13 of Appendix L, page L-3, relieve the requirements of Section 3.6.7? | No. |
| M | 9th - May 1993 | | If the design temperature of a tank is 250ºF, but the maximum operating temperature is 150ºF, do the provisions of Appendix M need to be followed? | No, since the application of Appendix M is based on maximum operating temperature and not design temperature. |
| M.3.2 | 9th - May 1993 | | Should the M.3.2 yield strength reduction factor also be applied to the 0.426T and 0.472T terms of Section 2.3.3.1 when determining the allowable stress S? | Yes. |
| M.3.5 | 10th - Nov. 1998 | | In API 650 Appendix M, Section M.3.5, what is meant by " if the ratio is less than 1.0"? | If the yield strength of the material at the maximum operating temperature is less than 30,000 lbf/in.$^2$ then the allowable stresses specified in 3.10.3 must be multiplied by the ratio of the yield strength at the maximum operating temperature divided by 30,000. |
| M.4.1 | 9th - May 1993 | | When butt-welded annular plate is required per M.4.1, are the butt-welds required to be radiographed per Section 6.1.2.9 even if the design stress value in the first shell course is less than 23,200 psi? | No. M.4.1 refers the user to Section 3.1.5.6, when annular plates are required for tanks with a diameter exceeding 100 ft. Section 3.1.5.6 requires complete penetration and fusion radial joints for the annular plates. Section 6.1.2.9 qualifies the radiography requirements to apply to cases "when annular plates are required by Section 3.5.1." Section 3.5.1 requires annular plates when Group IV, IVA, V, or VI materials are used, except when the maximum product stress is less than 23,000 psi and the test stress is less than 24,900 psi. The radiography requirements are currently based on the stress levels in the annular plates. Appendix M limits these stress levels by the factors required in Table M-1. There are no conditions under which non-Group IV, IVA, V, or VI materials can be used under Appendix M provisions to result in product or test stresses exceeding the aforementioned limits. There are conditions under which Group IV, IVA, V, or VI materials can be used under Appendix M provisions to result in products or test stresses exceeding the aforementioned limits. However, under these latter conditions,<br>the requirements of 6.2.1.9 would still apply and radiography would be required. |

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| N.2.2 | 10th - Nov. 1998 | 650-I-03/02 | Referring to API 650, Section N.2.2, if part of the material to be used in a tank is not clearly identified, but the mill test records are available, can the tank supplier state that the material in question is covered by these records (regarding heat and lot number) and verify this by chemical analysis only (no physical testing)? | No. If records are not available and traceable, N.2.2 requires that all material be verified by both chemical analysis and physical testing. |
| P.3 | 10th - Nov. 1998 | 650-I-12/04 | 1: If a nozzle has a compensating pad to Table 3-6, does the code require a check to be made on stress levels at the edge of the pad and if so can WRC 297 be used with the stress reduction factor applied from P.3?<br><br>2: If the nozzle neck meets the requirements of Table 3-7, are any further checks required to find stress levels in the nozzle neck and if so can WRC 297 be used with the stress reduction factor applied from P.3? | 1: No.<br><br>2: No. |
| P.3.1.A | 12th Ed, Ad 1 | INQ-650-D72 | 1) Does the reference to WRC 297 allow for use of WRC 107 or 537?<br><br>2) Does API provide equations for the figures P.2a to P.2l? | 1) No, WRC 297 is a supplement to WRC 107. The reference allows the use of the supplement WRC-297. WRC-107 would be used to the extent that it works with WRC-297.<br>2) No, API does not provide equations beyond those listed in the standard. |
| S.1.5 | 9th - May 1993 | | Since it is not stated in Appendix S, what is the minimum roof plate thickness? | Referring to Section S.1.5, since no requirements are stated in Appendix S, you must refer to Section 3.10.2 to determine the minimum roof plate thickness. |
| S.3.2 | 9th - May 1993 | | Section S.3.2 states that the minimum shell thickness is computed by the formulas shown for $t_d$ and $t_t$. What would be the minimum allowable thickness if the computed thickness gives values less than 3/16 in.? | Section S.1.5 explains the applicability of the requirements in Appendix S. Thus in this instance, refer to Section 3.6.1.1 for the minimum shell thickness requirements. |
| S.3.2 | 9th - May 1993 | 650-I-32/98 | When a tank is constructed out of stainless steel, is there a minimum thickness requirement other than that calculated using the design formulas in API 650, Section S.3.2? | Yes. The limits in Section 3.6.1.1 apply to all materials. See Appendix S, Section S.1.5 |
| S.3.2 | 10th - Nov. 1998 | 650-I-28/03 | Should bottom plates for stainless tanks be 1/4 in. thick? | No. The 3/16 in. minimum bottom plate thickness for stainless steel is intentional and is not related to the joint efficiency. |
| S.3.5.2 | 10th - Nov. 1998 | 650-I-54/02 | Does API 650, Appendix S, Section S.3.3 require seamless stainless steel nozzles necks? | No. See Table S-1a. |
| S.4.10.3 | Ed 12, Ad 0 | 650-2013-F12 | Is there a specific definition for quality limits for water to qualify as potable for application of the 21-day hydrotest exposure time given in S.4.10.3? | No, the term is not defined in API 650. The term is used in the sense of its customary definition as found in reputable sources. |
| S.4.14.2 | 9th - May 1993 | 650-I-23/98 | Referring to API 650, Appendix S, Section S.4.14.2, does this mean that all the butt-welded shell joints in the tank are to be penetrant tested, or only the butt-welded joints which have a backing strip? | Only those butt-welded shell joints that have a backing strip have to be penetrant tested. |
| S.4.14.2 | 9th - May 1993 | - | Referring to API 650, Appendix S, Section S.4.14.2, if butt-welded joints are made without the use of backing strips and welded from both sides with full penetration, are the joints required to be liquid-penetrant tested? | No. |
| Table S-2a/b | Ed 11, Ad 3 | INQ-650-D06 | Are the formulas for td and tt (S.3.2.2.3) using Sd and St respectively required to use the allowable stress Sd given in the allowable stress tables S-2a and S-2b? | No. The allowable stress tables S-2a and S-2b give Sd at various maximum operating temperatures. They also give St at ambient temperature. The values for St labeled as ambient temperature relates to the temperature at which testing should occur and should not be confused as being equal to the Sd value at ambient temperatures. |
| Table 2 | 10th-add. 4 | 650-I-04/07 | I have noticed a discrepancy between API and ASME for minimum metal temperature application of SA516-70N material. API 650 classifies this material under Group V with MMT above -29C, Table 2-3a and Figure 2-1. The same material with WT up to approx ½" is allowed to -48C by ASME 31.3 and sec VIII div 1. | Pending |
| Table 4-4 | Ed 11, Ad 2 | 650-2012-F1 | May CSA G40.21-350W semi-killed be classified as a group II material? | No, The only Group II CSA grade is CSA G40.21-260W |
| Table 4-4 | Ed 11, Ad 2 | 650-2012-F1 | May CSA G40.21-350W semi-killed be classified as a Group II material? | No. The only Group II CSA grade is CSA G40.21-260W |
| Table 5-1a/b | Ed 11, Ad 3 | INQ-650-D26 | Does Table 5-1a or Table 5-1b require calculation of two annular thicknesses, one based on product stress and one based on hydrotest ? | No. Tables 5-1a and 5-1b utilize the larger shell stress (product or hydrostatic test) then select the corresponding annular thickness for the same condition (product or hydrostatic test). If product controls then corrosion allowance would be added. Refer to 5.5.3. |
| Table 5-3, Table 5.10 | Ed 11, Ad 2 | INQ-650-D17 | When using Tables 5.3 and 5.10 for tanks that store products that are heavier than water, is the calculated pressure from the product filled to the design liquid level used? | Yes. For products heavier than water, use column 2 (equivalent pressure) in lieu of column 1 (the design liquid level) to determine plate thickness in Tables 5.3 and 5.10. |
| Table E-4 | Ed 11, Ad 2 | INQ-650-D25 | 1: Are moments and shears calculated in Appendix E to be used for foundation design as ASD basis?<br><br>2: Are the reduction factors listed in Table E-4 correctly related to ASD? | 1: Yes.<br><br>2: Yes. |
| Table J-1 | 10th - Nov. 1998 | 650-I-03/01 | Are the depths specified in Table J-1 properly specified as "maximum" depths or should they be "minimum" depths? | The depths are maximum, as stated in the table. |

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| Tables S-2a/b | Ed 11, Ad 3 | INQ-650-D06 | Are the formulas for $t_d$ and $t_t$ (S.3.2.2.3) using $S_d$ and $S_t$ respectively required to use the allowable stress $S_d$ given in the allowable stress tables S-2a and S-2b? | No. The allowable stress tables S-2a and S-2b give $S_d$ at various maximum operating temperatures. They also give $S_t$ at ambient temperature. The values for $S_t$ labeled as ambient temperature relates to the temperature at which testing should occur and should not be confused as being equal to the $S_d$ value at ambient temperatures. |
| V | 10th-add. 4 | 650-I-15/06 | In the definitions for Appendix V, is f = 0.6 * Fy with Fy being yield strength as shown in Table 3-2? | No. See V.3.1 “Nomenclature” for definition of “f”. |
| V | 10th-add.4 | 650-I-19/06 | In V.3.1 Xbtm is defined as 16 tb. In V.8.2.3 second paragraph where lact is defined, it says to use 32 tb. In the example, the last calculation uses Xbtm and calculates it using 16tb. Which is correct? | The definition of Xbtm is correct. |
| V.1 | Ed 11, Ad 3 | INQ-650-D15 | Does V.1 require tanks to meet Annex V requirements if their design external pressure exceeds 0.036 psig but their operating external pressure is atmospheric (nominally 0 psig)? | Yes. |
| V.7.3.3 | 10th-add.4 | 650-I-24/06 | In paragraph 2 of the example, we are shown how to figure the length of effective roof plate and shell plate. The formula used does not match the formula in the referenced paragraphs V.7.3.3 and V.7.3.4 respectively and solve with different results. Which formula is to be used? | Both formulas give the same results. The difference is in the units. The factors 2.1 and 1.47 are based on using R and D in units of feet. The factors 0.6 and 0.43 are based on using R and D in units of inches. . |
| V.7.3.5 | 10th-add.4 | 650-I-21/06 | In paragraph 2, should the formula from V.7.3.5 have the E1 values replaced with JEs and Jer? | Yes. |
| V.7.3.5 | 10th-add.4 | 650-I-23/06 | In Addenda 4, Appendix V there is a definition for JEc and a definition for JEst. In paragraph V.7.3.5, we are directed to use JEst for calculating the area of the top stiffener as shown in Figure V-1B. Where a top angle is installed as shown in Details d or e of Figure F-2, and these top angles are butt welded, can JEc be substituted for JEst in this formula? | No. |
| V.8.1.2 | 10th-add.4 | 650-I-22/06 | In Addenda 4, Appendix V, paragraph V.8.1.2 shows us how to solve for Ps. In paragraph V.8.1.3, we are shown how to solve for tmin using Ps in the formula. Should the formula in V.8.1.2 be solving for Psmax in lieu of Ps and the formula in V.8.1.3 use Ps as defined under V.3.1? | Yes, the equation shown in V.8.1.2 is the maximum pressure for which the stated equations are valid. Yes, Ps used in V.8.1.3 is as defined in V.3.1. |
| V.8.2.2.1 | 10th-add.4 | 650-I-26/06 | In paragraph 9 of the sample, it shows the formula from V.8.2.2.1 as<br>N^2 = SqRt ( 5.33 * D^3 / tsmin * Ls^2 ).<br>In paragraph V.8.2.2.1, the formula is shown as<br>N^2 = SqRt ( 5.33 * D^3 / tsmin * H^2 * ts).<br>Which is the correct formula? | Both are correct. The number of buckling waves is a function of the stiffener spacing. When Ls is less than HTS, Ls should be used to calculate the number of buckling waves. |
| V.8.2.2.6.1 | 10th-add.4 | 650-I-25/06 | In paragraph 13, the formula shows to be divided by "f" but the same formula in V.8.2.2.6.1 shows the divider to be "fc". The sample shows the value 21,600 for the divider. Should it be 15,000 (Fy * .4 for components considered for intermediate and bottom stiffener regions)? | Yes, fc should be used in paragraph 13, rather than f. |
| V.11 | 10th-add.4 | 650-I-27/06 | In paragraph 4 at the bottom of page V-11, the formula result reads: "tavg > = 0.703 in." Should this read: "tsmin > = 0.698 in."? | Yes, the correct term is “tsmin”. |