FABRICATION NEWS

January 1, 2025

BOARDMAN NEWSLETTER:

Your positive feedback to the newsletter we've sent out over the years is greatly appreciated. As STEWARDS for your Custom Fabrication needs, providing valuable education to the marketplace and building strong relationships is our primary focus. We promise to be your custom fabrication resource.

We hope you find this newsletter beneficial as we share tips in the pressure vessel design and construction process.

If there are any topics you would like us to address, please let us know

External Pressure and Lines of Support

Unlike vessels designed for internal pressure only, there is no single formula for designing for external pressure. It is an iterative process where many factors come into play like the length of the cylinder, size, the distance between your lines of support, etc. The critical piece in design for external pressure is the overall geometry and its resistance to collapse.

The required minimum thickness of a cylindrical shell or tube under external pressure is determined by the following procedure:

- Cylinders having Do/t values ≥ 10
  - Assume a value for t and determine the ratios L/Do and Do/t.
  - Enter Section II, Part D, Subpart 3, Figure G at the value of L/Do
  - Use all these charts and move through the instructions in UG-28 until you end up with a Pa value that is greater than or equal to P.
    - P – external design pressure
    - Pa – calculated value of maximum allowable external working pressure at assumed value t
  - Follow UG-28 for other situations to determine thickness required

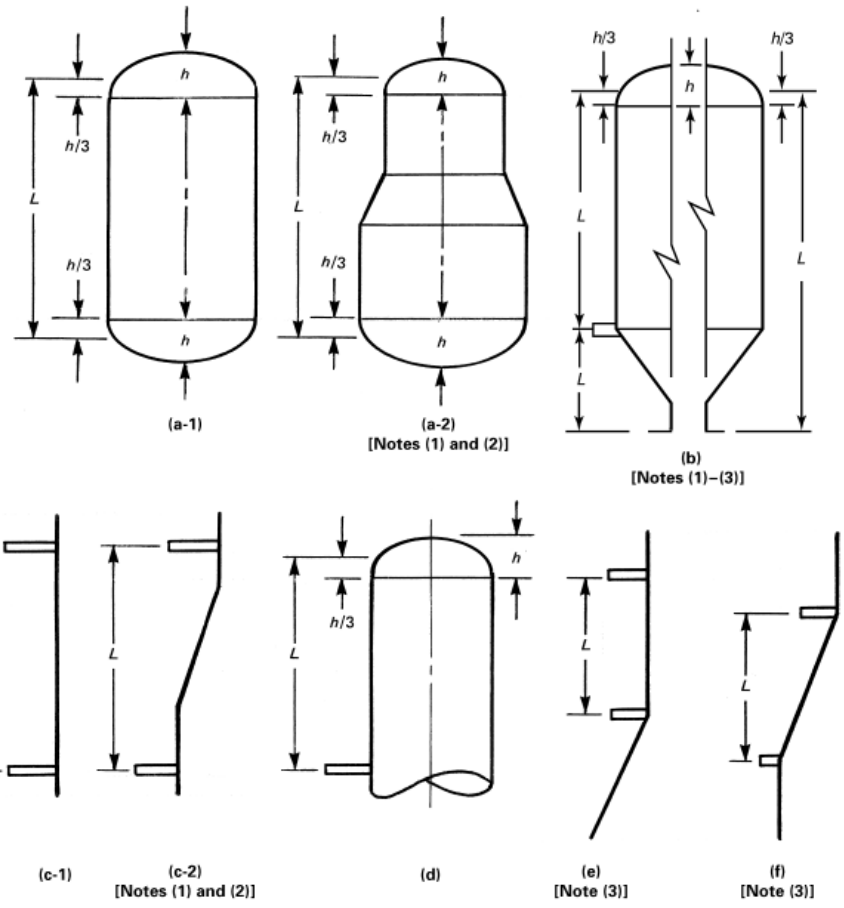
- Adding a line of support changes your L dimension and can affect your thickness required.
  - NOTE: Only when external pressure governs the thickness can a line of support help your required thickness. For example, if you add a stiffening ring to a vessel where internal pressure governs, the stiffening ring will not reduce your required thickness.

Lines of Support

Below is a list of possible lines of support to use in your design:

1. A circumferential line on a head (excluding conical head) at one-third the depth of the head from the head tangent line.
2. A stiffening ring that meets the requirements of UG-29
3. A jacket closure of a jacketed vessel that meets the requirements of Mandatory Appendix 9-5.
4. A cone-to-cylinder junction or knuckle-to-cylinder junction of a toriconical head or section that satisfies the moment of inertia requirement of Mandatory Appendix 1-8.

Figure UG-28.1
Diagrammatic Representation of Lines of Support for Design of Cylindrical Vessels Subjected to External Pressure



NOTES:
(1) When the cone-to-cylinder or the knuckle-to-cylinder junction is not a line of support, the required thickness of the cone, knuckle, or toriconical section shall not be less than the required thickness of the adjacent cylindrical shell. Also, the reinforcement requirement of Mandatory Appendix 1, 1-8 shall be satisfied when a knuckle is not provided at the cone-to-cylinder junction.
(2) Calculations shall be made using the diameter and corresponding thickness of each cylindrical section with dimension *L* as shown. Thicknesses of the transition sections are based on Note (1).
(3) When the cone-to-cylinder or the knuckle-to-cylinder junction is a line of support, the moment of inertia shall be provided in accordance with Mandatory Appendix 1, 1-8 [see UG-33(f)].

BOARDMAN'S 10th ANNUAL ASME SECTION VIII ENGINEERING SEMINAR:

It's hard to believe this will be our 10th year hosting our engineering seminar. It's important that this event provides the greatest amount of value FOR YOU and we continue to make improvements on this course. Boardman's commitment to education for our clients and our employees is unmatched. Our engineering seminar is recognized as the most impactful seminar for an engineer to deepen their ASME code knowledge and combine with the practical application of pressure vessel fabrication and shop experience. As *STEWARDS for YOUR Custom Fabrication Needs*, we are excited to have a great group attending our 2025 seminar on April 22-23! We will share the feedback from our 2025 event in our Q3 newsletter.

Our 4rd annual Section IX Seminar will be held at our facility in October. For additional information on how to attend our educational seminars or for us to bring those experiences to your site, please contact us at the information listed below.

We would love to hear from you and have an opportunity to quote your next project

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