



## Risk Solutions

# Pressure Points

## Table of Contents

Ask the Engineer .....	1
B16.5 Flanges in Section VIII, Division 1, Design, Part 1 & 2.....	3
Changes to Korean Energy Use Rationalization Act and Energy Act.....	4
Did You Know?.....	5

## Ask the Engineer

**Q:** My Shop has received an order to build a Pressure Vessel in accordance with ASME Section VIII Division 1, 2017 Edition. I noticed that paragraph UG-11(e) allows a Certificate Holder to subcontract welding of standard pressure parts to an individual or organization not holding an ASME Certificate if pressure parts are fabricated to a standard other than an ASME product standard. Can I take advantage of this provision to subcontract the welding of an ASME B16.5 slip on flange to a seamless 2 : 1 ellipsoidal head (which will be used as head/enclosure of the Pressure Vessel and also to attach some nozzles to the ellipsoidal head by welding in a shop which doesn't have an ASME Certificate of Authorization?

**A:** The quick answer is No.

UG-11 rules do not apply to welded shells , heads and quick-actuating or quick-opening closures as stated in the first paragraph of UG-11(a). Additionally, see the two Interpretations [VIII-1-83-65 and VIII-1-92-54].

Interpretation: VIII-1-83-65  
Subject: Section VIII-1, UG-11, Welding on Formed Heads With a Flued Manway  
Date Issued: December 29, 1982  
File: BC82-293



Hartford Steam Boiler

Munich RE 

**Q:** A formed head containing an integral flued manway could be furnished under the provisions of UG-11(b) or UG-77(c) without a Manufacturer's Partial Data Report and Part Stamping. Assume that in order to provide for gasket seating surface, it is necessary to weld a ring to the flued manway. May this be done under the provisions and requirements of UG-11(c)(2)?

**A:** No.

**Note:** UG-11 rules have been rewritten in 2011 Addenda. Some of the old UG-11(c)(2) rules are now located in UG-11(c)(4) and UG-11(c)(8). This Interpretation is otherwise technically valid and confirms that UG-11 rules do not apply to welded (which means any type of welding) shells and heads.

Interpretation: VIII-1-92-54  
Subject: Section VIII, Division 1 (1989 Edition, 1990 Addenda); UG-11(c)  
Date Issued: March 9, 1992  
File: BC91-402

**Q:** May hinged heads fabricated to a parts Manufacturer's standard and complying with the requirements of UG-11(c)(1) and (2) in Section VIII, Division 1 be used for vessel or communicating chamber heads without Partial Data Reports?

**A:** No.

**Note:** UG-11 rules have been rewritten in 2011 Addenda. Some of the old UG-11(c)(1) and UG-11(c)(2) rules are now located in UG-11(c)(3), UG-11(c)(4) and UG-11(c)(8). Although not explicitly mentioned in the question, it is implied that the hinged head is welded and used as the head (end closure) of the vessel. This Interpretation is otherwise technically valid.

It may appear that "**welded** shell or head" restriction stated in UG-11(a) applies only when there are weld seams on the shell or head. The Interpretation VIII-1-92-06 below clarifies that the restriction will apply to any welding performed on a shell or head such as a nozzle attachment weld made on a seamless head.

Interpretation: VIII-1-92-06  
Subject: Section VIII, Division 1 (1989 Edition, 1990 Addenda); UG-11(c)  
Date Issued: August 9, 1991  
File: BC91-270

**Q:** Is it the intent of UG-11(c) in Section VIII, Division 1 that the reference to heads in the subtitle be applicable to only formed or flat heads containing a Category A butt weld (i.e., segmented or two piece heads)?

**A:** No.

**Note:** UG-11 rules have been rewritten in 2011 Addenda. The prohibition that states UG-11 rules are not applicable to welded shells and heads is now found in UG-11(a).

For situations where UG-11 requirements cannot be applied, the Certificate Holder has the option to request a Temporary Shop Certificate (see the web link below) from ASME and oversee the welding at the shop where they desire to conduct the welding activities as mentioned in the question (Q:) above.

[https://www.asme.org/wwwasmeorg/media/ResourceFiles/Shop/Certification%20%26%20Accreditation/BPV-Certification/BPV-Certification\\_Additional-Information\\_Temporary-Shop-Used-by-Certificate-Holders.pdf](https://www.asme.org/wwwasmeorg/media/ResourceFiles/Shop/Certification%20%26%20Accreditation/BPV-Certification/BPV-Certification_Additional-Information_Temporary-Shop-Used-by-Certificate-Holders.pdf)

## B16.5 Flanges in Section VIII, Division 1 Design; Part 1 of 2

This is the first in a two part series about ASME B16.5 flanges, and their application in Section VIII, Division 1 Design. In this installment we will start by talking about the B16.5 pressure-temperature rating. Then, we will talk about external pressure design, other UG-22 loads, and how to consider these loadings as they relate to B16.5 flanges. In the next article we will address corrosion allowance and cladding as they relate to B16.5 flanges, we will talk some more about UG-22 loadings, we will learn about reducing flanges, and how to use material in a standard flange to contribute to opening reinforcement.

Parts built to the ASME B16.5 standard are acceptable for use in Section VIII, Division 1 pressure vessels per UG-44. Paragraph UG-11(c) provides the rules for incorporating these standard parts into VIII-1 construction. The Manufacturer of the pressure vessel takes responsibility that the standard parts comply with the rules of VIII-1, and to ensure that the standard parts are suitable for the design conditions of the completed vessel.

Per UG-11, the Manufacturer's responsibility is to obtain documentation which includes: the material used, the pressure-temperature rating, and the basis for the rating. The Manufacturer shall have this documentation available for examination by the Inspector when requested. UG-22 provides a list of other loadings that should be considered. If there are any additional loadings on a standard flange, it is the responsibility of the Manufacturer to account for them.

The basis for the rating of B16.5 flanges primarily takes into account internal pressure. Non-mandatory Appendix A describes the method used for establishing Pressure-Temperature ratings. Paragraph A-1.1 explains that there are other loads, and states three other considerations which affect the rating: 1) stresses resulting from bolt-up and gasket compression; 2) distortion due to loads transmitted through attached piping; 3) other limitations.

One of the advantages of using a flange built to the ASME B16.5 standard is that we don't have to perform any design calculations. Or do we? There are several reasons which would require that design calculations be performed for a B16.5 flange, such as:

- External pressure design: Mandatory Appendix 2, paragraph 2-11 provides rules for estimating the stresses in a flange which is exposed to external pressure. For most cases the flange is able to withstand a large external pressure by virtue of its geometry. It may be a given that a B16.5 flange can withstand full vacuum conditions (15psi external pressure), but for greater pressures, the calculation should be performed and made available to the inspector.
- Additional loadings on the flange: Other UG-22 loads need to be considered in the design. If VIII-1 does not provide complete rules for calculating the stress induced by these additional loadings, then per paragraph U-2(g) the manufacturer would provide details of design and construction which are as safe as those in VIII-1.

In October of 2016, ASME issued an Interpretation about external loads applied to nozzle standard flanges. Please see the Interpretation below.

Interpretation: BPV VIII-1-16-85  
Subject: External Loads Applied to Nozzle Standard Flange  
Date Issued: 25th of October, 2015  
Record Number: 16-1609

**Q:** When superimposed static or dynamic reactions, as required by UG-22, are specified for the design of a pressure vessel, is it permitted to use an ASME standard product as defined in UG-11(c) produced in accordance with an ASME Standard referenced in UG-44 without performing supporting calculations that indicate the component is acceptable for all design conditions?

**A:** No.

There was a lot of talk about this “new” rule that required calculations for standard flanges, but this Interpretation merely clarified the existing rules. UG-22 requires all loadings to be considered. The basis for the B16.5 Pressure-Temperature rating primarily consider internal pressure. Although B16.5 takes into account some other loads, they are not specified, and any additional loadings should be evaluated. This is also true of piping loads which are transmitted to a vessel through a nozzle. If the user specifies a negligible loading due to piping loads, then the designer does not need to provide any additional calculations.

Most designers may be familiar with WRC 107 & 297, and their update, WRC 537, which estimate the stresses at the nozzle to vessel juncture. If those loads are transmitted through a flanged connection, then the stresses in that connection must be accounted for. In many cases, the piping system may be designed so as not to impart a load on the vessel or flange. If this is the case, then the loading may be considered negligible, and calculations would not be required.

We will continue this conversation in the next installment of B16.5 Flanges in Section VIII, Division 1 Design. If there are any questions, or if you are unsure about the applicable loading conditions, please contact the Codes & Standards staff at [techsupport@hsb.com](mailto:techsupport@hsb.com).

## Changes to Korean Energy Use Rationalization Act and Energy Act

Effective December 3, 2017, there were significant changes under the Korean Energy Use Rationalization Act and Energy Act, that have an impact on pressure vessel exports to South Korea. The Korean Energy Agency (KEA), formally, KEMCO (the Korean Energy Management Company) is the current governing body, and with the December 3rd changes to the Act, requires that all pressure equipment (PE) falling under the KEA Regulation to have the design approved and inspected by KEA, which includes fabrication surveys outside of South Korea. In the past, KEA accepted ASME code stamped PE imported into South Korea without direct design approval and fabrication surveys. KEA will no longer accept ASME code stamped pressure equipment without prior approval.

The following is a list of pressure equipment that falls under KEA requirements, and exemptions.

- Pressure Vessels that exceed the following conditions are subjected to KEA requirements:
  - Design temperature  $\geq$  boiling point
  - 1st Class: Design Pressure x Capacity  $\geq$  0.04 MPa\*m<sup>3</sup>
  - 2nd Class: Design Pressure greater than 0.2 MPa
  - Internal Volume  $\geq$  0.04 m<sup>3</sup>
  - ID  $\geq$  200 mm + Length  $\geq$  1000 mm

- The following Boilers shall be excluded from KEA requirements:
  - Design Pressure  $\leq$  0.1 MPa + ID  $\leq$  300 mm + Length  $\leq$  600mm
  - Design Pressure  $\leq$  0.1 MPa + Heating surface  $\leq$  5 m<sup>2</sup>
  - Header ID  $\leq$  150 mm + Heating surface  $\leq$  5 m<sup>2</sup>
  - Boilers generating hot water open to the air
  - Small hot water boiler that uses gas  $\leq$  17 kg/h (232.6 kW for city gas)

Unless prior approval is provided to use the ASME code, design of Pressure Equipment falling under KEA regulations must meet the applicable Korean Standard:

- Pressure vessel - KS B 6750
- Power boiler - KS B 6753
- Heating boiler - KS B 6754

The PE manufacturer must use the websites listed below to contact KEA for the design approval and arrange for fabrication inspections through KEA.

[http://www.energy.or.kr/renew\\_eng/main/main.aspx](http://www.energy.or.kr/renew_eng/main/main.aspx)

[http://www.energy.or.kr/renew\\_eng/energy/industry/Inspection.aspx](http://www.energy.or.kr/renew_eng/energy/industry/Inspection.aspx)

The Manufacturer is advised to contact the end customer in South Korea to obtain the name of the appropriate regulatory body and any requirements that are supplemental to the ASME Code.

## Did You Know?

Hartford Steam Boiler's experienced Codes and Standards (C&S) team can address your most difficult pressure equipment challenges. We provide specialized knowledge in areas such as design, stress analysis, materials, welding, NDE, testing, and inspection. This specialized knowledge is available to clients by providing them insight into code rules, thus helping them avoid costly rework or redesign.

The Codes and Standards team combined has well over 200 years of ASME and NBIC Code experience. HSB supports C&S staff active participation on more than 40 ASME BPV and NBIC Committees. With this knowledge, we are available to provide in-depth technical support to our clients. We also offer fee-based design review services to ensure compliance with code and jurisdictional requirements around the world. If you have a technical question, the Codes and Standards team can be reached at [techsupport@hsb.com](mailto:techsupport@hsb.com).

###

December 2018

*Pressure Points* is published by

Hartford Steam Boiler  
One State Street  
Hartford, CT 06103

[GetInfo@HSB.com](mailto:GetInfo@HSB.com)

Editor:  
Stephen McKelvey

Contributors:  
Nathan Carter, Codes & Standards  
Jayaram Vattappilly, Codes & Standards  
David Allore, Global Services, International Codes  
Emmanuel Alexis, Codes & Standards