An Unsolicited White Paper on the Topic of Machined Components for use on ASME Section VIII, Div. 1 Pressure Vessels

NOTE: THIS IS NOT AN ASME APPROVED PAPER.
IT IS INSTEAD THE OPINION OF ASME MEMBER ENGINEERS.

AN EVOLUTION OF ASME CODE CASES 2155 & 2156-1 AND THE RESULTANT PENDING MODIFICATION TO PARAGRAPH UG-14

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ABSTRACT

This is a brief narrative on ASME Code Cases 2155 and 2156-1. The intent being to not only clarify the pending changes to ASME Section VIII Division 1, as impacted by the above mentioned Code Cases, but to also inform the product manufacturers, pressure vessel fabricators, and end users of the possible impact to them. These changes to Section VIII, Division 1 will also be transposed and made effective to the corresponding paragraph in Section VIII, Division 2.

To reiterate a statement found in the ASME Boiler and Pressure Vessel Code (BPVC), which reads, "*Only the Committee has the authority to provide official interpretations of this Code*." The "*Committee*" mentioned in that statement refers to any of the eleven committees that collectively make up the BPVC committee as a whole.

It must therefore be understood that these analysis and clarifications are an assessment of the above mentioned authors of this text and not that of ASME. This is an opinion paper intended to alleviate and prevent misunderstandings that are currently occurring in the marketplace surrounding Code Cases 2155 and 2156-1, which are to eventually, in whatever form they take, be codified in Section VIII Divisions 1 and 2.

While ASME makes available a great deal of training and education on the use and understanding of their codes and standards, and makes every effort to inform the public and users of the ongoing changes to these codes and standards, it becomes the users responsibility to stay abreast of such changes to the respective codes and standards they are effected by.

And by extension, this paper acts on behalf of the users of this Code by asserting some degree of that responsibility by respectfully explaining, what is perceived to be misinterpretations or misunderstandings, of the aforementioned Code Cases.

With that said, cases, such as this, in which time and nuancing of the interpretation have occurred over many years, have taken their toll. The titled Code Cases have been under consideration for decades, in one form or another, which has attributed to a mixture of misunderstanding and confusion on behalf of manufacturers, engineers, fabricators, procurement personnel, and end users.

That degree of confusion will be made apparent in the following dialog. This paper will describe the circumstance of the inquiry, the Code Cases, a tentative resolution, and what the industry can do to comply with Code Cases 2155 and 2156-1 as well as the proposed new paragraph UG-14.

The dialog presented in this paper does not circumvent, nor does it replace the proposed text put forward for consideration under consensus ballots and the eminent revision to paragraph UG-14.

Definitions

The following definitions pertain to the subject matter of this paper. While they are not ASME definitions, they do paraphrase, to a large extent the explanations given in ASME and are used to define the following terminology:

Ballot: A mechanism and protocol orchestrated, recorded, and controlled by ASME's proprietary C&S Connect software, by which a Record, or Records are voted on. One or more Records can be submitted for voting under a single Ballot.

Code Case: A method or process by which a Code Rule, as it pertains to alternative rules concerning materials, construction, or in-service inspection activities, can be modified, added, or deleted immediately upon ASME approval. Code Cases are published on a quarterly basis, and do not expire, but can be annulled.

Code Interpretation: Clarification of the meaning of a particular Code requirement or Code Case. A request for interpretation is submitted as a Technical Inquiry that can

be answered with a 'yes' or 'no' response, possibly with a brief proviso if needed.

Code Rules: Requirements contained in a Code.

Intent Interpretation: Reiteration of a Code Interpretation that prompted the need to revise a Code Rule to better define its intent.

Proposal: A written example of the edits, additions, and omissions, along with an explanation as to changes being proposed to a Code Rule.

Record: The digital document used to put forward a proposal for balloting.

Technical Inquiry: A request for clarification or interpretation regarding a specific or a combination of related Code Rules or a Code Case. The inquiry must be worded in a manner that will permit a simple 'yes' or 'no' response, possibly with a brief proviso if needed. It is the prerogative of the responding ASME committee, subgroup, or task group to rephrase the inquiry, if need be, in order to clarify the statement or to allow for a "yes" or "no' response.

From Inquiry to Code Revision

Code committees meet regularly to consider such topics as revisions to Code rules, the addition of new Code rules as dictated by proposals within the Code Committee, Code Cases, and Code Interpretations. In this particular case the following discussion is focused on Technical Inquiries submitted by users of the Code.

Typically a Technical Inquiry is submitted to the ASME staff secretary of the respective Code Committee. It should be written in a manner that will allow the, as yet to be determined, ASME respondent to answer the inquiry with a simple 'yes' or 'no' response.

The staff secretary will determine whether it is a proper Inquiry or actually a matter for a consultant. If it is a matter for a consultant a letter will be sent to the inquirer stating as much. If it is indeed a valid Inquiry the staff secretary will forward the Inquiry on to the Subgroup or Subcommittee responsible for maintaining the section of the Code pertaining to the subject matter contained in the Inquiry. The Subgroup or Subcommittee will then assign the Inquiry to a Project Manager (PM) or Task Group (TG) Chair.

If the inquiry is not worded in the manner as mentioned earlier it will be necessary for the PM or TG to re-phrase the question such that the Year, Addenda, and requirement of the standard are clearly stated, and the resultant response can be a 'yes' or 'no.' In re-phrasing the inquirer's question, the essence of the question originally asked by the inquirer must be retained.

Once approved, the Inquiry can then complete the process in one of two ways.

- If it is merely a yes or no response, with a possible brief proviso, then the response can be issued as a Code Interpretation.
- If, however, it necessitates a need to revise the effected Code Rule(s) it then becomes an Intent Interpretation, which, in-turn, triggers a Code Case.

As a Code Case, the process then becomes one in which a proposal, recommending the edit of an existing Code Rule and/or the edition of a new Code Rule, is balloted for a vote. Once approved the Code Case is issued, going into effect upon its publication. Publication of Code Cases are done on a quarterly basis.

The turnaround time from Inquiry to published Code Case can typically take anywhere from a few months to a year or so. But in some cases can take years, even decades to resolve and publish as a Code Case and ultimately as a revised Code Rule. And so it is with our titled Code Case.

AN OVERVIEW

The current ASME Section VIII, Division 1 - 2017 paragraph UG-14 reads as follows:

"(a) Rod and bar stock may be used in pressure vessel construction for pressure parts such as flange rings, stiffening rings, frames for reinforced openings, stays and stay-bolts, and similar parts. Rod and bar materials shall conform to the requirements for bars or bolting in the applicable part of Subsection C.

(b) Except for flanges of all types, hollow cylindrically shaped parts [up to and including NPS 4 (DN 100)] may be machined from rod or bar, provided that the axial length of the part is approximately parallel to the metal flow lines of the stock. Other parts, such as heads or caps [up to and including NPS 4 (DN 100)], not including flanges, may be machined from rod or bar. Elbows, return bends, tees, and header tees shall not be machined directly from rod or bar."

What has been a long standing and notable issue, beginning back in 1987, regarding the limitations on forged rod and bar stock, as specified under paragraph UG-14, for pressure containing components, has led to a degree of confusion over the past three decades.

This brief paper is an attempt to distill the decades old background information on this issue down to its base essentials. And to then clarify what has transpired over time leading to where things currently stand.

What follows is a non-lineal progression of events that will reiterate the involved Code Cases that are currently active, as well as related past Records that evolved into the current Code Cases 2155 and 2156-1.

There will most likely be interested parties that may be unfamiliar with the ASME process involved in how a Code issue, such as this, makes the transition from an inquiry to a Code revision. A process, we might add, which has not been completed with these titled Code Cases. Please refer to the previous section titled "From Inquiry to Code Revision" for a description of the process.

CODE CASES (From Current Proposal File)

Code Case 2155 (Approved December 6, 1993)

The initial inquiry under Code Case 2155 reads as follows:

"In addition to the pressure parts listed in UG-14, may rod and bar material be used for heads of pressure vessels constructed under Section VIII, Division 1?"

The initial inquiry was modified by the code committee to read instead as follows:

"*In lieu of the rules of UG-14, may rod and bar material be used for heads of pressure vessels constructed under Section VIII, Division 1?*"

Response to the inquiry under Code Case 2155-1 incorporating edits from Record 17-683 and Interpretation BC01-381, reads as follows:

"*It is the opinion of the Committee that, in lieu of the rules of UG-14, rod and bar material may be used for heads of pressure vessels constructed under Section Vlll, Division 1 provided the following additional requirements are met.*

(a) The material shall conform to one of the specifications given in Section II and shall be limited to those permitted in the applicable part of Subsection C.

(b) Flat heads with welding hubs, and heads machined so that the axis of the finished head parallel to the axis of the vessel is parallel to the long axis of the rod or bar, shall:

(1) in addition to those required by the material specification, have at least two transverse tensile test specimens taken from each lot (as defined in the material specification) of rod or bar material and having the same diameter. The second specimen shall be oriented at 90 deg around the perimeter from the first specimen. The axis of the tensile specimen shall be located, as nearly as practicable, midway between the center thickness and the surface of the rod or bar. Both specimens shall meet the mechanical property requirements of the material specification, for Table UCS-23 materials, and the reduction of area shall be not less than 30%.

(2) be ultrasonically examined by the straight beam technique in accordance with SA-388. The examinations shall be performed along the perimeter of the head and also in the axial direction. The head shall be unacceptable if:

(-a) the examination results show one or more indications accompanied by loss of back reflection larger than 60% of the reference back reflection;

(-b) The examination results show indications larger than 40% of the reference back reflection when accompanied by a 40% loss of back reflection.

(3) before welding, have the cut surfaces of the head adjacent to the weld examined by magnetic particle or liquid penetrant methods in accordance with Appendix 6 or 8, respectively, of Section VIII, Division 1.

(c) This Case number shall be shown on the Manufacturer's Data Report."

Code Case 2156-1 (Approved September 18, 2006)

The initial inquiry under Code Case 2156-1 reads as follows:

"*In addition to the pressure parts listed in UG-14, may rod and bar material be used for hollow cylindrical-shaped parts larger than NPS 4 constructed under Section VIII, Division 1*?"

The initial inquiry was modified by the code committee to read instead as follows:

"*In lieu of the rules of UG-14, may rod and bar material be used for hollow cylindrical-shaped parts constructed under Section VIII, Division 1*?"

Response to the inquiry under Code Case 2156-1 incorporating edits from Record 17-683 and Interpretation BC01-381, reads as follows:

"*It is the opinion of the Committee that, in lieu of the rules of UG-14, rod and bar material may be used for hollow cylindrical-shaped parts constructed under Section VIII, Division 1, provided the following additional requirements are met:*

(a) The materials shall conform to one of the specifications given in Section II and shall be limited to those permitted in the applicable part of Subsection C.

(b) The longitudinal axis of the part shall be parallel to the longitudinal axis of the rod or bar.

(c) In addition to those required by the material specification, at least two transverse tensile test specimens shall be taken from each lot (as defined in the material specification) of rod or bar material and having the same diameter. The second specimen shall be taken at 90 deg around the perimeter from the first specimen. The axis of the tensile specimen shall be located, as nearly as practicable, midway between the center thickness and the surface of the rod or bar. Both specimens shall meet the mechanical property requirements of the material specification and, for Table UCS-23 materials, the reduction of area shall be not less than 30%.

(d) Each rod or bar, before machining, shall be 100% ultrasonically examined perpendicular to the longitudinal axis by the straight beam technique in accordance with SA-388. The shell shall be unacceptable if:

(1) The examination results show one or more indications accompanied by loss of back reflection larger than 60% of the reference back reflection.

(2) The examination results show indications larger than 40% of the reference back reflection when accompanied by a 40% loss of back reflection.

(e) Before welding, the cut surfaces of the part adjacent to the weld shall be examined by magnetic particle or liquid penetrant methods in accordance with Appendix 6 or 8, respectively, of Section VIII, Division 1.

(f) This Case number shall be shown on the Manufacturer's
Data Report."

EXPLANATION

From Record 14-878 established May 8, 2014, Code Cases 2155 & 2156-1

"A manufacturer of standard pressure parts has a component currently made of SA-479 316L bar stock which has been machined into a hollow cylindrical shape. The geometry of the component requires the starting material to be bar stock 8 inches in diameter. The component is a manufacturer's standard pressure part acceptable under the rules of UG-11(d), but its acceptance is occasionally questioned due to its being machined from bar stock. To resolve these concerns, the manufacturer is requesting a code revision to UG-14 to allow the use of bar stock in the fabrication of his product. Due to the volume of components produced and the variety of sizes and configurations for the components, the tooling costs for changing the source material to a proprietary casting make such an approach

prohibitively expensive. The components are used in sanitary service, where the typical surface roughness and porosity in castings even after machining would be unacceptable. The currently produced component has an excellent safety record, and supporting engineering calculations and proof testing demonstrates a pressure rating capability far greater than required. The manufacturer believes it is reasonable to allow these components to be machined from bar stock by applying a 50% knockdown factor to the allowable stress when performing the applicable thickness calculations. The intent of the knockdown factor is to account for unexpected variability in the transverse properties of the bar from different heats of bar stock. Several background information files have been provided which depict the product being manufactured and multiple sets of transverse test data for several heats and diameters of bar stock, along with the MTRs for the materials which were tested. The most common defect found in larger diameters of bar stock is centerline piping segregation, which is typically machined out of bar stock when producing a hollow cylindrical component. Applying UT to the bar prior to machining is not always effective in locating the piping segregation.

6/5/2014: The proposal has been revised since the last balloting to prohibit its use for producing flanges, caps, heads, tees, elbows, return bends, and header tees. A requirement to examine the finished part by PT in accordance with Appendix 8 has been added. The limiting diameter of the bar stock has been metricated as well.

8/9/2016: In discussion at SGD, it was first identified that the current rules in UG-14 are not sufficiently clear to limit their application. NPS4 (DN 100) does not specify an ID or an OD, and can vary widely depending upon the Schedule number assigned if the OD is being considered. The new proposal revises the existing code words to limit the ID of the parts which are to be made of rod and bar under the current rules to 4 in. (100 mm). The proposal also provides a stand-alone subparagraph which segregates the items which are NOT permitted to be produced from rod and bar into a complete laundry list to eliminate possible confusion. And finally, the proposal adds new conditions under which hollow cylindrical parts having an ID greater than 4 in. (100 mm) but not greater than 8 in. (200 mm) may be machined from rod and bar. These new conditions include the same axial centerline requirements which already exist, and add a requirement to apply a value of E = 0.5 when calculating the minimum required thickness of the part, as well as requiring the same surface examinations currently imposed by Code Cases 2155 and 2156. The net effect is the elimination of the transverse property testing and UT examinations currently required by the Code Cases for cylindrical components falling within this limited range of inside diameters.

8/23/2016: Revised proposal at SGD.

1/17/2017: Proposal revised to incorporate comments resulting from a ballot among SGM and SGD members.

3/7/2017: Further revisions include markup of Code Cases to allow these rules to be followed if so desired."

FURTHER EXPLANATION

From Record 01-381 established October 11, 2002, Code Cases 2155 & 2156-1

"*NOTES TO SGM VOTERS: A parallel change to VIII-2 will be accomplished as a Common Rule, once consensus is reached on the concepts as proposed in VIII-1. The Track Changes Word file is loaded as Committee Correspondence.*

1) The existing Cases also have an "arbitrary" 30% minimum reduction of area (RA) requirement. There are many materials approved for VIII-1 use that would have <<30% reduction of area [or elongation, at least, and thus RA] for the actual material specification requirements. So, this Code Case requirement is inconsistent with the basic material specification requirements, and the proposed revisions rectify that. In previous attempts to incorporate the Cases, the Project Manager heard suggestions of a compromise of limiting this additional RA requirement to carbon and low-alloy steels only, for which it was thought that the RA requirement was intended - this limitation is included in this proposal.

2) The Code Cases have been around for over 20 years [as of 2002], *and it's now [past] time to incorporate them. The proposed revisions are starting from RN17-683, which has already been approved by BPV VIII, however, several editorial and technical modifications were made in the Cases and in their incorporation in UG-14.*

a) a "-X" was added after the Code Case number to indicate that it would be the next sequential number - assuming that RN17-683 will get published before this item passes BPTCS.

b) The existing definition of "lot" in the Code Cases is not correct. As a bare minimum, the lot should all be of the same heat. Therefore, the proposal defers to the material specification definition for "lot", but retains the [possibly additional] requirement that the bars also be of the same nominal cross section dimensions - to account for differences in working the material to the bar product form.

c) The existing mechanical property requirements are only for "tensile and yield requirements", however, this was made more general with the premise being that we want all the mechanical properties in the transverse direction to be at least as good as the longitudinal direction. For example, this would also include elongation, which is currently not required.

d) In addition to limiting the 30% RA requirement to Table UCS-23 materials, the confusing statement to account for materials for which an RA of >30% is required is deleted - this is now covered by the general requirement that all mechanical properties of the specification have to be met.

e) The use of the term "bar stock" is not really precise. Bar stock would more typically be stock that would be thrown in a closed-die forging press to make a forged part - or starting stock. Bar is the [semi-]finished product form that is being certified to. So, the word "stock" is removed.

f) To [hopefully] finally reconcile the age-old conflict regarding flanges in UG-14 and 2-2(d), further

modifications from RN17-683 were made. First, flanges are now permitted to be machined from bar. However, for medium-sized bar, the 50% penalty is imposed and for the larger-sized bar, the NDE and transverse tension tests are now required. Second, other items that are machined across the grain (caps, elbows, return bends, tees, and header tees) are treated the same as flanges and now permitted to be machined from bar - all now require surface NDE."

CLEAN VERSION OF UG-14 AS PROPOSED IN RECORD 17-1800 UNDER BALLOT 17-2653
Ballot 17-2653 Closed on 10/6/17

"*UG-14 RODS AND BARS*

(a) Rod and bar may be used in pressure vessel construction for pressure parts such as flange rings, stiffening rings, frames for reinforced openings, stays and stay-bolts, and similar parts. Rod and bar materials shall conform to the requirements for bars or bolting in the applicable part of Subsection C.

(b) Hollow cylindrically-shaped parts, heads, caps, flanges, elbows, return bends, tees, and header tees shall not be machined directly from rod or bar except as provided in (c) below.

(c) Parts machined from bar for flanges, the back of the flange and the outer surface of the hub, and heads, caps, elbows, return bends, tees and header tees shall be examined by the magnetic particle or liquid penetrant method in accordance with the requirements of Mandatory Appendix 6 or 8, respectively.

(1) Parts may be machined from rod or bar having a starting diameter not greater than 5.50 in. (140 mm), provided that the axial length of the part is approximately parallel to the metal flow lines of the stock.

(2) Parts may be machined from rod or bar having a starting diameter greater than 5.50 in. (140 mm), but not greater than 8.00 in. (205 mm), provided the axial length of the part is approximately parallel to the metal flow lines of the stock, and the minimum required thickness of the component is calculated following the rules of this Division using 50% of the specified allowable stress.

(3) As an alternative to (c)(2) above and for rod or bar having a starting diameter greater than 8.00 in. (205 mm), parts may be machined from such rod or bar, if the following requirements are met:

(-a) The longitudinal axis of the part shall be parallel to the longitudinal axis of the rod or bar.

(-b) At least two transverse tension test specimens shall be taken from each lot (as defined in the material specification) of rod or bar material, and having the same diameter.

(i) The second specimen shall be taken at 90 degrees around the perimeter from the first specimen.

(ii) The axis of the tension test specimen shall be located, as nearly as practicable, midway between the center thickness and the surface of the rod or bar.

(iii)Both specimens shall meet the mechanical property requirements of the material specification.

(iv)For Table UCS-23 materials, the reduction of area shall be not less than 30%.

(-c)Each rod or bar, before machining, shall be 100% ultrasonically examined perpendicular to the longitudinal axis by the straight beam technique in accordance with SA-388. The rod or bar shall be unacceptable if:

(i) the examination results show one or more indications accompanied by loss of back reflection larger than 60% of the reference back reflection, or

(ii) the examination results show indications larger than 40% of the reference back reflection when accompanied by a 40% loss of back reflection.

(-d) For heads and the flat portion of caps, the examinations of (-c) shall also be performed in the axial direction.

(-e) Before welding, the cut surfaces of the part adjacent to the weld shall be examined by magnetic particle or liquid penetrant methods in accordance with Appendix 6 or 8, respectively.

(d) (1) Hubbed flanges shall not be machined from plate or bar (except as permitted in UG-14(c)) material unless the material has been formed into a ring, and further provided that:

(-a) in a ring formed from plate, the original plate surfaces are parallel to the axis of the finished flange. (This is not intended to imply that the original plate surface be present in the finished flange.)

(-b) the joints in the ring are welded butt joints that conform to the requirements of this Division. Thickness to be used to determine postweld heat treatment and radiography requirements shall be the lesser of

$$t \text{ or } \frac{(A-B)}{2}$$

where these symbols are as defined in 2-3.

(-c) the back of the flange and the outer surface of the hub are examined by either the magnetic particle method as per Mandatory Appendix 6 or the liquid penetrant method as per Mandatory Appendix 8."

ASSESSMENT

The compliance issue of machining hollow cylindrically-shaped parts, heads, caps, flanges, elbows, return bends, tees, and header tees in accordance with ASME Section VIII, Division 1 has been around since 1987, when an inquiry that became BC87-296 asked the following question:

"*In accordance with UG-14 of Section 1, Division 1, may shells of pressure vessels be machined from rod or bar material?"*

A reply of "*No*," was issued in an ASME response dated October 19, 1992.

Over the next 25 years this same question, although expressed in various ways, would be repeated over the years being finally distilled down to Code Cases 2155 and 2156-1.

Such pointed inquiries raised much broader concerns in the minds of those giving thought to these issues. The review groups would, in fact, broaden the scope of the

eventual interpretation and Code revision to capture a much broader range of product and product sizes in conjunction with a stipulated need to perform additional comprehensive testing, examination, and additional tooling/machining requirements, as reflected in proposed Record 17-1800, which closed under disapproval on October 6, 2017.

UG-14(c), as proposed above, starting on Page 3 of this paper, under Record 17-1800, ballot 17-2653, establishes specific requirements and criteria in allowing the machining of rod and bar in the manufacture of hollow cylindrically-shaped parts, heads, caps, flanges, elbows, return bends, tees, and header tees. These added requirements and criteria are incrementally progressive in relation to the starting size of rod or bar. As the rod or bar size incrementally increases so too does the compliance requirements. There are three different size categories that breakdown as follows:

1. A starting diameter not greater than 5.50 in. (140 mm),
2. A starting diameter greater than 5.50 in. (140 mm), but not greater than 8.00 in. (205 mm),
3. A starting diameter greater than 8.00 in. (205 mm).

In accordance with the latest proposal under Record 17-1800, components whose size complies with item #1 above shall comply with tentative paragraph UG-14 *(c) (1)*. Components whose size complies with item #2 above shall comply with tentative paragraph UG-14 *(c) (2)*. And Components whose size complies with item #3 above shall comply with tentative paragraph UG-14 *(c) (3)*.

DISCONNECT

Throughout these past thirty years, since the initial inquiry back in 1987 regarding UG-14, there have often times been disconnects over this issue between the manufacturer of components, engineers, fabricators, and procurement. Disconnects that fall within the scope and compliance of the UG-14 related code cases and the design, procurement, and fabrication of such components as an integral part of a Section VIII, Division 1 pressure vessels.

These disconnects have been largely the result of being unaware of the code cases or misunderstandings with regard to the intent of the code cases, complicated by the moving target of an evolving code case over many years. As the scope and nuances of the Code Case response has evolved so too has its interpretation by the Code's users.

ASME provides ample training, publications, notifications, errata, addenda, and more to keep the public and users of their codes and standards apprised of their ongoing work and revisions to that work. It becomes the responsibility of the engineer, fabricator, and user to stay abreast of these changes.

But there are a few cases in which time and scope variation, as it relates to the code cases them self, have had a hand in blurring the lines of understanding of what the manufacturer, engineer, and fabricator are to comply to. This is one such case. A case involving the aforementioned Code Cases 2155 and 2156-1 and their impact on Section VIII, Division 1, paragraph UG-14.

RECONCILING

As of this writing, Record 17-1800, the record under which the above mentioned Code Cases have been developed into a proposal, has not yet been approved under Ballot 17-2653, which closed on October 6, 2017. The fate of Record 17-1800, under Ballot 17-2653, hung on a single disapproval. That disapproval is based on the issue of flanges with a hub and flanges without a hub. The wording of that disapproval indicating that it should be made clear that there is added examination required for flanges with a hub.

That aside, the essential elements of the proposal remain. The difference between the code cases, as written, and the proposed modifications resulting from such code cases, as found in Record 17-1800, is the all too necessary need to develop more specific and meaningful text in the codified version. Which can be found in the "Clean version of UG-14, starting on page 3 above.

Each player in the supply chain of a component, whether it be "*hollow cylindrically-shaped parts, heads, caps, flanges, elbows, return bends, tees, and header tees*," as described in the "Clean version" of UG-14(b) above, or "*parts machined from bar for flanges, the back of the flange and the outer surface of the hub, and heads, caps, elbows, return bends, tees and header tees*," as described in the "Clean version" of UG-14(c), is responsible for establishing or verifying code compliance. In this case compliance, at least until a revised paragraph UG-14 is issued, in accordance with Code Cases 2155 and 2156-1.

Whether it concerns a tank-bottom valve with a hollow-cylindrically shaped weld end (in accordance with tentative UG-14(b) or a magnetic-mixer mounting post plate, in accordance with tentative UG-14(c), the manufacturer should take the lead by ensuring compliance with the above mentioned paragraphs, as noted. If not stated in a request for quote (RFQ) or purchase order, it should be the manufacture's due diligence to go back to the purchaser questioning this missing requirement.

The verifying paperwork certifying that the material, work, and required testing was done in compliance with the respective code cases, should all be in place and shipped with the product.

It then becomes the responsibility of the vessel fabricator, and ultimately the owner/end user to verify, through vendor documentation, that the material, work, and required testing all comply with the respective elements of the BPVC including any respective Code Cases. Such respective Code Cases shall be indicated on the Manufacturer's Data Report.

It might also be mentioned that Code Cases 2155 and 2156-1, as they relate to paragraph UG-14, are also of tangential regard to paragraph UG-6(b). In that UG-6(b) stipulates a limitation that, "*Forged rod or bar may only be used within the limitations of UG-14*." In making such a statement, the reader is cautioned that the mere listing of a material in ASME BPVC Section II – Materials, Part A: Ferrous Material Specifications, as an example, is not to imply that there are no other dictates involving that listed material.

As further example, specifying materials such as SA-182/SA-182M – Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service, as listed under Table UHA-23, or SA-479/SA-479M Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels, as also listed under Table UHA-23, still requires those listed materials to comply with the requirements of UG-14.■

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