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AGENDA

B16 Subcommittee C - Steel Flanges

13 March 2017

CALL TO ORDER

ATTENDANCE & INTRODUCTIONS

ADOPTION OF THE AGENDA

APPROVAL OF THE MINUTES - March 2016

ANNOUNCEMENTS

There will be C&S Connect Process Training at 8:30 in this meeting.

WORK LOAD

- Cheta, Ayman - 2 records
- Davila, Carlos - 3 records
- Dennis, Brian - 1 record
- Lucas, Richard - 1 record
- Rahoi, Dennis - 3 records
- Zaidi, Mohammad - 1 record

MEMBERSHIP

The roster is on page **5-7**

The following members have terms expiring June 30, 2017:

- Ayman Cheta, Chair
- Michael Katcher

REVISION ITEMS

11-341 - B16.5 - Less Than Favorable Ratings on Materials
Project Manager: Davila, Carlos
Please see Mr. Grubb's email. Reviewed at the 2010 B16 SC N meeting, to be discussed at B16 MTC. This item has been opened as a place marker.

March 2011: Mr. Jolly advised of a Code Case in regards to the issue N-539, the committee would like Mr. McMahon to look into it.
March 2012: Related to 11-340, check on B16 SC N status.

March 2017: No proposal file. Last updated August 2016. Item Closed. The Summary of Changes and Proposal field should be updated.

11-539 - B16.5 - Revision to Para. 2.8.3 In Regards to B Dimension
Project Manager: Dennis, Brian

Mr. Dennis expressed concern in regards to the B dimension and how users reference the NPS, even though it is a dimensionless value.

March 2011: This item was opened in regards to Mr. Dennis's concern with para. 2.8.3 and the B dimension, relating to item 10-316.
March 2012: Mr. Dennis expressed concern in regards to the B dimension and how users reference the NPS, even though it is a dimensionless value. Proposal to be developed.

March 2017: Last updated August 2015. Subcommittee Approved. Comments on the latest ballot need responses. The Summary of Changes and Proposal field should be updated.

11-540 - B16.5 - Update Material Specification Listings and Alloys
Project Manager: Rahoi, Dennis
Update the materials material grade listings within the materials groupings and the pressure temperature tables to UNS numbers. Additionally the Item will cover ASTM realignments of material grades within different specifications. The Committee Correspondence file contains inquiries regarding possible realignments/issues that need to be addressed. The Background File contains a simplified word document outlining the realignment concerns shown in the Committee Correspondence file.

March 2012: Proposal to be developed in the coming weeks.

March 2017: Last updated June 2012. Subcommittee Proposal. The Summary of Changes and Proposal field should be updated.

11-541 - B16.47 - Update Material Specification Listings and Alloys
Project Manager: Rahoi, Dennis
Update the materials material grade listings within the materials groupings and the pressure temperature tables to UNS numbers. Additionally the Item will cover ASTM realignments of material grades within different specifications. The Committee Correspondence file contains inquiries regarding possible realignments/issues that need to be addressed. The Background File contains a simplified word document outlining the realignment concerns shown in the Committee Correspondence file.

March 2012: Work in progress.

March 2017: Last updated June 2012. Subcommittee Proposal. The Summary of Changes and Proposal field should be updated.

11-542 - B16.5 - Updating Note (2) in Para 4.2.2(b)
Project Manager: Rahoi, Dennis

Updating note (2) to reference BPV SC II Tables Part A, B, and Table ED-1. Should also look into other books to see if change needs to be made.

March 2012: Updating note (2) to reference BPV SC II Tables Part A, B, and Table ED-1. Should also look into other books to see if change needs to be made. Proposal to be developed, also to review B16.47 and B16.34.

March 2017: No proposal file. Last updated April 2012. Subcommittee Proposal. The Summary of Changes and Proposal field should be updated.

11-767 - B16.5 - Material Request ASTM A182-F6a
Project Manager: Davila, Carlos Page: **9-10**
The following material request was received from Mr. Zhao on March 23, 2011. The requestor supplied material information.

March 2012: No report.

March 2017: Last updated August 2015. Subcommittee Proposal. The Summary of Changes and Proposal field should be updated.

12-567 - B16.47 Revision - Addition of Bolt Length
Project Manager: Zaidi, Mohammad
This item is to cover the addition of bolt length requirements to tables as in B16.5.

March 2017: No proposal file. Last updated April 2012. Subcommittee Proposal. The Summary of Changes and Proposal field should be updated.

12-634 - B16.5 - Revision - Comparison of Table 1 to P/T Tables
Project Manager: Davila, Carlos Page: **11**
Table 1 of B16.5 was compared to each of the pressure temperature tables in regards to nominal designation listings, and material listings. From the review there were some inconsistences found, see background file. Corrections have been made such that the material table is consistent with the pressure temperature tables. I looked into this issue (for materials B564 Grade N08810) - B16.5 Table 1 list 42Ni-2Fe-21Cr - B16.5 Material Group Tables 2-3.15 and II-2-3.15 list 33Ni-42Fe-21Cr - B16.34 Table 1 list 42Ni-2Fe-21Cr Which one is correct, I looked into the issue and found the following nominal designation for Grade N08810 (33Ni-2Fe-21Cr) which is different from all of the above. Which one is correct such that I can apply it correctly to both books as needed.

March 2017: Last updated January 2013. Subcommittee Proposal.

14-2171 - B16.5 Paragraph 6.4.6
Project Manager: Cheta, Ayman Page: **12**
This record is opened in accordance with the Minutes from the last B16 Subcommittee C meeting

March 2017: Last updated April 2015. Subcommittee Proposal. Comments on the latest ballot need responses. The Summary of Changes and Proposal field should be updated.

14-2172 - B16.5 - Figures 8 and 9: Hub Angle
Project Manager: Cheta, Ayman Page: **13**
This record is opened in accordance with the Minutes of the last B16 Subcommittee C meeting

March 2017: Last updated April 2015. Subcommittee Proposal. The Summary of Changes and Proposal field should be updated.

Boring/Tapping of B16.47 Blinds
Project Manager: Schmidt, Bob

March 2017:

INTERPRETATIONS
15-936 - Reducers manufacturing
Project Manager: Lucas, Richard
B16.5 - 2013 , 5.1

Inquiry (Original):
Dear Gentleman, we had fabricated eccentric and concentric reducers (increasers, in fact) to connect pump nozzles to the pipings, always with flanges joined (by welding) to a longitudinal welded cone, please see sketch below. Is this arrangement still acceptable even with the new paragraph 5.1? Thanks and best regards Mauro F. Bragantini Engineering Manager KSB Brazil Phone: 55 11 4596 8643 Fax: 55 11 4596 8628 I have seen below remarks about ASME replies, however without attaching a drawing is impossible to describe my interpretation doubt. So, please take it in consideration.

Current Status: Subcommittee Proposal.

NEW BUSINESS

Boring/tapping of B16.47 blinds
B16.5 covers this as reducing flanges but B16.47 does not cover such flanges so we need to address equipment taps through blind flanges by a revision to notes to the dimension tables.
Project Manager: Schmidt, Robert

March 2017:

Class 150 flanges and valves historical P/T ratings
Project Manager: Jolly, Guy

March 2017:

NEXT MEETING

ADJOURNMENT

Respectfully Submitted,

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Total Number of Members: 22

Record#	Primary Committee Responsible	Record Level	Record Sub-Type *
11-539	B16 SC C Steel Flanges	SC Approved	Revision

Subject *

B16.5 - Revision to Para. 2.8.3 In Regards to B Dimension

Explanation *

Mr. Dennis expressed concern in regards to the B dimension and how users reference the NPS, even though it is a dimensionless value.

Proposal File

(91KB) View Current Proposal File

Committee Correspondence File

(81KB) View the Current Committee Correspondence File

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Project Manager *

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Subcommittee Item History

March 2011: This item was opened in regards to Mr. Dennis's concern with para. 2.8.3 and the B dimension, relating to item 10-316.March 2012: Mr. Dennis expressed concern in regards to the B dimension and how users reference the NPS, even though it is a dimensionless value. Proposal to be developed.

Ballot#:
Ballot Level: Subcommittee
Final Record Status: Approved
Date Opened: 08/11/15
Date Closed:08/26/15
Record Status Date: 08/26/2015
Description: B16 SC C recirculation ballot for record 11-539 "B16.5 - Revision to Para. 2.8.3 In Regards to B Dimension"
Voting Results:
B16 Subcommittee C:14 Approved1 Disapproved (AppletonA)0 Disapproved w/out Comment0 Abstain0 Not Voting5 Not Returned (HailegiorgisG , RamakrishnanT , TezzoD , TuckerJ , WaldenG)
Comments & Negatives Posted for Ballot#: 15-997RC2

FrikkenD (Approved)
Date Posted: 08/16/15 Not part of this proposal, but "end user" should be "purchaser". The manufacturer seldom deals with the "end user", whoever that is.

Response:
DennisB: 03/16/16 Agreed.

ZaidiM (Approved)
Date Posted: 08/17/15 Please revise to say:2.8.3 Bore. The bore diameter "B" shall ------

Record#	Primary Committee Responsible	Record Level	Record Sub-Type *
11-767	B16 SC C Steel Flanges	SC Proposal	Revision

Subject *

B16.5 - Material Request ASTM A182-F6a

Explanation *

The following material request was received from Mr. Zhao on March 23, 2011. The requestor supplied material information.

Proposal File

(159KB) View Current Proposal File

Background Material File

(42KB) View Current Background Material File

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Project Manager *

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Subcommittee Item History

March 2012: No report.

Ballot#:
Ballot Level: Subcommittee
Final Record Status: Disapproved
Date Opened: 08/31/15
Date Closed:10/14/15
Record Status Date: 10/14/2015
Description: B16 Subcommittee C first consideration ballot for record 11-767 "B16.5 - Material Request ASTM A182-F6a"
Voting Results:
B16 Subcommittee C:8 Approved6 Disapproved0 Disapproved w/out Comment0 Abstain1 Not Voting (DennisB)5 Not Returned (AppletonA , HailegiorgisG , HolstromJ , RamakrishnanT , WaldenG)
Comments & Negatives Posted for Ballot#: 15-2358

BedesemW (Disapproved) Date Posted: 09/25/15 This negative is based on several reasons:1. Procedural - this action is in response to an inquiry from 2010. It would not appear that use of a Case to speed up implementation is the appropriate action. 2. There may have been very good reasons why the addition of A182 F6a has not been approved for the standard over the past years. I question whether all the issues been fully evaluated?3. Technical - are we comfortable that control of the heat treatment for this heat-treatment strength-enhanced material will always be done correctly to assure required strength and ductility?4. I would seem more desirable to add the requested material into a P-T table (perhaps a new one) in B16.5 and B16.47	Response: **DavilaC**: 09/29/15 Agree that the response is to an inquiry we received several years ago. The use of a case was to see if it would be a good process for this type of request based on the success of a previous case. Due to the negative responses received, however, I will ask to open an item to add the material to B16.5 and B16.47.
EllenbergerJ (Disapproved) Date Posted: 09/17/15 I agree with both Mr. Frikken and Schmidt.	Response: **DavilaC**: 09/29/15 Please see responses to Mr. Frikken and Mr. Schmidt.
FrikkenD (Disapproved) Date Posted: 09/06/15 Delete (a), the reference to (a) in (b), and (d). The case should be short and sweet, describing requirements. It should not contain long explanations or explain what the requirements are not.	Response: **DavilaC**: 09/29/15 Agree with your suggestion. Will remove the notes you suggest.
PatrickW (Disapproved) Date Posted: 09/25/15 As written ASME B16.5 and B16.34 restrict the materials of construction to those listed in Table 1A and 1 respectively. I feel the response should be negative. Also, there is a lot of 'consulting' in the reponse.	Response: **DavilaC**: 09/29/15 At the last meeting this case was proposed to make the material available quickly due to an inquiry received several years ago. Please see changes proposed by Mr. Frikken.
SchmidtR (Disapproved) Date Posted: 08/31/15 Why after four years are we treating this as a code case instead of just adding the materials to B16.5 and B16.47 since all the information to determining the P-T ratings seems to be available?	Response: **DavilaC**: 09/29/15 This case was in response to an inquiry received concerning the use of this material several years ago. It was discussed several times at committee meetings and there were some concerns about adding it to B16.5 and B16.47. At the last meeting it was decided to issue a case in the interest of time. If case is not approved we will open an item to add the material to B16.5 and B16.47.
ZaidiM (Disapproved) Date Posted: 09/23/15 In my opinion, it will set a practice for everyone to send an inquiry and the committee researches and provides the relevant data for calculations. As suggested, lets add this material to the standard.	Response: **DavilaC**: 09/29/15 Agree with your comments. If we are not successful in approving this case we will open an item to add the material to B16.5 and B16.47.

Record#	Primary Committee Responsible	Record Level	Record Sub-Type *
12-634	B16 SC C Steel Flanges	SC Proposal	Revision

Subject *

B16.5 - Revision - Comparison of Table 1 to P/T Tables

Proposal

Make corrections to material listings such that Table 1 and the pressure tables are consistent.

Explanation *

Table 1 of B16.5 was compared to each of the pressure temperature tables in regards to nominal designation listings, and material listings. From the review there were some inconsistences found, see background file. Corrections have been made such that the material table is consistent with the pressure temperature tables.I looked into this issue (for materials B564 Grade N08810) - B16.5 Table 1 list 42Ni-2Fe-21Cr - B16.5 Material Group Tables 2-3.15 and II-2-3.15 list 33Ni-42Fe-21Cr- B16.34 Table 1 list 42Ni-2Fe-21CrWhich one is correct, I looked into the issue and found the following nominal designation for Grade N08810 (33Ni-2Fe-21Cr) which is different from all of the above. Which one is correct such that I can apply it correctly to both books as needed.

Summary of Changes

Make corrections to material listings such that Table 1 and the pressure tables are consistent.

Proposal File

(390KB) View Current Proposal File

Background Material File

(152KB) View Current Background Material File

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Ballot#:
Ballot Level: Subcommittee
Final Record Status: Disapproved
Date Opened: 04/11/12
Date Closed:05/14/12
Record Status Date: 05/14/2012
Description: B16 Subcommittee C ballot concerning Item 12-634 "B16.5 - Revision - Comparison of Table 1 to P/T Tables".
Voting Results:
B16 Subcommittee C ballot concerning Item 12-634 "B16.5 - Revision - Comparison of Table 1 to P/T Tables".B16 Subcommittee C9 Approved, 2 Disapproved (RahoiD, ZaidiM), 0 Disapproved Without Comment, 0 Abstain, 0 Not Voting, 10 Not Returned (AppletonA , DennisB , EllenbergerJ , HolstromJ , KatcherM , McLeanWi , PatrickW , RamakrishnanT , TuckerJ , WaldenG)
Comments & Negatives Posted for Ballot#: 12-899

RahoiD (Disapproved)
Date Posted: 04/16/12 In table 2-3.15 and in II-2-3.15 (both locations), the composition of the alloy 800 family of alloys is 32 Ni, not 42
Follow-Up Response:
Date Posted: 05/07/12
ok

Response:
Thank you. Will review and correct.

ZaidiM (Disapproved)
Date Posted: 04/21/12 There is a discrepancy between B16.34 and B16.5. Note that CD4MCu is not listed in ASTM A995. In A995 it is CD4MCuN and this is what B16.34 shows. CD4MCuN should also say Gr. 1B and CD3MWCuN should also say Gr. 6A (both as listed in B16.34).Recommendation:(1). Change A351 - CD4MCu to A995 - CD4MCuN and add "Gr. 1B"(2). Change A351 - CD3MWCuN to A995 - CD3MWCuN and add "Gr. 6A".

Response:
Thank you. Will review the information with B16.34 and make the necessary corrections.Staff Secretary (5/15/12): Thanks for bringing this issue up, The material listing issues are being looked into and will be handled under a new separate item.

Record#	Primary Committee Responsible	Record Level	Record Sub-Type *
14-2171	B16 SC C Steel Flanges	SC Proposal	Revision

Subject *

B16.5 Paragraph 6.4.6

Explanation *

This record is opened in accordance with the Minutes from the last B16 Subcommittee C meeting

Proposal File

(314KB) View Current Proposal File

Background Material File

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Project Manager Notes

Proposal discussed during March 2015 meeting, and SC C agreed to consult with Mr Walt Stephen of SC G

Ballot#:
Ballot Level: Subcommittee
Final Record Status: Disapproved
Date Opened: 02/11/15
Date Closed:03/20/15
Record Status Date: 03/20/2015
Description: B16 Subcommittee C four week first consideration ballot for records:14-2169 "B16.5 - Paragraph 5.3.4 and 5.4.2"14-2170 "B16.5 Paragraph 6.4.5.3"14-2171 "B16.5 Paragraph 6.4.6"14-2172 "B16.5 - Figures 8 and 9: Hub Angle"14-2173 "B16.5 Table 5: Groove Radius"
Voting Results:
B16 SC C:14-2169: 13 Approved, 1 Disapproved (SchmidtR), 0 Disapproved w/out Comment, 0 Abstain, 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2170: 12 Approved, 2 Disapproved (SchmidtR, ZaidiM), 0 Abstain, 0 Disapproved w/out Comment, 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2171: 10 Approved, 3 Disapproved (FrikkenD, GulgunE, NayyarM), 0 Disapproved w/out Comment, 1 Abstain (SchmidtR), 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2172: 9 Approved, 4 Disapproved (BedesemW, FrikkenD, NayyarM, SchmidtR), 0 Disapproved w/out Comment, 1 Abstain (GulgunE), 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2173: 10 Approved, 3 Disapproved (FrikkenD, NayyarM, SchmidtR), 0 Disapproved w/out Comment, 1 Abstain (GulgunE), 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)
Comments & Negatives Posted for Ballot#: 15-337

FrikkenD (Disapproved)
Date Posted: 02/23/15 It is impossible to manufacture flanges to this requirement because “w” is undefined.The requirement is too stringent, much more stringent than is needed for most applications. Using the acceptance criteria for soft-faced gaskets would be an improvement.

GulgunE (Disapproved)
Date Posted: 03/12/15 The Current table 3 method is very simple to make a decision on gasket surface defect and has been used successfully.

NayyarM (Disapproved)
Date Posted: 03/04/15 We need to discuss this at the coming meeting so that members can understand the logic.

SchmidtR (Abstain)
Date Posted: 02/12/15 I agree that perhaps for new flanges the present allowance for surface defects may be to large. However, keep in mind that these allowances apply to casting as well as forging materials and that may require a larger allowance. I will bow to manufacturers who have to live with this.

Record#	Primary Committee Responsible	Record Level	Record Sub-Type *
14-2172	B16 SC C Steel Flanges	SC Proposal	Revision

Subject *

B16.5 - Figures 8 and 9: Hub Angle

Explanation *

This record is opened in accordance with the Minutes of the last B16 Subcommittee C meeting

Proposal File

(17KB) View Current Proposal File

Background Material File

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Project Manager Notes

Proposal discussed during March 2015 meeting, and SC C agreed to request more information from the author of the ASME PVP paper.

Ballot#:
Ballot Level: Subcommittee
Final Record Status: Disapproved
Date Opened: 02/11/15
Date Closed:03/20/15
Record Status Date: 03/20/2015
Description: B16 Subcommittee C four week first consideration ballot for records:14-2169 "B16.5 - Paragraph 5.3.4 and 5.4.2"14-2170 "B16.5 Paragraph 6.4.5.3"14-2171 "B16.5 Paragraph 6.4.6"14-2172 "B16.5 - Figures 8 and 9: Hub Angle"14-2173 "B16.5 Table 5: Groove Radius"
Voting Results:
B16 SC C:14-2169: 13 Approved, 1 Disapproved (SchmidtR), 0 Disapproved w/out Comment, 0 Abstain, 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2170: 12 Approved, 2 Disapproved (SchmidtR, ZaidiM), 0 Abstain, 0 Disapproved w/out Comment, 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2171: 10 Approved, 3 Disapproved (FrikkenD, GulgunE, NayyarM), 0 Disapproved w/out Comment, 1 Abstain (SchmidtR), 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2172: 9 Approved, 4 Disapproved (BedesemW, FrikkenD, NayyarM, SchmidtR), 0 Disapproved w/out Comment, 1 Abstain (GulgunE), 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)14-2173: 10 Approved, 3 Disapproved (FrikkenD, NayyarM, SchmidtR), 0 Disapproved w/out Comment, 1 Abstain (GulgunE), 0 Not Voting, 6 Not Returned (DennisB , EllenbergerJ , HailegiorgisG , RamakrishnanT , TezzoD , WaldenG)
Comments & Negatives Posted for Ballot#: 15-337

BedesemW (Disapproved)
Date Posted: 02/13/15 I support revision of the flange hub figures, but I believe we should have a new ballot that shows the actual revised figures for better clarity also to assure that the intent of the proposed revision is achieved.

Response:
ChetaA: 04/12/15 Proposal discussed during March 2015 meeting, and SC C agreed to request more information from the author of the ASME PVP paper.

FrikkenD (Disapproved)
Date Posted: 02/23/15 The proposal needs to include a study showing that the 25 degree maximum hub angle will produce flanges with some straight length in the hub in all sizes and classes.

Response:
ChetaA: 04/12/15 Proposal discussed during March 2015 meeting, and SC C agreed to request more information from the author of the ASME PVP paper.

NayyarM (Disapproved)
Date Posted: 03/04/15 We need to hear author's basis for making these changes at the next meeting. Others may have different opinion than the author of this proposal.

Response:
ChetaA: 04/12/15 Proposal discussed during March 2015 meeting, and SC C agreed to request more information from the author of the ASME PVP paper.

SchmidtR (Disapproved)
Date Posted: 02/12/15 Not sure how you arrived at the 25 degree max, but feel this may not work on lower pressure classes where the hub clearance for the nut may be an issue. In many cases on smaller flanges scalloping of the hub results when you spot face.

Response:
ChetaA: 04/12/15 Proposal discussed during March 2015 meeting, and SC C agreed to request more information from the author of the ASME PVP paper.

ASME B16 COMMITTEE CORRESPONDENCE

3/2/15 (update 12/2/16)

TO: NOTE FOR RECORD
From: Guy A. Jolly

SUBJECT: **Class 150 ASME B16.5 Pressure Temperature Rating History**

B16SC-C members as you well know the Class 150 flanges have a "nonstandard pressure-temperature rating" that is significantly less than the rating we would expect for these flanges. The Class 300, 400, 600, 900, 1500, and 2500 B16.5 ratings are directly proportional to each other at temperature in a specific material group. In short for a specific Material Group the Class 600 rating is 2 times the Class 300 rating, the Class 1500 rating is 5 times the Class 300 rating, etc. For historic reasons the Class 150 B16.5 rating does not meet **½ the Class 300 rating** and therefore has a nonstandard rating. **Table #1** attached indicates the current Class 150, Class 300, and Class 600 pressure-temperature rating for Material Group 1.1 and what the Class 150 rating could be if it was **one-half (½) the Class 300 rating.**
In reviewing the history on this matter the following has been learned:

1. During WWII **the USA War Production Board (WPB**) brought together a group of Stress Analyst and flange experts to review the B16e-1939 (later B16.5) flange standard Pressure-Temperature ratings that existed at that time. This was a "full time job" for this team and action was at a premium. Their goal was to make Carbon Steel flanges more acceptable for the defense industry projects during WWII without relying on alloy steel flanges. With exception of the Class 150 flanges they increased all the flange ratings and published an American War Standard **(B16e5-1943)** for flanges that was used during WWII for defense contracts. Following WWII the ASME Flange Committee adopted the American War Standard pressure temperature ratings and those ratings are fairly close to what we have in B16.5 today. **See Table #2 for Class 150 P/T history**. The American War Standard history indicates that they did not change the Class 150 ratings with the reason**, "the Class 150 series is not sufficiently strong to warrant any improvement in its present rating"**. So the pressure-temperature rating was left as it was published in **B16e-1932 for Class 100 flanges.** Possibly they didn't need the Class 150 flanges and left their P/T ratings as-is. In any event the Class 150 ratings go back to the initial ratings of **B16e** which was **1st published in the 1927.** The urgency of getting things done during WW II was very important and the Class 150 flange dimensions just did not warrant a higher rating according to the experts at that time. During the WW II years we had two (2) standards for flanges-**B16e-1939** and **B16e5-1943.** Eventually the War Production Board pressure temperature ratings were post-war validated in **B16.e6-1949**. The next edition changed the B16e designation to **B16.5-1953**.
2. Recently I got an extract of **B16e-1932** and the **Class 150** flange was not even referenced but was listed as **Class 100**. In the **B16e-1937** the Class 100 was changed to Class 150 without a change to the Class 100 P/T ratings nor change in critical dimensions. NPS 3-1/2 and smaller flanges had an increase in flange thickness. It is projected that this change from Class 100 to Class 150 also had an impact on the WW II team's decision not to increase the P/T rating of the Class 150 flanges.
3. Even today under **B16.5-2013**, Appendix B, paragraph B2.3, when determining pressure rating for Class 150 flanges you use **115** instead of 150. In short B16.5-2013 treats Class 150 flanges as Class 115 flanges and not true Class 150. Even so the Ratio of Class 300/Class 115 (2.61) cannot be used as a multiple of the Class 115 rating x 2.61 to gain the Class 300 rating.
4. Furthermore for A182 F91 and other high strength B16.5 alloys Class 150 ratings are the same as A105 Class 150 flanges. This is because the Class 150 ceiling pressure is based on an

empirical equation with carbon steel as the strength source and 1000F as the temperature limit for flanges or flanged valves.

5. **Table 1A** indicates a significant difference in the "Selected Stress S1" use to determine P/T ratings for Class 150 (use Class 115) and Class 300 carbon steel flanges using Equation B-2 of Appendix B, B16.5-2013. For the same flange material you would expect the same S1 for P/T development.

ASME PROJECT MONEY

Since ASME has project money possibly B16 SC-C could propose a project to get the Class 150 flanges checked by a Stress Analyst Group to Section VIII, Division 1, Appendix 2 to the guidelines above to see if we could increase the P/T ratings to **the ½ x Class 300** requirement. There are Stress Analysis firms that use ASME Section VIII, Division 1 programs that could get this very rapidly. Since the Longitudinal, Radial, and Tangential Stress in flanges are inversely proportional to the square of the flange thickness, or hub thickness increase, a small increase in these dimensions would go a long way in increasing Class 150 P/T ratings.

FUTURE

Possibly such a Project would be too disruptive to the industry and not be considered. But a "Full Class 150 flange standard" by ASME or other organization, including MSS, could be a 1st step in testing the waters for future flange standard development.

It was recently noted that there are Class 175 flanges to "Industry Standards" on the market and it is projected that these flanges have a design basis that matches the design basis used for the current Class 150 B16.5/B16.47 flanges. In short their P/T rating would 175/150 =1.167 x Class 150 rating for an applicable material from B16.5 or B16.47. This seems consistent with the Class 75 rated flanges in B16.47 that have a rating of ½ x Class 150 rating.

CLASS 150 PT RATINGS B16.5 FLANGES

TABLE #1

MATERIAL GROUP 1.1 FROM B16.5-2013 PRESSURE TEMPERATURE RATINGS				
Temp. F	Current Class 150 Pressure Rating (psig)	Current Class 300 Pressure Rating (psig)	Current Class 600 Pressure Rating (psig)	Class 150 Proposed Pressure Rating (1/2 x Class 300 Rating) (psig)
-20 to 100	285	740	1480	370
200	260	680	1360	340
300	230	655	1310	330
400	200	635	1265	315
500	170	605	1205	300
600	140	570	1135	285
650	125	550	1100	275
700	110	530	1060	265
750	95	505	1015	255
800	80	410	825	205
850	65	320	640	160
900	50	230	460	115
950	35	135	275	70
1000	20	85	170	40

NOTE: Even the pressure ratio of P150 versus P300 @ temperature does not remain constant. The Pressure Ratio starts at 0.385 at 100F buts drops to a low 0.188 at 750F. The pressure ratio of P300 versus P600 = 0.5 is a constant. The variation in the Class 150 ratio suggests that Class P/T ratings may need investigation.

TABLE #1A

CLASS 150 VERSUS CLASS 300 SELECTED STRESS S1 (PSI)		
T °F	CLASS 150 (115) S1	CLASS 300 S1
100	21685	21585
200	19785	19835
300	17500	19105
400	15215	18520
500	12935	17645
600	10650	16625
650	9510	16040
700	8370	15460
750	7230	14730
800	6085	11960
850	4945	9335
900	3805	6710
950	2665	3940
1000	1520	2480

TABLE 2--HISTORY OF B16.5 PRESSURE-TEMPERATURE RATINGS FOR CARBON STEEL FLANGES (psig)

TEMP. F	B16e-32 RF GASKET CLASS 100	B16e-39 RJ CLASS 150 [a]	B16e-39 RJ CLASS 300	AMERICAN WAR STANDARD		B16.5-57 RJ CLASS 150	B16.5-57 RJ CLASS 300	B16.5-13 CLASS 150	B16.5-13 CLASS 300
				B16e5-43 RJ CLASS 150	B16e5-43 RJ CLASS 300				
100	230	275	600	275	720	275	720	285	740
150	220	255	575	255	710	255	710	--	--
200	210	240	550	240	700	240	700	260	680
250	200	225	525	225	690	225	690	--	--
300	190	210	500	210	680	210	680	230	655
350	180	195	475	195	675	195	675	--	--
400	170	180	450	180	665	180	665	200	635
450	160	165	425	165	660	165	660	--	--
500	150	150	400	150	625	150	625	170	605
550	140	140	380	140	590	140	590	--	--
600	130	130	360	130	555	130	555	140	570
650	120	120	340	120	515	120	515	125	550
700	110	110	320	110	470	110	470	110	530
750	100	100	300	100	425	100	425	95	505
800	85	85---92	250-275	92	365	92	365	80	410
850	70	70---82	200-245	82	300	82	300	65	320
900		70	210	70	210	70	225	50	230
950		55	165	55	165	55	155	35	135
1000		40	120	40	120	40	85	20	85

(a) The "other than RJ gaskets" had the same P/T rating as the B16e-32 RF edition on the left.

NOTES: ALL THE DATA ABOVE IS FOR CARBON STEEL FLANGE RATINGS THAT INCLUDED A105 AND A216 WCB.

1. B16E-1939 PRESSURE TEMPERATURE RATINGS WERE GASKET SPECIFIC (RING JOINT AND OTHER) AND FLUID SERVICE SPECIFIC (STEAM, WATER AND OIL). THE RED DATA INDICATES EXTENSION OF P/T RATINGS FOR "OIL SERVICE". WATER AND STEAM SERVICE TEMPERATURE ENDED AT 850F-black data. B16e-39 DATA ABOVE IS FOR RING JOINT (RJ) RATINGS. OTHER GASKET RATINGS (FLAT METAL, ASBESTOS, And OTHER) HAD SIGNIFICANTLY LOWER RATINGS (83.3% of RJ from B16e5-1943).
2. EXCEPT FOR THE CLASS 150 FLANGES THE AMERICAN WAR TIME STANDARD (B16e5-43) SIGNIFICANTLY INCREASED P/T RATINGS. IT REMOVED "SERVICE FLUID SPECIFIC" BUT RETAINED "GASKET SPECIFIC" DETAILS.
3. THE B16.5-1957 RATINGS ARE INDICATIVE OF THE POST WWII RATINGS. THE WAR TIME STANDARD WERE ADOPTED BUT CLASS 150 FLANGE RATINGS HAVE NOT CHANGED.
4. The B16.5-1973 Edition used a different approach with ceiling pressures to obtain a slightly different P/T rating for flanges. See below. The ceiling pressures were based on materials that had the highest strength at temperature included in the B16.5-1973 Standard at that time.

5. The B16.5-2013 data in above table indicates a slight difference in P/T ratings based on the methodology introduce with the B16.5 and B16.34 P/T rating determination in the 1973 editions of these documents.
6. CHRONOLOGY OF FLANGE B16.5 STANDARD
   A. **B16e-1927**, included coverage for 250, 400, 600, 900, and 1350 Lb. (actual psig @ 750F ratings for steam) flanges and fittings. The goal was to develop a flange standard for high superheated steam in the pressure range 250 to 3200 psi. The only listed materials were ASTM A95-26T (forerunner to A216). Also forged steel flanges covered. Forged material **A105-26T** referenced and the "T" symbolize a tentative standard at that time. Only threaded and van stone (lapped flange type with forged lap on pipe) flanges (now called loose flanges) covered. Bolting material specified was **ASTM 96-26 (forerunner to A193**).Three strength grades listed Class A 95K/70K, Class B 105K/80K, and Class C 125K/105K representing Tensile/Yield strength values.
   B. **B16e-1932**, Class 100, 300, 400, 600, 900, and 1500 flanges and flanged fittings had coverage. The Class 300 and Class 1500 had same drill template as the 250 and 1350Lb flanges but the Class 1500 was extended from NPS 12 to NPS 24. Class 150 coverage not included. **No welding coverage**. The Class 100 rating not in sync (1/2 x Class 300) with Class 300, 400, 600, 900 and 1500 ratings. **B16e-1927** Class 250 flanges changed to Class 300 and Class 1350 changed to Class 1500 in **B16e-1932**.
   C. **B16e-1932,** all P/T ratings for Class 300 through Class 1500 at temperatures were a multiple of the Class 300 rating. Class 100 ratings at temperature were not 1/3 the Class 300 rating except at 750F (primary temperature). At 750F Class 100, 300, 400, 600, 900, and 1500 were multiples. **No welding coverage in this issue.**
   D. **Starting in 1938 Taylor-Waters (Modern Flange Design-Taylor Forge)** started to present formulas for calculation of flange stresses. Later the methods were presented in a paper by E.O. Waters, D. B. Rossheim, D.B. Wesstrom and F.S. G. Williams (Formulas for Stresses in Bolted Flanged Connections) FSP-59-4, ASME Transactions, April 1937. These formulas were eventually adopted by ASME and became part of Boiler Code for flange design methodology.
   E. **B16e-1939, included welding neck flanges and welding bevels for 1st time as welding was fast emerging technology. RJ gasket flanged joints were introduced in this edition. RJ gasket dimensions were from API 5-G-3-1937. The addition of RJ gaskets introduced an across the board P/T rating increase for RJ flanges.** Flanges up to this edition were "loose flanges" not significantly impacted by circumferential stress due to internal pressure. Bolt-up and pressure retention of joint stresses most important. The welding neck flanges changed this since these flange stresses are impacted by internal pressure. Also the **Class 100** flanges were changed to **Class 150** with no changes in P/T ratings from **B16e-1932 for those flanges that use "other than RJ gaskets".** Class 1500 from NPS 14 to NPS 24 were added. Class 2500 flanges were added. Ring joint gaskets (from API 5-G-3-1937) added to this document complete with P/T ratings. **Class 150** loose flanges 3-1/2" and smaller had a minimal flange thickness dimension increase. The flange thickness of Class 150 fittings were not changed because the body of fitting is integrally cast with reinforcement inherent in casting process. **Gasket specific P/T ratings published with RJ** being greater than the gaskets classified as "other than RJ". **Materials** referenced as follows:

Cast Materials Carbon Steel- ASTM A95-36 (Withdrawn in 1957. Replaced by ASTM A216.)
Cast Material Carbon Moly Steel ASTM A157-36 Grade C1. (Withdraw in 1957 and replaced with A217.)
Forged Steel, Carbon A105-1936, Forged Steel, Carbon, A181-1937.
Carbon-Moly A182 -1936. Grade F1.
The dimensions of **B16e-39** were not changed.

F. **B16e5-1943, American War Standard**. Except for **Class 150** all Class P/T ratings were increased. Dimensions were not changed. This Special Committee noted in the standard that Class 300 had the best relative strength. Based on relative strength the others were arranged as follows--Class 2500, Class 600, Class 1500, Class 400 and Class 900. **The War Standard Committee indicated the Class 150 series is not sufficiently strong to warrant any improvement in its present pressure rating**. The P/T ratings of **B16e5-43** were not significantly changed from 1943 up to 1973. **Valve construction rules added to this document.**
D. B. Rossheim one of authors on **paper above** was appointed to this Special War Standards Committee to develop P/T rating for flanges. This was a "full time job" for this team and action was at a premium. Their goal was to make Carbon Steel flanges more acceptable for the defense industry projects during WWII without relying on alloy steel flanges.
DOD orders required these pressure-temperature ratings for flanges, valves and fittings and not B16e-1939. During the WWII period there were two standards for these products- B16e-1939 and B16e5-1943.

G. **Supplement to B16e-1939 published (B16e6-1949),** Post WWII but **adopted** B16e5-43 P/T ratings.

H. **B16.5-1953**-changed from **B16e** notation to B16.5. P/T rating method was made an Appendix to this document. Class A and Class B P/T rating tables used based on gasket specific details-RJ and Other than RJ gaskets.

I. **B16.5-1957**-becoming a mature document with Appendix for P/T rating development. The P/T data above for the B16.5-1957 Edition indicates that the 1943 ratings remained in place. The gasket specific rating (Class B) was removed from this edition and the RJ gasket P/T ratings became the standard. A "other than RJ gasket" requirement (Appendix) was added to standard to ensure "other than RJ gaskets" merited the RJ gasket P/T rating.
A **1960 Addenda** to B16.5 had published P/T ratings for Aluminum (ASTM B247 MIA-O (3003-0) and B247 GSIIA (6061-T6) and B148 Alloy 9A (C95200) flanges. The ratings for C95200 was later included in ASME B16.24 flange standard.

J. **B16.5-1961**-Minor clarifications made to document. No information

K. **B16.5-1968**-Last edition that had full scope for **valve construction**. This edition had the same Class 150 and Class 300 ratings as the 1957 Edition. This was the reference document for valve construction for ASME Section III "N" valves until B16.34-1977 was published.

L. ***B16.5*-1973 and B16.34-1973** committee concurrently developed the flange and valve standard including P/T ratings. BW valves were covered by B16.34-1973 and flanged valves by B16.5-1973. P/T ceiling pressures introduced during this development stage. This was the 1st Edition of B16.34. During this period B16 SC-C (flanges) and B16SC-N (valves) were formerly organized and a "new method" with "ceiling pressures" added to the P/T

development process. At this stage coordination of P/T ratings for valves and flanges became the normal operating procedure.

M. **B16.5-1977**-All **valve construction rules** removed from B16.5 scope and placed in B16.34-1977. The B16.5 -77 document became the stand alone construction document for flanges and flanged fittings. Valve construction was totally under B16.34 from this stage forward.
N. **B16.5-1981**-Nickel alloys added to B16.5.
O. **B16.5-88 Threaded and socket welding end** requirements were added to B16.34 scope as well as the **B16 Limited Class (adoption of MSS SP-84).**
P. **The B16.5 and B16.34** documents continue to use the P/T development methods introduced in the B16.5-1973 Edition. Even though there have been ASME Section II, Part D (2000 Edition) allowable stress changes there have been no changes in the allowable stresses (Selected Stress Method) used for B16.5 flanges and B16.34 valves since 1973.