ASME BPV XI Nuclear Inservice Inspection

Interpretation Session Handout

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According to IWB-3510.2(b), when a laminar flaw joins with a planar flaw, the laminar flaw shall be governed by the standards of Table IWB-3510-1. The figure 1 presents the situation that a laminar flaw joins with a planar flaw. The table IWB-3510-1 is about the allowable standard of planar flaws. Although the dimension \( a \) of the laminar flaw is zero or very small, should I compare the dimension \( a \) (depth) and the dimension \( \ell \) (length) of the laminar flaw with the Table IWB-3510-1 to justify the laminar flaw’s acceptance?

![Figure 1 A laminar flaw joins with a planar flaw](image)

Discussion

According to IWB-3510.2(b), when a laminar flaw joins with a planar flaw, the laminar flaw shall be governed by the standards of Table IWB-3510-1. The figure 1 presents the situation that a laminar flaw joins with a planar flaw. The table IWB-3510-1 is about the allowable standard of planar flaws. Although the dimension \( a \) of the laminar flaw is zero or very small. Proximity rules were recently discussed in Code Case 848-1.

The Article 4(a)(2) of that Code Case N-848-1 mentions, as a matter of fact, that if quasi-laminar flaws (including aminar flaws by definition) have to be combined with a planar flaw, the combination and the characterization of the combined single flaw shall follow IWA-3330 i.e., the characterization rules for multiple planar flaws.

In other words, when a laminar flaw joins with a planar flaw, the laminar flaw shall be reclassified into planar flaws i.e., with corresponding dimensions \( a \) and \( \ell \) (= dimensions of the projection of the aminar flaw in the plane of the planar flaw), even if the dimension \( a \) may be very small.

Therefore, for the purpose of defining the characteristics of the flaw to be used in conjunction with the acceptance standards IWB-3500, the laminar flaw shall also be considered as planar flaw.

should I compare the dimension \( a \) (depth) and the dimension \( \ell \) (length) of the laminar flaw with the Table IWB-3510-1 to justify the laminar flaw’s acceptance?
Figure 1 A laminar flaw joins with a planar flaw

Proposed interpretation re-write:

Does Code Case N848-1 provide requirements for the situation where a laminar flaw joins with a planar flaw?

Proposed Response: Yes
**Inquiry:** Within IWA-3390, is it the intent that the terms $a_1$, $a_2$ and $a_3$ represent the through-thickness extent of each defect which occurs between the planes A-A', B-B' etc., rather than the overall through-thickness extent of each defect?

**Reply:** Yes

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IWA-3390  **MULTIPLE ALIGNED SEPARATE FLAWS**

(a) Discontinuous flaws, as shown in Figure IWA-3390-1, that are coplanar in the through-wall direction of the section thickness, that are located within two parallel planes $\frac{3}{2}$ in. (13 mm) apart (i.e., normal to the pressure-retaining surface of the component), and that are aligned to reduce the net section thickness may be treated as separate and individual planar flaws if the following requirements are met.

1. The $a$ dimensions for the flaw aspect ratio, $a/\ell$ of the individual flaws do not exceed the allowable flaw standards for the respective Examination Category applicable to the component.

2. The additive flaw depth dimensions within the bounding parallel planes shown in Figure IWA-3390-1 are not in excess of the following limits.

(-a) two surface flaws (one $a_1$ on the outer and the other $a_2$ on the inner surface of the component),

$$(a_1 + a_2) \leq (a_s + a'_s)/2$$

within planes A-A' and B-B';

(-b) two subsurface flaws, $$(a_1 + a_2) \leq (a_e + a'_e)/2$$

within planes C-C' and D-D';

(-c) two surface and one subsurface flaws:

1. $$(a_1 + a_3) \leq (a_s + a_e)/2$$

within planes E-E' and F-F'

2. $$(a_1 + a_2 + a_3) \leq (a_s + a_e + a'_e)/3$$

within planes F-F' and G-G'

3. $$(a_2 + a_3) \leq (a'_s + a_e)/2$$

within planes G-G' and H-H'
Figure IWA-3390-1
Multiple Aligned Planar Flaws (\(\frac{1}{2} \text{ in.} = 13 \text{ mm}\))

Unclad surface

1/2 in.

Clad surface

Pressure-retaining surface of unclad component or clad-base metal interface of clad component

Parallel planes bounding aligned flaws

Section T-T

Surface Flaws

Subsurface Flaws

Surface and Subsurface Flaws

25
Question:
Is it the intent of Table IWB-2500-1, Category B-J, Note 1 (Note 2 in the 2004 Edition with 2006 Addenda and subsequent editions/addenda), that if B-J welds selected in accordance with Note 1(a), (b) and (c) exceed 25% of the total number of welds, that more than 25% of the welds shall be selected for examination?

Reply: No.


Passed WG-ISG 9-0-0-0 on 8/8/2017
Passed WG WCS vote 13-0-0-0 on August 9, 2017 including 17-1989

FOR INFORMATION ONLY:

Note that action 17-1989 has been issued to revise note 2 of Table IWB-2500-1, Examination Category B-J.

ORIGINAL Inquirer Proposed Question (discussed at February 2017 meeting):
Is it the intent of Section XI, Table IWB-2500-1, Examination Category B-J, Note (1) to require more than a 25 percent of B-J weld be examined including Note (1), (a)(b)(c)(d) altogether or to require the examination for all welds specified at (a), (b), (c) plus for additional piping welds as stated at (d) during interval?
Inquirer Proposed Reply: <None Provided>

Inquirer 6/20/2017 revised inquiry:

Inquirer Background: Based on the question (2) of Question(s) and Reply(ies) of the code Interpretation (Date Issued 03/06/2000, Record No IN98-009, Interpretation No XI-1-98-70), Table IWB-2500-1, B-J, Footnote (1) requires 25% of the total nonexempt weld population of be selected for examination during an Inspection Interval. However, there are no specific comments on the 25% of the total weld population of B-J, but rather only comment on the 25% of the welds in reactor coolant (RC) system as stated at(d) during Interval.

Inquirer Proposed Question: Is it the intent of Section XI, Table IWB-2500-1, Examination Category B-J, Footnote(1) to require 25% of B-J welds be examined including Note (1), (a)(b)(c)(d) altogether or to require the examination for all welds specified at (a), (b), (c) (regardless of the percentage of the total number of the welds) plus for additional piping welds as stated at (d)(to require 25% of the welds in RC system) during interval?

Inquirer Proposed Reply: <None Provided>

Inquirer: Mr. Tae-Hwa Kong,
ANSCO, 418, Munji-Dong, Yuseong-Gu, Daejeon, South Korea, wpark@ansco.kr
Standard Designation: ASME BPV Section XI

Subject Description: The requirement of Table 2500-1, Examination Category B-J


(Background)

Based on the question(2) of Question(s) and Reply(ies) of the code Interpretation (Date Issued 03/06/2000, Record No IN98-009, Interpretation No XI-1-98-70),

Table IWB-2500-1, B-J, Footnote(1) requires 25% of the total nonexempt weld population of be selected for examination during an Inspection Interval.

However, there are no specific comments on the 25% of the total weld population of B-J, but rather only comment on the 25% of the welds in reactor coolant (RC) system as stated at(d) during Interval.

Let me ask you a question for clarification.

Question: Is it the intent of Section XI, Table IWB-2500-1, Examination Category B-J, Footnote(1) to require 25% of B-J welds be examined including Note (1), (a)(b)(c)(d) altogether or to require the examination for all welds specified at (a),(b),(c) (regardless of the percentage of the total number of the welds) plus for additional piping welds as stated at (d)(to require 25% of the welds in RC system) during interval?
IWB-3523 Standards for Examination Category B-O, Pressure Retaining Welds in Control Rod Drive and Instrument Nozzle Housings

IWB-3523.1 Allowable Planar Flaws.

(a) The size of an allowable planar flaw within the boundary of the examination surfaces and volumes delineated in Figure IWB-2500-18 shall not exceed the limits specified in IWB-3523.2 and IWB-3523.3, as applicable.

(b) Where a flaw extends beyond the boundaries of the examination surfaces and volumes, or separate flaws are detected that lie both within and beyond the boundaries but are characterized as a single flaw by the rules of IWA-3300, the overall flaw size shall be compared with the standards of (a).

(b) Any two or more coplanar aligned flaws characterized as separate flaws by IWA-3300 are allowable, provided the requirements of IWA-3390 are met.

IWB-3523.2 Allowable Flaw Standards for Surface Examination.

(a) The size of allowable flaws shall not exceed $\frac{3}{16}$ in. (5 mm) for the preservice examination and $\frac{1}{4}$ in. (6 mm) for the inservice examination.

(c) Where a flaw on the outer surface of the housing exceeds the allowable standards, the housing may be examined using the volumetric method, and the acceptance standards of IWB-3523.3 shall apply.

IWB-3523.3 Allowable Flaw Standards for Volumetric Examination

(a) The depth of an allowable preservice flaw shall not exceed 10% of weld thickness; the length shall not exceed 60% of weld thickness.

(b) The depth of an allowable inservice flaw shall not exceed 12.5% of weld thickness; the length shall not exceed 75% of weld thickness.

Inquiry

Shall component thickness $t$ used in IWB-3523.3(a) and IWB-3523.3(b) be the average thickness over the length of the weld if the weld section thickness are variable (e.g. figure IWB-2500-18(c) as well as IWB-2500-18(d))?

Revised Proposed Response: The Code does not address this issue.
Figure IWB-2500-18
Control Rod Drive and Instrument Nozzle Housing Welds

Examination Volume A-B-C-D
Surface Examination Area A-B or C-D
Question 1:
Does IWC-1221(a) exempt components or piping segments NPS 4 (DN 100) and smaller from the volumetric and surface examination requirements of IWC-2500, regardless of the number or size of inlets or outlets in the components or piping segments?

Reply 1: Yes.

Question 2:
Does IWC-1221(a)(3) [2004 Edition and later Editions and Addenda] exempt components and piping segments greater than NPS 4 (DN 100) with multiple inlets or multiple outlets from the volumetric and surface examination requirements of IWC-2500, provided the cumulative cross-sectional area of all of the inlets does not exceed the area defined by the O.D. of NPS 4 (DN 100) pipe and the cumulative cross-sectional area of all of the outlets does not exceed the area defined by the O.D. of NPS 4 (DN 100) pipe?

Reply 2: Yes.

Question 3:
Does IWC-1221(a)(3) [2004 Edition and later Editions and Addenda] exempt components and piping segments greater than NPS 4 (DN 100) with multiple inlets or multiple outlets from the volumetric and surface examination requirements of IWC-2500, if the cumulative cross-sectional area of all of the inlets exceeds the area defined by the O.D. of NPS 4 (DN 100) pipe or the cumulative cross-sectional area of all of the outlets exceeds the area defined by the O.D. of NPS 4 (DN 100) pipe?

Reply 3: No.


Passed WG-ISC 7-0-1-0 on 8/8/2017 with Mr. Hoffman (NRC) abstaining
Passed WG-ISC vote 13-0-0-0 on August 9, 2017.
FOR INFORMATION ONLY:

Standard Designation: ASME BPV Section XI, IWC 1220 and 1221
Subject Description: Components Exempt from Examination

(Background)
- IWC-1220 Components Exempt from Examination: Through the 2001 Edition with 2003 Addenda
  The following components or parts of components are exempted from the volumetric and surface examination requirements of IWC -2500.
  IWC-1221(a): For systems, except high pressure safety injection systems in pressurized water reactor plants:
  (1) piping NPS 4 (DN 100) and smaller
  (2) vessel, pump, and valves and their connections in piping \[^1\] NPS 4 (DN 100) and smaller
      Note 1: In piping is defined as having a cumulative inlet and a cumulative outlet pipe cross-sectional area neither of which exceeds the nominal OD cross-sectional area of the designed size.

- IWC-1220 Components Exempt from Examination: 2004 Edition and Later Edition and Addenda, The following components or parts of components are exempted from the volumetric and surface examination requirements of IWC -2500.
  IWC-1221(a): For systems, except high pressure safety injection systems in pressurized water reactor plants:
  (1) components and piping segments NPS 4 (DN 100) and smaller
  (2) components and piping segments which have one inlet and one outlet, both of which are NPS 4 (DN 100) and smaller
  (3) components and piping segments which have multiple inlets or multiple outlets, whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 (DN 100) pipe
  - In comparison with above two paragraphs, the term “piping segments” for the latter is used instead of “piping”. It is not clear whether the terminology was intended to be different meaning in Sec XI recently published.
  - And also, it is not considered as any essential changes of the contents even though there are some different terminology and sentences between two paragraphs.

**Question 1:** Do “piping” and “piping segments” specified above have the same meaning?

**Response:** Yes

**Question 2:** As shown in Fig 1, there are piping segment NPS 4 (DN 100) and its connections in piping which have multiple inlet (NPS 2) and multiple outlet(NPS 2).
In this case, piping segment NPS 4 (DN 100) shall be exempted?

**Response:** Yes
Question 3: As shown in Fig 2, there are piping segment NPS 6 (DN 150) and its connections in piping which have one inlet (NPS 4) and one outlet(NPS 4). In this case, piping segment NPS 6 (DN 150) shall be exempted?

Response: Yes

Question 4: As shown in Fig 3, there are piping segment NPS 6 (DN 150) and its connections in piping which have multiple inlet (NPS 4) and multiple outlet(NPS 4), whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 (DN 100) pipe. In this case, piping segment NPS 6 (DN 150) shall be exempted?

Response: Yes
(Fig. 3)
Inquiry # 17-1950

Subject: NDE personnel qualification requirements for repair/replacement activities.


Paragraph/ Fig. / Table No.: IWA-4511, and IWA-4520

Original Question and Reply:

Question 1: Does the restriction in IWA-4520(b), which prohibits Owners from using the personnel qualifications, methods, techniques, and acceptance criteria of Section XI on fabrication and nonpressure-retaining welds, prevent an Owner from using the alternative of IWA-4511 (i.e., qualification and certification of NDE personnel in accordance with IWA-2300) on fabrication and nonpressure-retaining welds.

Reply 1: No

Question 2: Based on IWA-4511, may Class 1, 2, and 3 fabrication and nonpressure-retaining welds be examined by NDE personnel that have been qualified and certified in accordance with IWA-2300.

Reply 2: Yes

Revised Question and Reply:

Question 1: Does IWA-4520(b) prevent an Owner from using the alternative of IWA-4511 (i.e., qualification and certification of NDE personnel in accordance with IWA-2300) on fabrication and nonpressure-retaining welds?

Reply 1: No. IWA-4520(b) does not provide any requirements for fabrication and nonpressure-retaining welds.

WGDP 8/8/17 vote: 10-0-0 SGRRA 8/9/17 vote: 21-0-1

Question 2: Based on IWA-4511, may Class 1, 2, and 3 fabrication and nonpressure-retaining welds be examined by NDE personnel that have been qualified and certified in accordance with IWA-2300?

Reply 2: Yes

WGDP 8/8/17 vote: 10-0-0 SGRRA 8/9/17 vote: 23-0-0
### Interpretation Team

<table>
<thead>
<tr>
<th>Interpretation Team</th>
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<tr>
<td>Rick Swayne</td>
<td>AU</td>
<td></td>
</tr>
<tr>
<td>Scott Kulat</td>
<td>AU</td>
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<td>Dan Lamond</td>
<td>AU</td>
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<tr>
<td>Kimberly Verderber</td>
<td>Staff</td>
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**View Interpretations Record# 17-1950**

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### A. Record Information

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**Committees Involved in This Record**

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<th>8. Record Established:</th>
<th>9. Last Updated By:</th>
<th>10. Last Updated On:</th>
<th>11. Date of Issuance:</th>
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<td>08/03/2017</td>
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### B. Record Description

1. **Subject *

   **Standard Designation * Edition/Addenda * Paragraph/Fig./Table No. *
   
   BPV Section XI 2007 Edition/ 2008 Addenda IWA-4520(b)

   **Subject Description *

   **2. Proposed Question(s) and Reply(ies) *

   **3. Explanation *

### C. File Attachments

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**View/Manage File Attachments**
IWA-4511 specifies that NDE personnel are to be qualified and certified in accordance with the Construction Code identified in the Repair/Replacement Plan. Alternatively, IWA-4511 allows NDE personnel to be qualified and certified in accordance with IWA-2300. 

IWA-4520(a) specifies that welding or brazing areas and welded joints made for fabrication or installation of items shall be examined in accordance with the Construction Code identified in the Repair/Replacement Plan. 

IWA-4520(b) includes an alternative that may be used in lieu of the examination requirements of IWA-4520(a). The IWA-4520(b) alternative allows an Owner to authorize “use of the personnel qualifications, methods, techniques, and acceptance criteria of Section XI in lieu of those of the Construction Code” provided certain conditions are met. However, the IWA-4520(b) alternative only applies to “pressure-retaining installation (but not fabrication) welds or welds made for correction of flaws or defects”. It does not apply to fabrication welds or nonpressure-retaining welds (e.g., component support installation welds since they are nonpressure-retaining). 

Based on the above, some have questioned whether the IWA-4520(b) restriction on using Section XI personnel qualifications supersedes IWA-4511 and, thereby, prevents an Owner from using the IWA-2300 alternative on fabrication and nonpressure-retaining welds. The purpose of this inquiry is to obtain clarification on this issue.
15. Original Inquiry(ies):
Proposed inquiry 1: Does the restriction in IWA-4520(b), which prohibits Owners from using the personnel qualifications, methods, techniques, and acceptance criteria of Section XI on fabrication and nonpressure-retaining welds, prevent an Owner from using the alternative of IWA-4511 (i.e., qualification and certification of NDE personnel in accordance with IWA-2300) on fabrication and nonpressure-retaining welds.

Proposed Inquiry 2: Based on IWA-4511, may Class 1, 2, and 3 fabrication and nonpressure-retaining welds be examined by NDE personnel that have been qualified and certified in accordance with IWA-2300.

16. Proposed Reply(ies):
Proposed Reply 1: No
Proposed Reply 2: Yes

H. Additional Committee information

1. Codes Affected by Proposed Revision
None

2. Related Committee Records
None

3. Proposal Keywords
None

4. Secondary Committee[s] w/Related Actions
Pending Committees
Committees Responded
None
None

5. Type (Nuclear Only)
None

6. Committee Notes
None

7. Text of Committee Objections (if made at a meeting)
None

8. Committee Approval Date
None

9. Exception to CSP-38

I. Editor Input

1. Editor Acceptance of Proposed Revision Attachment
N/A

2. Editorial Review
(Activated only if ItemLevel = Board Approved)
Has not yet been reviewed by the editor for publication

3. Editor Notes

Editor's Fields Last Updated By:

J. Latest Ballot
None

K. Ballot History

1. Board Ballot History
None

2. Standards Committee Ballot History
None
3. SC Ballot History
None

4. Interpretation Ballot History
None

L. ANSI Level
No ANSI information is available at this time

M. Publications Level
No Publications Level Information is available at this time.

Minimum Site Requirements: IE 6.0+ • Firefox 2.0+ • Chrome 4.0+
Question 1:
Is it a requirement of Examination Category B-A, Item Numbers B1.20, B1.21, and B1.22 that the Reactor Vessel Meridional and Circumferential Head Welds be examined for essentially 100% of the accessible length?

Reply 1: Yes.

Question 2:
Is it a requirement of Examination Category B-A, Item Numbers B1.20, B1.21, and B1.22 that the Reactor Vessel Meridional and Circumferential Head Welds be examined for essentially 100% of the entire weld length if 100% of the weld length is not accessible?

Reply 2: No.

Applicability: 2017 Edition

Question 1 passed WG-ISC 7-1-1-0 on 8/8/2017 with Mr. Navratil negative for use of “essentially” vs. IWA-2200(c) and Mr. Hoffman (NRC) abstaining.

Question 2 passed WG-ISC 9-0-0-0 on 8/8/2017

SG WCS passed by a vote of

Questions 1 and 2 voted by SG WCS passed by a vote of 13-0-0-1
View Interpretations Record# 17-1953

* Required field

A. Record Information

1. Record#  2. Primary Committee Responsible  3. Record Level  4. Record Sub-Type *
17-1953  BPV XI  Stds Comm Proposal  Interpretations

Committees Involved in This Record

5. Board  6. Standards Committee
Boards Included
None

7. Sub-Tier Committee
None

8. Record Established:  9. Last Updated By:  10. Last Updated On:  11. Date of Issuance:
08/04/2017

B. Record Description

1. Subject *

Standard Designation *  Edition/Addenda *  Paragraph/Fig./Table No. *
BPV Section XI  2017  Table IWA-2500-1 Examination Category B-A

Subject Description *
Coverage Requirement

2. Proposed Question(s) and Reply(ies) *

3. Explanation *

C. File Attachments

1. Proposal File
None

2. Background File
None

3. Committee Correspondence File
None

4. Signed Issuance Letter
None
In the 1974 edition of the Code the requirements for pressure retaining welds in Vessels under Examination Category B-B requires at least 10% of the length of each longitudinal shell weld and meridional head weld and 5% of the length of each circumferential shell weld and head weld.

Starting with the 1977 Edition with the Summer 1978 Addenda and through the 2017 Edition, Table IWB-2500-1, Examination Category B-A, Item numbers B1.20, B1.21, and B1.22 require examination of the accessible length of all reactor vessel head welds. All Item numbers in Examination Category B-A with the exception of B1.50 "Repair Welds" also reference Note (2) that states, "Includes essentially 100% of the weld length."

Note (2) adds a degree of confusion. If it requires essentially 100% of the entire length of the weld then there is no need for the requirement to state the accessible length. If it requires essentially 100% of the accessible length of the weld then it is unnecessary as you are required to examine the accessible length.

15. Original Inquiry(ies):
   Question 1:
Is it the requirement of Examination Category B-A, Item Numbers B1.20, B1.21, and B1.22 that the Reactor Vessel Meridional and Circumferential Head Welds be examined for essentially 100% of the accessible length?

Question 2: Is it a requirement of Examination Category B-A, Item Numbers B1.20, B1.21, and B1.22 that the Reactor Vessel Meridional and Circumferential Head Welds be examined for essentially 100% of the entire weld length?

16. Proposed Reply(ies):
Proposed response 1: Yes

Proposed response 2: No

H. Additional Committee information

1. Codes Affected by Proposed Revision  
2. Related Committee Records  
None  

3. Proposal Keywords
None

4. Secondary Committee[s] w/Related Actions

Pending Committees  
Committees Responded

None  
None

5. Type (Nuclear Only)
None

6. Committee Notes
None

7. Text of Committee Objections (if made at a meeting)
None

8. Committee Approval Date
None

9. Exception to CSP-38

I. Editor Input

1. Editor Acceptance of Proposed Revision Attachment  
N/A

2. Editorial Review
(Activated only if ItemLevel = Board Approved)  
Has not yet been reviewed by the editor for publication

3. Editor Notes

Editor's Fields Last Updated By:

J. Latest Ballot
None

K. Ballot History

1. Board Ballot History  
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2. Standards Committee Ballot History  
None

3. SC Ballot History
None
4. Interpretation Ballot History
None

☐ L. ANSI Level
No ANSI information is available at this time

☐ M. Publications Level
No Publications Level Information is available at this time.