COMMITTEE CORRESPONDENCE

Committee: Subgroup Water-Cooled Systems

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Subject: Code Case N-613

Date: October 30, 2000

Kenneth B. Thomas, Secretary
Subgroup Water-Cooled Systems
Cooper Nuclear Station
P.O. Box 98
Brownville, NE 68321

Dear Mr. Thomas

Subject: Proposed Revision to Code Case N-613, "Ultrasonic Examination of Full Penetration Nozzles, Examination Category B-D, Item No's. B3.10 and B3.90, Reactor Vessel-To-Nozzle Welds, Fig. IWB-2500-7(a), (b), and (c), Section XI, Division 1"

The following revision to Code Case N-613 is being submitted for committee consideration and approval (SGWCS has jurisdiction over the extent of coverage). Several licensees have requested use of this Code Case. During NRC staff review of Code Case N-613 relative to the NRC's endorsement of Appendix VIII to Section XI, it was determined that Code Case N-613 conflicts with and unacceptably reduces the requirements of 10 CFR 50.55a(b)(2)(xv)(K)(2)(i). The attached revision would address the issue. The proposed revision has also been submitted to the Working Group Procedure Qualification and Volumetric Examination, Subgroup Nondestructive Examination (SGNDE) [SGNDE shares the figures with SGWCS and has jurisdiction over the proposed NDE].

Background: Several licensees have requested use of this Code Case. During NRC staff review of Code Case N-613 relative to the NRC's endorsement of Appendix VIII to Section XI, it was determined that Code Case N-613 conflicts with and

unacceptably reduces the requirements of 10 CFR 50.55a(b)(2)(xv)(K)(2)(i). This provision requires that the inner 15% of the reactor vessel wall be examined in 4 directions (modified Table VIII-S7-1). If this cannot be successfully accomplished, supplementary limited examination coverage should be performed from the bore or shell. The supplementary examinations are also delineated in the rule. The Code Case does not address supplementary examinations. In addition, an adequate technical basis does not exist to support eliminating examination for radial flaws.

The NRC's endorsement of Appendix VIII includes coverage requirements for Supplement 7, "Qualification Requirements for Nozzle-to-Vessel Weld." These coverage requirements emphasize ultrasonic examination of the weld volume at the weld root for circumferential and radial flaws and de-emphasize ultrasonic examination of the remaining weld volume.

This proposed revision to Code Case N-613 considers supplementary examinations by addressing the inspection volume (a diagrammatic portrayal of the requirements is attached). Section 50.55a(b)(2)(xv) does not describe the volume being inspected. Scanning direction is addressed in paragraphs (b)(2)(xv)(K)(2) and (b)(2)(xv)(K)(3).

The proposed revision addresses one other aspect not included in Code Case N-613, prior examination results as a condition for use of the Code Case. The Code Case did not impose prior examination results of the excluded volume area as a condition for its use on the rationale that the: (1) base metal was extensively examined during construction, preservice examination, and inservice examination, and shown to be free of flaws; (2) creation of flaws during plant service is unlikely due to the low stresses in the base metal away from the weld; and (3) stresses caused by welding are concentrated at and near the weld. This rationale is reasonable for those welds presently in licensees ISI programs. For repair/replacement welds or welds added to a program (e.g., change in selection criteria), (1) - (3) above would be an acceptable basis for use of the Code Case as long as it can be demonstrated that the excluded base metal has indeed been extensively examined during construction, preservice examination, and inservice examination with acceptable results.

Finally, an editorial correction to Figure 3, Nozzle in Shell or Head, Code Case N-613, is required so that this figure is consistent with Figures 1 and 2 of the Code Case as well as Figure IWB-2500-7(c). Examination Volume M-N-O-P is not shown on this figure.

Sincerely,

ASME International

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/RA/

Wallace E. Norris, Member
SG Water-Cooled Systems

cc: Gary Park, Chairman SGWCS
Stan Walker, EPRI

Case N-613
Ultrasonic Examination of Full Penetration Nozzles, Examination Category B-D, Item No's. B3.10 and B3.90, Reactor Vessel-To-Nozzle Welds, Fig. IWB-2500-7(a), (b), and (c), Section XI, Division 1

Inquiry: What alternatives to the examination requirements of Section XI, Appendix I, and Section V, Article 4, are permissible when performing ultrasonic examination of reactor vessel-to-nozzle welds?

Reply: It is the opinion of the Committee that ultrasonic examination of Category B-D nozzles may be conducted using techniques designed for detection and sizing of surface and subsurface flaws within the examination volume (A-B-C-D-E-F-H), oriented in a plane normal to the vessel inside surface and parallel to the weld for Figs. 1, 2, and oriented in a plane normal to the nozzle inside surface and parallel to the weld for Fig. 3.

Case N-613-1
Ultrasonic Examination of Full Penetration Nozzles, Examination Category B-D, Item No's. B3.10 and B3.90, Reactor Vessel-To-Nozzle Welds, Fig. IWB-2500-7(a), (b), and (c), Section XI, Division 1

Inquiry: What alternatives to the examination requirements of Section XI, Appendix I, Table I-2000-1, and Section V, Article 4, are permissible when performing ultrasonic examination of reactor vessel-to-nozzle welds?

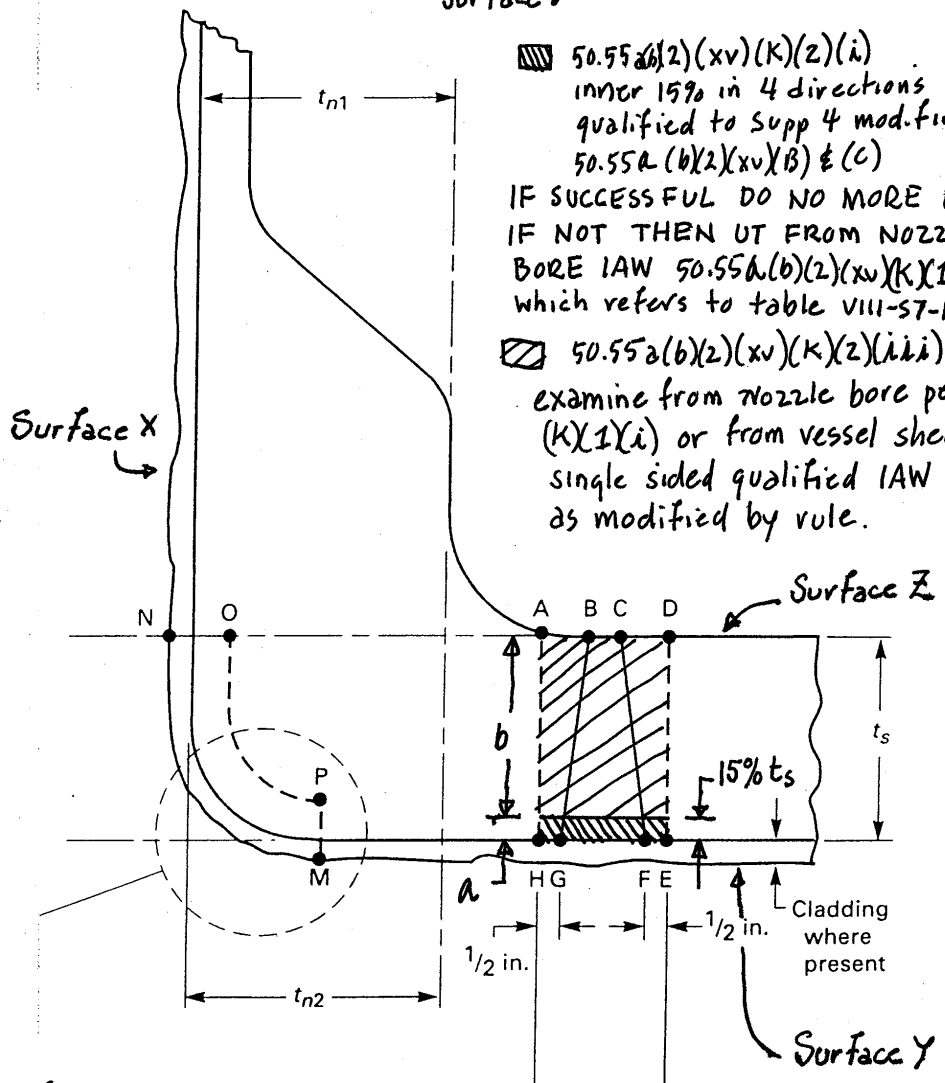
Reply: It is the opinion of the Committee that ultrasonic examination of previously ultrasonically examined Category B-D nozzles, as diagramed in IWB-2500-7(a), (b), and (c), may be examined within the reduced examination volume (A-B-C-D-E-F-H) as diagramed in Figs. 1, 2, and 3.

Example using UT from Rx inner surface:

50.55a(b)(2)(xv)(K)(2)(i) inner 15% in 4 directions qualified to Supp 4 mod. fied by 50.55a(b)(2)(xv)(B) & (C)

IF SUCCESSFUL DO NO MORE UT.
IF NOT THEN UT FROM NOZZLE BORE IAW 50.55a(b)(2)(xv)(K)(1) which refers to table VIII-S7-1 Modified

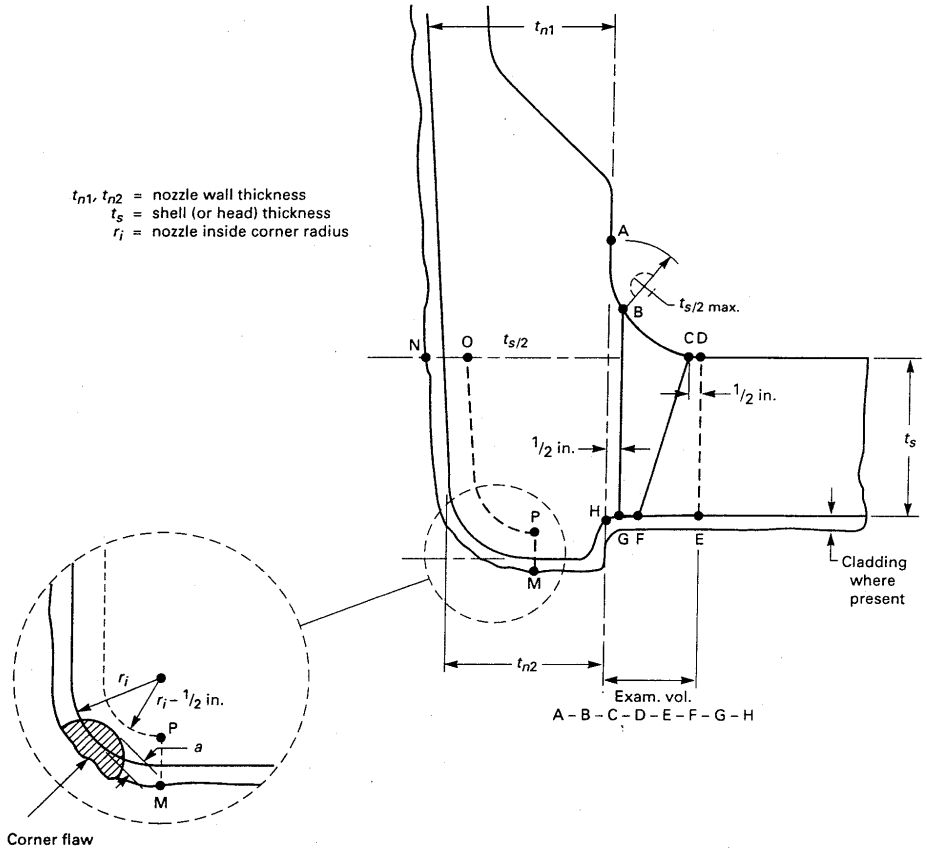
50.55a(b)(2)(xv)(K)(2)(iii) examine from nozzle bore per (K)(1)(i) or from vessel shell using single sided qualified IAW Supp 6 as modified by rule.



Per table VIII-S7-1

a: Flaws parallel & perpendicular (perpendicular excluded by (b)(2)(xv)(K)(1)(i))

b: OD Parallel
Subsurface Parallel

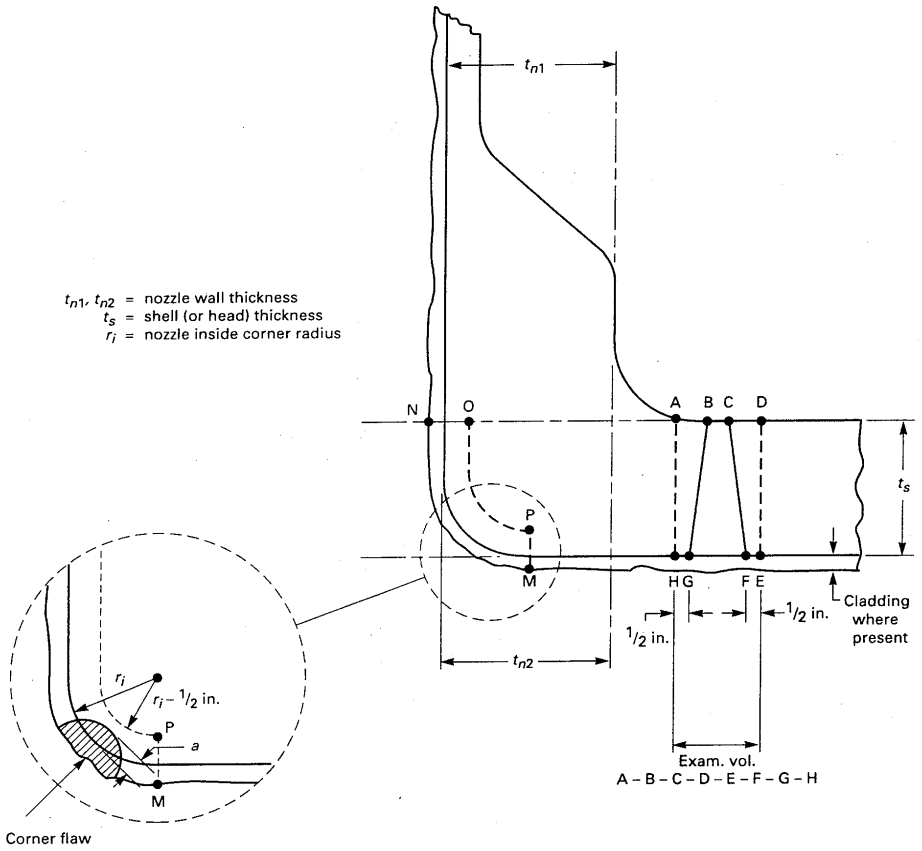


EXAMINATION REGION [Note (1)]	EXAMINATION VOLUME [Note (2)]
Shell (or head) adjoining region	C - D - E - F
Attachment weld region	B - C - F - G
Nozzle cylinder region	A - B - G - H
Nozzle inside corner region	M - N - O - P

NOTES:
(1) Examination regions are identified for the purpose of differentiating the acceptance standards in IWB-3512.
(2) Examination volumes may be determined either by direct measurements on the component or by measurements based on design drawings.

FIG. 1 NOZZLE IN SHELL OR HEAD
(Examination Zones in Barrel Type Nozzles Joined by Full Penetration Corner Welds)

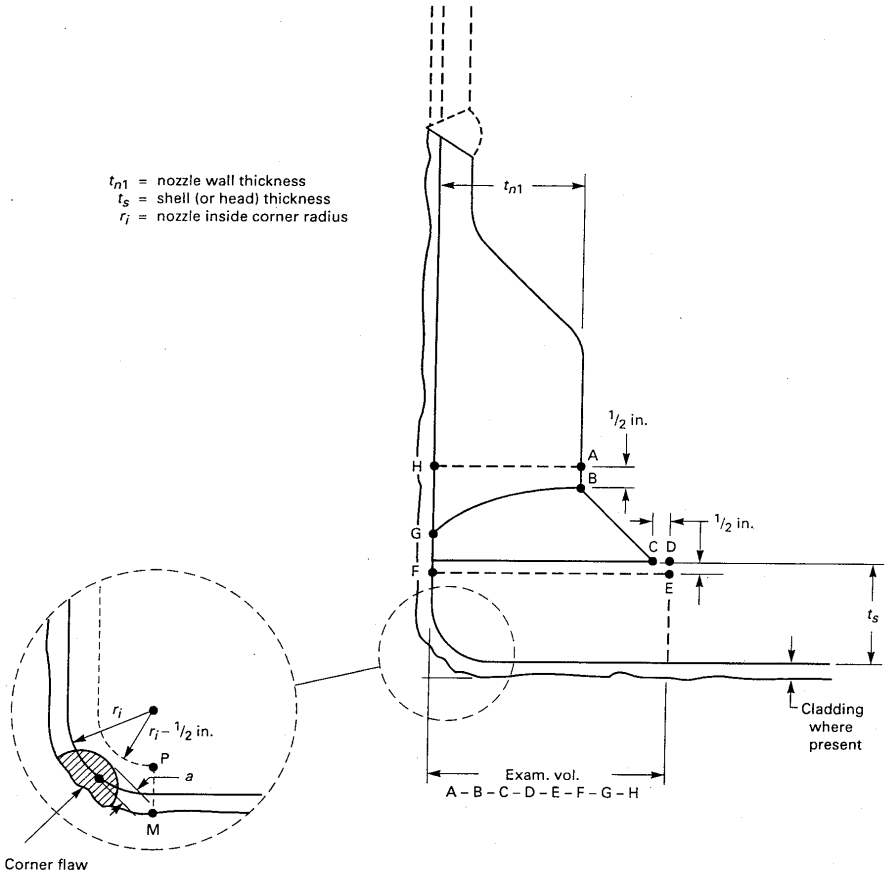
Figure Diagraming NRC Required Coverage



EXAMINATION REGION [Note (1)]	EXAMINATION VOLUME [Note (2)]
Shell (or head) adjoining region	C – D – E – F
Attachment weld region	B – C – F – G
Nozzle cylinder region	A – B – G – H
Nozzle inside corner region	M – N – O – P

NOTES:
(1) Examination regions are identified for the purpose of differentiating the acceptance standards in IWB-3512.
(2) Examination volumes may be determined either by direct measurements on the component or by measurements based on design drawings.

FIG. 2 NOZZLE IN SHELL OR HEAD
(Examination Zones in Flange Type Nozzles Joined by Full Penetration Butt Welds)



EXAMINATION REGION [Note (1)]	EXAMINATION VOLUME [Note (2)]
Shell (or head) adjoining region	C – D – E – F – G
Attachment weld region	B – C – G
Nozzle cylinder region	A – B – G – H
Nozzle inside corner region	M – N – O – P

NOTES:
(1) Examination regions are identified for the purpose of differentiating the acceptance standards in IWB-3512.
(2) Examination volumes may be determined either by direct measurements on the component or by measurements based on design drawings.

FIG. 3 NOZZLE IN SHELL OR HEAD
(Examination Zones in Set-On Type Nozzles Joined by Full Penetration Corner Welds)