

IWA-2233 Eddy Current Examination

Eddy current examination shall be conducted in accordance with Section V, Article 8, Appendix II.

IWA-2234 Acoustic Emission Examination

Acoustic emission may be used in lieu of the successive inspections of IWB-2420(b) or IWC-2420(b) to monitor growth of flaws detected by other NDE methods. The flaws shall be sized by ultrasonic examination in accordance with Mandatory Appendix I, Supplement 12, prior to initiating use of acoustic emission. Acoustic emission monitoring shall be initiated prior to resuming operation of the system. Acoustic emission shall be conducted in accordance with Section V, Article 13, with the following additional requirements.

(a) The following flaw growth calculation and acceptance criteria shall be used.

(1) Every two months during the current inspection period, calculate the flaw growth in accordance with Section V, Article 13, Appendix I. Using this growth rate, predict the flaw size at the end of the current inspection period.

(2) If the calculated flaw size at the end of the current inspection period meets the acceptance criteria of IWB-3600 or IWC-3600, as applicable, continue the two-month monitoring process described in (1) above.

(3) If the calculated flaw size at the end of the current inspection period does not meet the acceptance criteria of IWB-3600 or IWC-3600, as applicable, the following actions shall be performed.

(-a) Calculate the flaw size at the end of the next two-month time span. If this calculated flaw size meets the acceptance criteria of IWB-3600 or IWC-3600, as applicable, continue the two-month monitoring process described in (1).

(-b) If the calculated flaw size at the end of the next two-month time span does not meet the acceptance criteria of IWB-3600 or IWC-3600, as applicable, the component shall be corrected by repair/replacement activity in accordance with IWB-3130 or IWC-3120, as applicable.

(b) If no flaw growth is observed for one operating cycle, the component examination schedule may revert to the original schedule of successive inspections of IWB-2410 or IWC-2410, as applicable.

IWA-2240 ALTERNATIVE EXAMINATIONS

Alternative examination methods, a combination of methods, or newly developed techniques may be substituted for the methods specified in this Division, provided the Inspector is satisfied that the results are demonstrated to be equivalent or superior to those of the specified method.

IWA-2300 QUALIFICATIONS OF NONDESTRUCTIVE EXAMINATION PERSONNEL**IWA-2310 GENERAL**

(a) Personnel performing nondestructive examinations (NDE) shall be qualified and certified using a written practice prepared in accordance with ANSI/ASNT CP-189, Standard for Qualification and Certification of Nondestructive Testing Personnel, as amended by the requirements of this Division. Certifications based on SNT-TC-1A, ANSI N45.2.6, or earlier editions of ANSI/ASNT CP-189 are valid until recertification is required. Recertification shall be in accordance with the edition of ANSI/ASNT CP-189 referenced in IWA-1600 as amended by the requirements of this Division. Outside agencies, as defined in Mandatory Appendix VII, may be used to qualify NDE personnel; however, the Employer shall be solely responsible for the certification of Levels I, II, and III personnel. Non-destructive and visual examination personnel qualified and certified in accordance with the requirements of this Division are qualified and certified to perform examinations in accordance with the requirements of previous Editions and Addenda.

(b) As an alternative to a personnel qualification program based on CP-189, the ASNT Central Certification Program (ACCP) may be used. The supplemental requirements of this Division shall apply to qualification of personnel in accordance with the ACCP.

IWA-2311 Written Practice

(a) The Employer shall prepare a written practice in accordance with ANSI/ASNT CP-189.

(b) The written practice shall specify the duties and responsibilities of the Principal Level III.

IWA-2312 NDE Methods Listed in ANSI/ASNT CP-189

(a) Qualifications shall be based on the methods, techniques, procedures, and equipment used for the NDE required by this Division.

(b) Training, qualification, and certification of ultrasonic examination personnel shall also comply with the requirements of Mandatory Appendix VII.

(c) Training, qualification, and certification of visual examination personnel shall comply with the requirements of Mandatory Appendix VI.

(d) The visual examination training and experience hours specified in ANSI/ASNT CP-189 shall be applied to the combined certification of an individual for VT-1, VT-2, and VT-3 visual examination. Certification in only one of the VT techniques is a limited certification, and the requirements of IWA-2350 apply.

(e) Personnel certified in an NDE method, and whose training and experience in that method met the requirements of an edition of ASNT SNT-TC-1A or ANSI/ASNT

I-3200 PIPING

(a) The required piping examination volume shall be examined in two axial directions. When examination in the circumferential direction is required, the circumferential examination shall be performed in two directions.

(b) When examination of ferritic welds from both sides is not possible, procedures and personnel qualified for single-side examination in accordance with Appendix VIII, Supplement 3 shall be used to examine the required volume. When examination of austenitic welds from both sides is not possible, procedures and personnel qualified for single-side examination in accordance with Appendix VIII, Supplement 2, with all flaws on the opposite side of the weld, shall be used to examine the required volume.



(c) Dissimilar metal welds shall be examined in two axial and two circumferential directions. Procedures and personnel qualified solely from the austenitic side of the weld may be used to perform examinations from either side of the weld. When examination from both sides is not possible, procedures and personnel qualified for single-side examination in accordance with Appendix VIII, Supplement 10, with all flaws on the opposite side of the weld, shall be used to examine the required volume.

(d) When using angle beam examination, overlaid welds shall be examined in two axial and two circumferential directions. When using straight beam examination, overlaid welds shall be examined from the accessible surface.

I-3300

~~REACTOR PRESSURE VESSEL~~ **SHELL AND NOZZLE-TO-SHELL WELDS**

(a) The clad-to-base-metal interface and the adjacent volume to a depth of at least 15% of the vessel thickness, ~~7~~, shall be examined from four directions, using procedures and personnel qualified in accordance with Appendix VIII, Supplement ~~4 and 6~~. The vessel thickness, ~~7~~, shall be measured from the clad-to-base-metal interface. The examination shall include scans parallel and perpendicular to the weld.

orthogonal

the requirements of (a) above cannot be met because of access restrictions,

(b) If ~~access is not available~~, the required examination volume shall be scanned to the extent and in the directions allowed by the physical restrictions. The limitations shall be documented in the record of examination. Examination coverage of the inner 15% ~~T~~ is acceptable provided

in accordance with (a) above

shall met the following requirements:

(1) the required volume is examined in one direction parallel and one direction perpendicular to the weld.

shall be

(2) the procedure and personnel are qualified for single-side access in accordance with the requirements of Appendix VIII, Supplement 4, and Appendix VIII, Supplement 6, 2.3, and

shall be

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(3) the initial examination shall be performed using a procedure qualified to detect flaws with a tilt angle of 45 deg relative to the weld centerline. Subsequent examinations may be performed using procedures qualified for a tilt angle of at least 10 deg.

shall

(c) The remaining 85% of the vessel thickness shall be examined in four directions using procedures and personnel qualified in accordance with Appendix VIII, Supplement 6. The examination shall include scans parallel and perpendicular to the weld.

orthogonal

(d) As an alternative to (c), the outer 85% of the vessel thickness may be examined in one direction parallel and one direction perpendicular to the weld, using procedures and personnel qualified for single-side access in accordance with the requirements of Appendix VIII, Supplement 6, 2.3.

above

shall

I-3310 NOZZLE-TO-SHELL WELD EXAMINATIONS CONDUCTED FROM THE INSIDE

(a) If the provisions of I-3300(b) cannot be met because of access restrictions, and the nozzle-to-shell weld is examined from the inside, the required examination volume shall be scanned in accordance with I-3300 (a) and (b) to the extent and in the directions allowed by the physical restrictions.

(b) The inner 15% t shall be examined

(1) in one radial direction from the vessel shell using procedures and personnel qualified in accordance with the requirements of Appendix VIII, Supplement 4 for single-side access or from the nozzle bore using procedures and personnel qualified in accordance with Appendix VIII, Supplement 7; and

(2) in one circumferential direction using procedures and personnel qualified in accordance with the requirements of Appendix VIII, Supplement 4 for single-side access.

I-3400 REACTOR PRESSURE VESSEL NOZZLE-TO-SHELL WELDS

I-3410 EXAMINATIONS CONDUCTED FROM THE INSIDE

(a) The clad-to-base-metal interface and the adjacent examination volume to a depth of at least 15% T (measured from the clad-to-base-metal interface) shall be examined from four orthogonal directions, using procedures and personnel qualified in accordance with Appendix VIII, Supplements 4 and 6.

(b) When the examination volume defined in (a) cannot be effectively examined in all four directions, the examination shall be augmented by examination from the nozzle bore, using procedures and personnel qualified in accordance with Appendix VIII, Supplement 7.

(c) The remaining 85% of the required examination volume shall be examined in at least one radial direction from

(1) the nozzle bore, using procedures and personnel qualified in accordance with Appendix VIII, Supplement 7, or

(2) the vessel shell, using procedures and personnel qualified for single-side examination in accordance with Appendix VIII, Supplement 6.

I-3420 EXAMINATIONS CONDUCTED FROM THE OUTSIDE

(a) The clad-to-base-metal interface and the adjacent examination volume to a depth of at least 15% T (measured from the clad-to-base-metal interface) shall be examined from one radial and two opposing circumferential directions using procedures and personnel qualified in accordance with Appendix VIII, Supplements 4 and 6, for examination performed in the radial direction, and Appendix VIII, Supplement 5, for examination performed in the circumferential directions.

(c)

~~(b)~~ The remaining 85% of the required examination volume shall be examined in at least one radial direction using procedures and personnel qualified for a single-side examination in accordance with Appendix VIII, Supplement 6.

I-3320 NOZZLE-TO-SHELL WELD EXAMINATIONS CONDUCTED FROM THE OUTSIDE

(a) If the provisions of I-3300(b) cannot be met because of access restrictions, and the nozzle-to-vessel weld is examined from the outside, the required examination volume shall be scanned in accordance with I-3300 (a) and (b) to the extent and in the directions allowed by the physical restrictions.

(b) The inner 15% t shall be examined

(1) in two opposing radial directions using procedures and personnel qualified in accordance with Appendix VIII, Supplement 4; or one radial direction using procedures and personnel qualified in accordance with Appendix VIII, Supplement 4, for single-side access; and

(2) two opposing circumferential directions using procedures and personnel qualified in accordance with Appendix VIII, Supplement 5.

I-3400 NOZZLE INSIDE-CORNER REGION

The nozzle inside-corner region shall be examined in two opposing circumferential directions using procedures and personnel qualified in accordance with Appendix VIII, Supplement 5 for examinations conducted from the outside or Appendix VIII, Supplement 7 for examinations conducted from the inside.

I-2600

~~SUPPLEMENT 12 — FLAW SIZING~~ APPENDIX VIII EXAMINATION

(a) Flaws shall be sized in accordance with a qualified procedure that meets the requirements of Appendix VIII.

(b) For components to which Appendix VIII is not applicable, ~~sizing techniques~~ qualified in accordance with Appendix VIII may be applied, provided such components, materials, sizes, and shapes are within the scope of the qualified ~~flaw sizing~~ procedure.

examination procedures, personnel, and equipment

examination

(b) Examination coverage shall be in accordance with I-3000.

(c) No other I-1000 or I-2000 requirements apply.

TABLE I-2000-1
REQUIRED SUPPLEMENTS

Supplement	Reactor Vessel Flange and Attachment Welds I-2110(b)	Reactor Vessel CRD Housing Welds I-2110(c)	Other Vessels > 2 in. (50 mm) Thick I-2120	Other Vessels ≤ 2 in. (50 mm) Thick I-2210	Other I-2400
1 — Calibration Block Material and Thickness	X		X		X
2 — Calibration Blocks for Clad Welds/Components	X		X	X	X
3 — Calibration Blocks for Curved Surfaces			X	X	X
4 — Alternative Calibration Block Design	X		X	X	X
5 — Electronic Simulators	X		X	X	X
6 — Pulse Repetition Rate	X		X	X	X
7 — Instrument Calibration	X		X		X
8 — Scan Overlap and Search Unit Oscillation			X		X
9 — Scan Angles			X		
10 — Recording Criteria	X	X	X	X	X
11 — Geometric Reflectors	X		X	X	X
12 — Flaw Sizing	X	X	X	X	X