

December 5, 2003

Mr. Randy T. Linden, Chairman
Performance Demonstration Initiative, Inc.
769 Salem Boulevard (NUCSA1)
P.O. Box 467
Berwick, PA 18603-0467

SUBJECT: NOZZLE-TO-REACTOR PRESSURE VESSEL WELD COVERAGE ISSUES

Dear Mr. Linden:

In a letter to me dated October 4, 2002, your predecessor, Mr. Michael Bratton, expressed Performance Demonstration Initiative's (PDI) understanding of the examination coverage requirements for nozzle-to-vessel welds as stated in 10 CFR 50.55a(b)(2)(xv)(K). PDI held the view that the coverage requirements were wholly contained in 10 CFR 50.55a(b)(2)(xv)(K), and included a "White Paper" containing the technical justification supporting its understanding of the regulations.

The NRC staff has reviewed the information provided by PDI and concludes that the implementation of 10 CFR 50.55a(b)(2)(xv)(K) is not exclusive of 10 CFR 50.55a(b)(2)(xv)(G). The staff's interpretation is based on nozzle-to-vessel weld examination requirements which originated from the staff's position on reactor pressure vessel (RPV) weld examinations, and is summarized in the attachment to this letter. If you have any questions regarding this matter, please contact Donald Naujock of my staff at 301-415-2767, or email, DGN@NRC.GOV.

Sincerely,

/RA/

Terence L. Chan, Chief
Piping Integrity and NDE Section
Materials and Chemical Engineering Branch
Division of Engineering

Attachment: As stated

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NOZZLE TO REACTOR PRESSURE VESSEL WELD
EXAMINATION REQUIREMENTS - 10 CFR 50.55a(b)(2)(xv)(K)

INTRODUCTION

By letter dated October 4, 2002, Performance Demonstration Initiative's (PDI) explained its understanding of the examination coverage for nozzle-to-vessel welds as being wholly contained in 10 CFR 50.55a(b)(2)(xv)(K) and that the outer 85% of the welds need not be examined for flaws perpendicular to the weld centerline. PDI held the view that the coverage requirements were wholly contained in 10 CFR 50.55a(b)(2)(xv)(K), and included a "White Paper" containing the technical justification supporting its understanding of the regulations.

The NRC staff has expressed a differing interpretation on the exclusivity of 10 CFR 50.55a(b)(2)(xv)(K) and the elimination of examinations for flaws perpendicular to the outer 85% of the weld. As discussed below, the staff's conclusions are based on nozzle-to-vessel weld examination requirements which originated from the staff's position on reactor pressure vessel (RPV) weld examinations. The staff accepted the concept that flaws, if they develop during plant operations, would most likely originate from the RPV inside surface. To provide assurance that any detrimental flaws would be found, the staff required that ultrasonic examination coverage be performed according to 10 CFR 50.55a(b)(2)(xv)(G) to the extent possible but not less than the coverage in 10 CFR 50.55a(b)(2)(xv)(K). The coverage assures confidence in the effectiveness of the examination.

DISCUSSION

10 CFR 50.55a(b)(2)(xv)(K) states that "When performing nozzle-to-vessel weld examinations, the following provisions must be used when the requirements contained in [the American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI] Supplement 7 to Appendix VIII are applied for nozzle-to-vessel welds *in conjunction with* Supplement 4 to Appendix VIII, Supplement 6 to Appendix VIII, or combined Supplement 4 to Appendix VIII and Supplement 6 to Appendix VIII qualification (emphasis added)." The phrase, "... in conjunction with ..." indicates that the examination requirements in Supplement 7 to Appendix VIII must be used together with the requirements in Supplement 4, Supplement 6, or combined Supplements 4 and 6. The NRC has adopted coverage requirements for the use of Supplements 4 and 6 to Appendix VIII in 10 CFR 50.55a(b)(2)(xv)(G). Therefore, the coverage requirements in 10 CFR 50.55a(b)(2)(xv)(K) are linked to coverage requirements of 10 CFR 50.55a(b)(2)(xv)(G). Thus, PDI's interpretation of the relevant NRC requirements is incorrect.

Examinations from the Inside Surface of the Vessel

As stated in 10 CFR 50.55a(b)(2)(xv)(K)(2)(i), examinations performed from the inside surface of the nozzle-to-vessel weld must be performed in four directions on the inner 15%. This requirement is in keeping with the importance of finding flaws on the vessel inside surface. Where full coverage cannot be achieved, Code relief would normally be sought. However, the staff recognized that many nozzle-to-vessel weld configurations have restrictive access for which examination in all four directions may be impractical. To minimize the need to submit a relief request under a determination of impracticality, the staff provided in paragraphs (K)(2)(ii) and (K)(2)(iii) minimum acceptable examination coverage criteria. The intent of paragraphs

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(K)(2)(ii) and (K)(2)(iii) is to reduce the burden caused by circumstances beyond the control of the licensees and not diminish the achievable examination.

The provisions of paragraphs (K)(2)(ii) and (K)(2)(iii) do not exempt licensees from examination in four directions. The basis for examination in four directions is contained in the opening paragraph of 10 CFR 50.55a(b)(2)(xv)(K) which outlines the provisions for examining nozzle-to-vessel welds in conjunction with Supplements 4 and 6. The provisions for implementing Supplements 4 and 6 examinations are contained in 10 CFR 50.55a(b)(2)(xv)(G). These provisions require examination of the inner 15% in four orthogonal directions. For nozzle-to-vessel welds, licensees are expected to perform examination in four directions or to the extent possible but not less than the requirements in paragraphs (K)(2)(ii) and (iii). The provisions in paragraph (K)(2) are generic solutions to nozzle design conditions that restrict the directions of an examination.

10 CFR 50.55a(b)(2)(xv)(G)(3) stipulates examination for the outer 85% volume be performed in two perpendicular directions. The staff recognizes that nozzle-to-vessel weld examinations from inside the RPV in two directions may be difficult because of restrictive nozzle configurations and wandering beam direction. To alleviate the need for licensees to request relief based on impracticality every time restrictions prevent an examination in two directions, the staff provided a generic solution in paragraph (K)(2)(iii) that establishes minimum acceptance criteria for examinations performed on the outer 85% of the weld from the nozzle bore. The minimum acceptance criteria permit an examination from one radial direction which is optimum for detecting and sizing circumferential flaws and not optimum for finding axial flaws.

In some cases, licensees may choose to perform the examination from the RPV outside surface rather than from the nozzle bore. For such examinations, 10 CFR 50.55a(b)(2)(xv)(K)(2)(iii) requires licensees to use 10 CFR 50.55a(b)(2)(xv)(G) which stipulates examination in two perpendicular directions.

Examinations from the Outside Surface of the Vessel

For ultrasonic examinations performed from the outside surface of the nozzle-to-vessel weld, the nozzle itself may obstruct the examination in four directions on the inner 15% through-wall. The staff recognized the obvious nozzle restriction in 10 CFR 50.55a(b)(2)(xv)(K)(3)(i) which establishes a minimum three direction inspection requirement: one radial and two circumferential directions. The requirement is based on an assumption that nozzles would interfere with examinations performed from the nozzle side of the weld, thus creating an impractical condition. The application of paragraph (K)(3) is to establish minimum acceptable criteria for examinations that a licensee determined to be impractical from four directions.

10 CFR 50.55a(b)(2)(xv)(K)(3)(ii) provides the same flexibility for examination of the outer 85% from the outside surface as from the inside surface. Examinations are to be performed according to Supplement 6 as modified by 10 CFR 50.55a(b)(2)(xv)(G)(3). If restrictions inhibit an examination in two perpendicular directions, the impacted area must be examined in at least one radial direction.

CONCLUSION

In summary, the staff concludes that 10 CFR 50.55a(b)(2)(xv)(K) requires the examination of nozzle-to-vessel welds to be performed in accordance with 10 CFR 50.55a(b)(2)(xv)(G) where achievable. The staff recognizes that restrictions often hinder nozzle-to-vessel weld examinations in four directions. When such restrictions prevent complete coverage, the maximum achievable coverage is acceptable provided the minimum coverage requirements in 10 CFR 50.55a(b)(2)(xv)(K) are satisfied.