July 6, 2015

MEMORANDUM TO: Mark S. Miller, Deputy Director
Division of Reactor Safety
Region II

FROM: Mirela Gavrilas, Deputy Director ***/RA/***
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

SUBJECT: FINAL RESPONSE TO TASK INTERFACE AGREEMENT 2014-02, INTERPRETATION OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE, SECTION XI, TABLE IWB-2500-1, NOTE 1

By memorandum dated October 23, 2014 (Agencywide Documents Access and Management System Accession No. ML14296A336), the U.S. Nuclear Regulatory Commission Region II Office requested technical assistance from the Office of Nuclear Reactor Regulation (NRR) to determine regulatory requirements pertaining to Surry, Unit 1, regarding the inspection of reactor pressure vessel component supports, as required by the American Society Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC), Section XI. This concern was identified during an inspection and was documented as Unresolved Item 05000280/2013005-01 in the Surry Power Station-NRC Integrated Inspection Report 05000280/2013005, 05000281/2013005 (ADAMS Accession No. ML14041A449). Specifically, Region II requested NRR address the following issues related to the interpretation and implementation of exemptions in Table IWB-2500-1 at Surry, Unit 1:

1. Contrary to the requirements of IWB-2500-1, Note 1, the Reference 1 calculation provided by Dominion includes horizontal loads under normal load conditions and includes loads imposed by the reactor coolant system piping, not just the loads imposed by the reactor vessel component. Please provide the NRR position on the acceptability of using Table IWB-2500-1, Note 1, as the exclusion criteria basis for not performing the prescribed surface examination of the weld build-up to reactor nozzle outer surface when the weld build-up configuration is as described in Section 3.0 of the enclosure, for the Surry sliding anchor support configuration.

2. Please provide clarification on the following note taken from the February ASME Code Committee meeting: "The Code action cannot include shear stress in inquiry since that is not in Code and inquiry cannot write Code," Reference 2.

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With regard to the first issue, the NRR staff's review of the interpretation of the ASME BPVC, Section XI, Table IWB-2500-1, Note 1, determined the exclusion criteria for performing the prescribed surface examination are met; therefore, a surface examination is not required. With regard to the second issue, the note clarification inquiry is separated into two categories: requirement interpretations and intent interpretations. If the inquiry is considered an intent inquiry, a corresponding BPVC change is required to be processed along with the inquiry response. If the inquiry is considered a requirement interpretation, the inquiry may be answered without processing a BPVC change to clarify the meaning. The basis for this position can be found in Section 3.0 of the enclosure.

Enclosure:
Task Interface Agreement

With regard to the first issue, the NRR staff's review of the interpretation of the ASME BPVC, Section XI, Table IWB-2500-1, Note 1, determined the exclusion criteria for performing the prescribed surface examination are met; therefore, a surface examination is not required. With regard to the second issue, the note clarification inquiry is separated into two categories: requirement interpretations and intent interpretations. If the inquiry is considered an intent inquiry, a corresponding BPVC change is required to be processed along with the inquiry response. If the inquiry is considered a requirement interpretation, the inquiry may be answered without processing a BPVC change to clarify the meaning. The basis for this position can be found in Section 3.0 of the enclosure.

Enclosure:
Task Interface Agreement

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TASK INTERFACE AGREEMENT 2014-02

ASME CODE, SECTION XI, TABLE IWB-2500-1

NOTE 1 INTERPRETATION

1.0 INTRODUCTION

This Task Interface Agreement (TIA) 2014-02, formally documents the U.S. Nuclear Regulatory Commission (NRC) staff position regarding the inspection of the reactor pressure vessel (RPV) component supports, as required by the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPVC), Section XI at Surry, Unit 1.

2.0 BACKGROUND

During the 2013 inservice inspection (ISI) at Surry, Unit 1, Region II identified an Unresolved Item (URI), URI 05000280/2013005-01, related to the inspection of the RPV component supports as required by ASME BPVC, Section XI. The Code of record for the current ISI program is the 1998 Edition of the ASME BPVC Section XI with the 2000 addenda. This Code edition includes inspection requirements for both nuclear class 1 piping and vessel supports (Subsection IWF), and their attachment welds (Subsection IWB). Subsection IWB, Table IWB-2500-1, item number B10.10, describes the examination requirements for welded attachments for vessels, piping, pumps, and valves. Note 1 of Table IWB-2500-1, states that attachment welds (weld build-up) on nozzles, that are in compression under normal load conditions and provide only component support, are excluded from the surface examination requirements. The note also provides additional conditions to identify what type welded attachment configurations require inspection. Table IWB-2500-1 also references Figures IWB-2500-13, -14 and -15, to further describe the examination requirements.

Region II noted that the scope of the Surry, Unit 1, ISI program for the inspection of the nuclear class 1 RPV supports, did include the requirements for the IWF portion of the ASME BPVC, Section XI required inspections. However, the licensee excluded the surface examination requirements for the RPV support attachment welds, required by Table IWB-2500-1 item number B10.10, based on the exemptions provided by Note 1 of the table.

Licensee's Position:

The licensee's position is that the surface examinations are not required, based on the exclusion criteria provided in Note 1 of Table IWB-2500-1 for attachment welds under compressive loads during normal conditions, and the configurations described in Figures IWB-2500-13, -14 and -15. The figures show the IWB boundaries for locations that utilize the attachment weld to join another support member to the pressure boundary surface. During the initial discovery period, the licensee stated that it would submit a BPVC interpretation inquiry to the ASME BPVC committee to support its position on its interpretation of Table IWB-2500-1. After startup, the licensee informed Region II inspectors that it would not make a BPVC inquiry, as originally intended, because a poll of other licensees showed that other utilities took the same approach for the reactor supports.

3.0 REGIONAL EVALUATION

Region II inspectors reviewed design basis calculations and drawings for the Surry, Unit 1, RPV supports, and identified that "normal case" loading conditions on the supports included both compressive and shear loads. The calculations provided in Reference 1, show normal case support loads to be in both vertical compression and horizontal directions. The design drawings showed no attached member to the pressure boundary, as described in Figures IWB-2500-13, -14 and -15. However, the drawings did show a weld build-up on each RPV nozzle, which serves as the attachment point used for the transfer of loads from the nozzle to the building structure.

The ASME BPVC, Table IWB-2500-1, Note 1, states, in part, that a weld build-up on nozzles that is in compression under normal conditions, and provides "only component support," is excluded from examination. In Surry's case, the support supplies not only reactor component support, but also serves as a sliding anchor that transfers loads imposed by the reactor coolant system (RCS) piping to the neutron shield tank intervening element, and then to the building structure. The licensee's calculations clearly show the loads that are supported come from the RCS piping loads and the reactor, not just the reactor component.

The loads imposed on this support location from the RCS piping, which are typically offset by reactor dead weight loads, can only be transmitted to the building support structure through the weld build-up on the reactor nozzle. The support includes a mono-ball assembly mounted to the weld pad build-up by plates, cap screws, and dowel pins. Through additional plates, and the threaded end of the monoball, the support is also provided with vertical hold down plates for any upload case. This arrangement transfers RCS piping loads and reactor loads to the intervening elements of the neutron shield tank, which are then resolved to the building structure. This configuration makes the weld build-up, screws, and dowel pins mounted to it, part of the support load path that will induce tensile and horizontal loads in the nozzle weld build-up pad, and the RCS nozzle pressure boundary, under certain load conditions. The load tables in Reference 1 provide loads consistent with this configuration. Figures 1 and 2 provide a general sketch of the RPV support configuration.

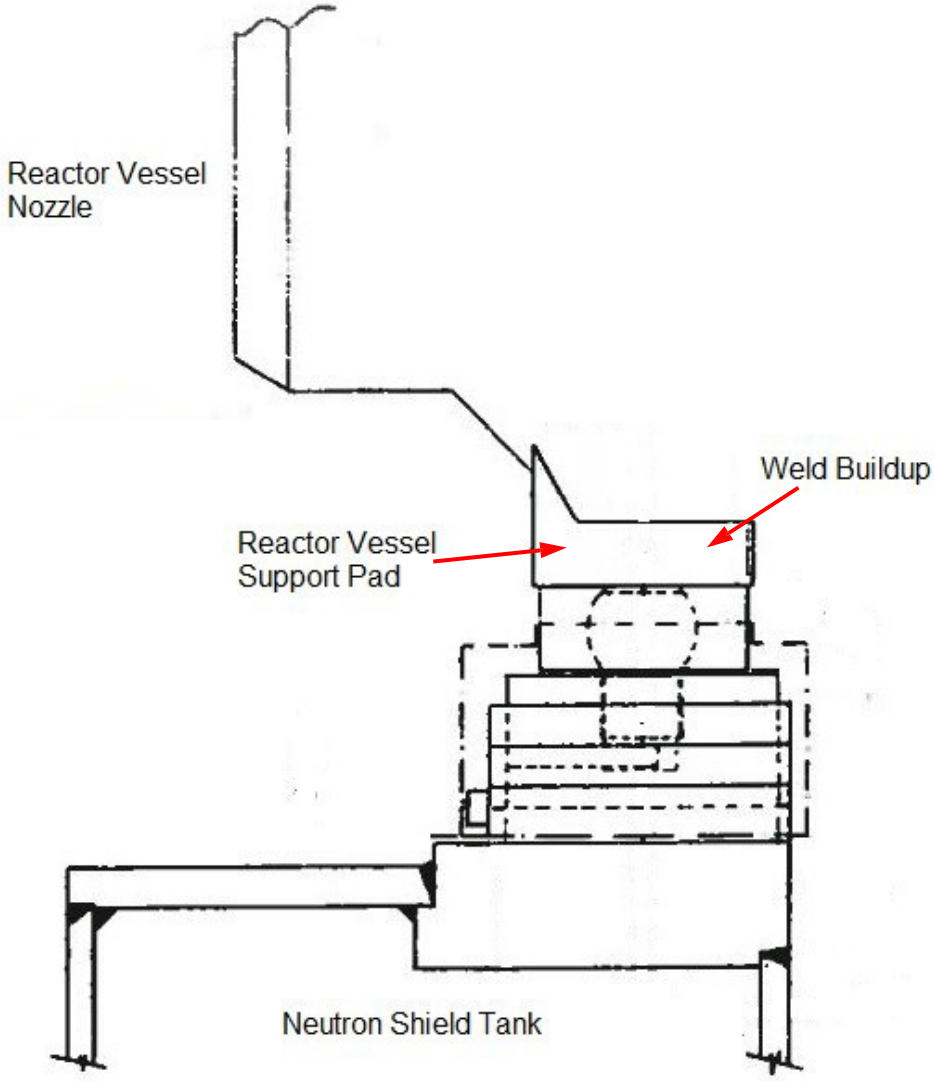

Figure 1 – Side View of RPV Support

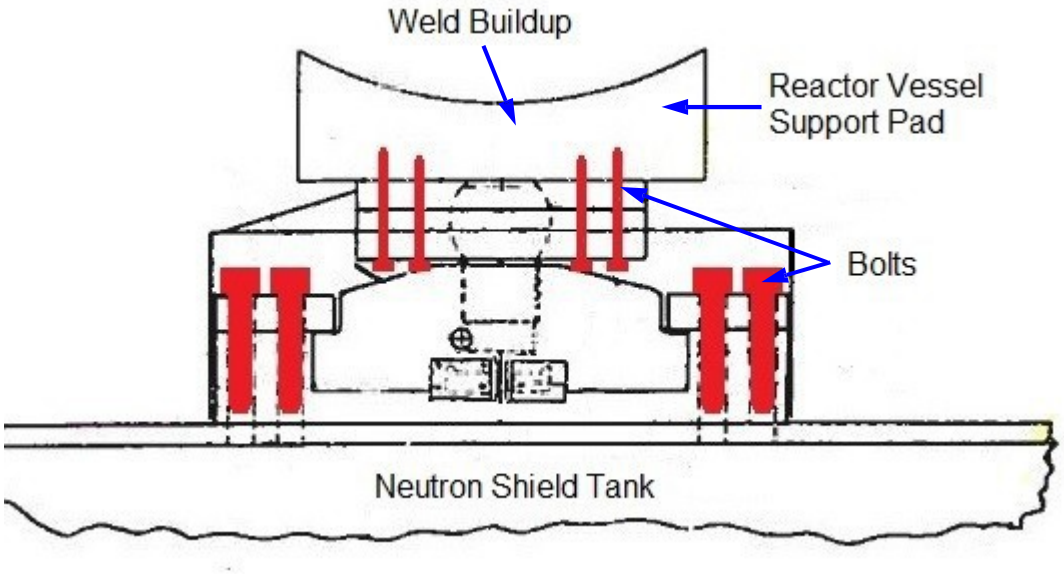

Figure 2 – Cross Section View of RPV Support

The support under discussion is used in the licensee's calculations (Reference 1) as a support for the reactor vessel, and is also used as a sliding anchor type restraint to transfer loads imposed by the RCS piping through the weld build-up, and other support assembly members, to the neutron shield tank upper surface components and ultimately into the building structure. The support provides four directions of restraint; two vertical directions and two horizontal directions and along with associated moments, and is typically referred to as a sliding anchor support.

Reference 1, Table 6.1.1, provides load tables showing both a vertical compressive load maximum of 290.5 kips, and maximum shear load of 16.59 Kips, not just a compressive load under normal conditions, as described in IWB-2500-1 Table, Note 1. Likewise, Table 6.1.2, "Surry Unit 1 & 2 Deadweight Loads," provides a vertical load of 81.44 kips compressive load, and a 6.32 kips shear load due to the connected RCS piping. [Note that these loads are not component support loads caused by supporting the reactor component itself, as is described by Note 1 of the ASME Table IWB 2500-1.]

4.0 REGULATORY REQUIREMENTS

Region II requested NRR provide technical assistance on the interpretation and implementation of the exemptions in Table IWB-2500-1 as follows:

1. Contrary to the requirements of IWB-2500-1, Note 1, the Reference 1 calculation provided by Dominion includes horizontal loads under normal load conditions, and includes loads imposed by the RCS piping, not just the loads imposed by the reactor vessel component.

Please provide the NRR position on the acceptability of using Table IWB-2500-1, Note 1, as the exclusion criteria basis for not performing the prescribed surface examination of the weld

build-up to reactor nozzle outer surface; when the weld build-up configuration is as described above for the Surry sliding anchor support configuration.

This request is intended to address the two questions that were originally developed by NRR and Region II inspection personnel for ASME Code Committee review.

2. Please provide clarification on the following note taken form the February ASME Code Committee meeting, Reference 2:

    - "The Code action can't include shear stress in inquiry since that is not in Code and inquiry can't write Code"?

Region II inspection personnel are interpreting this to mean that ASME Section III of the BPVC does not allow shear stress (horizontal loads) to be applied to this type support configuration with a weld pad build-up. Please provide NRR concurrence on this interpretation.

Based on the above, the NRR staff response follows:

Issue 1, NRR Response

It is the positon of NRR staff that it is acceptable to use Table IWB-2500-1, Note 1, as the exclusion criteria basis for not performing the prescribed surface examination of the weld build-up to reactor nozzle outer surface; when the weld build-up configuration is as described above for the Surry, Unit 1, sliding anchor support configuration, when the stress due to a horizontal shear force does not exist or the conditions (a) through (d) in Note 1 are not met.

The reactor vessel support for Surry, Unit 1, does not have an attachment weld that joins an attachment directly to the surface of the component or integrally cast or forged attachment to the component. Therefore, a surface exam is not required. To consider the significance of not performing a surface examination of this support, the NRR staff determined the maximum tensile stress intensity due to the shear load to be 389 psi based on Reference 1, Table 6.1.1. This is compared to the Pm +Pb allowable for SA-302 Gr. B in accordance with ASME BPVC Subsection NF, 1998 Edition. The allowable is 34,350 psi. This load is negligible even if it were cyclic.

Issue 2, NRR Response

The comment included in the February 2014 ASME Code Committee meeting notes refers to the protocol used by the ASME Code Committee in addressing ASME BPVC inquires. Inquiries are separated into two categories, requirements interpretations and intent interpretations. If the inquiry is considered a requirement interpretation, the inquiry may be answered without processing a BPVC change to clarify the meaning. If the inquiry is considered an intent inquiry a corresponding BPVC change is required to be processed along with the inquiry response. Since the BPVC language in Note 1 does not contain the term shear stress, the ASME Code

Committee processing the inquiry did not want to address the inquiry as written; otherwise it would need to treat it as an intent inquiry and the response would be delayed. This statement does not imply the ASME BPVC has allowed shear stress to be applied to this type of component support nor does it imply that the ASME BPVC restricts shear stress.

5.0 CONCLUSION

The NRR staff finds that a surface exam is not required, as the reactor vessel support for Surry Unit 1, does not have an attachment weld that joins an attachment directly to the surface of the component or integrally cast or forged attachment to the component. The comment in the meeting notes refers to the protocol used by the ASME Code Committee in addressing inquiries.

6.0 POTENTIAL OUTCOME PATHS

- Immediate Implications: As the NRR staff concluded a surface examination was not required, no licensee action is necessary with respect to this issue.

- Generic Implications: Issuing a generic communication, such as an Information Notice or Regulatory Issue Summary is recommended to inform operating reactor licensees of this issue. The issue has been forwarded for generic communication consideration.

- Backfit Considerations: Resolution of this issue does not constitute a backfit because it does not involve a new or different position from a previously applicable staff position.

7.0 REFERENCES

1. Dominion Calculation CE-1642, “The Effect of Reactor Pressure Vessel (RPV) Head Replacement on the [RPV] Support System (Neutron Shield tank) Surry Power Units 1 and 2”, Revision 0, May, 27, 2003.
2. Nygaard, James. *Working Group on Inspection of Systems and Components BPV Standards Committee on Nuclear Inservice Inspection – Section XI*. February 11, 2014. San Diego, CA. New York: American Society of Mechanical Engineers, May 2014. Print.
3. ASME Section XI, Table IWB-2500-1, 1998 Ed. w/2000 Addenda.
4. B&W Drawing, 134816E, Primary Inlet Nozzle, Revision 3.
5. Virginia Electric Power Company, Surry Power Station, Drawing 11448-FV-7D, Reactor Neutron Shield Tank Sheet 3, Revision 6.

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Date: July 6, 2015