



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30303-1257

June 10, 2015

Mr. Ronald A. Jones
Vice President, New Nuclear Operations
South Carolina Electric and Gas
P.O. Box 88 (Mail Code P40)
Jenkinsville, SC 29065-0088

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION UNIT 2 – U.S. NUCLEAR
REGULATORY COMMISSION (NRC) SPECIAL INSPECTION REPORT NO.
05200027/2015009

Dear Mr. Jones:

The Nuclear Regulatory Commission (NRC) conducted a special inspection from February 23 through February 27, 2015, at the Virgil C. Summer Nuclear Station, Unit 2, in Jenkinsville, SC and a subsequent in-office inspection from April 21 through April 27, 2015. The purpose of the special inspection was to assess the facts and circumstances surrounding an event involving contact with the containment vessel shell and structural rebar located within the containment vessel during concrete coring operations.

Between February 5 and February 10, 2015, ten holes were cored in the Unit 2 containment vessel layer 2 basemat in preparation for relocating vertical dowels interfering with embed plates to be placed in layer 3. The processes of determining where those holes were to be cored, and the types of dowels involved contributed to the unintentional drilling through structural rebar in three cored holes, and contacting the containment vessel shell with the drill in one cored hole.

Two NRC-identified findings of very low safety significance (Green) were identified during this inspection. These findings were determined to involve violations of NRC requirements. However, because of their very low safety significance, and because the issues were entered into your corrective action program, the NRC is treating the issues as non-cited violations (NCVs) in accordance with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector office at the Virgil C. Summer Nuclear Station Units 2 and 3.

If you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your

disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector office at the Virgil C. Summer Nuclear Station Units 2 and 3.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system Agencywide Document Access and Management System (ADAMS). ADAMS is Accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this letter, please contact us.

Sincerely,

/RA/

Jamie Heisserer, Chief
Construction Inspection Branch 2
Division of Construction Inspection

Docket No. 05200027
License No. NPF-93

Enclosures:

1. NRC Inspection Report No. 05200027/2015-009
2. Special Inspection Team Charter

cc: (See page 3)

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Letter to R. Jones from Jamie Heisserer dated June 10, 2015

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REGULATORY COMMISSION (NRC) SPECIAL INSPECTION REPORT NO.
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**U.S. NUCLEAR REGULATORY COMMISSION
REGION II**

Docket No.: 52-027

License No.: NPF-93

Report No.: 05200027/2015-009

Licensee: South Carolina Gas & Electric

Location: Jenkinsville, SC 29065

Dates: February 23-27, 2015
April 21-27, 2015

Inspectors: E. Michel, Senior Construction Inspector
P. O'Bryan, Reactor Operations Engineer
C. Oelstrom, Construction Resident Inspector

Approved by: Jamie Heisserer, Chief
Construction Inspection Branch 2
Division of Construction Inspection

SUMMARY OF FINDINGS

Inspection Report (IR) 05200027/2015009, 2/23/15 through 2/27/15 and 4/21/15 through 4/27/15; Virgil C. Summer Nuclear Station Unit 2, special inspection report.

This report covers a special inspection conducted by regional and headquarters inspectors. Two green non-cited violations (NCV), one associated with Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix B, Criterion III, "Design Control"; and the other associated with 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings." The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) which is determined using Inspection Manual Chapter (IMC) 2519, "Construction Significance Determination Process". Cross-cutting aspects are determined using IMC 0613, Appendix F, "Construction Cross-Cutting Areas and Aspects." All violations of Nuclear Regulatory Commission (NRC) requirements are dispositioned in accordance with the NRC's Enforcement Policy and the temporary enforcement guidance outlined in enforcement guidance memorandum (EGM) 11-006. The NRC's program for overseeing the safe construction of commercial nuclear power reactors is described in IMC 2506, "Construction Reactor Oversight Process General Guidance and Basis Document."

A. NRC-Identified and Self Revealed Findings

Cornerstone: Construction/Installation

- Green: The NRC identified an Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings" for damage to safety related structural rebar as a result of failure by South Carolina Electric and Gas (SCE&G), through their contractor Chicago Bridge & Iron (CB&I) Power, to implement appropriate procedures for coring into concrete. No immediate corrective actions were necessary to alleviate immediate safety or security concerns. Subsequent corrective actions to evaluate damaged safety related rebar have been completed. The licensee entered this issue into their corrective action program as CR-NND-15-00539.

The finding was associated with the Construction/Installation cornerstone. The inspectors determined the performance deficiency was more than minor following the guidance in IMC 0613, "Power Reactor Construction Inspection Reports," Appendix E, Example 16. The inspectors evaluated the finding in accordance with IMC 2519, "Construction Significance Determination Process," Appendix A, "AP 1000 Construction Significance Determination Process," and determined the finding was of very low safety significance (Green) because it was associated with a portion of a structure assigned to the intermediate risk importance column, and Row 2, of the construction significance determination matrix. The finding was determined to be an ITAAC finding because it was material to the acceptance criteria of Unit 2 ITAAC 760 (3.3.00.02a.i.a). The acceptance criteria of this ITAAC requires that a reconciliation report is completed that concludes the "as-built" construction conforms to the approved design. At the time of the inspection, this finding was associated with deviations from design requirements that would not have been reconciled by the licensee as required by the ITAAC; however, as of the writing of this report, the associated deviations have been adequately reconciled. The inspectors screened the finding for a possible construction cross-cutting aspect in accordance with Appendix F, "Construction Safety Focus Components and Aspects," of IMC 0613. This finding has a cross-cutting aspect in the area of Human Performance,

Avoid Complacency aspect because the licensee failed to adequately develop a process which would recognize and plan for the possibility of mistakes. [H.12]. (Section 2)

Cornerstone: Design/Engineering

- Green: The NRC identified a construction finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" for inadvertently damaging the Unit 2 containment vessel bottom head (CVBH) as a result of the failure by SCE&G, through their contractors CB&I Power and Westinghouse Electric Company (WEC), to adequately verify a design change that was implemented for post-installing safety related rebar and coring into concrete. No immediate corrective actions were necessary to alleviate immediate safety or security concerns. Subsequent corrective actions to repair the CVBH have been completed. The licensee entered this issue into their corrective action program as CR-NND-15-00539.

The finding was associated with the Design/Engineering cornerstone. The inspectors determined the performance deficiency was more than minor because it represented an adverse condition that rendered the quality of an SSC unacceptable or indeterminate, and required substantive corrective action. The inspectors evaluated the finding using the construction SDP in accordance with IMC 2519, "Construction Significance Determination Process," Appendix A, "AP 1000 Construction Significance Determination Process" and determined that the finding was of very low safety significance (Green) because it was associated with a portion of a structure assigned to the intermediate risk importance column and Row 1 of the construction significance determination matrix. The inspectors screened the finding for a possible construction cross-cutting aspect in accordance with Appendix F, "Construction Cross-Cutting Components and Aspects" of IMC 0613. This finding has a cross-cutting aspect in the area of Human Performance, Work Management aspect, because the licensee failed to adequately identify and manage risk commensurate to the work and did not adequately coordinate different groups or job activities. [H.5]. (Section 2)

B. Licensee-Identified Violations

No findings were identified.

REPORT DETAILS

Summary of the Degraded Condition

Between February 5 and February 10, 2015, ten holes were cored in the Unit 2 containment vessel layer 2 basemat in preparation for relocating vertical dowels interfering with an embed plate to be placed in layer 3. The processes of determining where those holes were to be cored, and the types of dowels involved contributed to the unintentional drilling through structural rebar in three cored holes, and contacting the containment vessel shell with the drill in one cored hole.

4. OTHER ACTIVITIES

4OA5 Other Activities – Special Inspection (IP 93812)

.1 Develop a sequence of events, including key decision points associated with the removal and replacement of the dowels

a. Inspection Scope and Observations

The inspectors reviewed documentation including the root cause report and corrective action documents; and interviewed licensee and consortium personnel, including the root cause team, the craft and field engineers at the job site during the coring evolution, and engineering personnel, to develop a detailed sequence of events.

Sequence of Events

2014 Layer 2 of reinforced concrete was constructed inside the Unit 2 containment vessel (CV). As part of this construction, vertical rebar dowels were installed and these dowels extend up into the construction layer above layer 2 (layer 3). At the time of the NRC Special Inspection, layer 3 concrete had not been poured, but construction of layer 3 rebar and embed plates was in progress.

1/9/15 CB&I surveyors and carpenters laid out the “N line” on layer 2 concrete inside containment. The N line is the north/south bisector of the containment horizontal cross section and is used as a reference for locating layer 3 embed plates. The surveyors marked 2 points on the N line. However, the carpenters drew a line offset to the east by 1 foot off the true N line due to vertical rebar dowels interfering with the chalk line.

CB&I carpenters marked the centerlines for embed plates P1, P2, P3, and P4 on the containment concrete. However, these were different carpenters that did not realize that the chalk line for the N line was offset by 1 foot. Thus, the centerlines for embed plates P1 thru P4 were inadvertently offset by 1 foot.

- 1/20/15 CB&I field engineers identified that there were previously constructed rebar dowels that interfered with a planned pipe installation in layer 3 of the CV and initiated Nonconformance and Disposition report (N&D) number VS2-CR01-GNR-000259. This interference would later require a new dowel hole to be bored – one of the ten bored holes referenced in the remainder of this timeline.
- 1/23/15 A CB&I field engineer identified that there were previously constructed vertical rebar dowels interfering with the marked locations of embed plates P1, P2, and P3. The field engineer initiated N&D VS2-CR01-GNR-000263 for this condition. In the N&D, the field engineer specified that the interfering dowels were type 3A and 3G vertical dowels. The field engineer also listed drawing VS2-1110-CR-531 as the reference drawing that showed the location of the interfering dowels. This was an error. The correct drawing that showed the location of the interfering dowels was VS2-1110-CR-532, which shows that the interfering dowels were actually type 3B and 3L vertical dowels.
- 2/2/15 The Westinghouse Electric Company (WEC) responsible engineer for N&D VS2-CR01-GNR-000263 dispositioned the N&D, providing repair instructions and engineering justification for the type of repair. The WEC responsible engineer did not, however, recognize that embed plates P1 through P4 were in locations that could not potentially interfere with type 3A and 3G vertical dowels. A comparison of CV drawings would have revealed the error. Had the responsible engineer correctly identified the locations of embed plates P1 through P4, he would have realized that the interfering dowels were type 3B and 3L vertical dowels. In the N&D disposition, the responsible engineer specified that the bore holes be a minimum of 25 inches deep - a depth that could be accommodated in the type 3A and 3G vertical dowel positions without impacting structural rebar or the CVBH, but could not be accommodated in the type 3B or 3L vertical dowel positions.
- 2/3/15 A second WEC engineer reviewed and verified the N&D VS2-CR01-GNR-000263 disposition. This engineer also did not identify the correct location of embed plates P1 through P4 or the correct type of vertical dowels in those locations by comparing CV drawings.
- WEC issued the disposition for N&D VS2-CR01-GNR-000263.
- A CB&I field engineer marked seven spots on the layer 2 containment concrete. Six holes were marked for new bore holes associated with embed plates P1, P2, and P3. One hole was marked for a new bore hole associated with the piping interference from N&D VS2-CR01-GNR-000259.
- 2/5/15 Core drilling started.
- 2/6/15 Coring of 4 holes was completed.
- 2/7-8/15 No work was performed over the weekend.

- 2/9/15 CB&I carpenters discovered the mistake in laying out the centerlines for embed plates P1 through P4 and corrected the error by laying out new embed plate centerlines.
- Given the change in the location of the centerlines for embed plates P1 through P4, a CB&I field engineer marked three new holes to be cored to compensate for the new embed plate locations. The field engineer also identified that three of the four previously cored holes could not be used and required filling with grout without a replacement dowel. The field engineer designated these 3 holes as R1, R2, and R3.
- 2/10/15 Drilling of the remaining 6 holes was finished. The CB&I field engineer designated the 7 holes that were to have dowels installed in them as D1 through D7. These 7, along with holes R1, R2, and R3, brought the total to 10 cored holes in this timeframe.
- The ten holes were filled with water to pre-soak them prior to grouting. Hole R1 would not hold water and emptied. The other 9 holes held water.
- 2/11/15 The pre-soaks for holes D1 through D7 were completed and they were grouted with dowels installed in them. A CB&I quality control (QC) inspector would not approve the grouting of R1, R2, or R3 because, without dowels installed in the holes, the condition of the holes differed from the specifications of N&D VS2-CR01-GNR-00263.
- At the request of the CB&I QC inspector, the CB&I field engineer generated a new N&D for holes R1, R2, and R3 (N&D VS2-CR01-GNR-00275).
- 2/12/15 The CB&I QC inspector notified the CB&I Concrete Manager by email that hole R1 would not hold water. The CB&I Concrete Manager initiated an investigation of why hole R1 would not hold water. Borescope photographs were taken in hole R1, but initial photos were unclear.
- At approximately 6:00 p.m., additional borescope photos were taken. A CB&I field engineer determined that the CV was exposed. The CB&I Concrete Manager and the CB&I Nuclear Island Construction Manager were informed of the condition of hole R1. The CB&I Nuclear Island Construction Manager also realized the potential for having cut structural rebar in hole R1.
- The CB&I Nuclear Island Construction Manager directed that all core drilling be stopped until the issue was resolved.
- The CB&I Concrete Manager quarantined a dumpster in which the concrete cores had been placed. Darkness and poor weather prevented an immediate examination of the contents of the dumpster. The CB&I Concrete Manager also attempted to contact the CB&I Site Director but failed to reach him.
- 2/13/15 At 6:00 a.m., the CB&I Concrete Manager and the CB&I Senior Construction Manager met with the CB&I Site Director and notified him that it appeared the CVBH had been contacted. The CB&I Site Director

requested additional information for confirmation.

Sections of 9 concrete cores were retrieved from the quarantined dumpster. There was evidence that structural rebar had been cut in at least 2 sections of the cores.

2/14-15/15 No work was performed over the weekend.

2/16/15 At 6:00 a.m., the CB&I Concrete Manager and the CB&I Senior Construction Manager met with the CB&I Site Director and presented him with the evidence of contacting the CV during core drilling.

At 6:30 a.m. hours, the CB&I Site Director notified the CB&I Project Director, the WEC Site Director and acting Vice President of Construction, and the SCE&G construction organization.

(approximately 7:00 a.m.) The CB&I Project Director notified the SCE&G Site Vice President and CB&I Senior Management.

2/17/15 The CB&I Lead Field Engineer entered the issue into the CB&I corrective action program (CAR 2015-0539).

An SCE&G representative notified the NRC Senior Resident Inspector of the incident.

b. Findings

No findings of significance were identified.

.2 Review the licensee's (and CB&I's) assessment of human performance issues, procedure violations, and/or code violations. Develop an independent assessment based on the sequence of events.

a. Inspection Scope and Observations

The inspectors conducted interviews with CB&I, WEC, and SCE&G personnel; constructed a timeline of events (Section 4OA5.1); and reviewed corrective action program documents, work instructions, and procedures in order to assess human performance, procedural compliance, and potential violations of governing codes and standards. Personnel interviewed included CB&I craft workers and their supervisors, CB&I field engineers and their supervisors, WEC design engineers and their supervisors, and managers from all three organizations. Lists of personnel interviewed and documents reviewed are included in the Supplemental Information section at the end of this report.

In addition to the independent assessment described below, the inspectors evaluated how human performance was addressed in the root cause evaluation, "VC Summer Root Cause Analysis for Corrective Action Report 2015-0539", and discussed human performance issues with members of the licensee and consortium. The inspectors concluded there were no concerns with the licensee's assessment.

i. Independent Human Performance Assessment

Inspectors used the human performance attributes in IMC 0613, Power Reactor Construction Inspection Reports, Appendix F – Construction Cross-Cutting Areas and Aspects to evaluate the performance of the personnel involved in the events related to this Special Inspection. While several cross-cutting aspects have been identified as human performance short-comings, per IMC 0613 appendix F, only the cross-cutting aspect associated with the principal cause of each of the non-cited violations listed in this report have been assigned to those non-cited violations.

Inspectors observed that the weakness associated with the human performance attributes listed below contributed to this event. Alpha numeric designators are consistent with those used in IMC 0613, Appendix F. Only cross-cutting aspects in the Human Performance cross-cutting area were evaluated.

H.1 Resources: Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support nuclear safety.

Although CB&I procedure NCSP 3-33, Installation of Drilled-In Concrete Anchors, is the governing procedure for core drilling, it does not provide adequate direction to perform some work steps. The procedure does not provide work steps for operating a core drill machine and core drilling is not clearly identified as an activity governed by NCSP 3-33. The title of the procedure is “Post-Installed Anchors” and the procedure provides only “suggested” methods to avoid embedded items.

H.2 Field Presence: Leaders are commonly seen in the work areas of the plant observing, coaching, and reinforcing standards and expectations. Deviations from standards and expectations are corrected promptly. Senior managers ensure supervisory and management oversight of work activities, including contractors and supplemental personnel.

Field engineers provided direction to core-drilling craft personnel with little or no additional supervision over several days of core-drilling activities. Field engineers made key decisions without input from their supervisors. Construction supervisors did not consider direct observation of the core-drilling activities to be necessary.

H.4 Teamwork: Individuals and work groups communicate and coordinate their activities within and across organizational boundaries to ensure nuclear safety is maintained.

Communications break-downs occurred between CB&I carpenters, leading to the embed plate centerlines being incorrectly marked. Additionally, CB&I field engineers failed to communicate problems with the core-drilling activities (for example having to relocate several of the holes, encountering rebar several times during drilling, and hole R1 not holding water for the pre-soak) to their supervisors.

H.5 Work Management: The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities.

Work planning and execution was problematic in that review of potential adverse impact to structural rebar or the CVBH were not recognized and sufficient instructions,

precautions, and oversight was not provided to avoid errors. Additionally, work instructions did not contain adequate precautions to avoid damaging these components.

H.9 Training: The organization provides training and ensures knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values.

Neither craft nor field engineering personnel received training at the site on core drilling operations, and they were not knowledgeable of the appropriate procedures governing core drilling.

H.11 Challenge the Unknown: Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding.

Field engineers did not stop core drilling when structural rebar was encountered. They were convinced that there was sufficient room to drill the holes despite abundant indications to the contrary. They did not stop the work activities to analyze these indications to ensure their assumptions were correct.

H.12 Avoid Complacency: Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Individuals implement appropriate error reduction tools.

Craft personnel held pre-job briefs prior to core drilling, but the briefs only included industrial hazards and personnel safety issues. Craft personnel did not discuss potential adverse impacts on structures, systems, or components. Field engineers did not attend the pre-job brief with craft personnel.

The N&D disposition for the drilling only specified a minimum hole depth and did not specify a maximum depth, thus missing an opportunity to reinforce that the drilling could have negative consequences.

WEC Design Engineering personnel did not verify that the dowels specified in the N&D for the core drilling were correct, despite having the information needed to determine that there was an error in the N&D.

H.14 Conservative Bias: Individuals use decision making-practices that emphasize prudent choices over those that are simply allowable. A proposed action is determined to be safe in order to proceed, rather than unsafe in order to stop.

Field engineers directed that the core drilling be conducted per the N&D that they initiated. While this is allowed by site procedures, it does not ensure that all governing procedures are used and followed correctly. Had the field engineers adequately researched core drilling requirements, they would have been aware of additional precautions.

ii. Compliance with Procedures and Codes

The inspectors reviewed both implemented and existing procedures for the coring of holes in concrete and post-installation of safety-related rebar. At the time of the incident, CB&I Power had procedures in place for the post-installation of anchors in concrete, which included requirements for grouted anchors and embedments. These procedures were reviewed for applicability to the coring performed for the post-installation of safety-

related rebar. In addition, the procedures were reviewed for conformance with the licensing basis, applicable codes, and to ensure compliance with the requirements of 10 CFR Part 50 Appendix B for corrective actions and non-conformances (e.g. encountering rebar during coring and/ or anchor installation).

The inspectors interviewed the three CB&I field engineers (one of whom was in training) directly involved in the core boring operations to understand how N&Ds were created and processed for this incident, the use of safety equipment and procedures such as ground fault interrupters, training and qualifications, and the implementation of quality assurance procedures. The inspectors observed that the field engineers performed their duties with limited supervision. For example, the field engineers were solely responsible for creating N&Ds, which describe the set of conditions from which the corrective actions for field activities are generated; and they independently developed the means and methods by which to accomplish those field activities. With respect to this incident, an error in the N&D for the selection of vertical dowel type contributed to contacting the CVBH and structural rebar during core boring operations. It was also observed that the N&D process was the favored means of dispositioning hardware issues and the 10 CFR Part 50, Appendix B corrective action program (CAP) was rarely used. While the field engineers were familiar with the CAP, they did not appear to make use of it to document conditions adverse to quality, which could result in less effective evaluations of those conditions.

The inspectors interviewed the Westinghouse civil engineer who evaluated N&D VS2-CR01-GNR-000263 to relocate dowels within layer 2 of the basemat, the Westinghouse Site Engineering Manager, and Westinghouse Lead Mechanical Engineer.

The inspectors reviewed the actions surrounding contact with the CVBH in hole R1. Specifically, the inspectors reviewed the procedures used to conduct repairs to the CVBH to ensure they were in compliance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Subsection NE. The inspectors also reviewed the repair traveler and N&D report for the repair. Ultrasonic thickness measurements and visual inspection of the as-repaired area were observed and verified to confirm the repair did not reduce the CVBH wall below the ASME required minimum design thickness.

b. Findings

i. Failure to implement procedures for coring concrete and post installing anchors

Introduction: An ITAAC finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and drawings," was identified by the NRC for unanalyzed damage to safety related structural rebar as a result of the failure by SCE&G, through their contractor CB&I Power, to adequately implement procedures for post-installing safety related rebar and coring into concrete.

Description: In early February 2015, CB&I Power was installing relocated dowels in preparation for the proposed layer 3 of concrete inside the CV. The relocated dowels were being post-installed by coring into the existing concrete of layer 2 (below the proposed layer 3) and grouting the post-installed dowels in the cored holes. As stated above, ten holes were cored. To prepare for grouting, each hole was filled with water to pre-soak the hole. However, one of the holes (R1) closest to the CVBH wall did not hold water. A subsequent borescope examination of that hole revealed that the drill

penetrated completely through the concrete and had impacted the CVBH. Subsequent inspection also revealed that the core bit had cut through safety-related rebar at this location. The contractor investigated potential rebar impacts from coring at the other nine locations and determined safety-related rebar was impacted at the D2 and D7 core locations as well.

The VC Summer Unit 2 project had procedures in place for installing reinforcing steel and post-installing rebar or anchors by coring and grouting. These procedures included corporate level procedures NCSP 3-33-1, Installation of Drilled-In Concrete Anchors, and NCSP 3-42-1, Reinforcing Steel installation; and site level instruction CSI 3-40-0, Installation of Post Installed Anchors. Both corporate level procedures and site instructions were required to be followed.

These procedures had requirements regarding contact with, or damage to structural rebar described as follows. NCSP 3-33-1, Attachment 7.1, entitled "Drilled-In Concrete Anchor Installation Attributes," was the construction quality completion (CQC) checklist which provided those attributes to be verified by a field engineer and superintendent during coring. Attribute W90 required, in part, "Rebar has not been cut unless approved (list approval documents in remarks)." NCSP 3-33-1 also required in Section 6.2.2.e that, "Discipline Construction Superintendent and responsible Field Engineer shall verify...that reinforcing steel has not been cut." Site level instruction CSI 3-40-0, Section 6.2.1 stated, in part, "post installed anchors shall not be drilled into structural rebar or embedded plates unless approved by the Engineer." Finally, NCSP 3-42-1, Section 6.8b stated, in part, "any item, condition or material which deviates from drawings, specifications or other engineering requirements and cannot be resolved within the scope of such requirements, or otherwise requires an Engineering disposition, shall be reported In accordance with, NCSP 2-8, "Nonconformance Reporting and Control"."

The contractor failed to adequately implement the above mentioned procedures for the ten cored holes. Specifically, the work was performed per the "Repair" dispositions in N&D VS2-CR01-GNR-00259 and N&D VS2-CR01-GNR-00263, but those N&Ds failed to incorporate CB&I procedures NCSP 3-33-1, CSI 3-40-0, and NCSP 3-42-1. As a result, the N&Ds provided no approvals for cutting safety related rebar, and safety related rebar was cut at three core locations (R1, D2, and D7). Coring was not stopped by the Field Engineer or Construction Superintendent when rebar was contacted. In addition, the Field Engineer or Superintendent did not contact the Engineer for approval or to report the nonconformance of the impacted rebar, as required by the procedures. Prior to grout placement on core locations D2 and D7, neither the Field Engineer nor Construction Superintendent verified that rebar was not cut. As a result ITAAC 3.3.00.02a.i.a was materially impacted because these two locations contained unanalyzed structural deviations from the original design that would not have been reconciled.

Analysis: The inspectors determined that the left in-place, damaged and unanalyzed structural rebar in core holes D2 and D7 as a result of the failure to implement the appropriate procedures as required by 10 CFR Part 50, Appendix B, Criterion V, was a performance deficiency. The performance deficiency was more than minor following the guidance in IMC 0613, "Power Reactor Construction Inspection Reports," Appendix E, Example 16. Specifically, CB&I did not implement the appropriate requirements for coring into concrete and impacting safety related rebar, thereby leaving the cutting of safety related rebar unacceptable or indeterminate. The finding was determined to be an ITAAC finding because it was material to the acceptance criteria of Unit 2 ITAAC 760 (3.3.00.02a.i.a). The acceptance criteria of this ITAAC requires that a reconciliation

report, concluding the “as-built” construction conforms to the approved design, is completed for the areas associated with the ITAAC. The structural rebar that was impacted in holes D2 and D7, and then subsequently grouted over, is included within the scope of ITAAC 760, and would not have been reconciled by the licensee as required by the ITAAC. The inspectors reviewed SCE&G Condition Report CR-NND-15-000263 and N&D No.’s VS2-1110-GNR-000011, VS2-CR01-GNR-000294, and VS2-CR01-GNR-000295 to determine whether appropriate action was taken to address the non-conforming condition of the unanalyzed cut rebar in core holes D2 and D7. The inspectors determined the dispositions and justifications of the cut rebar reconciled the unanalyzed condition with the design. The cut rebar still met the licensing basis and no longer impact the ITAAC 3.3.00.02a.i.a acceptance criteria. No additional findings were identified. NCV 05200027/2015009-01 is closed.

The inspectors concluded this finding was associated with the Construction/Installation Cornerstone. The inspectors evaluated the finding using the construction SDP in accordance with IMC 2519, "Construction Significance Determination Process," Appendix A, "AP 1000 Construction Significance Determination Process" and determined that the finding was of very low safety significance (Green) because it was associated with a portion of a structure assigned to the intermediate risk importance column and Row 2 of the construction significance determination matrix.

The inspectors screened the finding for a possible construction cross-cutting aspect in accordance with Appendix F, “Construction Cross-Cutting Components and Aspects” of IMC 0613. This finding has a cross-cutting aspect in the area of Human Performance, Avoid Complacency aspect, because the licensee failed to adequately develop a process which would recognize and plan for the possibility of mistakes. [H.12].

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures and Drawings” requires, in part, that “Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings.”

Contrary to the above, during coring and grouting in early February for the construction of layer 3 concrete inside the CV, the licensee, through their contractor CB&I Power, failed to implement appropriate procedures for post-installing safety related rebar and coring into concrete. Specifically, coring was not stopped by the Field Engineer or Construction Superintendent when rebar was contacted at locations R1, D2, and D7 per procedures NCSP 3-33-1, CSI 3-40-0, and NCSP 3-42-1. In addition, the Field Engineer or Superintendent did not contact the Engineer for approval, or report the nonconformance of the impacted rebar. Prior to grout placement, neither the Field Engineer nor Construction Superintendent verified that rebar was not cut. As a result, core locations D2 and D7 were grouted with an unapproved, unanalyzed and unreconciled structural defect. If left uncorrected, these unanalyzed and unreconciled defects, in this portion of the structure, had the potential safety consequence of preventing the CV foundation from meeting its intended design function per the UFSAR, Tier 1, Section 3.3.2.a). Corrective actions taken by the licensee, to date of this report, include: issuing a stop work order on all coring activities, reviewing and revising procedures for coring and post-installing anchors in concrete, training of management and craft, developing new procedures for penetrating concrete, and analyzing the impacts of the cut structural rebar.

Because this violation was of very low safety significance (Green) and it was entered into the licensee's corrective action program as CR 15-0539, this violation is being treated as a non-cited violation (NCV 05200027/2015009-01), Failure to Implement Procedures for Coring Concrete and Post-Installing Anchors, consistent with Section 2.3.2 of the NRC Enforcement Policy and EGM 11-006.

ii. Failure to verify a design change did not adversely impact the containment vessel

Introduction: A construction finding of very low safety significance (Green) and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control" was identified by the NRC for damage to the Unit 2 CV shell as a result of the failure by SCE&G, through their contractors CB&I Power and WEC, to adequately verify a design change that was implemented for post-installing safety related rebar and coring into concrete.

Description: On January 23, 2015, while making preparations for pouring layer 3 of concrete inside of the Unit 2 CV, a CB&I field engineer identified that there were previously constructed vertical rebar dowels interfering with the marked locations of embed plates P1, P2, and P3 on the installed concrete layer 2. The field engineers initiated an N&D for this condition (N&D VS2-CR01-GNR-000263). In the N&D, the field engineer specified that the interfering dowels were type 3A and 3G vertical dowels. The field engineer also listed drawing VS2-1110-CR-531 as the reference drawing that showed the location of the interfering dowels. This was an error. The correct drawing that showed the location of the interfering dowels was VS2-1110-CR-532, which shows that the interfering dowels were actually type 3B and 3L vertical dowels. Type 3B and 3L dowels are located closer to the CVBH and are shorter than type 3A and 3G dowels. Had it been recognized that the interfering dowels were actually 3B and 3L type dowels, then the potential for impacting the CVBH would have been more apparent.

WEC Design Engineering dispositioned the N&D, and also used the incorrect dowel type in the technical justification for the work. Neither the WEC Responsible Engineer nor the WEC Verifier for the N&D recognized that the CB&I field engineer specified the wrong dowel types. However, the CB&I field engineer also included as references in the N&D drawings VS2-1120-CE-011, "Concrete Embedment at EL 83' 0" and 84' 6" Overall Plan View," and VS2-1110-CR-519, "Containment Concrete Reinforcement EL 71' 6" up to EL 83' 0"/84' 6" General Vertical Dowel Plan." These drawings showed that the location of the embed plates could not interfere with type 3A and 3G dowels, and the correct dowel types were 3B and 3L.

WEC Design Engineering specified in the N&D that the interfering dowels be cut and holes bored into the layer 2 concrete for replacement dowels. The depths of the holes were specified to be a minimum of 25 inches, but did not list a maximum depth. Drilling 25 inches into the layer 2 concrete near the embed locations resulted in drilling in close proximity to the CVBH, and the CVBH was contacted in hole R1.

Analysis: The inspectors determined that the damage to the CV, due to the failure to ensure that a design change would not adversely impact the CV, as required by 10 CFR Part 50, Appendix B, Criterion III, was a performance deficiency. Per IMC 0613, "Power Reactor Construction Inspection Reports," Appendix E, the performance deficiency was more than minor because it represented an adverse condition that rendered the quality of an SSC unacceptable or indeterminate, and required substantive corrective action. Specifically, CB&I and WEC failed to verify that a change to the design of the vertical rebar in layer 2 of the Unit 2 concrete inside of the CV did not adversely affect the CV,

and this deficiency led to damage to the CVBH which required concrete excavation and CVBH repair.

The finding was associated with the Design/Engineering cornerstone. The inspectors evaluated the finding using the construction SDP in accordance with IMC 2519, "Construction Significance Determination Process," Appendix A, "AP 1000 Construction Significance Determination Process" and determined that finding was of very low safety significance (Green) because it was associated with a portion of a structure assigned to the intermediate risk importance column and Row 1 of the construction significance determination matrix.

The inspectors screened the finding for a possible construction cross-cutting aspect in accordance with Appendix F, "Construction Cross-Cutting Components and Aspects" of IMC 0613. This finding has a cross-cutting aspect in the area of Human Performance, Work Management aspect, because the licensee failed to adequately identify and manage risk commensurate to the work and did not adequately coordinate different groups or job activities. [H.5]

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control" requires, in part, that "Measures shall be established to assure that applicable regulatory requirements and the design basis, as described in 10 CFR Part 50, section 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures and instructions."

Contrary to the above, the licensee, through their contractors CB&I and WEC, failed to specify in N&D VS2-CR01-GNR-000263 those measures be taken to avoid damage to the CV shell. Specifically, incorrect vertical dowel types were specified and thus, the incorrect core bore depth was specified in the N&D. As a result, in early February 2015, core hole drilling contacted and damaged the CV shell. The CV shell was subsequently repaired per ASME Code, Section III, Subsection NE requirements. Other corrective actions included issuing a stop work order on all coring activities, reviewing and revising procedures for coring and post-installing anchors in concrete, training of management and craft, developing new procedures for penetrating concrete, and analyzing the impacts of the cut structural rebar. This finding had the potential safety consequence of the CV not meeting its design specifications and adversely affecting its design function.

Because this violation was of very low safety significance (Green) and was entered into the licensee's corrective action program as CR 15-0539, this violation is being treated as a non-cited violation (NCV 05200027/2015009-02), Failure to verify a design change did not adversely impact the containment vessel, consistent with Section 2.3.2 of the NRC Enforcement Policy and EGM 11-006.

.3 Develop an independent extent of condition considering the 10 core bores from this event and any similar repairs made using this method

a. Inspection Scope and Observations

The inspectors reviewed N&Ds for the coring of holes in concrete and post-installation of safety-related rebar that had been issued prior to this incident at both VC Summer Unit 2 and 3. These N&D's were reviewed to determine the extent that coring and post installing safety rebar was utilized and for similarity to the coring performed for the ten cores described above.

Based on this review, the only coring to post-install safety related rebar has occurred at the Unit 2 site. The following paragraphs summarize the N&D's used for post-installing safety-related rebar.

VS2-CR01-GNR-000062 contained information on the location of safety related rebar, to be avoided, near the surface of the basemat and the depth of hole would not reach rebar located near the bottom of the basemat. VS2-CR01-GNR-000156 provided specific instructions to prevent damage rebar. Additionally, Engineering and Design Change Request (E&DCR) VS2-CR01-GEF-000090 was created from this N&D to address the coring. The same instructions were provided in the E&DCR. Specific Instructions Sheets (SIS) were created by the Field Engineer. The SIS identified the core locations and provided instructions. In addition, a CQC was included and completed in accordance with procedure NCSP 3-33, as required and discussed in Section 2 of this report. Comparing the locations of the cores to the construction plans, the inspectors determined that neither the CVBH nor the horizontal rebar were impacted at these locations.

VS2-CR01-GNR-000252 did not contain specific instructions to prevent rebar damage. No SIS or CQC was created by the FE for the coring of the holes. However, comparing the locations of the cores to the construction plans, the inspectors determined that CVBH and horizontal safety related rebar were not impacted at these locations.

VS2-CR01-GNR-000259 and VS2-CR01-GNR-000263 did not contain specific instructions to prevent rebar damage. No SIS or CQC was created by the FE for the coring of the holes. However, comparing the location of the core D1 from VS2-CR01-GNR-000259, with the construction plans, the inspectors determined that neither the CV nor horizontal safety related rebar were impacted at the D1 core location.

b. Findings

No findings of significance were identified.

Based on a review of the N&D's for post installing rebar and coring, the location of the cores, and the construction plans it appears the extent of coring activities impacting either safety related rebar or the CV were isolated to the cores drilled per VS2-CR01-GNR-000263.

.4 Evaluate the engineering dispositions for the coring/cut rebar and the CV surface defect to determine if they meet appropriate license and code requirements

a. Inspection Scope and Observations

The inspectors reviewed N&Ds for the safety related structural rebar impacted by the coring associated with N&D VS2-CR01-GNR-000263. These N&D's were reviewed for conformance with the licensing basis, applicable codes, and to ensure compliance with the requirements of 10 CFR Part 50 Appendix B.

To disposition the potential non-conformances WEC and CB&I reviewed as-built data, construction plans, concrete cores and performed additional exploratory investigations. The exploratory investigations included excavating the area around core hole R1 using hydro-demolition and removing grout and grouted dowels at select locations using

coring methods. Using the above methods, the contractor determined safety-related rebar was impacted only at the R1, D2, and D7 core locations.

The following N&Ds were generated to disposition the impacted safety-related rebar.

Hole No.	N&D for structural rebar impact
R1	VS2-1110-GNR-000011
D2	VS2-CR01-GNR-000294
D7	VS2-CR01-GNR-000295

The dispositions were use-as-is. The inspectors reviewed the justifications for the use-as-is dispositions to verify compliance with the design calculations, applicable codes, and the UFSAR. In addition, the justifications were reviewed for cumulative effects of all the impacted safety-related rebar on the containment vessel..

b. Findings

Based on the review of the N&Ds justifications, the inspectors concluded the use-as-is dispositions met the licensing basis, applicable codes, and complied with the requirements of 10 CFR Part 50 Appendix B.

No findings of significance were identified.

.5 Review the licensee's corrective actions, causal analysis and extent of condition associated with this event.

a. Inspection Scope and Observations

The inspectors interviewed the CB&I, WEC, and SCE&G personnel, including the root cause team; reviewed contractor and licensee corrective action documentation including the root cause analysis and associated SCE&G "Project Letter; and observed field conditions and equipment. The inspectors independently developed an assessment of the root and contributing causes of the event, the extent of condition, and the licensee's completed and planned corrective actions. Factors such as decision making, the design change process, the nonconformance assessment process, the use of and availability of procedures, timeliness of communication between the licensee the licensee's contractors (CB&I and WEC), and the use of construction experience (internal and external) were considered in this assessment.

Inspectors found that the licensee and its contractors correctly identified the root and contributing causes of the event. The root causes were: 1) site management failed to develop and implement a clear and effective work process for core drilling, and 2) single point vulnerabilities within CB&I Field Engineering and unclear division of roles and responsibilities of Design Engineering and Field Engineering in the Nonconformance and Disposition process.

Inspectors found that the licensee and its contractors adequately addressed the extent of condition (see Section 4 for details of the extent of condition), and assigned appropriate corrective actions. Planned or completed corrective actions include: 1) repair damage to the CVBH, 2) ensure (via disposition) cut structural rebar did not prevent the containment structure from fulfilling its design function, 3) revise procedures for core drilling, 4) revise CB&I and WEC procedures for the N&D process, 5) revise

corrective action program procedures for initiating corrective action requests, 6) revise work management procedures for evaluating risk and conducting pre-job briefs, and 6) provide training to personnel for the process changes included in the procedure changes discussed above.

b. Findings

No findings of significance were identified.

5. Exit Meeting

The inspection scope and preliminary results from February 23-27, 2015, inspection activities were debriefed to A. Torres and other members of the licensee's staff on February 27, 2015. No dissenting comments were received from the licensee. Proprietary information was discussed but not included in the report. The inspection scope and preliminary results from April 21-27, 2015, inspection activities were presented to members of the licensee staff on April 30, 2015. No dissenting comments were received from the licensee. Proprietary information was not discussed.

SUPPLEMENTAL INFORMATION

1. List of Persons Contacted

Name	Title
J. Arnall	CB&I Concrete Manager
Z. Ashcroft	SCE&G Construction Supervisor
K. Bridge	CB&I Field Engineer
J. Cagle	CB&I Concrete Superintendent
J. Cole	WEC Consortium Licensing
J. Comer	CB&I Performance Improvement Manager
J. Ervin	CB&I Field Engineer
A. Fleetwood	CB&I Lead Field Engineer
R. Gadson	CB&I Concrete Finisher
P. Gibbons	SCE&G Construction Engineer
K. Hollenback	CB&I Project Director
I. Johnson	CB&I Concrete Finisher
A. Jones	CB&I Concrete Finisher
J. Karmozyn	CB&I Site Engineering
D. Krebs	WEC Lead Mechanical Engineer
J. Oswald	CB&I Concrete Finisher
D. Rau	CB&I Quality Control Inspector
A. Rice	SCE&G Licensing
J. Robinson	CB&I Concrete Foreman
J. Robinson	WEC Site Engineering Manager
M. Ross	CB&I Concrete Finisher
F. Salter	SCE&G Licensing
K. Savastano	SCE&G Welding Engineer
G. Sanders	SCE&G Licensing
A. Torres	SCE&G General Manager, Nuclear Plant Construction
J. Wallace	CB&I Concrete Finisher
W. Wood	CB&I Site Director
T. Williams	CB&I Field Engineer
E. Wills	CB&I Director of Licensing and Regulatory Compliance
K. Young	SCE&G Issue Manager
W. Zhao	WEC Civil Engineer

Other licensee employees contacted included engineers, technicians, production staff, and office personnel.

2. List of Items Opened, Closed, and Discussed

Opened/Closed	NCV 2015-009-01	Failure to Implement procedures for coring concrete and post installing anchors
Opened/Closed	NCV 2015-009-02	Failure to verify a design change did not adversely impact the containment vessel

3. Inspection Procedures Used

IP 93812, Special Inspection

4. Documents Reviewed

Codes and Procedures:

American Concrete Institute (ACI) 349-01, Code Requirements for Nuclear Safety Related Concrete Structures
 APP-GW-GAP-428, Revision 4, WEC Control of Nonconforming Items for the AP1000 Program
 CB&I Traveler – Nuclear (Form CMS-720-03-FM-07102) for Repair A2-CVBH at Nuclear Island Core Hole R1, 3/9/2015
 CMS-830-15-PR-18010, Revision 3, General Repair Procedure Materials and Welds for Class 2 and Class MC Products
 NFS-GH-43, SRE Control Program, Rev. 23
 QS 15.01, Revision 05.02, CB&I Nonconformance and Disposition Report
 QS 15.03, Revision 02.00, CB&I Risk Release of Unsat/Nonconforming Material/Equipment
 QS 16.05, Revision 6, CB&I Corrective Action Program
 QS 16.06, Revision 0, CB&I Causal Analysis Determination Procedure
 NCSP 3-33, Revision 1, CB&I Installation of Drilled-In Concrete Anchors
 NCSP 3-42, Revision 1, CB&I Reinforcing Steel installation
 CSI 3-40, Revision 0 and 1, CB&I Installation of Post Installed Anchors
 WEC 3.3.3, Revision 1.0, WEC Change Control for the AP1000 Plant Program

Drawings and Calculations:

302-F0055-D, Area A/B P&ID, Sheet 2, dated January 2, 2014
 APP-1100-CCC-005, Revision 0, Design Calculations, Containment Mass Concrete Reinforcement, Elevation 71'-6" to 83'-0"/84'-6"
 VS2-1120-CE-011, Revision 3, Concrete Embedment at EL 83' 0" and 84' 6" Overall Plan View
 VS2-1110-CR-519, Revision 2, Containment Concrete Reinforcement EL 71' 6" up to EL 83' 0"/84' 6" General Vertical Dowel Plan
 VS2-1110-CR-531, Revision 2, Containment Concrete Reinforcement EL 71' 6" up to EL 83' 0"/84' 6" Vertical Dowel Layout at CJ 76' 6"
 VS2-1110-CR-532, Revision 0, Containment Concrete Reinforcement EL 71' 6" up to EL 83' 0"/84' 6" Vertical Dowel Layout at CJ 80' 0"/80' 6"

Corrective Action Program Documents:

CAR 2015-0539, CB&I CAP entry issued due to hole R1 not holding water for pre-soak
 CAR 2015-0610, CB&I CAP entry issued due to holes R1, R2, and R3 being improperly located
 CAR 2015-0626, CB&I CAP entry issued due to incorrect referenced drawing in N&D VS2-CR01-GNR-000263
 CAR 2015-0677, CB&I CAP entry, Human Performance – Organizational processes and cultural values associated with barriers of providing a [sic] appropriate Pre-Job Briefing
 CR-NND-15-00263, SCE&G CAP entry issued due to the CVBH and rebar being impacted by core drilling
 CR-NND-15-00352, SCE&G CAP entry related to NRC Special Inspection questions related to the CB&I General Repair Procedure
 CR-NND-15-00365, SCE&G CAP entry to track CB&I CAR 2015-0677
 CR-NND-15-00366, SCE&G CAP entry, Errors related to VS2-CR01-GNR-000263

CR-NND-15-00368, SCE&G CAP entry, NRC Special Inspection Team debriefed potential Green NCV
N&D VS2-1208-GNR-000008, CB&I N&D for CVBH being impacted by core drilling
N&D VS2-1110-GNR-000008, R1 Core/CVBH Contact
N&D VS2-1110-GNR-000011, R1 Core/CVBH Contact
N&D VS2-CC01-GNR-000156, Terminator/ WLS conflict
N&D VS2-CR01-GNR-000062, 4-Line missing dowels
N&D VS2-CR01-GNR-000252, Rebar/Embed P8 Interference – layer 3
N&D VS2-CR01-GNR-000259, CB&I N&D for dowel interference with embed plate P8
N&D VS2-CR01-GNR-000263, CB&I N&D to relocate dowels due to interference with embed plates
N&D VS2-CR01-GNR-000275, Improper Core Locations Inside Containment
N&D VS2-CR01-GNR-000279, Cut Containment Rebar
WEC Issue ID #100081407, WEC CAP entry issued due to incorrect dowel types specified in VS2-CR01-GNR-000263
WEC Issue ID #100082761, WEC CAP entry issued for potential improvements to WEC procedures due to core drilling impacting the CVBH.
VC Summer Root Cause Analysis for Corrective Action Report 2015-0539, Structural Rebar Cut and Contact Made with the CV Bottom Head During Core Drilling Operations at the VC Summer Unit 2 Nuclear Construction Site, 4/10/2015
N&D VS2-CR01-GNR-000294, Indeterminate Cut Containment Bar (D2, D3)
N&D VS2-CR01-GNR-000295, Indeterminate Cut Containment Bar (D6, D7)

Miscellaneous:

CB&I Letter; dated Feb 21, 2015 to Westinghouse Electric Company, LLC; SUBJ: Unit 2 CVBH Core Drill Issue: Concrete Removal for Boring Hole R1
CB&I Presentation, CV Bottom Head (CVBH) Issue
SCE&G Letter; dated Apr 17, 2015, NND-15-0254; SUBJ: Corrective Action Report 2015-0539 – CV Bottom Head Contact

February 20, 2015

MEMORANDUM TO: Eric Michel, Senior Construction Inspector
Construction Inspection Branch 3
Division of Construction Inspection

FROM: Victor M. McCree **/RA/**
Regional Administrator

SUBJECT: SPECIAL INSPECTION CHARTER TO EVALUATE THE
INADVERTENT DAMAGE OF THE V. C. SUMMER UNIT 2
CONTAINMENT VESSEL

You have been selected to lead a Special Inspection to assess the circumstances surrounding the inadvertent damage to the V. C. Summer Unit 2 containment vessel bottom head while drilling concrete on February 9, 2015. Your onsite inspection should begin on February 23, 2013. Chad Oelstrom, RII/DCI, and Phil O'Bryan, NRO/DCIP, will assist you in this inspection.

A. Basis

On February 16, 2015, the licensee was notified by Chicago Bridge & Iron (CB&I) that during core boring activities the previous week, the core bit made contact with the CV at a location approximately 27" below the concrete surface, potentially damaging the vessel. In addition, the core bit cut into safety-related rebar in two locations. During the week of February 9, 2015, at the Summer Unit 2 construction site interferences were identified while placing embed plates in preparation for the layer 3 concrete pour inside of the CV. Seven dowels (vertical rebar) extending from the layer 2 placement were cut off and holes for replacement dowels were drilled in ten locations. It was during these activities that the CV was potentially damaged and the rebar cut.

In accordance with Inspection Manual Chapter (IMC) 2504, "Construction Inspection Program: Inspection of Construction and Operational Programs," Appendix C, "Response to Non-Performance Related Issues/Events," deterministic criteria were used to evaluate the level of NRC response to this construction event. Through review of the deterministic criteria in IMC 2504, Region II management determined that this was a significant event that, while not covered by deterministic criteria, warrants additional inspection or oversight. Specifically, the circumstances which resulted in the inadvertent damage to safety related rebar and the CV revealed several concerns regarding construction practices which warrant additional inspection. Region II determined that the appropriate level of NRC response is a Special Inspection.

CONTACT: Jamie Heisserer, RII/DCI
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This Special Inspection is chartered to identify the circumstances surrounding the damage to the CV and safety-related rebar, review the licensee's actions following discovery of the condition, and to evaluate the licensee's actions to address the damage.

B. Scope

The inspection is expected to perform data gathering and fact-finding in order to address the following:

1. Develop a sequence of events, including key decision points associated with the removal and replacement of the dowels.
2. Review the licensee's (and CB&I's) assessment of human performance issues, procedure violations, and/or code violations. Develop an independent assessment based on the sequence of events.
3. Develop an independent extent of condition considering the 10 core bores from this event and any similar repairs made using this method.
4. Evaluate the engineering dispositions for the coring/cut rebar and the CV surface defect to determine if they meet appropriate license and code requirements.
5. Review the licensee's corrective actions, causal analysis and extent of condition associated with this event. Considerations should include:
 - Decision making
 - Design change process
 - Nonconformance assessment process
 - Use of and availability of procedures
 - Timeliness of communication with the licensee
 - Use of construction experience (internal and external)

C. Guidance

You will use Inspection Procedure 93812, "Special Inspection," for the conduct of the inspection. Your duties will be as described in Inspection Procedure 93812, where applicable to construction activities. The inspection should emphasize fact-finding in its review of the circumstances surrounding the event. Safety concerns identified that are not directly related to the event should be reported to the Region II office for appropriate action.

You will report to the site, conduct an entrance, and begin inspection no later than February 23, 2015. It is anticipated that the on-site portion of the inspection will be completed during this week. A daily status briefing of Region II management will be provided beginning the second day on-site at approximately 4:00 PM. A report documenting the results of the inspection should be issued within 45 days of the completion of the inspection. The report should address the applicable areas specified in section 3.02 of Inspection Procedure 93812. At the completion of the inspection, you should provide recommendations for improving the Construction Reactor Oversight Process inspection procedures and the Special Inspection process based on any lessons learned.

This Charter may be modified should you develop significant new information that warrants review.

cc: G. Tracy, NRO
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