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Omission of Vertical Reinforcing Steel in
Fuel Handling Building Wall 3FHW006362.5

10CFR50.55(e) Defect/Noncompliance Report
Report Number 008 WPPSS Unit 3

Summary

On October 24, 1979 concrete placement number FHW006362.5 was completed by Morrison-Knudsen. This placement is an interior shear wall in the Fuel Handling Building of Unit #3. As the vertical reinforcing steel for the next subsequent concrete placement was being set in place it was found that 194 vertical dowels had been left out of the previous placement. The responsible concrete placement contractor's Quality Control program who has the first line inspection responsibility, overlooked the 194 #11 vertical dowels which were omitted.

Description

Morrison-Knudsen, the placing contractor, has an approved concrete placing and inspection procedure #CP-11 which has a concrete placement checklist that includes verifying that all rebar is installed properly. This preplacement checklist was signed for final release but not for Reinforcing Steel QC Inspection at the time of concrete placement. However, the WPPSS/Ebasco's Concrete Tracking Record, which must be signed prior to release of concrete for placement, was signed by the contractor's foreman and QC Inspector indicating all rebar was placed correctly. The contractor could not give any definite reasons for the omission of the subject dowels, except for an error in interpretation of the drawings.

The wall in which the noncompliance occurred is a 7' 6" to 9' thick shear wall that separates the Fuel Handling Building from the Reactor Auxiliary Building. The subject dowels are 11' 0" long straight #11 bars which were to be installed with a 5' 0" embedment length below elevation 362.5 and a 6' 0" projection above elevation 362.5. This wall serves as a main load bearing shear wall. The design loads exerted on the wall are a combination of earthquake, temperature, slab, and equipment loads. The third row of reinforcing in each face from elevation 357.7 to elevation 425 is due to temperature loads exerted by the Fuel Pool starting at elevation 383. The structural integrity of the wall would have been adversely impacted had the subject dowels been omitted.

The contractor initiated a Nonconformance Report (NCR #2510) on 10/30/79 and it was transmitted to the Owner/Engineer on 10/31/79. The NCR identified the dowels which had been omitted. The applicable Engineering drawing is 3240-G-2456 R2.

Corrective
Action

The following repair operation has been performed to satisfactorily correct the condition created by the omission of the subject dowels.

1. The contractor attempted to drill 194 3 inch \pm 1/2" diameter holes 4' 6" (+6"-0") deep. These holes were drilled as close to the design location as possible. Whenever the hole could not be drilled in the specified location due to interference

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with embedded items, the alternate location was approved by the Engineer and documented. One hundred eighty-eight (188) holes were drilled successfully to the required depth. Three (3) dowels were installed to a reduced depth of approximately 30". Three (3) dowels could not be placed due to congestion of embedded rebar and conduit. All the above conditions were approved by the Engineer.

2. The holes were drilled with carbide tipped, rotohammer type drilling equipment to provide a roughened surface in the hole for bond purposes and to minimize accidental damage to embedded items. The holes were inspected by the contractor's QC and the Engineer prior to grouting to insure that no embedded items were functionally or structurally affected.
3. The dowels were then grouted into the holes using an approved proprietary (nonshrink) grout; mixed, placed, cured and tested in accordance with approved procedures and specifications.
4. The contractor is in the process of documenting the repair operation by providing the following documentation:
 - a) An as-built of the location of the 191 dowels and 3 test dowels
 - b) Inspection reports witnessing the drilling operation
 - c) Inspection reports of drilled holes
 - d) Inspection reports of the grouting of the dowels
 - e) Curing reports

The three additional test dowels were grouted in an identical method as the permanent dowels for the express purpose of performing a tensile pull test to verify that the proposed corrective action was sufficient to meet the design criteria as specified by the Design Engineer in the above stated Nonconformance Report #2510. The test dowels have been successfully pull tested to 57 Kips, 14% above the design criteria, using an approved calibrated hydraulic jacking device. No bar movement or concrete failure was detected. The design criteria of 50 Kips tensile load was provided by the Ebasco Design Engineers based on a combination of the worst possible loading conditions.

Design Engineering has provided this recommended corrective action and has evaluated and approved the methods used and the results of the pull tests.

The following action to prevent recurrence will be taken:

1. Morrison-Knudsen shall be required to change its procedures to require that all drawings applicable to concrete placements surrounding the one being checked out will be reviewed and checked for reinforcing bars and interferences which may impact the placement in question.

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2. The contractor shall be required to complete its concrete placement checklist and attach a copy to the Concrete Tracking Record prior to signing the latter.

This requirement shall be satisfied as follows:

- a) A signed-off contractor preplacement checklist shall be available for review when the final sign-off of the Owner/Engineer Tracking Record is completed.
 - b) The contractor's preplacement checklist shall remain with the contractor's copy of the Owner/Engineer's Tracking Record and be filed in the appropriate placement's permanent QA record package.
3. The contractor shall be required to provide a procedural mechanism to verify that all the required bars are installed in the correct location and manner, such as marking up a current set of rebar placing drawings by the QC inspector.
 4. Upon completion of the above three items a training session shall be conducted with the applicable personnel to assure that the actions as stated will be correctly implemented.