DETAILS I

Prepared by: s/f/ Henderson, for 7/14/76
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Reactor Technical Assistance Branch
Headquarters
date

Dates of Inspection: June 24 and 25, 1976

Location of Inspection: Bechtel Associates, Midland, Michigan

Reviewed by: s/f/ Henderson, for 7/14/76
K. V. Seyfrit, Chief
Reactor Technical Assistance Branch
Headquarters
date

The material contained in these Details applies to both Units 1 and 2, unless specifically identified with a single unit.

1. Individuals Contacted

K. D. Bettke- Consumers Power Company- QA Engineer

Bechtel Associates

R. L. Castleberry- Project Engineer
J. L. Hurley- Asst. Project Engineer
J. C. Hink- Asst. Project Engineer
C. V. Newton- Senior QA Engineer
R. P. Narang- Civil-Structural Engineering Supervisor
W. F. Holub- QA Engineer
J. C. Arora- Civil-Structural Group Leader for Aux. Bldg.
T. R. Thiruvengadam- Civil-Structural Group Leader for Contain. Bldg.
P. V. Regupathy- Civil-Structural Engineer on Aux. Bldg.
A. Almuti- Civil-Structural Engineer
A. Boos- Field Engineering

2. Purpose of Special Inspection

The review of Nonconformance Reports submitted by the licensee under the ALAB-106 Order of March 26, 1973 revealed several items related to the reinforcing steel in several locations in reinforced concrete structures. Bechtel, the licensee's architect-engineer, had completed investigation and evaluation of the nonconforming items and concluded that minor corrections were adequate or none were needed at all. The inspection was to ascertain whether the conclusions and actions taken by Bechtel did in fact maintain the margins associated with the original design criteria.

3. Conduct of the Inspection

The Bechtel resolution for each of the 16 Nonconformance Reports was reviewed during discussions with the design, quality assurance and field engineering personnel to determine whether the resolution was acceptable. Each of the items was reviewed. The comments on the items are listed below. Items "a" through "o" related to the Aux. Bldg. and Item "p" to the containment.

a. NCR C-18: Examination of Bechtel drawings C-210 and C-219 indicated that #11 bars had been required at 18" centers along a diagonal line and the fabricator's shop drawings supplied rebar for 18" ctrs. on the orthogonal. The result was that 4-#11's were omitted in the steel shipment indicating that all rebar shipped to the site for use in this area was placed. The oversight occurred in the checking of shop drawings against the engineering drawings and the fact that at this time rebar placement check-off by QA was completed from shop drawings which were to have been approved. Currently revisions are being made to the QA procedures related to rebar and concrete placement which should reduce nonconformances such as this. Since in this case the rebar spacing was excessive and 4 pieces were missing, 8 pieces were added by drilling and grouting the rebar into place with a 3' embedment. A double number was used to account for a shorter embedment. This adequately addressed the north face of the wall. The addition of 3-#11's in the south face corrected 3 missing rebars. The discrepancy in concrete cover was corrected by thickening the wall.

b. NCR-158: The missing horizontal dowels from the north and south walls were installed by drilling and grouting. The vertical dowels in the G-line header were also drilled and grouted. This adequately repaired the structure. The cause of this missing rebar was not determined but was apparently related to openings in walls.

c. NCR-172: Vertical #11 bars were noted as missing during a field inspection and repair of these 35 locations was accomplished by adding 35 drilled and grouted vertical dowels. The repair is acceptable. The cause was rebar displacement due to openings being relocated.

d. NCR-260: Some discrepancies in documenting this NCR were noted and the licensee agreed to revise and correct the NCR. The technical adequacy of the repairs completed was examined and found to be acceptable. The missing horizontal dowels were placed by drilling and grouting. It was not determined why the horizontal reinforcing steel was omitted. The repairs completed will return the structure to a condition which satisfies the original criteria.

e. NCR-290: This item involved the omission of 8-#11's at an opening and resulted from an engineering change being made which did not get incorporated into the shop drawings prior to concrete placement. Dowels were drilled and grouted into place so that adequate lap length was provided for closure of the construction opening. This item was a Drawing Change Notice which was not integrated into all drawings before placement was completed. The corrected situation will satisfy the original criteria for the structures.

f. NCR-295: Beam shear reinforcing was reduced by 50% from design by the omission of double bundles of #6 ties at 9" ctrs. the beam was originally reinforced as a normal beam was originally reinforced as a normal beam and reanalysis was completed using deep beam provision applicable to the section (2' X 8' nominal). The reanalysis indicated the as built capacity satisfied the original design conditions. The use of 2-#6's instead of 3-#8's and the lack of 4-#6's was analyzed and the conclusion reached was that no repairs were needed. The information and documentation review resolved this item satisfactorily. The cause of this nonconformance is not known.

g. NCR-296: One #8 rebar was missing and the situation was corrected by drilling and grouting a #8 dowel in place. No analysis needed in this case and the item is considered resolved since the embedment was more that adequate.

h. NCR-326: Auxiliary reinforcing in the area of the pipe tunnel wall penetration in the form of double bundles of ties were not placed. Instead single ties were placed, reducing the effective steel areas by 50%. A total of 42 ties were omitted. The cause was apparently due to detailing errors by the fabricator in preparing shop drawings from the engineering drawings. The original design of the penetration area had been based on conservative hand computations using simplifying assumptions. A reanalysis was performed modeling more exactly the actual case at hand. On the basis of the STARDYN 3 analysis the existing as-built condition meets the original design conditions. This item is considered resolved.

i. NCR-396: A total of 12-#8's were omitted from the area formed by the intersection of two orthogonal walls. Normally the duplication of the steel is not used since normal practice is to carry steel in one wall and stop the other wall's vertical steel as that wall intersects the outer face of the orthogonal wall. Consequently this omission was judged to have no detrimental effect on the structure. This item is considered closed.

j. NCR-398: A total of 20-#11 horizontal rebars were missing in 2 walls above Elevation 614' and correction was made by using equivalent steel area by use of 40-#8's since the embedment length could not be achieved through the wall thickness for #11 bars. Corrections were made by drilling and grouting bars into place. This rework brings the structure back to the condition as originally designed. Cause was not determined. This nonconformance is considered resolved.

k. NCR-135: Reinforcing steel was located too far inside outer concrete surfaces to comply with rebar placement tolerances in a wall section. A review of the design indicated the design concept was based on a shear wall system so that the location was not critical. It would only be critical if the wall were designed to resist loads as flexural member. This item is considered resolved.

l. NCR-168: Six vertical #11's were mislocated in a doorway to be built above. The corrective action was to drill and grout 3-#11's on each side of the opening. This was completed and should have no adverse effect on the structure. This item is considered resolved.

m. NCR-254: This item involved 14-#11's and there was no rework required for the same reasons as item k above.

n. NCR-256: A dowel was cut near a wall penetration and had insufficient length remaining to complete a field bend of 180° hook. Repair consisted of a bent dowel drilled and grouted into place. This item is resolved.

o. NCR-258: Three #9 bars were short and had short embedment lengths. A review of the resulting stresses in this auxiliary rebar indicated to the licensee that no repairs were needed. A review of the reduced embedment shows the structure is unaffected by this reduction. This item is resolved.

p. NCR-276: In the haunch of the reactor containment building there were 8-#11's which had portions of the embedment cut short as a result of wall penetrations. An evaluation based on the redundancy of reinforcing steel in this area of the containment indicated that the original criteria could still be met. This item is resolved.

4. General Comments

A review was made of the technical aspects of the drilling and grouting of reinforcing steel which was utilized to correct several of these non-conformances. This included a review of the diameter of holes versus

rebar diameter and the length of embedment to develop the ultimate strength of the reinforcing steel Embeco 636 grout used in this repair work has common usage for this purpose and is acceptable.

5. Summary

A review of the correction actions taken by the licensee on the non-conformances listed indicated that the structures involved will still satisfy the leading criteria specified in the SAR and that the function of these structures will be maintained during all design conditions.