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ELKE 462 File: C191
Bechtel Job No. 10466
SKUPPS Project.
Concrete Testing of KG&E
Reactor Building Base Mat

- Ref:
1. PCA letter Shideler to Phillips dated 4/19/78
 2. DIC letter Hitt to Arterburn dated 7/25/78
 3. DIC letter Hitt to Arterburn dated 10/5/78

Encl: A. NCR 1-0229-C

Dear Mr. Johnson:

At the request of KG&E, Bechtel has reviewed the studies conducted to investigate the low strength values indicated for the Wolf Creek base mat 90-day concrete cylinders (see enclosed NCR 1-0229-C). These studies successfully demonstrate the acceptability of the materials used in the mix and the in-situ strength of the base mat concrete. In summary, the studies include:

1. PCA report attached to letter Shideler to Phillips dated April 19, 1978.
 - a. PCA investigated all concrete ingredients (coarse aggregate, fine aggregate, cement, admixture). None of the ingredients were found to have any adverse properties.
 - b. PCA investigated samples of the actual concrete cylinders for the base mat and found that the concrete is of a good quality and indicated that the actual strength should be well above the 5000 psi design requirement.

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- c. PCA saw cut and tested 19 cubes from cylinders previously tested for the base mat concrete at 90 days. The cubes were representative of high and low strength cylinders. All of the cube strength results, reported as equivalent cylinder strengths by decreasing the actual cube strength 20%, showed a strength exceeding the 5000 psi design strength (Max. 7950 psi, Min. 5060 psi and Average of 5970 psi). It should be noted that the concrete had been previously stressed during testing of the cylinders, so it is probable that initial hair line cracks existed in the test cubes. Therefore, results of tested cubes are probably on the conservative side.
2. DIC report on Windsor Probe testing program attached to letter Hitt to Arterburn dated July 25, 1978.

The results of a correlation between 90 day Windsor probe tests and 90 day 6 x 12 inch cylinder tests using concrete test slabs and companion cylinders of the same mix design as the Reactor Building base mat showed that the average Windsor probe results were 678 psi higher than those of the cylinders (Windsor probe: Max. 7550 psi, Min. 7200 psi, Average 7355 psi; Cylinders: Max. 6940 psi, Min. 6550 psi, Average 6677 psi). Windsor probe results, therefore average $\frac{678 \times 100}{7355} = 9.22\%$ higher than the cylinder results.

DIC reported an average of 6495 psi (Max. 6992 psi, Min. 5916 psi) for 33 Windsor probe readings taken on the circumference of the base mat at 10 degrees intervals (3 readings not available). Applying the results of the test slabs correlation to the average Windsor probe readings taken on the base mat, the corresponding cylinder strength for the base mat concrete is estimated to be:

$$6495 \times \frac{100 - 9.22}{100} = 5896 \text{ psi}$$

3. Investigation of the testing machine performed by PCA at the request of DIC (see report attached to letter Hitt to Arterburn dated October 5, 1978) indicated that misalignment of cylinders in the testing machine or misalignment of the machine parts could reduce the test results by as much as 27 percent. For example, the studies demonstrate that if the cylinder was located beneath the center of the upper swivel head of the testing machine, the strength would be 7 1/2% higher than the indicated strength. Although test factors influenced the results, there is no way to quantify their actual effect.

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4. DIC computer output for the cylinder breaks, which is also attached to the letter Hitt to Arterburn dated October 5, 1978 indicated a trend of changing results with time between dates when the testing machine was serviced. After servicing and calibration of the machine subsequent to the base mat cylinder breaks the test results were shown to have a higher strength level and improved consistency. This indicates that the machine was a factor affecting the test results. However, the magnitude of this effect is not known.

The referenced documents discussed above demonstrate that the in-situ strength of the base mat concrete meets specification requirements and all materials used in the mix are acceptable.

Based on the above there is no material nonconformance and NCR 1-0225-C is returned since no further Bechtel action is required.

Truly yours,

J. L. Turcera

Project Engineering Manager

MAD/mcf

cc: N. A. Petrick, w/1
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