



UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 651

August 25, 1970

J. P. O'Reilly, Chief
Reactor Inspection and Enforcement Branch
Division of Compliance, Headquarters

SACRAMENTO MUNICIPAL UTILITY DISTRICT (RANCHO SECO)
DOCKET NO. 50-312

The Rancho Seco construction site was visited on July 15-17, 1970 for the purpose of conducting a routine construction inspection. Observation of concrete placement had been planned, however, this was not possible since placement was held up pending resolution of the rebar spacing nonconformance which our inspector identified. Two other items of nonconformance involving weld electrode storage and Cadweld splice tests were noted. A proposed CDW has been submitted to CO:HQ for all three items. It is our understanding that the licensee plans to take prompt corrective action on each of these deficiencies. We also feel that the separation of the inspectors from field engineering contract administration will most certainly enhance the quality control program and help to reduce these type of deficiencies.

You will note that the licensee has agreed to prepare some comparative samples of concrete for testing to demonstrate the validity of the current concrete placement test program. SMUD has not agreed to go any further than point of placement slump tests unless the comparative tests show a discrepancy. If we desire additional testing, it will require DRL correspondence with the licensee because the code in question (ASTM-C172), is permissive in this respect.

The next inspection has been scheduled for the week of September 14, 1970. Mr. W. Kelly of CO:II will assist on the inspection for the purpose of reviewing radiographs and welding of the containment liner plate.

A handwritten signature in cursive script, reading "G. S. Spencer", is positioned above the typed name.

G. S. Spencer
Senior Reactor Inspector

Enclosure:
CO Report No. 50-312/70-5
by R. T. Dodds, dtd 8/25/70

800 221 0796

J. P. O'Reilly

2

August 25, 1970

cc w/enclosure:

E. G. Case, DRS (3)

P. A. Morris, DRL

R. S. Boyd, DRL (2)

R. C. DeYoung, DRL (2)

D. J. Skovholt, DRL (3)

P. W. Howe, DRL (2)

L. Kornblith, Jr., CO

Regional Directors, CO

REG files

U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION V

Report of Inspection

CO Report No. 50-312/70-5

Licensee: Sacramento Municipal Utility District
License No. CPPR-56
Category A

Date of Inspection: July 15-17, 1970

Date of Previous Inspection: May 26 28, 1970

Inspected by:

R. T. Dodds

8/25/70

R. T. Dodds
Reactor Inspector

Reviewed by:

G. S. Spencer

8/25/70

G. S. Spencer
Senior Reactor Inspector

Proprietary Information:

None

SCOPE

Type of Facility:

Pressurized Water Reactor

Power Level:

2452 Mwt

Location:

Rancho Seco, California

Type of Inspection:

Construction Inspection

Accompanying Personnel:

None

SUMMARY

Construction Deficiencies - The following construction deficiencies were identified for which a CDN will be sent to the licensee pending review and concurrence by Compliance Headquarters.

1. Approximately 10-15 Class E6010 electrodes were found stored in a heated holding oven in direct violation of quality assurance procedures. (Section D.1.)
2. Cadweld splices were not being tested in accordance with the schedule specified in the PSAR. Also, there was a tendency to have "sister splice days" when none or very few production splices were being made. (Section E.3.)
3. The spacing of vertical reinforcing steel bars in the exterior face of the containment building wall was in variance with the physical dimensions shown on the design drawings. Spaces were observed to vary up to 36½-inches. The required spacing is 13½-inches. (Section E.1.)

Status of Previously Reported Problems

1. Although the licensee and/or his contractors have instituted strong inspection procedures to correct the previously noted deficiencies involving after hour weld material control, a similar item of nonconformance was observed during normal working hours (during the current inspection) that pointed out the possible need for issue control above and beyond inspection. (Section D.1.)
2. The Cadweld splices were now being permanently marked 12-inches from the end of the bar as a reference point to confirm proper centering of the bar ends in the splice. (Section D.2.)

Other Significant Items

1. Site construction was estimated to be on schedule with 15% completion based on the expenditure of funds. Two-thirds of the second lift (10 feet per lift) of the containment wall had been placed. The vertical portion of the liner plate was scheduled to be completed by August 10, 1970. One of the two natural draft cooling towers was almost complete (385 feet out of 425 feet). (Section B.)
2. Bechtel has been awarded the mechanical equipment installation contract. SMUD plans an early meeting with DRL to provide details of the new construction management plan. The field inspectors will now be reporting to a Chief Inspector rather than to the field engineers. (Section C.)

3. Calibration weights of the concrete batch plant have been serialized. (Section D.3.)
4. Concrete sampling and testing practices are discussed in Section E.2. Comparative tests have been planned to demonstrate the acceptability of current practices. (Section E.2.)

Management Interview - The results of the inspection were discussed with Messrs. Mattimoe, Raasch, Jackson, Hiltz, Stinchfield, Vander Knyff and McMahon. Specific comments by the licensee regarding items discussed were as follows:

1. The item of nonconformance involving weld electrode was acknowledged. While not called for by contract, issue control will be discussed with CB&I.
2. The concrete sampling technique will be evaluated. As a minimum, comparative samples will be tested to prove the validity of the current program. In the future, slump tests will be made at both truck discharge and point of placement for pumped concrete.
3. The spacing of rebar will be investigated thoroughly and action taken pursuant to an engineering directive. All nonconformance will be documented. An engineering justification report will be prepared and will be available to the Commission for review.
4. In the future, the Bechtel inspectors, rather than the subcontractor, will "call the shots" on Cadweld splice testing. The program will comply with the PSAR as amended and will follow good quality control sampling practices.
5. Mr. Mattimoe expressed the opinion that the separation of the inspectors from the field engineers may not solve all the inspection problems and may "ham string" the contractors, but SMUD needs to get "purified." Hopefully, this will be a start in the right direction.

DETAILS

A. Persons Contacted

The following personnel were contacted during the inspection:

SMUD

J. Mattimoe	- Project Manager
D. Raasch	- Project Engineer
J. Jackson	- Quality Assurance Director
J. Hiltz	- Civil Engineer

Bechtel Corporation

W. Stinchfield	- Project Manager
J. Vander Knyff	- Construction Manager
V. McMahon	- Project Quality Assurance Engineer
R. Cutler	- Manager, Civil Construction
A. Ericson	- Concrete Testing Laboratory Supervisor
E. Hadsell	- Inspector (Reinforcing Steel)
H. Davis	- Inspector (Concrete Placement)

Chicago Bridge and Iron (CB&I)

R. Childres	- Job Foreman
R. Jamison	- Welding Inspector (Supervisor)

B. Status of Construction

Site construction was estimated to be on schedule with 15% completion based on the expenditure of funds. Two-thirds of the second lift (10 feet per lift of the containment wall had been placed with the remaining pour scheduled at the time of the inspection. The containment building was estimated to be 28% complete with the liner plate for the walls scheduled to be completed within three weeks. About 385 feet of the total 425 foot height of the first of the two natural draft cooling towers had been completed.

C. Project Administration

Mr. Jackson stated that Bechtel (Vernon, California office) had been awarded the mechanical equipment installation contract. In view of the possible conflict of interest between inspection and construction, SMUD is planning to have an early meeting with the Commission (DRL) to provide details of the new management plan. One item of particular interest will be the separation of the field inspectors from the field engineers. The field inspectors will now report to a Chief Inspector who reports to the Project Manager rather than the Construction Manager.

Mr. Stinchfield has been appointed Project Manager and Mr. Vander Knyff has been made Construction Manager. Their former assignments were Construction Manager and Assistant Construction Manager respectively. As Project Manager, Mr. Stinchfield will have both inspection and construction reporting to him. However, Quality Assurance will continue to report directly to Mr. Ibsen, Start-up and Quality Assurance Manager for Bechtel, Vernon Office.

D. Previously Reported Deficiencies

Corrective action in response to deficiencies that were identified at the time of the last visit was reviewed with Mr. Jackson. Tours were also made of the construction site to observe current practices.

1. Weld Electrode Control

Following the previous inspection, the licensee was cited for failure to exercise proper electrode control practices in that 1) low hydrogen electrodes had been found stored in a cold storage bin rather than in a heated oven and 2) low hydrogen electrodes were found in an open container after work hours. Other type electrodes (E6010) were observed to have been left out overnight contrary to CB&I material control procedures.

The following corrective action was taken by the licensee and the construction subcontractor (CB&I).

- a. The construction and quality assurance supervisors have started a continuing program of discussing weld electrode control with the assistant supervisors and have been holding regular meetings with welders and other members of the construction crew in an effort to stress the importance of keeping welding materials separated and handled or stored properly at all times. The men have been advised that any further violations will subject them to discharge.
- b. All welding materials will be removed from the tank and/or scaffolding and kept stored in two separate steel tool rooms. The welding electrodes in the boxes in each of these two rooms will be kept separated by manufacturer's type and checked frequently to see that they are not mixed up or left lying around in an unworkmanlike manner.
- c. All hot rod welding electrode storage ovens will also be removed from the scaffolding and kept in these steel tool rooms.
- d. Each welder will be permitted to carry only that amount of welding electrodes, from the electrode storage room to the tank site, which he is able to carry in his electrode pouch. The welders will also be instructed to return all remaining electrodes to the proper storage cans or rod ovens at the end of the shift of work.
- e. The jobsite QA supervisor and/or his designated representative will patrol the scaffolding both inside and outside the tank each evening at, or just after, the shift change daily to make absolutely certain that no unused welding electrodes have been left scattered around loosely or otherwise on the tank site where it may be damaged by weather, etc. and erroneously used in such damaged condition.
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- f. The QA supervisor and his representative have taken the

following action to exercise control over the welding materials being used.

- (1) The box tops of electrode containers, certificates of analysis and bills of lading of all welding material are being checked upon arrival at the site to ensure that the welding materials were the types specified for the project.
- (2) They are making certain that all welding electrodes, etc. are separated into different stacks by distinct and different types of electrodes.
- (3) Welders are being instructed as to which electrodes should be used for each portion of welding.
- (4) The welders at work are being audited at least twice each day to see that they are using correct welding materials.
- (5) Work areas are policed frequently throughout the day to make sure that loose bundles of electrodes, etc. are not left lying around.

Even with this strong inspection program for material control, the inspector still observed one item of nonconformance with CB&I's QA program. Approximately 15 E6010 electrodes were observed to be stored in a heated oven on July 15, 1970 at about 1:30 p.m. This was a direct violation of Section 8.4.2 of the QA manual which states in part that "...class E7010 electrode (same class electrode as E6010) must not be stored in holding ovens..." The oven was clearly labeled with a sign stating, "7018 ROD ONLY." The welder who placed the E6010 electrode in the oven was discharged from the job the following day according to Mr. Boyd. This item was included in a proposed CDN submitted to CO:HQ.

The inspector accompanied Mr. Boyd on an after-hour tour around the containment liner on July 15. Mr. Jamison was observed to be making a "walk-down" tour around the inside and outside of the vessel liner. No discrepancies with material control procedures were observed during the inspector's tour around the inside of the liner.

2. Cadweld Splices

At the time of the last inspection, the subcontractor (Klinger Steel) had not been placing a permanent line mark 12 inches

back from the end of each reinforcing steel bar for a reference point to confirm that the bar ends were properly centered in the splice sleeve. Since then, ends of the reinforcing bars have been marked in accordance with the required specifications. Mark placement was spot checked and found to be satisfactory by the inspector during a tour of the construction site. Also, radiographs of 13 splices were checked and it was observed that all splices were centered as stated in the licensee's response to the CDN. (Section E.3. contains a different type of deficiency that was identified during the inspection.)

3. Calibration Weights for Scales

The weights that were being used to calibrate the concrete batch plant scales have now been serialized for purpose of identification.

E. Concrete - Followup Observation of Work

Followup observation of work connected with the manufacture and placement of concrete for the containment vessel walls per PI 4605.06 was one of the prime objectives of the inspection. The licensee was scheduled to place the last third of the second lift of the containment vessel wall on July 16, 1970; however, due to improper rebar spacing, the placement was delayed pending engineering disposition of the nonconformance. The following items were reviewed and discussed with the persons indicated: Preplacement QC inspections - Messrs. Davis and Cutler; Concrete Testing - Mr. Ericson; Rebar splices - Mr. Hadsell; and QC inspections - Messrs. Davis, Cutler and McMahon.

1. Preplacement QC Inspections (Rebar Spacing)

The preplacement practices and use of a checkoff list to ensure that all parties have concurred with the purposed placement is discussed in previous reports. Mr. Davis, who has the final word on preplacement, reviewed his practices with the inspector.

According to Davis, a construction print is used as a checkoff sheet to ensure that all rebar has been properly placed. The inspector, with Mr. Davis' assistance, checked rebar placement for quantity and size on the section of the containment vessel wall that was scheduled for concrete placement during the inspection. No discrepancies in size or number of bars were observed. However, the inspector noted that the rebar was not properly spaced in accordance with design requirements. Some bars were bunched together and others were far apart. When questioned Mr. Davis stated that the spacing should be 13½-inches. A walk around the containment vessel disclosed spacings up to 36½-inches apart.

Mr. Jackson, who was the inspector's continuous escort during the visit, immediately contacted Bechtel to discuss the significance of the spacing and issue a stop work order until the nonconformance had been documented and an engineering judgement rendered. As an explanation for relaxing the rebar spacing, Mr. Cutler, Manager of Civil Construction, stated that Bechtel Engineering had given them verbal relief on spacing around the tensioning system bearing plates and trumpets. However, once past these obstacles, they had neglected to bring the reinforcement spacing back into tolerance as the inspectors on the job had not been viewing spacing as a critical item.

The inspector noted that paragraph 504(b) of ACI 301, regarding bar spacing tolerance, requires that lengthwise members only have a tolerance from design specification of ± 2 inches. Regarding spacing of bars in walls and slabs, paragraph 804 of ACI-318 requires that the principal reinforcement shall be centered not farther apart than three times the wall or slab thickness nor more than 18 inches. Paragraph 5041(c) of ACI 301 states that bars may be moved as necessary to avoid interference with other embedded items. If the movement exceeds the allowable tolerances, the resulting arrangement of bars shall be subject to approval.

Since the inspection, the licensee has notified the inspector that bar placement has been documented and Bechtel Engineering has prepared a report to justify acceptance of the observed deficiencies of rebar already embedded in concrete. Mr. Jackson stated that the report would be made available to DRL for consideration.

The above item of nonconformance was included in a proposed CDN submitted to CO:HQ.

2. Slump, Strength and Entrainment Tests

The sampling practice for concrete placement was reviewed with Mr. Ericson. Some concrete had been pumped for placement inside the containment vessel for the primary shielding wall and the support structure for the reactor pressure vessel. Each batch of the pumped concrete was sampled and tested for slump at the discharge from the transporting truck. No tests of any kind were made of the pumped concrete at the point of placement. Of concrete pumped to date of inspection, the slump varied from 3.25-3.50 inches. No pumped concrete has been planned for the containment vessel walls.

The slump tests at the point of placement are considered a QC measure. However any concrete that exceeded the specified limit of 3.5 inches was rejected. Concrete for slump, strength and air

entrainment testing is primarily obtained at the batch plant. The samples are normally taken from the center portion of the batch during discharge to the conveying trucks. Control charts show the concrete manufactured to date to be of high quality and meeting the specified limits.

The failure to take strength tests of the concrete from the discharge end of the pumping equipment was cited as a deviation from Paragraph 1602 (a) 4.2. of ACI 301. Mr. Hiltz pointed out that Section 5.1.3.1. of the PSAR stated that concrete will be sampled in accordance with ASTM C-172, not ACI 301. After considerable discussion, Mr. Ericson volunteered to take point-of-placement samples to confirm the validity of the sampling technique. Also, he stated that slump tests would be taken at point of placement for all pumped concrete. This procedure was also volunteered by SMUD during the Management Interview.

3. Rebar Splices

The making of #18 and #14 rebar Cadweld splices was observed. It appeared that the splices were being made in conformance with the procedure specifications contained in Section 4.0 of Appendix 5C of the PSAR. A Bechtel Inspector was noted to be observing the splicing operation.

Discussion with Mr. Hadsell (Cadweld Inspector) disclosed that personnel of Klinger Steel, and not the inspector, determine when and what sister splices will be made. Section 5.0 of Appendix 5C to the PSAR requires that selected splices or "sister splices" shall be tensile tested for each position, bar size and grade of bar in accordance with the following schedule: "...3 out of the next and subsequent units of 100 splices." A check of the splice manufacturing records disclosed the following discrepancies with the sister splice program for the containment vessel wall:

<u>Period</u>	<u>Bar Size</u>	<u>Position</u>	<u>No. Splices</u>	<u>No. Test Splices</u>
5/8-6/17/70	14	Horizontal	138	2
6/11-7/14/70	14-18	Vertical	125	1
5/5-7/15/70	18	Horizontal	150	1
6/11-7/14/70	18	Vertical	193	3

In addition to the above discrepancies, it was observed that there has been a tendency to have sister splice days. For example, on February 3, 1970, a total of 15 sister splices (12 vertical and 3 horizontal - #18 rebar) were made without a single interim production splice. Another example would be during the period of April 28 - May 1, 1970 (four splice production days) when 124 production splices and 6 sister splices were made. Of the 6 sister splices 3 were made in one day when only 11 production splices were made.

The failure to comply with the splice program as outlined in Appendix 5C of the PSAR was included in the CDN.

The results of tensile tests of Cadweld splices (83 tests) were reviewed. Only one of the tests was a production splice, all the rest were sister splices or operator qualification tests. The specimens tested had tensile strengths of 92,880 - 110,890 psi. These values meet the minimum acceptable tensile strength limit of 75,000 psi and the average limit of at least 90,000 psi.

F. Pretressed Concrete - Followup Observation of Work

The inspector observed that the proper placement of tendon sheaths and anchorages was being checked by surveyors in preparation for concrete placement. Construction prints were being used as a guide and checkoff sheet. No other items relating to PI 4705.06 were checked at this time since concrete was not placed during the visit.

G. Miscellaneous Items

The following miscellaneous items were reviewed during the inspection.

1. Quality Assurance Audit Reports

Over 20 audits have been made by Bechtel QA engineers and SMUD's QA Director since the last inspection. In a majority of cases, no discrepancies were identified. In the others, corrective action was taken or planned on all deficiencies noted by the auditors. In the inspectors opinion, no items requiring Commission review were identified.

2. Nonconforming Reports

All nonconforming reports generated since the previous visit were reviewed. It appeared to the inspector that the nonconforming reports were being used as a strong quality control measure. No apparent items necessitating Commission review were identified by the inspector.

3. Configuration Control Document Files

From a review of the "Configuration Control Document" files, it appeared that both Bechtel Engineering and Field Engineering were following the Configuration Control QA procedures.