

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

Report of Inspection
CO Report No. 50-302/69-2

Licensee: Florida Power Corporation
License No. CPPR-51
Category A

Date of Inspection: April 17-18, 1969

Date of Previous Inspection: January 23-24, 1969

Inspected By: J. C. Bryant 4/30/69
J. C. Bryant, Reactor Inspector (Date)

Reviewed By: W. C. Seidle 5/1/69
W. C. Seidle, Senior Reactor Inspector (Date)

Proprietary Information: None

SCOPE

A routine announced inspection was made of Crystal River Unit 3, an 855 Mwe pressurized water reactor under construction near Crystal River, Florida.

SUMMARY

Safety Items - None

Noncompliance Items - None

Status of Previously Reported Problems - None

Other Significant Problems - None

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Management Interview - The exit interview was held with Bennett, and the following items were discussed:

1. Site Preparation

Bennett felt that the overall construction schedule would not be affected by eroded areas found in foundation rock (see Section B). ✓

2. Backfill

When asked what action would be taken as a result of low compressive strength of backfill concrete, Bennett replied that it would be justified in the FSAR (see Section C).

3. Batch Plant

Bennett expects difficulties to be eliminated by the time structural placements begin (see Section E).

4. Quality Assurance

The inspector emphasized to Bennett the need of having required quality control measures specified in contracts. Bennett produced documents from Chicago Bridge and Iron, who will fabricate the containment lines, detailing QC measures. The inspector pointed out that no mention was made of control of the low hydrogen electrodes specified. Bennett stated that the documents had not been accepted, and that he would make this addition.

DETAILS

A. Persons Contacted:

- H. L. Bennett, Florida Power Corporation, Construction Manager
- W. R. Zimmerman, Florida Power Corporation, Assistant Construction Manager
- E. E. Froats, Florida Power Corporation, Quality Supervisor
- C. Pachos, Florida Power Corporation, Structural Construction Supervisor
- E. P. Shows, J. A. Jones Construction Company, Construction Manager
- R. Fleck, Gilbert Associates, Inc., Resident QA Engineer
- J. Harris, Gilbert Associates, Inc., Geologist
- R. Boyd, Consulting Geologist to Gilbert Associates
- W. Hurst, Pittsburgh Testing Laboratory, Resident QC Chief Inspector
- R. Parrish, Florida Board of Conservation
- J. Moore, Florida Board of Conservation

B. Site Preparation - Excavation

The method of site preparation, as described in CO Report No. 50-302/69-1 is to excavate to competent rock then backfill with a lean (1500 psi) concrete mix to form the foundation for base mat construction. Backfilling has been delayed somewhat by the discovery of weathered areas adjacent to fissures in the rock. The areas were determined by passing a Vibrapaktor over the exposed limerock surface. All soft areas found have been excavated and either grouted or filled with lean concrete, depending on the size of the area.

Discovery of these soft spots has resulted in additional coring in areas still to be excavated to provide more precise planning of work. The inspector asked Bennett, Shows, Harris, and Boyd if this discovery created any doubts as to the competence of the foundation. Each expressed confidence that the only effect it would have would be to create more work and delay, and that the methods of excavation, backfill, and grouting are sound.

Shows
Harris
Boyd
Bennett

Some difficulty is being experienced with water coming through the grout curtain in the area of excavation for the sea water service sump. Pachos feels that this may necessitate the use, to some extent, of compacted, grouted rock fill, prior to placement of concrete fill.

C. Site Preparation - Backfill

Difficulties have been encountered with compressive strength of the lean concrete used for backfill. Florida Power Corporation (FPC) specifications call for all concrete to conform to ASTM C150 for Type II, moderate heat of hydration cement. ASTM C150 states that if moderate heat of hydration is required and tests for heat of hydration are not specified, the sum of tricalcium silicate and tricalcium aluminate shall not exceed 58%. Florida Portland Cement Company, the vendor, supplies a commercial Type II which exceeds this value and a moderate heat Type II which does not.

Florida Portland Cement Company furnished commercial type for the design mixes and for the first concrete placed which went into the mud sill under the tendon gallery. ICA Engineering Testing Company analyzed the cement, and reported as conforming to ASTM 150 Type II, and FPC personnel noted that the 58% value for moderate heat was exceeded.

When the discrepancy was noted, the proper cement was substituted. Concrete placed for the lower part of the containment backfill

conformed to the specifications for moderate heat. Twenty-eight-day break tests for this lot averaged 1503 psi with a low previous five average of 1255 psi, and with 52.7% breaking below 1500 psi. It was then decided to return to the commercial type for the remainder of the backfill. This concrete averaged, for 28-day tests, 2036 psi, and with no cylinders breaking under 1500 psi.

Note: ASTM C150 Table II, Note "e" states that when moderate heat of hydration is required, the strength requirements of mortar test cubes should be 80% of the values listed in the tables for Type II.

Bennett was asked what action would be taken concerning the low 28-day strength of the concrete. He said that Gilbert Associates, Inc. was preparing justification for the FSAR, and that no action would be taken. He pointed out that the design load of the containment building was 16,000 psf, which gives a safety factor of 10 using the 1255 psi value of the low previous five average. The inspector offered no objection to this, but pointed out the need for quality vigilance, since the Law report was available before the first concrete was placed.

Bennett was asked what cement would be used for construction. He replied that only Type II moderate heat would be used, and that new mixes were being designed using the correct cement.

D. Quality Control

1. Personnel

The quality assurance organization onsite has Froats with the title of Quality Supervisor; Fleck is the Gilbert Associates' resident quality assurance engineer whose mission is to audit quality control; Hurst is Pittsburgh Testing Laboratory's (PTL) resident chief inspector who actually supervises quality control. Hurst has five resident inspectors, and at the time of this visit had two temporary inspectors from the Tampa office. According to Froats, Hurst has on call as many inspectors as may be needed.

2. Observation of Performance

The inspector observed part of a 200 yard concrete placement. Slump, air entrainment, temperature, and revolutions were checked on each truck at the site, and no concrete was placed from the truck until approved by PTL. The first two loads were stiff and had water added at the site after slump and batch records were checked. Hurst stated that PTL and

the batch plant operator had obtained different values for moisture of the aggregate that day, and he then ordered the batch plant operator to use the PTL moisture values. Subsequent loads had the desired slump. Hurst also ordered that one truck not be used again at the site, since, as he informed the AEC inspector, the blades were worn and he considered the truck unreliable.

3. Placement Records

An examination of Froats' records revealed the following on each placement:

- a. A drawing showing the exact location of the placement.
- b. A pour slip with all applicable signatures, description of placement, and drawing reference.
- c. A PTL report of batch plant operations for the placement with specifications, source of materials, design sieve analysis, moisture, batch weights, and other batch information.
- d. A PTL gradation analysis for aggregate actually used.
- e. PTL onsite reports for each truck.
- f. PTL daily record of batch plant control giving ingredient weights and time on each batch, and cause for rejection when applicable. Records for each placement were together and easily recoverable.

4. Testing

A concrete block building of approximately 3000 square feet was built to house PTL facilities. PTL is equipped for sieve analysis of fine and course aggregates and for cylinder breaking. They are also capable of chemical analysis should FPC desire it. A decision has not been reached about rebar testing, but equipment may be added at the site to do this. All equipment appeared to be in good condition, and calibration records on scales were up to date.

E. Batch Plant Operation

Westcoast Concrete Company has had some difficulties in beginning operations. The earlier difficulties were due, primarily, to

getting accustomed to the new plant. Difficulties were encountered at first in getting the desired slump in the lean concrete without exceeding the allowable water-cement ratio. This was overcome by obtaining permission to increase the amount of cement, thus allowing more water to be used. Westcoast has rented delivery equipment from two other concrete vendors. This equipment was inspected by PTL and FPC.

The PTL temporary inspectors were brought onsite due to the breakdown of Westcoast Concrete's quality control. Records showed that on April 12, 48 yards (6 loads) of concrete were rejected. Three were rejected for excessive slump, and the other three because of appearance, even though air entrainment, slump, and batch plant records were all right. Investigation revealed that a new materials man at the plant had loaded sand into a coarse aggregate hopper and vice versa. The new man was there since the experienced man was fired the previous day for refusing to work on Saturday. As a result of this, PTL put two inspectors at the batch plant. Bennett stated that he had just taken the batch plant manager to task, and insisted that he pay more if necessary to obtain better workers.

F. Construction Status

Zimmerman gave the following tentative schedule:

Consolidation grouting of subsurface rock using a 25% concrete, 20% fly ash, and 55% limerock flour mix should begin April 28.

Tendon gallery walls should be placed in September, the base mat for containment in October, and the bottom liner plate in December.

G. Environmental Survey

The Florida Board of Conservation has two men at the site who have been in residence since January 1969. These men, R. Parrish and J. Moore, had numerous samples of sea creatures taken from the Gulf of Mexico up to 13 miles from the plant effluent. Parrish expressed regret that surveys had not begun before Crystal River Unit 1, a 350 Mwe coal-fired unit, became operational. He said that extensive surveys would be conducted at present and in the future as Unit 2, 500 Mwe coal fired, and Unit 3 become operational.