OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27
5010-107

PDR

UNITED STATES GOVERNMENT

Memorandum

TO : The Files
THRU: Roger S. Boyd, Chief
Research & Power Reactor Safety Branch, DRL

DATE: MAR 8 1967

FROM : W. Jensen
Research & Power Reactor Safety Branch, DRL

SUBJECT: REGULATORY STAFF AND ACRS SUB-COMMITTEE MEETINGS CONCERNING THE MONTICELLO NUCLEAR UNIT NO. 1 VESSEL FABRICATION

50-263

On February 2, 1967, a meeting was held to discuss the field erection of the primary vessel of Monticello Nuclear Station in anticipation of a meeting with the ACRS Sub-committee on February 3. Groups represented were:

AEC - DRL	AEC - SS	AEC - Chicago Operations Office
R. S. Boyd	A. Holt	G. W. Reinmuth
D. R. Muller	M. Bolotsky	J. G. Condelos
B. Grimes		
J. J. Shea		
P. Check		
M. A. Taylor		

NSP	CB&I	GE
D. F. McElroy	James T. Dunn	Jules Pearlman
Roland Jensen	Perry C. Arnold	J. B. Violette
Arthur Dienhart	Olof B. Johnson	Adolph Hubbard
Gerald Neils	Karl Krasin	I. R. Kobsa
E. C. Ward	Edward E. Varnum	J. J. Fox
Donald E. Nelson		

Parameter, Inc., for DRL	Shaw-Pittman for NSP
R. A. Lofy	G. Charnoff
W. J. Foley	
J. J. Chyle	

We had presented the applicant with a list of items requiring clarification. These were discussed as follows:

1. Macro Specimen Testing

Macro specimens will be fabricated of the vessel plate and welds and tested for mechanical properties by Charpy and tensil tests. The staff suggested that micro etch examinations also be made to identify segregation in the plate. CB&I, however, stated that the mechanical properties

alone should be adequate. To permit our further evaluation of possible local deviations in properties of the vessel from the macro specimen properties, the applicant agreed to supply our consultants with the properties of the weld heat affected zone as a function of electrode current and to supply additional data of macro specimen testing.

2. Charpy Test Quality

To substantiate the quality of the Charpy tests made on test specimens, CB&I stated that every six months their test equipment is qualified by Watertown Arsenal and that new equipment will be qualified before it is put into service. General Electric also checks all notches on all specimens for proper radius. We believe the quality of the test equipment and samples will be adequate but believe that more information should be provided to support the applicant's view that Charpy transition temperature curves for each material heat are not needed.

3. Chemical Analysis

Although the ASME Code requires a chemical analysis of the reactor vessel material and such tests are planned by CB&I, these tests do not show the local concentration of these materials. For example, soluble aluminum maldistributions can alter the strain aging properties of the steel. We therefore believe that more information concerning the extent of spectrographic analysis of the vessel plate material should be provided to permit us to determine if additional analysis supplemented by a gas analysis of at least some of the plates is necessary.

4. Recirculation Nozzle Location

CB&I described the revised recirculation outlet nozzle design which will permit the nozzles to be shop-installed and still leave ample room to weld the adjacent girth seam. The outside diameter of the nozzle forging has been decreased by four inches and the center line has been raised nine inches which provides a total clearance of fifteen inches to the girth weld below. The NPSH to the recirculation pumps will be reduced by only 3/4 feet from 325 feet. It was also stated that with the exception of the instrument penetrations, all nozzles will be butt-welded.

5. Vessel Orientation

Since an exact vertical orientation is vital to control rod operation and to weight distributions in the vessel internal structures, CB&I was asked to describe the methods by which the vessel centerline will be established and maintained throughout erection. This procedure is as follows: An optical theodolite will be beamed through the center-drive penetration in the bottom head, the top of the knuckle piece will be leveled, and the control rod drive penetrations bored vertically using

templates above and below the bottom head. Each additional ring will be centered optically and leveled. Smooth fit-up will be achieved by grinding high spots or building up low spots with weld beads.

6. Vessel Section Fit-up

Since flat spots in the vessel caused by poor fit-up will be susceptible to radiation damage, the staff requested the procedure which would be followed in the event of mismatch. CB&I stated that the maximum permissible misalignment will be 3/8" for vertical seams and 3/4" for girth seams. Sections which do not meet these specifications will be forced into tolerance using jacks. One such jacking operation was performed on the Philadelphia Hydrocracker with a 200-ton jack.

7. Vessel Instrumentation

During the vessel hydro tests, strain gages will not be utilized. CB&I does not believe they will be necessary since similar vessels have been so instrumented in the past to prove out the analytical methods. We suggested that a means be made to monitor the vessel dimensions in service. It is expected that lifetime inspectability will be covered at a later time.

8. Material Testing Records

We presented our opinion that the vessel quality could be improved if the CB&I design analyst were supplied with the test data of the vessel material so that plate with the least flaws could be placed in higher stress locations. We, therefore, questioned the extent of material testing records and the extent to which the analyst will be supplied with this data. It appears now that only mechanical specimen test data could be used in this manner. However, the degree that this information will be used in determining the plate location was not made clear. Flaws found by UT, dye penetrant, and magnetic particle testing will be manually logged and recorded permanently only if repair is necessary.

9. Field Radiography

Only CO^{60} radiography is to be used on field welds. This method was stated to be capable of resolutions to 1/2 the ASME Code penetrometer diameter of 160 mils. The penetrometer used in the field will have holes 2, 3, and 4 times the specified penetrometer sensitivity of 1% (60 mils). The penetrometer thickness will be 60 mils. Betatrons have exhibited the ability to detect cracks down to 2 mils thickness. CB&I believes that its ultrasonic inspection program will be adequate to detect cracks with the sensitivity of the Betatron and use of the Betatron would create an undue hardship on the vessel erection.

ACRS Sub-Committee Meeting

The following ACRS members compose the Sub-committee to review the Monticello Plant:

Dr. S. H. Hanauer	Dr. S. H. Bush
Dr. C. W. Zabel	Mr. H. Etherington
Dr. J. E. McKee	Mr. H. G. Mangelsdorf

The following information which was not discussed at the meeting with the staff was brought out in the applicant's presentations and Sub-committee questions:

The 3000-ton press will be used to form all vessel sections since the 6000-ton press may not be operational in time. Due to the lower capability of the smaller press, some vessel sections may be pressed hot. This is common practice, however, with other vessel manufacturers.

All vessel welds will be post weld heat treated at 1150°F. The ASME Code would allow a 150° tolerance around this temperature. CB&I will place a tolerance of +25°F and -50°F resulting in one-half the Code tolerance. The vessel steel can withstand at least 50 hours at 1150°F without loss of properties and records of the heating history of each plate will be maintained throughout the fabrication.

Flaws in the plate will be ground out and repaired only by CB&I in their Birmingham shop after evaluation by CB&I and GE. Ultrasonic inspections beyond the Code requirements will be used to inspect plates at the Lukens Steel Company Mill and at the CB&I shop.

The reactor primary piping will be tested with the vessel to only 1.25 times design pressure instead of 1.5 times design pressure as required by the Code for the primary piping alone.

Distribution:
~~Docket Case~~
D. Muller
J. Shea
B. Grimes
W. Jensen
DRL Reading
R&PRSB Reading