



MISSISSIPPI POWER & LIGHT COMPANY

Helping Build Mississippi

P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

JAMES P. McGAUGHY, JR.
ASSISTANT VICE PRESIDENT

May 29, 1981



Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 3100
Atlanta, Georgia 30303

Attention: Mr. J. P. O'Reilly, Director

Dear Mr. O'Reilly:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416/417
File 0260/15525/15526
PRD-80/28, Final Report, NSSS
Radiograph Noncompliance to Code
Requirements
AECM-81/157

References: 1) AECM-80/134, 6/20/80
2) AECM-80/261, 10/20/80

On May 22, 1980, Mississippi Power & Light Company notified Mr. M. Hunt, of your office, of a Potentially Reportable Deficiency (PRD) at the Grand Gulf Nuclear Station (GGNS) construction site. The deficiency concerns the failure of radiographs, supplied by subcontractors to our NSSS vendor, to meet ASME Code requirements. This report was originally due on May 7, 1981, but extensions were obtained until May 29, 1981, during telephone conversations with your Mr. P. Taylor on May 7, 1981, and Mr. Zajac on May 22, 1981.

Our investigation of this deficiency has been completed. We have determined that, although certain radiographs do not meet the ASME Code requirements, there would be no adverse effects on safety. Thus, the deficiency is not reportable within the meaning of 10CFR50.55(e). Our final report is submitted as Attachment A to this report.

Additionally, during a meeting in Atlanta, MP&L committed to provide information with respect to the NRC open item pertaining to Dikkers Radiographs. This information is submitted as Attachment B to this letter.

Yours truly,

J. P. McGaughy, Jr.

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Attachment A: Review of NSSS Radiographic Film except Dikkers
B: Review of Dikkers Radiographic Film

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. O'Reilly

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. N. L. Stampley
. R. B. McGehee
. T. B. Conner

. Victor Stello, Director
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

. G. B. Taylor
South Miss. Electric Power Association
P.O. Box 1589
Nattiesburg, MS 39401

bcc: Dr. D. C. Gibbs
Mr. D. C. Lutken
Mr. J. N. Ward
Mr. W. A. Braun
Mr. R. Trickovic
Mr. J. W. Yelverton
Mr. L. F. Dale
Mr. C. K. McCoy
Mr. T. H. Cloninger
Mr. R. A. Ambrosino
Mr. R. C. Fron
Mr. G. B. Rogers
Mr. M. R. Williams
Mr. L. E. Ruhland
Mr. D. L. Hunt
Mr. A. G. Wagner
Mr. P. A. Taylor
PRD File
File

FINAL REPORT FOR PRD-80/28
(Review of NSSS Radiographic Film except Dikkers)

I. Description of the Deficiency

Two (2) NRC inspections (416/79-23 and 416/79-34) identified various radiographic technique discrepancies with respect to non-destructive examination of components provided by two (2) sub-suppliers (Dikkers Valves and Associated Pipe) of NSSS equipment/components. As a result, MP&L commissioned Bechtel to review, for radiographic technique, ten percent (10%) of the radiographs provided by all NSSS sub-suppliers except for the two aforementioned sub-suppliers previously cited. This review included 14 additional sub-suppliers who had provided a total of 7,961 radiographic films as of February 13, 1980. Information relative to Associated Pipe was previously submitted by AECM-80/67, April 4, 1980 in response to NRC Infracation Item 79-34-01.

The review was performed to the applicable edition and addenda of the ASME Code as noted on the Code Data Report. It encompassed radiographic density, selection of penetrameters, penetrameter sensitivity, number of penetrameters and completeness of coverage.

The review resulted in the identification of nine (9) sub-suppliers whose radiographs failed to meet ASME Code requirements.

II. Analysis of Safety Impl'ations

Due to the nature of the discrepancies, a review of 100% of onsite radiographic film provided by NSSS sub-suppliers for Unit 1, with the exception of Dikkers Valves, was conducted. This film represented pipe spools, pumps, valves, and associated components. The review consisted of approximately 10,276 film locations, which includes those provided by Associated Pipe, and revealed approximately 1,424 deficiencies. These deficiencies can be categorized as follows:

<u>Category</u>	<u>Total Deficiency</u>	<u>Deficiency</u>
Density	821	Densities exceed limitations specified by code.
Documentation	72	Material thickness mis-stated and/or radiographic technique indicated on reader sheet is different from technique used.
Penetrameters	97	Incorrect size, inadequate sensitivity, or shim in the area of interest.

<u>Category</u>	<u>Total Deficiency</u>	<u>Deficiency</u>
Penetrameter/ Documentation	434	Combination of the deficiencies as noted above for the separate category but not readily discernible.

The 821 film locations with deficiencies in density have been determined readable. Even though the radiographs do not meet code requirements, by varying the lighting intensity, in and out movement of radiographs, composite or triple viewing of film, overlapping film, performance of ultrasonic examination or viewing component end prep areas on installation welds, we have verified defect free components.

Documentation errors were identified on 72 film locations. These resulted because the radiographic technique indicated on the radiographic reader sheet was different than the technique actually used or incorrect material thickness was recorded. Through measurement of penetrameter images on the film and ultrasonic thickness examinations, we are confident that acceptable techniques were employed and incorrect documentation related to radiographic technique will not affect material quality.

The 531 deficiencies categorized as either penetrameter (97) or penetrameter/documentation (434) errors have been determined to be satisfactory. Information supplied by the vendor confirms that minimum wall thickness was recorded on the radiographic reader sheet in lieu of the actual material thickness and that the penetrameter selection was based on actual material thickness plus clad thickness at the time of radiography. We believe that correct penetrameters were used and that the material thickness was incorrectly recorded on reader sheets. To confirm this assumption, MP&L calculated the equivalent penetrameter sensitivity as specified in ASME V, Article 22. Minimum wall thickness, and required penetrameter/"T"-hole versus actual penetrameter/"T"-hole were used in the computations. All discrepant film has sensitivity that exceeds code requirement. The clad pipe ends also received a 100% ultrasonic examination and a liquid penetrant examination of each weld layer at the time of cladding. Satisfactory equivalent penetrameter sensitivity calculations were also performed on other systems where utilization of incorrect penetrameter was indicated.

The chain of events which lead to MP&L final acceptance of the above items are as follows:

- o MP&L contracted Nondestructive Testing Engineering Division, Hartford Steam Boiler Inspection, to perform a 100% review of all on site G.E. supplied film for Unit I. The review was conducted by a team of four reviewers, one certified Level III and three certified Level II interpreters.

- o Each radiograph was reviewed and the results documented on data sheets. This team documented every noncompliance, no matter how minor. An example of this level of documentation is: densities were recorded as 1.98 where the required minimum is 2.0, and densities of 4.01, where the maximum required is 4.0. MP&L believes that these radiographs have been reviewed more stringently than any radiographs at existing nuclear sites.
- o On completion of this review, MP&L acquired the services of two recognized consultants in the field of radiography: Mr. Sam Wenk, Institute Engineer with Southwest Research Institute and Mr. Charles Hellier, General Manager of the Nondestructive Test Engineering of Hartford Boiler Inspection. MP&L Quality Assurance assigned Mr. James Kelley, from our QA Staff, to coordinate the effort. Mr. Kelley has extensive experience in radiography.
- o These individuals reviewed each potential problem that had been identified by the review team and recommended a disposition to each concern. Many of the recommended dispositions were based on the premise that certain radiographs, although not meeting each requirement of the code, were interpretable and could be used to assure the integrity of the component. When the variety of the components is considered, the difficulty of this task is evident. The manufacturer who originally reviewed the radiographs was familiar with the configuration of the component and also had the component in an unassembled state to visually inspect. This would have allowed the immediate visual verification of any questionable indications found by the reader. For example, Main Steam Isolation Valve film revealed what appeared to be linear anomalies which proved to be only "mold marks" when the valves were physically inspected by our team. In the majority of cases, the manufacturer's interpretations were substantiated after reviewing drawings and visually inspecting the items. This is why "lack of adequate information on the reader sheet" was identified as a category of deficiency. In many instances, the original reviewer was satisfied as to the identification of an indication and accepted the radiography, without documenting the rationale for accepting the film.
- o As MP&L attempted to clarify the limits of acceptability for densities, a review of alternate codes revealed quite a variance as to the limits industry has determined to be acceptable. For instance, for piping, whereas ASME Section III requires a density range between 2.0 and 4.0, ANSI B31.1 allows a range from 1.3 to 4.0, and older editions of Navships 250-1500-1 allowed a range from 1.5 to 3.3. Again, we reiterate that the review of radiographs is subjective and dependent upon the experience and knowledge of the process, and of the reviewer. MP&L did not set acceptable or rejectable limits for density. The team reviewed each radiograph which was noted to be outside the code limit and judged its acceptability. The recommended resolution to each problem was then documented and dispositioned.

MP&L is not trying to infer that there should not be adherence to the ASME Code; rather, we are postulating that radiographs of certain components, such as pump and valve castings, are many times impractical, if not impossible, to radiograph and meet all aspects of the code due to the configuration of the component. The ASME Code, Figure NX2573.1-1, allows discretion in these areas, but for many of the components installed at Grand Gulf, radiographs were provided covering the total area of the components. In these areas some discerning judgement must be exercised in determining acceptability.

Detailed documentation is available to justify MP&L's acceptance of the radiographs in question.

III. Corrective Actions Taken

In addition to the actions noted above pertaining to Unit 1, MP&L intends to provide an additional confidence level in the adequacy of radiography for Grand Gulf, by subjecting a sampling of Unit 2 film to a similar review. The review of Unit 2 Film will include any new suppliers who had not previously supplied components for Unit 1.

Inspection Item 79-23-01
(Review Dikkers Valves Radiographic Film)

Corrective Steps Taken and Results Achieved

1. G.E. contracted the Nuclear Engineering Service Company to perform a 100 percent review of GGNS Unit I and Unit II safety relief valves (SRVs) manufactured by Dikkers Valve Company. The 100 percent film review confirmed that the radiographic quality level was adequate for film interpretation and, in many instances, exceeded code requirements. The radiographs did not reveal any unacceptable discontinuities and all film was readable for defect evaluation.
2. To satisfy questions relating to the dark density area of the inlet flange, re-radiography was performed on areas (3-4-5) and (10-x-y) for each Unit I SRV valve. This re-radiography was performed for information only to provide an additional level of confidence and did not reveal any unacceptable discontinuities. This re-radiography substantiated GE's statement that the valves were sound in the heavy banded area.
3. As part of the original GE procurement documents, all valves were subjected to a 1.5X design pressure hydrostatic test and performance verification test under full steam and flow conditions. Each valve was determined operable and structural integrity was sound.
4. The raised adjusting bolt pads on approximately 80 valve bodies, similar to those used at GGNS, were re-radiographed by the Dikkers Valve Company. This re-radiography did not reveal any unacceptable discontinuities and confirmed that the material casting process is sound. This leads to the conclusion that the valves supplied for use at GGNS are also sound.
5. Stress was calculated for GGNS Unit I, II and spare safety relief valves. There was no indication of any region with excessive stress or inadequate thickness. In general, the stresses are well below the prescribed code limits. For example, the calculated body wall thickness is 0.63 inch, whereas the actual minimum wall thickness is 1.1 inches. The primary stress at the crotch between inlet and outlet is 3,493 PSI, comparing to a code allowable of 18,900 PSI. The primary stress at the crotch between bonnet and outlet is 4,524 PSI comparing to a code allowable of 18,900 PSI. This demonstrates that there is significant excess margin in the valve design.
6. Where radiographs display density variations out of specification limits, the location on the casting is that of substantial extra thickness or of rapidly changing cross section.
7. MP&L contracted Mr. Sam Wenk (Southwest Research Institute) to review a sampling of Dikker Valve radiographs. Mr. Wenk is a certified ASNT Level III Radiographic examiner. Mr. Wenk and an MP&L representative previously certified as an ASNT Level III Radiographic examiner, reviewed 100% of the

radiographs on nine SRVs. Additionally, they reviewed all the areas of the valves cited in NRC inspection report number 416/79-23. From this review, they concluded that all the reviewed radiographs were readable for defect evaluation and all components reviewed were defect free.

8. Two NRC Inspectors, Mr. S. A. Wenk, and an MP&L representative reviewed 100 percent of the radiographs for one Dikkers SRV. They concluded that the radiographs were readable for defect evaluation and in some instances had a quality level of 2-IT sensitivity. The samplings listed in paragraphs 7 and 8 represent more than 20 percent of all GGNS Unit I, II and spare Dikker SRV radiographs.
9. MP&L acknowledges that the Dikkers valves do not meet all code requirements relating to radiography, particularly in areas where the casting is of substantial extra thickness or rapidly changing cross sections. Investigations made and actions taken clearly establish that no rejectable material discontinuities exist in the GGNS Dikkers safety relief valves. The anomalies existing in the radiographic film will not affect safety.

Actions Taken to Prevent Recurrence

All Dikkers radiographs for GGNS Unit 1 & 2 valves have been received on site. Should additional radiographs be received from Dikkers in the future, MP&L intends to review a sampling of the item. GE has reported the following corrective actions to MP&L:

1. Dikkers Valve Company has upgraded its QA and radiographic program to the satisfaction of NRC vendor compliance inspector.
2. GE held a training seminar and instructed 45 GE quality assurance field representatives on the QC requirements, including the interpretation of radiographs and code requirements. Also, GE imposed densitometer scanning requirements for radiography density upon GE's vendors on new purchase orders.