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IE BULLETIN 79-14
SAFETY RELATED PIPING SYSTEMS
PHASE 2
ACCESSIBLE PIPING
INSPECTION REPORT
MONTICELLO NUCLEAR
GENERATING PLANT

Prepared for:
Northern States Power Company

Prepared by:
NUTECH

Prepared by:

Thomas N. Vogel

T. N. Vogel, P.E.

Approved and Issued by:

D. K. McWilliams for

A. B. Higginbotham, P.E.

Checked by:

D. K. McWilliams

D. K. McWilliams, P.E.

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Phase 2 Accessible Piping Inspection Report
Monticello Nuclear Generation Plant

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PREFACE

On July 2, 1979, the United States Nuclear Regulatory Commission issued IE Bulletin 79-14, "Seismic Analysis for As-Built Safety Related Piping Systems". The issue addressed in the Bulletin is that input used for seismic analysis of safety-related piping systems may not be representative of the as-built configuration. The Bulletin requires that each utility compare the as-built configuration of the piping systems to the input information used for the seismic analyses. All nonconformances that are identified in the inspection must be evaluated for their effects on system operability.

The inspections of the piping systems are being performed in two phases. The Phase 1 inspection covers one system in each set of redundant, normally accessible systems and all non-redundant accessible systems. The remaining redundant systems and the inaccessible systems are being inspected in Phase 2.

A summary report for the Phase 1 inspections for the Monticello Nuclear Generating Plant was issued on September 21, 1979. The purpose of this document is to present the results of the inspections of the Phase 2 accessible piping systems at the plant. The Phase 2 inaccessible systems will be covered in a subsequent inspection report.

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1.0 INTRODUCTION

Recently, the United States Nuclear Regulatory Commission (NRC) identified a series of generic issues which could potentially cause the seismic analysis of safety-related piping systems to yield inaccurate results. One of these issues involves the correlation of the as-built piping configuration and the information used for the seismic analysis of the piping system.

Due to this concern the NRC published IE Bulletin 79-14 (Reference 1), and the subsequent supplements to the Bulletin (Reference 2), which require that an inspection be conducted to verify that the input information for the seismic analysis of safety-related piping systems reflect as-built configurations. Further, the Bulletin requires that, where deviations are found, the licensee must consider the need to reevaluate the seismic analysis to the as-built configuration or modify the hardware.

On July 31, 1979, an Inspection Plan (Reference 3) was issued to describe the inspections to be conducted on the Seismic Category I and safety-related piping systems at Northern States Power Company's Monticello Nuclear Generating Plant. Subsequently on August 30, 1979, a revision to the Inspection Plan (Reference 4) was issued incorporating all new Bulletin requirements. The inspections compare the as-built configuration to the information which is required for the seismic analysis of the piping, e.g., piping size and wall thickness, piping configuration geometry, valve locations, valve operator orientations, support locations, and type of support. As described in the IE Bulletin and the Inspection Plan, the inspections are being performed in two phases. The Phase 1 inspections cover one system in each set of redundant, normally accessible systems and all non-redundant accessible systems. The remaining redundant systems and the inaccessible systems are included in the Phase 2 inspections.

This document reports the results of the inspections conducted on the Phase 2 accessible systems. These systems are defined in Section 2 with the details of the various tasks associated with the inspection being described in Section 3. The general procedures for resolving all discrepancies and the discrepancies that have been identified are provided in Section 4 and Section 5, respectively.

Based on engineering judgement, it is concluded that none of the discrepancies would impair operability. However, computer analysis was deemed necessary to demonstrate compliance with the original design requirements specified in the FSAR (Reference 5) for three lines. As indicated in Section 5 two of the three analyses have been completed. The analysis of the third line is in progress and is scheduled to be completed by October 31, 1979.

2.0 SYSTEMS INSPECTED

During July, August and September of 1979, NUTECH with support from Northern States Power Company (NSP) and Bechtel Power Corporation (Bechtel) conducted an inspection of the accessible Phase 2 piping systems at the Monticello Nuclear Generating Plant. These systems consist of the second side of all redundant accessible Seismic Category I and safety-related systems with outside diameters of 2-1/2 inches or greater which are accessible for inspection. The list of the Seismic Category I and safety-related systems considered under Phase 2 is given in Table 2.1 along with the applicable line segments and isometric drawing numbers used in the comparison.

TABLE 2.1

ACCESSIBLE PHASE 2 PIPING SYSTEMS

SYSTEM	APPLICABLE LINE SEGMENTS	REFERENCE DRAWING NUMBER
COR. SPRAY	TW6-12HE	6350
	TW7-10GE	6400
	TW7-8ED, EF	6400
	TW8-8GE, HE	6400
	TW9-2½GE, HE	6411
RHR SERVICE WATER	SW10-12GF	6429
	SW10-18GF	5451,6429,6424
	SW10-16GF	6424
	SW12-16GF	6346
EMERGENCY SERVICE WATER	SW25-4HF	6401,6431
	SW30B-3HF	6446,6431
RHR	TW21-3HE	6425
	TW22-14GE	6348
	TW23-12GE	6425
	TW23-10GE	6425
	TW24-12GE,HE	6425
	TW25-4GE,HE	6425
	TW27-20HE	6347
	TW14A-18HE (Valve)	6347
	TW14A-20HE (Valve)	6347
	TW15-14HE	6347
	TW17-14HE	6347
	TW19-10GE	6348
	TW19-14GE	6348
	TW20-14GE	6348
	TW20-16GE	6348
	D82-3-HE	SK-L-285

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3.0 DESCRIPTION OF THE PHASE 2 ACCESSIBLE PIPING INSPECTION

The Phase 2 accessible inspection consisted of three separate tasks: (1) an as-built inspection of the piping systems at the plant site, (2) a compilation of the input data used for the piping analyses, and (3) a correlation of the results from tasks 1 and 2 above to show conformance/nonconformance between the installed and analyzed piping. The details associated with each task are described in the following sections.

3.1 As-Built Inspection

NUTECH, with support from NSP, performed the as-built inspection of the Phase 2 accessible piping systems. The inspection consisted of measuring and recording physical dimensions and hardware information in enough detail to allow a complete comparison with the analysis input data. The information gathered at the site and the methods used to obtain the data are provided in Table 3.1.

Prior to the inspection, data books were prepared for each system. These books specify the dimensions and other information to be gathered at the site and are based on the drawings listed in Table 2.1. The completed, signed, and approved data books were maintained at the site until completion of the Phase 2 accessible piping site inspection at which time the books were transferred to the NUTECH offices in San Jose, California, to be used for the work described in Section 3.3.

3.2 Compilation of Analysis Input Data

Bechtel compiled the input data used for the analysis of the piping systems. This work effort consisted of organizing dimensions and information used in the piping stress analysis in the form of piping stress isometrics and supporting data.

3.3 Correlation of As-Built and Analytical Data

NUTECH, with the help of Bechtel, correlated the results of the inspections described in Sections 3.1 and 3.2, and identified Discrepancies by completing the discrepancy form shown in Figure 3.1.

The as-built data and the analytical data were considered in nformance so long as the as-built to as-analyzed differences remained within the tolerances specified in Table 3.2. These tolerances, while allowing for some deviation, are sufficiently restrictive to ensure system operability under specified earthquake loadings. Any measurement which exceeded the specified tolerance limit was identified as a descrepancy and evaluated in accordance with the requirements of Section 4.

In addition, any discrepancies requiring repair which were found at the time of the site inspection were reported to NSP via a Nonconformance Report form, Figure 3.2. These included primarily conditions such as loose bolts, etc.

TABLE 3.1

INSPECTION DATA

TYPE OF DATA	METHOD OF FIELD VERIFICATION	VERIFICATION IF OTHER THAN FIELD
I. Piping Data[1]		
a. Size	Tape Measurement of Circumference	
b. Wall-Thickness	Ultrasonic Digital Thickness Gage	
c. Configuration	Tape Measurement of Lengths	
d. Branch Connection	Visual Comparison with Fab. Drawings	
e. Material	N/A	Q.A. Inspection Report (Reference 6)
II. Insulation		
Thickness	Tape Measurement of Thickness	
III. In-Line Eqpt.		
a. Valves		
1. Location	Tape Measurement of Pipe length	
2. Operator Orientation	Visual Inspection	
3. Weight	N/A	Vendor/Vendor Dwg./ Eng. Judgment
b. Other Large Equipment		
1. Location	Tape Measurement of Pipe Length	
2. Weight	N/A	Vendor/Vendor Dwg.
IV. Supports		
a. Location	Tape Measurement of Pipe Length	
b. Type	Visual Comparison with Fab. Drawing	
c. Anchorage	Visual Comparison with Fab. Drawing	
d. Orientation	Visual Inspection	
e. Size or Load Capacity	Visual Comparison	
f. Design and Assembly Details.	Visual Comparison	
V. Clearance		
a. Floor or Wall Penetrations	Visual Inspection	
b. Directional Changes	Visual Inspection	

NOTE 1: For insulated piping, data was obtained by removing insulation and providing direct access to the system.

TABLE 3.2

INSPECTION CORRELATION TOLERANCES[1]

TYPE OF DATA	TOLERANCE
I. Piping Data	
a. Size (Outside Diameter)	± 5% of OD
b. Wall thickness	± 12% of nominal thickness
c. Configuration	Max of ± 5% of straight run length, 6" or 1 OD
d. Branch Connection	Same Type
e. Material	Same type as QA inspection document
II. Insulation	
a. Type	Same type
b. Thickness	± 20%
III. In-Line Equipment	
a. Valves	
1. Location	Max of ± 5% of straight run length, 6" or 1 OD
2. Operator Orientation	± 15° for operator angle
3. Weight	± 10% of total weight
IV. Supports	
a. Location	6" for pipe sizes < 4" 2 pipe diameters for pipe size > 4" but < 12" 24" for pipe size > 12"
b. Type	Same type as design documents
c. Anchorage	Same as design drawings
d. Orientation	± 5° for vertical supports ± 15° for remaining supports
e. Size or Load Capacity	Same size or load capacity or larger than indicated on design drawings.
f. Design and Assembly Details	Same as design drawings
V. Clearances	
a. Wall Penetration	1/8" minimum
b. Directional Changes	Visually ensure no evidence of contact with adjacent items.

1. Based on information developed and supplied by Bechtel (References 7 & 8).

FIGURE 3.1
DISCREPANCY FORM

nutech
San Jose, California

Project Monticello Nuclear Generating Plant File No. 30.0237.
Owner Northern States Power Company
Client Northern States Power Company

SYSTEM ____ LINE NO. ____
BOOK ____

DISC. NO.	DESCRIPTION OF DISCREPANCY	IMPACT OF OPERABILITY ENGINEERING EVALUATION	FURTHER ACTION REQUIRED (30 days)	BECHTEL BOOK ____ CALC: ____

SUMMARY OF EVALUATION:

Revision						Page ____ of ____
Prepared By/Date						
Checked By/Date						

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FIGURE 3.2

NONCONFORMANCE REPORT

SYSTEM _____ NONCONFORMANCE NO. _____

DESCRIPTION OF NONCONFORMANCE:

PROPOSED RESOLUTION OF NONCONFORMANCE:

ORIGINATED BY:	CHECKED BY:	APPROVED BY:	DATE:

CORRECTIVE ACTION TAKEN:

ACTION TAKEN BY:	DATE:	

_____ _____ _____

PLANT COORDINATOR PLANT SUPERINTENDENT, ENGINEERING/RADIATION PROTECTION DATE

4.0 REPORTING AND RESOLUTION OF DISCREPANCIES

NUTECH was responsible for resolving all discrepancies, subject to NSP review and approval. In resolving each identified discrepancy, the following approach was taken:

1. An engineering evaluation was made of the discrepancy to determine if it impaired the operability of the system. This evaluation was performed at two levels. The first level consisted of applying engineering judgment to the discrepancies to obtain an immediate, i.e., within two (2) days, evaluation of the impact of the discrepancy on system operability. When required, a second-level evaluation consisting of an analytical evaluation of the discrepancy was made. In some cases, this evaluation required the same degree of sophistication as was utilized in the original seismic analyses. However, most discrepancies did not warrant such a rigorous analysis technique.

2. Subsequently, an additional evaluation of the discrepancy was made to determine if the piping system still met the original design criteria described in the FSAR. Where it was determined by use of the original analyses that the as-built systems were adequate to meet the FSAR requirements, no further action was taken. However, if the as-built conditions were judged to have a potential for exceeding FSAR requirements, reanalysis of the piping system to the as-built condition and the original design requirements was accomplished.

In general, for those lines where reanalysis was deemed necessary, a revised stress report, and, where appropriate, drawings reflecting the as-built conditions will be issued to document the changes.

5.0 SUMMARY OF DISCREPANCIES IDENTIFIED DURING THE PHASE 2 ACCESSIBLE PIPING INSPECTION

The discrepancies identified in the inspection are discussed below. These discrepancies can be categorized in one or more of the following categories.

5.1 Discrepancies Resolved by Engineering Judgment

These discrepancies are those that exceeded the tolerances specified in Table 3.2, but were judged to be of no significant consequence to operability or compliance with FSAR requirements, e.g., an as-built pipe run which is shorter than the as-analyzed length, whereby the analysis is judged to be conservative, since the shorter unsupported length would have lower stresses. The discrepancies in this category require no further action.

5.2 Discrepancies Requiring Further Analysis to Evaluate Operability

These discrepancies required reanalysis rather than engineering judgement to ensure that an operability concern did not exist. No line segments were in this category.

5.3 Discrepancies Requiring Further Analysis to Evaluate FSAR Compliance

Discrepancies in this category are those which did not produce an operability concern, but did require reanalysis to verify that the original FSAR margins were maintained. Table 5.2 lists the line designations with such discrepancies, the discrepancy or reason for reanalysis, and the results of the reanalysis. A total of 3 lines required reanalysis in this category.

5.4 Discrepancies Identified During the Field Inspection

During the field inspection of the accessible piping, a total of 15 conditions requiring repair were found to exist in the piping systems. Of the 15 conditions reported in the Phase 1 report (Reference 9), 10 were associated with Phase 1 piping systems and 5 were associated with the Phase 2 accessible piping systems.

TABLE 5.1

LINES REQUIRING REANALYSIS

TO EVALUATE FSAR COMPLIANCE

SYSTEM	LINE DESIG	REASON FOR REANALYSIS	RESULTS OF REANALYSIS
RHR (Book 1)	TW14A-20HE TW17-14HE TW15-14HE TW27-20HE D82-3HE	Analyzed pipe segment lengths not within specified tolerance. Missing seismic restraint.	Maximum stress 18% of Code allowable.
RHR (Book 2)	TW21-3HE	Analyzed pipe segment lengths not within specified tolerance.	Maximum stress 43% of Code allowable.
RHR (Book 3)	TW23-12GE	Snubber support (SS-33) not analyzed in correct orientation.	In progress

6.0 CONCLUSION

An inspection survey addressing the concerns of IE Bulletin 79-14 was conducted at the Monticello Nuclear Generating Plant in July, August and September of 1979 for the accessible Phase 2 piping systems. Results of that inspection reveal that, based on engineering judgement, no operability concerns exist, and for all but three of the Phase 2 accessible piping segments, stresses meet the original design requirements for the plant.

For the three piping segments described above, a detailed analysis was performed to evaluate compliance with original design requirements. For two of the three lines, the detailed analysis has been completed and indicates stresses to be well within original design requirements. The analysis of the remaining pipe segment is in progress and will be completed by October 31, 1979.

7.0 REFERENCES

1. IE Bulletin 79-14, "Seismic Analysis for As-Built Safety-Related Piping Systems," Original Issue dated July 2, 1979, and Revision 1, dated July 18, 1979.

2. Supplements to IE Bulletin 79-14, "Seismic Analysis for As-Built Safety-Related Piping Systems," dated August 15, 1979, and September 7, 1979.

3. "IE Bulletin 79-14, SAFETY-RELATED PIPING SYSTEMS, INSPECTION PLAN, MONTICELLO NUCLEAR GENERATING PLANT", NUTECH Report NSP-37-005, Revision 0, dated July 31, 1979,

4. "IE Bulletin 79-14, SAFETY-RELATED PIPING SYSTEMS, INSPECTION PLAN, MONTICELLO NUCLEAR GENERATING PLANT", NUTECH Report NSP-37-005, Revision 1, dated August 30, 1979,

5. MONTICELLO NUCLEAR GENERATING PLANT, MONTICELLO, FINAL SAFETY ANALYSIS REPORT, Northern States Power Company, Minneapolis, Minnesota.

6. Quality Assurance Audit on NSP Pipe and Fitting Data, performed by Nuclear Services Corporation in November 1970.

7. Letter from C. B. Hogg to D. Anthony, dated July 24, 1979; Subject, "Job 10040, Monticello Nuclear Generating Plant Unit 1, Northern States Power Company, NRC IE Bulletin 79-14, As-Built Tolerances."

8. Letter from C. B. Hogg to D. Anthony, dated August 8, 1979; Subject, "Job 10040, Monticello Nuclear Generating

Plant Unit 1, Northern States Power Company, NRC IE Bulletin 79-14, Revised As-Built Tolerances."

9. "IE Bulletin 79-14, SAFETY-RELATED PIPING SYSTEMS, PHASE 1 INSPECTION REPORT, MONTICELLO NUCLEAR GENERATING PLANT" NUTECH Report NSP-37-025, Revision 0, dated September 21, 1979.