NSP

Northern States Power Company

Monticello Nuclear Generating Plant
2807 West Hwy 75
Monticello, Minnesota 55362-9637

July 20, 1998

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Supplemental Information Regarding the Seismic Verification of the MSIV Leakage Path at Monticello (TAC No. 96238)

Ref. 1 Letter from M.F. Hammer, NSP, to NRC Document Control Desk, "Seismic Verification of the MSIV Leakage Path at Monticello (TAC No. 96238)," June 15, 1998

By letter dated June 15, 1998 (Ref. 1), NSP provided supplemental information on the seismic verification of the MSIV leakage path to the condenser. A conference call between the NRC staff and NSP was held on July 8, 1998 regarding Ref. 1. NSP stated that it would submit additional information to supplement the June 15, 1998 letter. This information is provided as Attachment 1.

This submittal also supplements NSP's power rerate license amendment request dated December 4, 1997. This submittal does not affect the demonstration of no significant hazards included in the amendment request. Please contact Joel Beres at 612-295-1436 if additional information is required.

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M F Hammer

Michael F. Hammer
Plant Manager
Monticello Nuclear Generating Plant

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c: Regional Administrator - III, NRC
NRR Project Manager, NRC
Sr. Resident Inspector, NRC
State of Minnesota, Attn: Kris Sanda
J. Silberg, Esq.

Attachments

Attachment NSP Affidavit to the US Nuclear Regulatory Commission
Attachment 1 Supplemental Information Regarding the Seismic Verification of MSIV Leakage Path

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT   DOCKET NO. 50-263

Supplemental Information Regarding the Seismic Verification of the MSIV Leakage Path at Monticello (TAC No. 96238)

Northern States Power Company, a Minnesota corporation, by letter dated July 20, 1998 provides supplemental information regarding the seismic verification of the MSIV leakage path to the condenser for the Monticello Nuclear Generating Plant to a US Nuclear Regulatory Commission (NRC). This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

COLLEEN A. HANNON
NOTARY PUBLIC - MINNESOTA
My Comm. Exp. Jan. 31, 2000

By ______________________
Michael F. Hammer
Plant Manager
Monticello Nuclear Generating Plant

On this 20 day of July 1998 before me a notary public in and for said County, personally appeared Michael F. Hammer, Plant Manager, Monticello Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, and that to the best of his knowledge, information, and belief the statements made in it are true.

____
Colleen A. Hannon
Notary Public - Minnesota
Sherburne County

Attachment 1

Supplemental Information Regarding the Seismic Verification of the MSIV Leakage Path at Monticello

I. Pipe Support Anchorage

There were three main types of pipe support anchorage observed on the piping systems that are summarized below.

- Pipe support members, such as support steel or standard component brackets, welded directly to large in-place steel structural members. In this case the controlling anchorage was the attachment weld.
- Pipe support members, such as support steel or standard component brackets, welded to base plates that were attached to concrete walls, floors, and ceilings using expansion anchors.
- Pipe support members or standard component brackets bolted directly to large in-place steel

There were a few additional anchorages which were used on a limited basis. These include small bore pipe supports welded directly to modular embedments, support members attached directly to concrete structures by the use of concrete expansion anchors, and some cast-in-place light-metal struts.

Pipe Support Anchorage Evaluation Criteria

All pipe support structures and anchorage were reviewed as part of the walkdown effort. As a result of the walkdown, certain worst case supports were selected for a detailed evaluation. A contributing factor in this selection was the potential for failure of the pipe support anchorage. Table 1 below provides a summary of the various support reviews conducted and the associated types of anchorage reviewed. The criteria described by equations 4.4 through 4.7, section 4.1.2, of reference 1 was used for evaluation of structural steel and standard component supports.

Table 1 - Summary of Anchorage Types Reviewed in Depth

		Distribution of Support Anchorage			
Basis of Qualification	**Number of Supports Evaluated**	**Concrete Anchor Bolts**	**Welded**	**Bolted**	**Miscellaneous Other[1]**
Rod Fatigue Concerns	25	5	17	1	2
Worst Case Support Reviews	44	28	8	1	7
Supports on Systems Subjected to Detailed Analysis	30	9	16	0	5
Modified or Added Supports	31	10	4	8	9
Total	130	52	45	10	23

[1] Miscellaneous other includes attachment to modular embedments, embedded Unistrut and other types of anchorage not explicitly covered in the first three columns.

The criteria used in the evaluation of the various types of pipe support anchorages are discussed in the following paragraphs. All pipe support anchorages meet the criteria described below.

Welded Anchorage

The welded anchorage evaluation was based on criteria provided in the AISC Steel Construction Manual. The actual criteria used are as summarized below.

F_v (DWT + TH) $\leq$ AISC Allowables
F_v (DWT + TH + SSE) $\leq$ 1.7 * AISC Allowables

where:
F_v is the shear stress in the weld
DWT = Deadweight, TH = Thermal, and SSE = Safe Shutdown Earthquake

Concrete Expansion Anchor Bolts

Concrete anchor bolts were evaluated using linear interaction criteria with anchor bolt capacity determined in accordance with Appendix C of the SQUG-GIP. The SQUG-GIP anchor bolt capacities were used because they provide established capacities for anchorage consistent with the use of experience data.

Bolted Anchorage

For bolted anchorage using structural steel bolts the criteria of the AISC Steel Construction Manual with a 70% increase in allowables for SSE loads was used. For standard component brackets containing bolted anchorage, the demand loads were compared to the appropriate manufacturer's published capacities.

Other Types of Anchorage

For embedded light-metal struts the demand loads were compared to the appropriate manufacturer's published capacities. In this evaluation both the concrete embedment and the embedded member itself were evaluated. Modular embedments that had small bore pipe supports attached to them were reviewed and accepted using engineering judgment.

II. Basis of Piping Span Ratios

When conducting the field reviews to collect earthquake experience data, significant numerical data was collected on vertical and lateral support spacing (spans) on those systems which had successfully survived strong motion earthquakes. There were two types of support spacing (span) data collected: 1) the actual distances between vertical pipe supports, and 2) the actual distances between lateral pipe supports. This data was collected for a range of pipe sizes from ¾" diameter piping up to and including 24" diameter piping. The total amount of piping included in this data collection was in excess of 100,000 feet of piping. This piping encompassed in excess of 10,000 piping supports. In order to standardize this information for evaluation and future use, it was normalized to the standard deadweight support spacing spans given in Table 121.5 of the B31.1 Power Piping Code. This normalization was first done on per pipe size basis. For each pipe size the actual vertical spans were divided by the suggested B31.1 deadweight spans for that pipe size, and this was called the Vertical Span Ratio (VSR). Next for each pipe size the actual lateral pipe support spans were divided by B31.1 suggested deadweight spans for that pipe size, and this was called the Lateral to Vertical Support Span Ratio (LVSSR). These span ratios were then grouped and summarized across the various pipe sizes. The results of this tabulation are shown in Figures 5-1 through 5-4 of reference 1. They are identified as "Experience Data" on these figures.

In conducting the walkdowns for the Monticello MSIV leakage path, the actual support spans for the vertical and lateral supports were measured and normalized on a pipe size basis as was done for the experience data. These span ratios were then grouped across pipe size as was done for the experience data. The resulting tabulations are also shown as in Figures 5-1 through 5-4 of reference 1. They are identified as "Monticello Data" on these figures. These figures show that the Monticello span ratio data for both vertical and lateral support span ratios are well within the data collected for piping systems that survived the strong motion earthquakes discussed in Section 3.1 of reference 1. The Monticello design basis SSE is significantly lower than those earthquakes from which the span data was collected.

The experience span ratio data was also used as a screening criteria to identify systems or portions of systems whose seismic capacity required additional review or limited analytical evaluation. It was also used to screen systems that required additional supports to ensure they had adequate seismic capacity. By reviewing the experience data shown in Figures 5-1 and 5-2 of reference 1, it can be seen that the majority of piping systems which successfully survived strong motion earthquakes had Vertical Support Span Ratios (VSR) less than or equal to 1.5. Any Monticello piping systems having a VSR in excess of this 1.5 value was subjected to an in-depth review and evaluation. Similarly, by reviewing the experience data shown in Figures 5-3 and 5-4 of reference 1, it can be seen that the majority of piping systems which successfully survived strong motion earthquakes had Lateral to Vertical Support Span Ratios (LVSSR) less than or equal to 6.0. Any Monticello piping systems having a LVSSR in excess of this value of 6.0 was subjected to an in-depth review and evaluation. In several cases supports were added to systems exceeding this span criteria to bring affected components within the experience data and to insure that these components would have adequate capacity to withstand a SSE.

For systems containing threaded fittings, a reduced LVSSR ratio of 4 was used in the screening. This reduced screening criteria for threaded fittings was based on the ratio of B31.1 primary stress indices between threaded fittings and butt welded piping, i.e.,$(1/[.75*2.3])*(6) \approx 4$. There are very few systems in the Monticello MSIV leak path which contain threaded fittings, and the majority of these systems were adequately supported. Those piping systems containing threaded fittings having LVSSR values in the vicinity of 4 were subjected to detailed analysis or were modified to add additional supports to insure the LVSSR was well below the value of 4 used in the original screening.

III. Results of the Piping and Support Evaluations

All piping systems were evaluated to the screening criteria of Section 4.1.1 of reference 1. The systems meeting the screening criteria have the capacity to maintain leak tight structural integrity during and after a SSE. For the piping subjected to a detailed analysis as described in Table 5-9 of reference 1, the demand and capacity criteria described in Section 4.1.2 of reference 1 are met. This insures that the Table 5-9 piping systems have adequate capacity to maintain leak-tight structural integrity during and after a SSE.

All supports including the worst case supports given in Table 1 above and Table 5-11 of reference 1 were evaluated. These supports were demonstrated to have met the above anchorage design criteria and the support design criteria described in Section 4.1.2 of reference 1. All new or modified supports given in Table 1 above and Table 5-11 also met the above anchorage criteria and the support criteria described in Section 4.1.2 of reference 1. Meeting these criteria assures that adequate safety factors exist.

For modifications to piping systems described in Table 5-8 of reference 1, analytical evaluations were conducted, and all modified piping systems meet the criteria in reference 1.

IV. Results of the Buried Piping Analysis

The buried piping analysis evaluated both the seismic wave passage effects and the effects of relative motions between the buildings from which the piping exited and entered. The results of the analysis demonstrated the following.

The relative motions between buildings at the buried depth of the piping resulting from a SSE were very small and would not induce significant stresses in the piping.

The wave passage effects would produce stresses in the piping on the order of 11,000 psi which are significantly below the capacity criteria of Equation 4.2 of reference 1.

V. Condenser Anchorages

The condenser consists of High Pressure (HP) and Low Pressure (LP) shells. The forces from an SSE on the anchoring systems of the condenser were calculated. The following table demonstrates that the tension capacity and shear capacity of the condenser anchorages are greater than the corresponding design values. Operating loads include vacuum uplift. The table shows that the anchoring systems are capable of withstanding the SSE loads in combination with operating loads.

Load Type	*HP Condenser*	*LP Condenser*
Support Tension Capacity	245 kips	245 kips
Support Tension Demand (SSE + Operating Loads)	112 kips	143 kips
Support Shear Capacity	296 kips	296 kips
Support Shear Demand (SSE + Operating Loads)	235 kips	223 kips

Reference:

[1] Transmittal from M.F. Hammer, NSP, to the USNRC Document Control Desk, "Seismic Verification of the MSIV Leakage Path at Monticello (TAC No. 96238)," June 15, 1998

TRANSMITTAL MANIFEST

NORTHERN STATES POWER COMPANY

NUCLEAR LICENSING DEPARTMENT

MONTICELLO NUCLEAR GENERATING PLANT

Supplemental Information Regarding the Seismic Verification of the MSIV Leakage Path at Monticello (TAC No. 96238)

Manifest Date: July 21, 1998

Correspondence Date: July 20, 1998

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