UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 14, 1987

attached
Copy to P/S

PRIORITY ROUTING
FILE

Docket No. 50-341

F6-6
Ft/he

LICENSEE: Detroit Edison Company

FACILITY: Fermi-2

SUBJECT: MEETING SUMMARY FOR DECEMBER 11, 1986, MEETING ON MAIN STEAM TURBINE BYPASS FLOW LINE FAILURE

On December 11, 1986, members of the NRR staff met with the licensee to discuss failures experienced with the main steam turbine bypass flow line and corrective actions taken by the licensee to rectify the problems. Enclosure (1) is a copy of the meeting agenda and the slide presentation made by the licensee at the meeting. Enclosure (2) is a list of the meeting participants. Enclosure (3) documents the NRR's staff's position and comments expressed at the meeting with respect to actions taken by the licensee to identify the root cause of the problem, corrective actions taken as of the date of the meeting, and the follow-on surveillances planned by the licensee.

The meeting was noticed in the PDR by memorandum dated November 26, 1986.

John J. Stefano, Senior Project Manager
PWR Project Directorate No. 3
Division of PWR Licensing

Enclosures:
As stated

cc: See next page

8702180226 870209
PDR FOIA
PUNTENNE87-50 PDR

B/16

JAN 20 1987

Mr. B. Ralph Sylvia
Detroit Edison Company

Fermi-2 Facility

cc:
Mr. Harry H. Voigt, Esq.
LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N. W.
Washington, D. C. 20036

John Flynn, Esq.
Senior Attorney
Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

Mr. Dennis R. Hahn, Chief
Nuclear Facilities and Environmental
Monitoring Section Office
Division of Radiological Health
P. O. Box 30035
Lansing, Michigan 48909

Mr. Steve Frost
Supervisor-Licensing
Detroit Edison Company
Fermi Unit 2
6400 North Dixie Highway
Newport, Michigan 48166

Mr. Thomas Randazzo
Director, Regulatory Affairs
Detroit Edison Company
Fermi Unit 2
6400 North Dixie Highway
Newport, Michigan 48166

Mr. Walt Rogers
U. S. Nuclear Regulatory Commission
Resident Inspector's Office
6450 W. Dixie Highway
Newport, Michigan 48166

Monroe County Office of Civil
Preparedness
963 South Raisinville
Monroe, Michigan 48161

Ronald C. Callen
Adv. Planning Review Section
Michigan Public Service Commission
6545 Mercantile Way
P. O. Box 30221
Lansing, Michigan 48909

Regional Administrator, Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Enclosure (1)

AGENDA

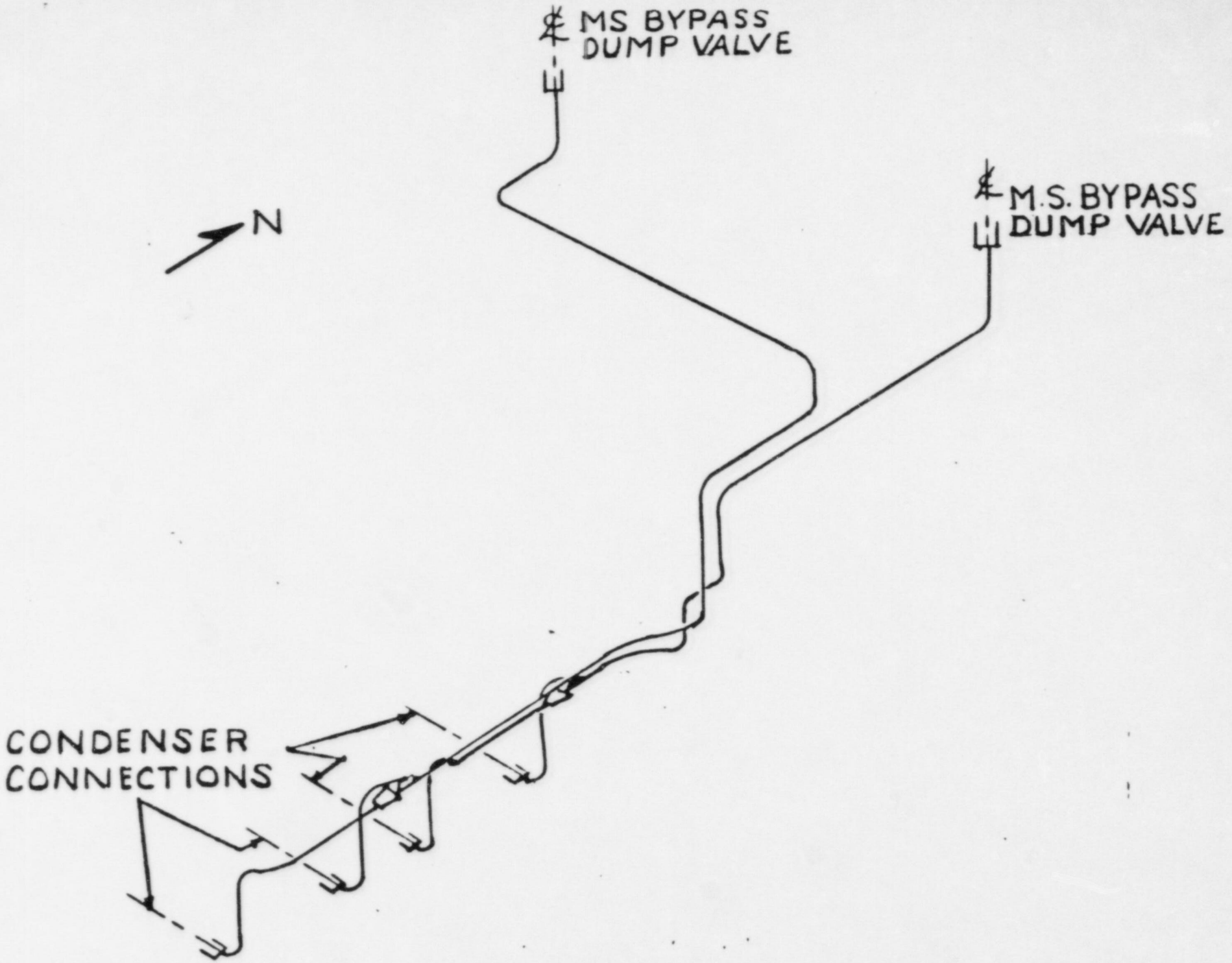
Objective of Presentation:

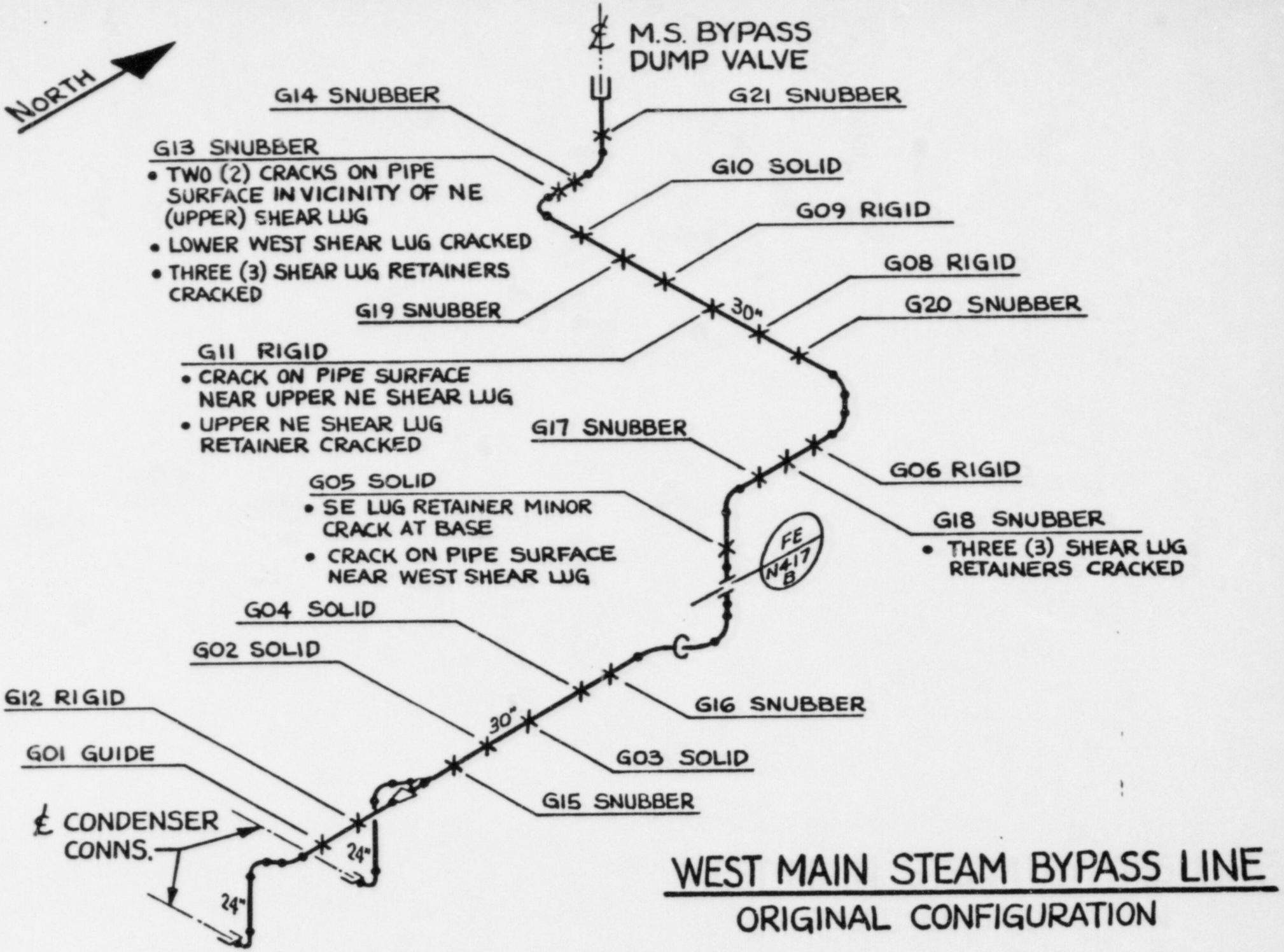
The actions and essential facts surrounding the initial reports of leakage on the main steam bypass lines, the corrective actions taken, and the followup measures implemented by Detroit Edison will be the subject of this presentation.

Detroit Edison believes that the root cause of the problem has been identified and adequately dealt with. Further, that the bypass lines in their current configuration will support normal operations for the 40 year design life of the plant.

AGENDA

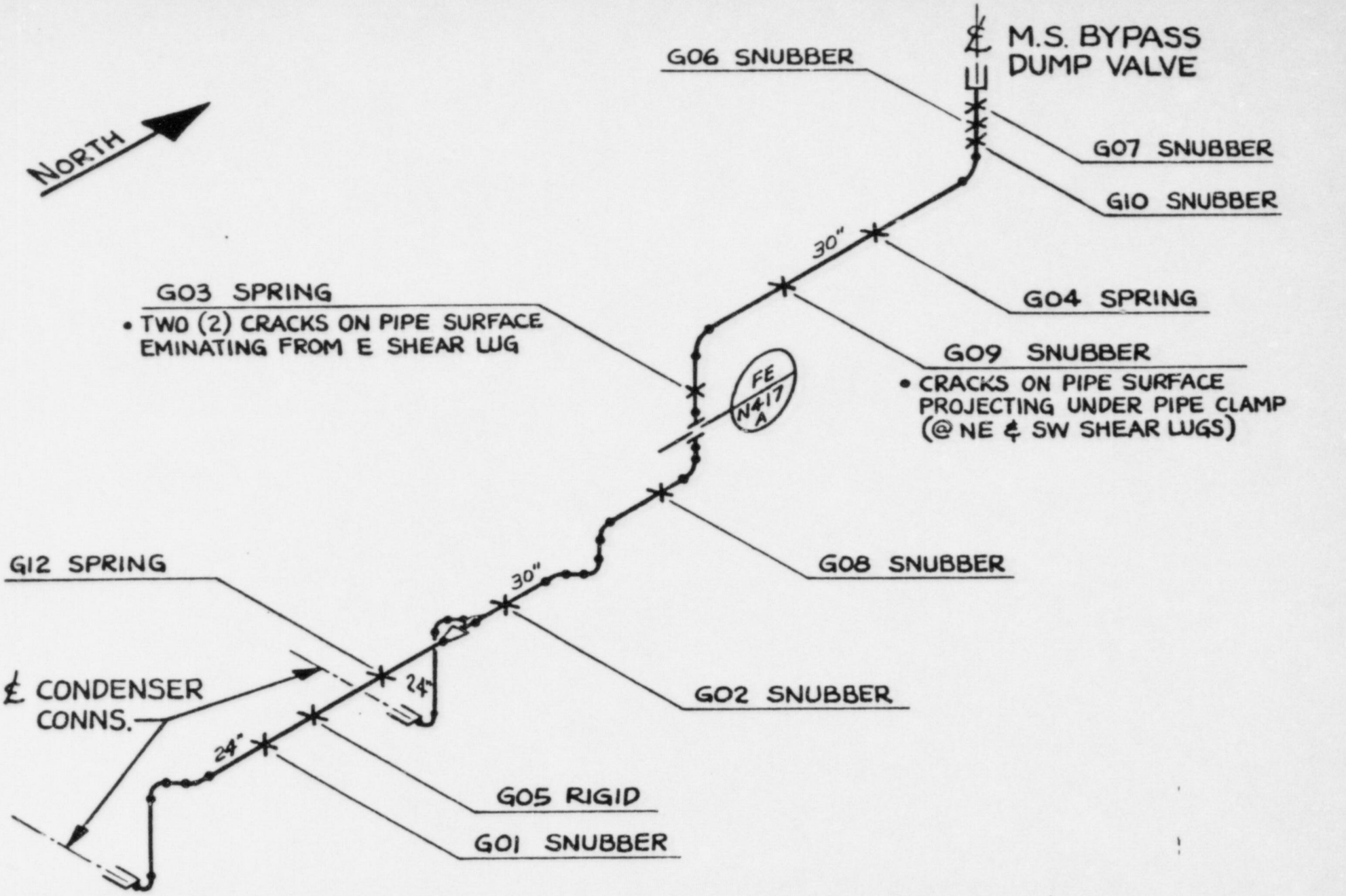
1. Initial Failure of the Main Steam Bypass Lines
   - Initial detection of the leakage
   - Determination of Root Cause
2. Modification of the Bypass Lines
   - Industry experience search
   - Consultants and A/E's
   - Synthesis of the modifications
   - NDE performed
3. Post Construction Testing
   - Hopper report on fatigue life
   - Testing program
   - Results of test data analysis
4. Supplemental Testing
   - Location of additional strain gages defined
   - Testing program
   - Results of testing
5. Service Life of the Lines
   - Operational modes of the system
   - Extrapolation to a 40 plant life
6. Residual Concerns Relative to the Bypass System
7. Line Monitoring and Contingency Plans
8. Summary


MS BYPASS
DUMP VALVE
M.S. BYPASS
DUMP VALVE
N
CONDENSER
CONNECTIONS



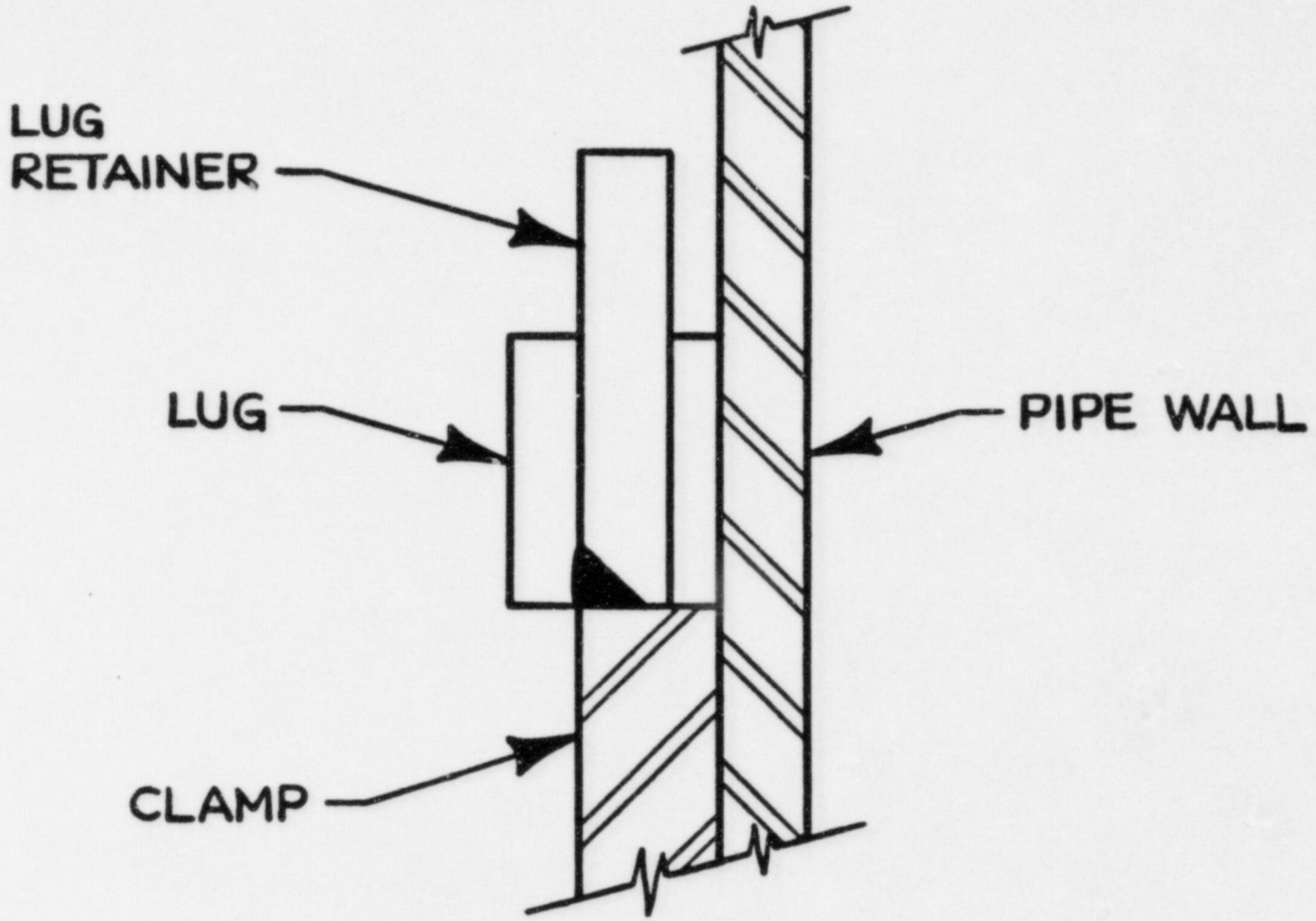
WEST MAIN STEAM BYPASS LINE

ORIGINAL CONFIGURATION

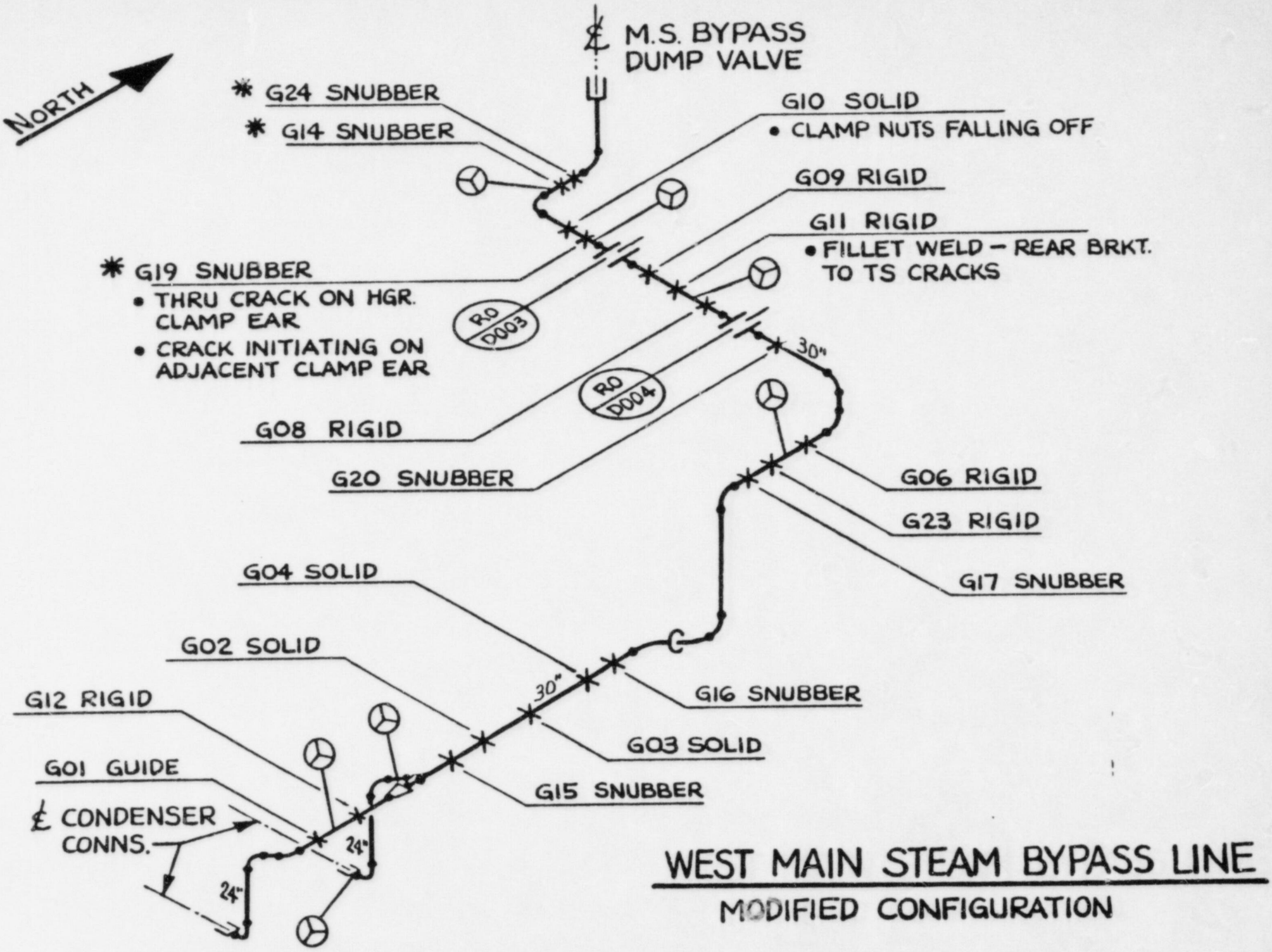


EAST MAIN STEAM BYPASS LINE

ORIGINAL CONFIGURATION



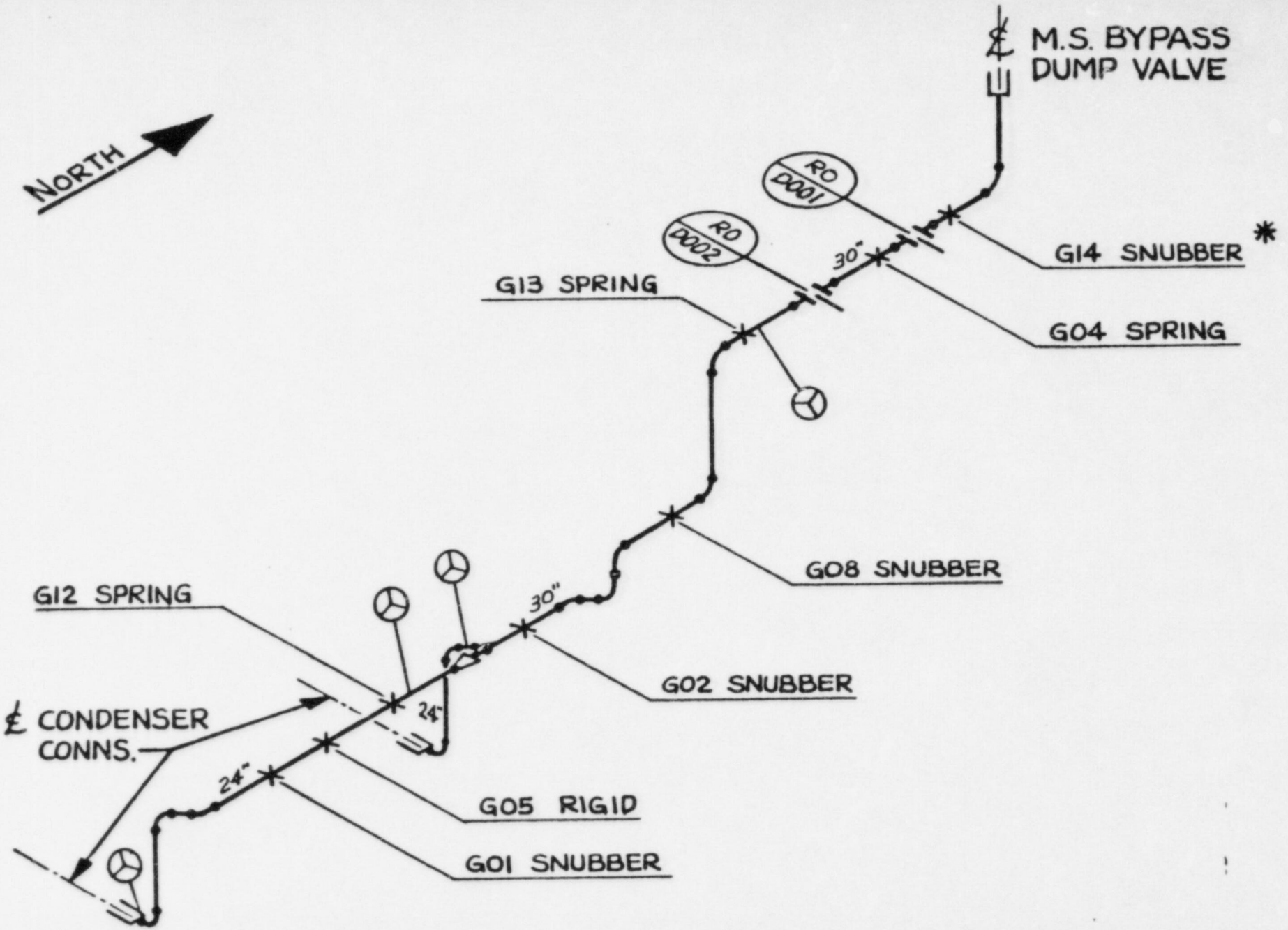
INTERGAL LUG ATTACHMENT



WEST MAIN STEAM BYPASS LINE

MODIFIED CONFIGURATION

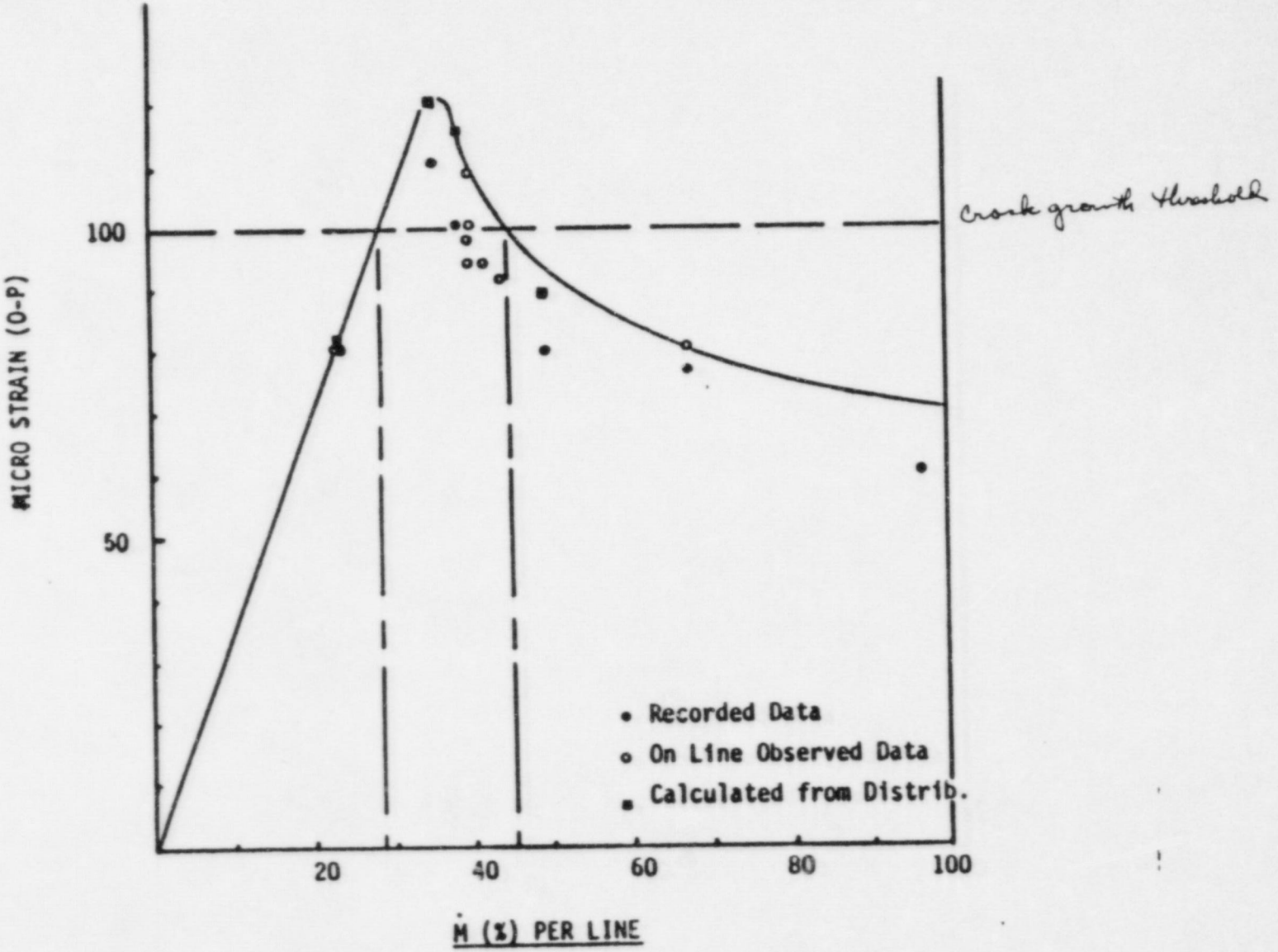
* REMOVED PER TMR-86-139 REV. A



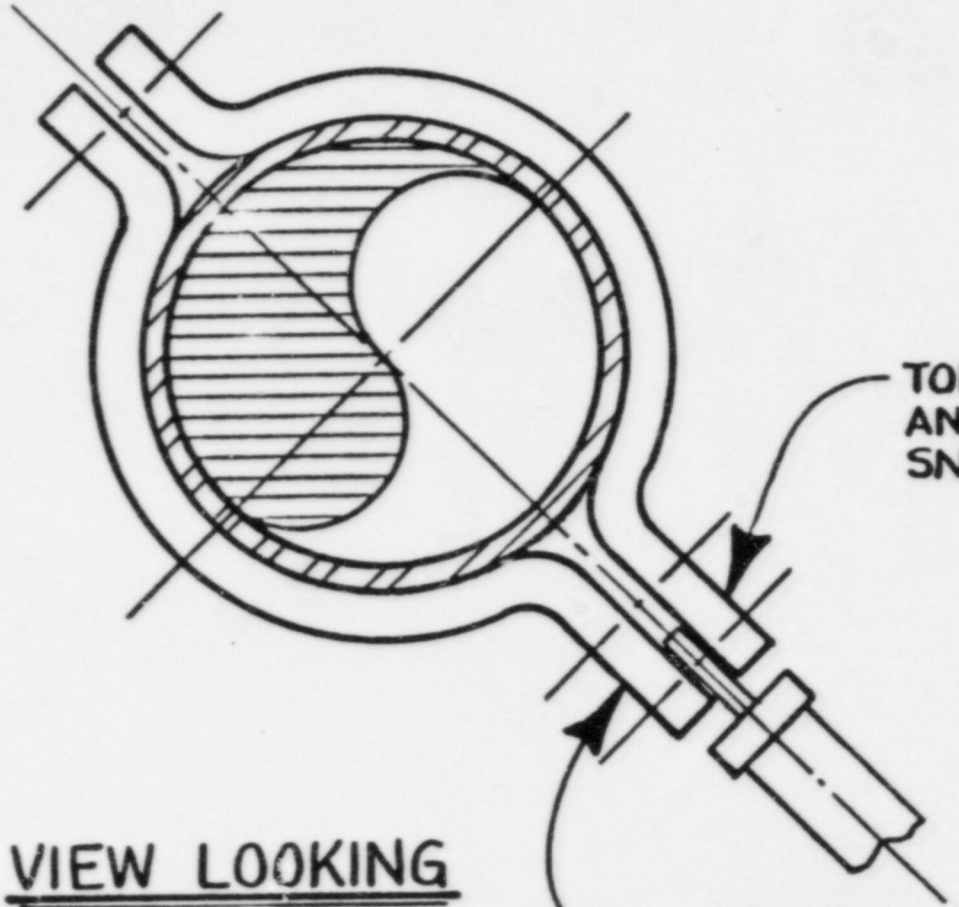
EAST MAIN STEAM BYPASS LINE

MODIFIED CONFIGURATION

* REMOVED PER TMR-86-139 REV. A



ALTERNATING STRAIN VS. MASS FLOW RATE



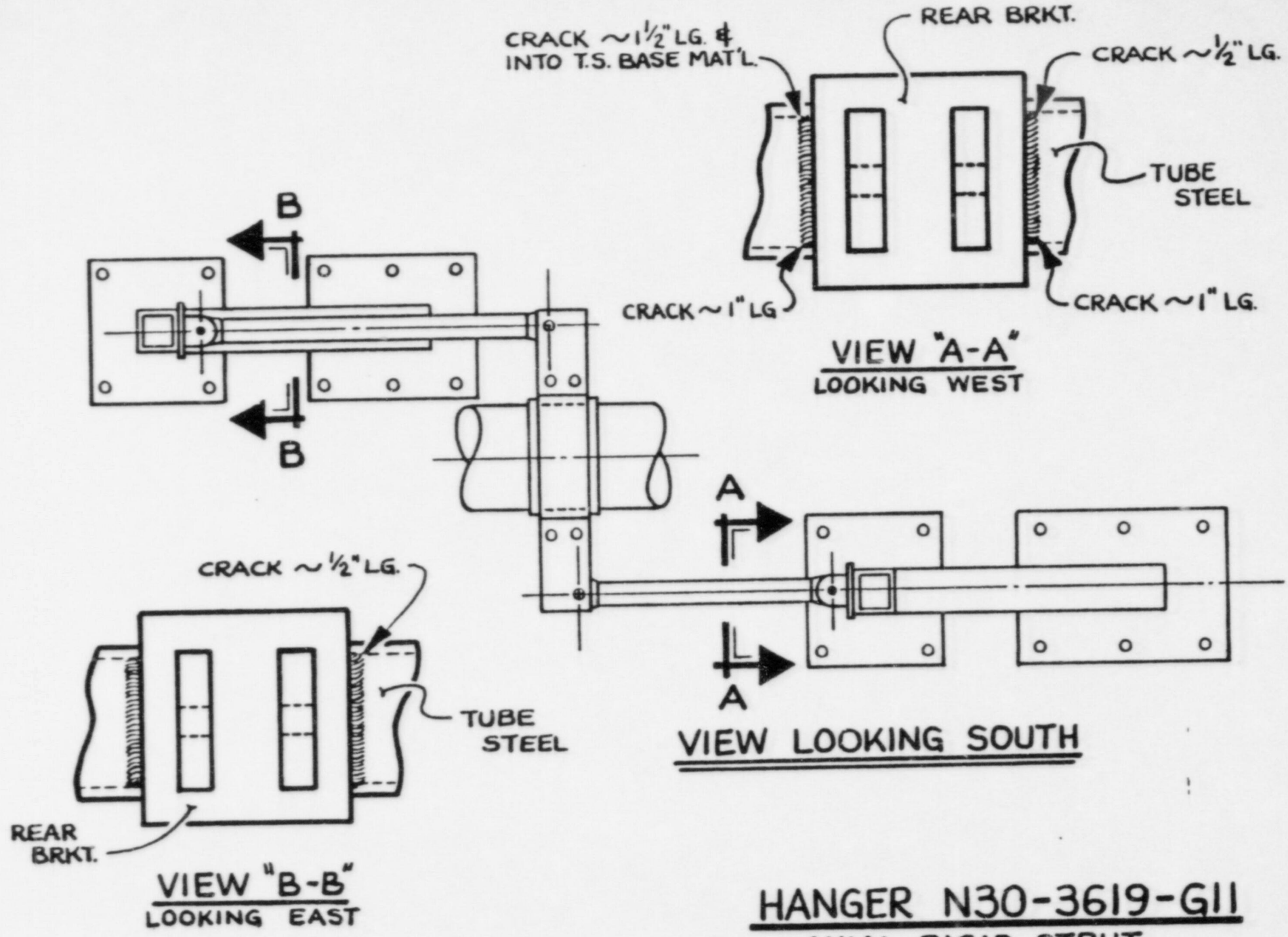
TOP CLAMP EAR FOUND CRACKED AND HELD IN PLACE ONLY BY SNUBBER PIN

VIEW LOOKING WEST

BOTTOM CLAMP EAR IS CRACKED, BUT NOT ALL THE WAY THROUGH.
ALSO SNUBBER FORWARD BEARING WAS FOUND FROZEN, WOULD NOT MOVE

HANGER N30-3619-G19

MECHANICAL SNUBBER



HANGER N30-3619-G11

AXIAL RIGID STRUT

The mainsteam bypass lines are acceptable for the 40 year normal operating life of the Fermi plant due to the following:

1. The lines meet or exceed the emperical requirements for avoidance of acoustically induced pipe wall cracking.

2. The lines meet or exceed the requirements of the ANSI B 31.1 code to which they were designed.

3. Two separate rigorus evaluations, which utilize two different methods, predict 100 days of cumulative life in the least desireable range of valve positions.

4. The pipe wall strains measured since the lines were modified show significantly reduced pipe wall strain are present.

5. The bypass line hangers and supports and snubbers meet or exceed the reqments of the ANSI B 31.1 and AISC codes to which they were designed.

6. The least desireable valve position range is not a hold point in the normal plant operating proceedures.

7. The lines have operated for a peroid of 8 cumulative days in the valve position range of interest with:

    a) Minor loosening of clamp nuts, which was resolved.

    b) Some snubber clamp and one instance of hanger tube steel cracking which could have occurred during operation of the original 3/8" wall line. Also, an analysis of the line shows that the supports could have been removed with no detremental effects.

ENCLOSURE (2)

DECEMBER 11, 1986

MEETING WITH DECO RE:
MAIN STEAM TURBINE BYPASS LINE FLOW-INDUCED VIBRATION

NAME	ORGANIZATION
John Stefano	NRC - Project Manager
R. Wayne Houston	NRR - Division of BWR Licensing
John Tsao	NRR - DRL/EB
Thomas Randazzo	Detroit Edison
Frank Agosti	Detroit Edison
Duane Danielson	NRC - RIII
John Jacobson	NRC - RIII
J. J. Harrison	NRC - RIII, Chief Eng. Branch
Bob Hermann	NRC - DRL/Section Chief, EB
E. G. Adensam	NRC - DRL/BWD-3
Stephanie Murphy	NIRS - 1616 P. St. NW, #160
R. G. La Grange	NRC - DRL/EB
T. Wang	Stone & Webster
Steve Frost	Detroit Edison
Gene Preston	Detroit Edison
Lawrence Simpkin	Detroit Edison
David Spiers	Detroit Edison
John Conroni	Detroit Edison
David Hopper	Hopper & Assoc.
Johseph Cohen	Detroit Edison

ENCLOSURE (3)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JAN 12 1987

Docket No.: 50-341

MEMORANDUM FOR: Elinor G. Adensam, Director
Project Directorate No. 3
Division of BWR Licensing

FROM: Gus C. Lainas, Assistant Director
Division of BWR Licensing

SUBJECT: FERMI UNIT 2: MAIN STEAM BYPASS LINE FAILURE
(TAC #63376)

Introduction

In September 1985, Detroit Edison (DECo) discovered through-wall cracks in two main steam bypass lines at Fermi Unit 2. Subsequently, DECo replaced both lines with a thicker wall pipe, redesigned some of the pipe supports, and analyzed the piping vibration. DECo has identified the root cause of the problem to be acoustically induced flutter of the pipe wall. On December 11, 1986 a meeting was held in Bethesda, Maryland for DECo to present their assessment of the problem and corrective actions that they have taken to resolve the issue. The Engineering Branch and Region III staff have evaluated this issue from the viewpoint of sound engineering practices rather than from assessment of meeting license requirements since the lines in question are a part of balance of plant. The assessment by the staff is to critique DECo on the basis of performance for this issue as an indicator of how they might address a similar problem in the "safety-related" part of the plant.

Both bypass lines (the West line and East line) are made of 30 inch diameter carbon steel pipe (API 5L Grade B) and are reduced to 24 inch diameter at the inlet to condenser. The cracks were found at various locations on the pipe surface including, pipe support lug attachments, small test connections, and flow measurement orifices. DECo replaced the original 0.375 inch thick pipe with a 1.0 inch thick pipe for the 30-inch diameter section and 1.25 inch thick pipe for the 24-inch diameter section. DECo also eliminated all pipe weld attachments. As a part of the modification, DECo conducted a test program to obtain as-built stresses and strains at various locations of the lines and contracted Hopper and Associates and Stone and Webster to predict the service life of the pipe using the test data. After resolutions of disagreements

Contact: J. Tsao
x29408

8702180212 3pp.

regarding the fatigue life of the pipe predicted by the two contractors, DECo concluded that the west line is acceptable if cumulative operation with bypass valve position between 30% and 45% opened for a period not to exceed 100 days, and that the east line can be operated indefinitely.

Discussion and Evaluation

The staff believes the licensee has properly identified the root cause of this vibration as acoustically induced pipe wall fluttering resulting from high pressure drop across the bypass dump valve seat. The dump valve opening is about 9 inches whereas the pipe opening is 28 inches. The supersonic steam entering the pipe is choked at the valve exit. When the steam is expanded into the larger pipe, the flow becomes turbulent and generates the acoustic vibrations.

The modification that has been performed by the licensee has not been successful in elminating the acoustically induced vibration from the piping system. The arguments presented by the licensee on alternative designs and why they could not be implemented at the facility appear plausible. However, in the design of the modification, it does not appear that sufficient considerations were given to this system with its inherent vibration problem. For instance, several supports on the system have cracked and nuts on clamps have fallen off. We understand that fillet welds rather than full penetration welds were used in the support design. Although this practice would meet the usual code requirements for supports of this type for power pipings, we believe that the fillet welds, with their inherent stress raisers, were not appropriate for this application. Further, no special care appears to have been taken by the licensee to preclude loosening of bolting in the system. As with the supports, no special considerations were taken with regard to the circumferential weldments in the piping. Weldments were made using backing rings. This type of joint is less desirable than an full penetration weldment made without a backing ring. A joint made without a backing ring would not only have been more readily inspectable but also would have been less likely to provide a site for potential fatigue crack initiation. With regard to inspection, volumetric examinations of the girth weld following fabrication could have provided added assurance that discontinuities from fabrication would not be present to serve the fatigue crack initiation sites. Also, no volumetric inservice inspection has been proposed to monitor if service-induced degradation has occurred.

CONCLUSION

The staff concludes that the licensee has been thorough and effective in identifying the root cause of the pipe vibration. However, the modification which is admittedly a compromise because of physical limitations and cost appear to have been done without going significantly beyond what the applicable ASME Codes would require. The licensee has attempted to reduce some stress raisers but has neglected quite a few others. Further, non-destructive inspections performed in past and those proposed by the licensee for the future are minimal.

Had this problem occurred in the "safety-related" part of the facility, the staff would have expected the licensee to have been more attentive to design, fabrication and inspection factors discussed above.

This completes our action on this TAC.

Gus C. Lainas, Assistant Director
Division of BWR Licensing

cc: R. Bernero
W. Houston
G. Lainas
J. Stefano
E. Adensam
B. D. Liaw
R. Hermann
J. Jacobson, R III
D. Danielson, R III
J. Harrison, R III
J. Tsao

Contact: J. Tsao
X-29408