Entergy

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Entergy Nuclear Operations, Inc.
Vermont Yankee
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Vernon, VT 05354
Tel 802-257-7711

November 20, 2003
BVY 03-107

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Technical Specification Proposed Change No. 262 – Additional Information
Alternative Source Term – Copyright Release

By letter[1] dated November 7, 2003, Vermont Yankee[2] (VY) provided supplemental information to the NRC to support VY's request to amend Facility Operating License DPR-28 for the Vermont Yankee Nuclear Power Station by incorporating an Alternative Source Term (AST) methodology into the facility's licensing basis. The supplemental information consisted of two reports regarding the seismic verification of the Alternative Leakage Treatment pathway. The reports were prepared by ABS Group Consulting, Inc. under contract to VY and bear a copyright by ABS Group Consulting, Inc.

Attachment 1 to this letter is a copyright and proprietary information release that permits the NRC to reproduce copies of the subject reports. It is not the intent of either VY or ABS Group Consulting, Inc. that the reports be treated as proprietary information.

The information provided herewith does not expand the scope or change the conclusions of the original application for a license amendment, and the prior determination of no significant hazards consideration is unchanged.

If you have any questions in this regard, please contact Mr. Len Gucwa at (802) 258-4225.

Sincerely,

James M. DeVincentis
Manager, Licensing

Attachment

cc: USNRC Region 1 Administrator (cover letter only)
USNRC Resident Inspector – VYNPS (cover letter only)
USNRC Project Manager – VYNPS (with attachment)
Vermont Department of Public Service (with attachment)

[1] Vermont Yankee letter to U.S. Nuclear Regulatory Commission, Proposed Change No. 262 - Supplement No. 2, "Alternative Source Term – Seismic Verification Reports," BVY 03-101, November 7, 2003.

[2] Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. are the licensees of the Vermont Yankee Nuclear Power Station.

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Attachment 1

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 262

Additional Information

Alternative Source Term – Copyright Release

Release Letter from ABS Consulting

ABS Consulting
RISK CONSULTING DIVISION

November 19, 2003

NE-03-225

Mr. James Fitzpatrick
Entergy Nuclear Vermont Yankee, LLC
546 Governor Hunt Road
Vernon, VT 05354

**Subject: ABSG Consulting Inc. Copyright and Proprietary Information Release, Vermont Yankee Alternative Leakage Treatment Pathways and Boundaries Seismic Verification.
ENVY Purchase Order Release VY015966**

Dear Mr. Fitzpatrick:

ABSG Consulting Inc., as original preparer of Report No. 1173875-R-001, Revision 1, "Vermont Yankee Alternative Leakage Treatment Pathways and Boundaries Seismic Verification Report," dated November 5, 2003, and Report No. 1173875-R-002, Revision 0, "Vermont Yankee Alternative Leakage Treatment Pathways and Boundaries Walkdown Report," dated July 29, 2003, for Entergy Nuclear Vermont Yankee, LLC, hereby grants permission to the U.S. Nuclear Regulatory Commission to reproduce the aforementioned reports or any parts thereof as reasonably needed for its internal use, for filing in NRC public document rooms, and for limited distribution to members of the public who may request such documents from the NRC. Furthermore, ABSG Consulting Inc. is not requesting that the subject reports be considered Proprietary Information or withheld from public disclosure within the provisions of 10 CFR 2.790.

If you should have any questions on this matter, please do not hesitate to contact me.

Regards,

Paul D. Baughman
Vice President
Project Manager

ABSG Consulting Inc. • 118 Portsmouth Avenue • Stratham, NH 03885 USA
Tel: 603-778-1144 • Fax: 603-778-7495
www.absconsulting.com

JBFA

OUTGOING NRR CORRESPONDENCE REVIEW CHECKLIST

BVY 03 - 107 Date: 11/20/03

Subject: PC-262 ADDITIONAL INFORMATION AST - COPYRIGHT RELEASE

1.	(Y)/N	VY letterhead is provided for signature.
2.	(Y)/N	Date is appropriate and consistent with headers on all pages.
3.	(Y)/N	BVY number is provided and consistent with headers on all pages.
4.	(Y)/N	Addressee is correct.
5.	(Y)/N	Subject is correct, including "License No. DPR-28 (Docket No. 50-271)"
6.	(Y)/N	Appropriate persons listed on "cc:" list. State listed on any amendment correspondence. Includes "(w/o proprietary information)" or "(w/o attachments)" as appropriate.
7.	(Y)/N	Signature proper.
8.	Y/(N)	Is this letter to be signed under Oath and Affirmation?
9.	(Y)/N	References/attachments are correctly referenced in the body of the letter. ~~Regulatory agency review status of such documents (e.g. approved/not approved) is clear.~~
10.	(Y)/N	All acronyms are defined at first use. except "NRC"
11.	~~Y/N~~ N/A	All acronyms used in NSHC are defined in NSHC.
12.	~~Y/N~~ N/A	NSHC checklist complete.
13.	~~Y/N~~ N/A	Cover letter mentions precedent(s) used; differences that do or do not matter are explained; and indicated how they are addressed.
14.	(Y)/N	There are no typographical errors.
15.	~~Y/N~~ N/A	All proprietary issues addressed. • Correct title(s)/date(s) on affidavit • Identified in cover letter • Releasable version developed (i.e. non proprietary version) • Proprietary information correctly designated and justified. • Non-proprietary and Proprietary version designated proprietary content in agreement. • Copyright release provided, if necessary.
16.	~~Y/N~~ N/A	If non-proprietary, then all attachments are free from proprietary and copyright statements.
17.	~~Y/N~~ N/A	Have revision bars been appropriately placed?
18.	~~Y/N~~ N/A	Page numbers correct.
19.	~~Y/N~~ N/A	PORC/SRC review.
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21.	(Y)/N	Correspondence contact information is provided.
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23.	Y/(N)	Commitment(s). (Yes, Enter AP 0055)

Comments: ______

Review Completed By: [signature] Date: 11/20/03

Entergy

Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
Vermont Yankee
322 Governor Hunt Rd.
P.O. Box 157
Vernon, VT 05354
Tel 802-257-7711

November 7, 2003
BVY 03-101

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Vermont Yankee Nuclear Power Station
License No. DPR-28 (Docket No. 50-271)
Technical Specification Proposed Change No. 262 - Supplement No. 2
Alternative Source Term – Seismic Verification Reports

By letter[1] dated July 31, 2003, Vermont Yankee[2] (VY) proposed to amend Facility Operating License DPR-28 for the Vermont Yankee Nuclear Power Station (VYNPS) by incorporating an Alternative Source Term (AST) methodology into the facility's licensing basis. The license amendment request (LAR) was prepared in accordance with applicable regulatory guidance, and the analyses performed using the AST demonstrate that postulated accident consequences meet regulatory acceptance limits.

The Safety Assessment that was provided as Attachment 5 to the July 31, 2003 letter discussed an Alternative Leakage Treatment (ALT) strategy that credits the reduction in main steam isolation valve releases due to the holdup and deposition provided by certain downstream components. An evaluation of the seismic ruggedness of this ALT pathway was referenced in the Safety Assessment (i.e., Reference 28). To assist the NRC staff in its evaluation of the acceptability of the ALT strategy, VY is providing as Attachment 1 hereto the ALT Pathways and Boundaries Seismic Verification Report (i.e., Reference 28 of the Safety Assessment) and as Attachment 2 the associated ALT Pathways and Boundaries Walkdown Report. As stated in Attachment 1, a confirmatory walkdown of normally inaccessible piping and equipment will be conducted during the upcoming Spring 2004 refueling outage. It should also be noted that Attachment 1 is an updated version of Reference 28 and the report number differs (due to a typographical error) from that specified in the Safety Assessment.

In response to discussions with the NRC staff regarding VYNPS' licensing basis relative to seismic criteria, VY confirms that VYNPS was licensed prior to Appendix A to 10CFR100 becoming effective. Consequently, Appendix A to 10CFR100 is not part of VYNPS' licensing basis. Item No. 6 on page 9-3 of Attachment 1 also acknowledges this licensing basis.

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[1] Vermont Yankee letter to U.S. Nuclear Regulatory Commission, "Alternative Source Term," Proposed Change No. 262, BVY 03-70, July 31, 2003.

[2] Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. are the licensees of the Vermont Yankee Nuclear Power Station.

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The information provided herewith is supplemental information that further supports the full scope application of an alternative source term for VYNPS. As such, this information does not expand the scope or change the conclusions of the original application for a license amendment, and the prior determination of no significant hazards consideration is unchanged.

If you have any questions in this regard, please contact Mr. Len Gucwa at (802) 258-4225.

Sincerely,

Jay K. Thayer
Site Vice President

STATE OF VERMONT)
)ss
WINDHAM COUNTY)

Then personally appeared before me, Jay K. Thayer, who, being duly sworn, did state that he is Site Vice President of the Vermont Yankee Nuclear Power Station, that he is duly authorized to execute and file the foregoing document, and that the statements therein are true to the best of his knowledge and belief.

Sally A. Sandstrum, Notary Public
My Commission Expires February 10, 2007

Attachments (2)

cc:

- USNRC Region 1 Administrator (cover letter only)
- USNRC Resident Inspector – VYNPS (cover letter only)
- USNRC Project Manager – VYNPS (two copies/with attachments)
- Vermont Department of Public Service (with attachments)

Docket No. 50-271
BVY 03-101

Attachment 1

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 262

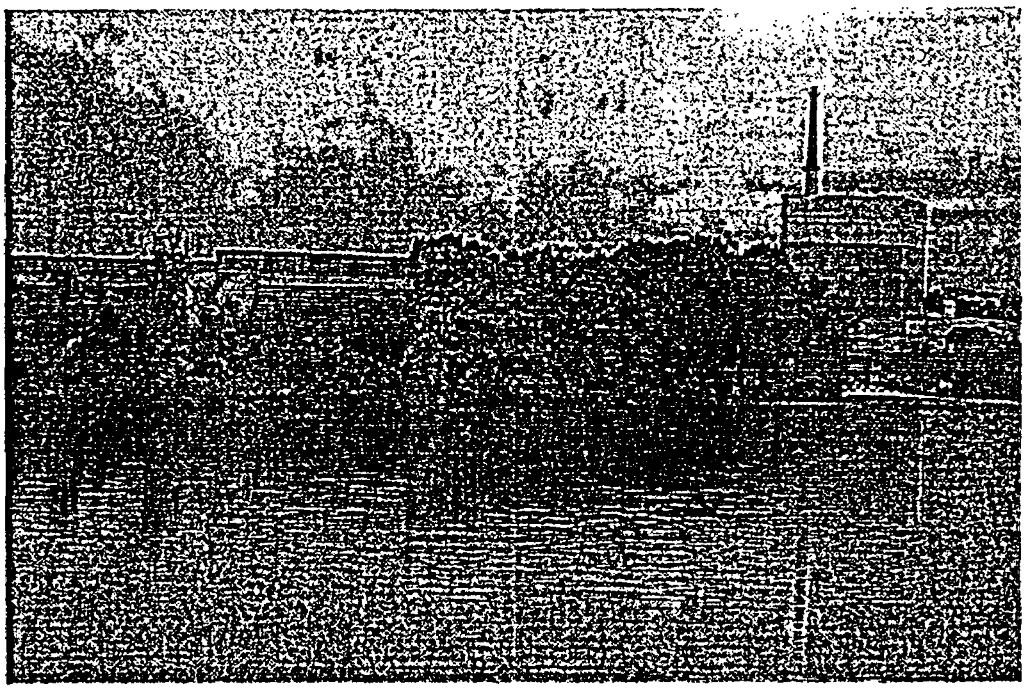
Supplement No. 2

Alternative Source Term – Seismic Verification Reports

ALT Pathways and Boundaries Seismic Verification Report

ABS Consulting
RISK CONSULTING DIVISION

Vermont Yankee Alternate Leakage Treatment Pathways and Boundaries Seismic Verification Report



Report No:
1173875-R-001, Revision 1
November 5, 2003

Prepared by:
ABS Consulting
118 Portsmouth Ave,
Stratham, NH 03885

Prepared for:
Entergy Nuclear Vermont Yankee, LLC

EQE

Table Of Revisions

Revision No.	Description of Revision	Date
0	Original Issue. Documents work performed and accessible area walkdown of June 2003	30-JULY-2003
1	Document revised to correct typographical error on page 4-1. 3rd Paragraph added word "database" before design practice. Revised following pages to Rev. 1 only: Cover (sht i), Table of Revisions (sht iii), Approval Cover Sheet (sht iv), Sheet 4-1, Design Review Checklist (sht E-2)	5-November-2003

Approval Cover Sheet

TITLE: Vermont Yankee Alternate Leakage Treatment Pathways and Boundaries Seismic Verification Report

REPORT NUMBER: 1173875-R-001

CLIENT: Entergy Nuclear Vermont Yankee

PROJECT NO.: 1173875

REVISION RECORD				
REV. NO.	DATE	PREPARED	REVIEWED	APPROVED
0	7/30/2003	Paul Bruck	James White	Paul Baughman
1	11/05/2003	Paul Bruck	James White	Paul Baughman

Summary

Regulatory Guide 1.183 Appendix A provides assumptions, acceptable to the NRC, for evaluation of the radiological consequences of loss-of-coolant accidents using Alternative Radiological Source Terms (ASTs). For boiling water reactor (BWR) main steam isolation valve (MSIV) leakage, the regulatory guide allows credit for a reduction in MSIV releases due to holdup and retention in main steam piping downstream of the MSIVs and in the main condenser. Such credit is based in part on the piping and components in the alternate leakage treatment (ALT) release path and those structures and equipment making up the ALT boundaries, being capable of performing their required functions during and after a safe shutdown earthquake.

This report confirms the scope of the ALT pathways. Additionally this report confirms, by walkdown and assessment in accordance with BWROG Topical Report NEDC-31858P-A and NRC SER, the seismic ruggedness of the ALT pathways and associated boundary piping for piping accessible during power operation. A walkthrough of piping normally inaccessible during power operation was performed during a brief reactor power-down. This walkthrough ascertained that the inaccessible piping was of the same general construction as the accessible piping that has been evaluated herein. This report also confirmed seismic ruggedness of the Turbine Building and condenser.

A full walkdown of all normally inaccessible piping and equipment will be performed during Re-Fueling Outage 24 (RFO-24). Verification of the seismic ruggedness for the presently inaccessible pathways, boundaries and equipment will be performed via technical evaluation, engineering experience with past performance of similar systems and walkdown. Piping and support systems considered as outliers to the verification process will be assessed and, if necessary, modified at that time.

Contents

Figures and Tables

Attachments

Report Total Number of Pages: 108

1. Introduction

This report describes the initial work performed in support of alternate leakage treatment (ALT) leakage paths and boundaries seismic verification. The work was performed in accordance with recommendations by the General Electric BWR Owners' Group (BWROG) Report for increasing MSIV leakage rate limits, and eliminating leakage control systems (Reference 1). Efforts included confirmation of the extent of the ALT leakage paths and boundaries; review and assessment of the seismic capability of the Turbine Building; evaluation of the condenser and condenser anchorage; seismic assessment of the stop valves and supports; and walkdown evaluation of normally accessible[1] piping, components and supports within the defined ALT boundaries. The intent of the walkdowns was to identify specific design conditions that might be associated with poor piping and/or component seismic performance. These specific poor seismic performance design conditions were identified as outliers. Outliers are subjected to detailed qualitative and/or quantitative assessment. Where required, modifications to resolve poor seismic performance configurations will be recommended. Walkdowns are focused toward identification of the following areas:

- Piping, pipe support and equipment seismic vulnerabilities, such as excessive span, heavy unsupported components, non-ductile piping or support material, high localized stresses, severe corrosion, and poor anchorage
- Seismic interaction caused by failure and falling (II/I) or by displacement and proximity impact
- Differential displacement and anchor displacement of structures, equipment and piping
- Seismic verification of boundary components
- Valve attributes

The scope of the effort is described in Section 2. Results of the work are described in Sections 3 through 8.

The seismic verification followed the guidelines of BWROG Report NEDC-31858P-A (Reference 1), the NRC Safety Evaluation Report (SER) (Reference 2), and previous MSIV ALT submittals by similar vintage BWR plants.

[1] Normally inaccessible piping, components and supports will be walked down during RFO-24.

2. Scope

In general terms, the scope of the seismic verification effort is the ALT seismic boundary and includes the condenser, main steam lines and all piping and tubing located off the main steam lines between the MSIVs and the turbine stop valves that could result in steam leakage.

The specifics of the seismic verification boundary are described by Entergy Nuclear Vermont Yankee (ENVY) in Technical Evaluation No. 2003-012 (Reference 3), which is included in its entirety as Attachment A. The seismic verification boundary is shown therein (see page A-9 within Attachment A). Several leakage paths and isolation boundary lines are defined and for organization, are placed into nine (9) groups described as either a Path or Boundary line below. A mark-up of the simplified flow diagram showing these groupings is shown in Figure 2-1.

Path 1	MS Low Point (LP) drains to condenser (Primary path)
Path 2	MS Low Point Drains downstream of MSIVs to condenser (Alternate path)
Path 3	Steam Jet Air Ejector (SJAE) supply line low point drain (Backup path)
Boundary 4	AOG steam supply (Boundary)
Boundary 5	Main Steam sample lines (Boundary)
Boundary 6	Steam to turbine steam seal system (Boundary)
Boundary 7	Steam to EPR, MPR and miscellaneous instruments (Boundary)
Boundary 8	Steam to turbine bypass valves (Boundary)
Boundary 9	Stop valve drains (Boundary)

Each of these paths and boundaries are described further below (based in part on References 3 and 30).

Path 1 – This is the primary ALT leakage path and follows the main steam low point drains to the condenser via drain valves LCV-101-38A, B, C and D, which are air operated valves (AOVs). These valves can be position changed from the control room and will fail to an open position on loss of air or power. Any of the four identified valves will provide an adequate drainage path (Ref. 3). The piping path extends from four 6" drain pots on the main steam headers, through the four indicated 1" AOV valves, to a common 8" header that goes to connection #67 on the condenser. The piping is located entirely within the Turbine Building.

Path 2 – This ALT leakage path is the alternate ALT drain path and follows main steam low point drains to the condenser via AOV valve LCV-2-143. This valve can be position changed from the control room and will fail open on loss of air or power. The piping path extends from four 1½" connections to the main steam headers just downstream of the MSIVs, to a common header and open manual valve V60-24, which serves as an orifice. The orifice ID is 0.7 inches providing a flow area of 0.86 square inches. From there, the path extends through 1" valve LCV-2-143 to a connection to 3" MSD-4, which then goes to condenser connection #47. The piping is located both in the Reactor Building (main steam tunnel and Torus area) and the Turbine Building.

Path 3 – This backup ALT leakage path is via the steam jet air ejector (SJAE) supply line low point drain air operated valve, LCV-101-39. The valve can be position changed from the control room and fails to an open position on loss of air or power. The piping path extends from a connection on main steam line 18" MS-1A through open manual valve V60-1. Prior to reaching the SJAE manifold, the line splits, going through 1" valve LCV-101-39 and then rejoining piping from the SJAE manifold. Within this path, AOVs FCV-101-37 and PCV-101-35 need to close to establish the path to condenser connection #68. These latter AOVs can be position changed from the control room, and fail to a close position on loss of air or power to the solenoid, based on a spring return, (Reference 3). Except for the 1" piping local to LCV-101-39, the majority of the piping in Path 3 is either 2", 2½" or 3" NPS. All the Path 3 piping is located in the Turbine Building.

Boundary 4 – This seismic boundary piping involves the advanced off gas (AOG) steam supply system. The boundary is at valves PRV-OG-834A and B, which are air operated valves arranged in parallel that fail to a closed position on loss of air or power. The piping path extends from a 2" connection on main steam line 18" MS-1B through open manual valve OG-9072 and motor operated valve OG-9060 up to the steam reducing station that includes 2" valves PRV-OG-834A and B. A ¾" drain line takes off from just upstream of the steam reducing station, passing through steam trap MS-113-1A, and then extending to a connection to line 3" MSD-4 (see Path 2 discussion above), just prior to condenser connection #47. A new check valve will be added to the ¾" drain line (line ¾" MS-189-D3) near the connection to 3"MSD-4 piping, to isolate this path to AOG. All the Boundary 4 piping is located in the Turbine Building.

Boundary 5 – This seismic boundary piping involves the main steam sample lines that connect to each of the four main steam headers. These lines do not require active isolation since they are closed systems. The complete line is within the seismic boundary. There are a pair of ¾" lines connected to each header and also tubing to the sample sink. The distance to the second isolation valve in each case is short. All the lines are located in the Turbine Building.

Boundary 6 – This seismic boundary piping involves the steam to turbine seal system. The piping extends from a 5" connection just upstream of the stop valve on 18" MS-1A up to a tee. Beyond the tee, one leg goes through a 5" x 3" reducer connected to Valve V60-6. The other leg connects to Valve V60-10. Both valves are motor operated valves (MOVs) which fail "as-is" on loss of power. V60-10 is normally closed and V-60-6 is closed at power greater than 70%. The piping seismic

boundary includes piping and supports beyond the boundary valves, of a sufficient configuration to provide adequate seismic support of the valves and upstream piping. Piping is located within the Turbine Building.

Boundary 7 – The EPR, MPR and miscellaneous instrument connections consist of small bore piping and tubing. These lines are seismic boundary piping/tubing and are closed systems extending from the main steam piping to the end instrument. The lines are located within the Turbine Building.

Boundary 8 – This seismic boundary piping consists of the 16" diameter main steam bypass piping, from the main steam lines downstream of the outboard MSIVs to the turbine bypass valve chests, Z-1-1B and Z-1-1A. Piping beyond the valve chests is included within the review. The piping is located within the Turbine Building.

Boundary 9 – This seismic boundary piping consists of stop valve drain small bore piping to isolation valves V-60-2A-D. The piping extends beyond these valves to the condenser through 2½" MSD-6 to condenser penetration #33. The piping is located within the Turbine Building

In addition to the paths described above, the Turbine Building, the condenser, the main steam piping (identified as Boundary 10 in Table 2-1) and the main steam stop valves are considered part of the seismic verification boundary and are included for evaluation. Additionally, drain piping from HPCI/RCIC steam supply systems was verified as a part of this effort (identified as Boundary 11 in Table 2-1). For the purposes of reference within this report, these systems are considered within the ALT seismic boundary scope.

The ALT seismic boundary scope includes a number of active components to establish a path or isolate a boundary, in addition to the stop and control valves. These are identified in Table 2-1. The piping also includes a number of steam traps, which will generally provide flow isolation for the system conditions evaluated within this report. However, these components are not considered as active components, since failure of the trap either to isolate flow or permit flow has not been relied upon to establish either ALT paths or boundary points.

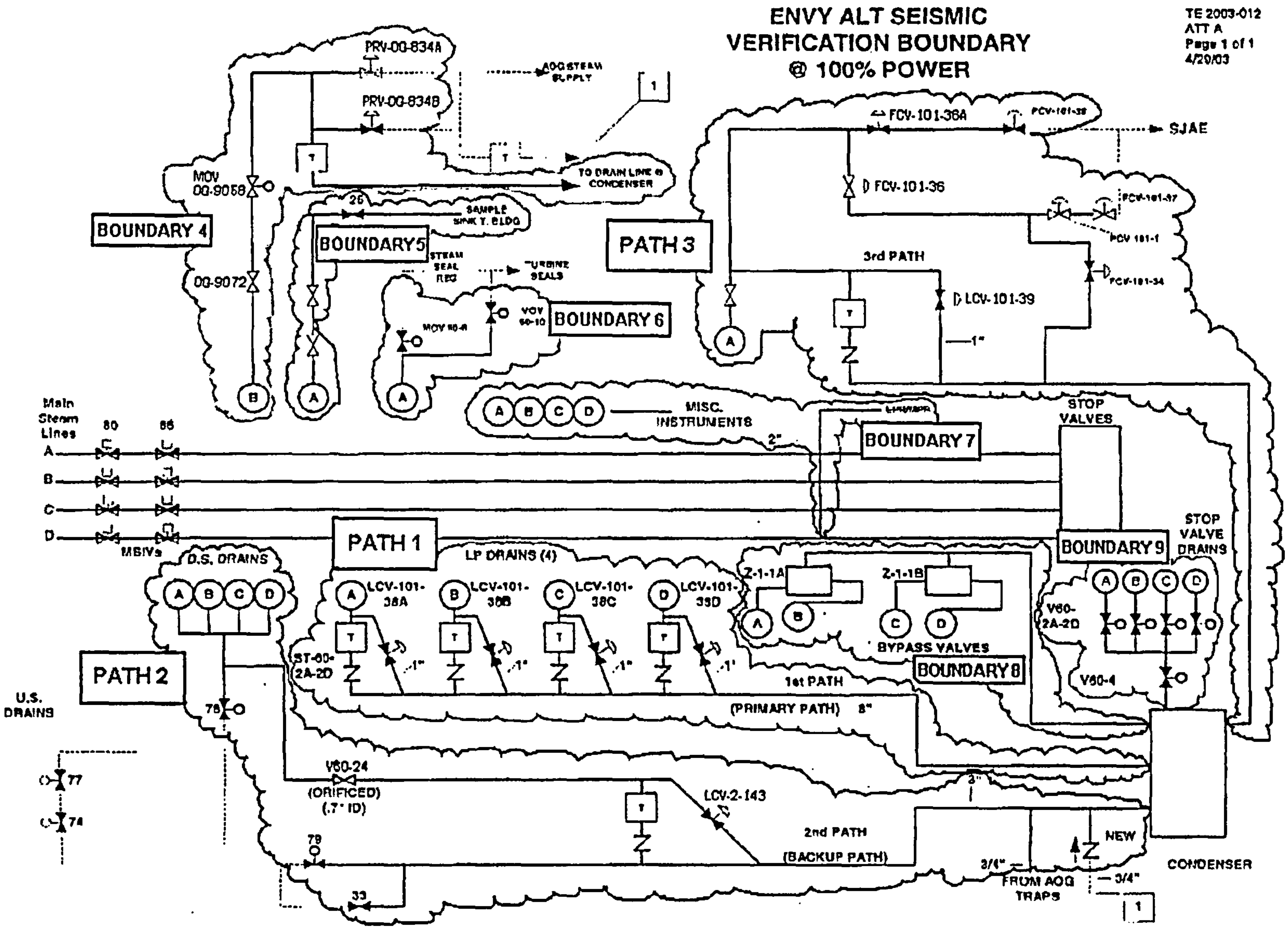


Figure 2-1: ALT Seismic Verification Scope

Table 2-1: ALT Boundary Description										
Line Path or Bound.	**Description**	**General Pipe Size**	**Start Point**	**Required End Point**	**Active or Passive**	**Active Component**	**Active Component Description**	**Required Active Function**	**Walkdown End Boundary**	**Notes**
1 - P	LP Drains	1", 1.5" 2", 2.5", 6", 8"	MS Lines A - D	Condenser Connection # 67	Active	LCV-101-38 A, B, C, D	1" AOV	Open	Condenser (Conn #67)	Primary Path – G191156 [30.1]
2 - P	MS LP Drains	1", 1.5" 2", 2.5", 3"	MS Lines A – D	Condenser Connection # 47	Active	LCV-2-143	1" AOV	Open	Condenser (Conn #47)	Alternate Path, Orificed Line G191167, G-191156 [30.1, 30.4]
3 - P	SJAE Supply Line Drains	1", 2", 2.5", 3"	MS Line A	Condenser Connection # 68	Active	LCV-101-39 FCV-101-37 PCV-101-35	1" AOV 3" AOV 2" AOV	Open Close	Condenser (Conn #68)	Backup Path G191156 [30.1]
4 - B	AOG Steam Supply	0.75", 2", 2.5"	MS Line B	Condenser Connection # 47 - @ 3"-MSD-4	Active	PRV-OG-834A PRV-OG-834B	1" AOV	Close	Condenser (Conn #47)	Check valve to be added to isolate path G191156 [30.1] A217 [30.3]
5 - B	MS Sample Lines	0.5", 0.75"	MS Line A - D	Sample Sink & misc end instruments	Passive	--	--	--	Sample Sink & misc end instruments	Boundary Line G191156 [30.1]

Table 2-1: ALT Boundary Description										
Line Path or Bound.	**Description**	**General Pipe Size**	**Start Point**	**Required End Point**	**Active or Passive**	**Active Component**	**Active Component Description**	**Required Active Function**	**Walkdown End Boundary**	**Notes**
6 - B	Turbine Steam Seal System	3", 5"	MS Line A	MOV-60-6 MOV-60-10	Passive	--	--	--	Sufficient system support beyond isolation valves	Boundary Line G191156 [30.1]
7 - B	EPR/MPR Misc. Instruments	0.75", 1", 2"	MS Lines A – D	Various Instruments	Passive	--	--	--	Instruments at end of system	Boundary Line G191156 [30.1]
8 - B	Steam to Turbine Bypass Valves	10", 16"	MSIVs	Condenser Connection # 41	Active	Bypass Valves Z1-1A Z1-1B	Piston Valves	Close	Condenser (Conn #41)	Boundary Line G191156 [30.1]
9 - B	Stop Valve Drains	1", 2½"	MS Lines A – D	Condenser Connection # 33	Passive	--	--	--	Condenser (Conn #33)	Boundary Line G191156 [30.1]

Table 2-1: ALT Boundary Description										
Line Path or Bound.	**Description**	**General Pipe Size**	**Start Point**	**Required End Point**	**Active or Passive**	**Active Component**	**Active Component Description**	**Required Active Function**	**Walkdown End Boundary**	**Notes**
10 - B MS Pipe - B	MS Piping	18"	MS Lines A – D	MS Stop Valves	Active	Stop Valves V60-3 A-D	Piston Valves	Close	Stop Valves	Boundary Line G191156 [30.1]
11 - B HPCI RCIC Drain - B	RCIC/HPCI Drains	1", 2"	3" MS-3B, 10" MS - 4B	Condenser Connection # 56	Passive	--	--	--	Condenser (Conn #56)	Boundary Line G191174 [30.5], G191169 [30.6]

3. Seismic Experience Database Comparisons

The seismic experience data were derived from an extensive database on the performance of power plants and industrial facilities in past strong-motion earthquakes. These performance data were compiled by ABS Consulting (formerly EQE) for the Seismic Qualification Utility Group (SQUG), the Electric Power Research Institute (EPRI) and others, and include over 100 facilities in more than 60 earthquakes that have occurred around the world from 1934 to present. Of particular interest for the scope of work herein is the performance of non-seismically analyzed main steam piping, related components and supports, and condensers.

The BWROG report (Reference 1) summarizes data on the performance of main steam piping and condensers in past strong-motion earthquakes and compares these piping and condensers with those in typical U.S. GE Mark I, II and III nuclear plants. The earthquake experience data and similarity comparisons are then used to draw conclusions on how the GE piping and condensers would perform in a design basis earthquake.

This section presents experience database comparisons that are plant specific to Vermont Yankee (VY). The purpose of this review is to ensure the vibratory ground motion experienced at each of the facilities with equipment being used as a surrogate for similar equipment at VY, met or exceeded the VY design basis earthquake.

3.1 VY Ground Response

Section 1.6.1.1.7 of the VY Updated Final Safety Analysis Report (UFSAR) (Reference 6), defines the design earthquake (DE) as having a maximum horizontal ground acceleration of 0.07g, and the maximum hypothetical earthquake (MHE) as having 0.14g maximum horizontal ground acceleration. The general ground response spectrum shape is as shown within sheet A.2-21 of the UFSAR for the DE, with the shape for the MHE being twice the DE curves depicted within the UFSAR. The horizontal earthquake time history used to generate in-structure response spectra for VY was based on the 1952 Kern County earthquake recorded at Taft, California, scaled to a peak ground acceleration (PGA) of 0.14g for the MHE.

The design earthquake (DE) is more commonly referred to as the operational basis earthquake (OBE) and the maximum hypothetical earthquake (MHE) is more commonly referred to as the safe shutdown earthquake (SSE). For assessment of the ALT pathways and boundaries the SSE level earthquake is of concern (Reference 1), and the term SSE is used throughout this report.

The VY 5% damped ground response spectrum is depicted in Figure 3-1, (and also Figures 3-2 through 3-10). The shape of the curve is based on the shape depicted within the UFSAR. Spectral acceleration at 33 Hz for this curve is 0.2 g versus 0.14 g PGA per the UFSAR. The difference is due to the conservative manner originally utilized in developing the ground response spectrum curve depicted in the UFSAR.

3.2 Seismic Ground Motions

Ground motion estimates of 13 database sites have been reviewed and accepted by the NRC staff for inclusion in the BWROG earthquake experience database, and are presented in the associated NRC SER (Reference 2). Comparisons of the ground response spectra of selected database facilities with the Vermont Yankee SSE ground spectrum (Section 3.1) were made to establish applicability of the BWROG experience-based methods for demonstrating seismic ruggedness of main steam piping, attached leakage path piping, other ALT pathways and boundary components, and associated supports/anchorages at Vermont Yankee. The VY SSE ground spectrum was not among the BWR plant spectra shown in the Reference 1 Topical Report.

The majority of the ALT pathways and boundaries piping and components and the condensers at Vermont Yankee are located in the lower elevations of the Turbine Building. Portions of specific lines initiate within the main steam tunnel, and pass through the lower elevations of the Reactor Building.

A composite comparison of the ground response spectra of selected earthquake experience database facilities (as accepted and shown in Reference 2) with the Vermont Yankee design basis SSE ground spectrum (from Section 3.1) is shown in Figure 3-1. The selected ground motions include the following nine sites from among the thirteen database facilities reviewed and accepted by the NRC in the Reference 2 SER.

- Grayson Power Plant (Glendale) – Horizontal direction
  1971 San Fernando Earthquake (M6.6)

- Las Ventanas Power Plant – Horizontal direction
  1985 Chile Earthquake (M7.8)

- Commerce Refuge to Energy Plant (LA Bulk Mail) – Horizontal direction
  1987 Whittier Narrows Earthquake (M5.9)

- Coolwater Power Plant – Horizontal direction
  1992 Landers Earthquake (M7.3)

- Burbank Power Plant – USGS estimate
  1971 San Fernando Earthquake (M6.6)

- PALCO Cogeneration Plant (Rio Dell) – Horizontal direction
  1992 Petrolia Earthquake (M6.9)

- El Centro Steam Plant – Horizontal direction
  1979 Imperial Valley Earthquake (M6.6)

- Moss Landing Power Plant – PG&E estimate
  1989 Loma Prieta Earthquake (M7.1)

- Valley Steam Plant – USGS estimate
  1971 San Fernando Earthquake (M6.6)

Individual plots of the 5% damped ground spectra of the above database facilities compared with the Vermont Yankee 5% SSE ground spectrum are shown in Figures 3-2 to 3-10. In general, the earthquake experience database sites have experienced strong ground motions that are in excess of the Vermont Yankee SSE in the frequency range of interest (i.e., about 0.5 Hz and above for piping and rigid range for equipment). All the database site ground motions envelope the Vermont Yankee SSE ground spectrum by large factors in various frequency bands within the 1 Hz and above range.

For comparison with selected condensers within the earthquake experience database, earthquake response at the Moss Landing site and at the Ormond Beach site was considered. Since the condenser is a massive structure located in the lower elevations of the Turbine Building, the condenser is effectively subjected to ground motion response. The structure is massive, with extensive internal bracing, and will respond in essentially a rigid manner. The Reference 2 accepted estimate of horizontal peak ground acceleration response is 0.35 g for Moss Landing[2]. The maximum horizontal PGA response is approximately 0.12 g for Ormond Beach. The Moss Landing PGA is well in excess of the VY SSE PGA of 0.14 g. The Ormond Beach PGA of 0.12 g was recorded some distance from the plant site and farther from the epicenter, however, based on Reference 2 it is considered as a representative estimate of this facilities ground motion. The Ormond Beach condenser is similar to the VY condenser in many respects, and inclusion of this condenser for comparison purposes to VY is reasonable, and enhances the earthquake experience comparison of condensers subjected to strong ground motion earthquakes in excess of or similar to the VY SSE PGA of 0.14g. Therefore, condensers within the earthquake database are a good basis of comparison for the performance of the VY condenser when subject to the design basis earthquake of SSE magnitude.

Based on the above observations and comparisons, the Vermont Yankee SSE ground spectrum is generally bounded by those of the earthquake experience database sites at the frequencies of interest. Hence, the use of the earthquake experience-based approach at Vermont Yankee for demonstrating seismic ruggedness of non-seismically analyzed main steam piping, related components and supports, and condensers – applied consistent with BWROG recommendations and SER limitations – is appropriate.

3.3 Piping

Main steam piping and condensers in the earthquake experience database have exhibited substantial seismic ruggedness, even when they are typically not designed to resist earthquake. This is also a common conclusion in studies of this type on other plant commodities such as welded steel piping in general, anchored equipment such as motor control centers, pumps, valves, structures, etc. With limited exceptions, normal industrial construction and equipment typically have substantial inherent seismic ruggedness, even when not designed for earthquakes. No failures of main steam piping have been seen. Anchored condensers have also performed well in past earthquakes with damage limited to minor internal tube leakage.

[2] The NRC SER accepted estimate is the PGE curve shown in Figure 4 of Reference 2.

The BWROG Report (Reference 1) contains detailed discussions and comparisons of main steam piping and condenser design in several earthquake experience database sites and example GE Mark I, II and III plants in the U.S. The general conclusions of these comparisons are as follows.

- GE plant designs are similar to or more rugged than those in the earthquake experience database that exhibited good earthquake performance.
- The possibility of significant failure in GE BWR main steam piping or condensers in the event of an eastern U.S. design basis earthquake is highly unlikely.
- Any such failure would also be contrary to a large body of historical earthquake experience data, and thus, unprecedented.

Plant-specific comparisons of the condensers at Vermont Yankee with those in the selected earthquake experience database are discussed in detail in Reference 8, and summarized in Section 6.0 herein. Plant-specific comparisons of main steam and drain piping at Vermont Yankee with piping included in the selected earthquake experience database are described below.

The piping at VY was fabricated and installed using industry standard practice generally complying with the standards of the B31.1 piping code (Reference 19) as outlined within the VY plant piping and pipe support specification (Reference 18). Thus the ALT seismic boundary piping at VY is consistent in design practice and construction with the piping results from facilities in the earthquake experience database. Table 3-1 presents a summary of piping data (sizes, schedules, materials, etc) for the main steam and drain piping at Vermont Yankee. The materials of construction for this piping are typically carbon steel of A106 Grade B or A53 Grade B composition, which have good ductility and low creep characteristics at service temperature. Certain portions of piping have been replaced with low and intermediate alloy steels of A335 Gr. P11 and P22 material, which are more resistant to flow accelerated corrosion (FAC) damage mechanisms. All the materials of construction are consistent with piping materials found within the experience database. Table 3-2 presents similar data for facilities in the earthquake experience database. Table 3-3 presents a summary comparison of the same data for Vermont Yankee and facilities in the earthquake experience database. Figure 3-11 presents the D/t and pipe size data graphically.

Table 3-3 and Figure 3-11 show that pipe sizes and D/t ratios[3] for ALT pathways and boundaries piping fall within the limits of the pipe sizes and D/t ratio the earthquake experience database piping, both in pipe size and in D/t ratio. An exception to this is that the VY seismic boundary piping (refer to Boundary 6 piping outlined in Section 2) contains 5" schedule 80 piping. The resulting D/t ratio for this piping being 15. Although the 5" piping is not explicitly represented in the earthquake experience database, piping of both smaller and larger size with comparable and enveloping (smaller and larger) D/t ratios are adequately represented in the database, refer to Figure 3-11. Thus, based on

[3] Ratio of pipe diameter (D) to pipe wall nominal thickness (t).

these factors it is also concluded the 5" piping is adequately enveloped by the experience data and supporting analysis.

The pipe materials, and associated allowable stress values from B31.1 (Reference 19), which represent the VY ALT seismic boundary scope, are presented in Table 3-1. Associated materials and allowable stresses for representative piping within the earthquake database are presented in Table 3-3. From Table 3-3 it can be seen that the piping materials used for the fabrication of the VY ALT seismic boundary scope are comparable with piping within the earthquake database.

Therefore, piping results from the database, with consideration of specific installation configuration concerns addressed through detailed walkdown (Section 4), can reasonably be applied to Vermont Yankee piping.

3.4 Equipment and Other Features

Other equipment within the scope of the leakage pathway review includes valves, instruments, and tanks, which are referred to as related equipment in this evaluation. The SQUG Generic Implementation Procedure (GIP) methodology, documented in Reference 23, and accepted by the NRC (Reference 24) was employed to address the seismic adequacy of this equipment. The GIP provides a formal procedure for evaluating these classes of equipment against the earthquake experience data. The VY design basis SSE ground response spectrum is compared to the GIP Bounding Spectrum in Figure 3-12. It can be seen that the GIP Bounding Spectrum envelops the VY design basis SSE ground response spectrum. As such use of the GIP methodology for evaluating the other equipment within the scope of the ALT seismic boundary is a reasonable approach for seismic qualification of these components.

Figure 3-1 Comparisons of Selected Database Site Spectra to Vermont Yankee SSE Ground Spectrum

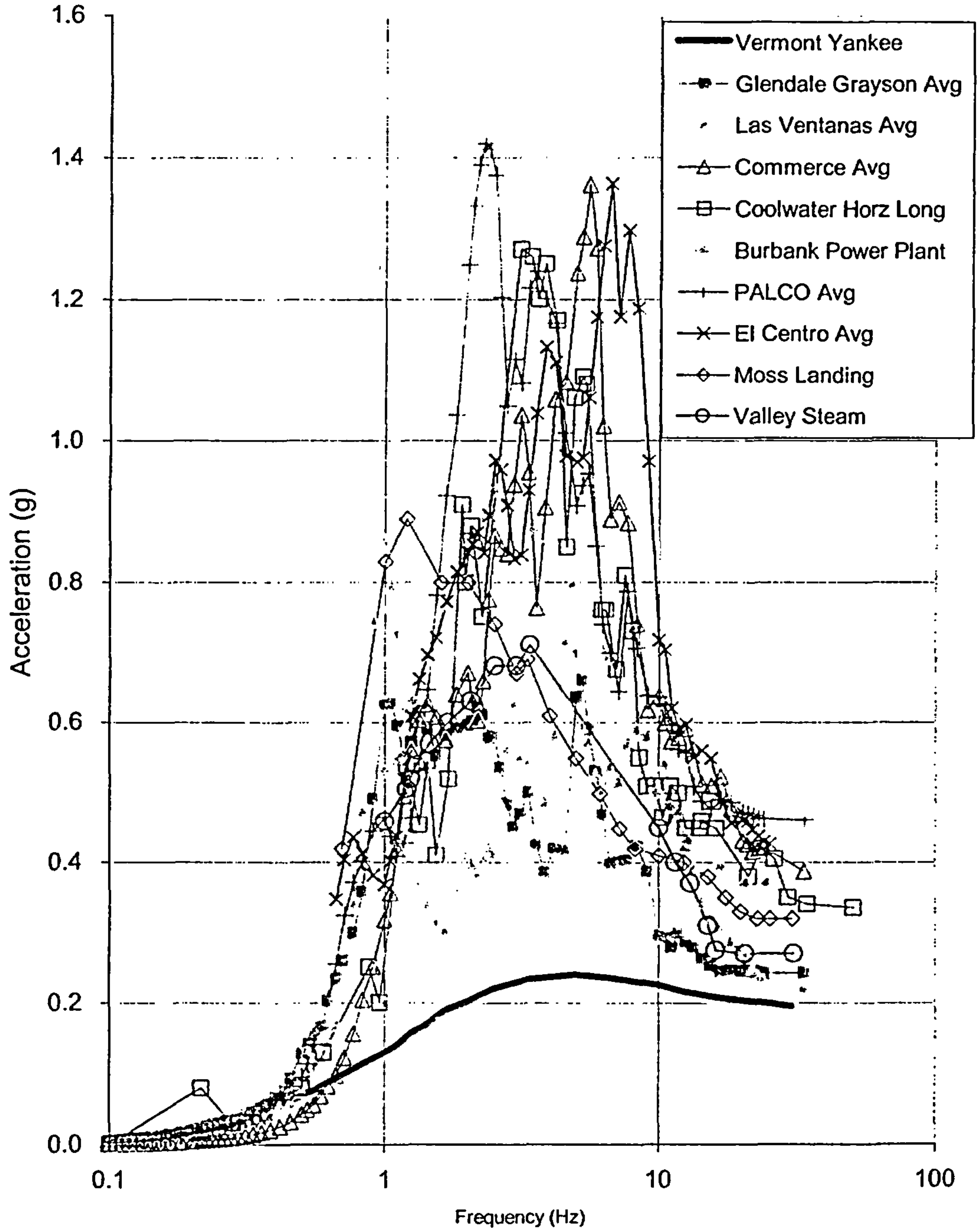


Figure 3-2 Comparison of Glendale Grayson Spectra to Vermont Yankee SSE Ground Spectrum

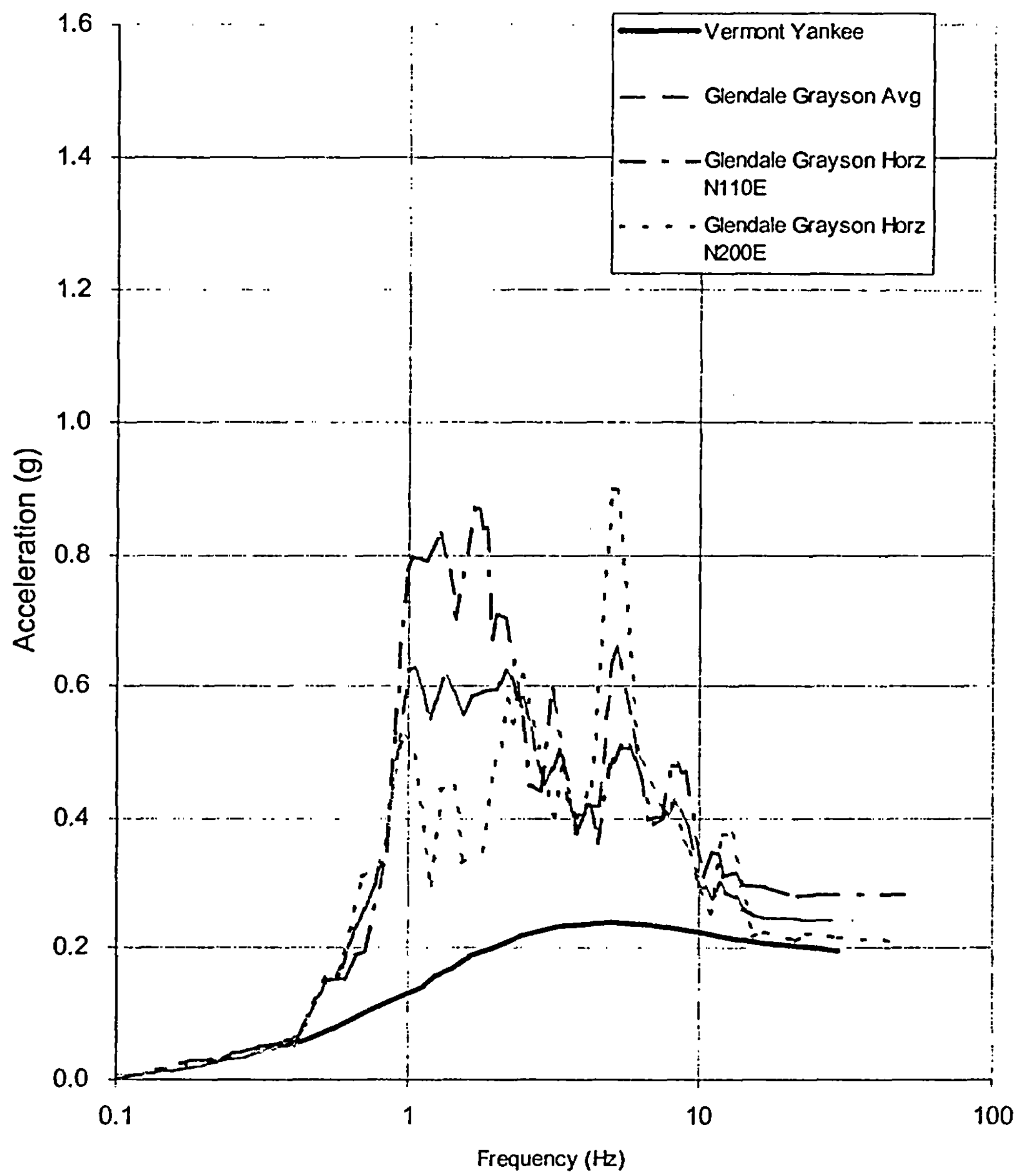


Figure 3-3 Comparison of Ventanas Spectra to Vermont Yankee SSE Ground Spectrum

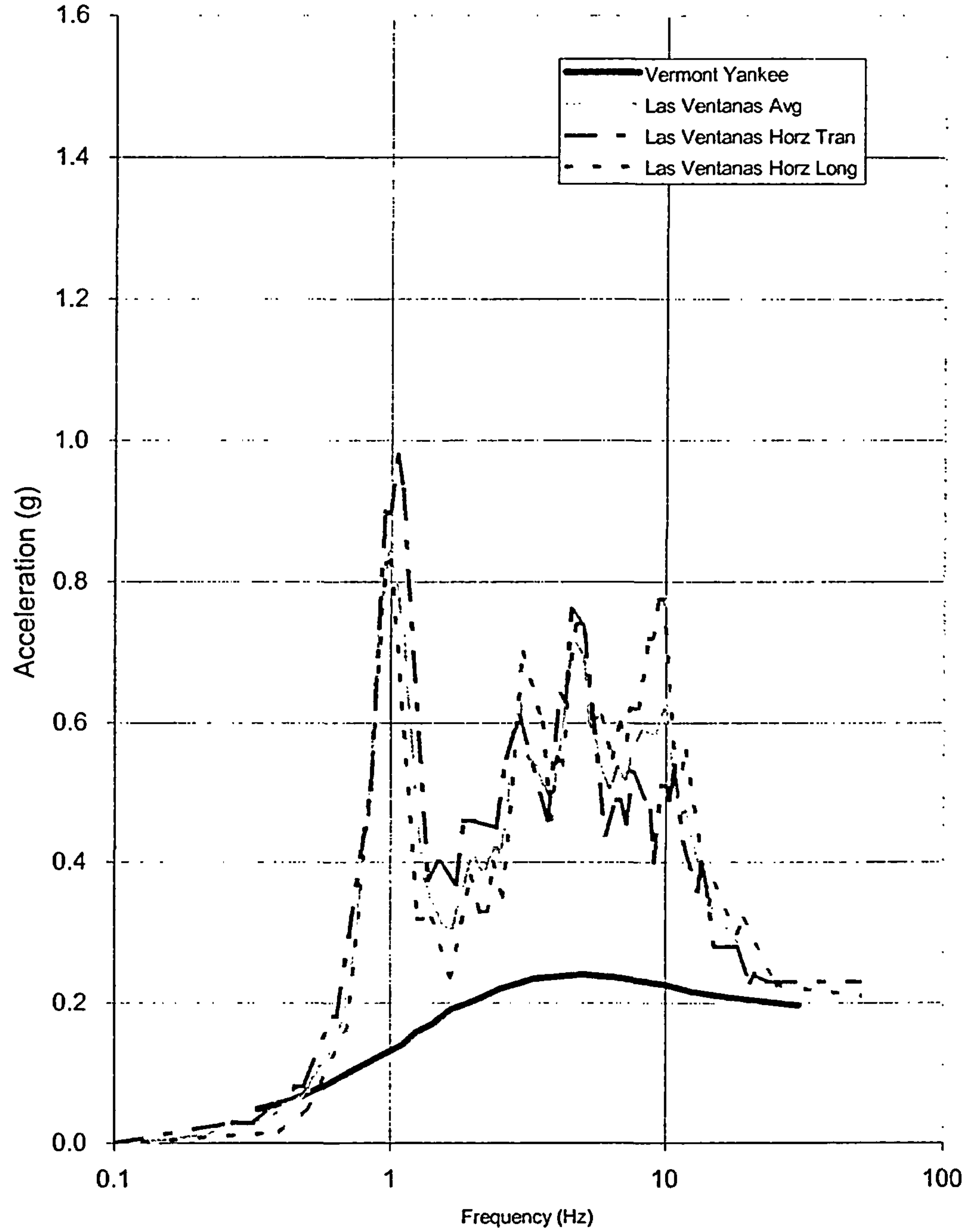


Figure 3-4 Comparison of Commerce Spectra to Vermont Yankee SSE Ground Spectrum

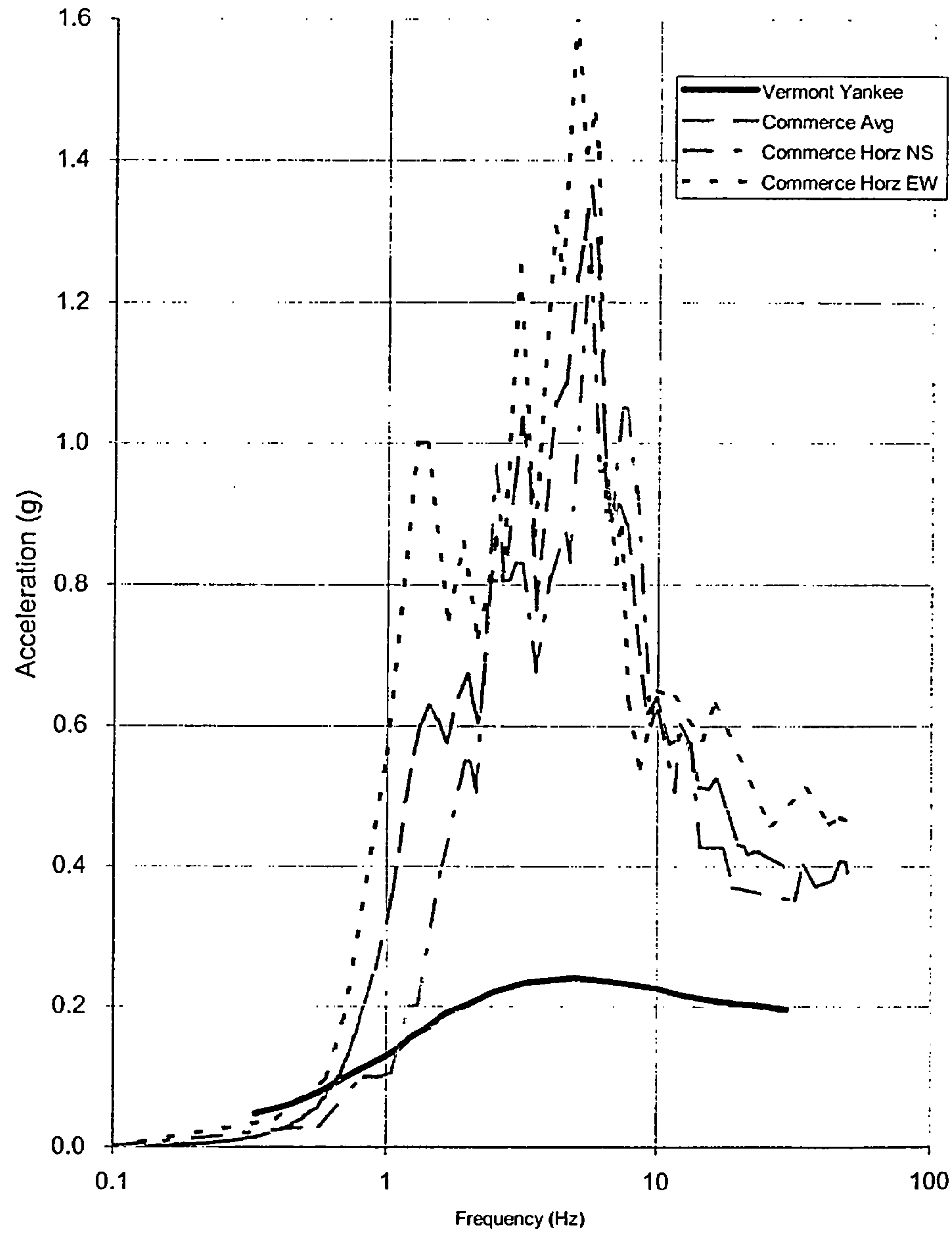


Figure 3-5 Comparison of Coolwater Spectra to Vermont Yankee SSE Ground Spectrum

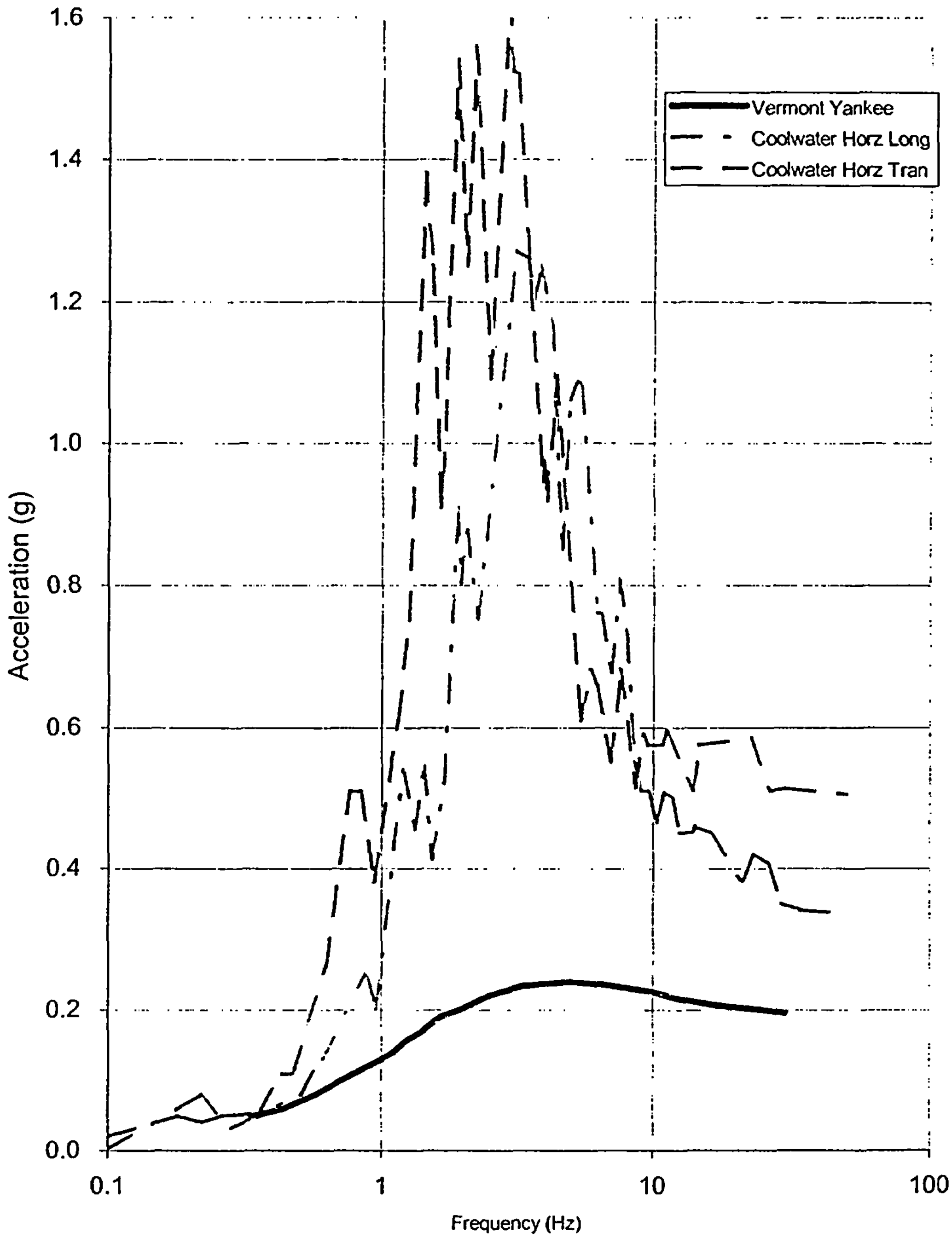


Figure 3-6 Comparison of Burbank Plant Spectrum to Vermont Yankee SSE Ground Spectrum

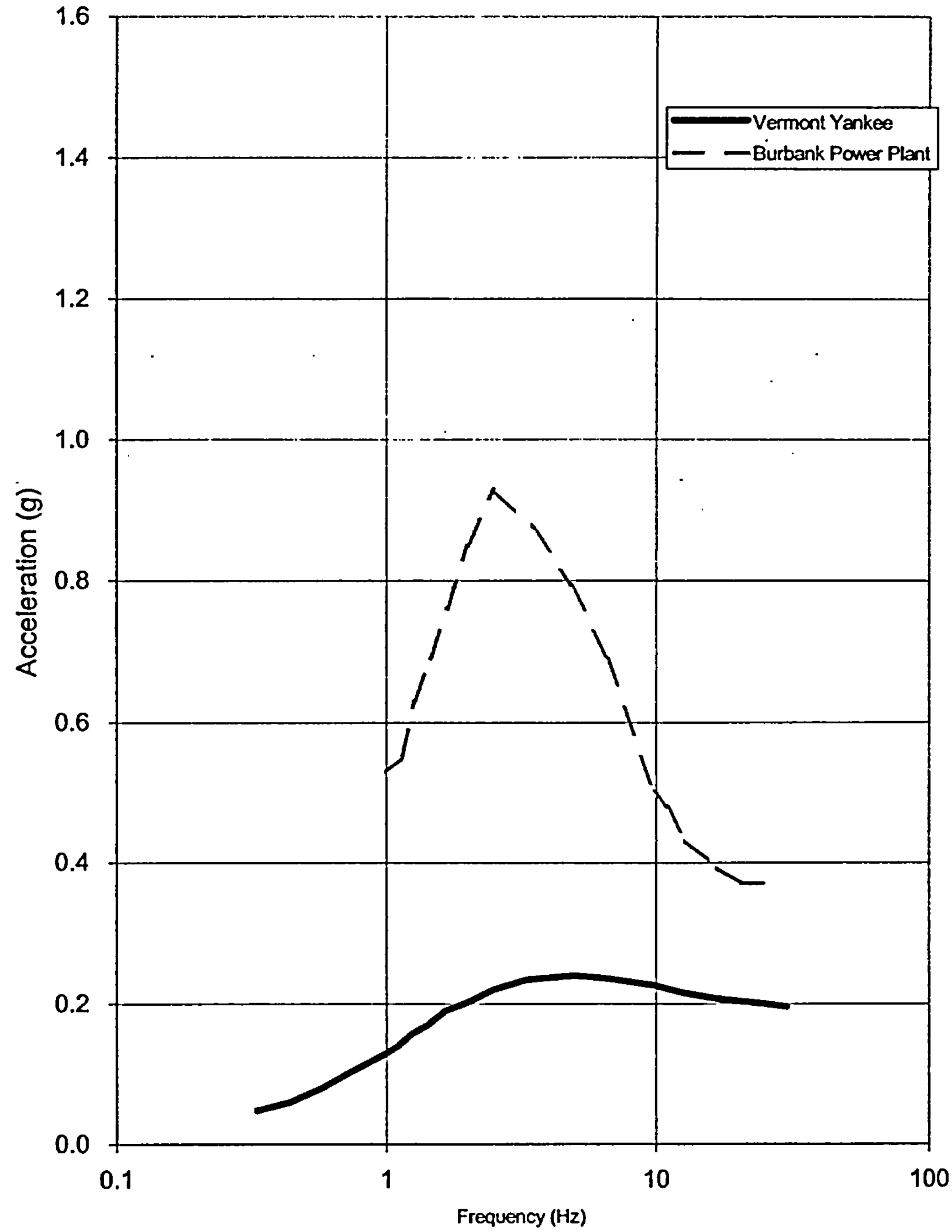


Figure 3-7 Comparison of PALCO Spectra to Vermont Yankee SSE Ground Spectrum

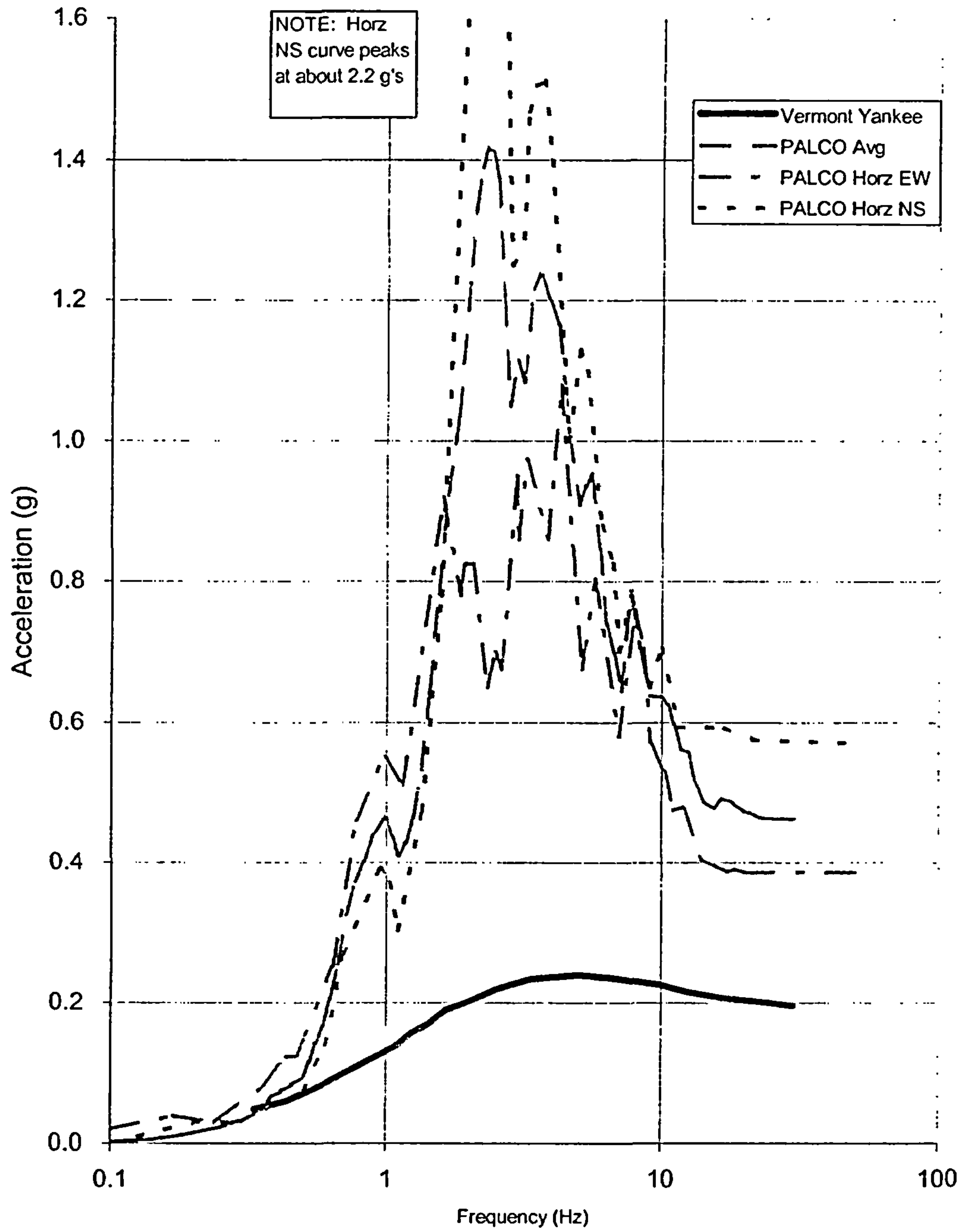


Figure 3-8 Comparison of El Centro Spectra to Vermont Yankee SSE Ground Spectrum

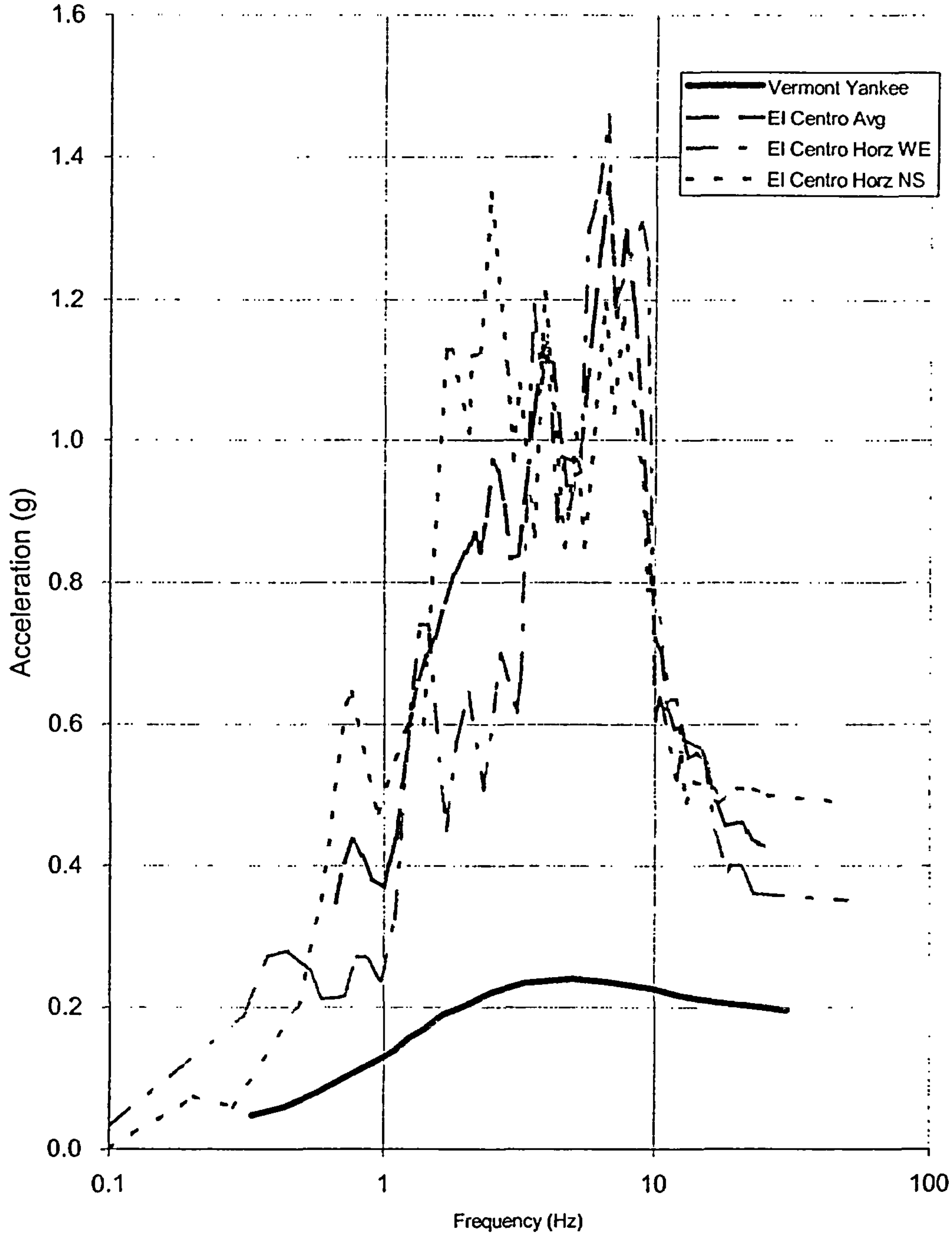


Figure 3-9 Comparison of Moss Landing Spectrum to Vermont Yankee SSE Ground Spectrum

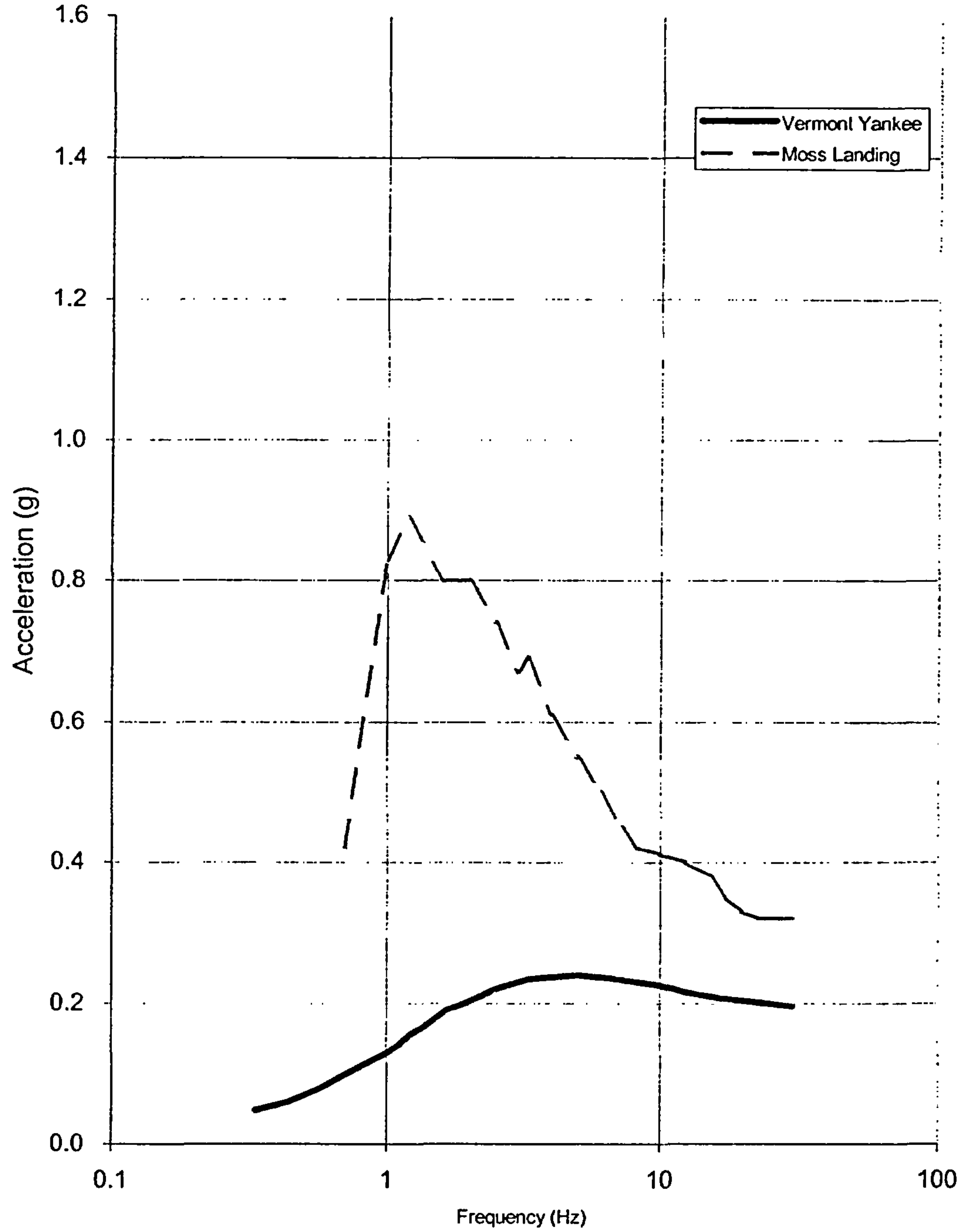


Figure 3-10 Comparison of Valley Steam Spectra to Vermont Yankee SSE Ground Spectrum

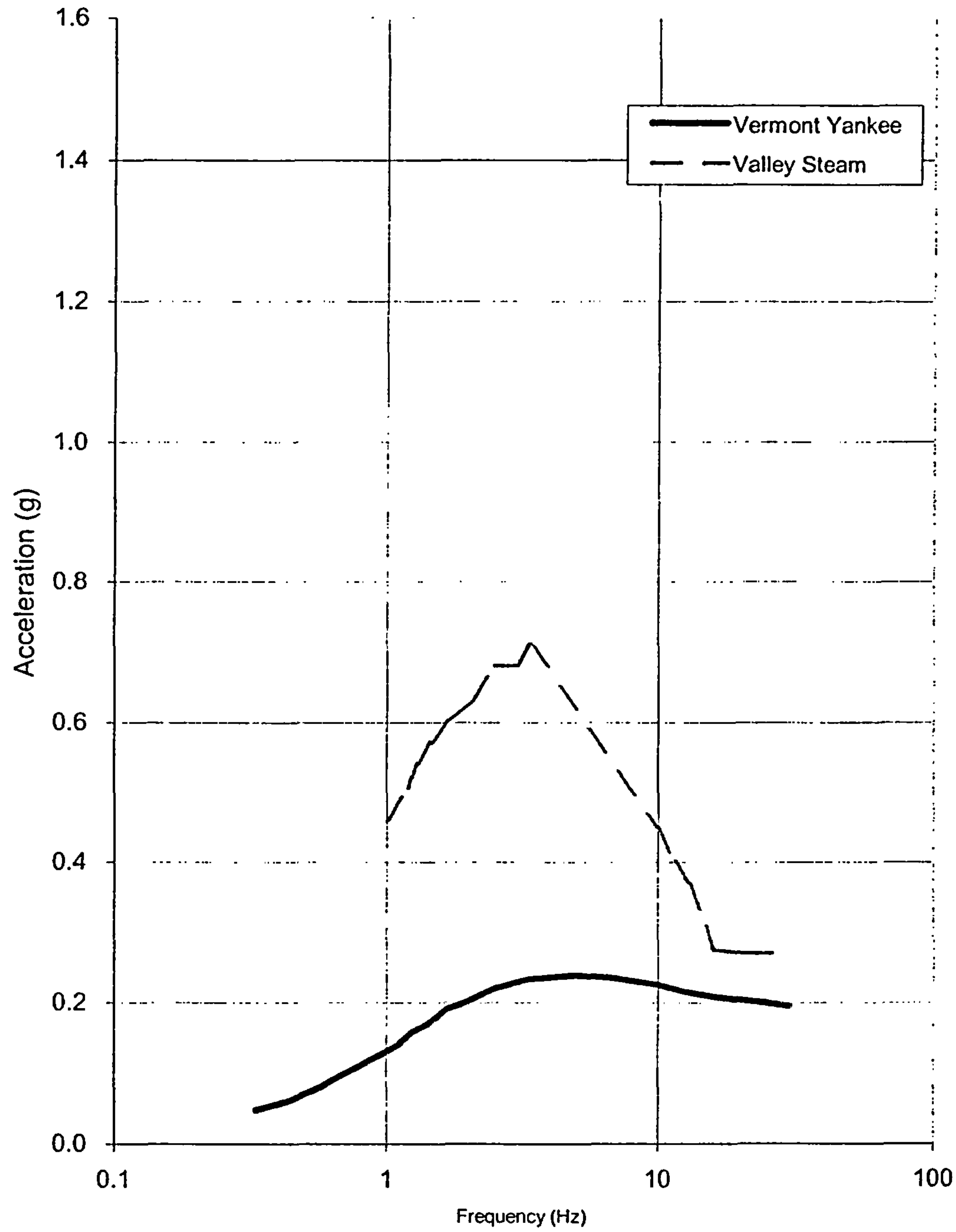


Table 3-1

Design Basis Data at Vermont Yankee for Main Steam and Drain Piping

Piping Description	Pipe Size (NPS)	Pipe O.D. (in)	Pipe Sch	Wall thick (in)	D/t	Piping Material	Piping Design Code
Main Steam and Drain Piping	18	18	80	0.937	19	CS & low & Int. Alloy Steel (Note 1)	B31.1 - 1967
	16	16	80	0.843	19		
	10	10.75	80	0.593	18		
	8	8.625	80	0.500	17		
	6	6.625	80	0.432	15		
	5	5.563	80	0.375	15		
	3	3.5	160	0.437	8		
	3	3.5	80	0.300	12		
	2½	2.875	160	0.375	8		
	2	2.375	80	0.218	13		
	2	2.375	160	0.343	7		
	1½	1.9	160	0.281	7		
	1	1.315	80	0.179	7		
	1	1.315	160	0.250	5		
	¾	1.05	80	0.154	7		
	¾	1.05	160	0.218	5		

Notes:

1. Materials of construction include carbon steels (CS) and low intermediate alloy steels, typically of A106 Grade B, A 53 Grade B and A335 Gr. P11 and P22 materials, (Reference 4, 5, and 18).

2. Typical B31.1 code (Ref. 19) material allowable stress limits for the materials identified in note 1, at room through maximum operating temperature of piping within the ALT pathways and boundaries, are 15 ksi.

Table 3-2

Seismic Experience Database Design Data

Facility	Pipe Size (NPS)	Pipe O.D. (inch)	Pipe Schedule	Wall Thickness (inch)	D/t
Valley Steam Plant Units 1 & 2	24	24.0	20	0.375	64
	20	20.0	20	0.375	53
	18	18.0	30	0.437	41
	16	16.0	30	0.375	43
	14	14.0	30	0.375	37
	12	12.75	40	0.406	31
	12	12.75	30	0.330	39
	10	10.75	160	1.125	10
	8	8.625	160	0.906	10
	6	6.625	40	0.280	24
	4	4.50	160	0.531	8
	4	4.50	40	0.237	19
	3	3.50	160	0.437	8
	3	3.50	80	0.300	12
	3	3.50	40	0.216	16
	2	2.375	160	0.343	7
	2	2.375	40	0.154	15
	1½	1.90	160	0.281	7
	1½	1.90	40	0.145	13
	1	1.315	40	0.133	10
	¾	1.05	160	0.218	5
	¾	1.05	40	0.113	9

Table 3-2

Seismic Experience Database Design Data

(continued)

Facility	Pipe Size (NPS)	Pipe O.D. (inch)	Pipe Schedule	Wall Thickness (inch)	D/t
El Centro Steam Plant	20	20.0	STD	0.375	53
	18	18.0	160	1.781	10
	18	18.0	XS	0.500	36
	18	18.0	STD	0.375	48
	14	14.0	40	0.437	32
	14	14.0	STD	0.375	37
	12	12.75	160	1.312	10
	12	12.75	STD	0.375	34
	10	10.75	40	0.365	29
	8	8.625	160	0.906	10
	8	8.625	120	0.718	12
	8	8.625	40	0.322	27
	6	6.625	120	0.562	12
	6	6.625	40	0.280	24
	4	4.50	80	0.337	13
	4	4.50	40	0.237	19
	3	3.50	160	0.437	8
	3	3.50	80	0.300	12
	3	3.50	40	0.216	16
	2	2.375	160	0.343	7
	2	2.375	80	0.218	11
	2	2.375	40	0.154	15
	1½	1.90	160	0.281	7
	1½	1.90	80	0.200	10
	1½	1.90	40	0.145	13
	1	1.315	80	0.179	7
	1	1.315	40	0.133	10
	¾	1.05	80	0.154	7
	¾	1.05	40	0.113	9

Table 3-2

Seismic Experience Database Design Data

(continued)

Facility	Pipe Size (NPS)	Pipe O.D. (inch)	Pipe Schedule	Wall Thickness (inch)	D/t
Moss Landing Units 1, 2 & 3	16	16.0	--	1.394	11
	12	12.75	--	1.148	11
	8	8.625	160	0.906	10
	8	8.625	30	0.277	31
	6	6.625	160	0.562	12
	6	6.625	40	0.280	24
	4	4.50	160	0.531	8
	4	4.50	80	0.337	13
	4	4.50	40	0.237	19
	3	3.50	160	0.437	8
	3	3.50	80	0.300	12
	3	3.50	40	0.216	16
	2	2.375	160	0.343	7
	2	2.375	80	0.218	11
	2	2.375	40	0.154	15
	1½	1.90	160	0.281	7
	1½	1.90	80	0.200	10
	1	1.315	160	0.250	5
	1	1.315	80	0.179	7
	¾	1.05	160	0.218	5
	¾	1.05	80	0.154	7

Table 3-2

Seismic Experience Database Design Data

(continued)

Facility	Pipe Size (NPS)	Pipe O.D. (inch)	Pipe Schedule	Wall Thickness (inch)	D/t
Moss Landing Units 4 & 5	24	24.0	40	0.687	35
	24	24.0	--	1.066	23
	--	18.8	--	2.287	8
	16	16.0	40	0.500	32
	16	16.0	--	0.902	18
	--	13.2	--	1.668	8
	8	8.625	160	0.906	10
	8	8.625	40	0.322	27
	6	6.625	160	0.562	12
	6	6.625	40	0.280	24
	4	4.50	160	0.531	8
	4	4.50	80	0.337	13
	4	4.50	40	0.237	19
	3	3.50	160	0.437	8
	3	3.50	80	0.300	12
	3	3.50	40	0.216	16
	2	2.375	160	0.343	7
	2	2.375	80	0.218	11
	2	2.375	40	0.154	15
	1½	1.90	160	0.281	7
	1½	1.90	80	0.200	10
	1½	1.90	40	0.145	13
	1	1.315	160	0.250	5
	1	1.315	80	0.179	7
	1	1.315	40	0.133	10
	¾	1.05	160	0.218	5
	¾	1.05	80	0.154	7
	¾	1.05	40	0.113	9

Table 3-2

Seismic Experience Database Design Data (continued)

Facility	Pipe Size (NPS)	Pipe O.D. (inch)	Pipe Schedule	Wall Thickness (inch)	D/t
Moss Landing Units 6 & 7	30	30.0	--	0.632	47
	26	26.0	--	1.128	23
	18	18.0	--	3.444	5
	12	12.75	--	2.444	5
	12	12.75	--	0.601	21
	8	8.625	--	1.650	5
	8	8.625	40	0.322	27
	6	6.625	--	1.268	5
	6	6.625	40	0.280	24
	4	4.50	--	0.861	5
	4	4.50	80	0.337	13
	4	4.50	40	0.237	19
	3	3.50	80	0.300	12
	3	3.50	40	0.216	16
	2½	2.875	--	0.550	5
	2½	2.875	80	0.276	10
	2½	2.875	40	0.178	16
	2	2.375	--	0.519	5
	2	2.375	80	0.218	11
	2	2.375	40	0.154	15
	1½	1.90	--	0.428	4
	1½	1.90	80	0.200	10
	1½	1.90	40	0.145	13
	1	1.315	--	0.301	4
	1	1.315	80	0.179	7
	1	1.315	40	0.133	10
	¾	1.05	160	0.218	5
	¾	1.05	80	0.154	7
	¾	1.05	40	0.113	9
	½	0.84	--	0.210	4
	¼	0.54	--	0.153	4

Table 3-3

Comparison of Vermont Yankee and Selected Database Piping Parameters

Parameter	Vermont Yankee	Database Sites
Pipe Diameter (in)	1.05 – 18.0	1.05 – 30.0
Wall Thickness (in)	0.154 – 0.937	0.113 – 3.444
Ratio, Diameter to Thickness (D/t)	5 - 19	4 to 64
Materials of construction	A 106 Grade B A 53 Grade B A 335 Grade P11 A 335 Grade P22	A 106 Grade B A 182 Grade P22 A 335 Grade P22 Chrome Moly.
Typical B31.1 Allowable Stress Value, S_h (Note 1)	15,000 psi	15,000 psi

Notes:

1. Material allowable values presented at room through maximum operating temperatures of the ALT pathways and boundaries piping.

Figure 3-11

Comparison of Vermont Yankee and Database Piping D/t Ratios

(applicable D/t ratios at top of each bar)

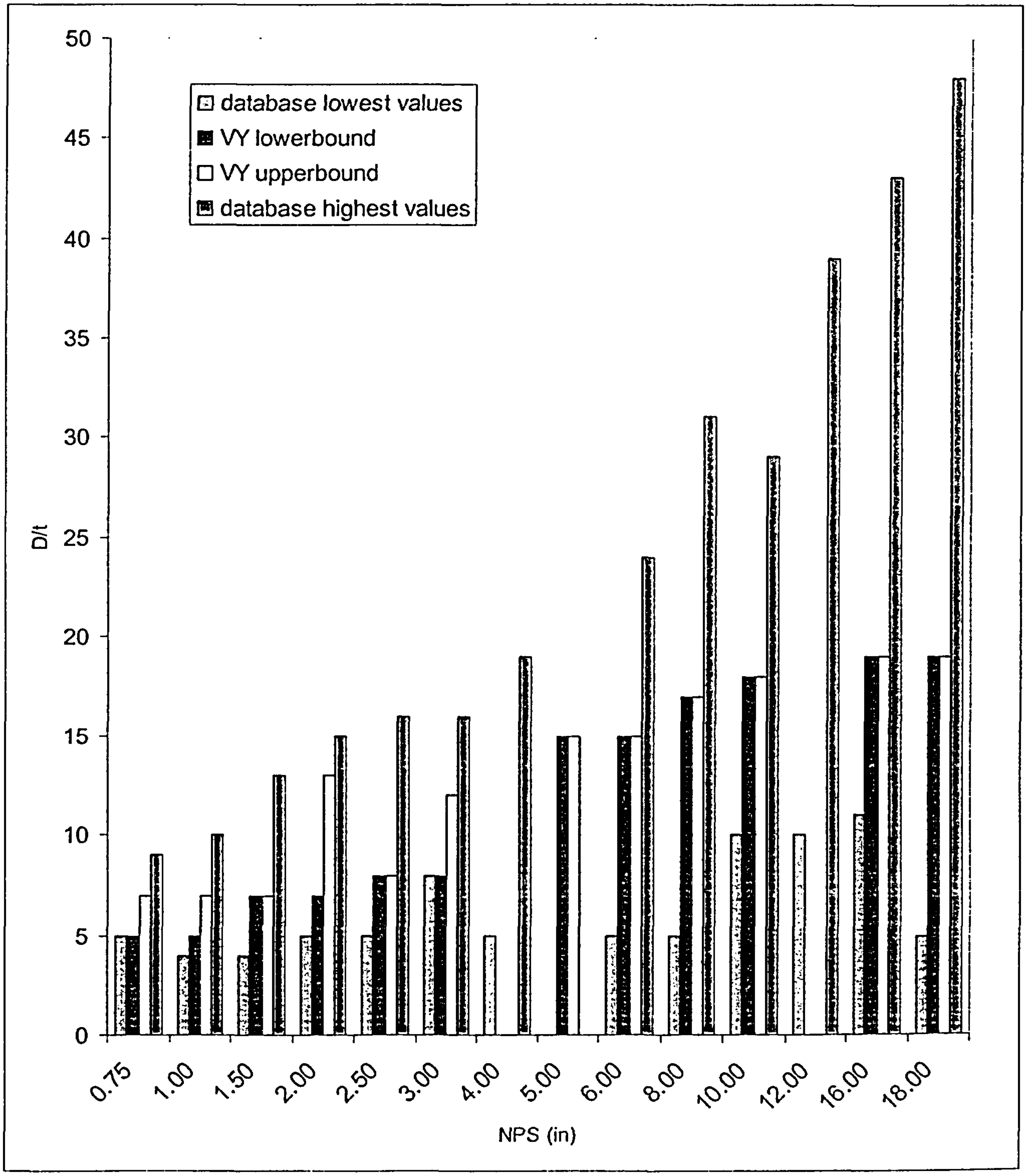
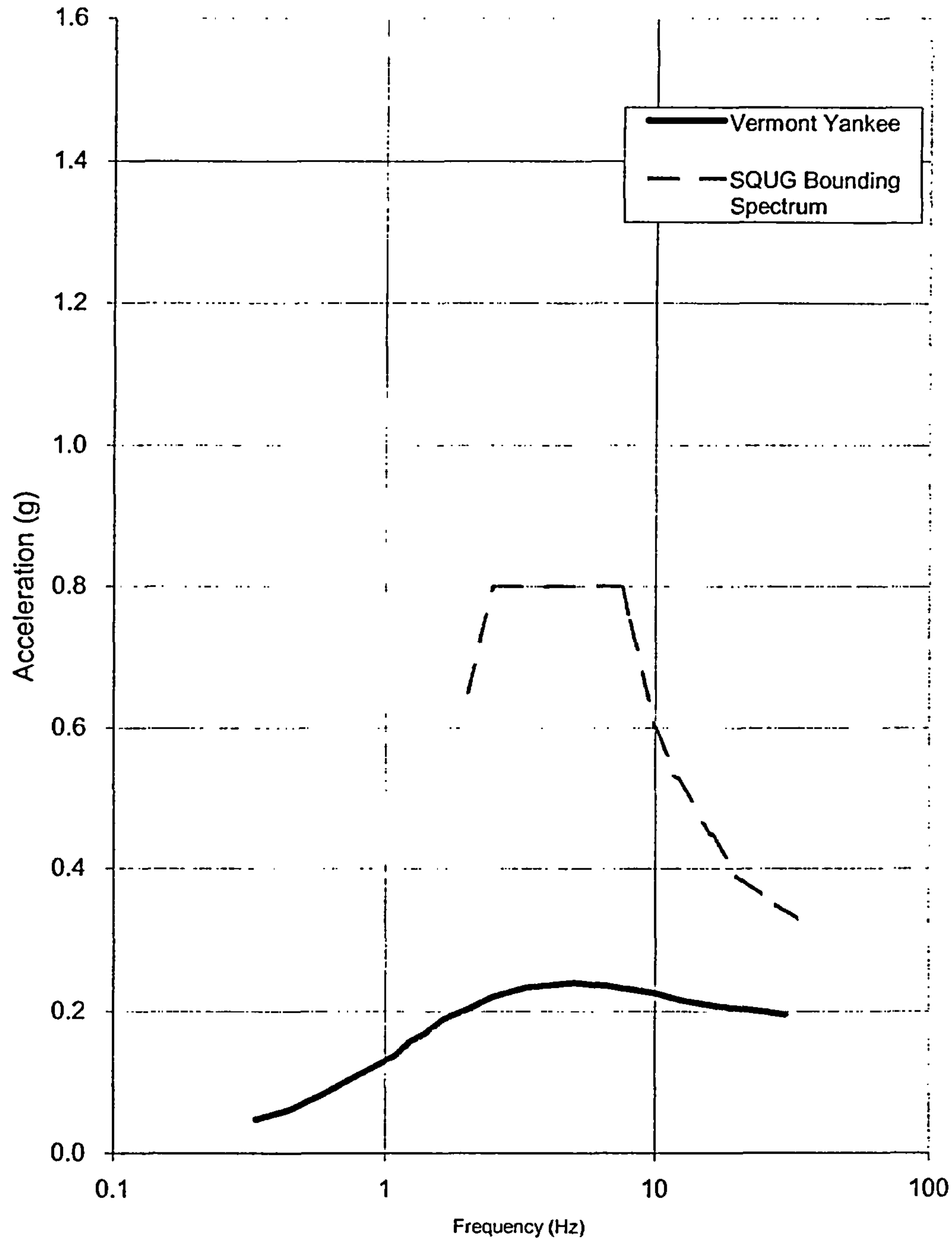


Figure 3-12 Comparison of Vermont Yankee Design Basis SSE Ground Response Spectrum with GIP Bounding Spectrum



4. Seismic Verification Walkdown

Very few components of nuclear plant systems are unique to nuclear facilities. Nuclear plant systems include piping, tubing, conduit and many other items that are common components of conventional power plants and industrial facilities. Seismic experience data based methods have been developed that address the question of adequacy of seismic performance of equipment and commodities not designed, procured and installed to current nuclear seismic criteria. By reviewing the performance of facilities that contain equipment similar to that found in nuclear plants, conclusions can be drawn about the performance of nuclear plant equipment during and after earthquake events. Extensive work has been performed documenting the performance of power plant equipment performance and the common sources of seismic damage to equipment and piping (References 1, 25).

Equipment, piping and tubing systems in the seismic experience database have performed very well in earthquakes, even though they have typically been designed for deadweight and operating loads only, with little or no consideration for seismic loads (Reference 25). Earthquake experience database methods provide the basis for review of the piping identified in Section 2 within the ALT seismic boundary.

The Seismic Review Team (SRT) performing the field walkdown first reviews the installed scope of equipment, piping and tubing. Evaluation of piping and equipment designs are performed to assure that installations are representative of database design practice and that components are free of known seismic vulnerabilities. Earthquake experience has identified conditions that have resulted in failure of piping and tubing systems and components. The conditions evaluated in this walkdown review include:

- Piping, pipe support and equipment design attributes
- Seismic anchor motion issues
- Seismic interaction issues (II/I and proximity)
- Valve design attributes
- Potential external corrosion indication

4.1 Piping, Pipe Support and Equipment Design Attributes

As part of the walkdown process, the Seismic Review Team reviews the various piping configurations and tubing systems and pipe and tubing supports that make up the ALT paths and boundary to ensure that the design attributes and conditions are consistent with good design and industry standard practices. The systems were also screened to ensure that they are free from known seismic vulnerabilities identified from earthquake experience data. These design attributes include:

- Piping with dead weight support greatly in excess of B31.1 suggested spans, or tubing with excessive sagging.
- Heavy, unsupported in-line components.
- Piping constructed of non-ductile materials such as cast iron or PVC.
- Non-standard fittings, or unusual attachments that could cause excessive localized stresses.
- Pipe supports that exhibit non-ductile behavior.
- Presence of severe corrosion.

In addition, anchorage of terminal equipment to piping and tubing systems are reviewed for adequacy.

4.2 Seismic Anchor Movement Issues

The experience database includes instances of seismic damage to piping, tubing and supports that were attributed to seismic anchor movement. Damage was the result of excessive movement of terminal end equipment, differential movement between supports in adjacent buildings, and excessive movements imposed on branch lines by flexible headers. These attributes are evaluated during the piping walkdowns.

4.3 Seismic Interaction Issues (II/I and Proximity)

The seismic interaction review is a visual inspection of structures, piping, or equipment adjacent to the components under evaluation. The seismic interaction review evaluates conditions where seismically induced failures (II/I) and displacements of adjacent structures, piping, or equipment (proximity) could adversely affect the required seismic performance of the system and components under consideration.

4.4 Valve Design Attributes

Screening guidelines are provided for valves that are relied upon to establish the ALT pathway or are part of the seismic verification boundary. The guidelines are consistent with the SQUG Generic Implementation Procedure (GIP, Reference 23) and include provisions for air-operated diaphragm valves, spring-operated pressure relief valves, piston operated valves of lightweight construction, motor operated valves, and substantial piston-operated valves. As such, use of this approach provides a high degree of confidence in the ability of these valves to withstand a seismic event and perform the desired operation of position changing for an active valve.

4.5 Representative Bounding Analytical Review

The team selects representative supports and anchorages to be addressed in a plant-specific seismic evaluation following the walkdown. Special consideration is given to

heavily loaded supports or those for which anchorage capacity appears marginal. For piping, the team determines if an enveloping analytical assessment would be appropriate and beneficial. Such a review entails consideration of diversity, complexity and extent of the piping and the areas that comprise the walkdown efforts.

As a supplement to the piping review process by walkdown observation, a representative path (Path 2 of Section 2) was selected for additional review, and was reviewed relative to this effort (see Section 8 herein). Portions of this same piping were addressed via walkdown (see Section 7 herein).

The Seismic Verification Walkdown is performed in accordance with Reference 12.

5. Building Qualification

The piping and equipment of the ALT pathways and boundaries are located within two buildings at Vermont Yankee, namely the Reactor Building and the Turbine Building. As part of the seismic verification process of the ALT pathways and boundaries piping and equipment, assurance must be provided that these buildings will not themselves become seismic hazards relative to the structural capability and continuing function of the ALT pathways and boundaries.

5.1 Reactor Building

The Reactor Building, in accordance with UFSAR 12.2.1.1.1 (Reference 6), is a Seismic Class I Structure. Its seismic capability has been assured in accordance with existing Seismic Class I design basis requirements for Vermont Yankee.

5.2 Turbine Building

Except for the diesel generator and oil day tank areas (which are designated as Seismic Class I areas), the Turbine Building is a Seismic Class II structure, in accordance with UFSAR 12.2.1.1.3. As such, an additional assessment of the seismic capability of the Turbine Building is warranted.

The seismic assessment of the Turbine Building was documented in ABS Consulting calculation 1173875-C-002 (Reference 7). A summary of this calculation is provided below.

As indicated, it must be demonstrated that the Turbine Building structure will not fail during or after an SSE event in a manner that would adversely impact the condenser and other piping and equipment relied upon to contain leakage through the MSIVs. A BWROG (Reference 1) survey of this type of industrial structure has, in general, confirmed that excellent past seismic performance exists. There are no known cases of structural collapse of either turbine buildings, power stations or structures of similar construction. To this end, the evaluation is based on a review of the current design, of existing calculations and of the extent of compliance within such programs as A-46 and IPEEE.

The original design of the Turbine Building structure was based on the VY site OBE and SSE using static lateral load evaluation methods (Reference 7). Two steel frames at the diesel generator area were originally selected for detailed seismic analysis. The analysis included modal frequency analysis and response spectrum analysis using the site 2% damping design seismic response spectra, in accordance with the UFSAR. The analysis included dead weight, 50% of snow load, an unloaded bridge crane in its parked position, and the OBE and SSE seismic coefficients. The OBE combination stresses were compared to normal American Institute of Steel Construction (AISC) allowable and the SSE combination stresses were compared to the yield stress. The analysis established that the controlling loading for the steel bents is the non-seismic fully loaded

crane combination including associated horizontal crane forces, full live load, and wind loads (refer to write-up in Reference 7). In the calculation of the lateral shear transfer, the analysis indicated that seismic loads were found to govern only the North-South direction above the operating floor at elevation 272.5'. Additionally, time history analysis of a stick model of the Turbine Building was performed to determine the in-structure response spectra and inter-story drift. This analysis showed that the structure is seismically rigid up to elevation 272.5'. The superstructure showed a maximum drift of 0.69 inches under the simulated SSE time history analysis.

The Turbine Building is founded on firm bedrock with substantial margin on compressive bearing stresses. The reinforced concrete substructure and steel-framing superstructure are capable of withstanding the VY site SSE without structural damage. This is evident based on the original building design and the successful completion of the Individual Plant Examination of External Events (IPEEE) program. It was shown in the IPEEE program that the Turbine Building structure has a high confidence of low probability of failure (HCLPF) of 0.3g, which exceeds the VY SSE PGA (Reference 7). The seismic verification walkdown to be performed during RFO-24 will identify masonry walls that may adversely impact the integrity of the ALT boundary piping and equipment. Seismic evaluations will be performed for walls that are not within the scope of PP7026, Reference 31.

On these bases, it was concluded that the Turbine Building structure will not adversely impact the functionality of the condenser, steam piping, and other components relied upon to contain MSIV leakage during and after the VY site SSE.

6. Major Equipment Qualification

6.1 Condenser and Anchorage

The condenser is the main collection point for leakage past the MSIVs and, as such, forms an integral part of the ALT pathways and boundaries. The purpose of the condenser qualification is to assure the condenser falls within the bounds of the earthquake experience database and establish the design of the condenser and associated anchorage is acceptable for seismic SSE earthquake demand applicable to the VY site. This assessment was separately addressed in ABS Consulting calculation 1173875-C-001 (Reference 8). A summary of the calculation is presented herein.

The condensers are required to remain intact during and after an SSE as part of the MSIV alternate leakage treatment path. This evaluation was performed using seismic experience data from past earthquakes, coupled with engineering analysis. The evaluation was performed to ensure the condensers were represented by seismic experience data, and that the anchorage is adequate using SQUG GIP methods (Reference 23). The condenser shell was evaluated to determine global and local shell stresses, ensure pressure boundary breach would not occur and assess local shell buckling. The evaluation follows the recommendations of the BWROG Report (Reference 1), combined with analysis using stress allowables consistent with SQUG GIP recommendations. The condensers are MSIV alternate leakage path walkdown outliers because they are not specifically included in the SQUG GIP 20 classes of equipment (References 23 and 25).

Seismic capacity vs. demand was evaluated by comparing the VY condenser with condensers in the seismic experience database that have experienced strong motion earthquakes in excess of the VY SSE. A discussion on the seismic demand comparison of VY to the earthquake database is presented in Section 3. Condenser size, construction, and design characteristics are summarized and compared with parameters for earthquake experience condensers, (Reference 8). This comparison determined that the VY condenser was similar to those within the earthquake experience database.

Anchorage is evaluated using established procedures from the GIP and supporting documents such as the EPRI anchorage guidelines (Reference 26). Concrete was evaluated using the requirements of ACI 318-99 (Reference 21). Load factors and allowable stresses are modified to be consistent with SQUG GIP methods. Stresses in the condenser shell are evaluated using the American Institute of Steel Construction (AISC) methods (Reference 22), with allowable stresses modified to be consistent with SQUG GIP values.

The evaluation demonstrates that the condenser design is typical of those at facilities that have experienced earthquakes equivalent to and in excess of the Vermont Yankee SSE. The Vermont Yankee condenser therefore satisfies the SQUG capacity vs. demand requirement on the basis that they compare favorably with database condensers. The condenser anchorage meets the requirements of the GIP (Reference

23), and the condenser shell stresses are low under SSE earthquake demand. On these bases, the condenser was determined to be adequate as part of the MSIV alternate leakage treatment path.

A walkdown of the VY main condenser, which is presently inaccessible during normal power operation, will be performed during RFO-24 to ensure construction and installation details conform to plant design drawing details.

6.2 Turbine Stop and Main Steam Control Valves

The turbine Stop Valves (SVs) and main steam Control Valves (CVs) form a portion of the ALT boundary and, as such, an assessment of the seismic capability of these valves and their associated supports is necessary. This assessment was separately addressed in ABS Consulting calculation 1173875-C-003 (Reference 9). A summary of the calculation is presented below.

The evaluation of the SV's and CV's was performed using the earthquake experience database (References 26, 27, 28) and manual calculation methods that follow the rules of the GIP (Reference 23). Calculations were performed to address the SVs' operator weak link, which is the yoke legs based on review of the operator design drawings and adequacy of the load path to the rigid supports and their anchorages (Refer to Reference 9). An evaluation of the yoke under a 3 g lateral load per the GIP shows that the seismic yoke stresses are small. An assessment of the structural steel for the loads transferred from the SVs and CVs are made.

Turbine Stop Valves and Main Steam Control Valves were not included in the scope of the A-46 or IPEEE programs at Vermont Yankee based on the plant developed safe shutdown equipment list (SSEL). Being hydraulically actuated, these valves are also not included in GIP twenty category of equipment. The SVs and CVs would therefore be identified as outliers in a SQUG assessment.

Based on comparison of valve configuration, support load path to the Turbine Building structure, and a comparison of the VY design basis SSE ground motion with the earthquake experience database, the evaluation demonstrates that the existing design of the SVs and CVs can be expected to demonstrate excellent performance under earthquake loading, without breach of pressure boundary nor functional failure. On these bases, the turbine Stop Valves and Main Steam Control Valves and associated supports satisfy associated seismic ruggedness criteria. A walkdown of these components, using the guidelines of Reference 12 will be performed during RFO-24 to confirm this conclusion.

6.3 Bypass Valves Steam Chest

The Bypass Valves Steam Chest forms a portion of the ALT pathways and boundary and, as such, an assessment of the seismic capability of the steam chest and associated supports is necessary. This assessment was separately addressed in calculation 1173875-C-004 (Reference 11) and is summarized below.

The qualification was performed using a combination of seismic experience data, SQUG engineering experience from the GIP (Reference 23), and individual component assessment (Reference 11).

The steam chest valves are hydraulically actuated spring assist-to-close valves similar to the design of the stop valves. The valve bodies for these valves are not of cast iron construction. As such, the earthquake experience database for the stop valves provides assurances for the structural integrity of the steam chest valves. The weak link for the valve assembly is the valve yoke. An evaluation of the yoke under a 3 g lateral load per the GIP shows that the seismic yoke stresses are small. An assessment of the vertical and horizontal rigid rods shows that the pipe reactions are within the design capacity of the rods and that adequate load path exist to transfer the support loads to the Turbine Building structure. On these bases, the Bypass Valves' Steam Chest Control Valves and associated supports satisfy associated seismic ruggedness criteria. A walkdown of these components, using the guidelines of Reference 12 will be performed during RFO-24 to confirm this conclusion.

7. Walkdown Results and Review

A walkdown was performed by the Seismic Review Team (SRT) in accordance with the walkdown procedure (Reference 12). Conditions that do not conform to walkdown screening guidelines or that are judged by the SRT to require further evaluation are documented as outliers. Each outlier is assigned a unique identification number that is based on the portion of the path or boundary system line identifier reviewed, along with a sequential suffix (e.g., path 1, outlier 1 would have a suffix 1-1). System description, outlier description, a designation as to which general walkdown criterion is involved and recommended action(s) are indicated.

A walkdown of all accessible portions of the system was performed the week of 6/16/2003 and results are described below. Remaining portions of the system will be included in walkdowns to occur during RFO-24.

One area of consideration that cannot be directly addressed via walkdown is the potential for internal pipe corrosion as discussed in Section 5.1.4 of the walkdown procedure (Reference 12). To this end, a review of all piping within the ALT boundary was undertaken to ascertain susceptibility to internal pipe or component corrosion from the Flow Accelerated Corrosion (FAC) degradation mechanism. This review is discussed below.

Vermont Yankee personnel previously performed a walkthrough[4] of the presently inaccessible areas of the ALT boundary, during a reactor power-down in May of 2003. Results of this walkthrough are also described below. This piping will be verified in accordance with the Reference 12 procedures during RFO-24.

7.1 ALT Boundary Walkdown – Week of 6/16/2003

A walkdown was performed on portions of the following paths and boundaries in accordance with the requirements of Reference 12:

- Path 2 (accessible areas)
- Boundary 5 (accessible areas)
- Boundary 7 (accessible areas)

[4] The term "walkthrough" is used to differentiate from a walkdown performed in accordance with procedural requirements of Reference 12. For a walkthrough, general visual observations only, are noted.

- HPCI/RCIC[5] steam supply drains (accessible areas)

Representative photo-documentation of the walkdown is provided in Attachment C. A separate walkdown report includes the specific results of the above walkdown. This report (Reference 13) will be revised to include the walkdowns of remaining ALT pathways and boundaries to be performed during RFO-24.

The accessible piping walked down during June of 2003, was constructed in a manner of similar configuration to piping within the earthquake experience database. Piping spans were, generally, in accordance with requirements for B31.1 deadweight spans, and no design attributes of the piping were noted which have resulted in poor seismic performance.

For the piping which was walked down, it was found that the supports and anchorage were consistent of good design practice and were of the same design and configuration of supports which have previously been evaluated and found acceptable for seismic loading, (Reference 10, 16).

Items considered as potential outliers by the SRT during the walkdown have subsequently been assessed, and found to be satisfactory, Reference 13 or will be addressed by additional walkdown during RFO-24.

7.2 Internal Pipe Corrosion Considerations

All ALT boundary piping was reviewed for susceptibility to Flow Accelerated Corrosion (FAC). A list of such piping is included in Attachment B, and based on this review, portions of the ALT seismic boundary piping are potentially susceptible to FAC.

All piping within the ALT seismic boundary is under the scope of the FAC inspection program at VY, Reference 14 and 15. A long-term program for monitoring FAC in these lines has been in place since 1990.

7.3 ALT Boundary Walkthrough by Vermont Yankee Personnel

Vermont Yankee personnel performed a walkthrough of the ALT pathways and boundary piping and equipment in May 2003 for regions of piping not generally accessible during normal power operation. This walkthrough was performed to provide a general assessment of the conditions of the piping and supports. Participants concluded that piping and supports for the ALT boundary piping appeared to conform to industry standards, such as the recommended spans as given in B31.1 (Reference 19) and typical support configurations as shown in MSS SP-58 (Reference 20). A member of the VY personnel who performed the walkthrough also participated as a member of the SRT, during the walkdown of accessible plant piping, Section 7.1. The reviewed piping

[5] Portions of the HPCI/RCIC system are included as a boundary relative to ALT pathways and boundaries seismic verification, refer to Section 2.

within the inaccessible areas was noted to be of similar construction to the walked down piping outlined in Section 7.1.

Photographs of typical piping, equipment and support configurations encountered during this walkthrough are included in Attachment D. A detailed walkdown of this piping will be performed during RFO-24.

7.4 Active Valve Assessment

As outlined within Section 2, a number of valves are required to position change to open a vent path to the condenser or isolate to establish ALT boundaries. These valves are assessed using the GIP approach as outlined in Sections 3.4 and 4.4. At this time the majority of identified active valves are in normally inaccessible regions of the plant, such that detailed walkdown of these components are presently not feasible. The exception being the Path 2 AOV LCV-2-143. This AOV was walked down and determined to be seismically rugged. For the remainder of the active valves, the valves were screened using GIP methods relative to actuator offset height and caveat compliance where applicable, based on available plant drawings (Reference 13). This review provides a degree of assurance as to the seismic ruggedness of the design of these valves. All Section 2 identified active valves (except as noted below) were determined to be acceptable, based on the initial review performed (References 9, 11 and 13). Actual walkdown to address interaction issues and any other poor performance seismic attributes will be completed during RFO-24, to confirm this preliminary conclusion.

Path 3 valves, PCV-101-35 and FCV-101-37 are required to close to establish this path, Reference 2. Based on a review of valve drawings (Reference 13), these AOVs have operator offset height greater than GIP guidelines. These valves are noted as potential outliers, pending actual configuration confirmation during RFO-24.

8. Analytical Assessment

Analytical assessment of specific piping and components are performed to address potential piping concerns or assess conditions found during the seismic verification walkdown that do not meet the walkdown screening guidelines (Reference 12), or which were judged by the Seismic Review Team (SRT) to require further review for outlier resolution.

Analytical criteria for the evaluation of piping, supports and associated components are selected to address the primary concern of ensuring the ability of the main steam piping downstream of the outboard MSIV, including bypass/drain piping, and the main condenser to remain structurally intact and act as a holdup volume for fission products during and after a Safe Shutdown Earthquake. Based on these goals analytical criteria are selected as follows:

> Piping: Piping analysis is performed using B31.1 code requirements (Reference 19), with piping critical damping of 5%, and an allowable stress limit of 2.4 S_h[6] is utilized. Seismic SSE demand is based on VY design basis in-structure response spectra, as utilized and accepted as seismic demand within the VY A-46 program, (Reference 23 and 24).
>
> Supports and Components: The criteria of the Generic Implementation Procedure (GIP) (Reference 23) are utilized for the qualification of these components. Allowable stresses are derived from Part 2 of the AISC code (Reference 22). Allowable loads for concrete expansion anchors are from GIP Appendix C (Reference 23).

Qualification criteria for piping, supports and equipment are summarized in Table 8-1. The basis for the loading combinations and stress criteria selected are to demonstrate potential outlier acceptance with consideration of primary stresses from earthquake inertia but also to address seismic anchor movement, which has been shown to be a potential cause of seismic-induced piping failure. Piping critical damping of 5% is utilized. The allowable stress criteria is consistent with stress levels used by other BWR plants of a similar vintage to VY to address the ALT pathways and boundaries seismic verification, and thus meets the requirements of limitation no. 7 of Reference 2, as an acceptable analytical method.

Within Table 8-1, for the assessment of piping, S_h is the basic material allowable stress per B31.1 power piping code (Reference 19), which is the lesser of 5/8 S_y or ¼ S_u. The majority of the piping under review is of A106 Grade B carbon steel material, with

[6] S_h refers to material allowable stress at maximum operating temperature, as listed in B31.1 (Reference 19)

material allowables of (S_h = 15,000 psi, S_y = 35,000 psi, and S_u = 60,000 psi at room temperature and S_h = 15,000 psi, S_y = 26,500 psi, and S_u = 60,000 at the maximum operating temperature of the ALT pathways and boundaries scope piping). Therefore for the assessment of piping, using the equation of Table 8-1, stresses will be limited to less than 1.03 S_y at room temperature and 1.36 S_y at maximum operating temperature. Limiting the range of applied stress to less than 2 S_y will ensure no significant membrane stress rupture will occur, and accumulated cyclic damage will be elastic. Therefore, given the limited number of strong motion cycles during a design basis SSE event (typically less than 20), only elastic cycling well below the 2 S_y limit will occur. As a result, a fatigue failure from the SSE loading would not occur.

8.1 Analytical Evaluation of Path 2 Piping System

An existing ENVY pipe stress calculation (Reference 16) for the piping and associated supports that make up the Path 2 portion of the ALT boundary (refer to Section 2 herein for scope description) provides a basis for analytical review. This piping is representative of the piping included for initial walkdown (refer to Section 7.1 herein), i.e. the presently accessible piping.

The analytical review is presented in a separate calculation (Reference 10). This review is summarized below.

The existing calculation (Reference 16) addresses the structural capability for the Path 2 piping and supports. For purposes of review, criteria are established in Reference 10 consistent with the analytical approach presented in Section 8.0. For seismic spectra application, the existing calculation methods are seen to be consistent with or conservative with respect to database evaluation methods (as summarized in Section 8). For supports, the criteria used in the existing calculation can be applied directly, again with significant margins.

On these bases, the Path 2 piping and supports, as represented by the configuration assessed in Reference 16, are considered seismically rugged.

8.2 Analytical Evaluation of Main Steam Piping

The main steam piping from the outboard MSIVs to the stop and control valves, including the Boundary line 8, steam to turbine bypass piping (refer to Section 2) was seismically evaluated by ENVY, as outlined in Reference 17. The criteria utilized in this evaluation, are plant design criteria as outlined within the VY UFSAR, (Reference 6), which are conservative relative to the criteria established for assessment of the ALT pathways and boundaries seismic verification. Resulting seismic stresses as calculated have significant margin relative to established stress allowable. On the basis of this calculation, combined with walkdown of this piping to be performed in RFO-24, this piping is considered seismically rugged.

Table 8-1: Evaluation Criteria for Outlier Resolution

Component	Load Combination	Stress Allowable
Piping	$D + L + P + OML + [E^2 + SAM^2]^{0.5}$	$2.4\ S_h \leq$ min $(2.0\ S_y, 0.7\ S_u)$
Pipe Supports	$D + L + OML + T + [E^2 + SAM^2]^{0.5}$	1.7 S
Equipment Anchorage	D + P +E +OML	GIP
Valve	E	GIP

Where:

D	-	Deadweight
L	-	Live load during normal operation
P	-	Normal Operating Pressure
T	-	Normal operating temperature thermal expansion loading
OML	-	Non-seismic operating mechanical loads from connecting piping, including weight, restraint of free end thermal displacements, and hydraulic thrust.
E	-	Seismic Inertia load, from SSE earthquake
SAM	-	Loading induced by seismic anchor motion of component supports, including SAM effects of connecting pipe.
S_h	-	Basic material Allowable at normal operating temperature, per B31.1 (Ref. 19)
Sy	-	Material yield stress at normal operating temperature
S_u	.	Material ultimate strength at temperature
S	-	Normal allowable stress limit, as defined within AISC, Part 2.
AISC	-	American Institute of Steel Construction, (Ref. 22)
GIP	-	Generic Implementation Procedure, (Ref. 23)

9. Conclusion and Recommendations

The scope of the ALT boundary is described herein. Seismic assessment of significant elements of pathway and boundary components is addressed with determinations made in all cases that applicable items satisfy associated seismic ruggedness criteria. Walkdowns of all normally accessible areas during power operation have been performed. A walkthrough of normally inaccessible piping was performed confirming, in general, the construction of this piping, supports and components are similar in design to the piping, which has been walked down at this time. The results of the walkdown of the accessible regions confirmed this piping and equipment are seismically rugged. Walkdowns and any necessary follow-on analytical assessments for remaining ALT pathway and boundary piping, equipment and supports which are not accessible during normal plant operation, will be conducted during Re-Fuel Outage 24 (RFO-24). Any components and piping configuration identified during this scheduled walkdown that may be associated with poor piping and/or component seismic performance will be identified as an outlier. Such outliers will be qualitatively and/or quantitatively evaluated, and, where deemed necessary, modifications will be implemented at that time.

Based on the partial results as described herein, there are no indications that Alternate Leakage Treatment pathways and boundary piping, equipment and supports will not satisfy necessary seismic ruggedness criteria for the Vermont Yankee station, with potential for a discrete number of passive (i.e. pipe support type) plant modifications which maybe warranted to address outlier issues. As indicated, this preliminary conclusion will be confirmed during RFO-24.

Within the NRC Safety Evaluation Report of the BWROG Topical Report (Reference 2 and 1, respectively), nine limitations to the use of the approach are identified. These limitations together with a discussion are outlined below, relative to the work presented in this report of the ALT pathways and boundaries seismic verification.

1. Detailed description of the ALT drain path and basis for its functional reliability:

   Discussion: Reference 3 provides a detailed description of the ALT drain paths and seismic isolation boundaries for AST. The reliability of the drain path active valves, their ability to operate, and single-active failure redundancy are clearly identified. The active valves have been added to the VY IST program.

2. Individual licensees should provide plant-specific information for piping design parameters, to demonstrate that they are enveloped by those associated with the earthquake experience database.

   Discussion: The main steam drain piping included in the ALT path to the condenser and associated boundary piping generally conforms to ASME/ANSI B31.1 design and fabrication guidelines. Piping is typically

constructed of ASTM A-106 Grade B carbon steel material with butt-welded or socket-welded joints. Piping supports generally consist of rigid members, rod and spring hangers. Based on the accessible piping presently walked down, support spans are generally consistent with B31.1 recommendations. A comparison of piping diameter and diameter to thickness (D/t) ratios was made and compared to those presented in the earthquake experience database, Table 3-3 and Figure 3-11. The design attributes of the VY ALT drain path and seismic isolation boundaries compared favorably to the attributes of the earthquake experience database sites.

3. Individual licensees should demonstrate that the plant condenser design falls within the bounds of design characteristics found in the earthquake experience database. This should include a review of as-built design documents and/or a walkdown to verify that the condenser has adequate anchorage.

   Discussion: The main condensers at VY have been confirmed to fall within the bounds of design characteristics found in selected conventional power plant condensers included in the earthquake experience database of Appendix D of Reference 1. The assessment of the main condenser is summarized as described in Section 6.1, based upon the review performed in Reference 8. The anchorage of the condenser was evaluated within Reference 8, and calculations were performed to confirm the adequacy of the condenser shell and anchorage during an SSE. The VY condenser anchorage load demand (combined seismic SSE with operation loading) is less than the total available anchorage capacity based upon anchorage capacity methods described within the SQUG GIP, Reference 23. Stresses in the condenser shell were evaluated using the American Institute of Steel Construction (AISC) methods, with allowable stresses modified to be consistent with SQUG GIP methods. Condenser shell stresses are determined to be satisfactory. The condenser is considered to be seismically rugged.

   A walkdown of the VY main condenser, which is presently inaccessible during normal power operation, will be performed during RFO-24 to ensure construction and installation details conform to plant design drawing details.

4. Individual licensees should perform a plant specific seismic evaluation for representative supports and anchorages associated with affected piping and the condenser.

   Discussion: The Seismic Review Team (SRT) performed field walkdown of all accessible areas during normal power operation. The walkdown team, consisting of degreed engineers with greater than 20 years experience in structural engineering and/or earthquake experience methodology reviewed ALT path and boundary piping and associated appendages, where accessible. For the piping that was walked down bounding calculations were performed to provide assurance that the ALT path and boundary piping, related supports and components will remain functional in the event of an SSE at VY.

The validation of the remainder of the ALT path and boundary piping, which is presently located in normally inaccessible areas of the plant during power operation, will be walked down by the SRT during RFO-24. Any components and piping configuration identified during this scheduled walkdown that may be associated with poor piping and/or component seismic performance will be identified as an outlier. Such outliers will be evaluated and where deemed necessary, modifications will be implemented at that time.

5. Individual licensees should confirm that the condenser will not fail due to seismic II/I type interaction (e.g., structural failure of the Turbine Building and its internals).

   Discussion: The VY Turbine Building (TB) for the regions of the building associated with ALT pathways and boundaries scope, is classified within the plant's UFSAR as a Seismic Class II structure. The VY main condensers are located within the lower elevations of the TB. The building above the main condensers and below the operating floor is a reinforced concrete structure. The superstructure above the turbine operating floor is a steel superstructure with panel siding and metal roof decking.

   The Turbine Building is designed for both Uniform Building Code (UBC) seismic and wind loading. The design is controlled by wind loading. Seismic margins against collapse of structures designed to commercial codes and standards are typically in the order of 1.5 times design ground motions. Due to these substantial design margins, failure and collapse of the Turbine Building under the design basis SSE loads is not expected. The ground motion response spectra of earthquake experience database selected facilities were compared with VY design basis ground spectrum as shown in Figure 3-1. In general the earthquake experience database sites have experienced strong ground motions that are in excess of the VY SSE at the frequency range of interest for the Turbine Building.

   Seismic interaction issues, including potential II/I failures will be reviewed by the SRT during the field walkdown scheduled for RFO-24.

6. Individual licensees of plants whose FSARs or UFSARs reference Appendix A to 10 CFR Part 100 should perform a bounding seismic analysis for the ALT path piping. Those licensees committed to Part 100 should discuss the basis for selecting a particular portion of the bypass/drain line for the bounding analysis.

   Discussion: VY was licensed prior to issuance of 10CFR100 Appendix A, and VY was also included in the USI A-46 program. The seismic verification of the ALT pathways and boundaries and related supports and components, was performed using the earthquake experience approach as outlined in NEDC-31858P-A (Reference 1). The following reviews were performed to demonstrate that the piping and related supports fall within the bounds of the experience database: (1) a review of the design codes and standards, piping design parameters and support configurations was performed, (2) for all presently accessible piping, seismic verification walkdowns were performed

to identify potential piping concerns, and these concerns which did not meet walkdown screening guidelines, or which were judged by the SRT to require further evaluation were identified as outliers. Bounding evaluations were performed for these outliers, to determine their adequacy or to identify a need for modification. Piping presently inaccessible during normal plant operation will be walked down and screened by the SRT during RFO-24.

7. The methodology and criteria used for the analytical evaluations should be those, which are in compliance with the design basis methodology and criteria, or those, which are acceptable to the NRC.

   Discussion: The evaluation of the ALT pathways and boundaries seismic verification follows the guidelines established in Topical Report NEDC-31858P-A (Reference 1) and the associated NRC Safety Evaluation (Reference 2). The key elements of the work performed and documented in this report are: (1) comparison of piping configuration, standards and design features to those of the earthquake experience database, (2) seismic verification walkdowns performed by the SRT, and (3) seismic assessments of selected components and piping configurations. Seismic assessments of systems, structures and components (SCCs) performed for this evaluation include the Turbine Building structure, the main condenser structure and anchorage, selected ALT pathways and boundaries including the main steam lines from the outboard MSIVs to the turbine stop valves, components of the turbine stop valves and the alternate path piping and supports.

   The Turbine Building structure was evaluated by comparison to the earthquake experience database and by reconciling the original UBC seismic and wind loads to the VY SSE criteria. The main condenser was compared to the condensers from the earthquake experience database. The main condenser shell and anchorage were confirmed by calculation to have margin in excess of that required. Piping, supports and components presently accessible were walked down and compared to criteria of the Generic Implementation Procedure (GIP) for seismic verification of nuclear plant equipment and to the piping and supports of the earthquake experience database.

   Piping, supports and components presently inaccessible will be walked down, during RFO-24. Items identified as outliers will be further evaluated, and, any required modifications will be implemented at that time.

8. The facility ground motion estimates shown in Figures 1 through 13 of the NRC Safety Evaluation (Reference 2) have been reviewed and accepted by the NRC for inclusion in the BWROG's earthquake experience database. These thirteen facility ground motion estimates may be used to verify the seismic adequacy of equipment in the alternate MSIV pathways for plants referencing the BWROG's Topical Report NEDC-31858P, Revision 2.

   Discussion: A composite comparison of the ground response spectra of selected earthquake experience database facilities with the VY SSE is included within Section 3 of this report. Nine of the thirteen sites were

included from the list reviewed and accepted by the NRC. For the condenser assessment an additional earthquake record site to the nine compared was reviewed to demonstrate condenser earthquake experience.

9. At the present time, there is no standard, endorsed by the NRC, that provides guidance for determining what constitutes an acceptable number of earthquake recordings and their magnitudes and for determining the required number of piping and equipment items, that should be referenced in the earthquake experience database when utilizing the BWROG methodology. Therefore, individual licensees are responsible for ensuring the sufficiency of the earthquake experience data being submitted for NRC review and determination. When a revision of the QME Standard that incorporates specific criteria for use of earthquake experience in the qualification of mechanical equipment is endorsed by NRC, such criteria should be followed in future applications involving MSIV ALT pathways evaluations.

   As stated above in discussion under item 7, this evaluation has followed the guidelines established with GE Topical Report NEDC-31858P-A and the associated NRC safety evaluation. As presented in this report, a representative and appropriate number of earthquake experience data comparisons have been presented in the seismic evaluation of the ALT pathways and boundaries.

10. References

1. "BWROG Report for Increasing MSIV Leakage Rates and Elimination of Leakage Control Systems", General Electric Report No. NEDC-31858P-A, August 1999.

2. Safety Evaluation of GE Topical Report NEDC-31858, Revision 2, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems", U.S. Nuclear Regulatory Commission, March 3, 1999.

3. "ALT Drain Paths and Seismic Isolation Boundaries for AST," Technical Evaluation No. 2003-012, Entergy Nuclear Vermont Yankee, 4/30/03.

4. ENVY, Engineering Record Correspondence, ERC No. 2003-036, Dated 07/01/03

5. ENVY, Engineering Record Correspondence, ERC No. 2003-050, Dated 07/15/03

6. Vermont Yankee Updated Final Safety Analysis Report (UFSAR), Rev. 17. Entergy Nuclear Vermont Yankee

7. "Verification of Structural Integrity of The Turbine Building," ABS Consulting Calculation No. 1173875-C-002, Rev. 0.

8. "Seismic Verification of Turbine Condenser," ABS Consulting Calculation No. 1173875-C-001, Rev. 0.

9. "Verification of the Seismic Capability of the Turbine Stop and Main Steam Control Valves," ABS Consulting Calculation No. 1173875-C-003, Rev. 0.

10. " Verification of the Seismic Capability of Path 2 Piping," ABS Consulting Calculation No. 1173875-C-005, Rev. 0.

11. "Verification of Structural Integrity of the Turbine By-Pass Valve Chests," ABS Consulting Calculation No. 1173875-C-004, Rev. 0.

12. "Walkdown Procedure Seismic Adequacy Review of MSIV Alternate Leakage Path Piping, Tubing and Equipment," ABS Consulting Procedure No. 1173875-P-002, Rev. 0.

13. "Vermont Yankee Alternate Leakage Treatment Pathways and Boundaries Initial Walkdown Report", ABS Consulting Report Number 1173875-R-002, Rev. 0

14. VY, Piping Flow Accelerated Corrosion Inspection Program – FAC Susceptible Piping Identification. Rev. 0

15. Vermont Yankee Program No. PP 7028, Piping Flow Accelerated Corrosion (FAC) Inspection Program.

16. "SRP Prob. #190 MSD Part 2," Vermont Yankee Calculation No. VYC-0608 Rev. 4 CCN 01.

17. "Main Steam Piping Turbine Building Piping Flexibility Analysis Cal. No. 317", Vermont Yankee Calculation No. 317, Rev. 1, CCN 1.

18. EBASCO QC-10. Ebasco BWR Specification for Piping, Piping Components, Hangers, and Supports for Station Piping Systems: Dated 9/15/68.

19. "Power Piping," USA Standard Code for Pressure Piping USAS B31.1.0-1967, ASME.

20. "Pipe Hangers and Supports – Materials, Design and Manufacture," American National Standard No. ANSI/MSS MSS SP58, MSS.

21. "Building Code Requirement for Reinforced Concrete," ACI 318-99, American Concrete Institute.

22. "Manual of Steel Construction – Allowable Stress Design", Eighth Edition. AISC 1980.

23. "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Revision 2 corrected, ©Seismic Utility Users Group (SQUG), 02/14/92.

24. Vermont Yankee – "Safety Evaluation Report for Unresolved Safety Issue (USI) A-46 Program Implementation (TAC No. M69490), Dated 03/20/00. (Ref. NVY 92-200).

25. "Summary of the Seismic Adequacy of Twenty Classes of Equipment Required for Safe Shutdown of Nuclear Plants," EPRI Report No. NP-7149D, March 1991; prepared by EQE Inc for the Electric Power Research Institute, Palo Alto, CA.

26. "Seismic Verification of Nuclear Plant Equipment Anchorage," EPRI Document No. NP-5228-SL, Vol. 1, Rev. 1, Final Report, June 1991.

27. "Database of Seismic Experience for Power Plant Equipment," WWW Version 2.0, February 2003, EPRI.

28. "Seismic Experience Data Collected at the Moss Landing Power Plant After the 1989 Loma Prieta Earthquake", Proprietary, EQE International.

29. "The October 17, 1989, Loma Prieta Earthquake: Effects on Selected Power and Industrial Facilities," Report No. NP-7500-SL, September 1991, EPRI.

30. Entergy Vermont Yankee Drawings:

    30.1. "Flow Diagram – Main, Extraction and Auxiliary Steam Systems," Ebasco Dwg No. G-191156, Rev. 31.

    30.2 "Flow Diagram – Sampling System – Sheet 1," Ebasco Dwg No. G-191164, Rev. 22.

30.3 "Engineering Flow Diagram – Turbine Bldg Area Off Gas Modification," Suntac Dwg No. A-217, Rev. 18.

30.4 "Flow Diagram – Nuclear Boiler," Ebasco Drwg No. G-191167, Rev. 73

30.5 "Flow Diagram – Reactor Core Isolation Cooling System", Ebasco Drwg No. G-191174 sht 1, Rev. 42.

30.6 "Flow Diagram – High Pressure Coolant Injection System", Ebasco Drwg No. G-191169 sht. 1, Rev. 47.

31. VY Procedure PP7026, "Masonry Wall Surveillance Procedure.

11. Nomenclature

ACI	-	American Concrete Institute
AISC	-	American Institute of Steel Construction
ALT	-	Alternate Leakage Path
AOG	-	Augmented Off-Gas
AOV	-	Air Operated Valve
BWR	-	Boiling Water Reactor
BWROG	-	BWR Owners Group
CV	-	Control Valve
DE	-	Design Earthquake, as defined within the UFSAR, typically referring to the more commonly used operational basis earthquake (OBE).
DBE	-	Design Basis Earthquake, typically referring to MHE for VY or SSE.
ENVY	-	Entergy Nuclear Vermont Yankee
FAC	-	Flow Accelerated Corrosion
GE	-	General Electric
GIP	-	Generic Implementation Procedure
HPCI	-	High Pressure Core Injection System
MHE	-	Maximum Hypothetical Earthquake, corresponds to the current industry safe shutdown earthquake (SSE)
MOV	-	Motor Operated Valve
MS	-	Main Steam
MSD	-	Main Steam Drains
IPEEE	-	Individual Plant Examination of External Events
IST	-	In-service Testing

MSIV	-	Main Steam Isolation Valve
NRC	-	Nuclear Regulatory Commission
OBE	-	Operating Basis Earthquake, or design earthquake
Outlier	-	Specific design condition that might be associated with poor piping and/or component seismic performance
PGA	-	Peak Ground Acceleration
RCIC	-	Reactor Core Isolation System
RB	-	Reactor Building
RFO	-	Re-fuel Outage
SE	-	Safety Evaluation
SER	-	Safety Evaluation Report
SJAE	-	Steam Jet Air Ejector
SSE	-	Safe Shutdown Earthquake, see MHE
SSEL	-	Safe Shutdown Equipment List
SQUG	-	Seismic Qualification Utility Group
SV	-	Stop Valve
SRT	-	Seismic Review Team
TB	-	Turbine Building
UBC	-	Uniform Building Code
UFSAR	-	Updated Final Safety Analysis Report
VY	-	Vermont Yankee Station
Walkdown	-	Plant walkdown performed in accordance with the Reference 12 procedures
Walkthrough	-	Plant walkdown performed for general observations, not in accordance with the Reference 12 procedures

Attachment A

Technical Evaluation No. 2003-12

(13 pp including this page)

TECHNICAL EVALUATION DOCUMENTATION

Technical Evaluation No. 2003-012

Title: ALT Drain Paths and Seismic Isolation Boundaries for AST

☒ QA (Safety Class, OQA, or Vital Fire) ☐ Non QA (Non-Safety) (Check One)

Background *(Enter a concise summary of the condition or reason for the requested TE stating the existing condition and the desired results. State the scope of the requested TE.)*

The purpose and scope of this evaluation is to document the results of reviews which identify the ALT drain paths and seismic isolation boundaries required to handle MSIV leakage for the Alternate Source Term (AST) analysis using the isolated main condenser strategy. Attachment A is a sketch showing the main condenser and the piping connected to the main steam lines between the (MSIVs) and the turbine stop valves along with associated valves when the plant is at 100% power. Attachment B is the same sketch with the valves in the Post Accident drain pathway lineup. As part of this review the control location and the failure position of associated air operated valves (AOVs) was determined and is included in Attachment C. It should be noted that the normal position of several of the valves in Attachment A (PRV-OG-834B, FCV-101-35 and 36A) are different than the sketch. This can be due to required position at various power levels or operating philosophy. This has no effect on the required failure position. The starting point for the evaluation is based on normal plant lineup at power operation.

This TE identifies the ALT boundary and includes a primary ALT drain path, a backup ALT drain path, and additional ALT drain paths which are readily available to provide additional redundancy if they are required.

The TE also identifies the AST MSIV leakage boundaries and proposed modifications to ensure high reliability.

The ALT drain paths and the active boundary end points require valves that are reliable, are included in the IST Program and that can be operated from the Control Room and fail to the required position on loss of power or air. Local operation of equipment in radiological areas is not considered following an accident.

Discussion *(Record the evaluation considerations and the results of the evaluation. Describe any features that required special attention during the TE process. Document and validate any assumptions made during the evaluation.)*

ALT DRAIN PATHS

The starting point for the evaluation is based on plant lineup at power operation. A primary and backup ALT drain path is required to assure controlled leakage considering a failure. Valves required to open must have high reliability. High reliability infers power from a reliable source or failure to the required position on loss of power or air along with the ability to operate the valve from the Control Room.

In addition to being ALT drain paths, the paths are part of the seismic boundary.

Air operated valves LCVs-101-38A, B, C and D, LCV-2-143, and LCV-101-39 fail open on loss of air or power. Failure of an EDG does not compromise the ability of these valves to open.

The primary ALT drain path is via the MS low point drain valves, LCVs-101-38A,B,C and D which as previously stated are air operated valves that fail open on loss of air or power. Any of the 4 valves provides adequate drainage. These valves are operated at CRP 9-23.

The backup ALT drain path is via the MS low point drain air operated valve located just downstream of the MSIVs, LCV-2-143, that fails open on loss of air or power. This valve is located downstream of manual valve V60-24 which serves as an orifice. LCV-2-143 is operated at CRP 9-23.

A third ALT drain path is via the SJAE supply line low point drain air operated valve, LCV-101-39 that fails open on loss of air or power. This valve is operated at CRP 9-23.

Since the radiological analysis accounts for leakage through the stop valves, it is not necessary to meet the flow area fraction ratio described in Section 4.0 to Appendix C of NEDC-31858P Rev. 2.

<u>ALT SEISMIC BOUNDARY</u>

The ALT seismic boundary includes the main condenser and all piping and tubing located off the MS lines between the MSIVs and the turbine stop valves which could result in steam leakage. In addition to the above the following leakage paths are within the ALT seismic boundary:

AOG steam supply
MS sample line
Steam to turbine steam seal system
Steam to SJAEs
Steam to turbine bypass valves
Steam to EPR, MPR and miscellaneous instruments
Stop valve and stop valve drains

The sample lines, EPR, MPR and miscellaneous instruments do not require active isolation since they are closed systems and entirely within the seismic boundary.

The turbine bypass valves and the stop valve drains also do not require active isolation since the valves are normally closed valves that fail as is on loss of power. Reactor pressure is rapidly reduced following a LOCA or MS line break eliminating bypass valve opening. Piping between valves and condenser is within seismic boundary.

Valves required to close must have high reliability. High reliability infers power from a reliable source or failure to the required position on loss of power or air along with the ability to operate the valve in the required time frame from the control room.

The stop valves have high reliability and fail closed on turbine trip.

Air operated valves PRV-OG-834A&B, FCV-101-37 and PCV-101-35 and the MSIVs fail closed on loss of air or power. Failure of an EDG does not compromise the ability of these valves to close. These valves operate independently of each other. Failure of a MSIV does not cause failure of the other valves and vice versa.

The AOG boundary is at valves PRV-OG-834A & B, which are air operated valves arranged in parallel that fail closed on loss of air or power. These valves are operated at CRP 9-50.

The SJAE boundary is at valves FCV-101-37and PCV-101-35 which are air operated valves that fail closed on loss of air or power. These valves are operated at CRP 9-6.

The turbine steam seal system boundary is at MOV 60-6 and normally closed MOV 60-10 which is arranged in parallel. MOV 60-6 is closed by procedure at 70% power, thus at 100% power both sources of steam are already isolated. MOVs fail as is on loss of power. Therefore no modifications are required to isolate the steam seal regulator at power greater than 70%.There is precedence in the EQ Program for postulating valve position at 100% power. Section 5.2.J of the EQ Program states that for HELBs, "it is assumed that all valves will be in their normal position at the time of the HELB. The valves are not in an abnormal position for long periods of time and, per SRP 3.6.1, we postulate the HELB to occur at normal power operating conditions."

A ¾" check valve is required to be installed on the drain line downstream of the trap off the AOG steam supply line to the AOG building in line No. ¾"- MS-189-D3 near the condenser.

Assumptions/Open Items *(List any assumptions used in the TE and provide a basis for each. List any open items requiring additional action prior to closure of the TE.)*

NONE

Material Requirements/Implementation Instructions *(List any identified specifications for equipment, materials, or services needed to implement the recommendations of the TE. Specify any special implementation instructions or cautions, such as field testing requirements or system interface requirements during implementation.)*

NONE

Recommendations *(List detailed recommendations, as required, to resolve the evaluated condition. List all documents requiring changes and attach marked up pages. Clearly state recommendations for plant modifications or changes to operating practices, including recommended changes to plant procedures.)*

The AST boundary should be based on this Technical Evaluation including the check valve addition.

Approvals/Closeout *(Print name and provide signature/date.)*

Name / Signature	Date	Role
PAUL A. RAINEY	4/29/03	Preparer (CE)
W.C. LYNCH	4/29/03	Attachment C Preparer
PEDRO B. PEREZ	4/30/03	Independent Reviewer
James W. Allen	4/30/03	Attachment C Reviewer
PAUL R. JOHNSON	4/30/03	Inter-Discipline Reviewer (EI&C)
JAMES C. FITZPATRICK	4/30/03	Inter-Discipline Reviewer (MSD)

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Lonnie J. Cantrell, 4/30/03 Inter-Discipline Reviewer (EPU)

James G. Rogers / James G. Rogers / 4-30-03 Department Manager

(signature) (date)

Closeout *(All actions that were recommended by the TE and accepted by management have been initiated and any identified open items have been dispositioned.)*

_______________ / _______ CE

(signature) (date)

Attachments *(Provide a list of all forms, document markups, etc. provided as part of the TE package.)*

Attachment A Sketch, "ENVY ALT Seismic Verification Boundary @ 100% Power"
Attachment B Sketch, "ENVY ALT Seismic Verification Boundary Drain Pathway Lineup"
Attachment C "AOV Evaluation Table"
VYAPF 6045.03 Technical Evaluation Database Input
VYAPF 6045.04 Technical Evaluation Review Sheet

TECHNICAL EVALUATION DATABASE INPUT

TE No. 2003-012

TE Title: ALT DRAIN PATHS AND SEISMIC ISOLATION BOUNDARY

Keywords: ALTERNATE, SOURCE, TERM, LEAKAGE, TREATMENT, MSIV, SEISMIC, ISOLATION, BOUNDARY

Design Input Documents - The following documents provide design input to this TE.

#	Document Title (including Rev. No. and Date, if applicable)
1	DWG G-191156, Rev. 30, Flow Diagram-Main, Extraction, & Auxiliary Steam Systems
2	DWG G-191167, Rev. 73, Flow Diagram, Nuclear Boiler
3	DWG A-217, Rev. 18, Eng Flow Diagram, Turbine Building Area Off Gas Modification
4	Specifications, drawings, operating procedures and VYEMs from right hand column of ATT C of TE 2003-012

Design Output Documents - The following documents are impacted by this TE.

#	Document Title
	NONE

General References

#	Reference Title (including Rev. No. and Date, if applicable)
5	GE NEDC-31858P Rev. 2, Class III, DRF B21-00461, September 1993, "BWROG Report for Increasing MSIV Leakage Rates and Elimination of Leakage Control Systems"
6	VY EQ Program Manual, Rev. 46

Data Entered into Database ____________ / ____ Entry Verified ____________ / ____
Signature Date Signature Date

VYAPF 6045.03
AP 6045 Original
Page 1 of 1

PAGE 5 OF 7

TECHNICAL EVALUATION REVIEW

TE #: 2003-012 Required Date: 3/27/03 Reviewer Assigned: JAMES FITZPATRICK (MECH/STRUCT)

Title: ALT DRAIN PATHS AND SEISMIC ISOLATION BOUNDARY

Comments:	Resolution:
① BACKGROUND: CHANGE SENTENCE ON NORMAL POSITION TO REFLECT ATTACHMENT "A" ONLY.	① CHANGED SENTENCE
② DISCUSSION: LAST PG. "SECTION 4.0 TO APPENDIX C" OF NEDC-31858.	② CORRECTED
③ TE DATABASE INPUT SHEET: UNDER #4 CHANGE TO ATTACH "C", ADD REF. 5: (NE-31858) AND REF. 6: VY EQ PROGRAM.	③ CORRECTED & ADDED REFERENCES

Reviewer Signature: [signature], Date: 4/30/03

DCE Signature: Paul A. Rainey, Date: 4/30/03

Reviewer Signature: [signature], Date: 4/30/03

Notes and Requirements:

1. Validate design input appropriateness relative to your area of expertise.
2. Verify Department Procedures, Program inputs, and output documents are appropriately addressed.
3. Meetings or discussions to resolve questions and comments are encouraged.
4. Resolution by telecon is acceptable and should be noted as such.
5. Make comments specific, and avoid generalizations and questions.
6. If no comments indicate "None"
7. Request Management assistance if resolution can not be achieved.
8. Return all comments to the CE by required date or request an extension.

VYAPF 6045.04
AP 6045 Original
Page 1 of 1

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ABS Consulting
RISK CONSULTING DIVISION

TECHNICAL EVALUATION REVIEW

TE #: 2003-015 12 656 Required Date: 30 April 03 Reviewer Assigned: P. Perez

Title: ALT Drain Paths and Seismic Isolation Boundaries for AST

Comments:

Please incorporate the editorial changes that are marked-up and were discussed with you.

Reviewer Signature, 4/30/03 Date

Resolution:

Incorporated

Paul D. Rainey, 4/30/03
DCE Signature Date

Reviewer Signature, 4/30/03 Date

Notes and Requirements:

1. Validate design input appropriateness relative to your area of expertise.
2. Verify Department Procedures, Program inputs, and output documents are appropriately addressed.
3. Meetings or discussions to resolve questions and comments are encouraged.
4. Resolution by telecon is acceptable and should be noted as such.
5. Make comments specific, and avoid generalizations and questions.
6. If no comments indicate "None"
7. Request Management assistance if resolution can not be achieved.
8. Return all comments to the CE by required date or request an extension.

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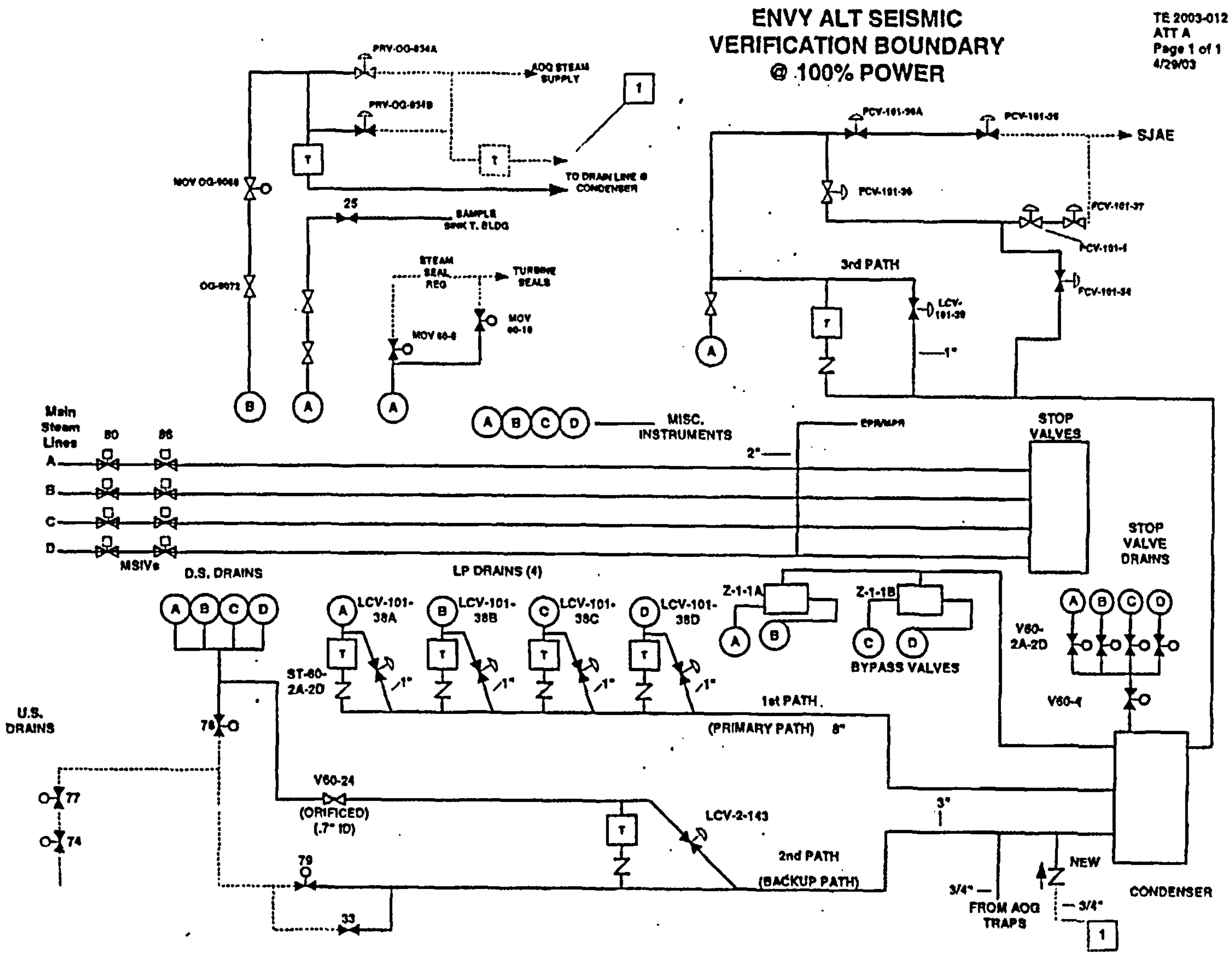
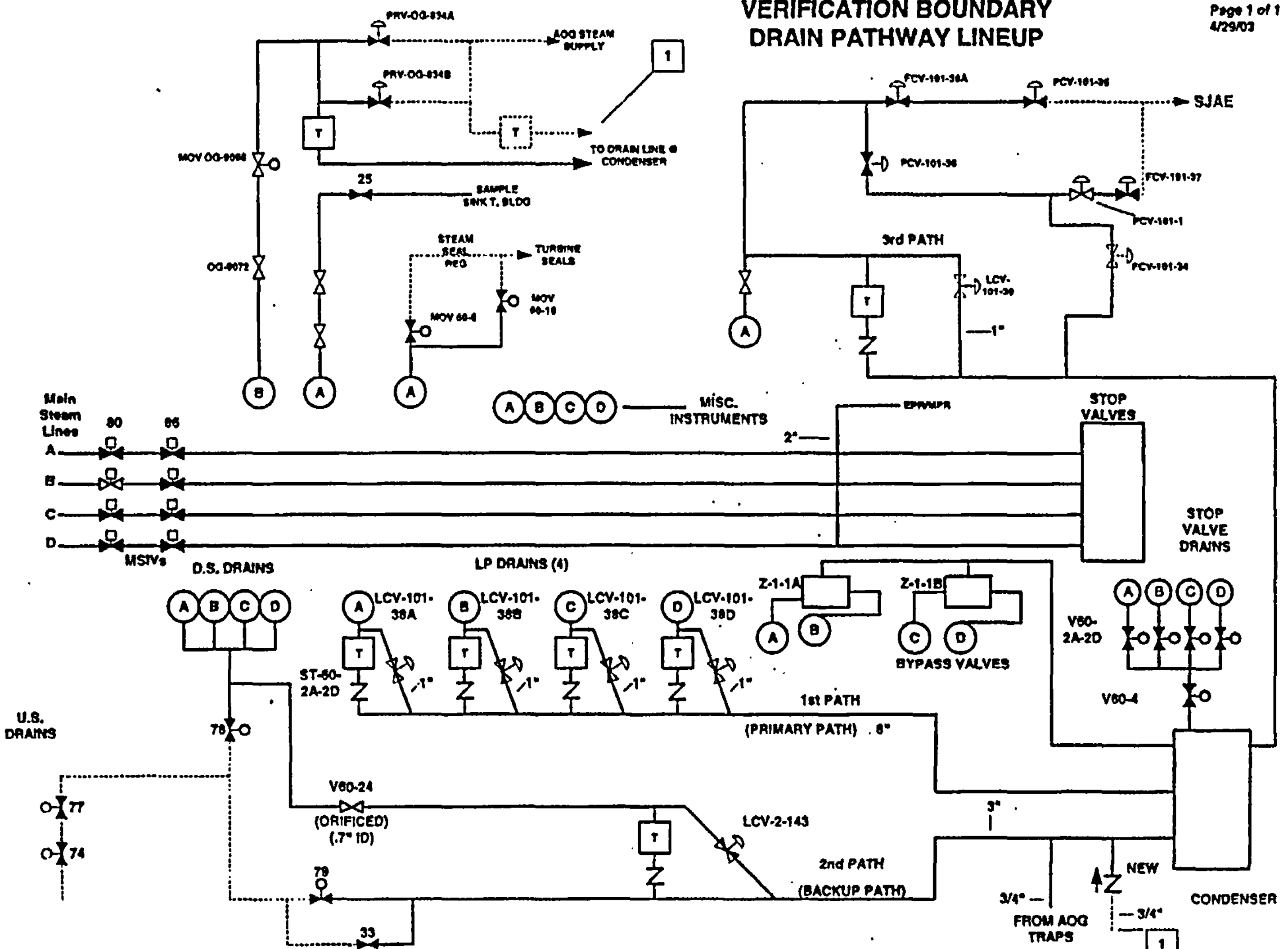
VYAPF 6045.04

1173875-R-001
Revision 0
7/30/2003
ATTACHMENT A


ENVY ALT SEISMIC
VERIFICATION BOUNDARY
@ 100% POWER
TE 2003-012
ATT A
Page 1 of 1
4/29/03
AOG STEAM SUPPLY
TO DRAIN LINE @ CONDENSER
SAMPLE SINK T. BLDG
STEAM SEAL REG
TURBINE SEALS
MISC. INSTRUMENTS
SJAE
3rd PATH
Main Steam Lines
MSIVs
STOP VALVES
STOP VALVE DRAINS
D.S. DRAINS
LP DRAINS (4)
LCV-101-38A
LCV-101-38B
LCV-101-38C
LCV-101-38D
ST-60-2A-2D
Z-1-1A
Z-1-1B
BYPASS VALVES
V60-2A-2D
V60-4
1st PATH
(PRIMARY PATH) 8"
U.S. DRAINS
V60-24
(ORIFICED)
(.7" ID)
LCV-2-143
2nd PATH
(BACKUP PATH)
FROM AOG TRAPS
NEW
CONDENSER

ENVY ALT SEISMIC VERIFICATION BOUNDARY DRAIN PATHWAY LINEUP

TE 2003-012
ATT B
Page 1 of 1
4/29/03



1173875-R-001
Revision 0
7/30/2003
ATTACHMENT A

TE 2003-012, R0
Attachment C
Page 1 of 3

AOV Table

FCV-101-34	Normal Position	Closed	EBASCO Spec VYNP-C-16 B-191301 Sh 547 R5
	Loss of Air Pressure	Open	EBASCO Spec VYNP-C-16 5920-5499 R1
	Loss of Power	Open	WO 03-1058
	Valve Control Location	CRP 9-23	B-191301 SH 547 R5
	Safety Class	NNS	SCW 94-1741
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 H4 R31
		Inst. Detail Dwg	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191264 SH 4 D6 R10
		Purchase Order	PO 706165
	P.O. 706165	Vendor Manual	VYEM 0138
		Operating Procedure	OP 2113 R19
	There is conflicting information between the P&ID and CWD. The indicated WO was completed to obtain a non-intrusive voltage measurement and light indication from CRP 9-23 to identify and record what position the valve is in when the solenoid is de-energized. Additional references are 5920-5479, 5920-5484, 5920-5473 and B-191260 SH 101.1.		
FCV-101-36	Normal Position	Open	EBASCO Spec VYNP-C-16
	Loss of Air Pressure	Close	EBASCO Spec VYNP-C-16 5920-5488 R2
	Loss of Power	Close	See below
	Valve Control Location	CRP 9-6 and AOG Panel	B-191301 SH 562 R15
	Safety Class	NNS	SCW 94-1740
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 H4 R31
	Accessory Devices	Inst. Detail Dwg.	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191264 SH 4 E6 R10
		Purchase Order	PO 706165
	P.O. 706165	Vendor Manual	VYEM 0138
		Operating Procedure	OP 2113 R19
	The solenoid is normally energized (B-191301 SH 562) keeping air in the actuator which keeps the valve open. The solenoid exhaust vent opens on loss of power which bleeds actuator air and the spring closes the valve. Process flow tends to open the valve also. Additional references are 5920-5484, 5920-5473 and B-191260 SH 101.1.		
FCV-101-36A	Normal Position	Open	ER 20030285
	Loss of Air Pressure	Close	ER 20030285
	Loss of Power	Close	See below
	Valve Control Location	CRP 9-6 and AOG Panel	B-191301 SH 562 R15
	Safety Class	NNS	SCW 94-1744
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 H4 R31
		Inst. Detail Dwg	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191264 SH 4 E6 R10
	P.O. 706165	Vendor Manual	VYEM 0138
		Operating Procedure	OP 2113 R19
	The drawings do not match the field configuration. ER 20030285 addresses this issue. Additional references are EBASCO Spec VYNP-C-16, 5920-5466, 5920-5473, 5920-5479, 5920-5484 and B-191260 SH 101.1. Per B-191301 SH 562, the solenoid is normally de-energized (i.e., contact 3-4 normally not made up) and valve is closed. If contact 3-4 is made up by closing switch SW 85, the valve opens. Therefore, on loss of power the valve closes.		
FCV-101-37	Normal Position	Open	EBASCO Spec VYNP-C-16
	Loss of Air Pressure	Close	EBASCO Spec VYNP-C-16 5920-5487 R2
	Loss of Power	Close	5920-5487 R2 B-191301 SH562 R15
	Valve Control Location	CRP 9-6 and AOG Panel	B-191301 SH 562 R15
	Safety Class	NNS	SCW 94-1739
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 I4 R31
		Inst. Detail Dwg	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191264 SH 4 E6 R10
	P.O. 706165	Vendor Manual	VYEM 0138
		Operating Procedure	OP 2113 R19
	The solenoid is normally energized (B-191301 SH 562) keeping air in the actuator which keeps the valve open. The solenoid exhaust vent opens on loss of power which bleeds actuator air and the spring closes the valve. Process flow tends to open the valve also. Additional references are 5920-5473, 5920-5479 and B-191260 SH 101.1.		

TE 2003-012, R0
Attachment C
Page 2 of 3

AOV Table

LCV-101-38A,B,C,D	Normal Position	Closed	EBASCO Spec VYNP-C-16
	Loss of Air Pressure	Open	EBASCO Spec VYNP-C-16 5920-5474 R2
	Loss of Power	Open	B-191302 SH 182 R2 5920-5474 R2 WO 03-1058
	Valve Control Location	CRP 9-23	B-191301 SH 182 R2
	Safety Class	NNS	SCW 94-1759
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 C2 R31
		Inst. Detail Dwg	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191264 SH 3 J3 R10
	P.O. 706165	Vendor Manual	VYEM 0138
		Operating Procedure	OP 2113 R19
	The solenoid is normally de-energized (B-191301 SH 182) keeping air in the actuator which keeps the valve closed. The solenoid exhaust vent opens on loss of power which bleeds actuator air and the spring opens the valve. WO 03-1058 verified that the valve closes on loss of power. Additional references are 5920-5473, 5920-5479 and B-191260 SH 102.1.		
LCV-101-39	Normal Position	Closed	EBASCO Spec VYPN-C-16
	Loss of Air Pressure	Open	EBASCO Spec VYPN-C-16 5920-5500 R1
	Loss of Power	Open	WO 03-1058 5920-5500 R1, B-191301 SH 547 R5
	Valve Control Location	CRP 9-23	See note below
	Safety Class	NNS	SCW 94-1749
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 I4 R31
		Inst. Detail Dwg	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191264 SH 4 D3 R10
		Vendor Manual	VYEM 0138
		Operating Procedure	OP 2113 R19
	There is conflicting information between the P&ID and CWD. WO 03-1058 obtained a non-intrusive voltage measurement and light indication from CRP 9-23 to verify that on loss of power the valve fails in the open position. Additional references are 5920-5479, 5920-5484, 5920-5473 and B-191260 SH 101.1.		
LCV-2-143	Normal Position	Closed	VYEM 0138, 5920-5490 R1
	Loss of Air Pressure	Open	5920-5490 R1, G-191167 R72
	Loss of Power	Open	WO 03-1058
	Valve Control Location	CRP 9-23	B-191301 Sh 547 R5
	Safety Class	N/0, N/N	SCWs 2000-0335K
	P&ID	Nuclear Boiler	G-191167 E17 R72
		Inst. Detail Dwg	B-191261 SH 46 R8
		Inst. Arrangement Dwg.	G-191265 SH 3 M9
	P.O. 706165	Vendor Manual	VYEM 0138
	There is conflicting information between the P&ID and CWD. WO 03-1058 verified that the valve fails open on loss of power (i.e., solenoid de-energized). Additional references are 5920-5479, 5920-5484, 5920-5473 and B-191260 SH 101.1.		
PCV-101-1	Normal Position	Modulating	(Pressure Control)
	Loss of Air Pressure	Open	5920-2398 R0
	Loss of Power	NA (no solenoid)	G-191156 I4 R31
	Valve Control Location	None	
	Safety Class	NNS	SCW 94-1672
	P&ID	Main, Extraction & Auxiliary Steam	G-191156 I4 R31
		Inst. Detail Dwg	B-191261 SH 52 R6
		Inst. Arrangement Dwg.	G-191264 SH 4 E6 R10
		Vendor Manual	GEK-6585 Tab 5
	Additional references are 5920-2397, B-191260 SH 101.4		

Attachment B

FAC-Susceptible Piping

Assessment based on configuration of piping, see in part Reference 30, and applicable references listed in the Walkdown Report, Reference 13. Material specification determined from Ref. 30 and Ref. 18. The ENVY FAC program is outlined in detail in Reference 15. In addition consideration of the Exclusion Criteria of Section 5.1 of Reference 14 has been incorporated into this review.

(2 pp including this page)

Path ID	Size	Line Number	Matl	FAC	Ref	Comments
1	1	MSD 7A, B, C, D	CS	yes	G-191156	Flow due to trap operation/leak-by
	1.5	MSD 7A, B, C, D	CS	yes	G-191156	Flow due to trap operation/leak-by
	2	MSD 7A, B, C, D	CS	yes	G-191156	Flow due to trap operation/leak-by
	2.5	MSD 7A, B, C, D	CS	yes	G-191156	Flow due to trap operation/leak-by
	6	MSD 7A, B, C, D	CS	yes	G-191156	Flow due to trap operation/leak-by
	1	MSD 8A, B, C, D	CS	yes	G-191156	Flow due to LCV operation/leak-by
	2.5	MSD 8A, B, C, D	CS	yes	G-191156	Flow due to LCV operation/leak-by
	8	MSD 9	CS	yes	G-191156	Flow due to trap/LCV operation/leak-by
2	1.5	MSD (CS 5.1.5)	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	2	MSD 3	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	2.5	MSD 3	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	1, 2.5	MSD 12	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	1	MSD	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	3	MSD 4	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	3	MSD 5	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
	2.5	MSD 11	CS	yes	G-191167	Flow due to trap/LCV operation/leak-by
3	2.5	AS 1	CS	yes	G-191156	Flow due to trap/LCV operation/leak-by
	2	AS 1	CS	yes	G-191156	Flow due to trap/LCV operation/leak-by
	1, 2	MSD	CS	yes	G191156	Flow due to trap/LCV operation/leak-by
	3	AS 1	CS	yes	G-191156	Flow due to trap/LCV operation/leak-by
4	2	HS 190 H1	CS	yes	G-191156	Flow due to trap operation/leak-by
	2.5	HS 190 H1	CS	yes	G-191156	Flow due to trap operation/leak-by
	2	HS 185 H1	CS	yes	G-191156	
	0.75	HCN-188-H1	P22	no	G-191156	
	0.75	MS-189-D3	P22	no	G-191156	
5	0.75	none	CS	no	G-191164	No flow
	0.5	V60-18A to V60-25	SS	no	G-191164	No flow / instrument tubing
6	5, 3	GE piping	CS	no	G-191156	Low use
7	1, 0.75	MPR/ EPT	CS/ SS	no	Main Steam Drains T.B. iso	No flow / instrument tubing
8	16	MS 2A, 2B, 2C, 2D	CS	no	G-191156	Low Use
	10	MS-3 A-E	CS	no	G-191156	Low Use
9	1	MSD 6	CS	yes	G-191156	Flow due to Stop valve leak-off
	2.5	MSD 6	CS	yes	G-191156	Flow due to Stop valve leak-off
10	18	MS-1 A- 1D	CS	yes	G-191156	
11	1	MSD	P11	no	G-191169/G-191174	
	2	MSD	P11	no		

Attachment C

ALT Boundary Walkdown – Week of 6/16/2003

(16 pp including this page)

Photos of selected locations as follows:

Path 2	Figures C2-1 through C2-4
Boundary 5	Figures C5-1 through C5-4
Boundary 7	Figures C7-1 through C7-4
Boundary 11 (RCIC/HPCI)	Figures C11-1 through C11-3

Figure C2-1

Path 2 Piping near V2-79MO

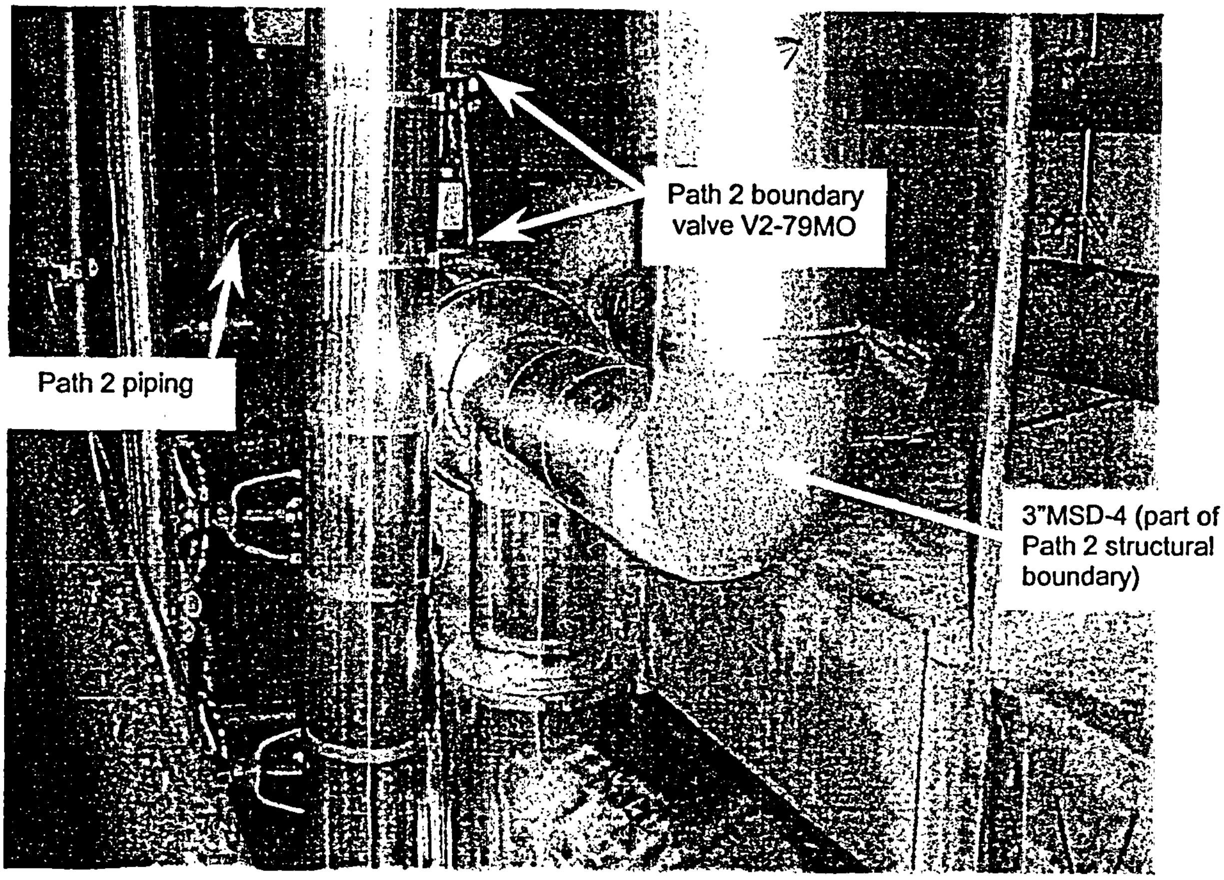


Figure C2-2

Path 2 – Solenoid for LCV-2-143

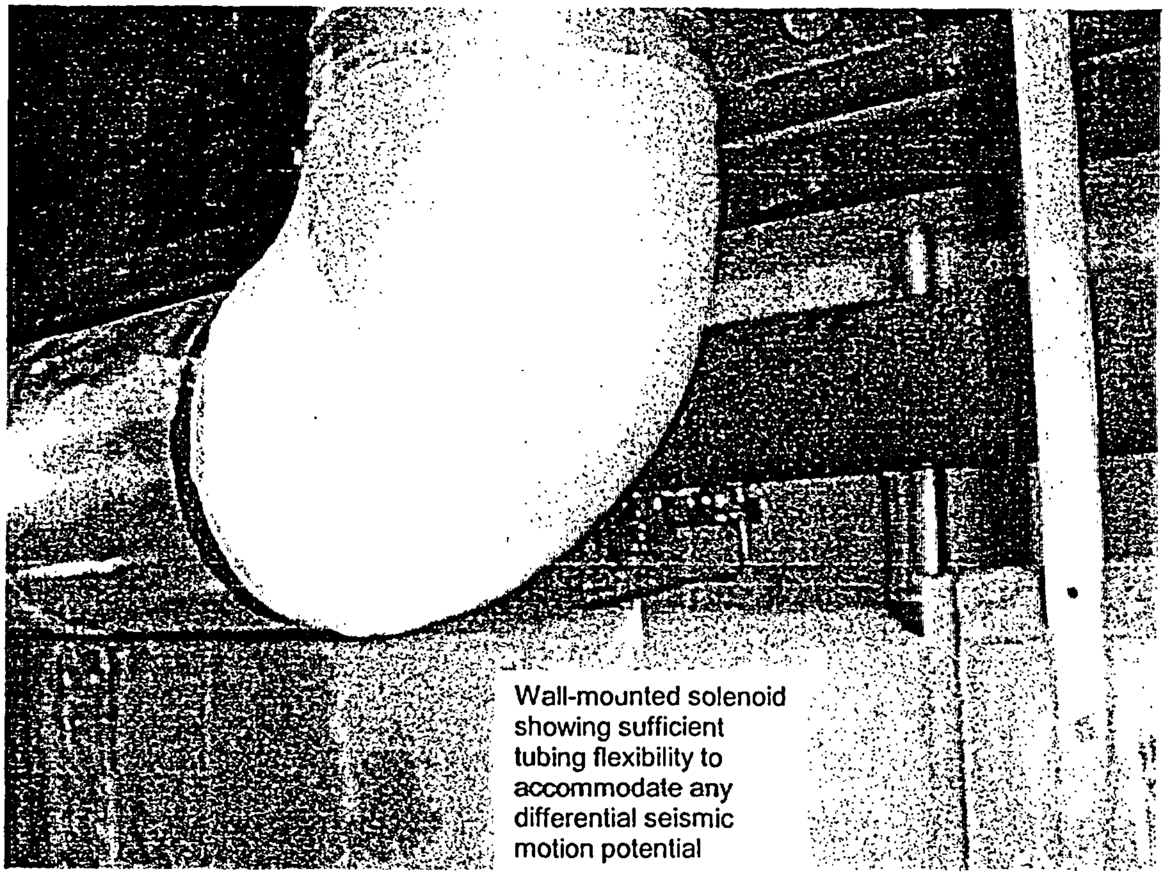


Figure C2-3

Path 2 – Steam Trap ST-60-3 bypass

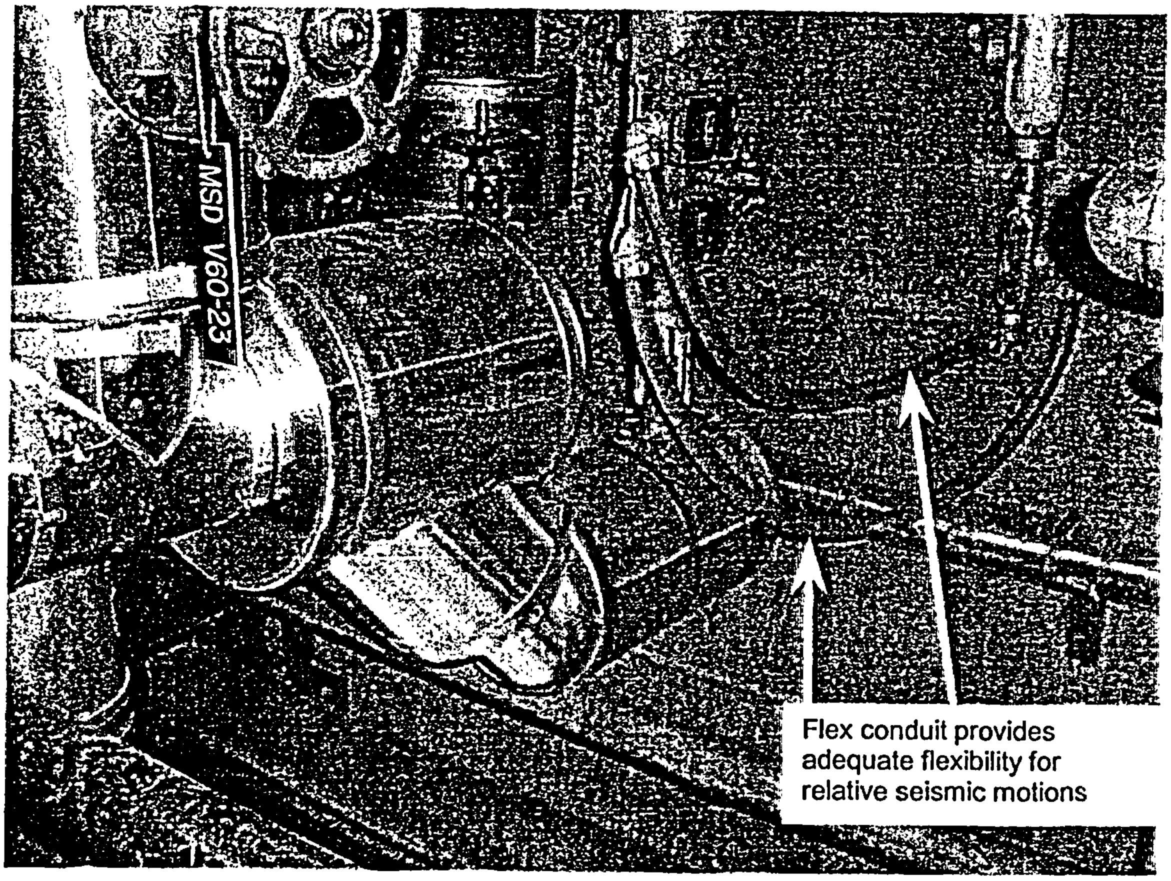


Figure C2-4

Path 2 – Isolated Drain Pipe from Path. Potential Interaction between scaffolding storage rack and adjacent floor drain piping. This will not have an adverse affect on drain path

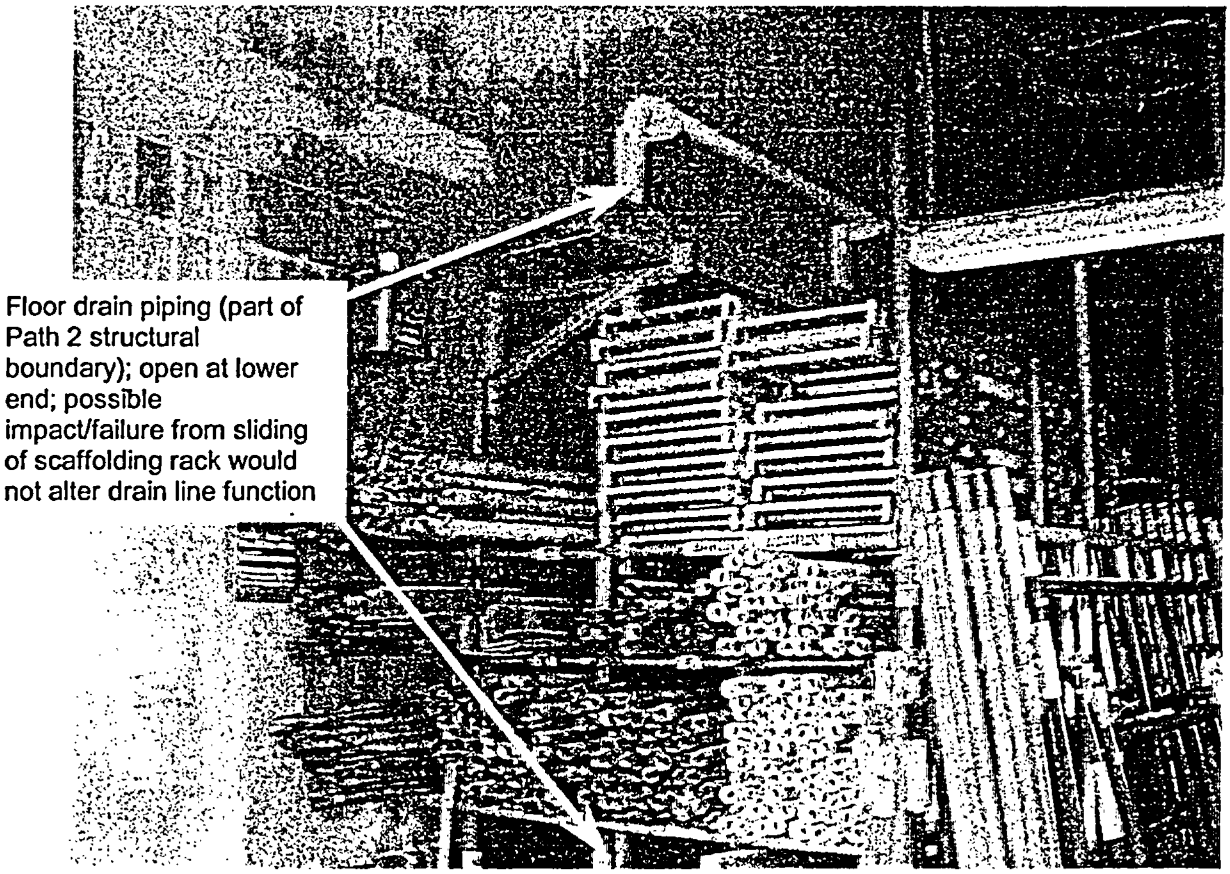


Figure C5-1

Boundary 5 – HVAC Duct above Sample Sink

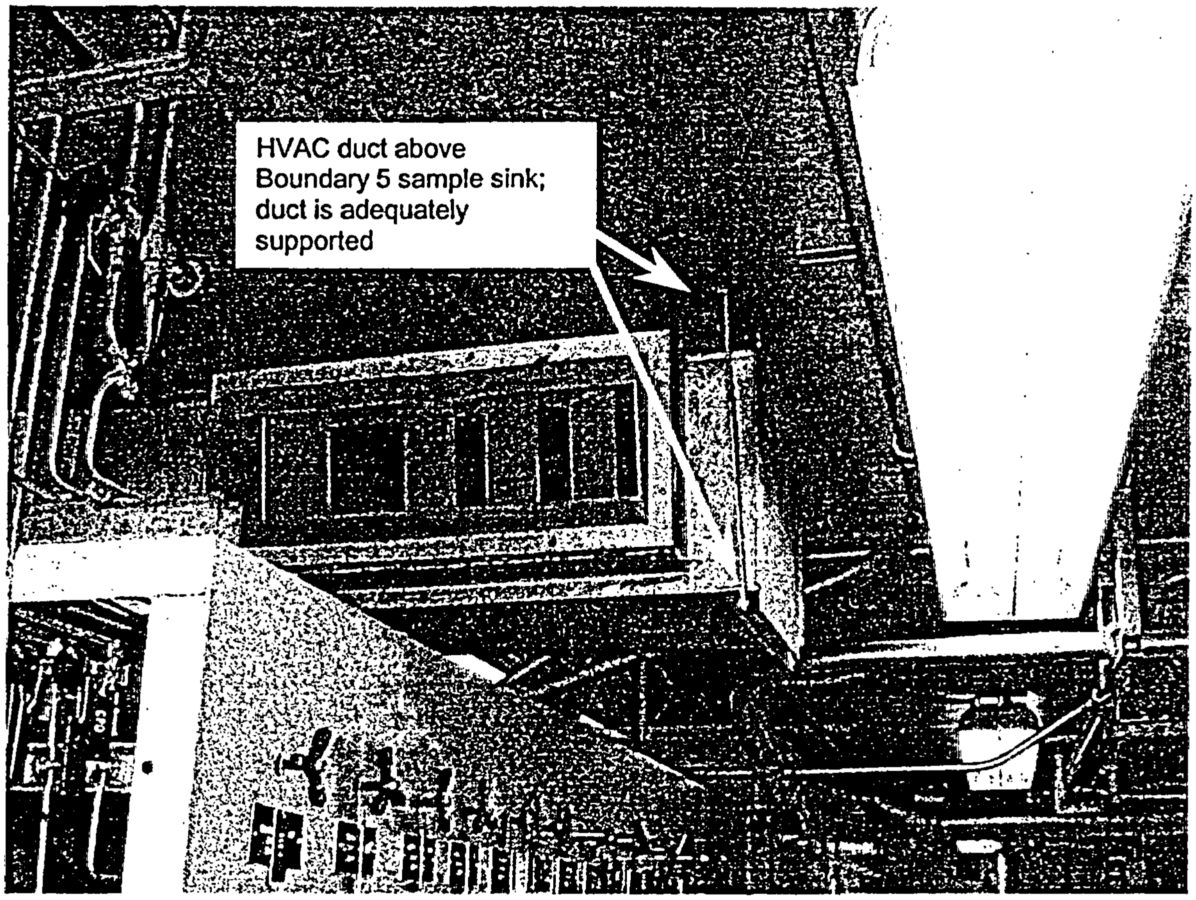


Figure C5-2

Boundary 5 – Instrument Sample Rack

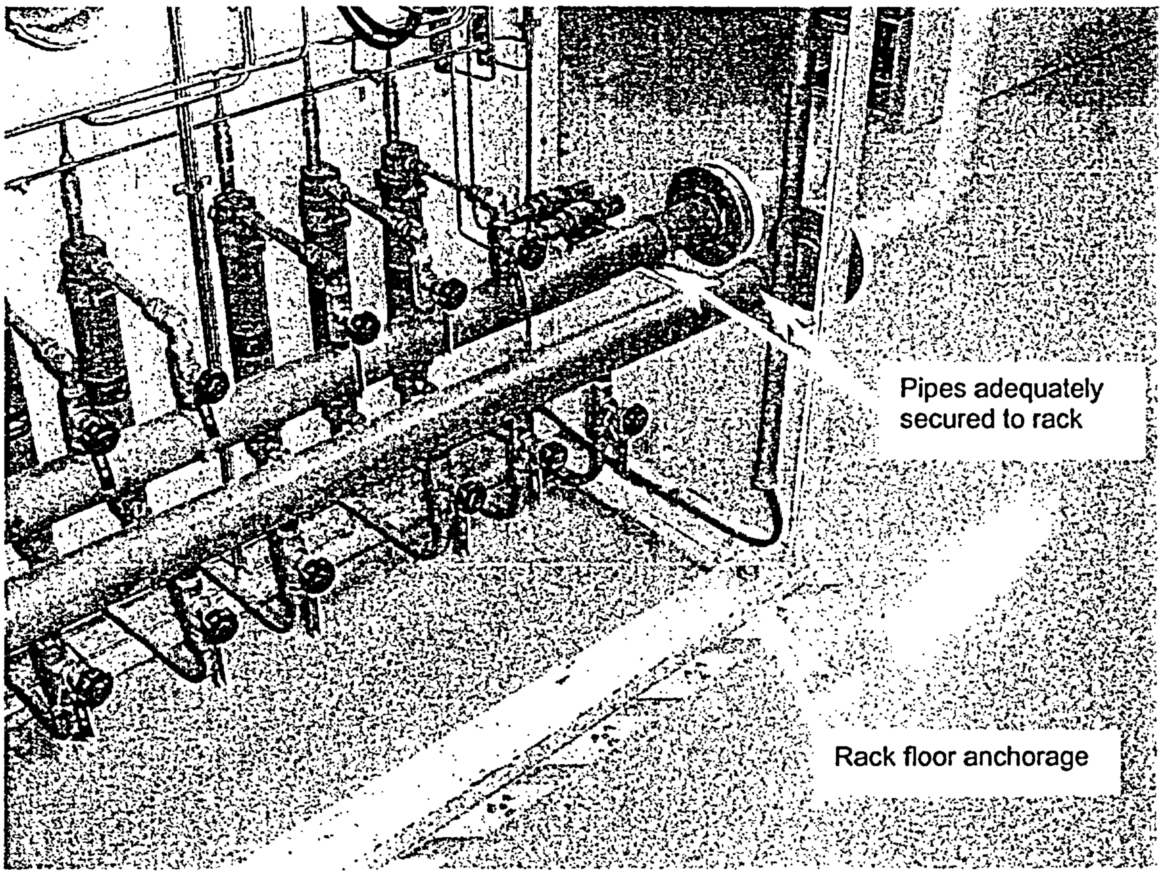


Figure C5-3

Boundary 5 – Instrument Sample Sink Backside

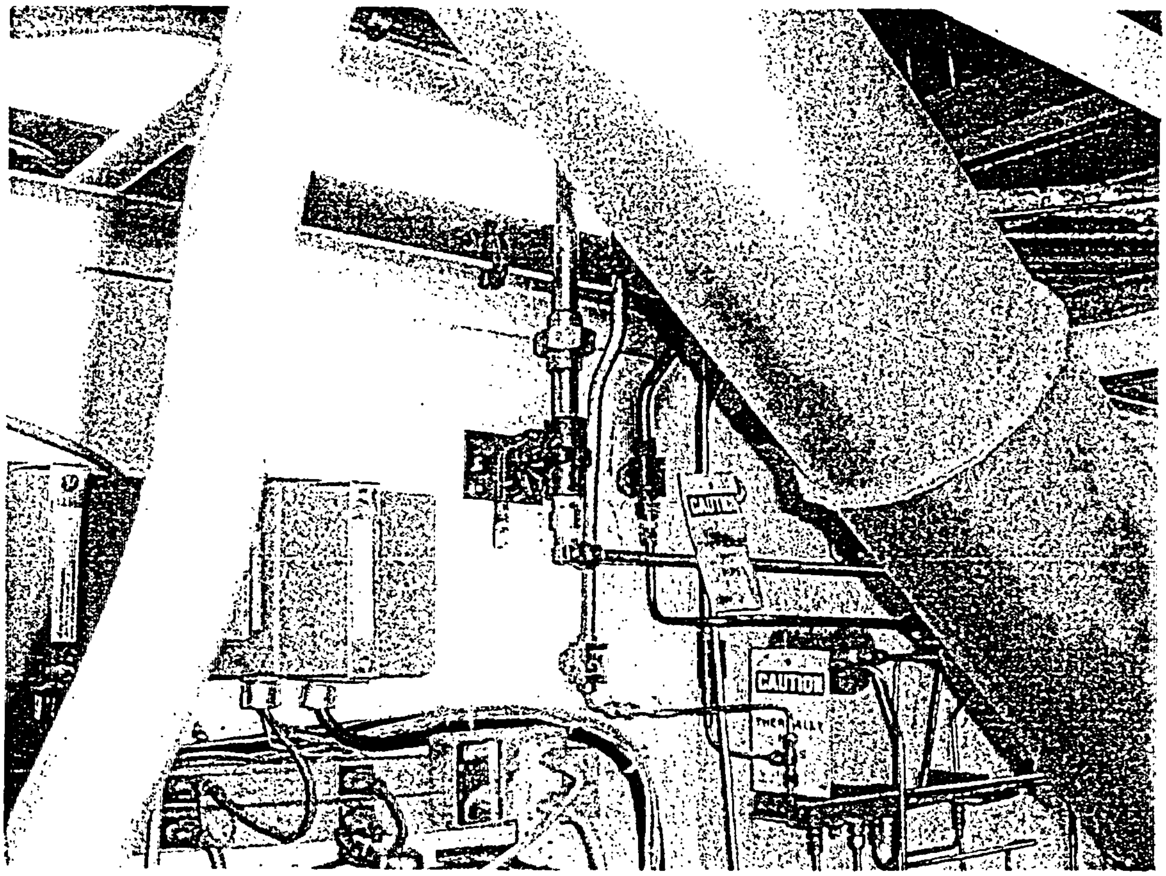


Figure C5-4

Boundary 5 – Instrument Sample Sink Tube Runs Connecting to Rack

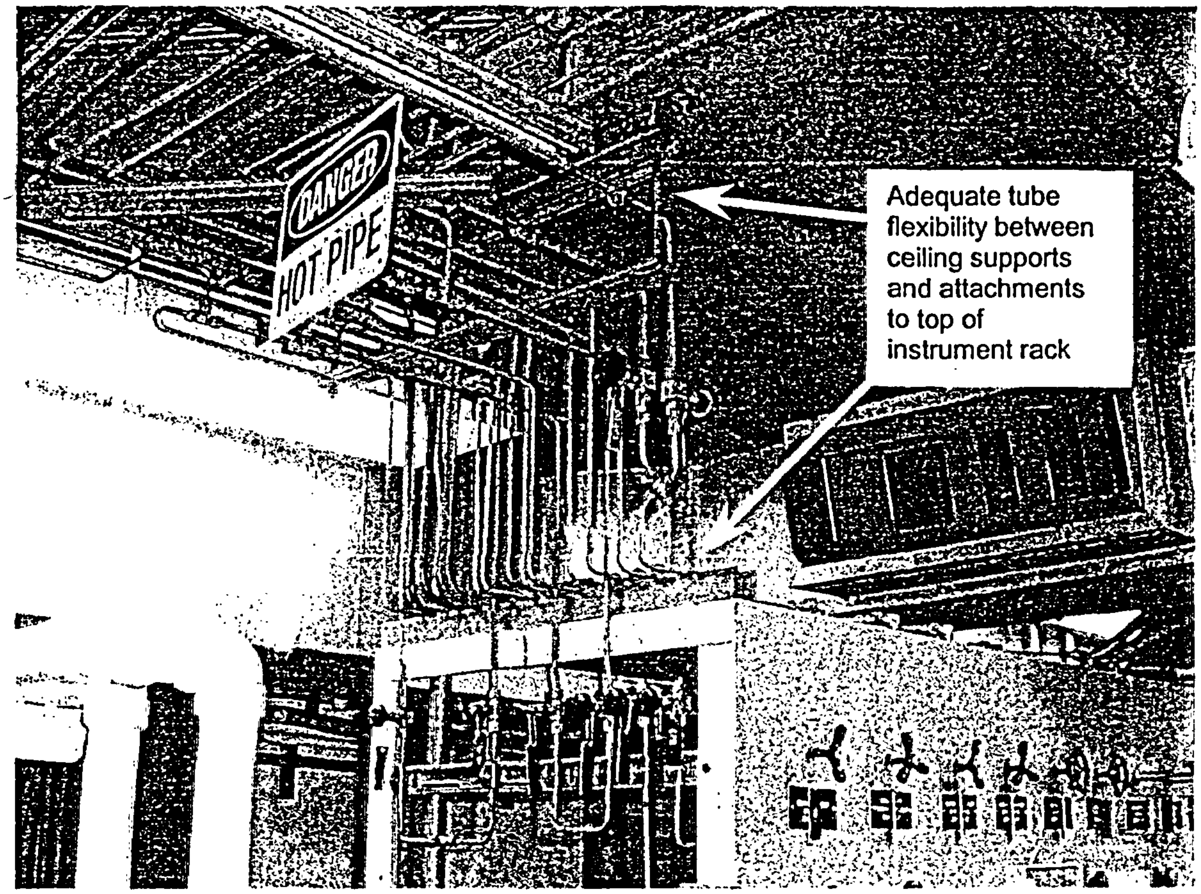


Figure C7-1

Boundary 7 – Pressure Switch Support Frame with anchorage detail

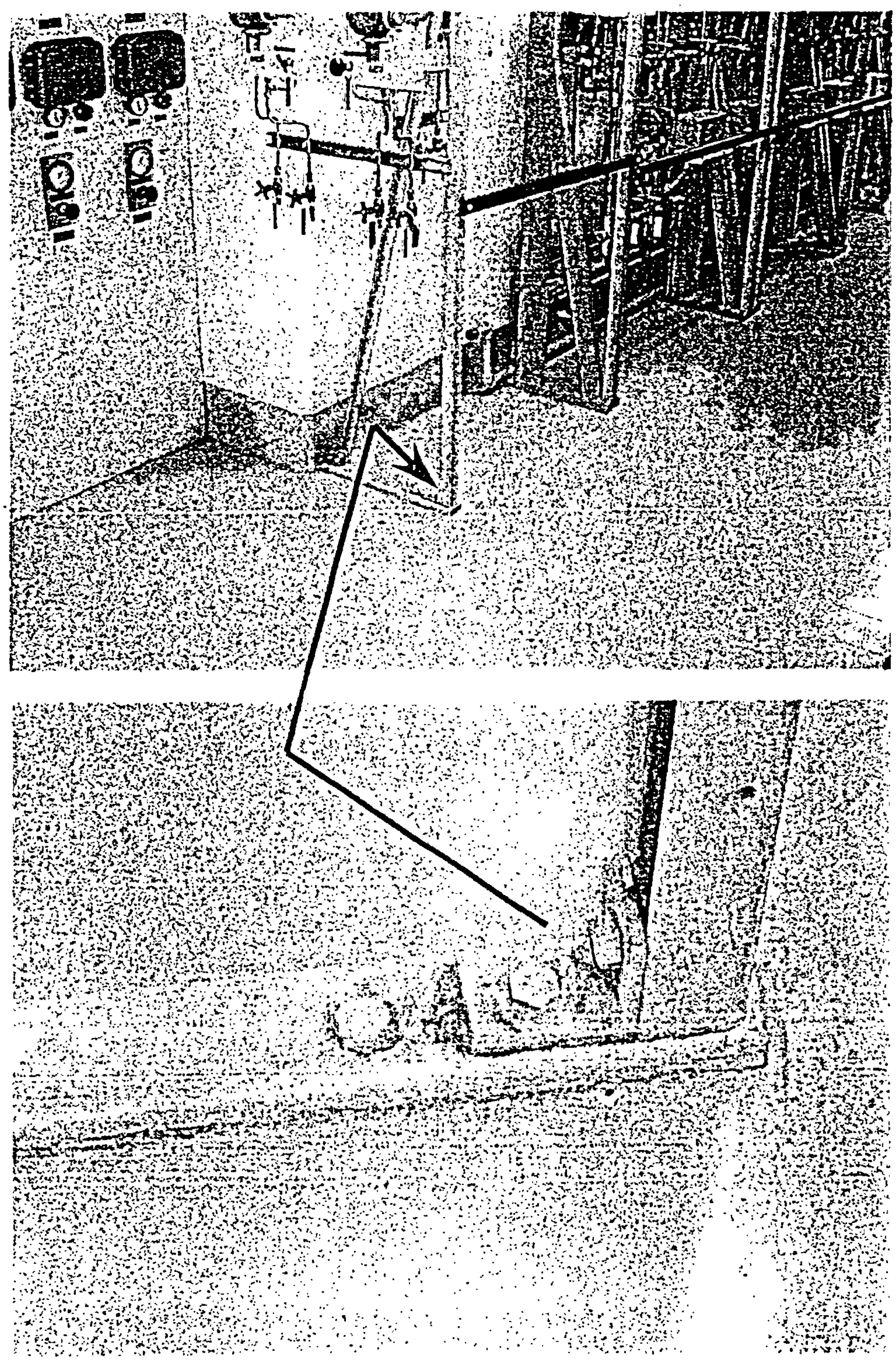


Figure C7-2

Boundary 7 – Typical Instrument Tubing Support Arrangement

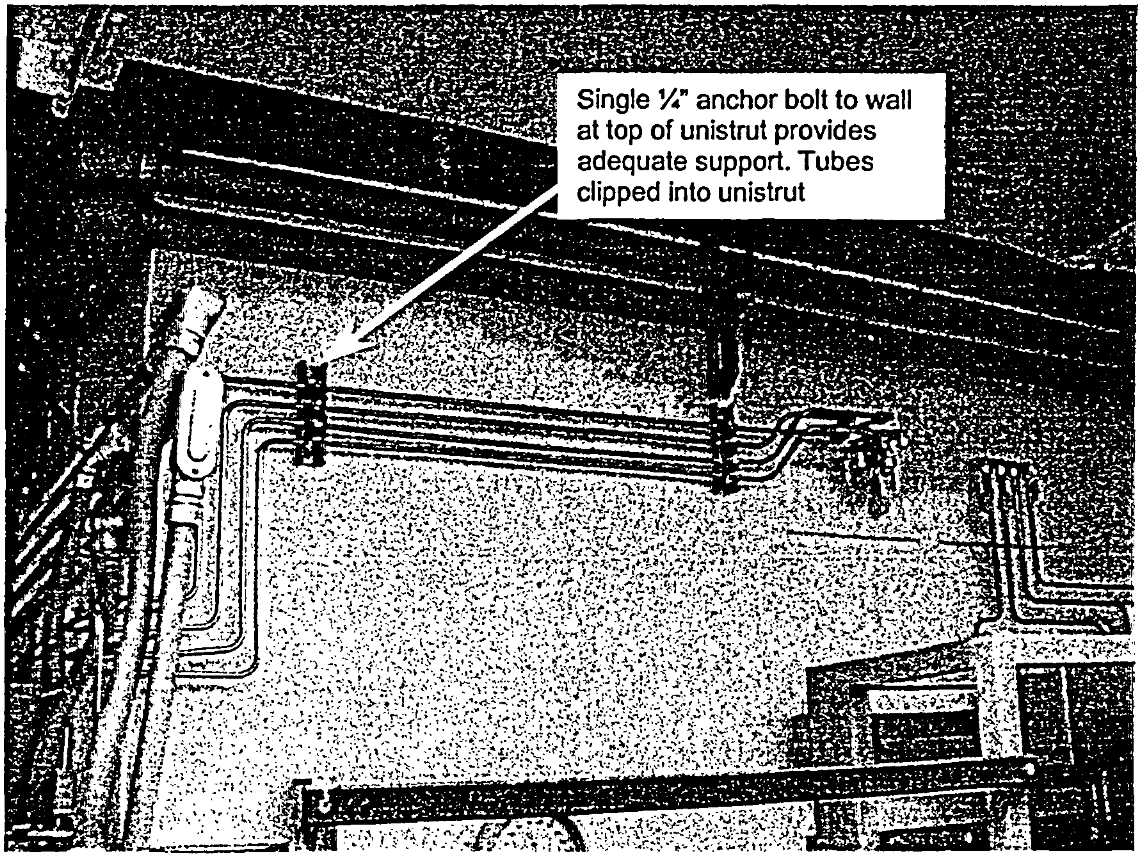


Figure C7-3

Boundary 7 – Typical Instrument Panel Arrangement – Plate 2

(Northwest End of Turbine Building)

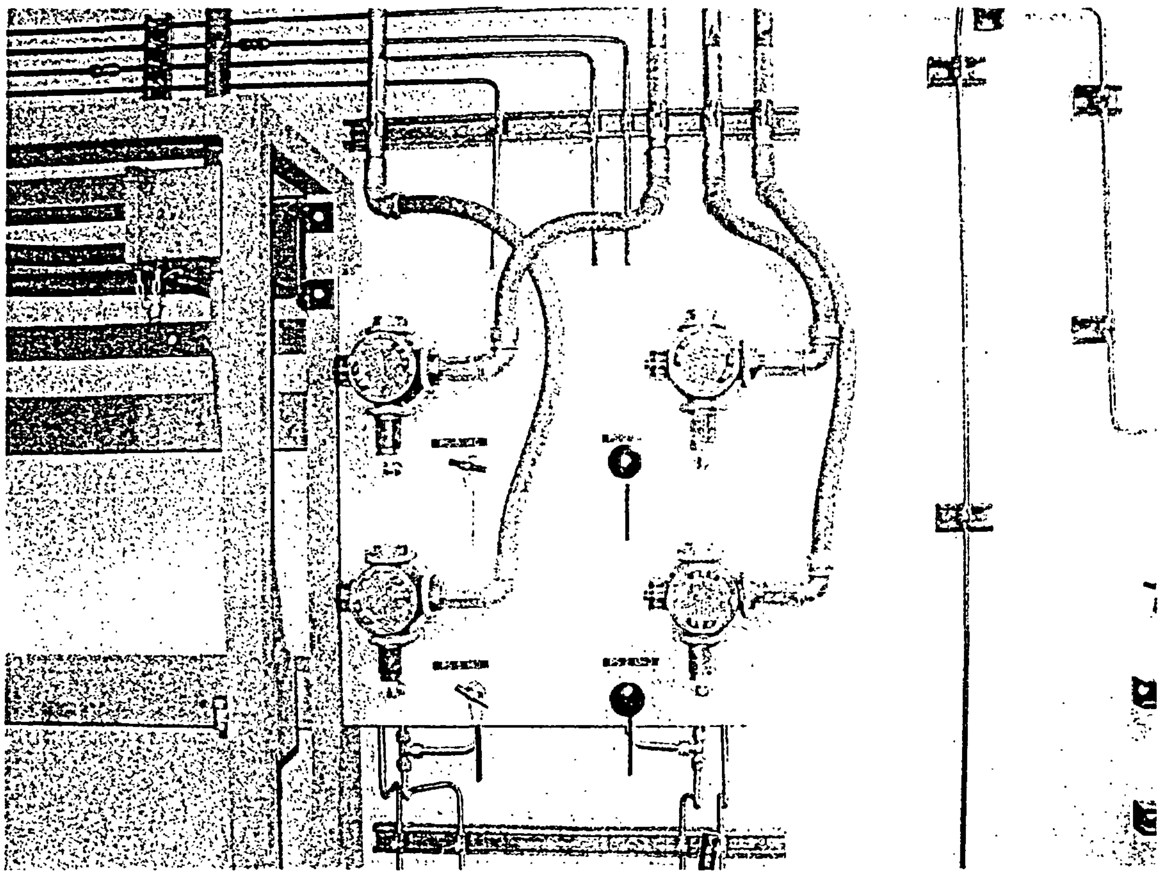


Figure C7-4

Boundary 7 – Typical Transmitter Support Arrangement

Rack 1A PT –101 –2 -3

(North End of Turbine Building)

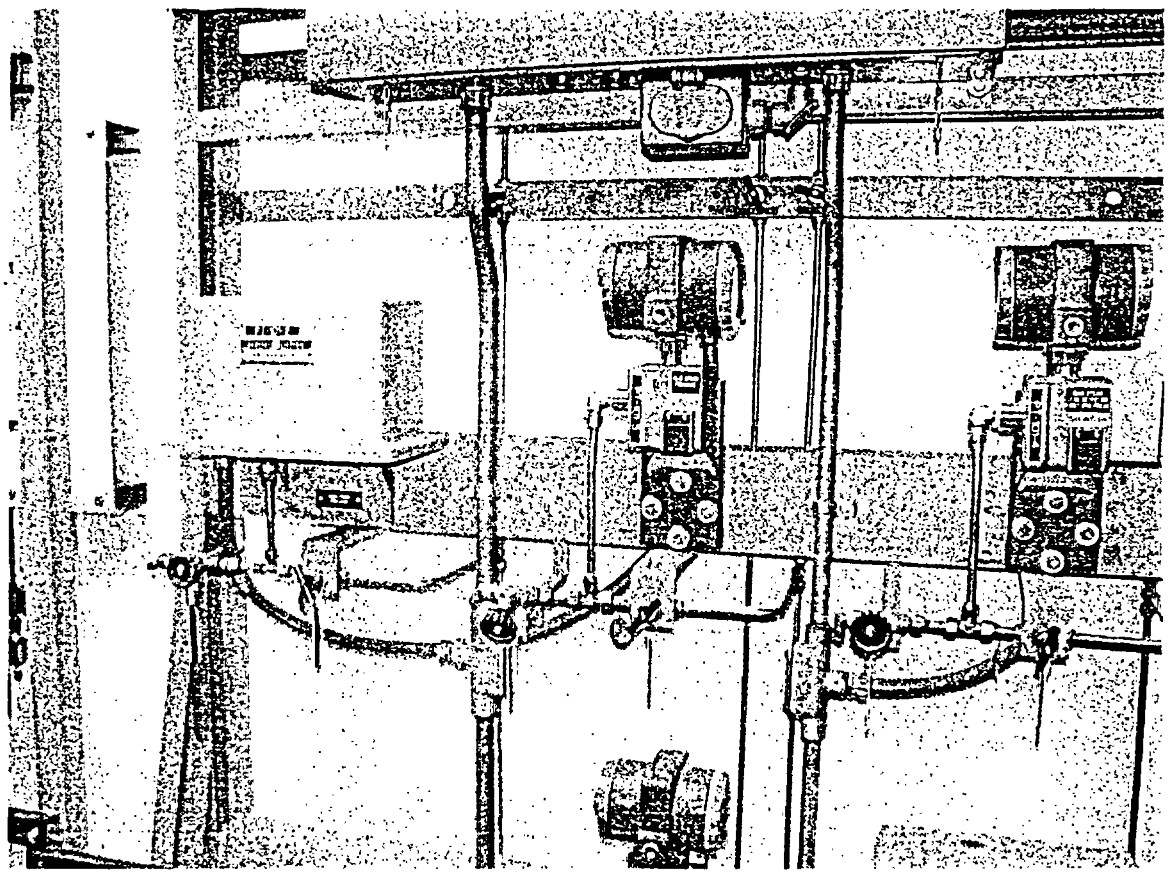


Figure C11-1

HPCI/RCIC – Typical Pipe Support on drain piping in HPCI Room of RB. Support has U-bolt for vertical and lateral guide

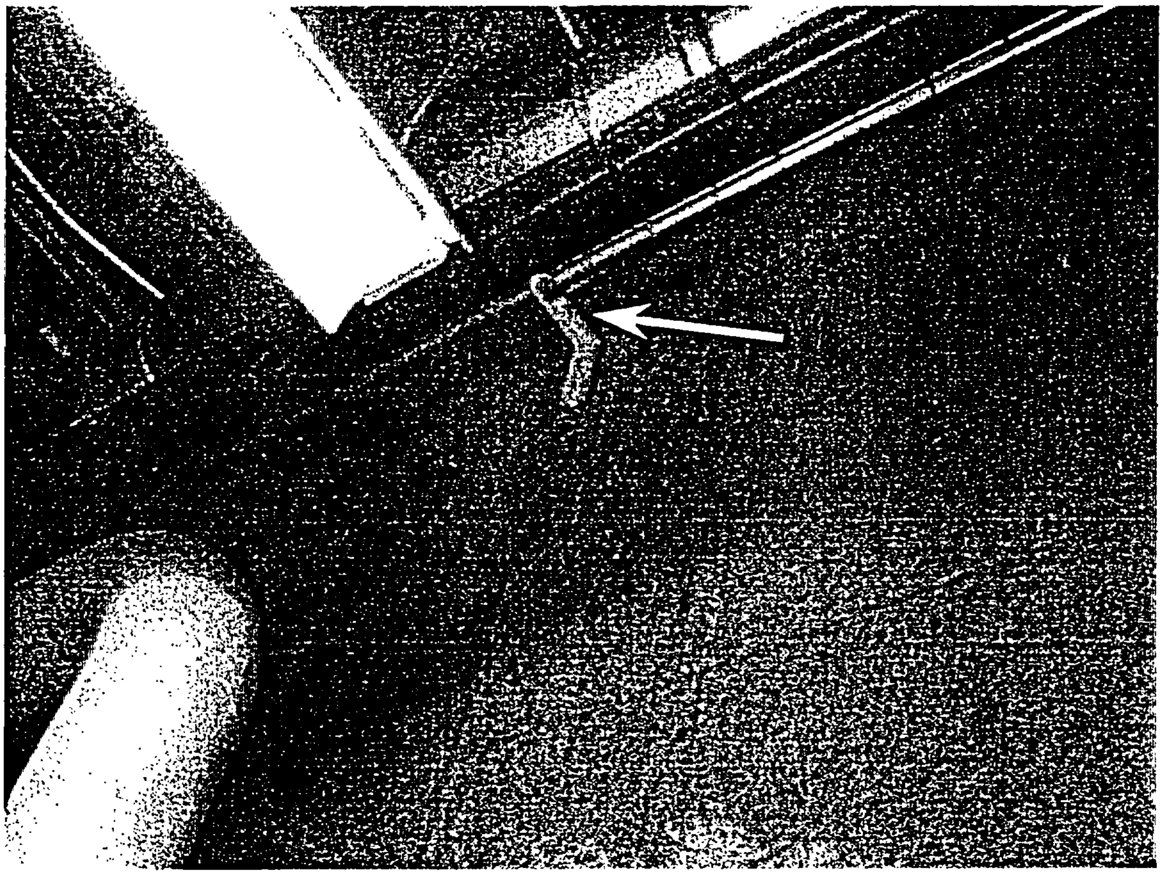


Figure C11-2

HPCI/RCIC – Operator Supports, Valves FCV-23-42 and -43

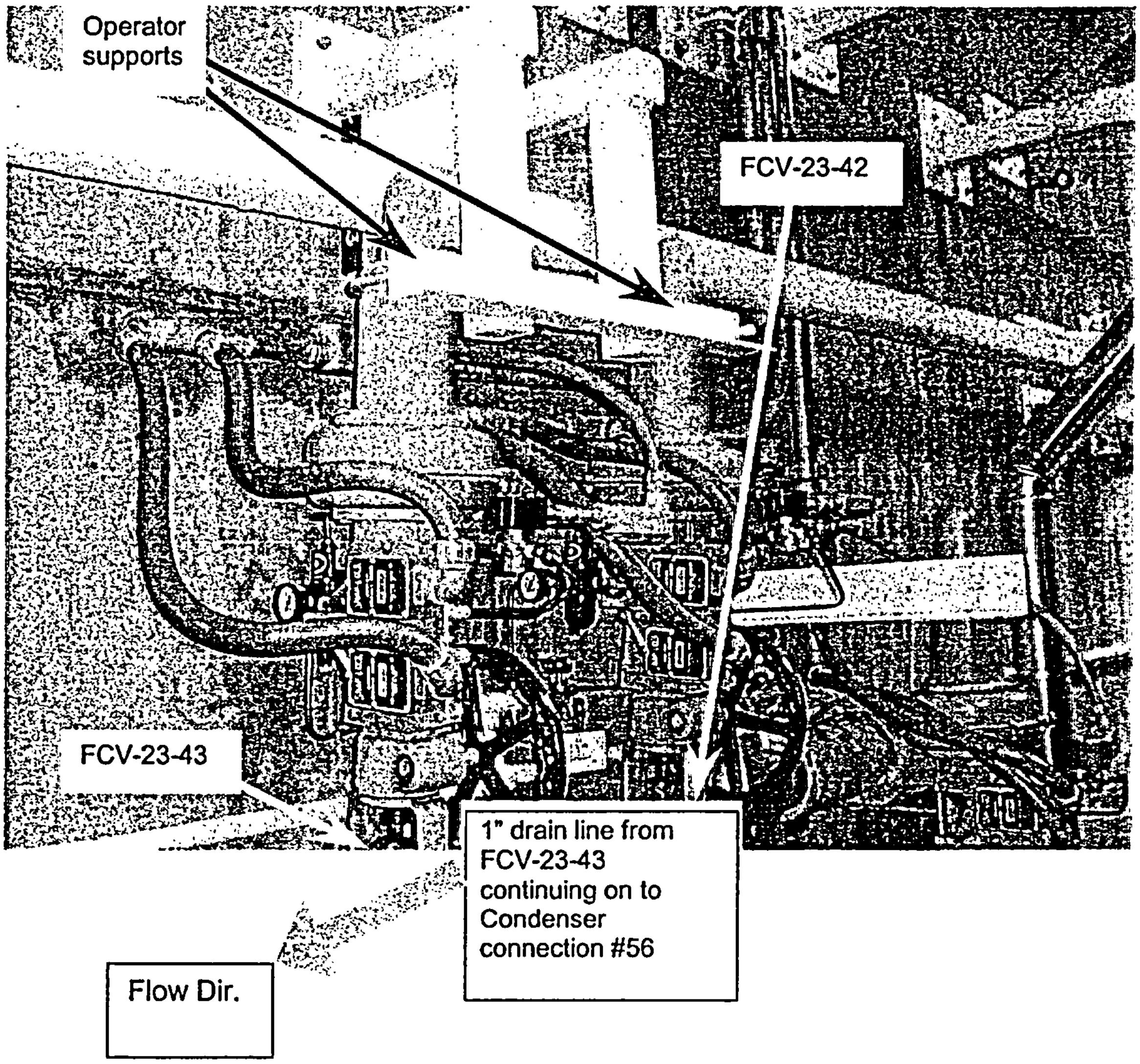
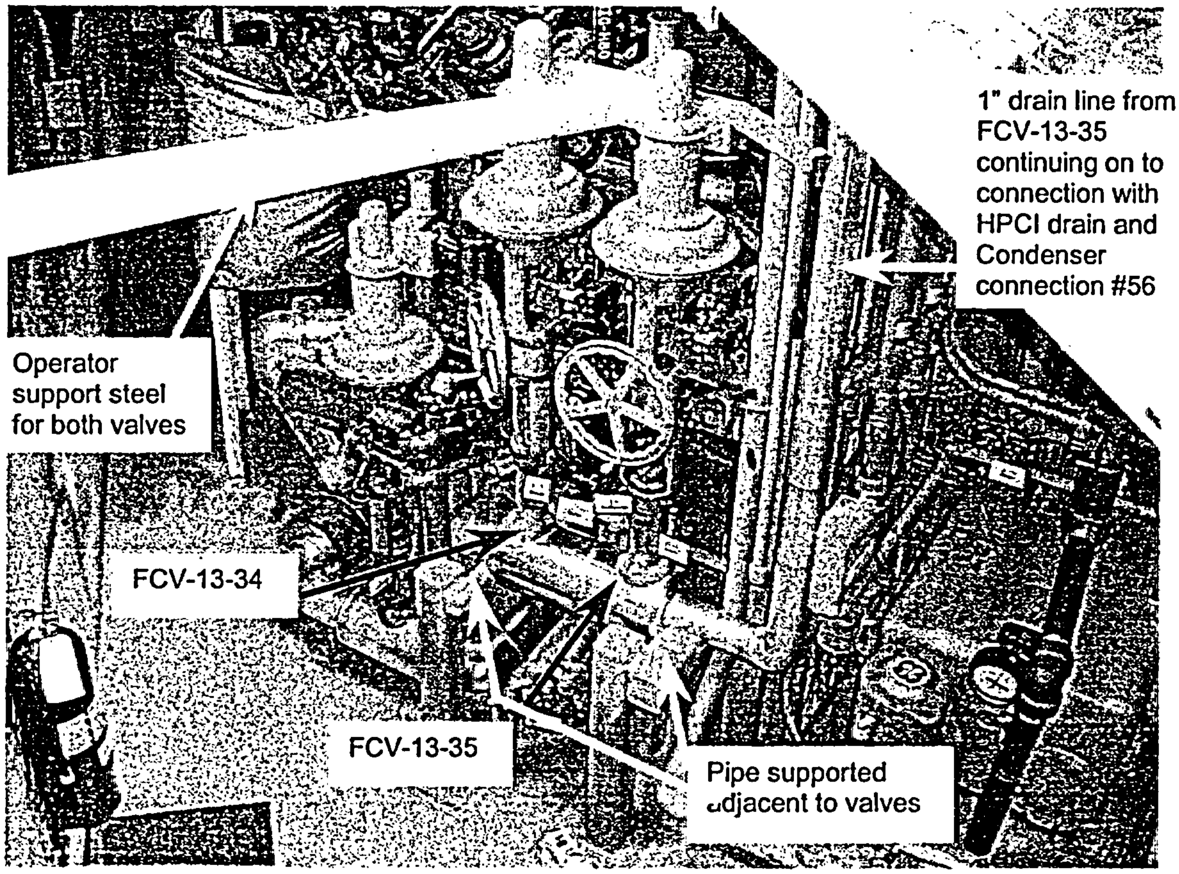


Figure C11-3

HPCI/RCIC – Operator Supports, Valves FCV-13-34 and -35



Attachment D

ALT Boundary Walkthrough by Vermont Yankee Personnel

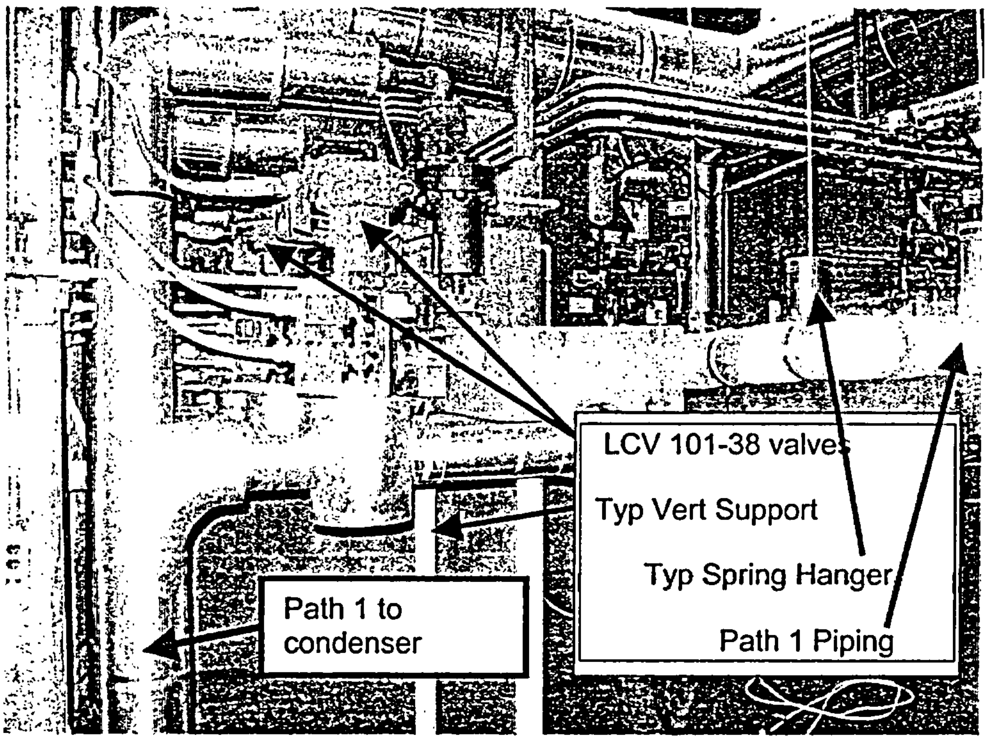
(11 pp including this page)

Photos of selected locations as follows:

Path 1	Figures D1-1 – D1-2
Path 2	Figure D2-1
Boundary 4	Figures D4-1 – D4-2
Boundary 6	Figures D6-1 – D6-2
Boundary 8	Figure D8-1
Boundary 9	Figure D9-1 – D9-2

Figure D1-1

Path 1 Piping Vicinity of LCV-101-38A through LCV-101-38D



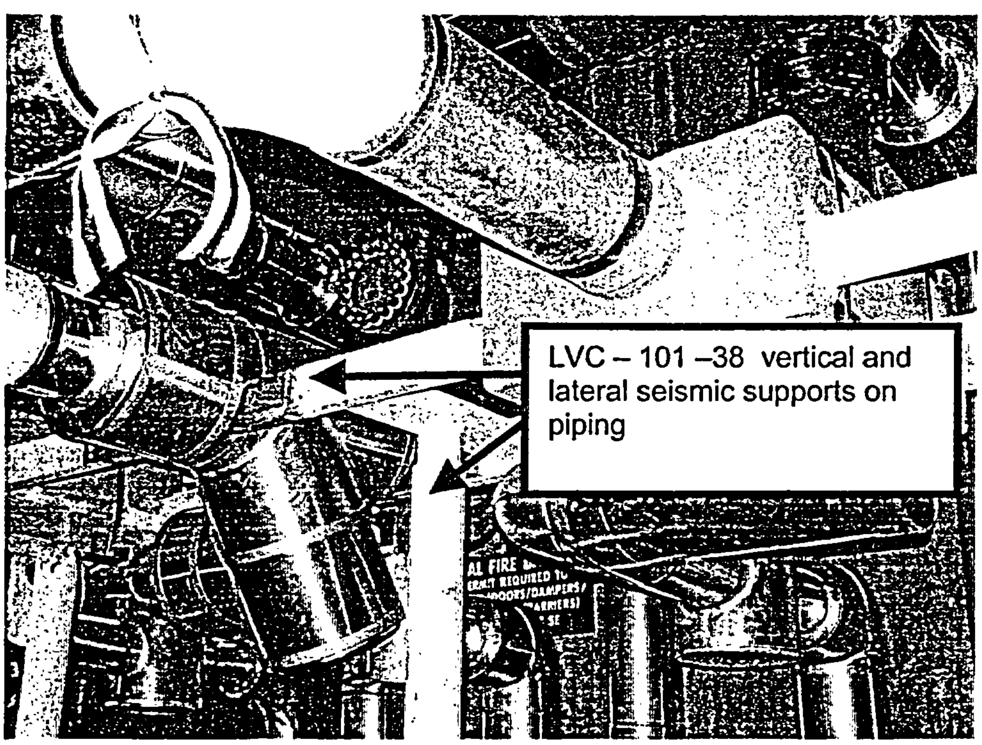
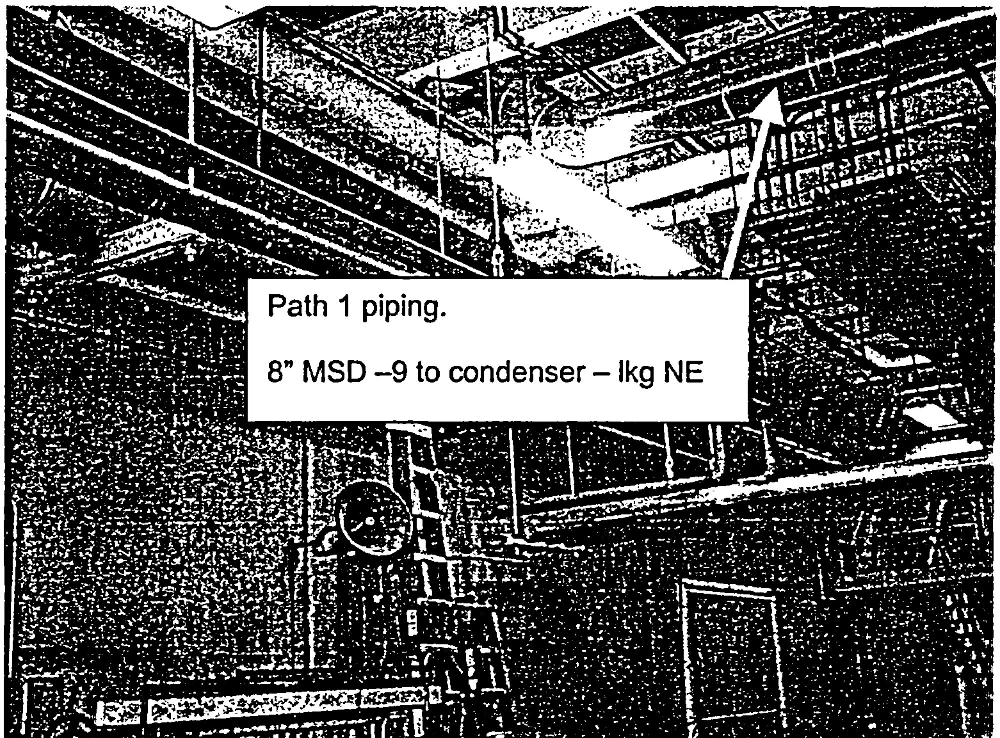


Figure D1-2:

Path 1 Piping to Condenser, Typical Rod Hung Arrangement



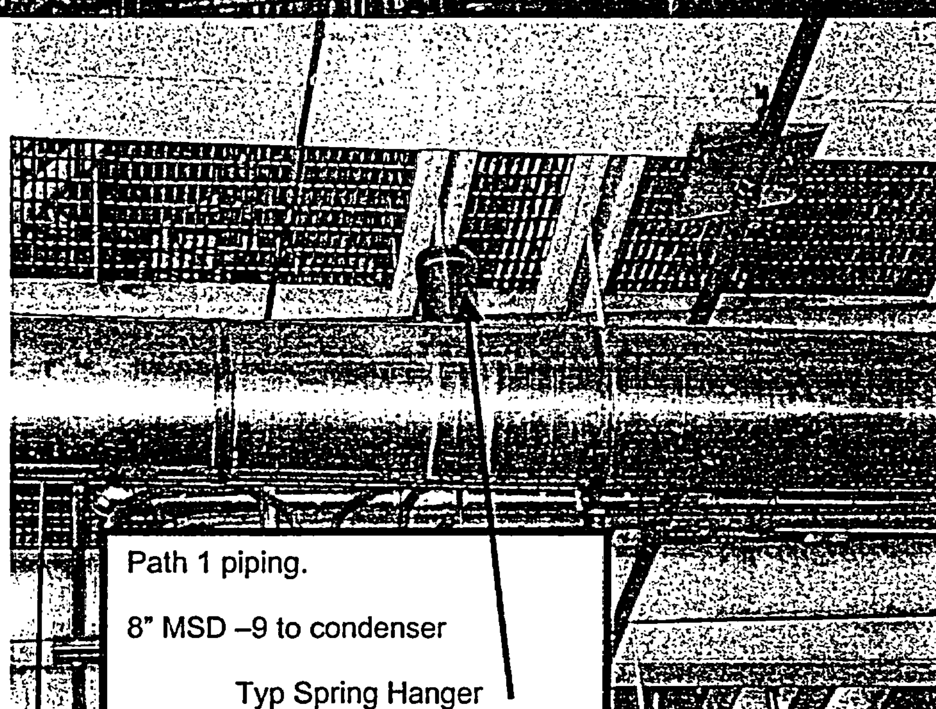


Figure D2-1:

Path 2 Piping adjacent to Condenser (Conn # 47), Tie in from AOG (3/4" piping near new check valve location)

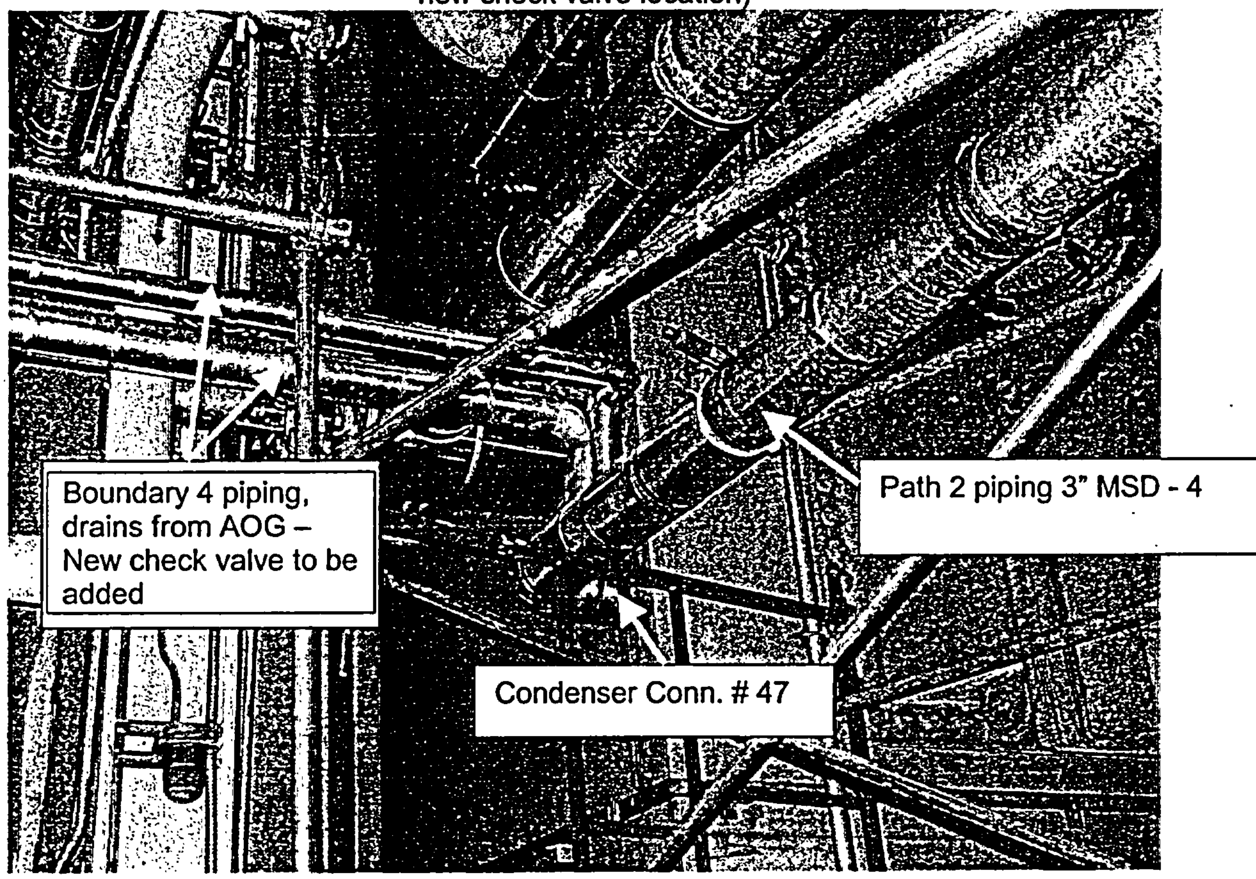
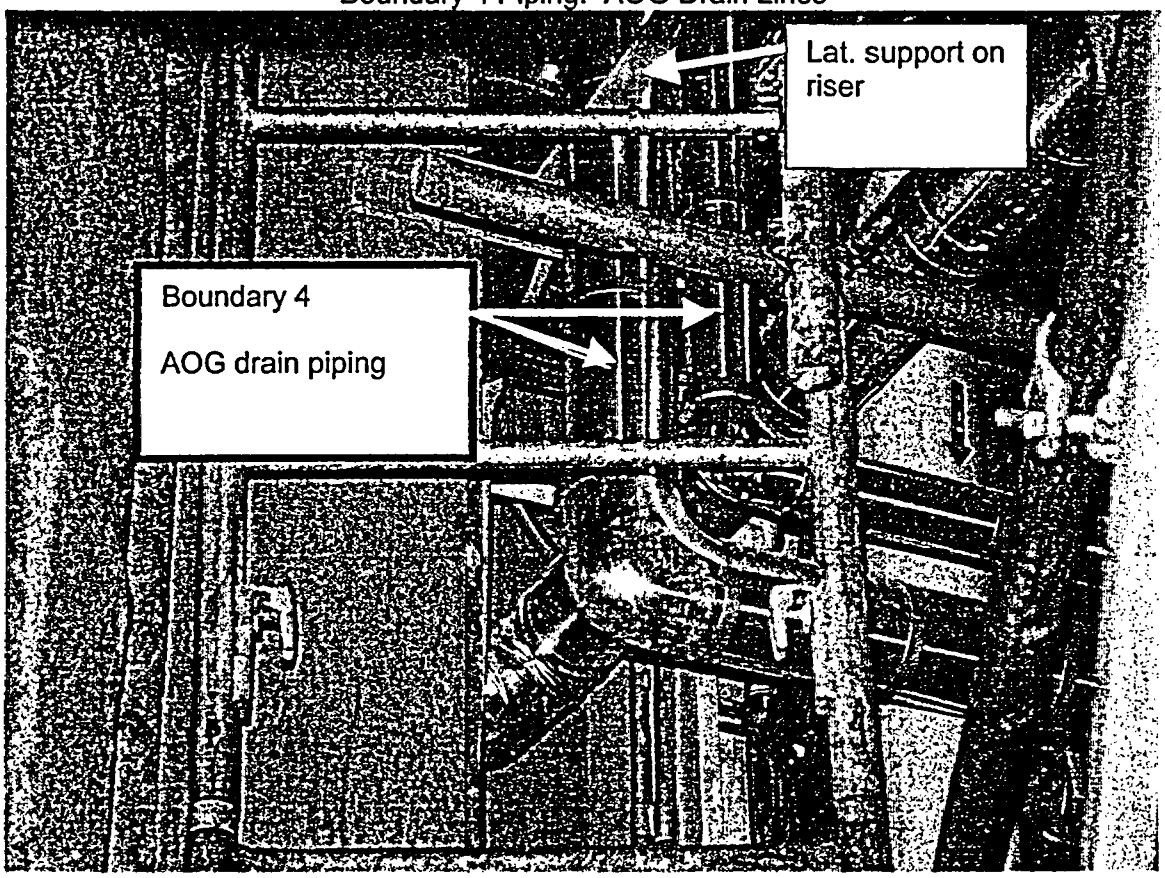


Figure D4-1:

Boundary 4 Piping: AOG Drain Lines



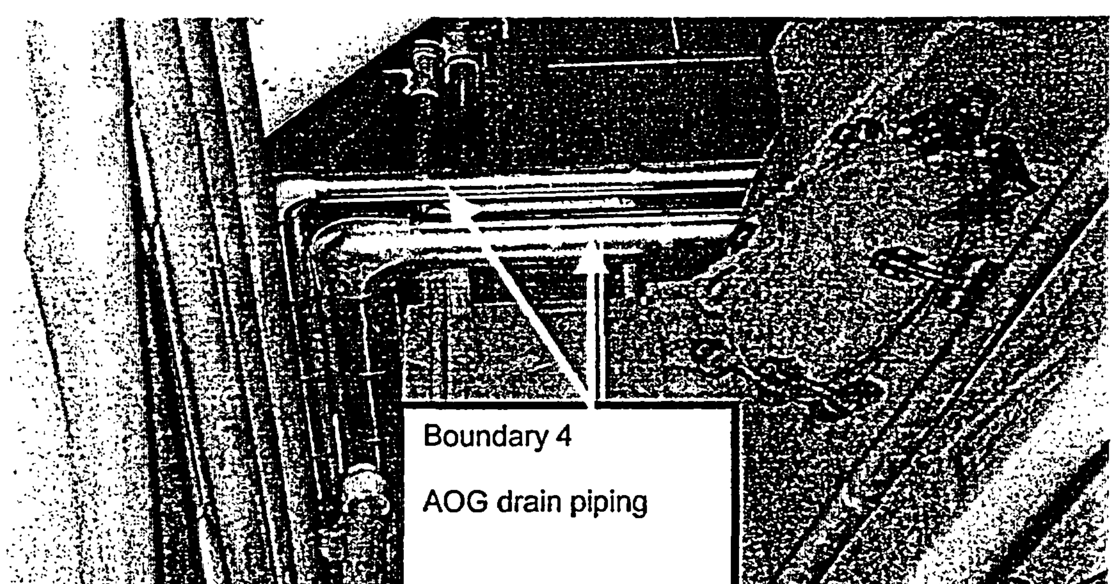


Figure D4-2:

Boundary 4 Piping: Attachment to Path 2 piping

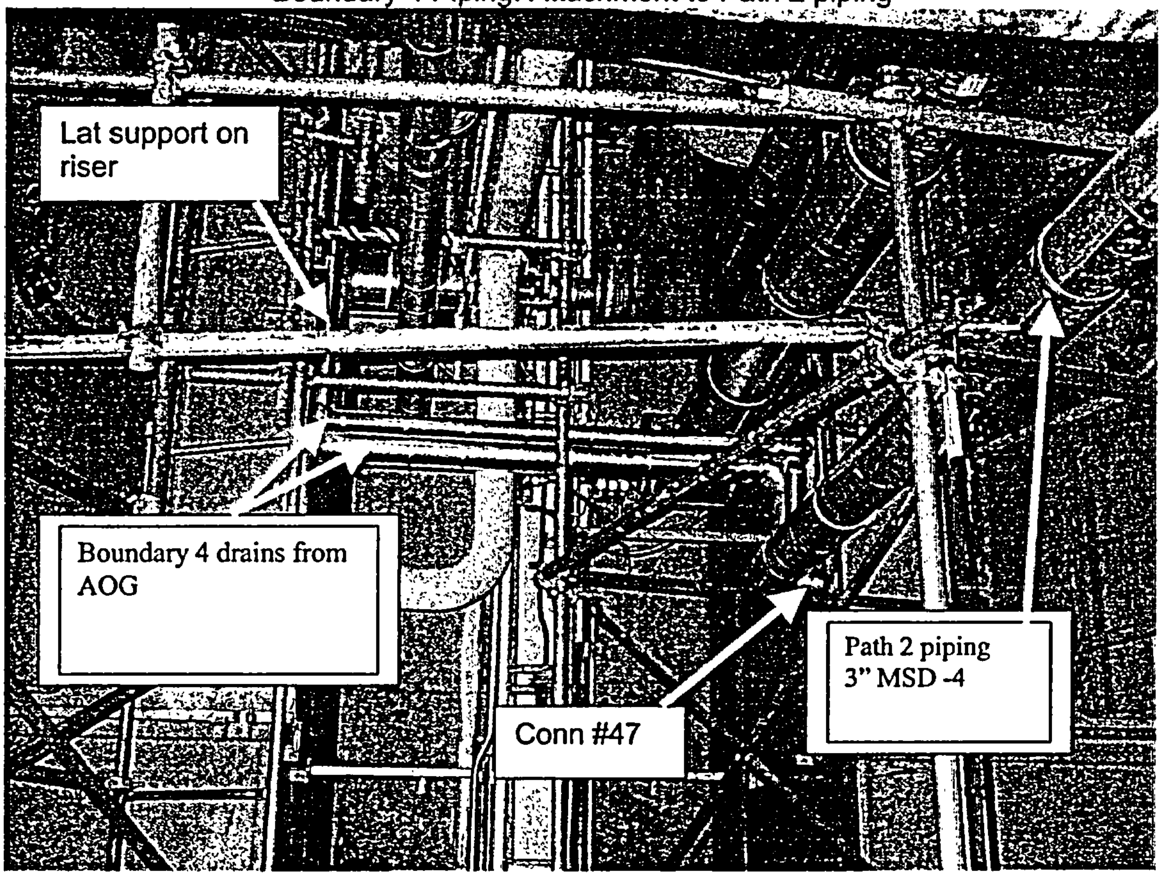


Figure D6-1:

Boundary 6 Piping: MOV 60-6

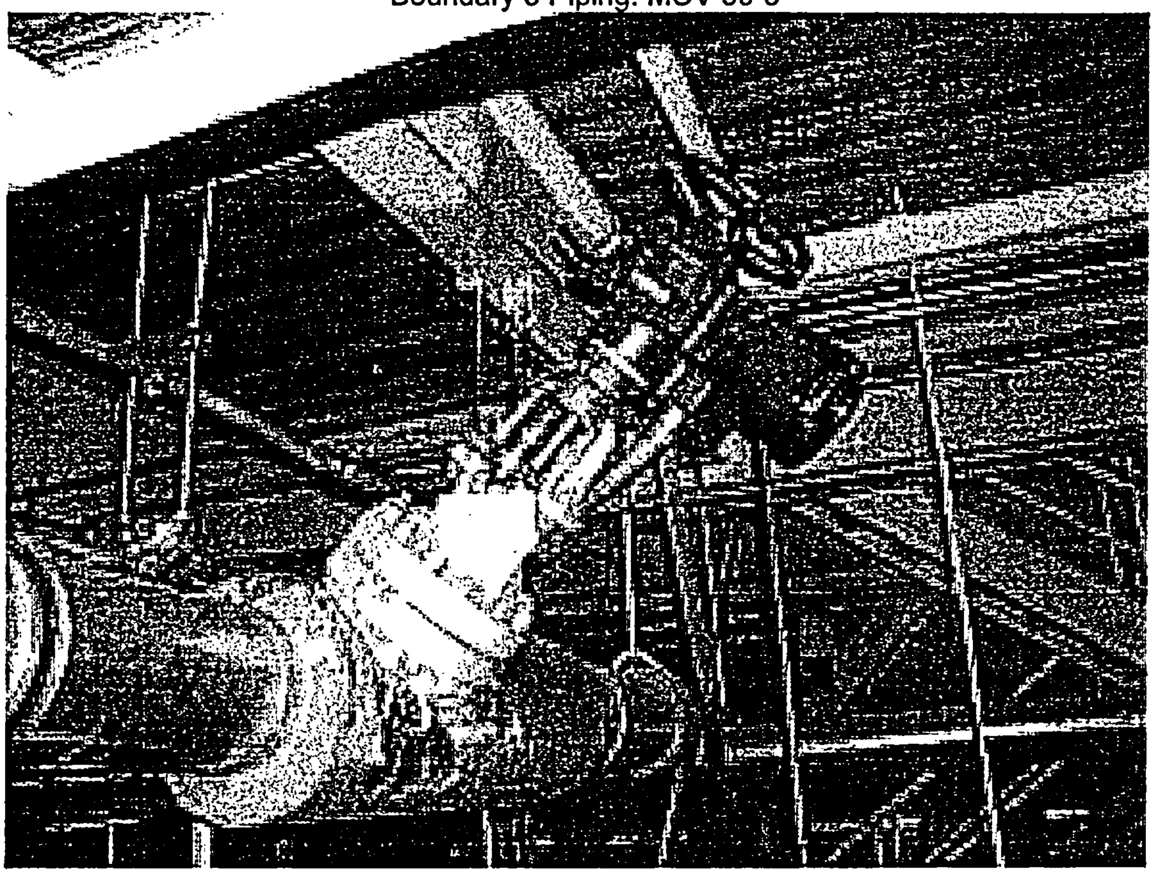


Figure D6-2:
Boundary 6 Piping: MOV 60-10

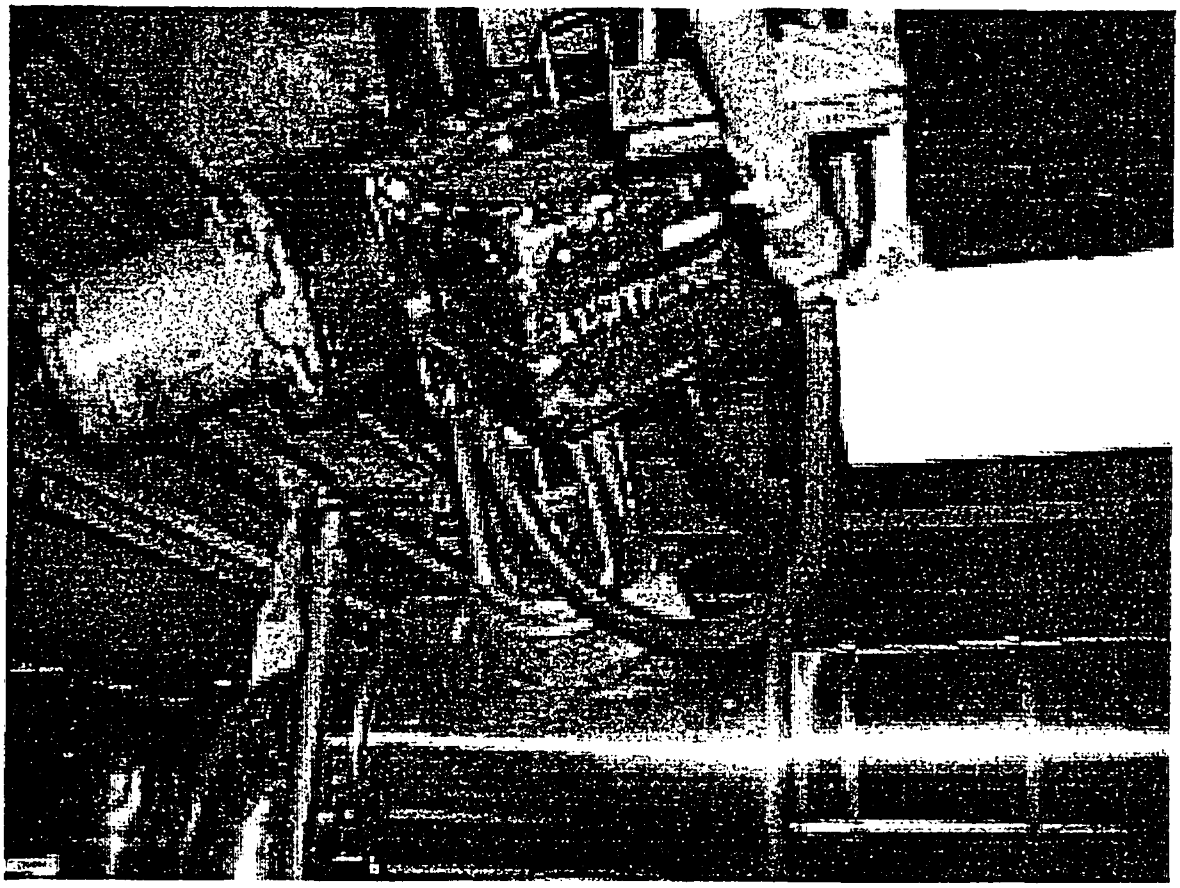


Figure D8-1
Boundary 8 Piping: Struts on Steam Chest

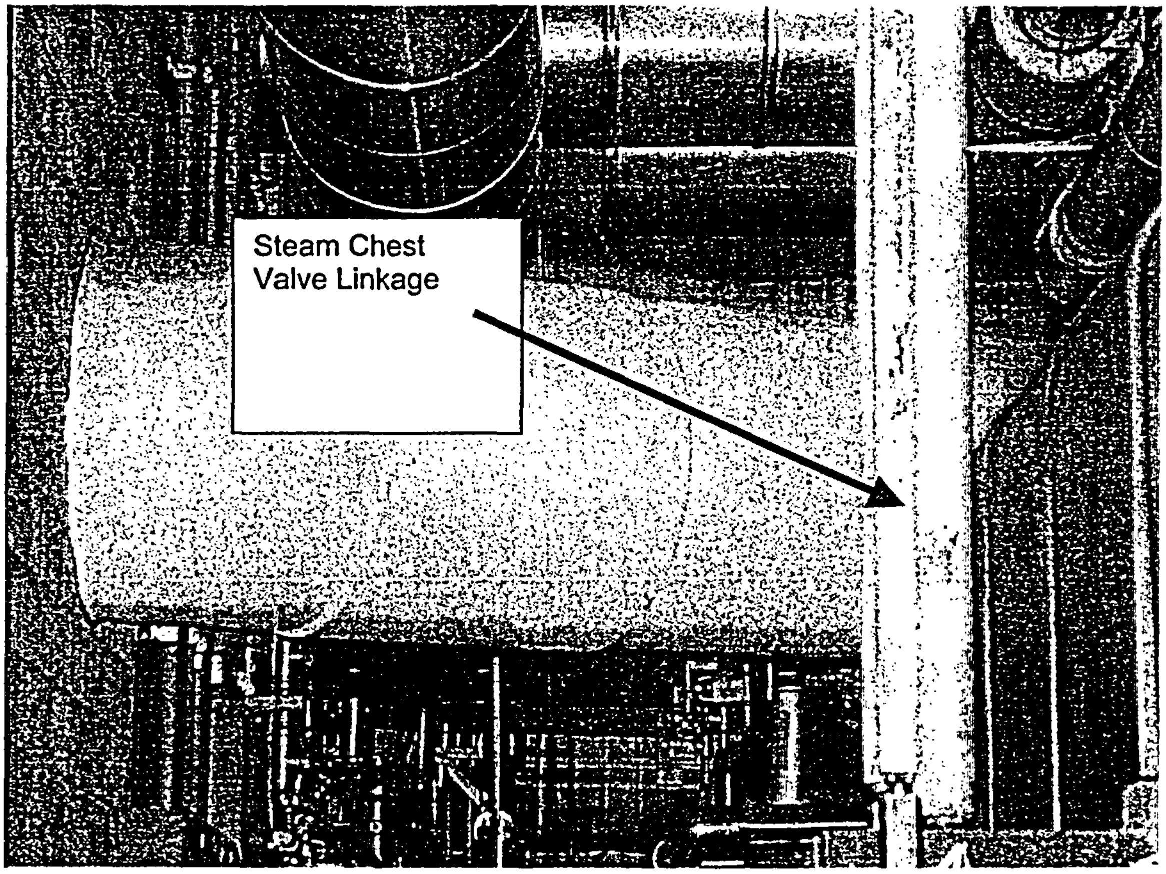


Figure D9-1
Boundary 9 Piping: MOV V60-2A

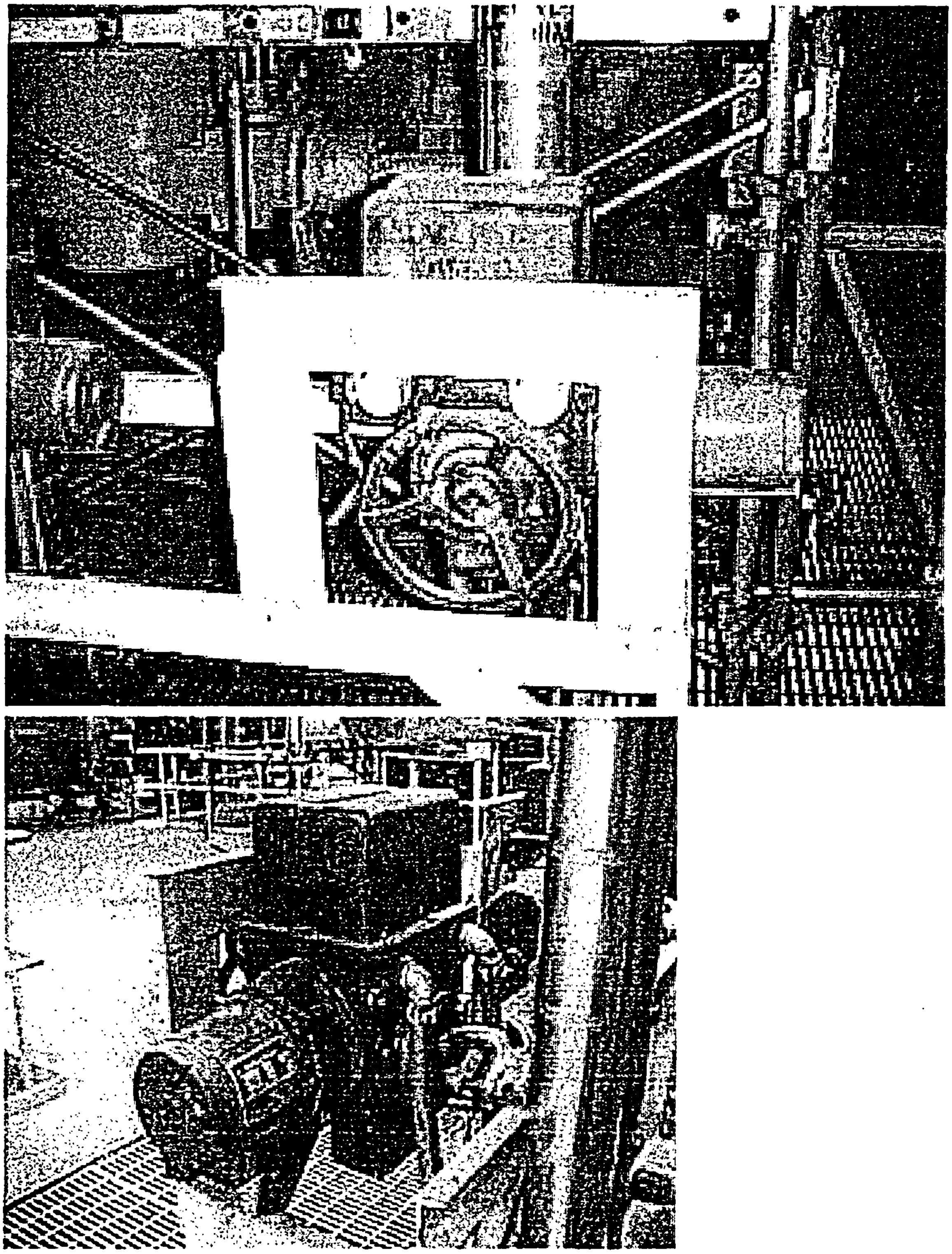
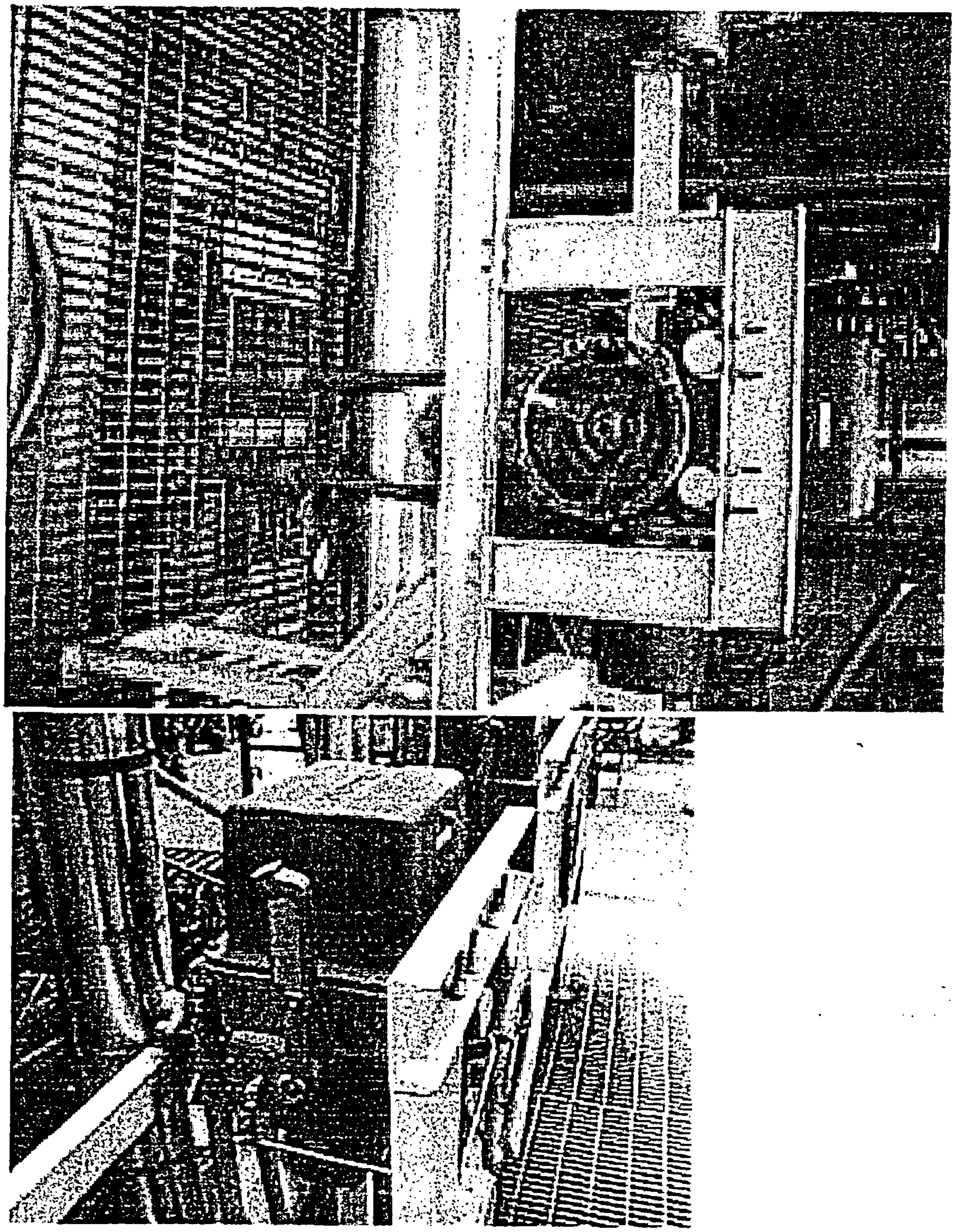


Figure D9-2
Boundary 9 Piping. MOV V60-2C



Attachment E

NQP-02 Exhibit 1 Review Guidelines

(2 pp including this page)

Design Review Checklist

Criterion	Design Attributes	Status (S, U, N/A)
1.	Were the inputs correctly selected and incorporated into design?	S
2.	Are assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent re-verifications when the detailed design activities are completed?	S
3.	Are the appropriate quality and quality assurance requirements specified?	N/A
4.	Are the applicable codes, standards and regulatory requirements including issue and addenda properly identified and are their requirements for design met?	S
5.	Have applicable construction and operating experience been considered?	N/A
6.	Have the design interface requirements been satisfied?	N/A
7.	Was an appropriate design method used?	S
8.	Is the output reasonable compared to inputs?	S
9.	Are the specified parts, equipment, and processes suitable for the required application?	N/A
10.	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?	N/A
11.	Have adequate maintenance features and requirements been specified?	N/A
12.	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?	N/A
13.	Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?	N/A
14.	Has the design properly considered radiation exposure to the public and plant personnel?	N/A
15.	Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?	S
16.	Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?	N/A
17.	Are adequate handling, storage, cleaning and shipping requirements specified?	N/A
18.	Are adequate identification requirements specified?	N/A
19.	Are requirements for record preparation review, approval, retention, etc., adequately specified?	N/A

Reviewed By: VLW   Date: 11-5-03

Docket No. 50-271
BVY 03-101

Attachment 2

Vermont Yankee Nuclear Power Station

Proposed Technical Specification Change No. 262

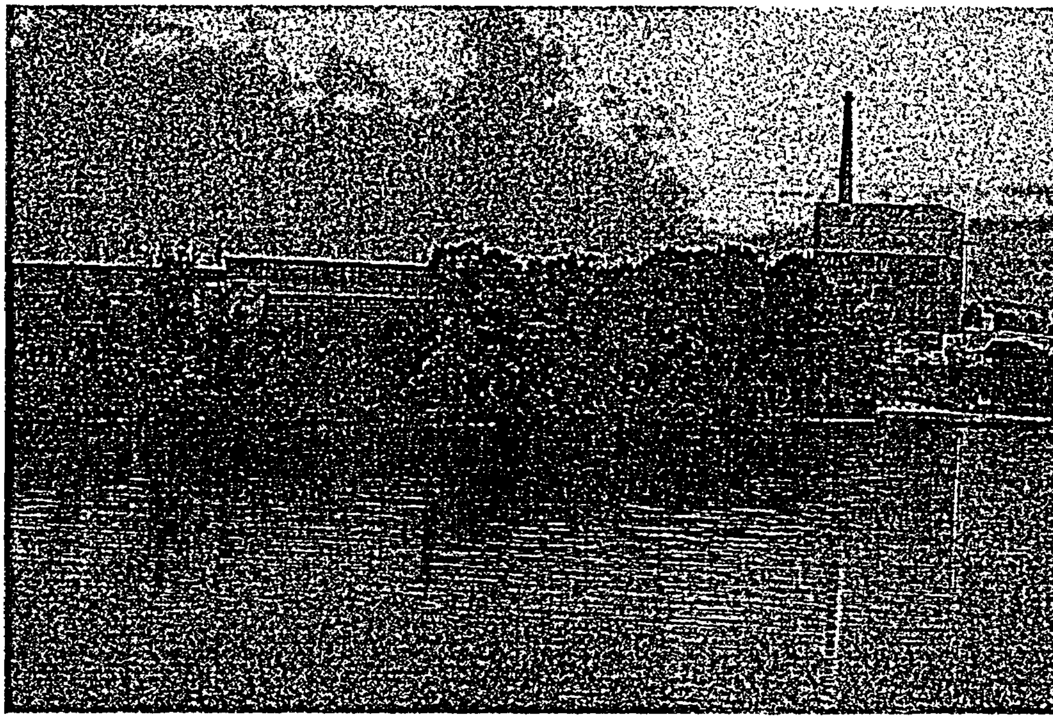
Supplement No. 2

Alternative Source Term – Seismic Verification Reports

ALT Pathways and Boundaries Walkdown Report

ABS Consulting
RISK CONSULTING DIVISION

Vermont Yankee Alternate Leakage Treatment Pathways and Boundaries Walkdown Report



Report No.:
1173875-R-002, Revision 0
July 29, 2003

Prepared by:
ABS Consulting
118 Portsmouth Ave,
Stratham, NH 03885

Prepared for:
Entergy Nuclear Vermont Yankee, LLC

EQE INTERNATIONAL

Table Of Revisions

Revision No.	Description of Revision	Date
0	Original Issue. Documents accessible area walkdown performed in June of 2003	29-JULY-2003

Approval Cover Sheet

TITLE: Vermont Yankee Alternate Leakage Treatment Pathways and Boundaries Walkdown Report

REPORT NUMBER: 1173875-R-002

CLIENT: Entergy Nuclear Vermont Yankee

PROJECT NO.: 1173875

REVISION RECORD				
REV. NO.	DATE	PREPARED	REVIEWED	APPROVED
0	7/29/2003	Paul Bruck	James White	Paul Baughman

Summary

Regulatory Guide 1.183 Appendix A provides assumptions, acceptable to the NRC, for evaluation of the radiological consequences of loss-of-coolant accidents using Alternative Radiological Source Terms (ASTs). For boiling water reactor (BWR) main steam isolation valve (MSIV) leakage, the regulatory guide allows credit for a reduction in MSIV releases due to holdup and retention in main steam piping downstream of the MSIVs and in the main condenser. Such credit is based in part on the piping and components in the alternate leakage treatment (ALT) release path, and those structures and equipment making up the ALT boundaries, being capable of performing their safety functions during and after a safe shutdown earthquake.

This report describes the work performed for supplemental plant specific seismic verification of the ALT pathways and boundaries piping and associated system components by walkdown. The work performed was in accordance with the recommendations of the General Electric BWR Owners Group Report, Reference 1, and the associated NRC Safety Evaluation Report, Reference 24.

This report addresses all piping within the ALT boundary scope accessible during normal power operation. A walkdown of the remainder of the scope (i.e., the inaccessible piping) will be performed during Re-Fuel Outage No. 24 (RFO-24).

Contents

Figures and Tables:

Attachments

No.	Description	Title	No of Pages
1	Path 1	Walkdown Information	10
2	Path 2	Walkdown Information	14
3	Path 3	Walkdown Information	10
4	Boundary 4	Walkdown Information	15
5	Boundary 5	Walkdown Information	12
6	Boundary 6	Walkdown Information	5
7	Boundary 7	Walkdown Information	16
8	Boundary 8	Walkdown Information	4
9	Boundary 9	Walkdown Information	8
10	Boundary 10	Walkdown Information	2
11	Boundary 11	Walkdown Information	19
A	1173875-P-002, Revision 0	Walkdown Procedure	42

Total No of Sheets, Report (Body Plus Attachments): 190

1. Introduction

This report describes the work performed in support of the Vermont Yankee (VY) alternate leakage treatment (ALT) leakage paths and boundaries seismic verification. The work is performed in accordance with recommendations of the General Electric BWR Owners Group (BWROG) for increasing MSIV leakage rate limits and eliminating leakage control systems (Reference 1), and also the NRC Safety Evaluation Report (Reference 24). Efforts include confirmation of the extent of the ALT leakage paths and boundaries; review and assessment of the seismic capability of the Turbine Building; evaluation of the condenser and condenser anchorage; seismic assessment of the stop valves and supports; and evaluation of piping, components and supports within the defined ALT boundaries via walkdown and supplemental quantitative assessments (walkdown verification). This report documents the results of the VY plant-specific walkdown verification.

The objective of the supplemental plant-specific walkdown verification is to identify specific design conditions that might be associated with poor piping and/or component seismic performance. These potential poor seismic performance design conditions are identified as outliers. Walkdowns are focused toward identification of the following potential vulnerabilities:

- Piping, pipe support and equipment seismic vulnerabilities, such as excessive span, heavy unsupported components, non-ductile piping or support material, high localized stresses, severe corrosion, and anchorage
- Seismic interaction caused by failure and falling (II/I) or by displacement and proximity impact
- Differential displacement and anchor displacement of structures, equipment and piping
- Performance of seismic verification boundary components
- Valve attributes

The scope of the efforts is described in Section 2. Items identified as outliers during the Vermont Yankee (VY) walkdown are outlined within this report.

Outlier configurations are subject to detailed qualitative and quantitative assessment and, where required, modifications to resolve poor seismic performance configurations.

2. Scope

In general terms, the scope of the seismic verification effort is the ALT seismic boundary and includes the main condenser, main steam lines and all piping and tubing located off the main steam lines between the Main Steam Isolation Valves (MSIVs) and the turbine stop valves that could convey leakage past the outboard MSIVs to the isolated condenser.

2.1 Seismic Verification Walkdown Boundary

Entergy Nuclear Vermont Yankee (ENVY) in Technical Evaluation No. 2003-012 (Reference 2) describes the seismic verification boundary. Several leakage paths and isolation boundary lines are defined and for organization, are placed into nine (9) groups described as either a Path or Boundary line. Additionally, the main steam lines to the stop valves will be reviewed (Boundary 10) and also HPCI/RCIC steam supply system drain piping was verified as part of this effort (Boundary 11). A mark-up of the simplified flow diagram showing the initial nine groupings are shown in Figure 2-1 based on the applicable VY P&ID's (Reference 7). The walkdown scope items are listed in Table 2-1. A summary of the piping pathways and boundaries, together with applicable P&IDs are outlined within Table 2-2.

2.2 Seismic Adequacy Walkdown Scope

The seismic verification walkdown scope includes consideration of design conditions that in past earthquake experience has been associated with piping damage and could contribute to pressure boundary failure and inventory release. These conditions include support failure, falling of non-seismically designed plant features (II/I), proximity impact, and differential seismic anchor motion of structures, piping or equipment. The scope and extent of these conditions are as specified in Reference 1 and are described in more detail in Sections 3 and 4 of this report.

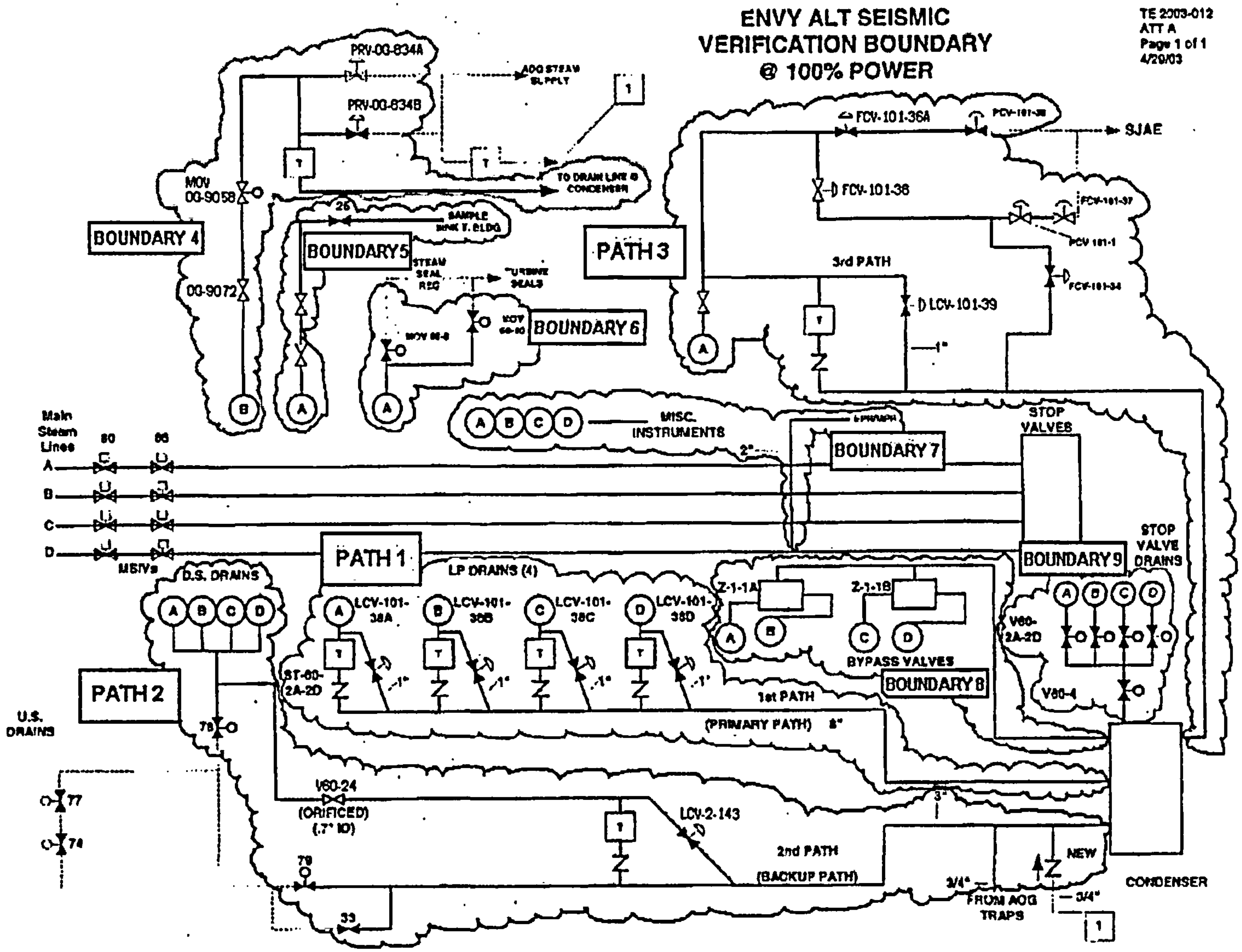


Figure 2-1: ALT Seismic Verification Scope

Table 2-1: Seismic Verification Walkdown Boundary

ID #	Type	Description
1	Path	MS Low Point (LP) drains to condenser (Primary path)
2	Path	MS Low Point Drains downstream of MSIVs to condenser (Backup path)
3	Path	Steam Jet Air Ejector (SJAE) supply line low point drain (Alternate path)
4	Boundary	Augmented Off Gas (AOG) steam supply (Boundary)
5	Boundary	Main Steam sample lines (Boundary)
6	Boundary	Turbine steam seal system (Boundary)
7	Boundary	Steam to EPR, MPR and miscellaneous instruments, misc vents/attachments (Boundary)
8	Boundary	Steam to turbine bypass valves (Boundary)
9	Boundary	Stop valves' drains (Boundary)
10	Boundary	MS Piping (Boundary)
11	Boundary	HPCI/RCIC Steam Supply Drains
12	Boundary	Main Condenser

Table 2-2: ALT Seismic Boundary (Piping) Description										
Line Path or Bound.	Description	General Pipe Size	Start Point	Required End Point	Active or Passive	Active Component	Active Component Description	Required Active Function	Walkdown End Boundary	Notes
1 - P	LP Drains	1", 1.5" 2", 2.5", 6", 8"	MS Lines A - D	Condenser Connection # 67	Active	LCV-101-38 A, B, C, D	1" AOV	Open	Condenser (Conn #67)	Primary Path – G191156 [7.1]
2 - P	MS LP Drains	1", 1.5", 2", 2.5", 3"	MS Lines A – D	Condenser Connection # 47	Active	LCV-2-143	1" AOV	Open	Condenser (Conn #47)	Alternate Path, Orifice Line G191167, G-191156 [7.1, 7.4]
3 - P	SJAE Supply Line Drains	1", 2", 2.5", 3"	MS Line A	Condenser Connection # 68	Active	LCV-101-39 FCV-101-37 PCV-101-35	1" AOV 3" AOV 2" AOV	Open Close	Condenser (Conn #68)	Backup Path G191156 [7.1]
4 - B	AOG Steam Supply	0.75", 2", 2.5"	MS Line B	Condenser Connection # 47 - @ 3"-MSD-4	Active	PRV-OG-834A PRV-OG-834B	1" AOV	Close	Condenser (Conn #47)	Check valve to be added to isolate path G191156 [7.1] A217 [7.3]
5 - B	MS Sample Lines	0.5", 0.75"	MS Line A - D	Sample Sink & misc end instruments	Passive	—	—	—	Sample Sink & misc end instruments	Boundary Line G191156 [7.1]

Table 2-2: ALT Seismic Boundary (Piping) Description										
Line Path or Bound.	Description	General Pipe Size	Start Point	Required End Point	Active or Passive	Active Component	Active Component Description	Required Active Function	Walkdown End Boundary	Notes
6 - B	Turbine Steam Seal System	3", 5"	MS Line A	MOV-60-6 MOV-60-10	Passive	—	—	—	Sufficient system support beyond isolation valves	Boundary Line G191156 [7.1]
7 - B	EPR/MPR Misc. Instruments	0.75", 1", 2"	MS Lines A – D	Various Instruments	Passive	—	—	—	Instruments at end of system	Boundary Line G191156 [7.1]
8 - B	Steam to Turbine Bypass Valves	16", 10"	MSIVs	Condenser Connection # 41	Active	Bypass Valves Z1-1A Z1-1B	Piston Valves	Close	Condenser (Conn #41)	Boundary Line G191156 [7.1]
9 - B	Stop Valve Drains	1", 2½"	MS Lines A – D	Condenser Connection # 33	Passive	—	—	—	Condenser (Conn #33)	Boundary Line G191156 [7.1]

Table 2-2: ALT Seismic Boundary (Piping) Description										
Line Path or Bound.	Description	General Pipe Size	Start Point	Required End Point	Active or Passive	Active Component	Active Component Description	Required Active Function	Walkdown End Boundary	Notes
10 - B MS Pipe - B	MS Piping	18"	MS Lines A – D	MS Stop Valves	Active	Stop Valves V60-3 A-D	Piston Valves	Close	Stop Valves	Boundary Line G191156 [7.1]
11 - B HPCI RCIC Drain - B	RCIC/HPCI Drains	1", 2"	3" MS-3B, 10" MS - 4B	Condenser Connection # 56	Passive	--	--	--	Condenser (Conn #56)	Boundary Line G191174 [7.5], G191169 [7.6]

3. Seismic Verification Walkdown

3.1 Methodology

Very few components of nuclear plant systems are unique to nuclear facilities. Nuclear plant systems include electrical panels and switchgear, air compressors, tanks, piping, conduit, and many other items that are common components of conventional power plants and industrial facilities. The seismic experience database was developed to address the problem of seismic qualification for equipment that was purchased as common "off the shelf" items or for commodities that require an upgrade in seismic classification. By reviewing the performance of facilities that contain equipment similar to that found in nuclear plants, conclusions can be drawn about the performance of nuclear plant equipment during and after a design basis earthquake. Typical sources of seismic damage for different classes of equipment and piping have been obtained and are explained in detail in References 4 and 5.

Visual and design document review examination of piping systems are to be performed to assess valve and other component vulnerabilities and potential for pipe failure. Seismic inertial effects in welded steel piping systems are not considered to be primary failure initiators. Inadequate piping system flexibility and excessive relative support deflections are the more likely contributors to seismically induced failures than dynamic shaking effects for welded steel pipe. Impact of valve operators on adjacent structures or equipment is the only credible valve failure mode of concern for seismic loads. Items to be observed in the walkdown are:

- Preferably, the piping systems should not be fabricated with threaded or Victaulic or other mechanical friction-type of connections. These details produce a non-ductile system that is sensitive to inertia loads and certain support configurations for strong motion earthquakes. When observed, these details need to receive special attention.

- The use of cast iron pipe is a potential problem since it does not have the strength or ductility of steel, and usually has low capacity connections.

- Branch lines out to their first support could be a potential concern if they do not have adequate flexibility. The necessary flexibility can come from either the supports or the pipe routing. Short, straight branch lines that are connected to relatively rigid anchor points are candidates for failure if the major run pipe is not restrained from motion close to the branch.

- The connection of pipe into vessels, heat exchangers, and other equipment anchor points could be of concern if the details used could transmit excessive loads to the nozzles. This situation could result from flexibility in the equipment support with the pipe system being rigidly supported near the equipment.

- Long unsupported runs of pipe adjacent to the equipment, particularly if heavy in-line components are mounted near the equipment.

- Pipe support failure near the equipment. Any indication of potential weak links in these supports should be noted for further evaluation.

- Proximity of valve operators to structures, components, or other subsystems should be examined. The principal concern for active valves is that the operator support may be bent so that the valve will not change position on demand. For active and passive valves, an additional concern is fracture of the top works that could breach the pressure boundary.

- Multiple failures of threaded rod supports (unzipping) on non-seismic piping could, in instances of long runs of pipe, potentially result in piping failure and subsequent flooding problems.

- The use of vibration or shock isolation systems on equipment to which piping attaches could adversely affect the seismic performance of the piping system if the pipe segments to the first support on either side of this component are not flexible enough to accommodate the equipment motion.

- The piping details across seismic gaps or between two buildings should be reviewed. Insufficient flexibilities in the routing detail could affect the pipe integrity for seismic differential building motions.

The increased pipe seismic responses may produce seismic interaction concerns. The following conditions should be reviewed during the walkdowns:

- Supports should be reviewed to insure they can accommodate motions in directions other than the primary load path. This concern is applicable to the clevis ends of struts and snubbers, and is not a concern unless there exist follow-on consequences, such as seismic missiles or seismic interaction.

- Relatively flexible piping spans should be reviewed for potential seismic interaction ramifications.

- Supports that only restrain dead weight loads and do not restrict the pipe from sliding off should be evaluated.

3.2 Walkdown

Plant walkdown of all accessible piping of the VY ALT pathways and boundaries scope, as defined in Section 2 of this report was performed in June 2003. The walkdown was performed in accordance with the procedural requirements outlined within Reference 3. The Seismic Review Team (SRT) comprised of James White and Paul Bruck of ABS Consulting. Both members of the VY ALT Pathways and Boundaries SRT are degreed engineers, with both individuals having in excess of twenty years of experience in structural engineering and/or earthquake engineering application, with extensive experience in commercial nuclear power plant facilities. Both members of the ABS

Consulting team are familiar with the earthquake experience methodology and have previously performed seismic verification of components using the earthquake experience approach. One member of the team has participated in numerous MSIV walkdown at other BWR facilities.

ABS Consulting (formerly EQE International) SRT's have performed complete ALT Pathways and Boundaries Seismic Verification Walkdowns in accordance with the recommendations of the GE NEDC-31858P-A recommendations (Reference 1) at a number of other nuclear facilities, both within the US and overseas.

Entergy Nuclear Vermont Yankee's Mr. James Fitzpatrick, who also participated in the walkdown, provided plant specific guidance, systems expertise and technical support.

Additionally, Vermont Yankee personnel previously performed a walkthrough[1] of the presently inaccessible areas of the majority of the ALT boundary, during a reactor power-down in May of 2003. Results of this walkthrough are also described in Section 4. This piping will be verified in accordance with the Reference 3 procedures during RFO-24.

3.3 Documentation

The field walkdown review utilized existing plant documentation as available including:

- System P&IDs identifying piping and equipment within the seismic verification review boundaries
- Piping isometric drawings
- Piping support drawings and piping layout drawings, as necessary
- Valve and equipment drawings and anchorage details/standards.

The walkdown review of piping and supports was primarily visual for qualitative attributes.

[1] The term "walkthrough" is used to differentiate from a walkdown performed in accordance with procedural requirements of Reference 3. For a walkthrough, general visual observations only are noted.

4. Walkdown Results and Open Items

The Seismic Review Team (SRT) in accordance with the guidelines of the walkdown procedure (Reference 3) performed a walkdown on the areas presently accessible during normal plant operation. Conditions that do not conform to walkdown screening guidelines or that are judged by the SRT to require further evaluation are documented as "outliers". Each outlier is assigned a unique identification number that is based on the portion of the path or boundary system line identifier reviewed along with a sequential suffix (e.g., path 1, outlier 1 would have a suffix 1-1). System description, outlier description, a designation as to which general walkdown criterion is involved and recommended action(s) are indicated.

A walkdown of all accessible portions of the system was performed the week of 6/16/2003 and results are described below. Remaining portions of the ALT Pathways and Boundaries seismic verification scope will be included in walkdowns to occur during RFO-24.

Vermont Yankee personnel previously performed a walkthrough of the presently inaccessible areas of the majority of the ALT boundary, during a reactor power-down in May of 2003. Results of this walkthrough are also described below. This piping and associated equipment will be verified in accordance with the Reference 3 procedures during RFO-24. The status of items relative to field walkdown is as shown in Table 4-1.

Walkdown outliers are summarized in Table 4-2. From the walkdown performed of the accessible areas of the piping, predominantly within the Reactor Building and a small portion of the Turbine Building, a limited number of outlier items were identified at this time.

For the walkdown performed, a number of occurrences of potentially non-damaging seismic interactions were noted. These conditions included proximity to architectural features, such as handrails, HVAC ducts and comparable sizes pipes or rod hanger supports. These types of conditions were evaluated by the SRT and, where judged to be non-damaging to components of the verification pathways and boundaries, are documented in the walkdown notes. Documentation from the field walkdown was prepared in accordance with Reference 3 requirements. The details of the walkdowns for the presently accessible paths and boundary piping lines are contained within the Attachments to this calculation, numbered in accordance with the identified path or boundary number outlined in Table 2-1. (i.e. Path2 information is contained within Attachment 2).

4.1 Outlier Open Items

The following outlier open items remain from the initial walkdown:

4.1.1 SJAE Supply Line Low Point Drains

Outlier No. 3-1: This path piping and associated equipment has not, at this time been walked down. Valves PCV-101-35 and FCV-101-37, based on screening review and drawings, are identified as a possible outlier due to operator offset length exceeding GIP screening recommendations. The actual configuration of these AOVs will be determined during RFO-24 walkdown. Based on this data, these AOVs will be evaluated at that time.

4.1.2 Turbine Bypass Valve Chests

Outlier No. 8-1: The Turbine Bypass Valve Chests are associated with Boundary 8 piping. These valves are considered as outliers, based on their design as represented in plant drawings. As such these components were evaluated within a separate assessment, Reference 18. These components have not presently been walked down, due to their normally inaccessible location in the plant, during normal plant operation. The components were found to be acceptable; Reference 18, pending walkdown to verify/validate specific inputs to the calculation. These components will be walked down during RFO-24.

4.1.3 Turbine Stop and Main Steam Stop and Control Valves

Outlier No. 10-1: The Turbine Stop and Main Steam Stop and Control Valves are associated with Boundary 10 piping. These valves are considered as outliers, based on their design as represented in plant drawings. As such these components were evaluated within a separate assessment, Reference 19. These components have not presently been walked down, due to their normally inaccessible location in the plant, during normal plant operation. The components were found to be acceptable, Reference 19, pending walkdown to verify/validate specific inputs to the calculation. These components will be walked down during RFO-24.

4.1.4 HPCI/RCIC Steam Supply Drains in Torus:

Outlier No. 11-1: The piping spans in the HPCI room of the Reactor Building were noted to have piping spans marginally in-excess of B31.1 recommended spans. The SRT judged the identified spans as acceptable, based on piping stress analysis performed on this piping (Reference 17), use of vertical/lateral guides in the region of these spans and the absence of concentrated weights. This outlier is considered to be satisfactorily addressed, (Refer also to walkdown notes within Attachment 11).

Outlier No. 11-2: A portion of the HPCI/RCIC Steam Supply Drains located within the Torus area was inaccessible during the field walkdown performed in June 2003. As such the spans along this length are unknown, and require to be confirmed.

4.1.5 Condenser

Outlier No. 12-1: The Condenser is considered as Boundary ID number 12. This component is considered an outlier, based on the component design as represented in plant drawings. As such the condenser was evaluated within a separate assessment, Reference 23. The condenser was found to be acceptable, Reference 23. The component will be walked down during RFO-24, to confirm this conclusion.

Table 4-1: Status of ALT Pathways & Boundaries Walkdown

Item	Type	Description	Location	Status
1	Path	MS Low Point (LP) drains to condenser (Primary Path)	Turbine Building	RFO-24
2	Path	MS Low Point Drains downstream of MSIVs to condenser (Alternate Path)	Portion in Reactor Building (Main Steam Tunnel & Torus area) and Turbine Building	Accessible area walkdown performed June 2003, remainder RFO-24
3	Path	Steam Jet Air Ejector (SJAE) supply line low point drain (Backup Path)	Turbine Building	RFO-24
4	Boundary	AOG steam supply	Turbine Building	RFO-24
5	Boundary	Main Steam sample lines	Turbine Building	Accessible area walkdown performed June 2003, remainder RFO-24
6	Boundary	Turbine steam seal system	Turbine Building	RFO-24
7	Boundary	Steam to EPR, MPR and miscellaneous instruments	Turbine Building	Accessible area walkdown performed June 2003, remainder RFO-24
8	Boundary	Steam to turbine bypass valves	Turbine Building	RFO-24
9	Boundary	Stop valves drains	Turbine Building	RFO-24
10	Boundary	MS Piping	Turbine Building	RFO-24
11	Boundary	HPCI/RCIC Steam Supply Drains	Portion in Reactor Building (Main Steam Tunnel & Torus area) and Turbine Building	Accessible area walkdown performed June 2003, remainder RFO-24

Table 4-2: VY Walkdown Outliers

Item[1]	Outlier ID #[2]	System Description	Outlier[3]	Conditions[4]					Recommended Resolution
				A	F	P	D	V	
3	3-1	SJAE Supply Line Low Point Drains	PCV-101-35, FCV-101-37 operator offset height > GIP requirements					X	Walkdown AOVs during RFO-24 and evaluate as necessary to determine acceptance
8	8-1	Steam to Turbine Bypass Valves	Turbine Bypass Valve Chests					X	Valves are GIP outliers. Separate assessment performed, Reference 18, indicating item acceptable. Confirm via RFO-24 walkdown
10	10-1	MS Piping	Turbine Stop & MS Control Valves					X	Valves are GIP outliers. Separate assessment performed, Reference 19, indicating item acceptable. Confirm via RFO-24 walkdown
11	11-1	HPCI/RCIC Steam Supply Drains	Portion of piping spans in HPCI room of Reactor Building have spans greater than B31.1 recommended		X				SRT concluded spans acceptable, refer to Section 4.1.2 and Att. 11. This item is considered closed.
11	11-2	HPCI/RCIC Steam Supply Drains	Portion of piping within Torus area of RB was inaccessible		X	X			Walkdown region of piping and determine spans are acceptable.

Item[1]	Outlier ID #[2]	System Description	Outlier[3]	Conditions[4]					Recommended Resolution
				A	F	P	D	V	
12	12-1	Condenser	Condenser	x	x				Condenser is considered an outlier. Separate assessment performed, Ref. 23, indicating item acceptable. Confirm via RFO-24 walkdown

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Table 4-3 Notes:

1. Item number is consistent with item number listed in Table 2-1, Scope.
2. Outlier ID # consists of item number plus consecutive outlier associated with that system
3. "Outliers" are plant conditions requiring further evaluation
4. Key to Issues:

   A. Anchorage

   F. Failure and Falling (II/I)

   P. Proximity and Impact

   D. Differential Displacement

   V. SQUG Valve Screening

5. References

1. "BWROG Report for Increasing MSIV Leakage Rates and Elimination of Leakage Control Systems", General Electric Report No. NEDC-31858P-A, August, 1999.

2. "ALT Drain Paths and Seismic Isolation Boundaries for AST," Technical Evaluation No. 2003-012, Entergy Nuclear Vermont Yankee, 4/30/03.

3. "Walkdown Procedure Seismic Adequacy Review of MSIV Alternate Leakage Path Piping, Tubing and Equipment," ABS Consulting Procedure No. 1173875-P-002, Rev. 0.

4. "Summary of the Seismic Adequacy of Twenty Classes of Equipment Required for Safe Shutdown of Nuclear Plants," EPRI Report No. NP-7149, March 1991; prepared by EQE Inc for the Electric Power Research Institute, Palo Alto, CA.

5. "Piping Seismic Adequacy Criteria Recommendation Based on Performance During and After Earthquakes," EPRI Report No. RP-2635-1 (two volumes), February 1987; prepared by EQE Inc for the Electric Power Research Institute, Palo Alto, CA.

6. "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Revision 2 corrected, ©Seismic Utility Users Group (SQUG), 02/14/92.

7. Vermont Yankee P&IDs

    7.1 "Flow Diagram – Main, Extraction and Auxiliary Steam Systems," Ebasco Dwg No. G-191156, Rev. 31.

    7.2 "Flow Diagram – Sampling System – Sheet 1," Ebasco Dwg No. G-191164, Rev. 22.

    7.3 "Engineering Flow Diagram – Turbine Bldg Area Off Gas Modification," Suntac Dwg No. A-217, Rev. 18.

    7.4 "Flow Diagram – Nuclear Boiler," Ebasco Drwg No. G-191167, Rev. 73.

    7.5 "Flow Diagram – Reactor Core Isolation Cooling System", Ebasco Drwg No. G-191174 sht 1, Rev. 42

    7.6 "Flow Diagram – High Pressure Coolant Injection System", Ebasco Drwg No. G-191169 sht. 1, Rev. 47.

    7.7 "Flow-Diagram – GE Diagram of Steam Seal Piping", VY Drwg 5920-12598, Rev. 1

8. Vermont Yankee Layout Drawings

8.1 "Reactor Building – Main Steam & Feedwater Piping Plans," Ebasco Dwg No. G-191180, Rev. 17.

8.2 "Reactor Building – Main Steam & Feedwater Piping Sections," Ebasco Dwg No. G-191181, Rev. 18.

8.3 "Turbine Building – Main Steam & Feedwater Piping Plans," Ebasco Dwg No. G-191182, Rev. 19.

8.4 "Turbine Building – Main Steam & Feedwater Piping Sections," Ebasco Dwg No. G-191183, Rev. 14.

8.5 "Piping Steam Seal," GE Dwg 754E310, Sht 1, Rev. 3. (VY 5920-1239 R3)

8.6 "Piping Steam Seal," GE Dwg 754E310, Sht 2, Rev. 3 (Vermont Yankee Dwg No. 5920-1240, Rev. 3).

8.7 "Piping Steam Seal," GE Dwg 754E310, Sht 3, Rev. 3 (Vermont Yankee Dwg No. 5920-1241, Rev. 3).

8.8 "Piping Steam Seal," GE Dwg 754E310, Sht 4, Rev. 3 (Vermont Yankee Dwg No. 5920-1242, Rev. 3).

8.9 "Plan – Tie-in Piping Existing Turbine Building Off Gas Modification," Suntac Dwg No. A-13012, Rev. 0.

8.10 "Details – Tie-in Piping Existing Turbine Building Off Gas Modification," Suntac Dwg No. A-13016, Rev. 1.

9. Vermont Yankee General Arrangement Drawings

9.1 "General Arrangement – Turbine Building Basement Floor Plan," Ebasco Dwg No. G-191143, Rev. 20.

9.2 "General Arrangement – Turbine Building Ground Floor Plan," Ebasco Dwg No. G-191144, Rev. 25.

9.3 "General Arrangement – Turbine Building Operating Floor Plan," Ebasco Dwg No. G-191145, Rev. 22.

9.4 "General Arrangement – Turbine Building Sections – Sheet 1," Ebasco Dwg No. G-191146, Rev. 18.

9.5 "General Arrangement – Turbine Building Sections – Sheet 2," Ebasco Dwg No. G-191147, Rev. 12.

9.6 "General Arrangement – Reactor Building Plans – Sheet 1," Ebasco Dwg No. G-191148, Rev. 21.

9.7 "General Arrangement – Reactor Building Plans – Sheet 2," Ebasco Dwg No. G-191149, Rev. 25.

9.8 "General Arrangement – Reactor Building Sections," Ebasco Dwg No. G-191150, Rev. 19.

10. Vermont Yankee Piping Isometric Drawings

10.1 "HPCI/RCIC Drain Line Replacement," Mercury Company Dwg No. VYI-HPCI/RCIC DRAIN, Rev. 1.

10.2 "H.P. Core Injection HPCI Room (HPCI) Part 3A," Mercury Company Dwg No. VYI-HPCI-PART3A, Sheet 1, Rev. 0.

10.3 "H.P. Core Injection HPCI Room (HPCI) Part 3A," Mercury Company Dwg No. VYI-HPCI-PART3A, Sheet 2, Rev. 0.

10.4 "Main Steam Drains Turbine Bldg/W. Torus Catwlk MSD Part 2," Mercury Company Dwg No. VYI-MSD-PART 2 Sh. 1, Rev. 0.

10.5 "Main Steam Drains Main Steam Tunnel MSD Part 2," Mercury Company Dwg No. VYI-MSD-PART 2 Sh. 2, Rev. 1.

10.6 "Main Steam Drains Torus Catwlk-E/Main Steam T. MSD – Part 2A," Mercury Company Dwg No. VYI-MSD-PART 2A Sh. 1, Rev. 2.

10.7 "Main Steam Drains Torus Catwlk-E/Main Steam T. MSD – Part 2A," Mercury Company Dwg No. VYI-MSD-PART 2A Sh. 2, Rev. 0.

10.8 "Main Steam Drains Torus Cat Walk/& LWR S.W. Corner Rm MSD-Part 2B," Mercury Company Dwg No. VYI-MSD-PART-2B, Rev. 1.

10.9 "Reactor Core Isolation Cooling (RCIC) Part 3A," Mercury Company Dwg No. VYI-RCIC-PART3A, Sheet 1, Rev. 0.

10.10 "Reactor Core Isolation Cooling (RCIC) Part 3A," Mercury Company Dwg No. VYI-RCIC-PART3A, Sheet 2, Rev. 0.

10.11 "Main Steam Turbine Building," Ebasco Dwg No. 5920-FS-I-1, Rev. 2.

10.12 "Auxiliary Steam and Main Steam Drains," Ebasco Dwg No. 5920-FS-I-1A," Rev. 2.

10.13 "Main Steam Drains T.B.," Ebasco Dwg No. 5920-FS-I-1B, Rev. 2.

10.14 "Main Steam Bypass & Cross-over Piping – Turbine Building," Ebasco Dwg No. 5920-FS-I-2, Rev. 3.

10.15 "Main Steam Reactor Bldg.," Ebasco Dwg No. 5920-FS-I-2, Rev. 4.

10.16 "Steam Seal Piping Sheet 1 of 3," Ebasco Dwg No. 5920-FS-I-27, Rev. 5.

10.17 "Main Steam Drains," Ebasco Dwg No. 5920-FS-I-77A, Rev. 4.

11. Vermont Yankee Equipment Data

11.1 Vendor Data Sheets for PCV-101-1: (1) "2" Thottle Valve Diaphragm Actuator PCV-101-1," Yankee Atomic 5920-2398 Rev. 0; (2) "2" Throttle Valve Body Steam to SJAE PCV-101-1," Yankee Atomic Dwg No. 5920-2397, Rev. 1.

11.2 Vendor Data Sheets for FCV-101-34: (1) Completed Ebasco Specification Worksheets (2 pp) for Air Operated Globe and Angle Control Valves and Controllers; (2) "Flow Control Valve FCV 101-34," Vermont Yankee Dwg No. 5920-5499, Rev. 1; (3) "Limit Switch Arr.," Vermont Yankee Dwg No. 5920-5479, Rev. 1; (4) "Solenoid Valve ASCo Model 8342A2," Vermont Yankee Dwg No. 5920-5484, Rev. 1.

11.3 Vendor Data Sheets for PCV-101-35: (1) Completed Ebasco Specification Worksheets (2 pp) for Air Operated Globe and Angle Control Valves and Controllers; (2) "Press Control Valve PCV-101-35," Yankee Atomic Dwg No. 5920-5747, Rev. 1; (3) "Valve Positioner," Yankee Atomic Dwg No. 5920-5496, Rev. 0.

11.4 Vendor Data Sheets for FCV-101-36: (1) Completed Ebasco Specification Worksheets (2 pp) for Air Operated Globe and Angle Control Valves and Controllers; (2) "Flow Control Valve FCV 101-36," Vermont Yankee Dwg No. 5920-5488, Rev. 2.

11.5 Vendor Data Sheets for FCV-101-36A: (1) Completed Ebasco Specification Worksheets (2 pp) for Air Operated Control Valves and Controllers; (2) "Flow Control Valve FCV 101-36A," Vermont Yankee Dwg No. 5920-5466, Rev. 2.

11.6 Vendor Data Sheets for FCV-101-37: (1) Completed Ebasco Specification Worksheets (2 pp) for Air Operated Globe and Angle Control Valves and Controllers; (2) "Flow Control Valve FCV-101-37," Vermont Yankee Dwg No. 5920-5487, Rev. 2.

11.7 Vendor Data Sheets for LCV-101-38A, B, C, D: (1) Completed Ebasco Specification Worksheets (2 pp) for Air Operated Globe and Angle Control Valves and Controllers; (2) "Level Control Valves LCV-101-38A, B, C, D," Vermont Yankee Dwg No. 5920-5474, Rev. 2; (3) "Limit Switch Arr," Vermont Yankee Dwg No. 5920-5479, Rev. 1.

11.8 Vendor Data Sheets for LCV-101-39: (1) Completed Ebasco Specification Worksheets (2 p) for 2" Throttle Valve Diaphragm Actuator; (2) "Level Control Valve LCV-101-39," Yankee Atomic Dwg No. 5920-5500, Rev. 1.

11.9 Vendor Data Sheets for PRV-OG-834A, B: (1) "Control Valve 20,000 Series – Cast Steel 900 & 1500 lb USAS Rating RF & RTJ Flanges Socket & Butt Weld Ends," Worthington Controls Dwg No. CP1-18-61; and (2) "Pressure Controller Reverse Superstructure," Mason-Neilan Dwg No. 51360-18-C.

11.10 Vendor Data Sheets for ST-60-2A, -2B, -2C, -2D, -3 and ST-62-1, -2: "Strong 1540F Steam Trap Flanged," Strong Dwg No. TA18135 Rev. 0.

11.11 "Globe Stop Valve Pressure Seal Bonnet/Welding Ends General Assembly Size 5 Figure B4016MLY," Edward Valves dwg for V60-10, Vermont Yankee Dwg No. 5920-12788 Sht 1 of 3, Rev. 0.

11.12 "Globe Stop Valve Pressure Seal Bonnet/Welding Ends General Assembly Size 5 Figure B4016MLY," Edward Valves dwg for V60-10, Vermont Yankee Dwg No. 5920-12788 Sht 2 of 3, Rev. 0.

11.13 "Valve V60-6 3" 950-U-WE(80)-X," Pacific Valves dwg for V60-6, Vermont Yankee Dwg No. 5920-1282, Rev. 3.

11.14 "Outline Bypass Valve," GE dwg 945D634 for Z-1-1A, B (Vermont Yankee Dwg No. 5920-157, Rev.2).

11.15 "Limitorque Outline for 1500lb Valves Type 7150W V13-27, V13-132, V60-2A-D, V60-5A-D," Vermont Yankee Dwg No. 5920-4208 Rev. 2.

11.16 "1 & 2 in – 1500lb M.O. Globe Valve V60-2, -5, V13-27, -132," Vermont Yankee Dwg No. 5920-5446 Rev. 1.

11.17 "2 ½ in – 1500lb Press Seal GTV w/Limitorque V60-4," Vermont Yankee Dwg No. 5920-3410, Rev. 5.

11.18 ENVY Drwg 5920-5490-R1 for LCV-2-143 Control Valve.

12. Vermont Yankee Pipe Spool Drawings

12.1 Auxiliary Steam Piece Mark AS-1-1, Ebasco Control No. A1-593 1.

12.2 Auxiliary Steam Piece Mark AS-1-2, Ebasco Control No. A1-593 2.

12.3 Auxiliary Steam Piece Mark AS-1-3, Ebasco Control No. A1-593 3.

12.4 Auxiliary Steam Piece Mark AS-1-4, Ebasco Control No. A1-593 4.

12.5 Auxiliary Steam Piece Mark AS-1-5, Ebasco Control No. A1-593 5.

12.6 Auxiliary Steam Piece Mark AS-1-8, Ebasco Control No. A1-593 8.

12.7 Auxiliary Steam Piece Mark AS-1-9, Ebasco Control No. A1-593 9.

12.8 Auxiliary Steam Piece Mark AS-1-10, Ebasco Control No. A1-601 1.

12.9 Auxiliary Steam Piece Mark AS-3-1, Ebasco Control No. A1-603 2.

12.10 Main Steam Piece Mark MS-1A-8.

12.11 Main Steam Drains Piece Mark MSD-7A-1, Ebasco Control No. A1-600 1.

12.12 Main Steam Drains Piece Mark MSD-7A-2, Ebasco Control No. A1-595 1.

12.13 Main Steam Drains Piece Mark MSD-7A-3, Ebasco Control No. A1-595 2.

12.14 Main Steam Drains Piece Mark MSD-7B-1, Ebasco Control No. A1-600 2.

12.15 Main Steam Drains Piece Mark MSD-7B-2, Ebasco Control No. A1-595 3.

12.16 Main Steam Drains Piece Mark MSD-7B-3, Ebasco Control No. A1-595 4.

12.17 Main Steam Drains Piece Mark MSD-7C-1, Ebasco Control No. A1-600 3.

12.18 Main Steam Drains Piece Mark MSD-7C-2, Ebasco Control No. A1-595 5.

12.19 Main Steam Drains Piece Mark MSD-7C-3, Ebasco Control No. A1-595 6.

12.20 Main Steam Drains Piece Mark MSD-7D-1, Ebasco Control No. A1-600 4.

12.21 Main Steam Drains Piece Mark MSD-7D-2, Ebasco Control No. A1-595 7.

12.22 Main Steam Drains Piece Mark MSD-7D-3, Ebasco Control No. A1-595 8.

12.23 Main Steam Drains Piece Mark MSD-8A-1, Ebasco Control No. A1-595 9.

12.24 Main Steam Drains Piece Mark MSD-8B-1, Ebasco Control No. A1-595 10.

12.25 Main Steam Drains Piece Mark MSD-8C-1, Ebasco Control No. A1-595 11.

12.26 Main Steam Drains Piece Mark MSD-8D-1, Ebasco Control No. A1-595 12.

12.27 Main Steam Drains Piece Mark MSD-9-1, Ebasco Control No. A1-596 1.

12.28 Main Steam Drains Piece Mark MSD-9-2, Ebasco Control No. A1-596 2.

12.29 Main Steam Drains Piece Mark MSD-9-3, Ebasco Control No. A1-596 3.

12.30 Main Steam Drains Piece Mark MSD-9-4, Ebasco Control No. A1-596 4.

12.31 Main Steam Drains Piece Mark MSD-9-5, Ebasco Control No. A1-596 5.

13. ENVY, Vermont Yankee Engineering Record Correspondence, ERC No. 2003-036 "Information to ABS Consulting, 1st Data Transmittal: (UFSAR Sections, Licensing Information, Specifications, Plant Layout Drawings, and Condenser Details) in support of VYDC 2003-011. Dated 07/1/03.

14. ENVY, Vermont Yankee Engineering Record Correspondence, ERC No. 2003-50 "Information to ABS Consulting, 2nd Data Transmittal: Piping and Pipe Support Data and Drawings for input to AST Seismic Evaluations". Dated 07/15/03.

15. ENVY, Vermont Yankee Block Wall Program.

16. ENVY, Vermont Yankee Calculation No. 317, Rev. 1, CCN: 1, "Main Steam Piping Turbine Building Piping Flexibility Analysis Cal. No. 317". July 2003.

17. ENVY, Vermont Yankee CCN No. VYC-0519 Rev. 0 CCN01, Calc. No. VYC-0519, Rev. 0 "Problem No. 102 SRP RCIC Part 3 + 3A".

18. "Verification of Structural Integrity of the Turbine By-Pass Valve Chests," ABS Consulting Calculation No. 1173875-C-004, Rev. 0.

19. "Verification of the Seismic Capability of the Turbine Stop and Main Steam Control Valves," ABS Consulting Calculation No. 1173875-C-003, Rev. 0.

20. "Verification of the Seismic Capability of Path 2 Piping", ABS Consulting Calculation No. 1173875-C-005, R0.

21. GE Drwg 5920-12598, "Steam Turbine Heat Balance"

22. EPRI NP-604, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin", Electric Power Research Institute, Palo Alto, CA. Prepared by NTS Engineering, Long Beach, California and RPK Consulting, Yorba Linda, CA, Revision 1, July 1991.

23. "Seismic Verification of Turbine Condenser", ABS Consulting Calculation No. 1173875-C-001, Revision 0.

24. Safety Evaluation of GE Topical Report NEDC-31858, Revision 2, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems", U.S. Nuclear Regulatory Commission, March 3, 1999.

6. Nomenclature

ACI	-	American Concrete Institute
AISC	-	American Institute of Steel Construction
ALT	-	Alternate Leakage Path
AOG	-	Augmented Off Gas
AOV	-	Air Operated Valve
BWR	-	Boiling Water Reactor
BWROG	-	BWR Owners Group
CV	-	Control Valve
DBE	-	Design Basis Earthquake, typically referring to MHE for VY or SSE.
ENVY	-	Entergy Nuclear Vermont Yankee
FAC	-	Flow Accelerated Corrosion
GE	-	General Electric
GIP	-	Generic Implementation Procedure
HPCI	-	High Pressure Core Injection System
MHE	-	Maximum Hypothetical Earthquake, corresponds to the current industry safe shutdown earthquake (SSE)
MOV	-	Motor Operated Valve
MS	-	Main Steam
MSD	-	Main Steam Drains
IST	-	In-service Testing
MSIV	-	Main Steam Isolation Valve
NRC	-	Nuclear Regulatory Commission
OBE	-	Operating Basis Earthquake, or design earthquake

Outlier	-	Specific design condition that might be associated with poor piping and/or component seismic performance
PGA	-	Peak Ground Acceleration
RCIC	-	Reactor Core Isolation System
RB	-	Reactor Building
RFO	-	Re-Fuel Outage
SE	-	Safety Evaluation
SER	-	Safety evaluation report
SJAE	-	Steam Jet Air Ejector
SSE	-	Safe Shutdown Earthquake, see MHE
SSEL	-	Safe Shutdown Equipment List
SQUG	-	Seismic Qualification Utility Group
SV	-	Safety Valve
SRT	-	Seismic Review Team
TB	-	Turbine Building
UFSAR	-	Updated Final Safety Analysis Report
VY	-	Vermont Yankee Station
Walkdown	-	Plant walkdown performed in accordance with the Reference 16 procedures
Walkthrough	-	Plant walkdown performed for general observations, not in accordance with the Reference 16 procedures

Attachment 1

Walkdown Information for Path 1

MS Low Point (LP) Drains to Condenser (Primary Path)

(10 pp including this page)

1-1 Piping Description

Path 1 – This is the primary ALT leakage path and follows the main steam low point drains to the condenser via drain valves LCV-101-38A, B, C and D, which are air operated valves (AOVs). These valves can be position changed from the control room and will fail to an open position on loss of air or power. Any of the four identified valves will provide an adequate drainage path (Ref. 2). The piping path extends from four 6" drain pots on the main steam headers, through the four indicated 1" AOV valves, to a common 8" header that goes to connection #67 on the condenser. The piping is located entirely within the Turbine Building. The extent of the piping is shown in Figure Att.1-1.

Walkdown Status: Piping to be walked down during RFO-24

1-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156	14, 7.1
Piping Drawings	G-191182, G-191183	14, 8.3, 8.4
Piping Isometric Drawings & Supports	5920-FS-I1, 5920-FS-IB Note 1.	14, 10.11, 10.13
Equipment Drawings	5920-5060, 5920-5474, 5920-5405	14, 11.7
Active Valve Drawings	5920-5474	14, 11.7
Is line seismically analyzed ?	No	

Note 1:

Details for supports on 8"-MSD-9 shown on Grinnell pipe support sketches Nos. 222 to 227 for drwg G-191182 for mark numbers MSH-121 to MSH-125. Details for spring can supports on 2"-MSD-7A-C shown on support sketches No's 248 to 250 for mark No's MSH-146 to MSH-148.

1-3 Active Valve Discussion

Valves LCV-101-38-A through D are 1" air operated valves (AOVs), which have an active function to open to establish the path. These valves are screened using Reference 6 methods. Valves will be walked down during RFO-24. The valves are shown in the Reference 11.7 drawings. AOV diaphragm design uses air to close, fail to

open position on loss of air, based on spring return. The fail-safe position for the valves are open. Ref. 2 determines these valves will open on loss of power to solenoid. Ref. 2 also establishes that any of the four lines will provide adequate drainage.

The valve drawing does not show explicit dimensional information for the valve, thus valve screening will be performed during RFO-24 walkdown.

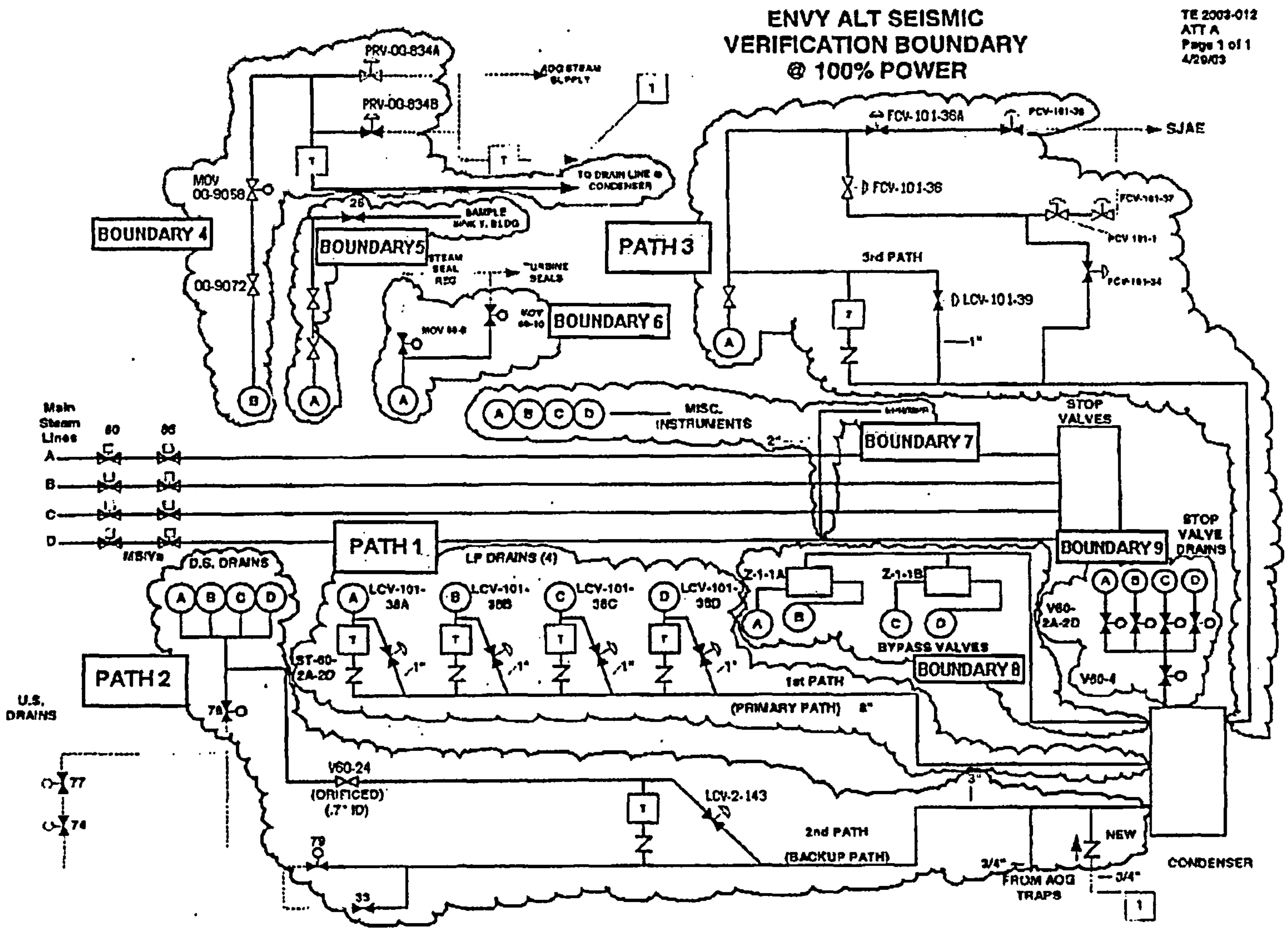


Figure Att.1-1: Path 1 Piping Definition

Figure Att.1-2: PATH 1 - Low Pressure (LP) drains to condenser (primary path) – Full Iso

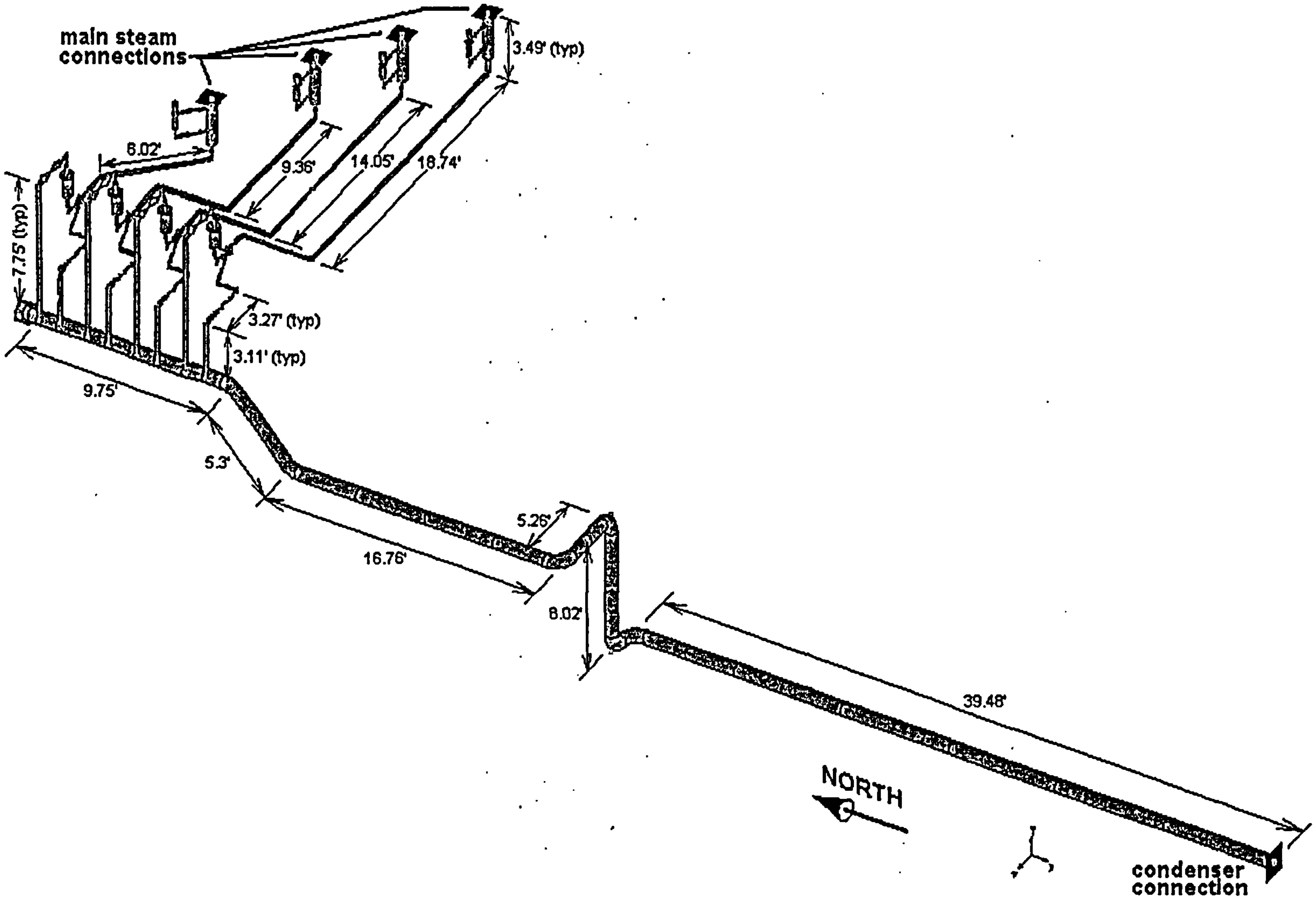


Figure Att.1-3:
PATH 1 - Low Pressure (LP) drains to condenser (primary path) – PARTIAL ISO (at main steam connections)

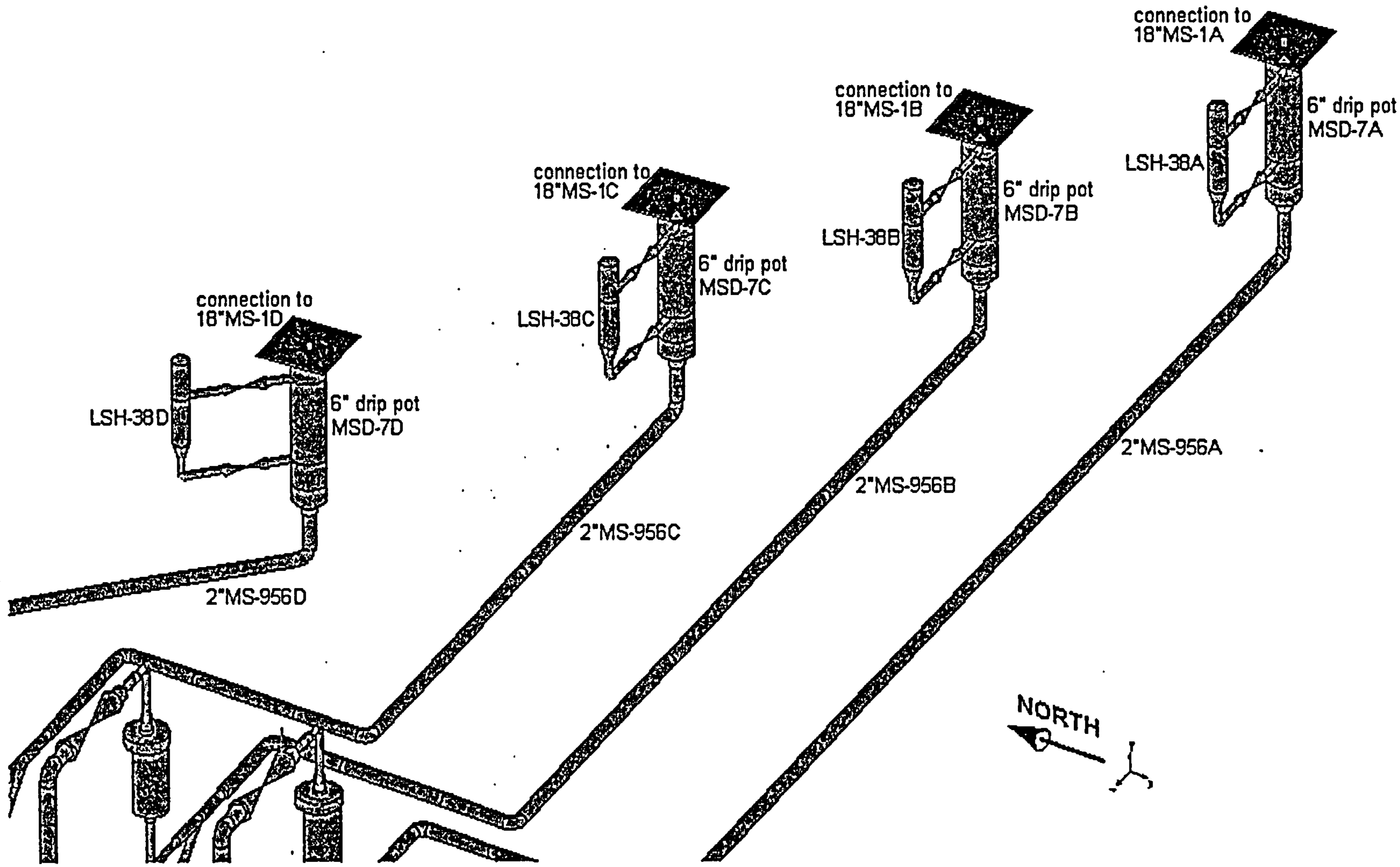


Figure Att.1-4:
PATH 1 - Low Pressure (LP) drains to condenser (primary path) – PARTIAL ISO (near steam traps and LCVs)

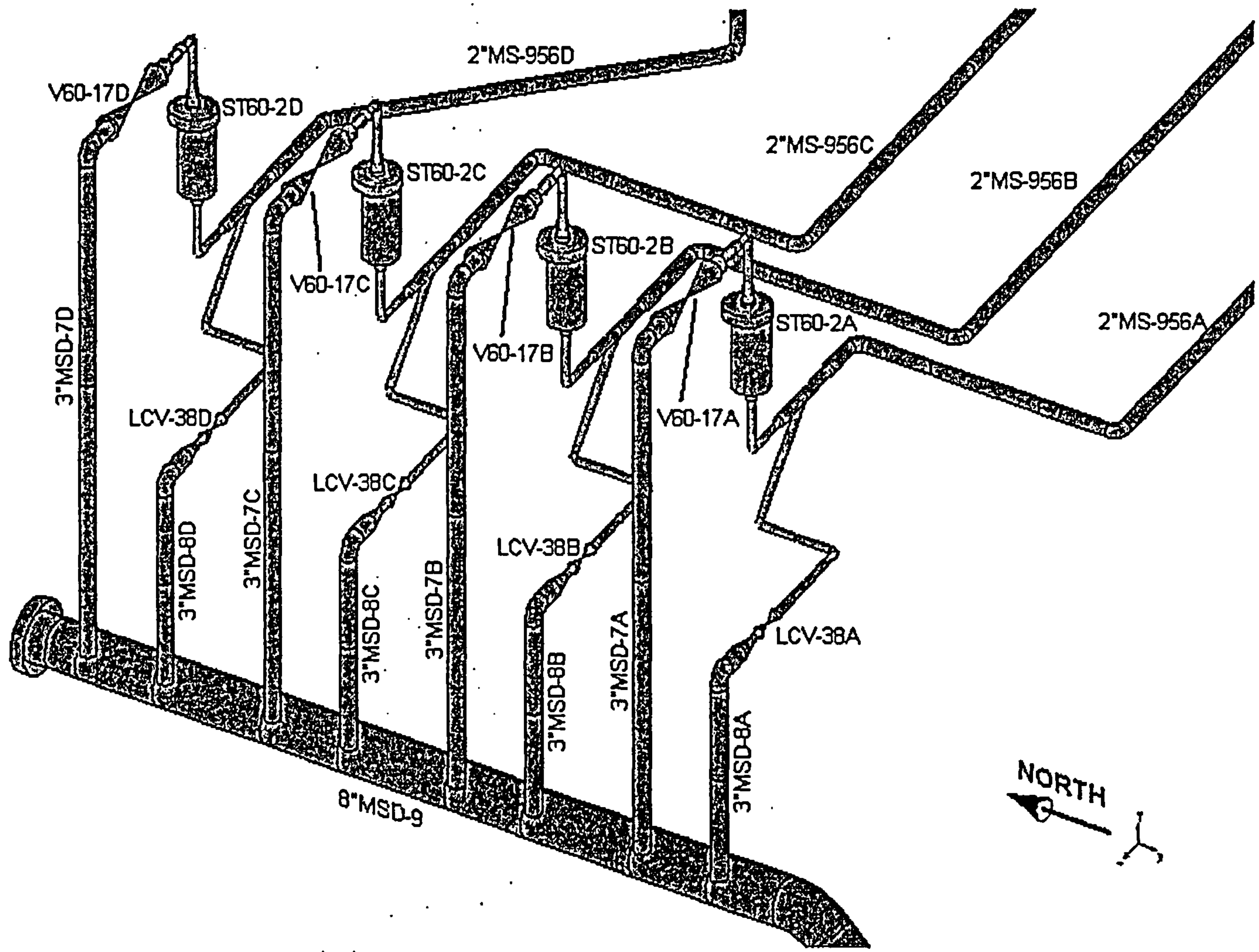


Figure Att.1-5:
PATH 1 - Low Pressure (LP) drains to condenser (primary path) – PARTIAL ISO (8"MSD-9 to condenser)

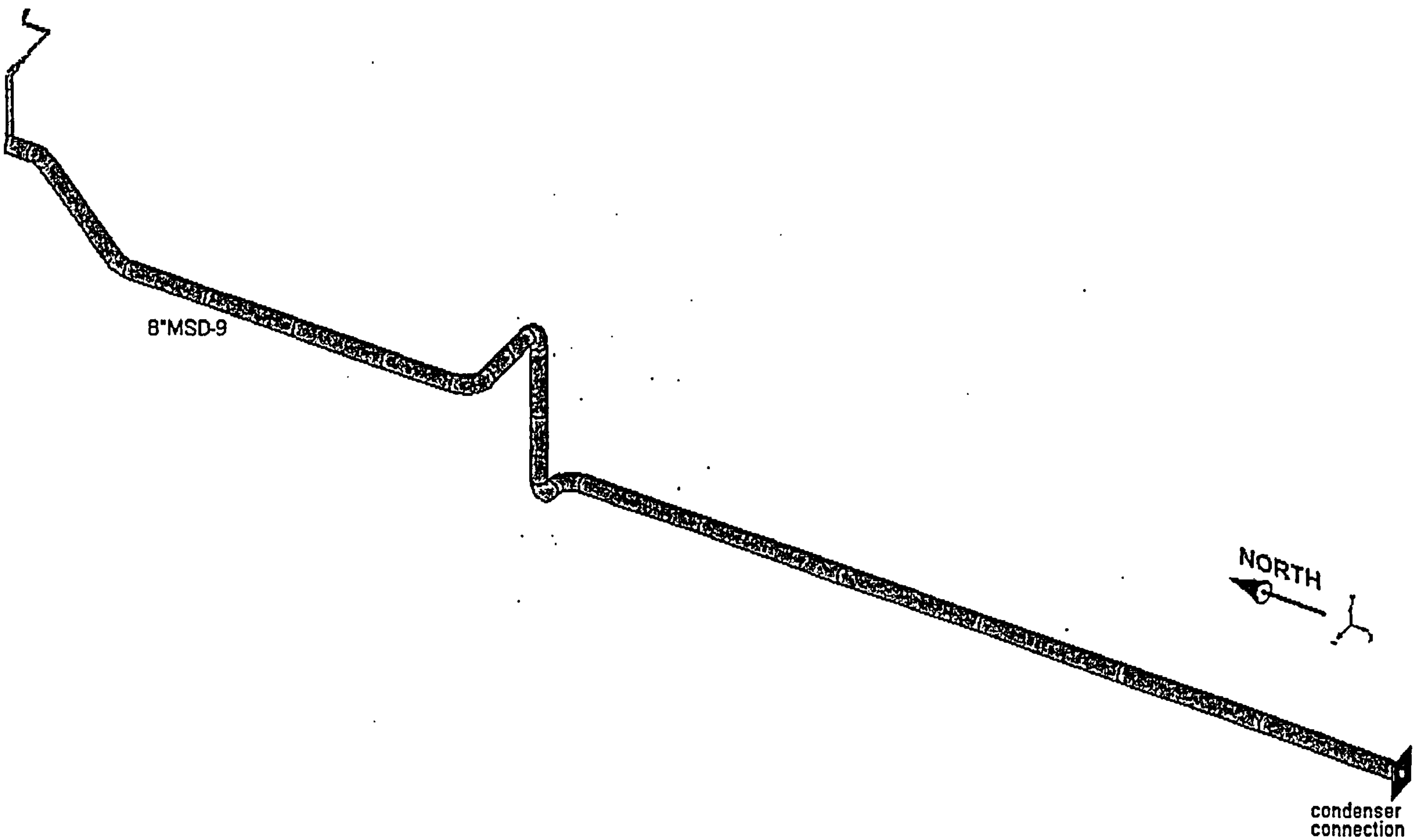
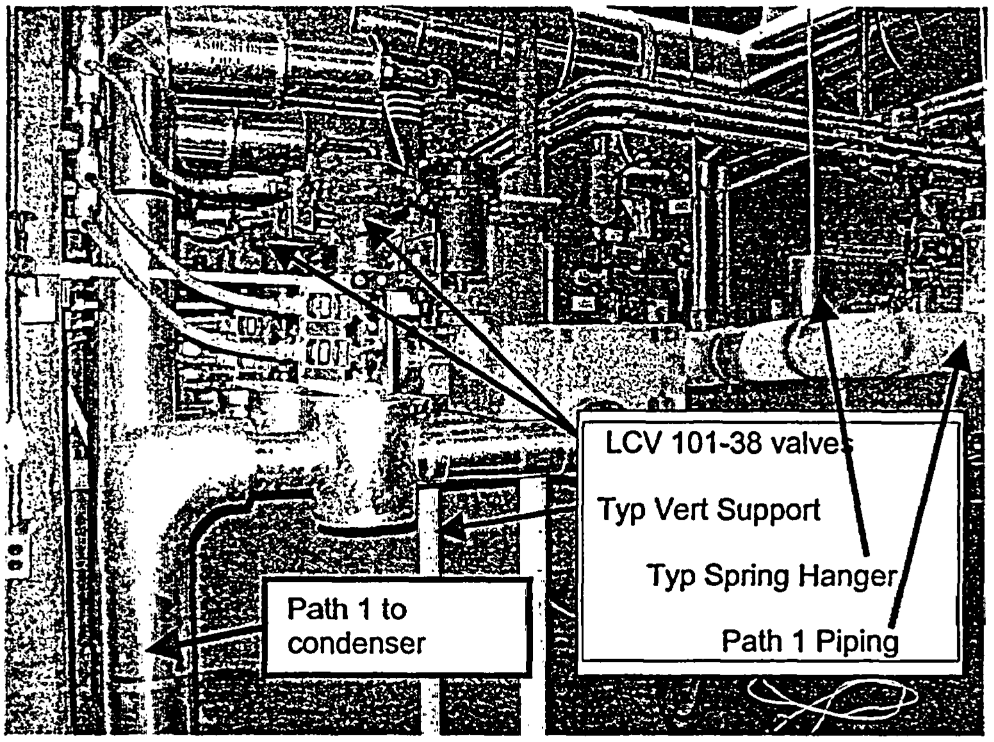


Figure Att.1-6

Path 1 Piping Vicinity of LCV-101-38A through LCV-101-38D



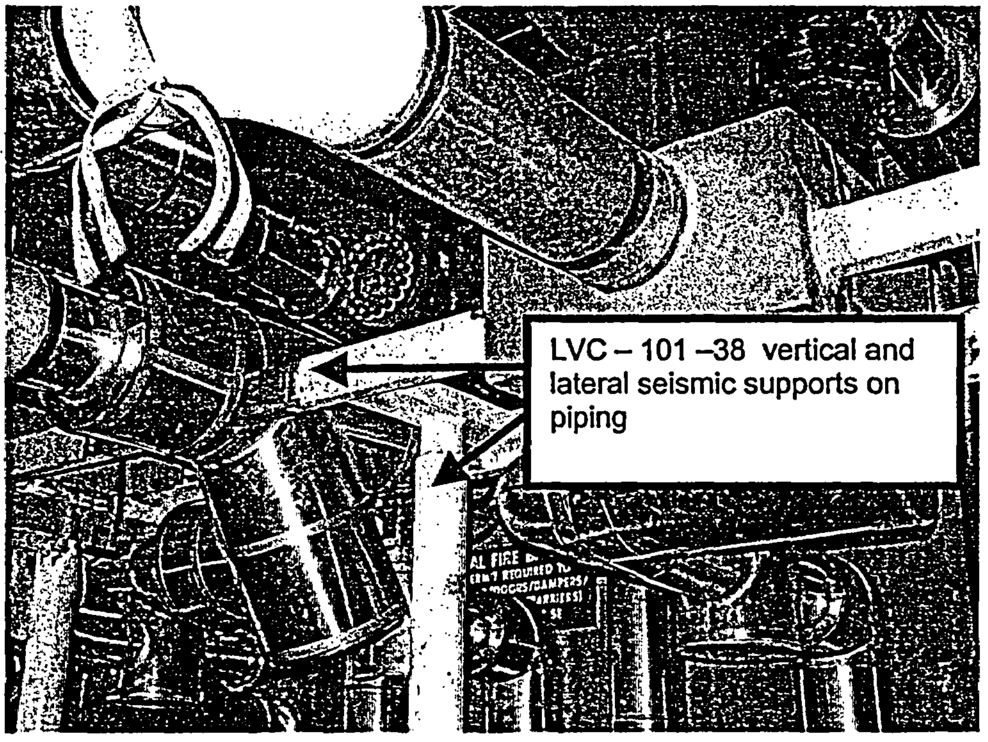
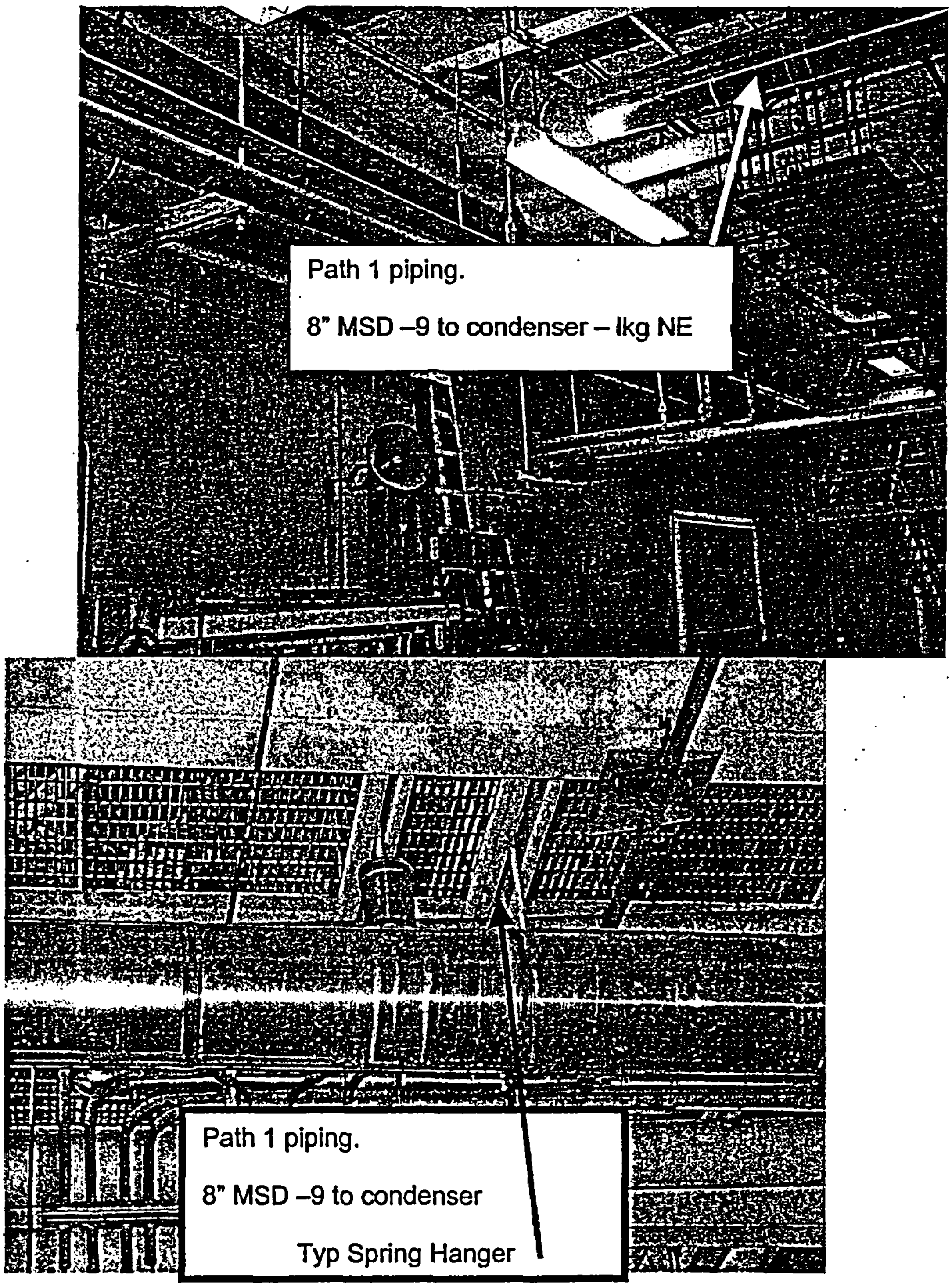


Figure Att.1-7:

Path 1 Piping to Condenser, Typical Rod Hung Arrangement



Attachment 2

Walkdown Information for Path 2

MS Low Point (LP) Drains downstream of MSIVs to Condenser (Backup Path)

(14 pp including this page)

2-1 Piping Description

Path 2 – This ALT leakage path is the alternate ALT drain path and follows main steam low point drains to the condenser via AOV valve LCV-2-143. This valve can be position changed from the control room and will fail open on loss of air or power. The piping path extends from four 1½" connections to the main steam headers just downstream of the MSIVs, to a common header and open manual valve V60-24, which serves as an orifice. The orifice ID is 0.7 inches providing a flow area of 0.86 square inches. From there, the path extends through 1" valve LCV-2-143 to a connection to 3" MSD-4, which then goes to condenser connection #47. The piping is located both in the Reactor Building (main steam tunnel and Torus area) and the Turbine Building. This pathway is depicted in Figure Att.2-1.

Walkdown Status: Portions of the piping (i.e. inside Reactor Building) was walked down during June of 2003, as shown in Figure Att.2-2. The remainder of the Path 2 piping (i.e. inside the Turbine Building) will be walked down during RFO-24.

2-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156, G-191167	14, 7.1, 7.4
Piping Drawings	G-191180, G-191181, G-191182, G-191183	14, 8.1, 8.2, 8.3, 8.4
Piping Isometric Drawings & pipe supports	VYI-MSD-Part 2, Sh1, 2 Part 2A, Sh1, Sh2, part 2B, 5920-FS-I77A. Note 1	14, 10.4, 10.5, 10.6, 10.7, 10.8, 10.17
Equipment Drawings	5920-5490, 5920-5060, 5920-2041, 5920-1872	14, 11.18
Active Valve Drawings	5920-5490,	14, 11.18
Is line seismically analyzed ?	Yes, Calc 1173875-C-004	15

Note 1:

Pipe supports listed and evaluated in stress calculation, refer to Reference 15.

2-3 Active Valve Discussion

Valve LCV-2-143 is a 1" AOV and is screened using Reference 6 methods. Valve will be walked down during RFO-24. AOV diaphragm design uses air to close, fail to open position on loss of air, based on spring return. The valve is depicted in the Reference 11.18 drawing. Based on the valve drawing, the centerline of the valve body to the top of the actuator is 35.875", which falls within the limits of Figure B.7-1 of Reference 6.

All caveats of this equipment class (GERS Air-operated Valves) of Reference 6 are met, accept Caveat 5 and 7. Caveat 5 – impact, was addressed during walkdown and found to be satisfactory (Refer to walkdown data sheets). Caveat 7 concerns use of cast iron body and yoke components. This valve has a steel body, which is satisfactory, however the yoke assembly is manufactured from high tensile cast iron. Given the strength of this material, and that proximity impact was determined during the walkdown not to be an issue (see walkdown sheets), this issue (yoke material) is considered to be acceptable for this valve.

The fail-safe position for the valve is open. Ref. 2 determines these valves will open on loss of power to solenoid.

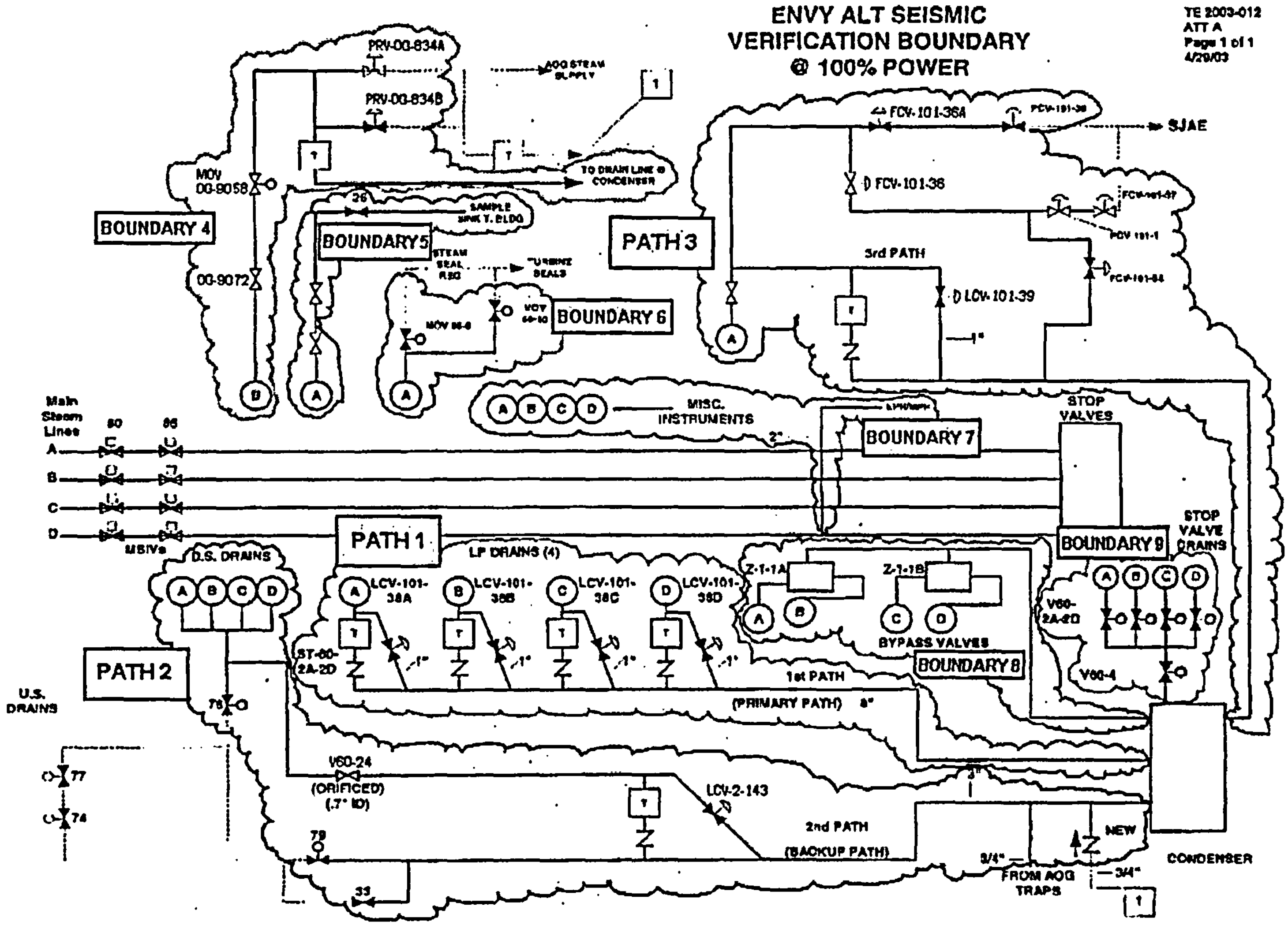


Figure Att.2-1: Path 2 Piping Definition

Figure Att.2-2: Portion of Path 2 Walked Down During June 2003

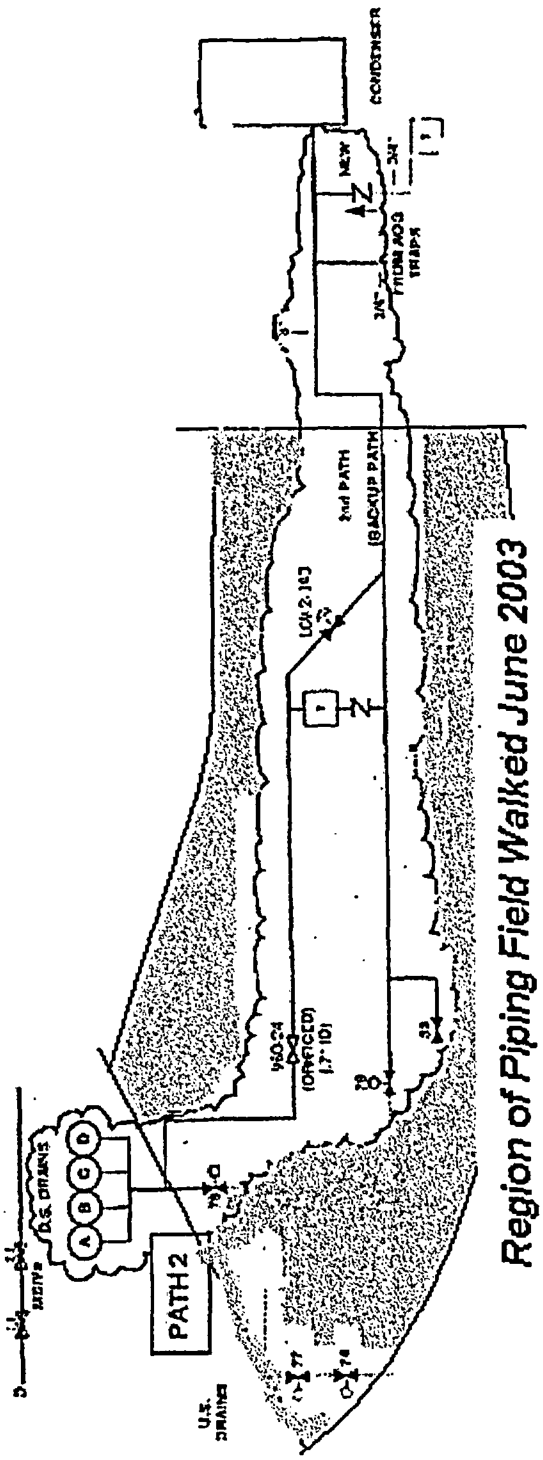


Figure Att.2-3

Path 2 Piping near V2-79MO

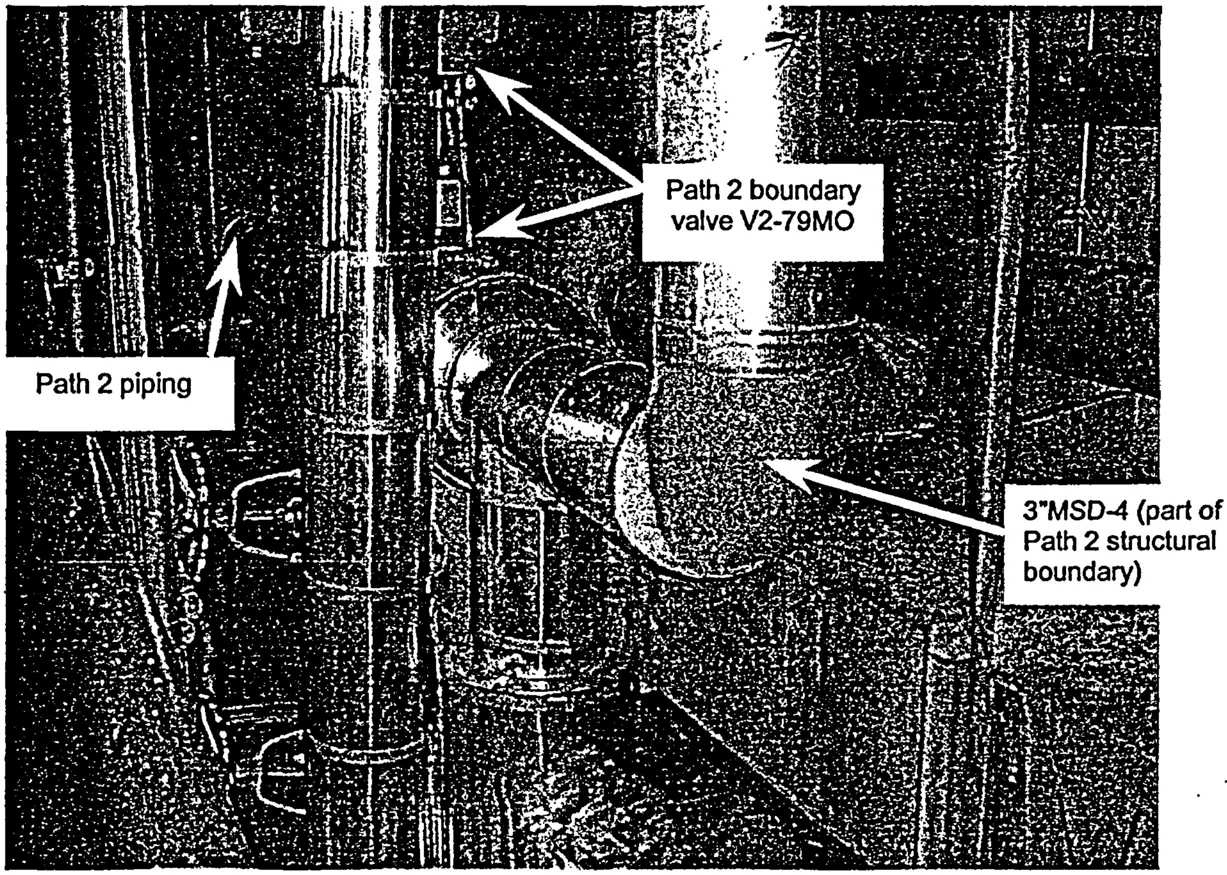


Figure Att.2-4

Path 2 – Solenoid for LCV-2-143

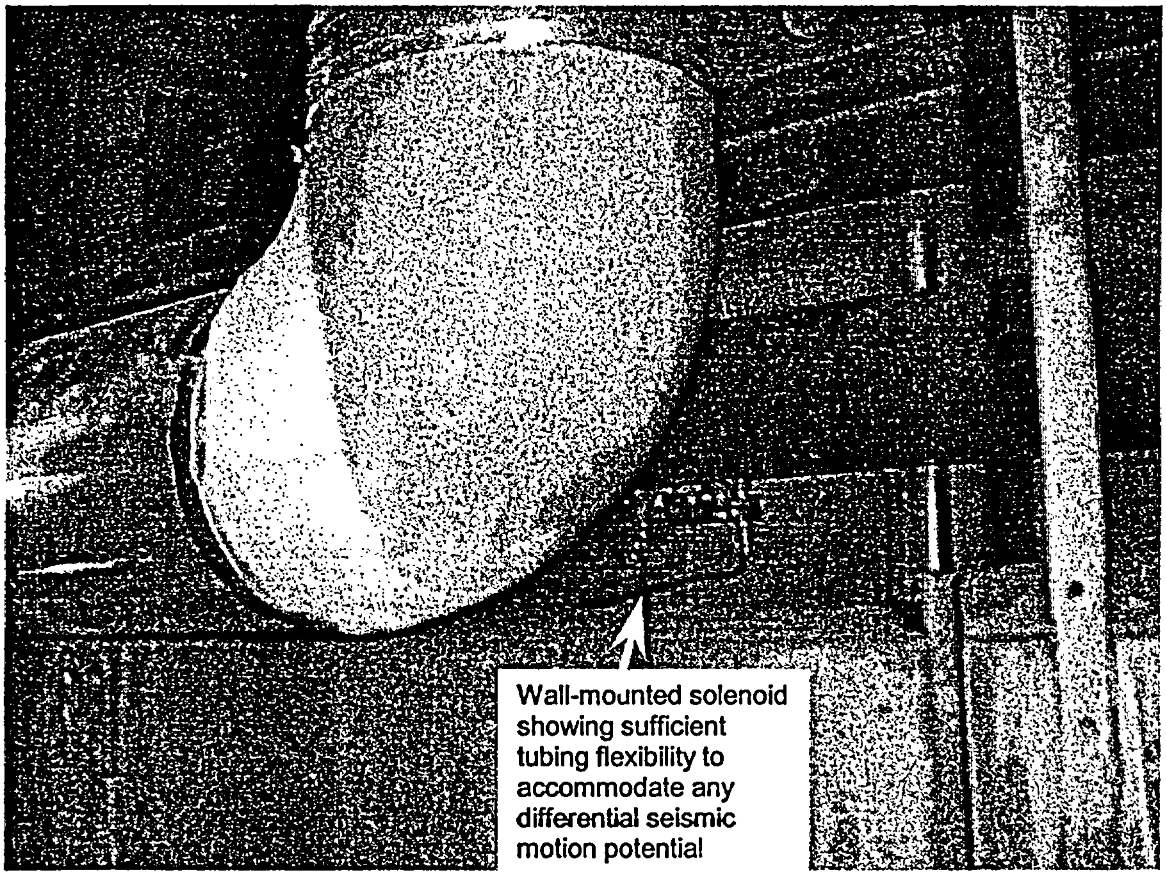


Figure Att.2-5

Path 2 – Steam Trap ST-60-3 bypass

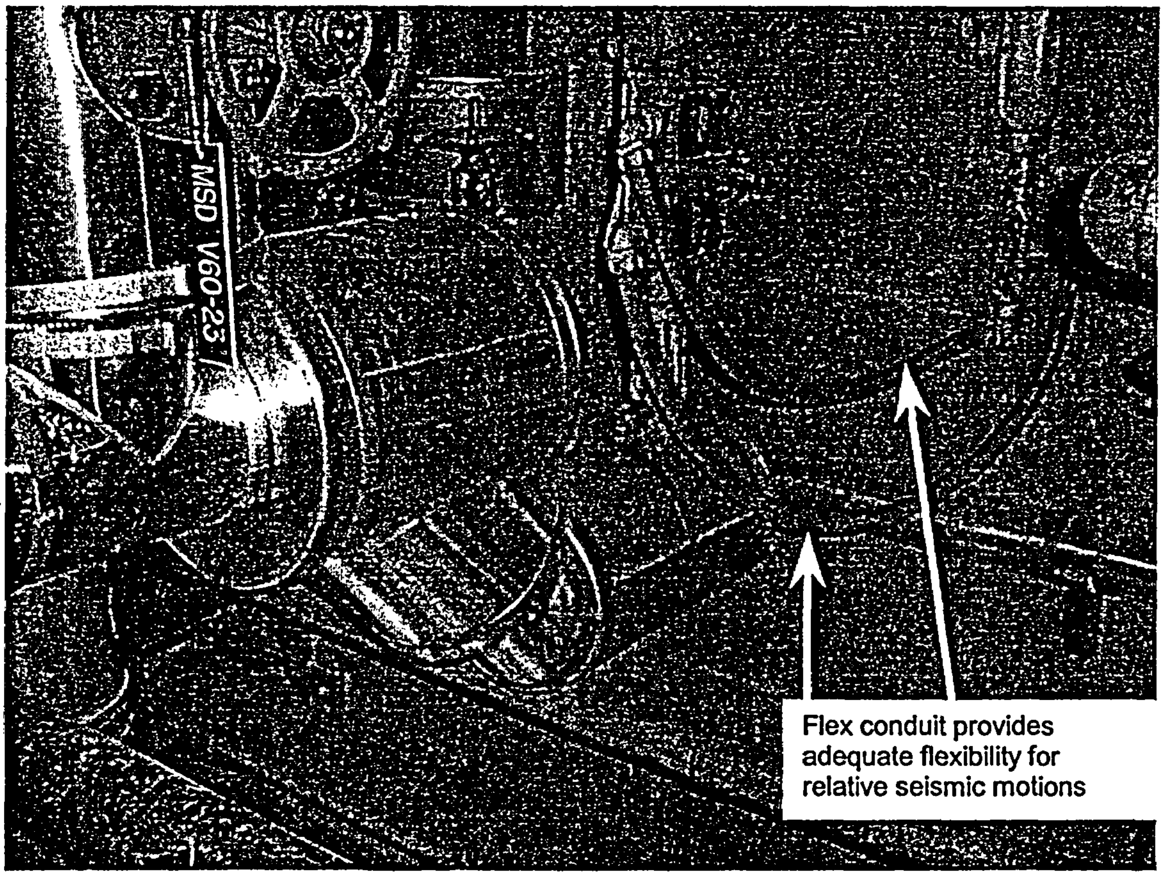
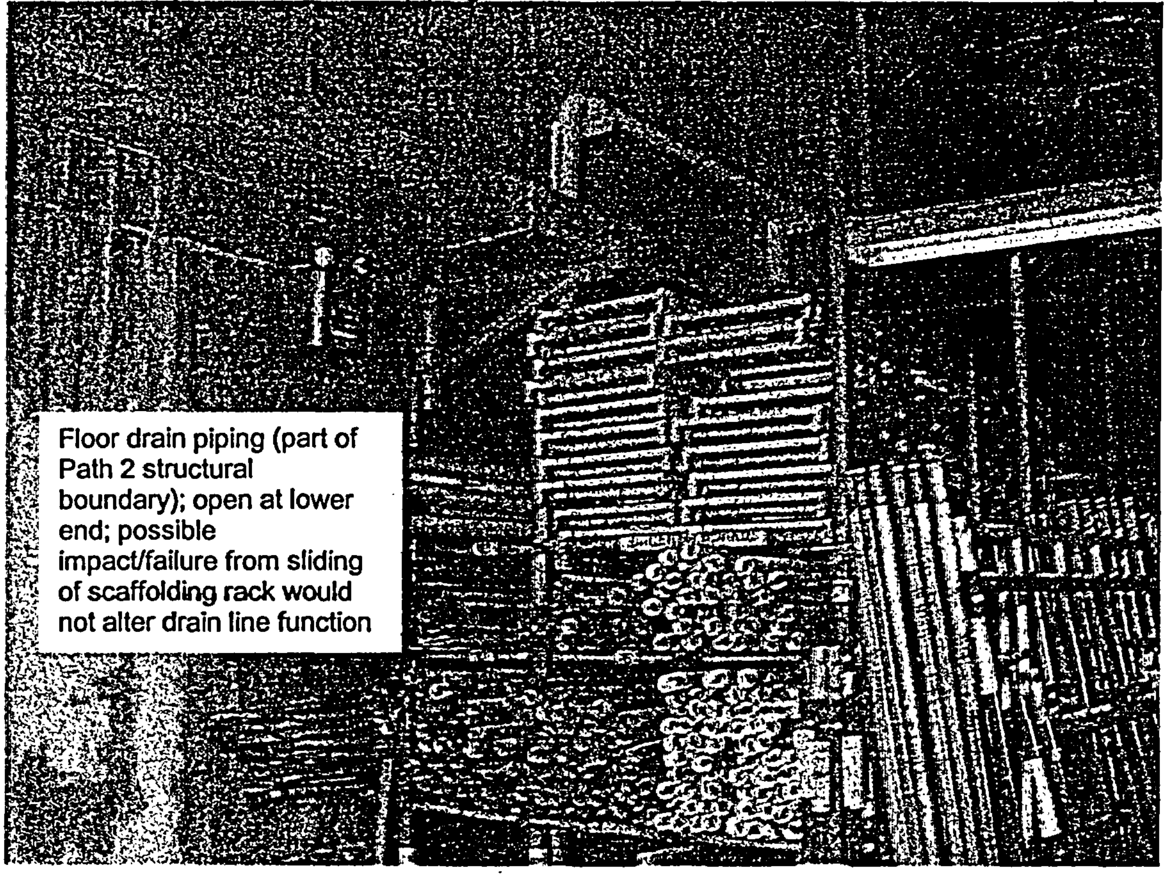


Figure Att.2-6

Path 2 – Isolated Drain Pipe from Path. Potential Interaction between scaffolding storage rack and adjacent floor drain piping. This will not have an adverse affect on drain path



11 73875-R-002
R.0
ATT. 2
SHT. 10

WALKDOWN DATA SHEET

PATH 2 SHEET 1 OF 5

System MAIN STEAM D.S. DRAINS

Equip. Class Piping and Tubing Systems Line Identifier 1, 1½, 2", 2½, 3" MSD 3 & 4

Bldg. REACTOR Floor El. TORUS COMPARTMENT AND S.W CORNER ROOM EL. 213'(FLOOR)

P&ID No. G-191167 & G-191156 Spec. No. QC-10: MSD (CS-5)

Isometric No. VYI-MSD-PART 2A, 2B, 2

Pipe/Tubing O.D. 1, 1½, 2, 2½, 3 Wall Thickness SCH. 160

Material A106 GR B

Insulation Type/Thickness 2" TO 3" TK. CALCIUM SILICATE

Piping System Boundary

Description PORTIONS OF PATH 2 ACCESSIBLE DURING PLANT OPERATION / SEE ATTACHED MARKED-UP P+ID FOR EXTENT OF PIPING

Functionality Requirement

1.	Pressure Boundary Integrity	(Y)	N		N/A

Review Criteria - Piping and Tubing

1.	No visible damage	(Y)	N	U	N/A
2.	No significant visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	(Y)	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing)	(Y)	N	U	N/A NOTE 2.
5.	No unusual pipe or tubing attachments	(Y)	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	(Y)	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	(Y)	N	U	N/A
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	(Y)	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	(Y)	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing	Y	N	U	(N/A)
11.	No large eccentric masses	(Y)	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	(Y)	N	U	
	Are the criteria met?	(Y)	N	U	

ABS Consulting

1173875-R-002, R0
ATT. 2
SHT. 11

Procedure ~~1173875-P-002~~
Revision 0
June ~~12, 2003~~
~~Page A3 of 12~~

WALKDOWN DATA SHEET

SHEET 2 OF 5

PATH 2

System MAIN STEAM D.S. DRAINS Equip Class Piping and Tubing Systems

Line Identifier MSD-3 & 4

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	(Y)	N	U	N/A NOTE 3
2.	No visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No unusual design	(Y)	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	(Y)	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	(Y)	N	U	N/A
6.	No visible damage	(Y)	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	(Y)	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	(Y)	N	U	N/A
9.	Does the load path appear adequate	(Y)	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)	(Y)	N		

Are the above criteria met? (Y) N U

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A NOTE 4.
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	No other concerns	(Y)	N	U	N/A NOTE 5.

Is equipment free of interaction effects? (Y) N U

Is the piping/tubing system seismically adequate? (Y) N U

Comments 1. PIPING COMES DOWN THROUGH PENETRATION IN STEAM TUNNEL FLOOR
2. TYPICAL SUPPORT SPANS 7' TO 9'. ISOLATED CASES OF VERTICAL SUPPORT SPANS EXCEED B31.1 SPAN (WATER SERVICE) OF 12' FOR 3"φ JUDGED ADEQUATE DUE TO ADEQUACY OF OVERALL SUPPORT CONFIGURATION.

(CONTINUED ON SH. 3)

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 06/20/03

ABS Consulting

WALKDOWN DATA SHEET

PATH. 2

SHEET 3 OF 5

System MAIN STEAM D.S. DRAINS Equip Class Piping and Tubing Systems

Line Identifier MSD-3#4

Comments/Outliers 3. TYPICAL SUPPORTS AROUND TORUS COMPARTMENT ARE ANGLES WELDED TO EMBED. PLATES SUPPORTING ROD HANGERS.

4. SOME LOCATIONS HAVE POTENTIAL FOR PIPE TO PIPE AND OTHER TYPE PROXIMITY INTERACTIONS. EXAMPLE IS DRAIN LINES AT EL. 227' ± ROD HUNG NEAR HPCI VALVE LCV-2-143. ALL ARE JUDGED NON-DAMAGING TO MS DRAIN PIPING.

5. SCAFFOLDING STORAGE RACK IS LOCATED ADJACENT TO PIPE (IN STRUCTURAL BOUNDARY) VERTICAL RISER TO FLOOR DRAIN IN SW CORNER ROOM. POTENTIAL PROXIMITY INTERACTION JUDGED NON-DAMAGING TO MS DRAIN PIPING.

1173875-R-002
R0
ATT. 2
SHT. 13

WALKDOWN DATA SHEET

SHEET 4 OF 5

PATH 2

System MAIN STEAM DRAIN P&ID No. G-191167 EM R72

Valve. ID No. LCV-2-143 Equip. Class Valves

Valve Description AOV - ACF INDUSTRIES AIR TO CLOSE/SPRING OPEN Isometric No. VYI MSD-Part 2A TORUS FLR.

Valve Location: Bldg. REACTOR Floor El. 213'-9" Room, Row/Col TORUS

Manufacturer, Model, Etc. ACF INDUSTRIES 70-18-1 BDF (1"Ø)

Drawing No. 5920-5400 R1

Functionality Requirement

1. Valve state change required VALVE NORMALLY CLOSED, VALVE FAILS OPEN WHICH IS DESIRED POSITION (AIR CLOSE - SPRING RETURN) (Y) N U

Review Criteria

1.	Does valve operator meet pipe centerline dimension restriction	(Y) N	U	N/A	
2.	Do valve power and control utilities have adequate slack	(Y) N	U	N/A	NOTE 4
3.	Valve operator is not supported independently of pipe	(Y) N	U	N/A	
	Are the criteria met?	(Y) N	U		

Interaction Effects

1.	Vulnerable valve components free from impact by nearby equipment or structures	(Y) N	U	N/A	
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y) N	U	N/A	
3.	Are any required electrical controls free of water spray interactions	(Y) N	U	N/A	
4.	No other concerns	(Y) N		N/A	
	Is equipment free of interaction effects?	(Y) N	U		NOTES 2,3,5
	Is equipment seismically adequate?	(Y) N	U		

Comments 1. REGULATOR MTD. SEPARATELY TO BRACKET BOLTED TO SOLID CONC. BLOCK BLOCKOUT, JUDGED ADEQUATE DUE TO LIGHT WEIGHT
2. SMALL BLOCKOUT ADJACENT TO VALVE JUDGED ADEQUATE - SMALL SPAN
3. VALVE IS ADJACENT TO HVAC DUCT WITH LITTLE OR NO GAP. DUCT HAS LATERAL SUPPORT AND WILL NOT HAVE SIGNIFICANT LATERAL DEFLECTION. POTENTIAL INTERACTION OF DUCT AND VALVE OPERATOR JUDGED NON-DAMAGING
4. TUBING TO VALVE OPERATOR HAS ADEQUATE FLEXIBILITY AND SLACK.
5. NO POTENTIAL INTERACTIONS TO TUBING OR VALVE CONTROLS

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

1173875-R-002, R0
ATT. 2
SHT. 14

PATH: 2

WALKDOWN DATA SHEET

SHEET 5 OF 5

System MAIN STEAM DRAIN P&ID No. G-191167

Valve. ID No. MS-V2-79 Equip. Class Valves

Valve Description MOV (3" GLOBE) Isometric No. VYI-MSD-PART 2

Valve Location: Bldg. REACTOR Floor El. TORUS FL 213'-0" Room, Row/Col TORUS

Manufacturer, Model, Etc. NALWORTH VALVE LIMITORQUE VALVE OPERATOR SMB-00

Drawing No. 5920-2041 R5

Functionality Requirement

1. Valve state change required NORMALLY CLOSED, MUST REMAIN CLOSED Y (N) U

Review Criteria

3"Φ PIPE ACTUAL = 30" ALLOW. = 30"

1. Does valve operator meet pipe centerline dimension restriction (Y) N U N/A
2. Do valve power and control utilities have adequate slack (Y) N U N/A
3. Valve operator is not supported independently of pipe (Y) N U N/A

Are the criteria met? (Y) N U

Interaction Effects

1. Vulnerable valve components free from impact by nearby equipment or structures (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls (Y) N U N/A
3. Are any required electrical controls free of water spray interactions (Y) N U N/A
4. No other concerns (Y) N N/A

Is equipment free of interaction effects? (Y) N U

Is equipment seismically adequate? (Y) N U

Comments PIPE SUPPORTING VALVE WILL HAVE MIMINAL MOVEMENT.
NO INTERACTION CONCERNS
VALVE WT CONSIDERED IN ANALYSIS (REF. 22)

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

Attachment 3

Walkdown Information for Path 3

Steam Jet Air Ejector (SJAE) supply line low point drain (Alternate Path)

(10 pp including this page)

3-1 Piping Description

Path 3 – This backup ALT leakage path is via the steam jet air ejector (SJAE) supply line low point drain air operated valve, LCV-101-39. The valve can be position changed from the control room and fails to an open position on loss of air or power. The piping path extends from a connection on main steam line 18"MS-1A through open manual valve V60-1. Prior to reaching the SJAE manifold, the line splits, going through 1" valve LCV-101-39 and then rejoining piping from SJAE manifold that extends to condenser connection #68. Except for the 1" piping local to LCV-101-39, the majority of the piping in Path 3 is either 2" or 2½" NPS. All the Path 3 piping is located in the Turbine Building.

Walkdown Status: To be walked down during RFO-24

3-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156	14, 7.1
Piping Drawings	G-191182, G-191183	14, 8.3, 8.4
Piping Isometric Drawings & Supports	5920-FS-I1, 5920-FS-I1A, 5920-FS-IB	14, 10.11, 10.12, 10.13
Equipment Drawings	FE-101-9 (Note 1) 5920-5499, 5488, 5466, 5487, 5500, 2398, 5747, 5060	14, 11.3, 11.4, 11.5, 11.6, 11.8,
Active Valve Drawings	5920-5500, 5920-5747, 5920-5487	14, 11.8, 11.3, 11.6
Is line seismically analyzed ?	No	

3-3 Active Valve Discussion

Valve LCV-101-39 is considered the active valves required to open to establish a path. The valve is screened using Reference 6 methods. The Valve will be walked down during RFO-24. AOV diaphragm design uses air to close, fail to open position on loss of air, based on spring return. The fail-safe position for the valve is open. Ref. 2 determines these valves will open on loss of power to solenoid.

The valve is depicted in the Reference 11.8 drawing. Based on the valve drawing, the centerline of the valve body to the top of the actuator is 35.875", which falls within the limits of Figure B.7-1 of Reference 6.

All caveats of this equipment class (GERS Air-operated Valves) of Reference 6 are met, accept Caveat 5 and 7. Caveat 5 – impact, will be addressed during walkdown. Caveat 7 concerns use of cast iron body and yoke components. This valve has a steel body, which is satisfactory, however the yoke assembly is manufactured from high tensile cast iron. The acceptance of this will be addressed by the SRT during RFO-24, based on system configuration and other applicable issues.

Valves FCV-101-37 and PCV-101-35 are considered as active valves, since they are required to close to establish the pathway to the condenser. These valves are depicted in the Reference 11.3, 11.6 drawings. These valves fail to a closed position on loss of air or power to the solenoid, based on spring return. Based on the valve drawings the operator-offset length exceeds GIP recommendations. Actual configuration will be determined during RFO-24, and the valves will be evaluated at that time.

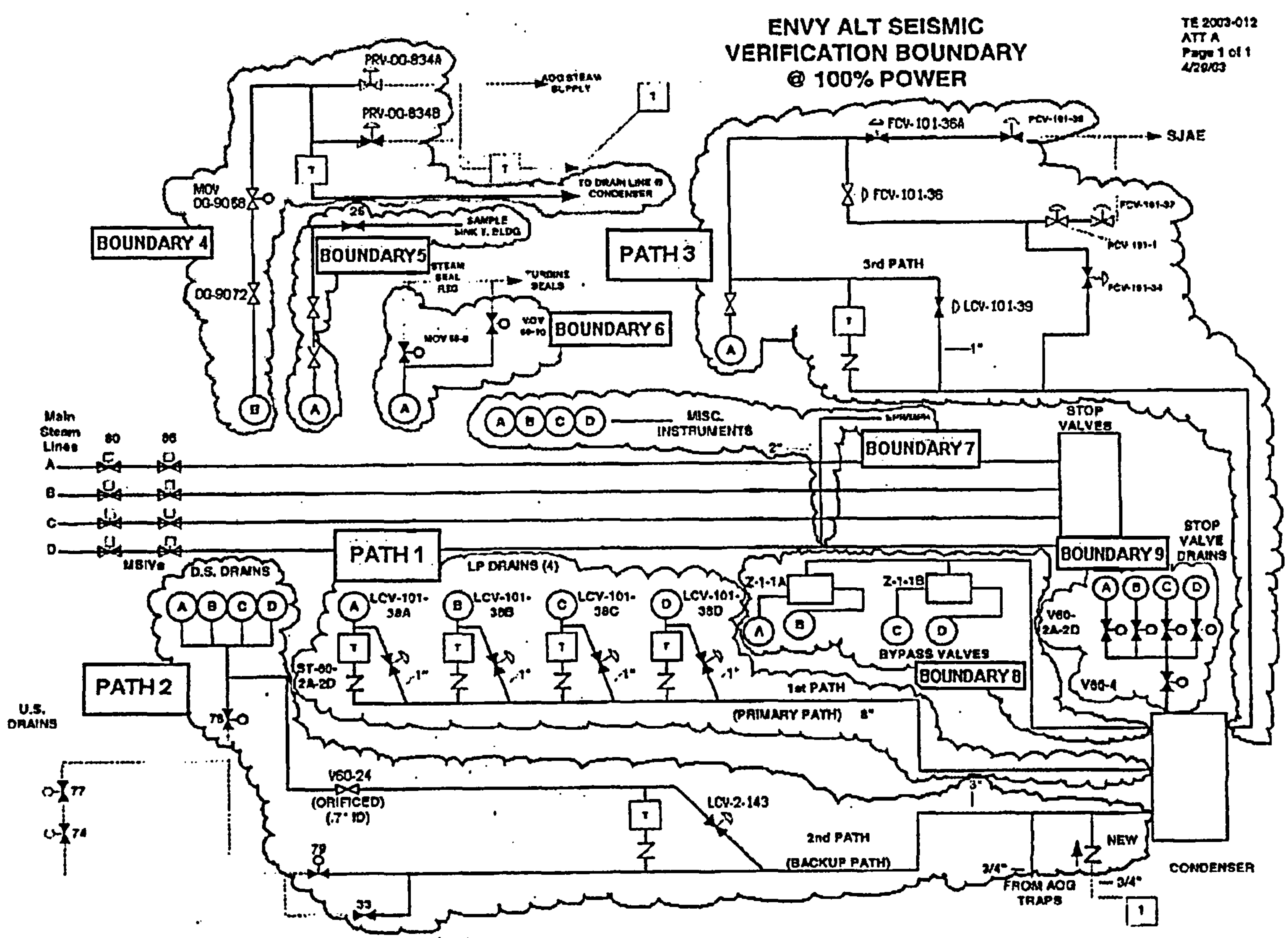


Figure Att.3-1: Path 3 Piping Definition

Figure Att.3-2: PATH 3 - Steam Jet Air Ejector (SJAE) supply line low point drain – FULL ISO

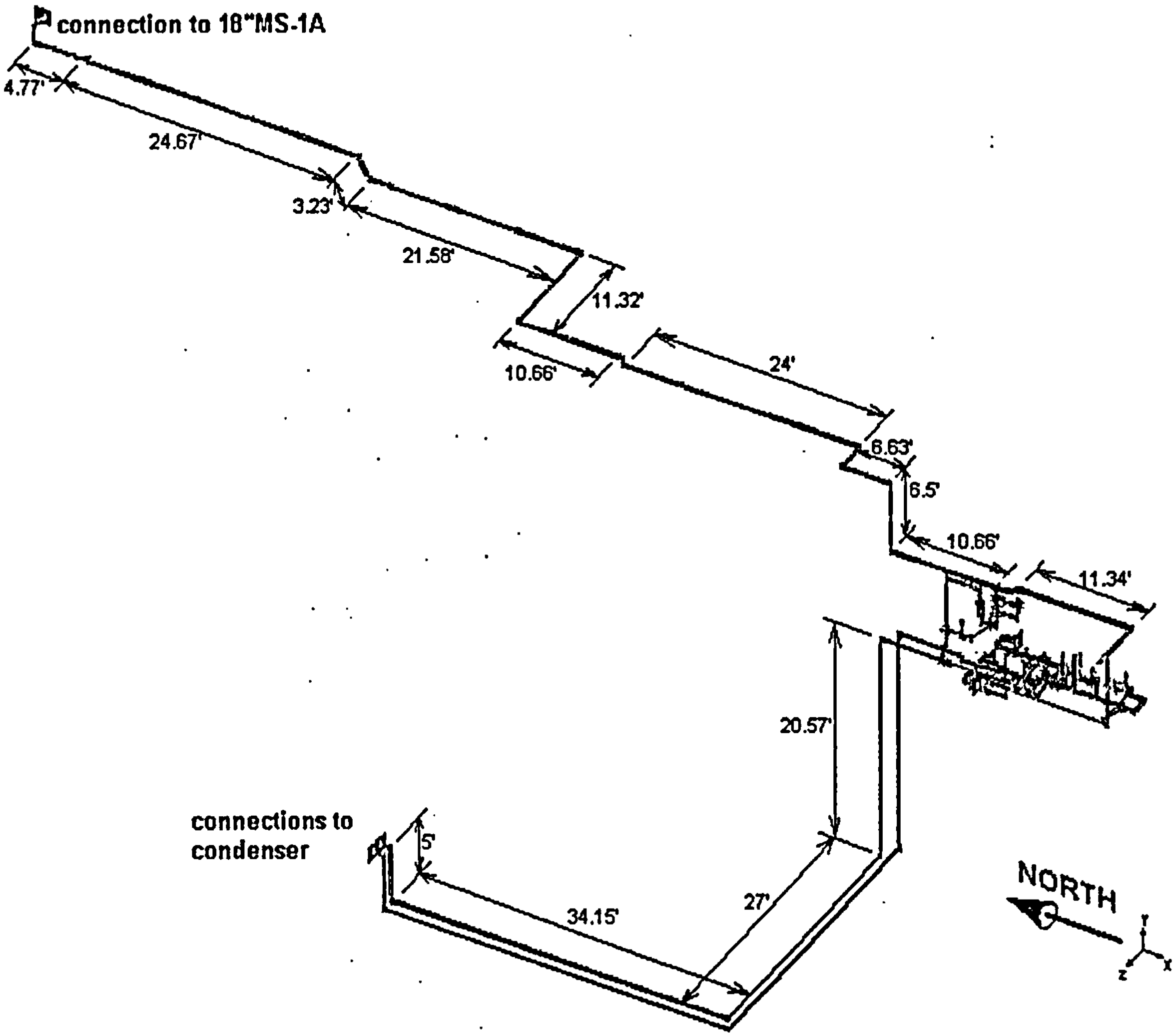


Figure Att.3-3: PATH 3 - Steam Jet Air Ejector (SJAE) supply line low point drain – PARTIAL ISO (at 18"MS-1A)

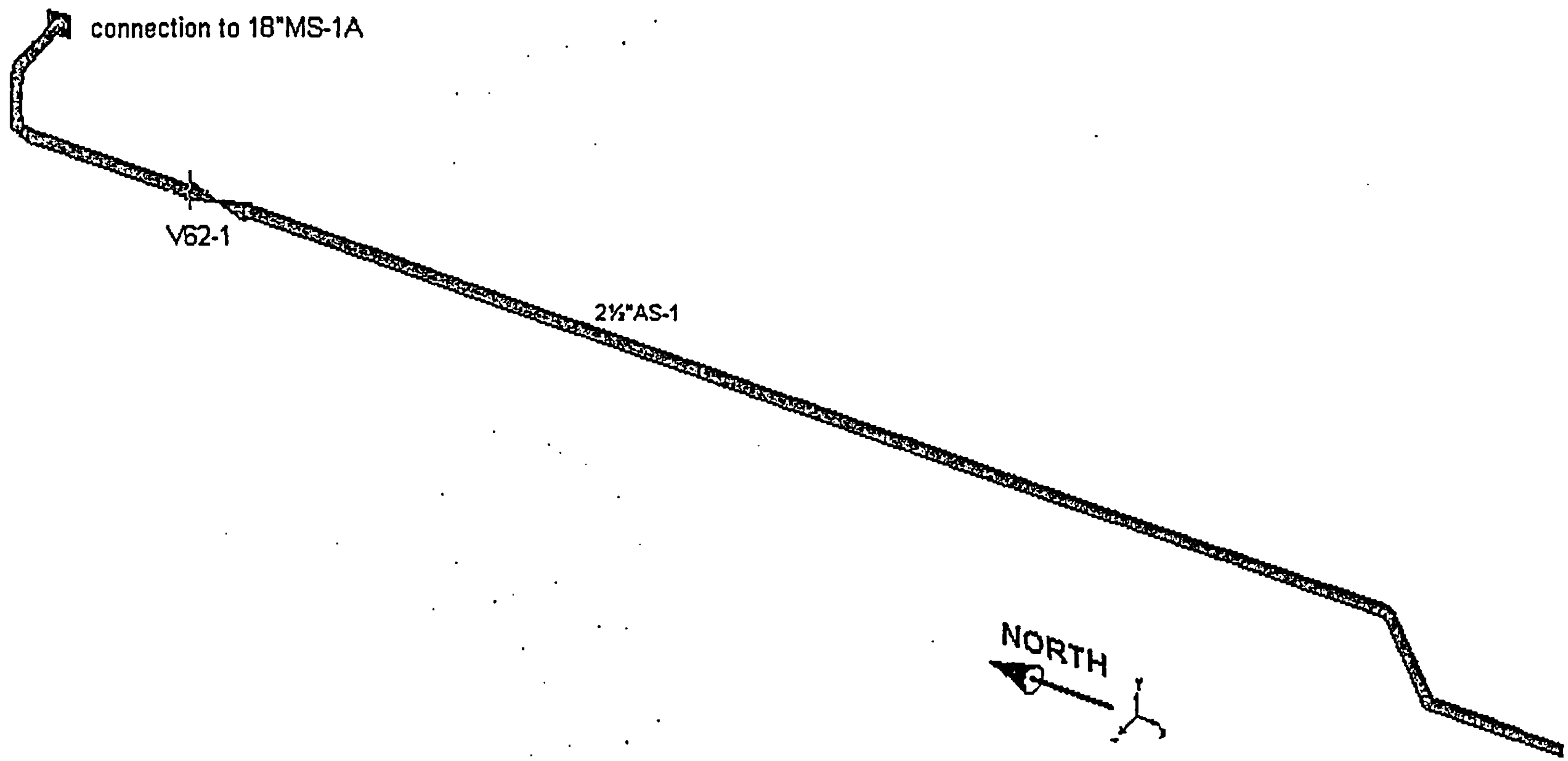


Figure Att.3-4: PATH 3 - Steam Jet Air Ejector (SJAE) supply line low point drain – PARTIAL ISO (continuation)

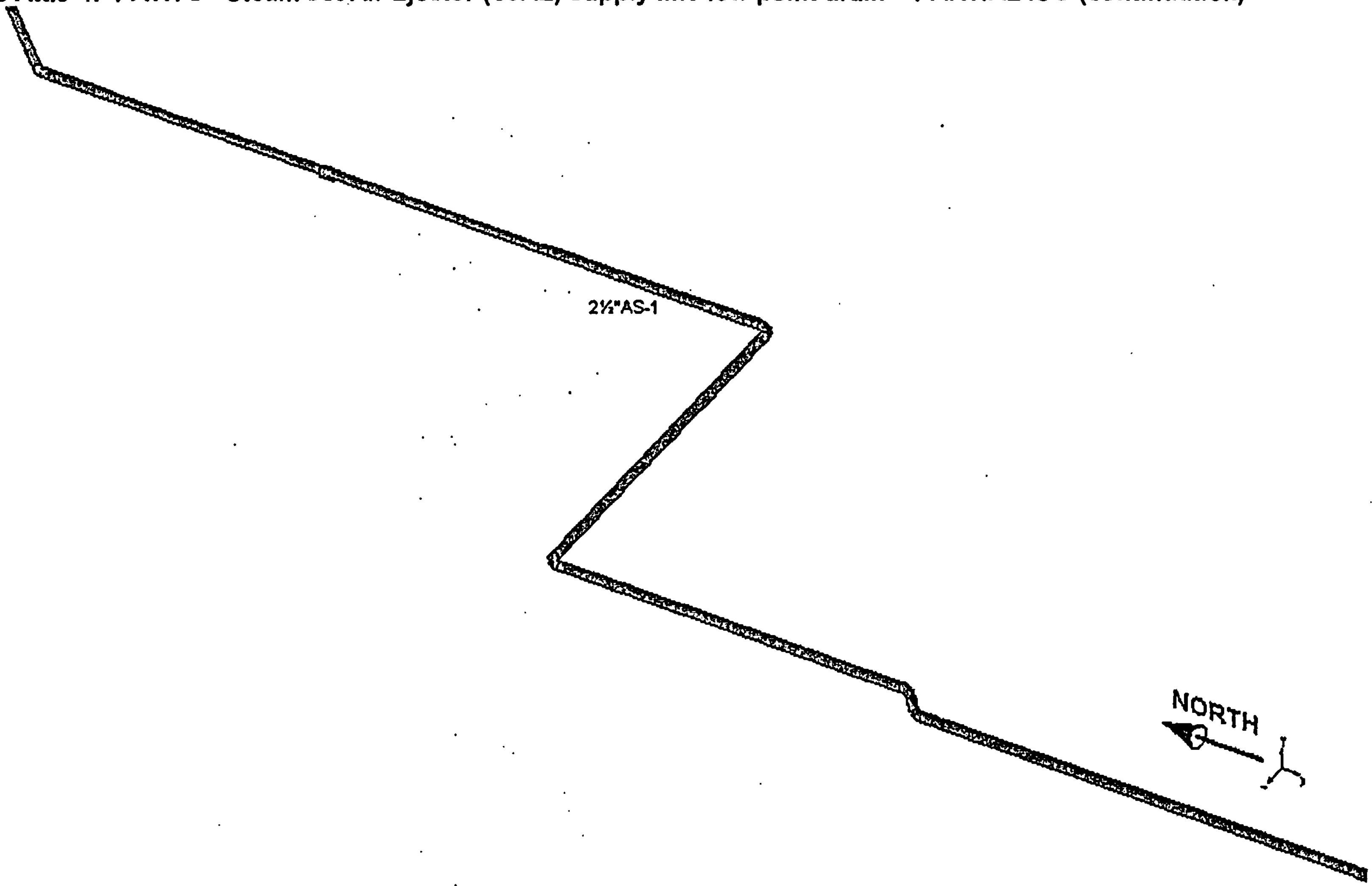


Figure Att.3-5: PATH 3 - Steam Jet Air Ejector (SJAE) supply line low point drain – PARTIAL ISO (start of SJAE manifold)

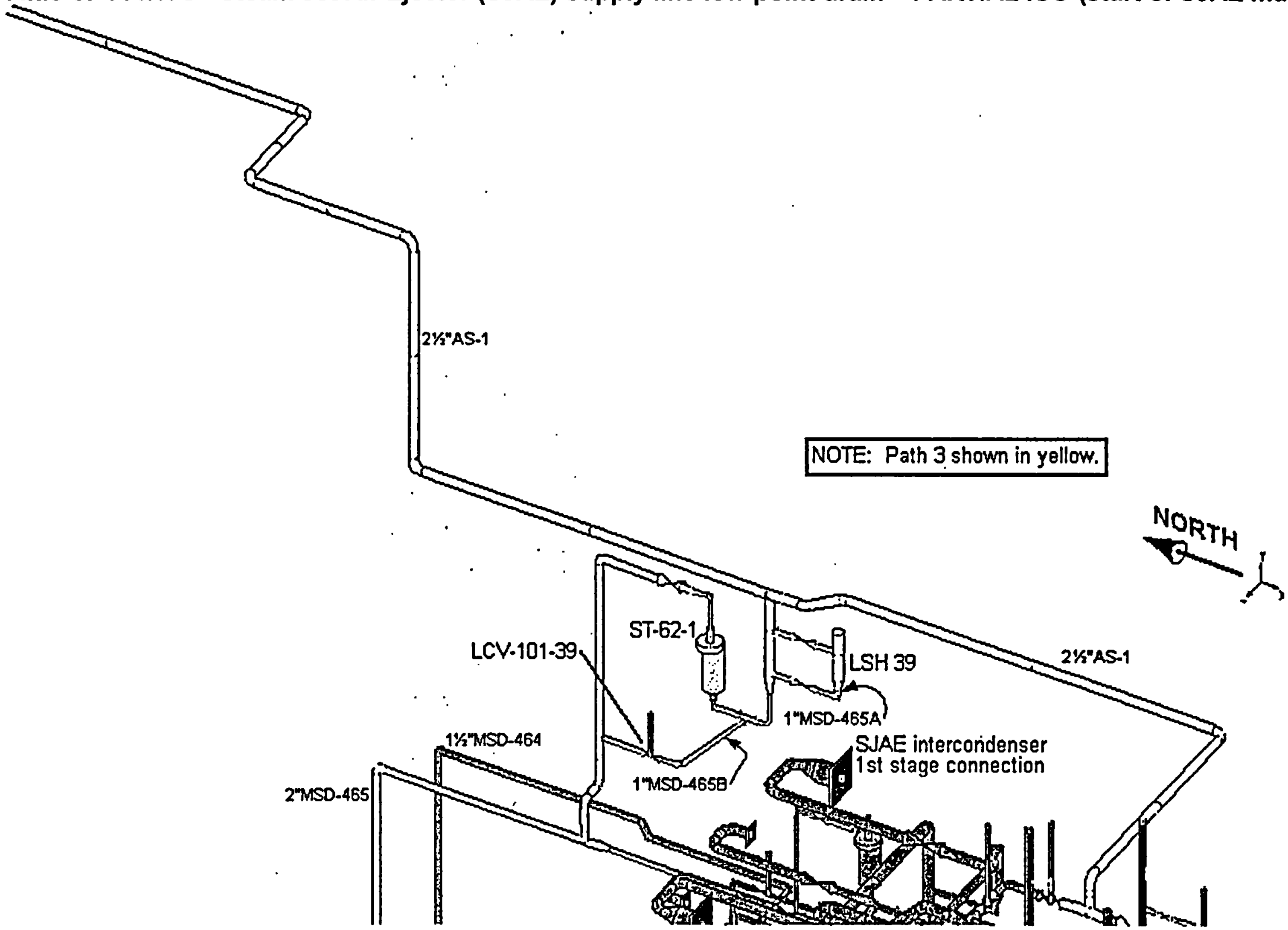


Figure Att.3-6: PATH 3 - Steam Jet Air Ejector (SJAE) supply line low point drain – PARTIAL ISO (SJAE manifold)

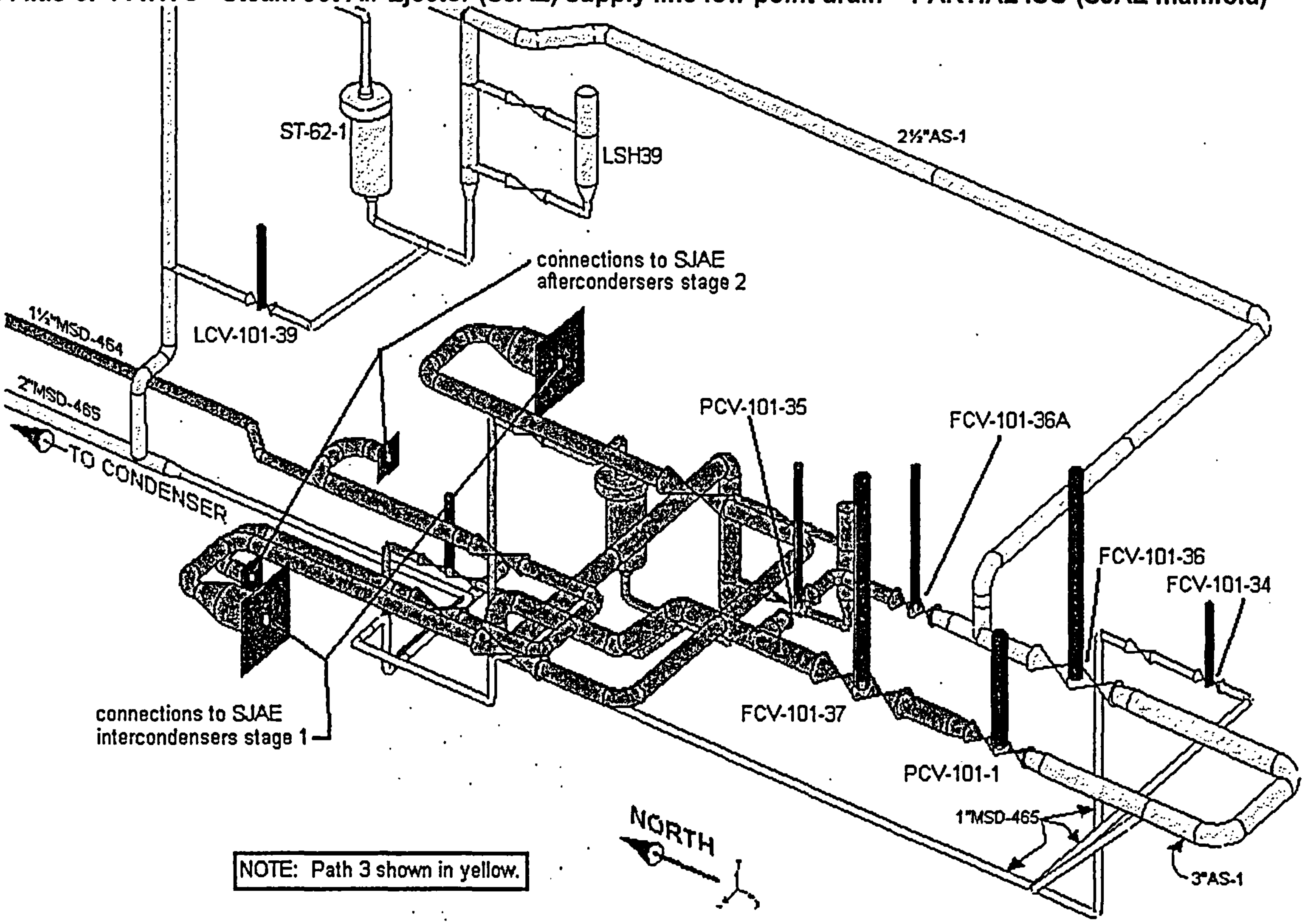
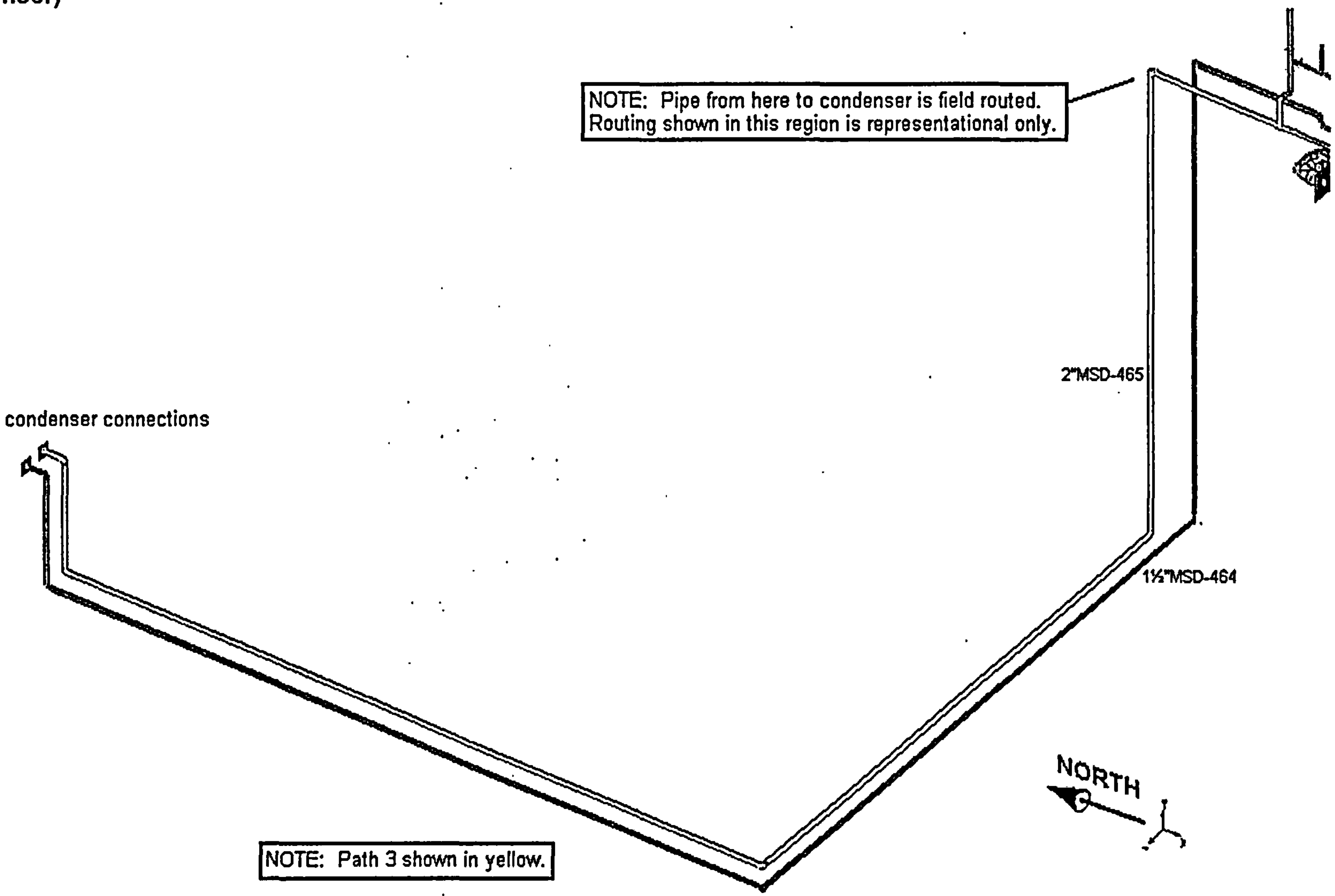


Figure Att.3-7: PATH 3 - Steam Jet Air Ejector (SJAE) supply line low point drain – PARTIAL ISO (SJAE manifold to condenser)



Attachment 4

Walkdown Information for Boundary Piping 4

AOG Steam Supply (Boundary)

(15 pp including this page)

4-1 Piping Description

Boundary 4 – This seismic boundary piping involves the advanced off gas (AOG) steam supply system. The boundary is at valves PRV-OG-834A and B, which are air operated valves arranged in parallel that fail to a closed position on loss of air or power. The piping path extends from a 2" connection on main steam line 18"MS-1B through open manual valve OG-9072 and motor operated valve OG-9060 up to the steam reducing station that includes 2" valves PRV-OG-834A and B. A ¾" drain line takes off from just upstream of the steam reducing station, passing through steam trap MS-113-1A, and then extending up to a connection to line 3"MSD-4 (see Path 2 discussion), just prior to condenser connection #47. A new check valve will be added to a branch piping line ¾"-MS-189-D3 near the connection to 3" MSD-4 piping, to isolate this path to AOG. All the Boundary 4 piping is located in the Turbine Building. The extent of the piping is shown in Figure Att.4-1.

Walkdown Status: Piping to be walked down during RFO-24

4-2 Applicable Drawings

Type	Number	Reference
P&ID	G191156, 33600-A217	14, 7.1, 7.3
Piping Drawings	TB Hanger Locations Sht 2, 33600-A-13012, 33600-A-13016	14, 8.8, 8.9,
Piping Isometric Drawings & Pipe supports	5920-12723, 5920-12724 33600-A13512, 33600-A13516, 33600-A18507, 33600-A18508	14,
Equipment Drawings	OG-9068: 5920-6653, EMPAC DATA PRV-OG-834A, 834B, MS-113-1A, MS-115-1A	14..
Active Valve Drawings	see above	14, 11.9
Is line seismically analyzed?	No	

4-3 Active Valve Discussion

The active valves within this boundary are considered as PRV-OG-834A and PRV-OG-834B. These valves are screened using Reference 6 methods. The valves are shown

in the Reference 11.9 information. Based on the available information, the offset length (valve centerline to top of actuator) is 35.3", which is within screening guidelines of Figure B.7-3 of reference 6. The remaining Reference 6 caveats for this class of equipment, will be addressed during the walkdown. Valves will be walked down during RFO-24. AOV diaphragm design uses air to open, fail to close position on loss of air, based on spring return. The fail-safe position for the valves is closed. Ref. 2 determines these valves will close on loss of power to the solenoid.

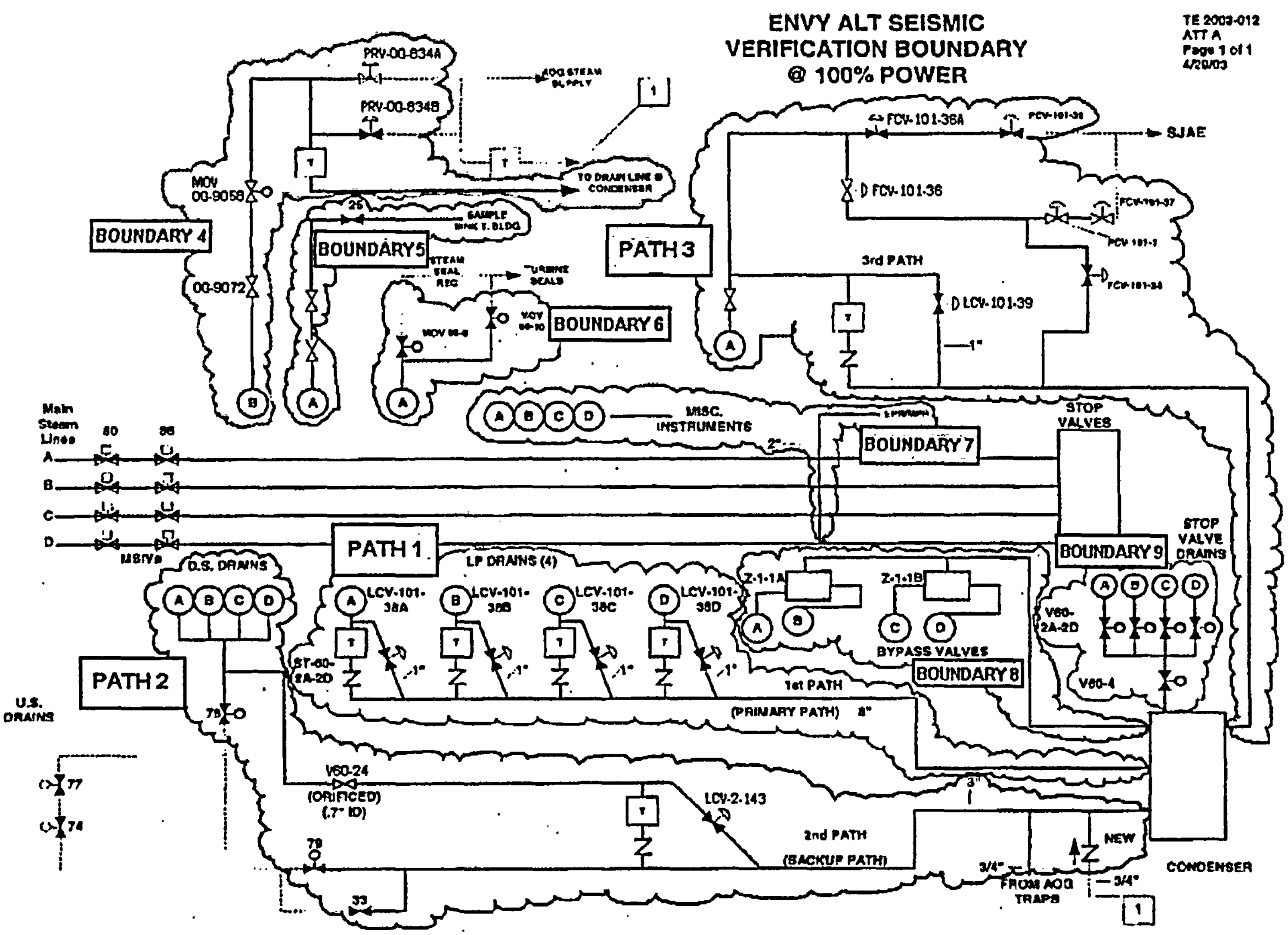


Figure Att.4-1: Boundary 4 Piping Definition

Figure Att.4-2: Boundary 4 – AOG Steam Supply – Full Iso

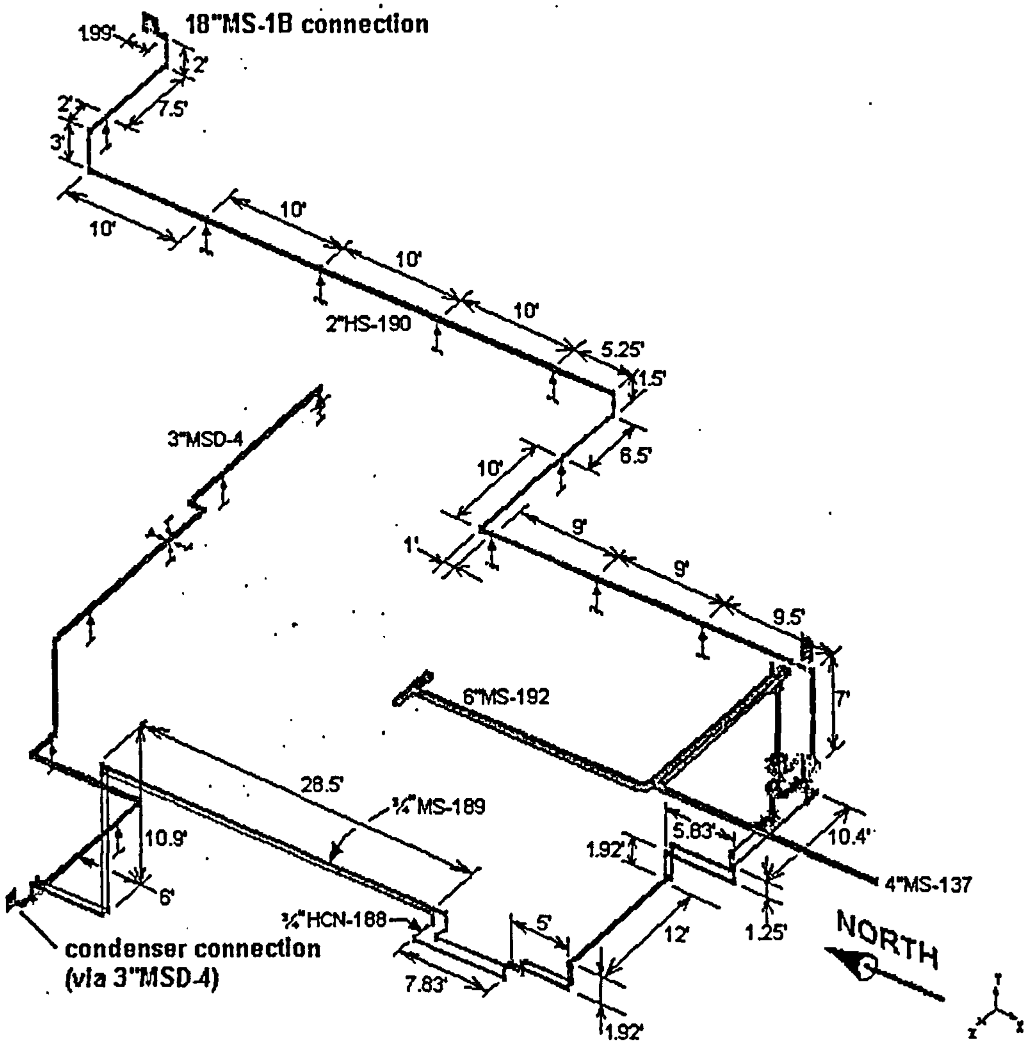


Figure Att.4-3: Boundary 4 – AOG Steam Supply – Partial Iso (at 18"MS-1B connection)

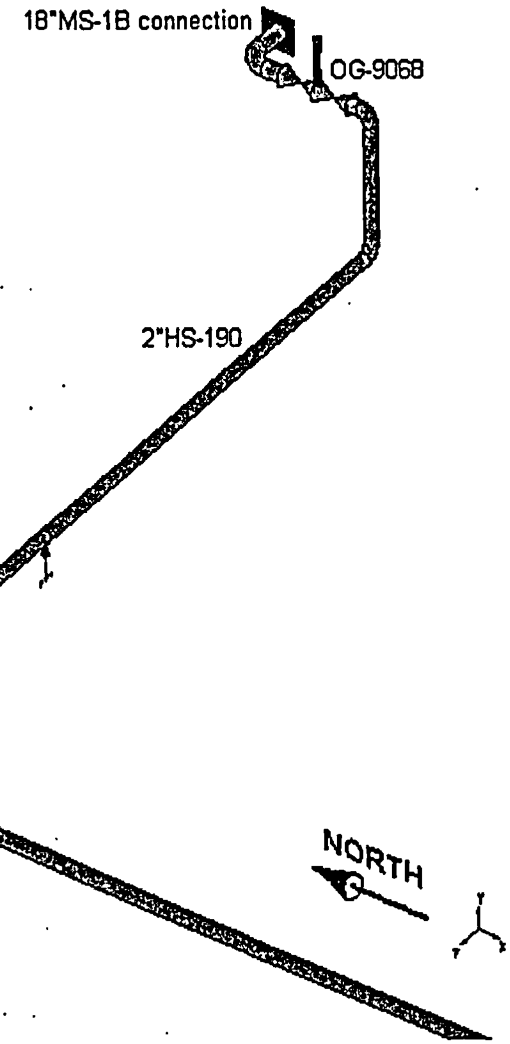


Figure Att.4-4: Boundary 4 – AOG Steam Supply – Partial Iso (continuation)

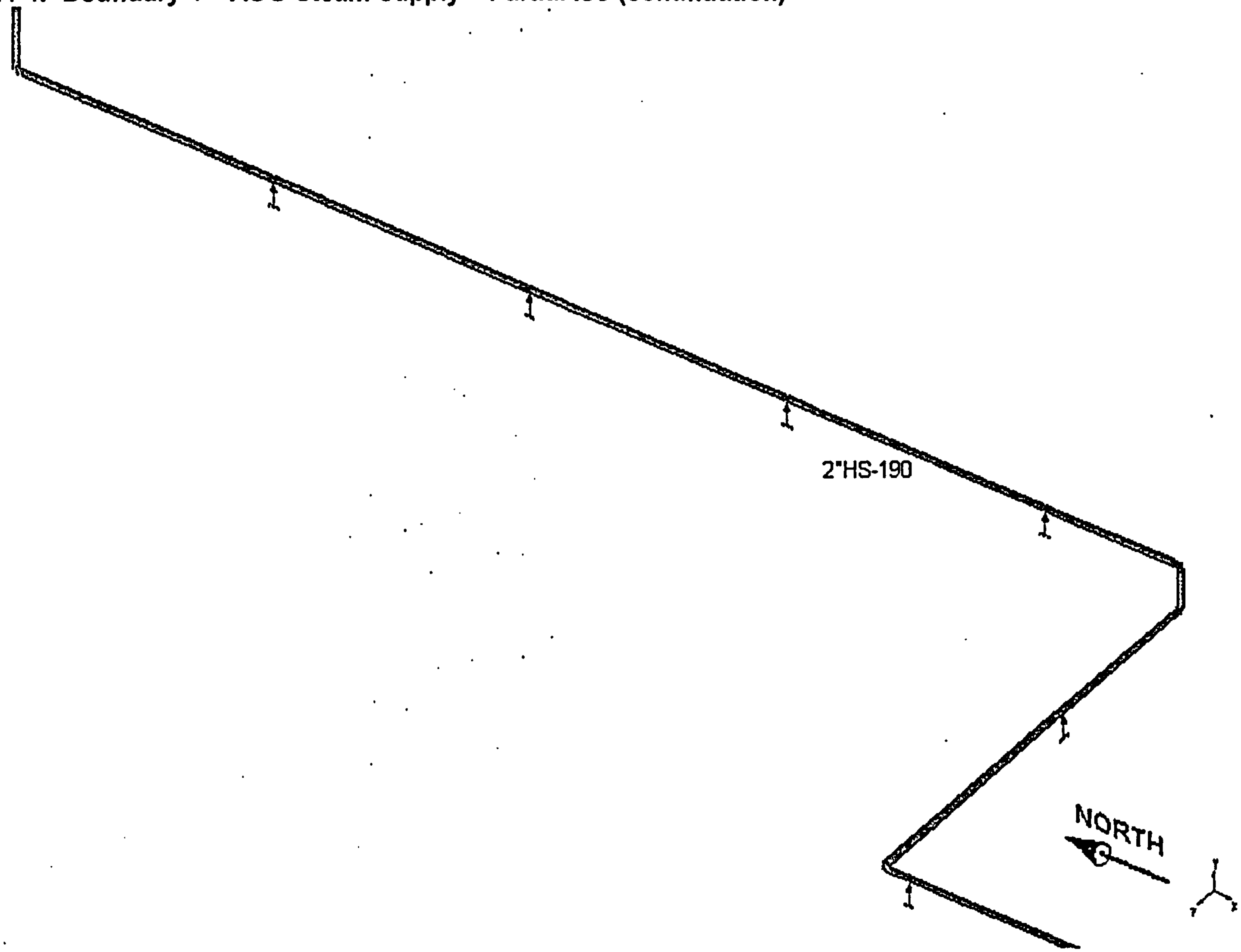


Figure Att.4-5: Boundary 4 – AOG Steam Supply – Partial Iso (region around steam reducing station)

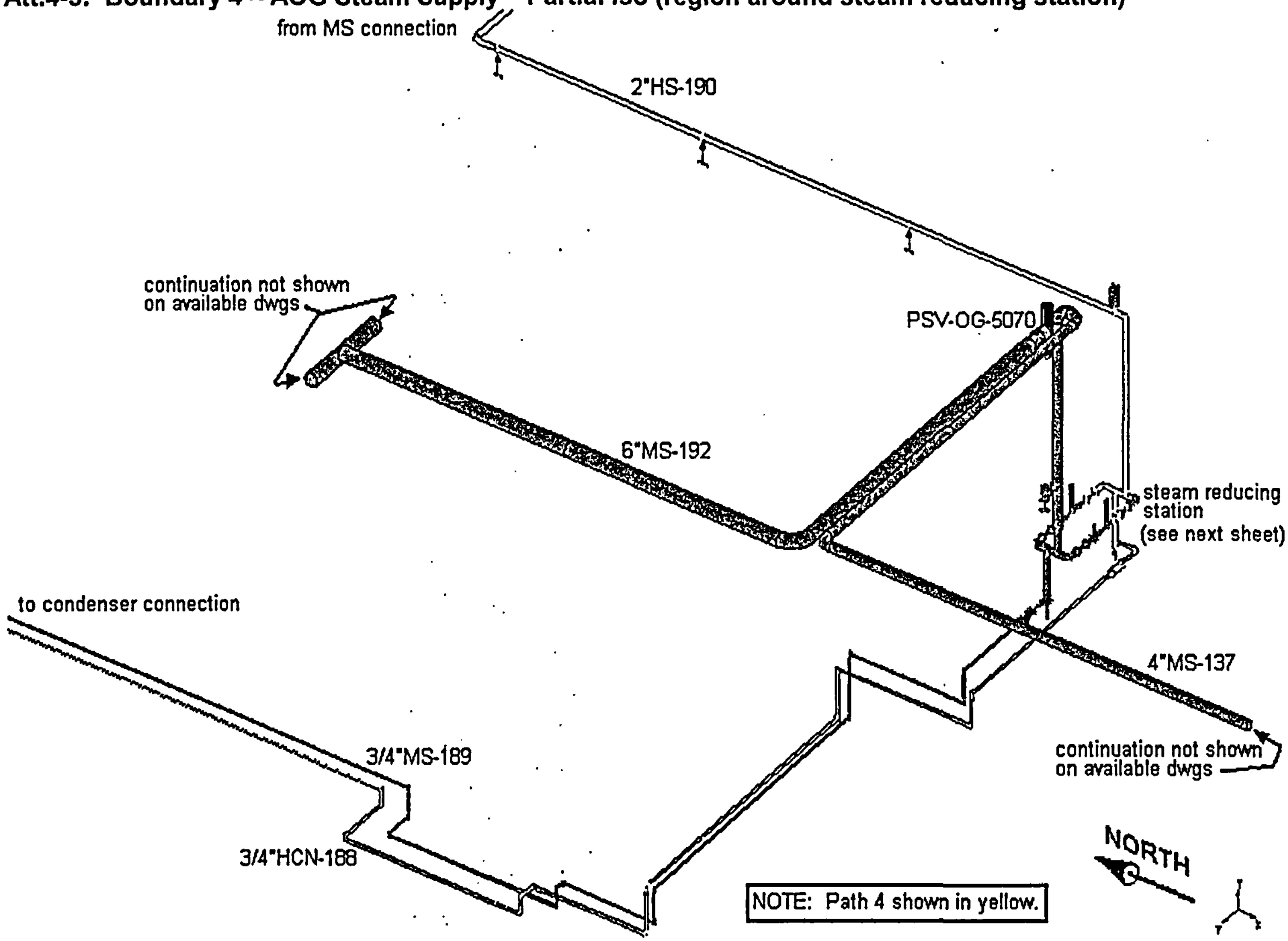


Figure Att.4-6: Boundary 4 – AOG Steam Supply – Partial Iso (steam reducing station)

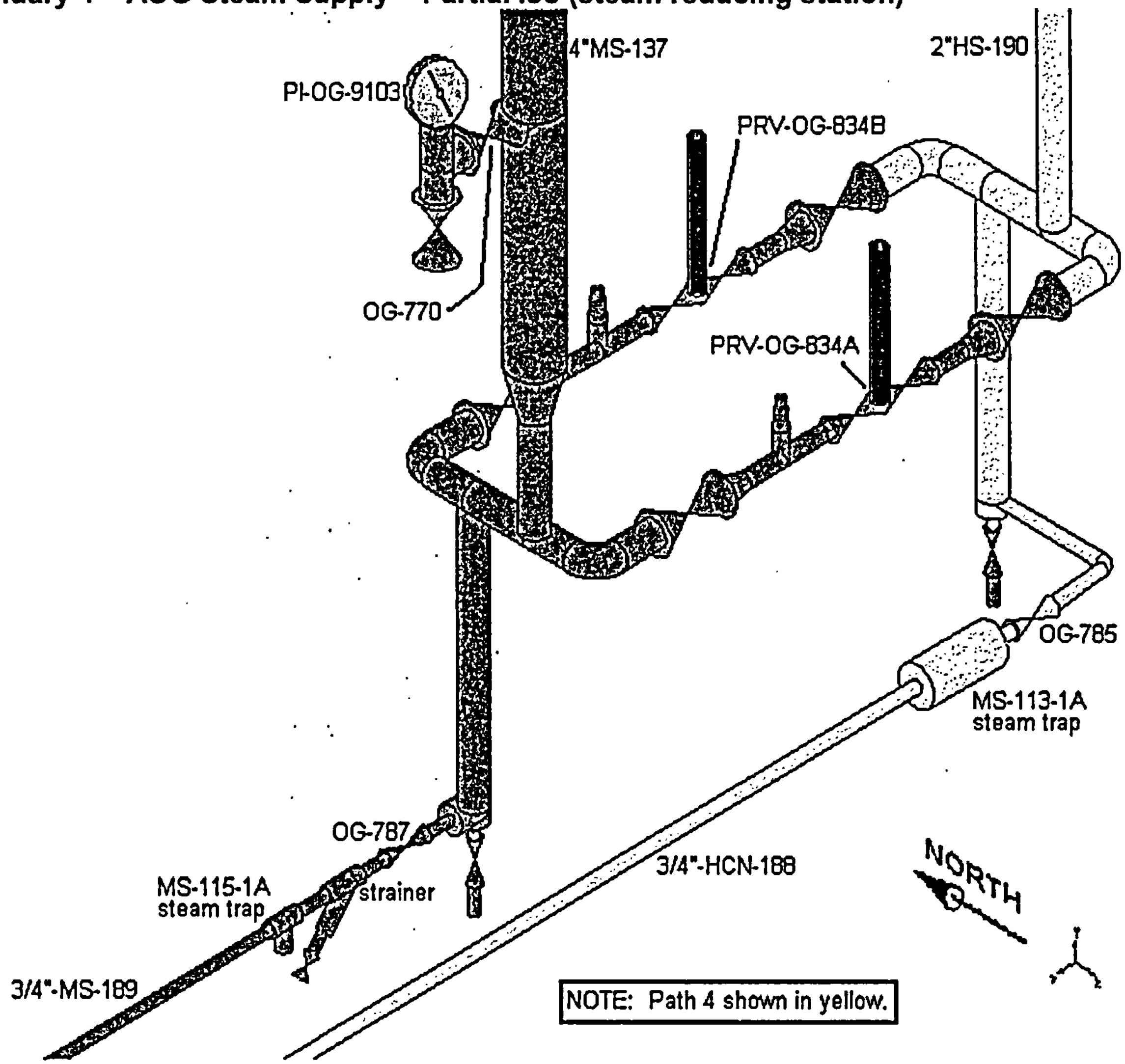


Figure Att.4-7: Boundary 4 – AOG Steam Supply – Partial Iso (relief valve above steam reducing station – reverse view)

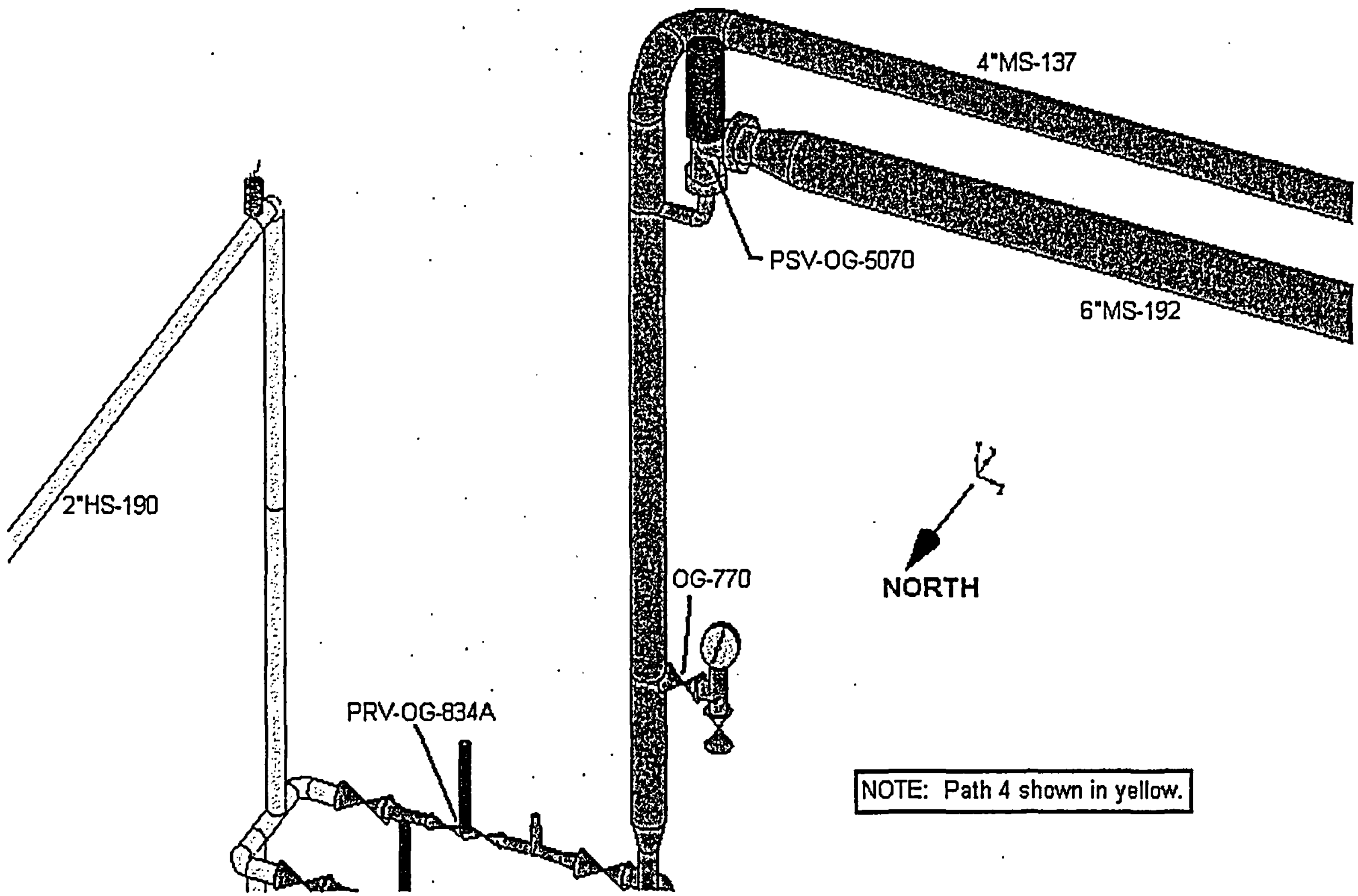


Figure Att.4-8: Boundary 4 – AOG Steam Supply – Partial Iso (downstream of steam reducing station)

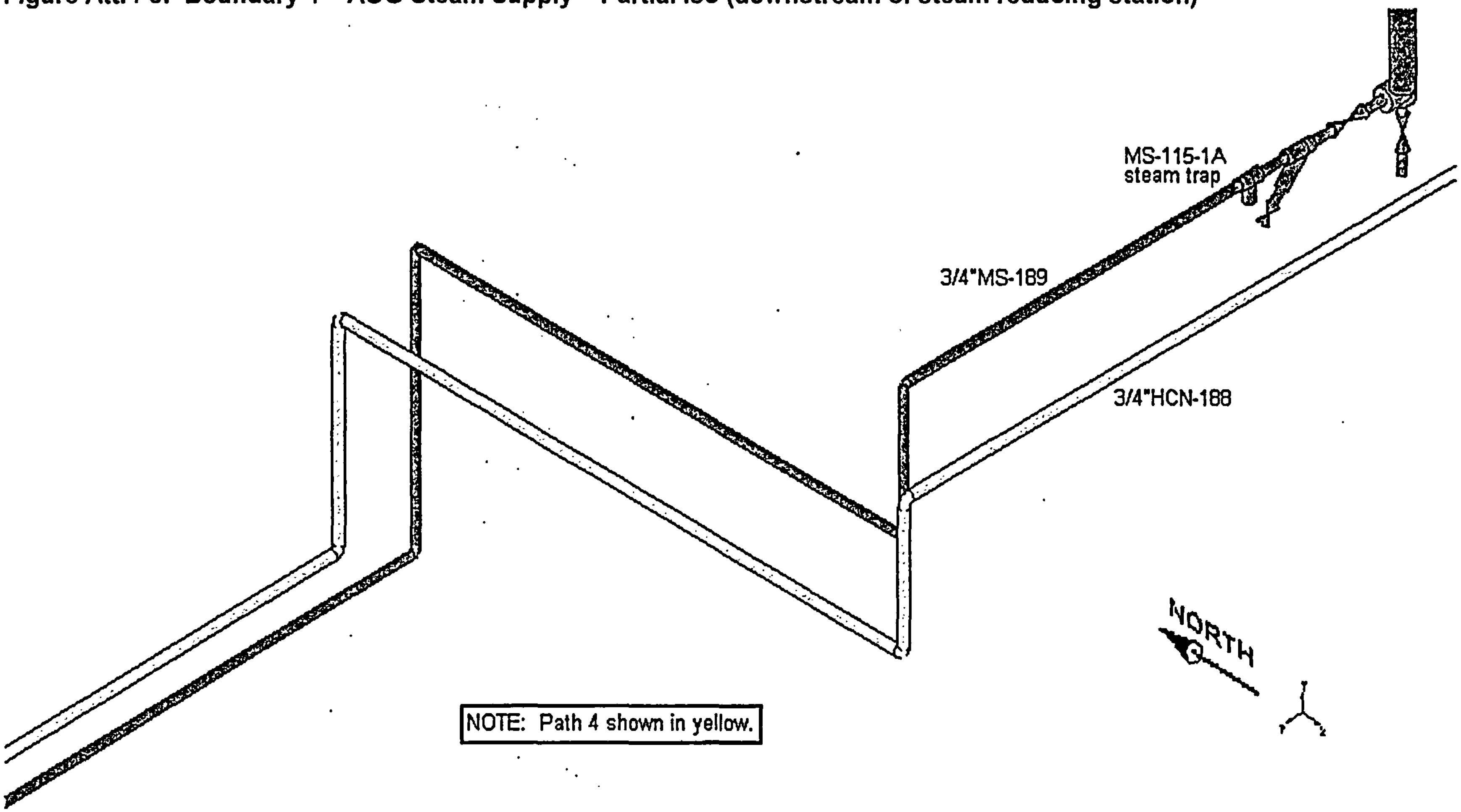


Figure Att.4-9: Boundary 4 – AOG Steam Supply – Partial Iso (downstream of steam reducing station – continuation)

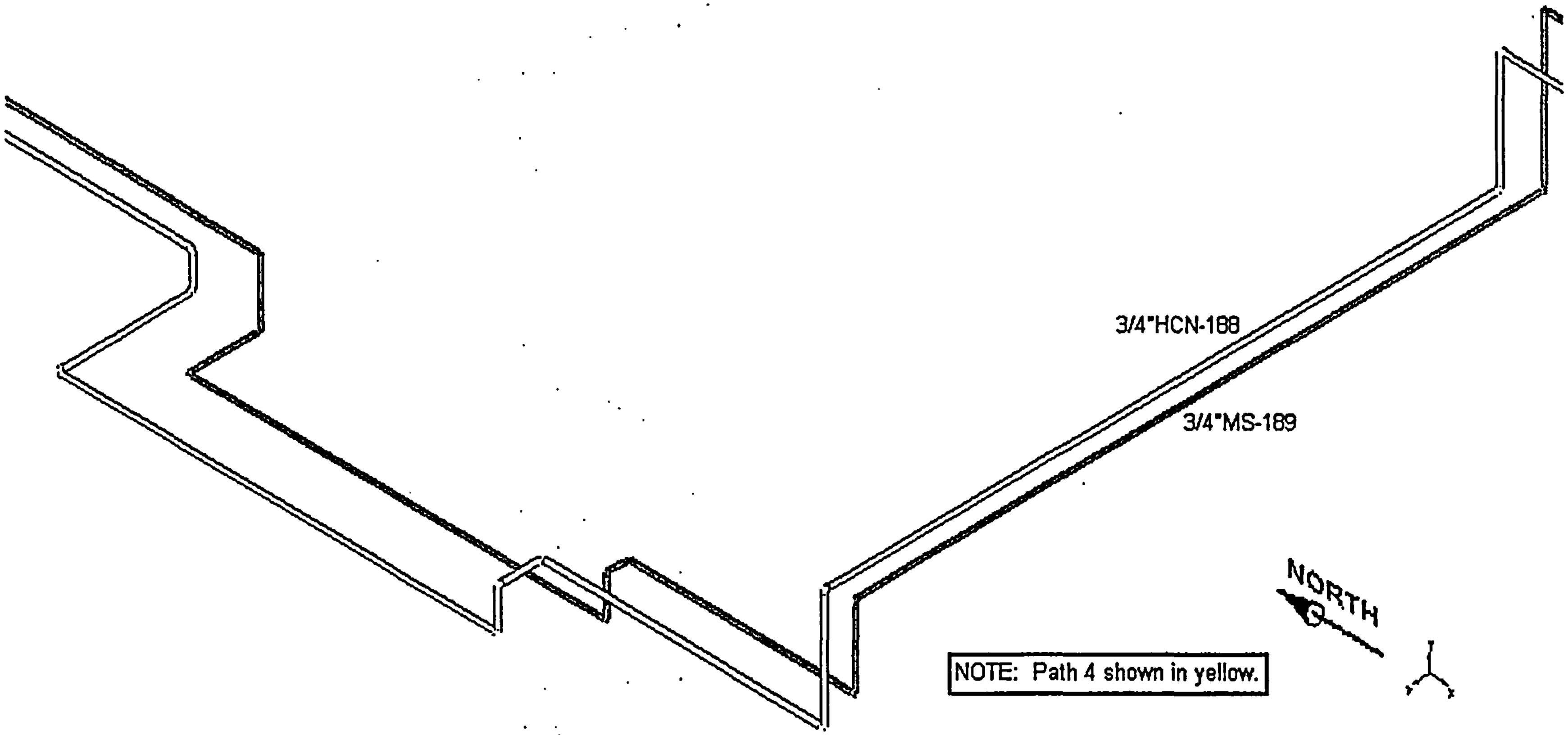


Figure Att.4-10: Boundary 4 – AOG Steam Supply – Partial Iso (downstream of steam reducing station – continuation)

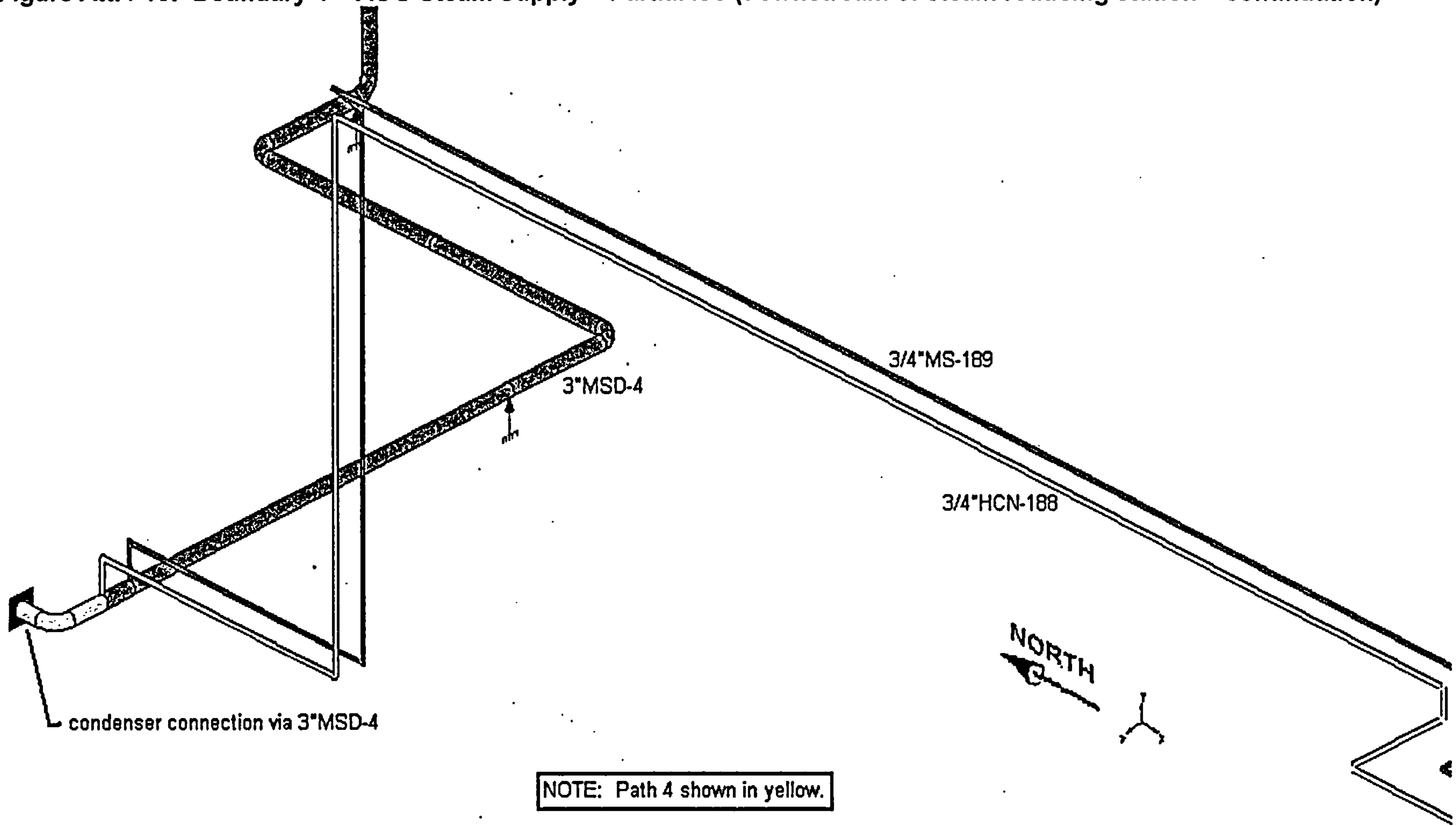
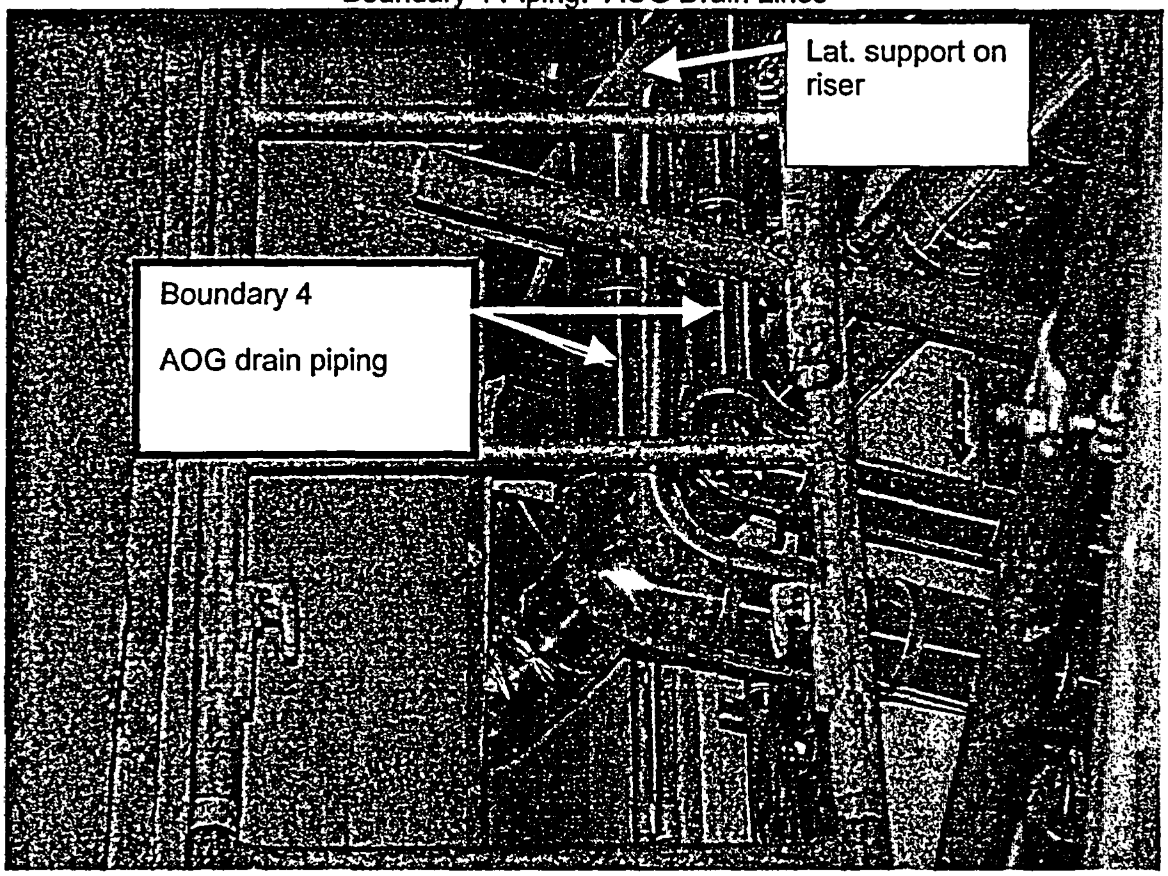


Figure Att.4-11:

Boundary 4 Piping: AOG Drain Lines



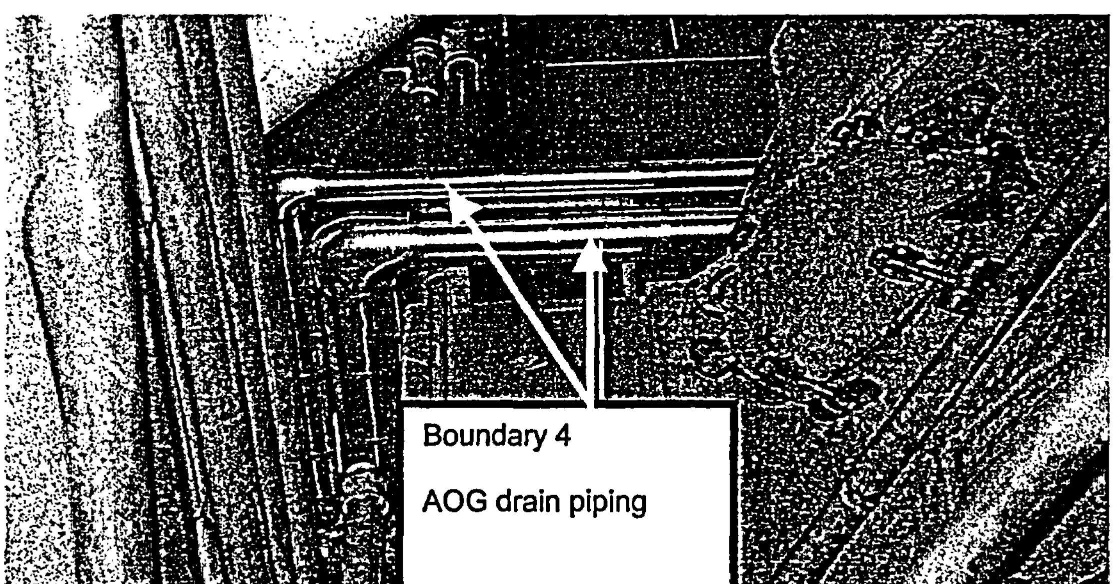
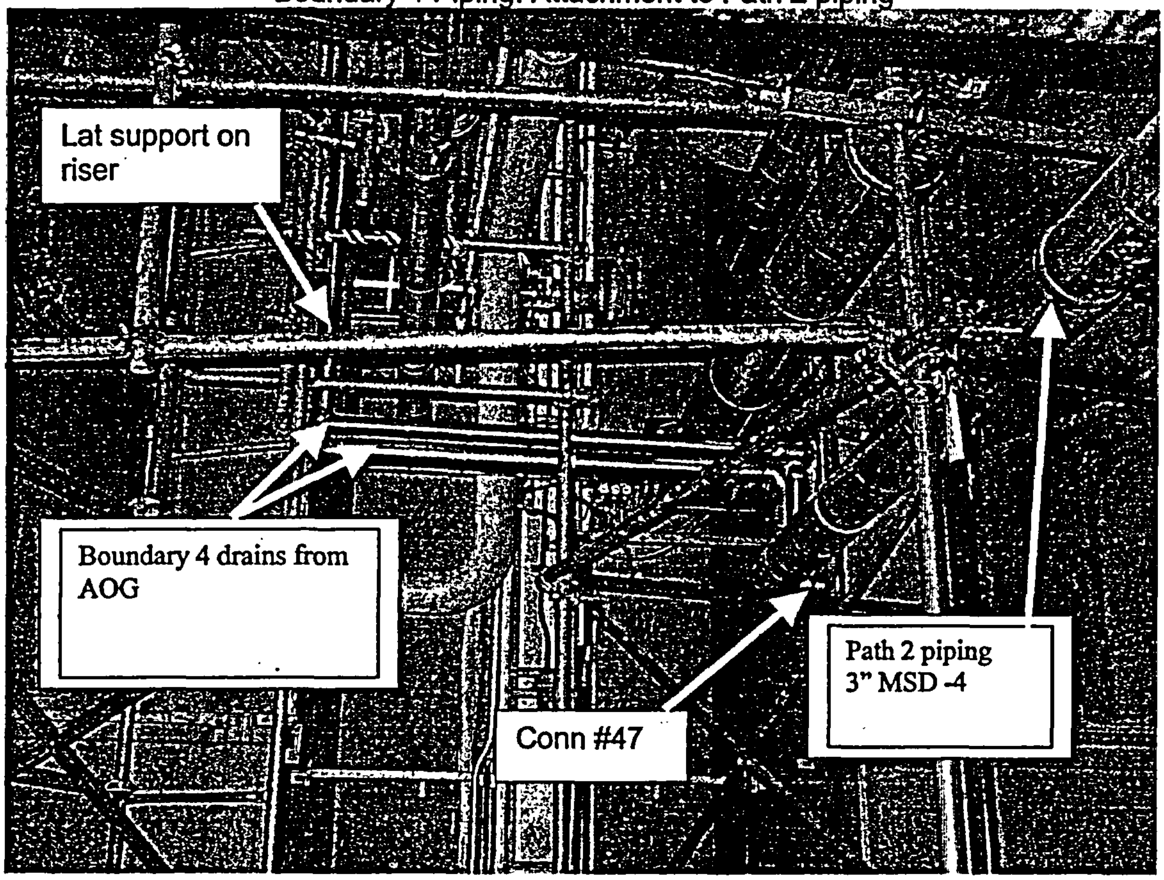


Figure Att.4-12:

Boundary 4 Piping: Attachment to Path 2 piping



Attachment 5

Walkdown Information for Boundary Piping 5

. Main Steam Sample Lines (Boundary)

(12 pp including this page)

5-1 Piping Description

Boundary 5 – This seismic boundary piping involves the main steam sample lines that connect to each of the four main steam headers. These lines do not require active isolation since they are closed systems and entirely within the seismic boundary. There are a pair of ¾" lines connected to each header and also tubing to the sample sink. The distance to the second isolation valve in each case is short. All the lines are located in the Turbine Building. The extent of the piping is shown in Figure Att.5-1.

Walkdown Status: Portion of the tubing at sample sink was walked down in June of 2003. Remainder of tubing/piping to be walked down during RFO-24

5-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156, G-191164, A-217	14, 7.1, 7.2, 7.3
Piping Drawings	G-191182, G-191183	14, 8.3, 8.4
Piping Isometric Drawings & Pipe Supports	5920-FS-I1 (Notes 1 & 2)	14, 10.11
Equipment Drawings	TB sample panel 5920-4274	14,
Active Valve Drawings	No	
Is line seismically analyzed ?	No	

Notes:

1. Drwg. For Information Only. Shows location of ¾" diameter taps off lines 18" MS-1A through 1D.
2. No support drwgs. Field run tubing

5-3 Active Valve Discussion

None

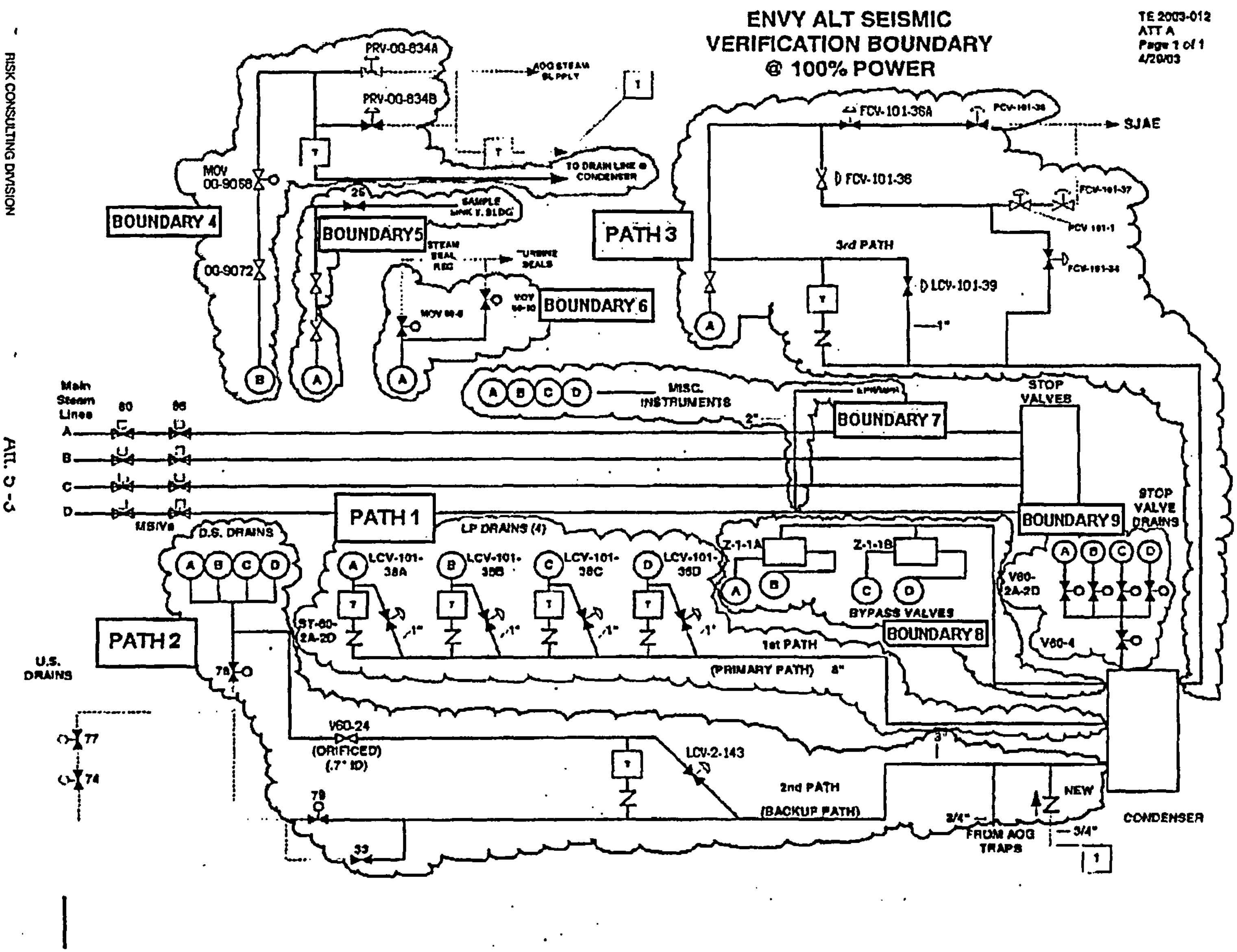


Figure Att.5-1: Boundary 5 Piping Definition

Figure Att.5-2

Boundary 5 – HVAC Duct above Sample Sink

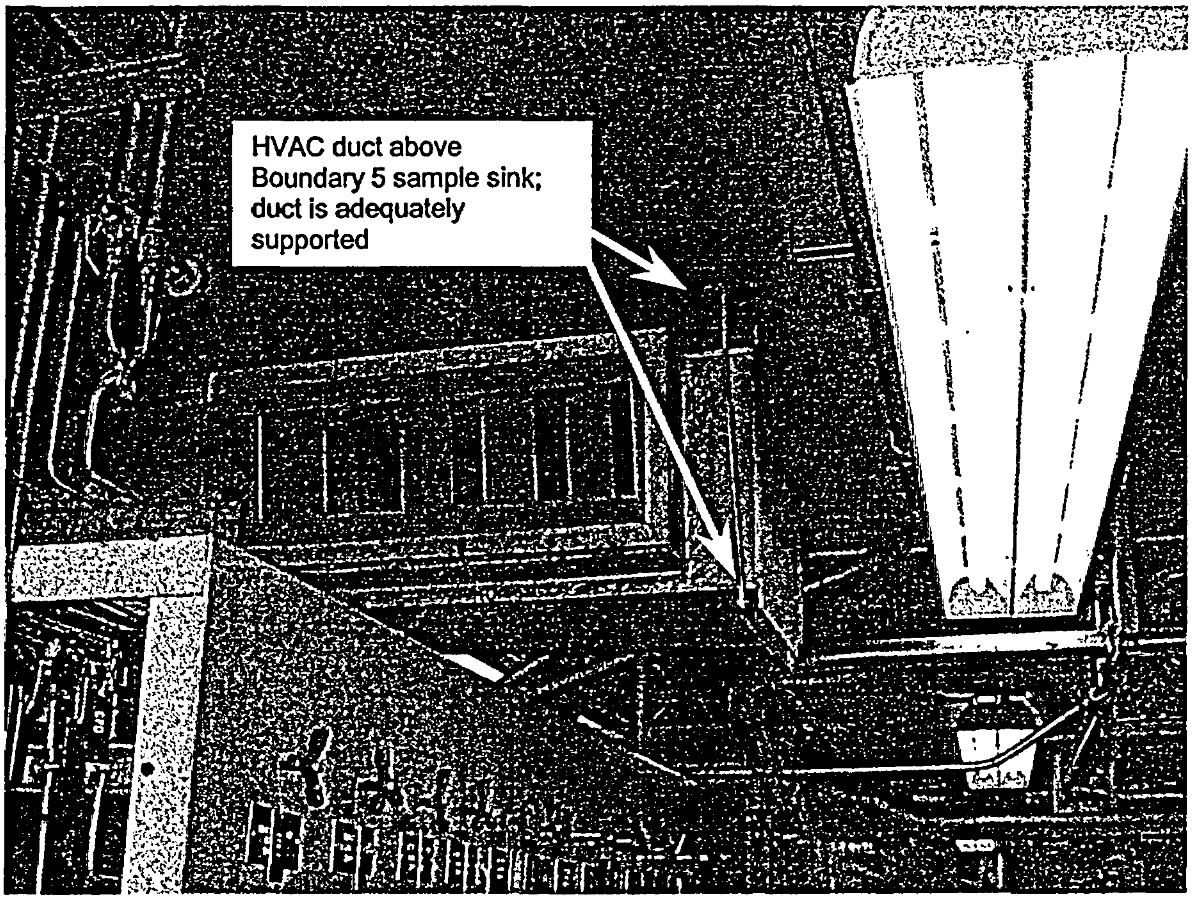


Figure Att.5-3

Boundary 5 – Instrument Sample Rack

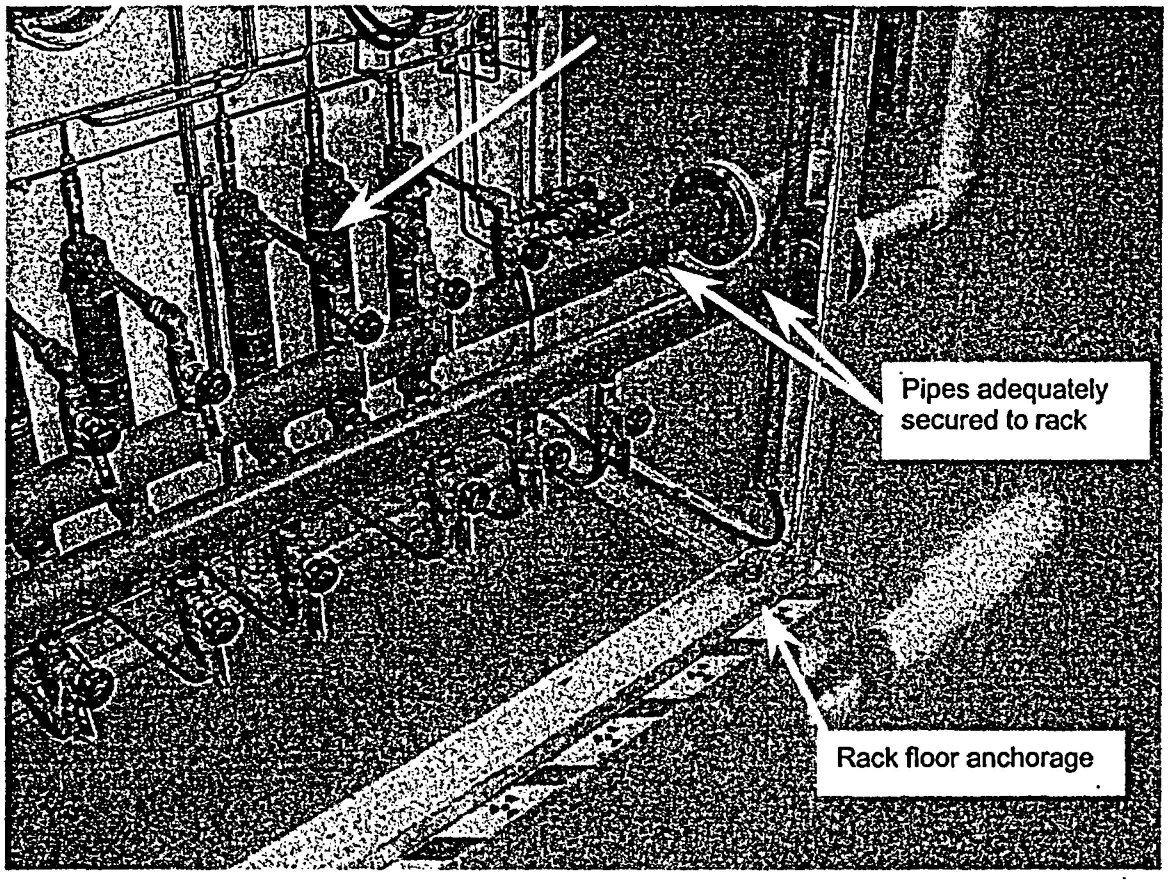


Figure Att.5-4

Boundary 5 – Instrument Sample Sink Backside

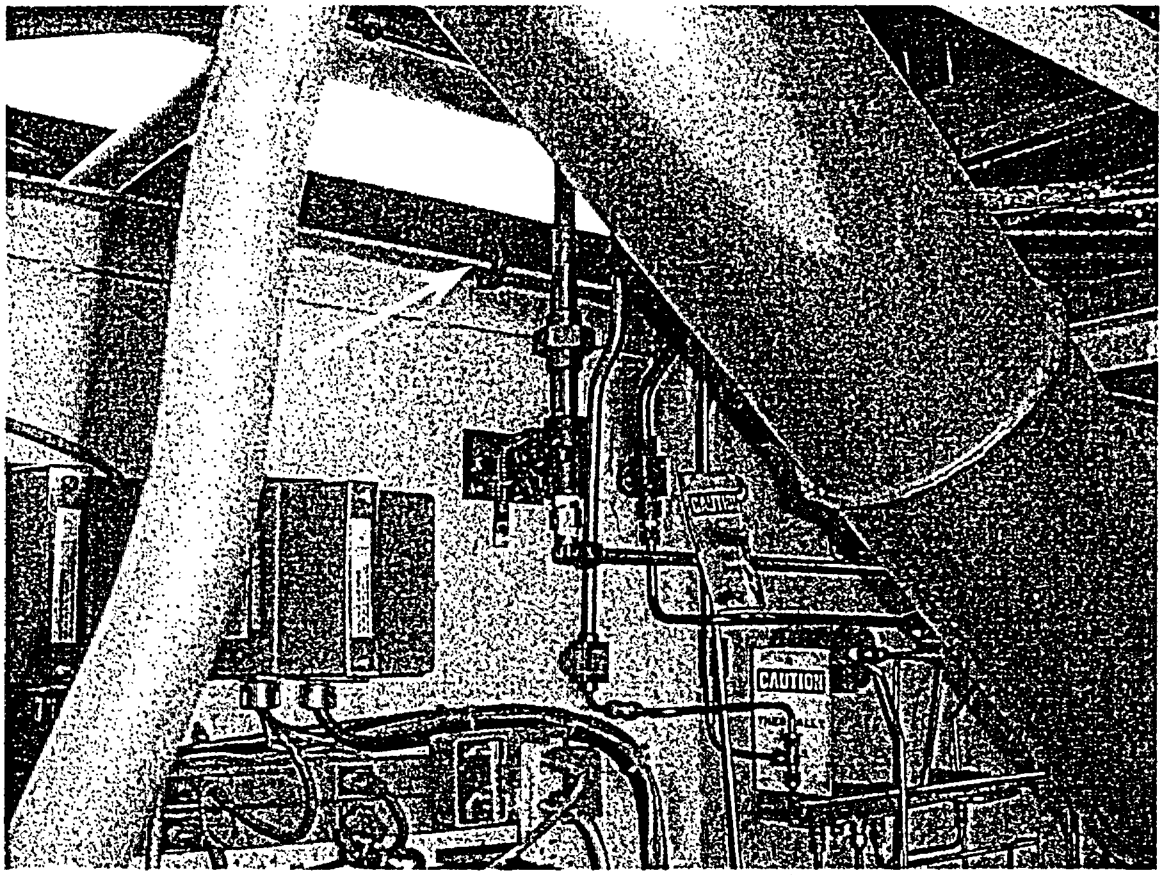
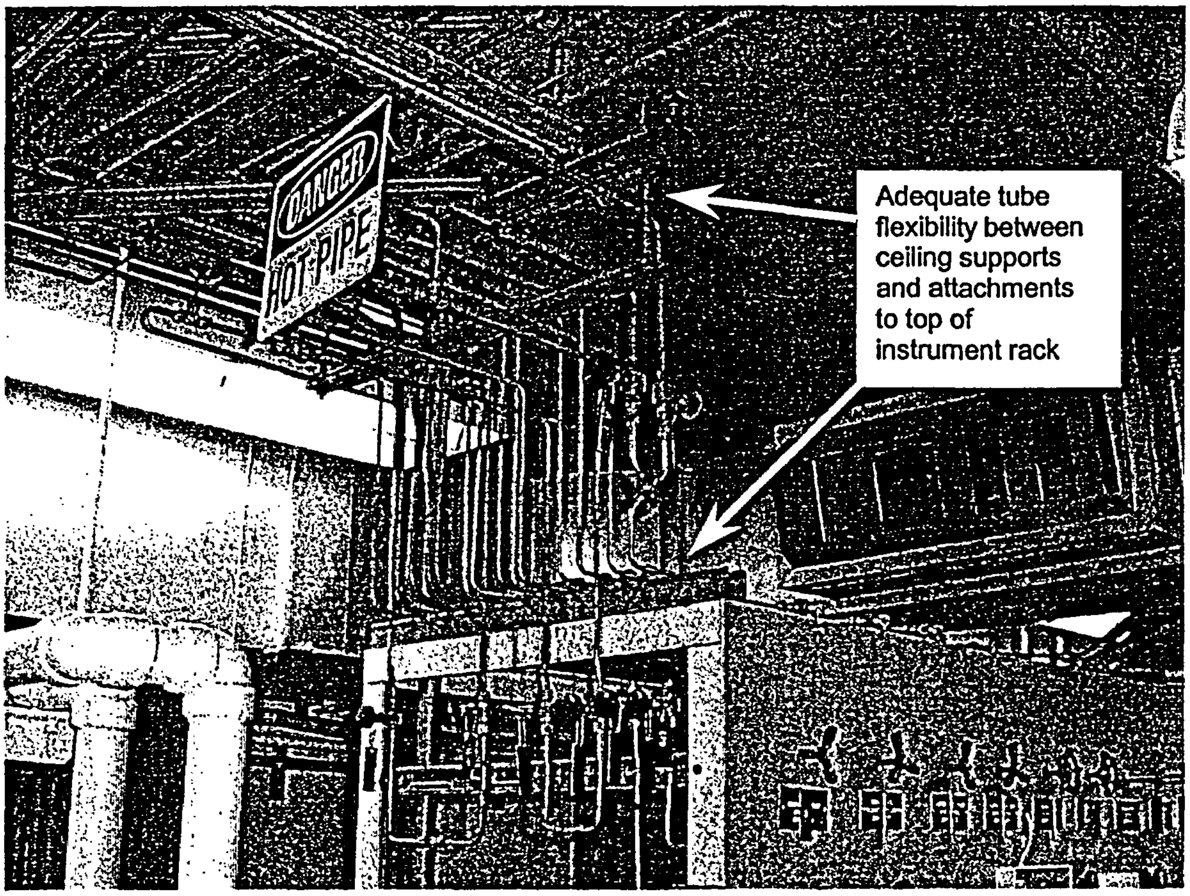


Figure Att.5-5

Boundary 5 – Instrument Sample Sink Anchorage Detail on Floor

Figure Att.5-6

Boundary 5 – Instrument Sample Sink Tube Runs Connecting to Rack



1173875-R-002, R0
ATT. 5. SHT. 9

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June 12, 2003
Page A11 of 12

BOUND. 5

WALKDOWN DATA SHEET

SHEET 1 OF 4

TURBINE BUILDING EL 237'

Equipment ID No. SAMPLE SINK Equip. Class Instruments on Racks

Equipment Description SAMPLE SINK FOR MS SAMPLE 37

Equipment Location: Bldg. TURBINE (NW END) Floor El. 237' Room, Row/Col ____

Manufacturer, Model, Etc. N/A

Drawing No. 5920-4274

Functionality Requirement

1. Function Required RACK MUST MAINTAIN SUPPORT OF MS SAMPLE 37 VALVE AND SAMPLE TUBING (FOR PRESSURE BOUNDARY) — (Y) N U

Review Criteria

1.	Is instrument rack of good seismic design for function above (mounting details, load paths, steel frame and sheet metal structurally adequate, etc.)	(Y)	N	U	N/A	NOTES 1, 2
2.	No other instrument rack concerns	(Y)	N			
	Are the criteria met?	(Y)	N	U	N/A	

Anchorage

1.	Does strength appear adequate	(Y)	N	U	N/A	
2.	Does stiffness appear adequate	(Y)	N	U	N/A	
3.	No other concerns	(Y)	N		N/A	
4.	Prepare and attach a sketch	Y	N		(N/A)	
	Are anchorages adequate based on judgment	(Y)	N	U	NOTE 3	

Interaction Effects

1.	Vulnerable components free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A	
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A	
3.	No other concerns	(Y)	N			
	Is equipment free of interaction effects?	(Y)	N	U	NOTE 4	

Comments 1. RACK IS SEISMICALLY ADEQUATE. MS SAMPLE VALVE 37 IS MOUNTED TO FRONT PLATE OF RACK. 2. RACK IS MADE FROM STRUCTURAL CHANNELS AND PLATE (WELDED). (CONTINUED ON SH. 2)

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

WALKDOWN DATA SHEET

SHEET 2 OF 4

System MS SAMPLE

Equipment ID No. TURBINE BUILDING EL. 237' SAMPLE SINK Equip. Class Instruments on Racks

Comments/Outliers

3. BASE OF RACK IS ANCHORED WITH 6 1/2"Φ SHELL ANCHORS. ANCHORAGE IS JUDGED ADEQUATE DUE TO LIGHT WEIGHT OF RACK AND LIGHT WEIGHT OF COMPONENTS MOUNTED ON THE RACK (TUBING AND SMALL MANUAL VALVES).

4. CANTILEVER END OF OVERHEAD DUCT (OVER TOP OF SAMPLE SINK) IS ADEQUATELY SUPPORTED. END OF DUCT HAS A STRAP SUPPORT. PLATE ON END OF DUCT WILL PREVENT DUCT FROM FALLING OFF SUPPORT.

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ATT. 5 SH. 11

WALKDOWN DATA SHEET

BOUNDARY 5

SHEET 3 OF 4

System SAMPLE SINK

Equip. Class Piping and Tubing Systems Line Identifier INSTRUMENT TUBING FROM NORTH WALL OF CONDENSER BAY TO SAMPLE SINK

Bldg. TURBINE (N-W END) Floor El. 237'

P&ID No. 6 191167 Spec. No.

Isometric No.

Pipe/Tubing O.D. 1/2"φ Wall Thickness 0.065 (G191167)

Material STAINLESS STEEL, SWAGELOCK FITTINGS

Insulation Type/Thickness LINE TO SAMPLE SINK IS INSULATED WITH ALUMINUM JACKET

Piping System Boundary

Description TUBING RUNS FROM WALL PENETRATION TO SAMPLE SINK (SAMPLE 37)

Functionality Requirement

1. Pressure Boundary Integrity	(Y)	N	N/A

Review Criteria - Piping and Tubing

1.	No visible damage	(Y)	N	U	N/A
2.	No significant visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	(Y)	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing)	(Y)	N	U	N/A NOTE 1
5.	No unusual pipe or tubing attachments	(Y)	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	(Y)	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	Y	N	U	(N/A)
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	(Y)	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	(Y)	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing	(Y)	N	U	N/A
11.	No large eccentric masses	(Y)	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	(Y)	N	U	

Are the criteria met? (Y) N U

ABS Consulting

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ATT. 5 SH. 12

WALKDOWN DATA SHEET

BOUNDARY 5

SHEET 4 OF 4

System SAMPLE SINK Equip Class Piping and Tubing Systems

Line Identifier TUBING FROM N. WALL OF CONDENSER BAY TO SAMPLE SINK

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	(Y)	N	U	N/A
2.	No visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No unusual design	(Y)	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	(Y)	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	(Y)	N	U	N/A
6.	No visible damage	(Y)	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	(Y)	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	(Y)	N	U	N/A NOTE 2.
9.	Does the load path appear adequate	(Y)	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)	(Y)	N		

Are the above criteria met? (Y) N U

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	No other concerns	(Y)	N	U	N/A

Is equipment free of interaction effects? (Y) N U

Is the piping/tubing system seismically adequate? (Y) N U

Comments 1. MAX. TUBING SPAN IS APPX. 4'

2. TUBING IS SUPPORTED BY CLAMPS ATTACHED TO P1001 MEMBERS. P1001 MEMBERS HAVE SMALL CLIP ANGLES WELDED TO ENDS. CLIPS ARE BOLTED TO CONCRETE WITH 1/4"Φ BOLTS. BOLTS ARE EITHER WEDGE ANCHORS OR SHOT-IN ANCHORS. ANCHORS JUDGED ADEQUATE DUE TO LIGHT LOADS AND RANDOM FIELD TUG TESTS (SIMILAR TO CONDUIT TUG TEST IN GIP).

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

Attachment 6

Walkdown Information for Boundary Piping 6

Turbine Steam Seal System (Boundary)

(5 pp including this page)

6-1 Piping Description

Boundary 6 – This seismic boundary piping involves the steam to turbine seal system. The piping extends from a 5" connection just upstream of the stop valve on 18" MS-1A up to a tee. Beyond the tee, one leg goes through a 5" x 3" reducer connected to Valve V60-6. The other leg connects to Valve V60-10. Both valves fail "as-is" on loss of power. V60-10 is normally closed and V-60-6 is closed at power greater than 70%. Piping seismic boundary is sufficient restraint beyond these two valves. Piping is located within the Turbine Building. The extent of the piping is shown in Figure Att.4-1.

Walkdown Status: Piping to be walked down during RFO-24

6-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156, 5920-12598	14, 7.1, 7.7
Piping Drawings	5920-1239, 5920-1240, 5920-1241, 5920-1242	14, 8.5, 8.6, 8.7, 8.8
Piping Isometric Drawings & Pipe Supports	5920-FS-I27, (Note 1)	10.16
Equipment Drawings	Refer to Grinnell sketches 1312 to 1315 for hangers	14
Active Valve Drawings	V60-10 (not Active) 5920-12788, MOV 60-6 (not Active) 5920-1282	11.11, 11.13 see Section Att.6-3 below
Is line seismically analyzed ?	No	

Note:

1. Details for supports on 5" SS piping shown on Grinnell Pipe Support Sketches Nos. 1312 to 1315 for Drwg. 754E310 for support Mark Nos. SS-H13 to SS-H15.

6-3 Active Valve Discussion

Both valves fail "as-is" on loss of power. V60-10 is normally closed and V-60-6 is closed at power greater than 70% (Reference 2). For this reason, these components are not designated as active. Valve drawings for these components are as shown in Reference 11.11, 11.12, and 11.13.

Figure Att.6-1: Boundary 6 Piping Definition

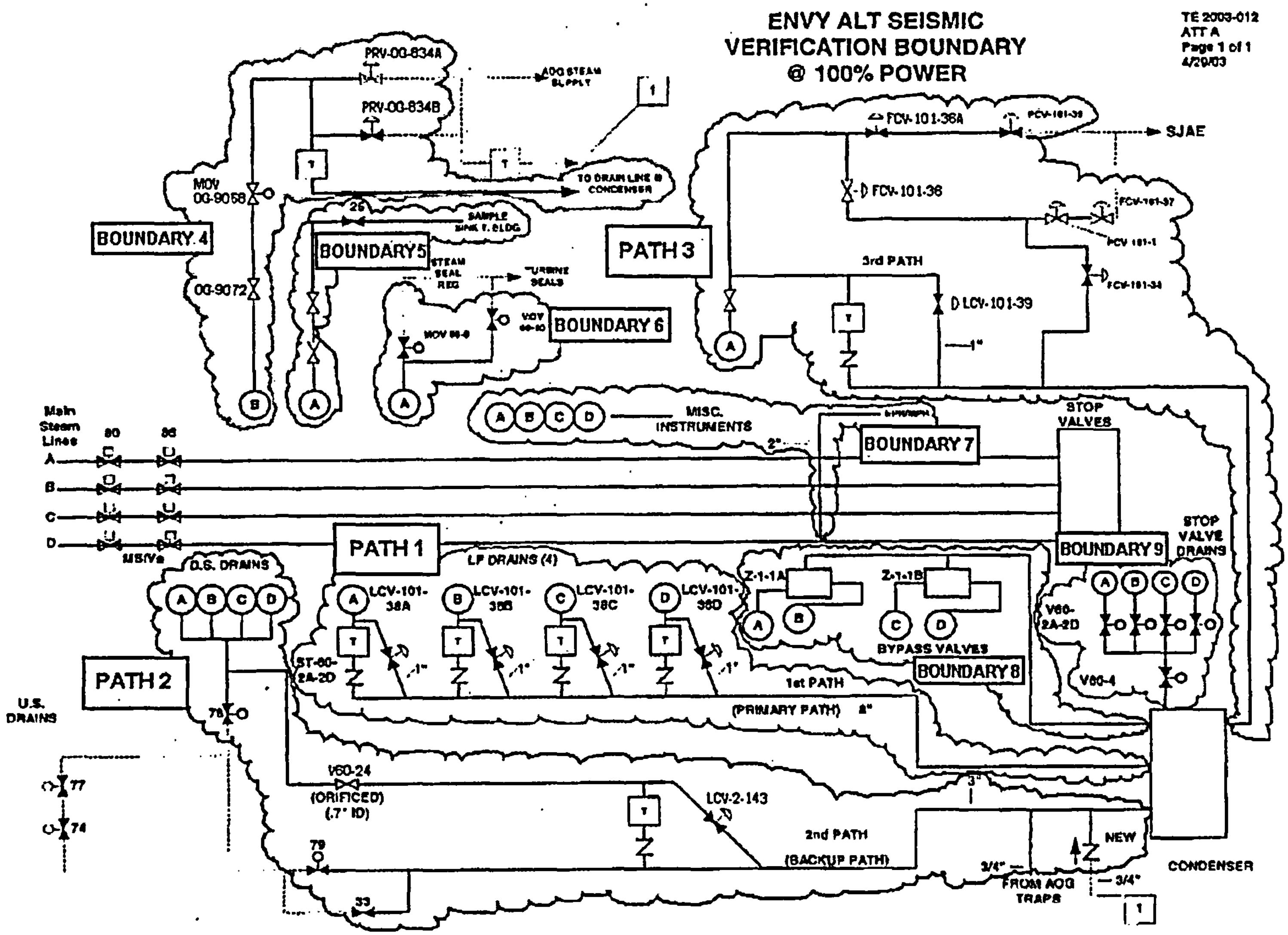


Figure Att.6-2:

Boundary 6 Piping: MOV 60-6

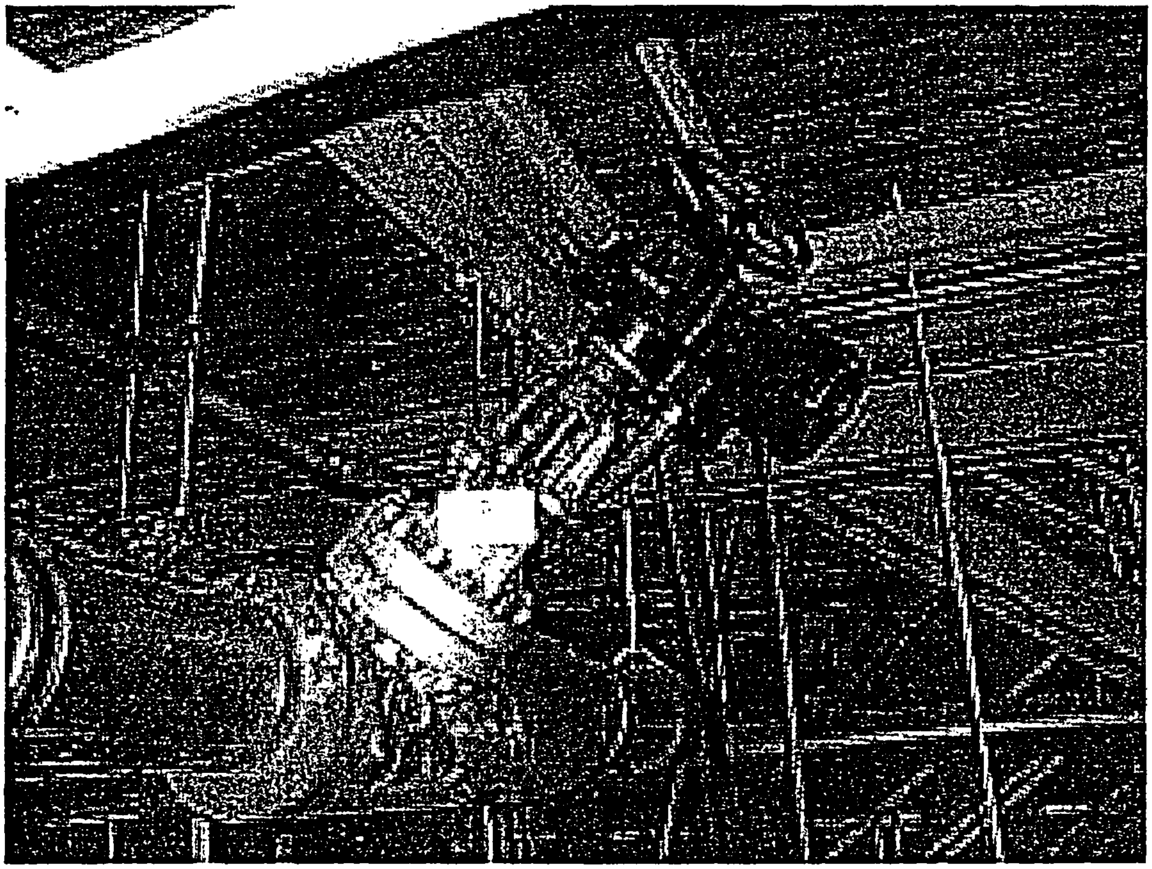
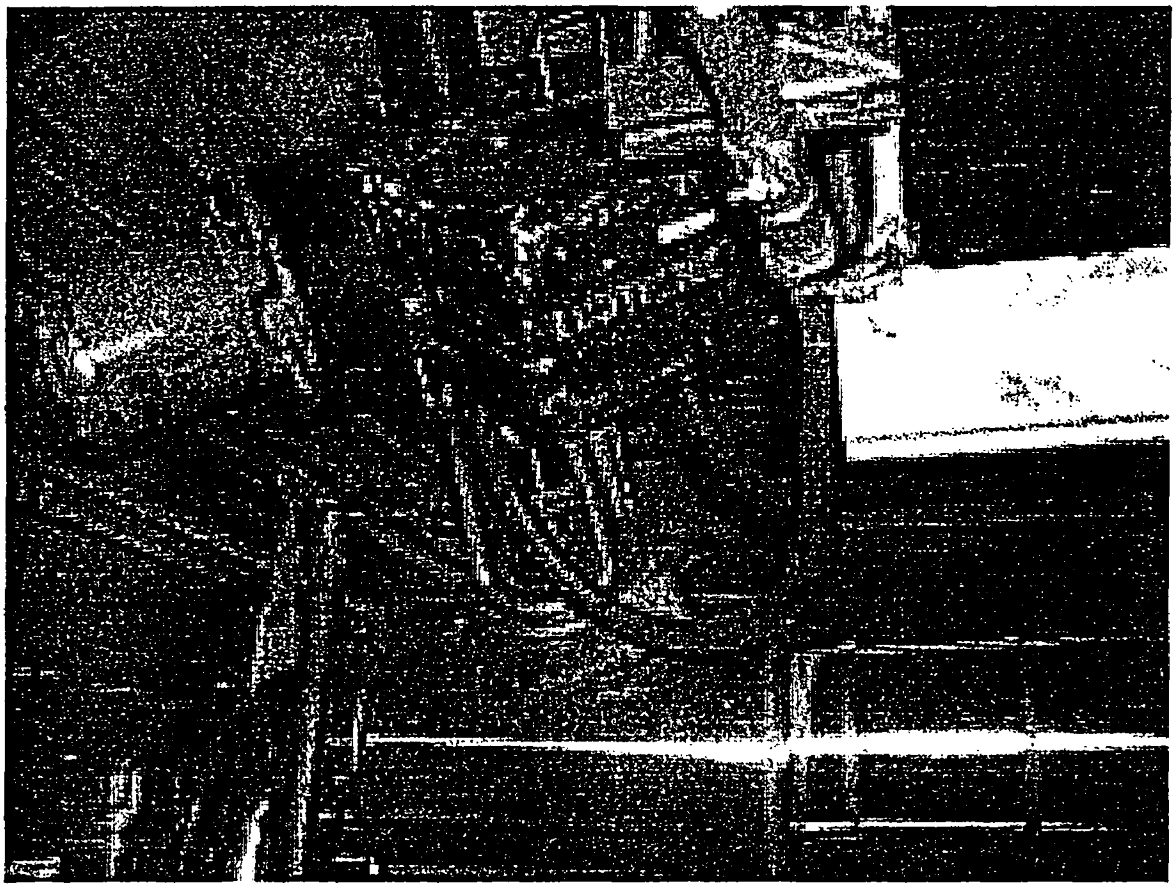


Figure Att.6-3:
Boundary 6 Piping: MOV 60-10



Attachment 7

Walkdown Information for Boundary Piping 7

Steam to EPR, MPR and miscellaneous instruments (Boundary)

(16 pp including this page)

7-1 Piping Description

Boundary 7 – The EPR, MPR and miscellaneous instrument connections consist of small bore piping and tubing. These lines are seismic boundary piping/tubing and are effectively closed systems extending from the main steam piping to the end instrument. The lines are located within the Turbine Building. The extent of the piping is shown in Figure Att.7-1.

Walkdown Status: Portions of the tubing and instruments (together with their respective rack support) were walked down in the accessible areas of the Turbine Building) during June of 2003. The remainder of the Tubing/Piping to be walked down during RFO-24

7-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156	14, 7.1
Piping Drawings	G-191182, G-191183, B-191261 sh 21 B-1, 1911261 sh 21 C-1	14, 8.3, 8.4
Piping Isometric Drawings	5920-FS-I1. No support drwgs. as field run tubing	14, 10.11
Equipment Drawings	B-191261 sh. 21A-1, 5920-5089	14,
Active Valve Drawings	NONE	
Is line seismically analyzed ?	No	

7-3 Active Valve Discussion

None

ABS Consulting
RISK CONSULTING DIVISION

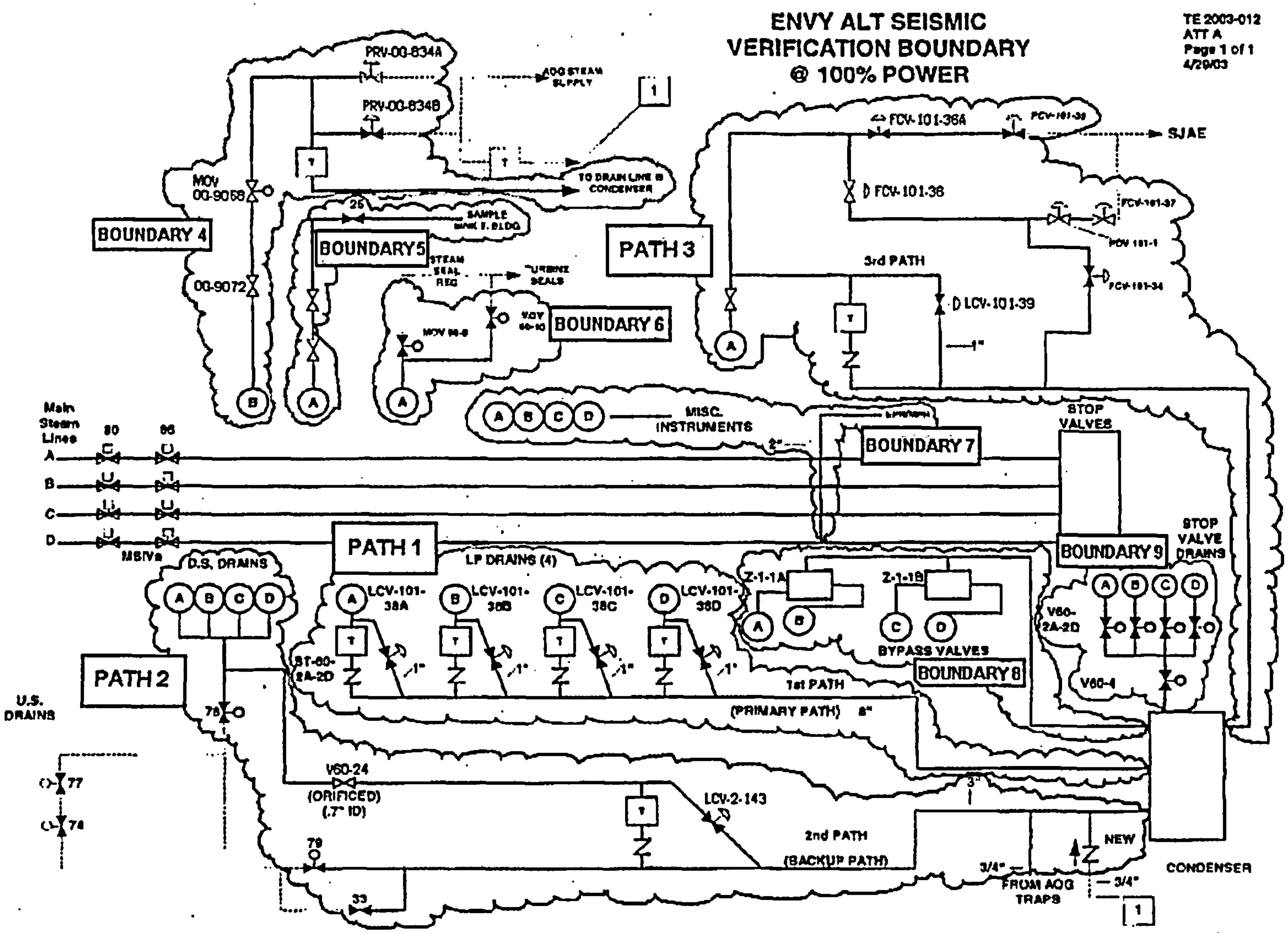


Figure Att.7-1: Path 1 Piping Definition

Figure Att.7-2

Boundary 7 – Pressure Switch Support Frame with anchorage detail

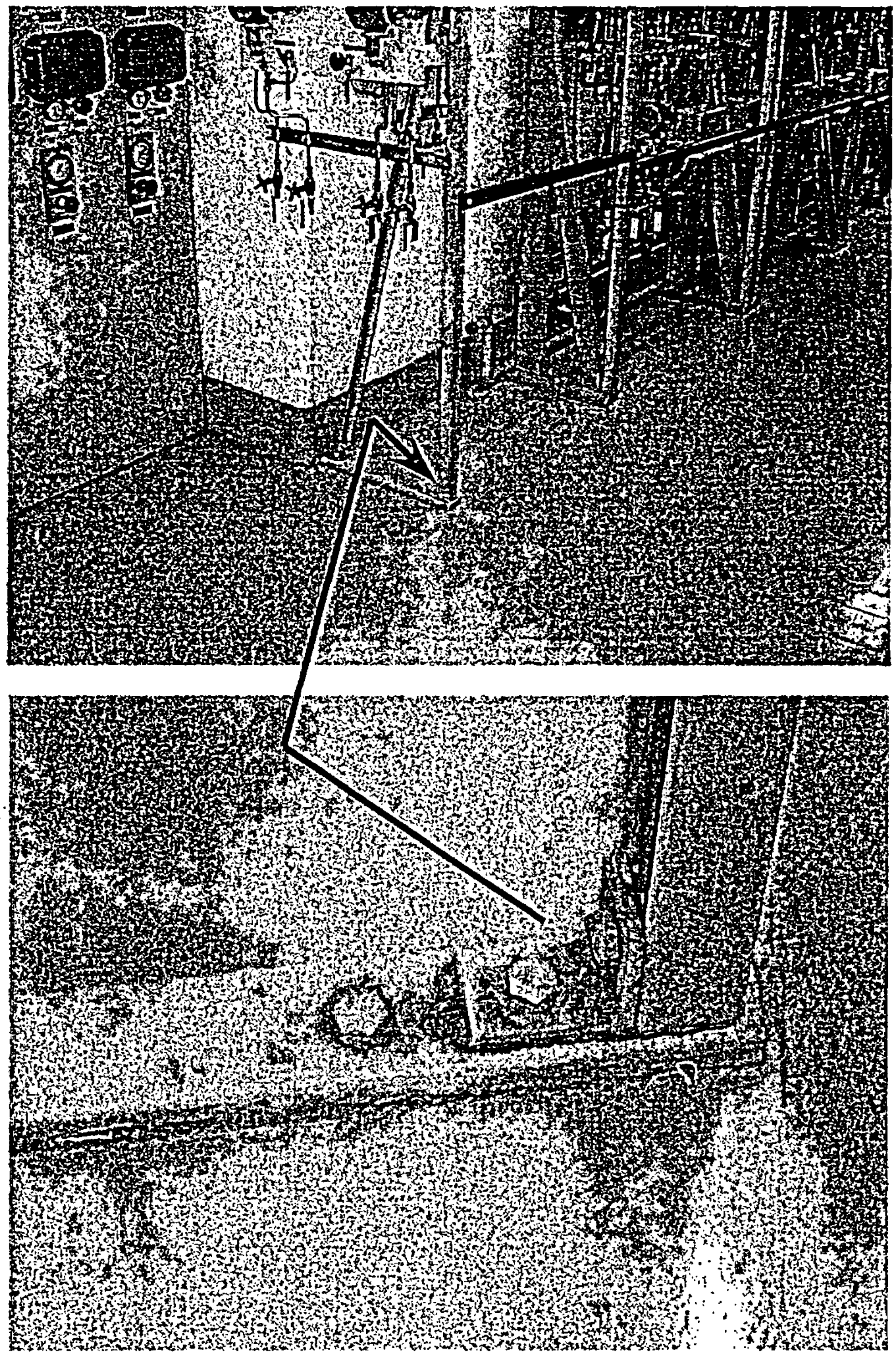


Figure Att.7-3

Boundary 7 – Typical Instrument Tubing Support Arrangement

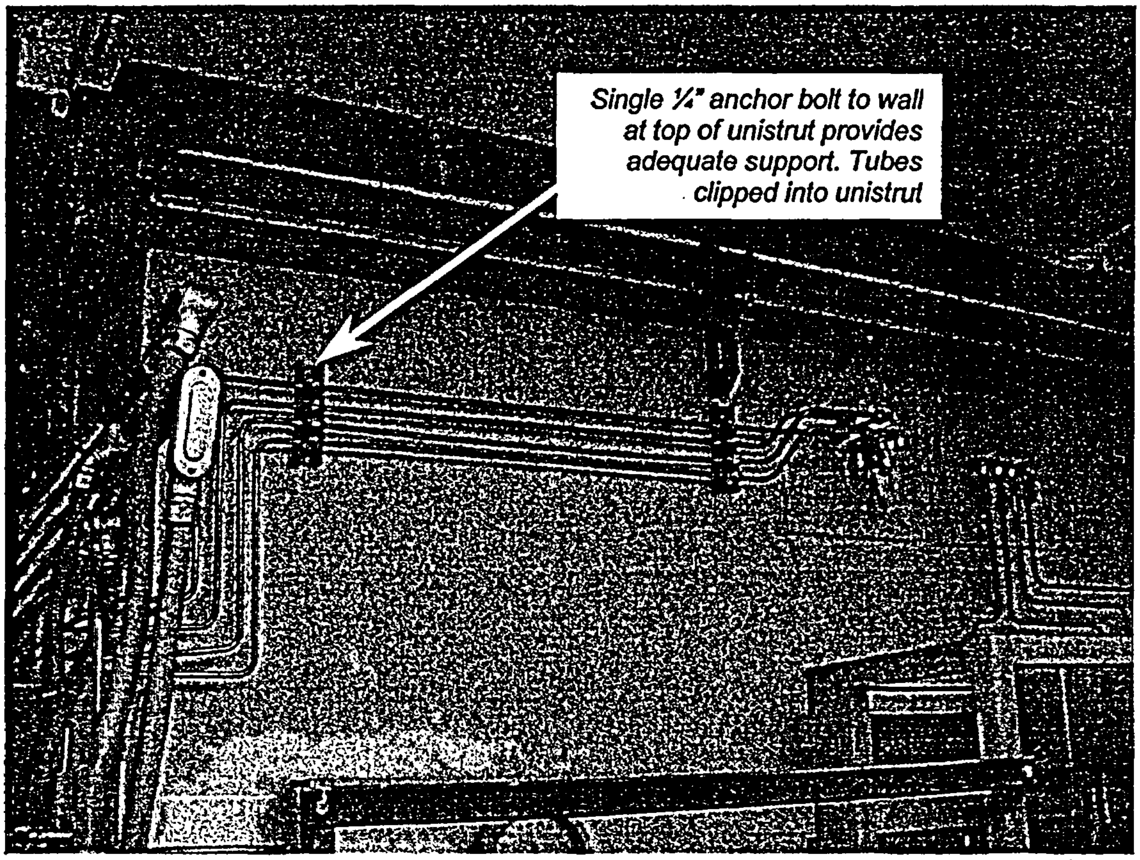


Figure Att.7-4

Boundary 7 – Typical Instrument Panel Arrangement – Plate 2

(Northwest End of Turbine Building)

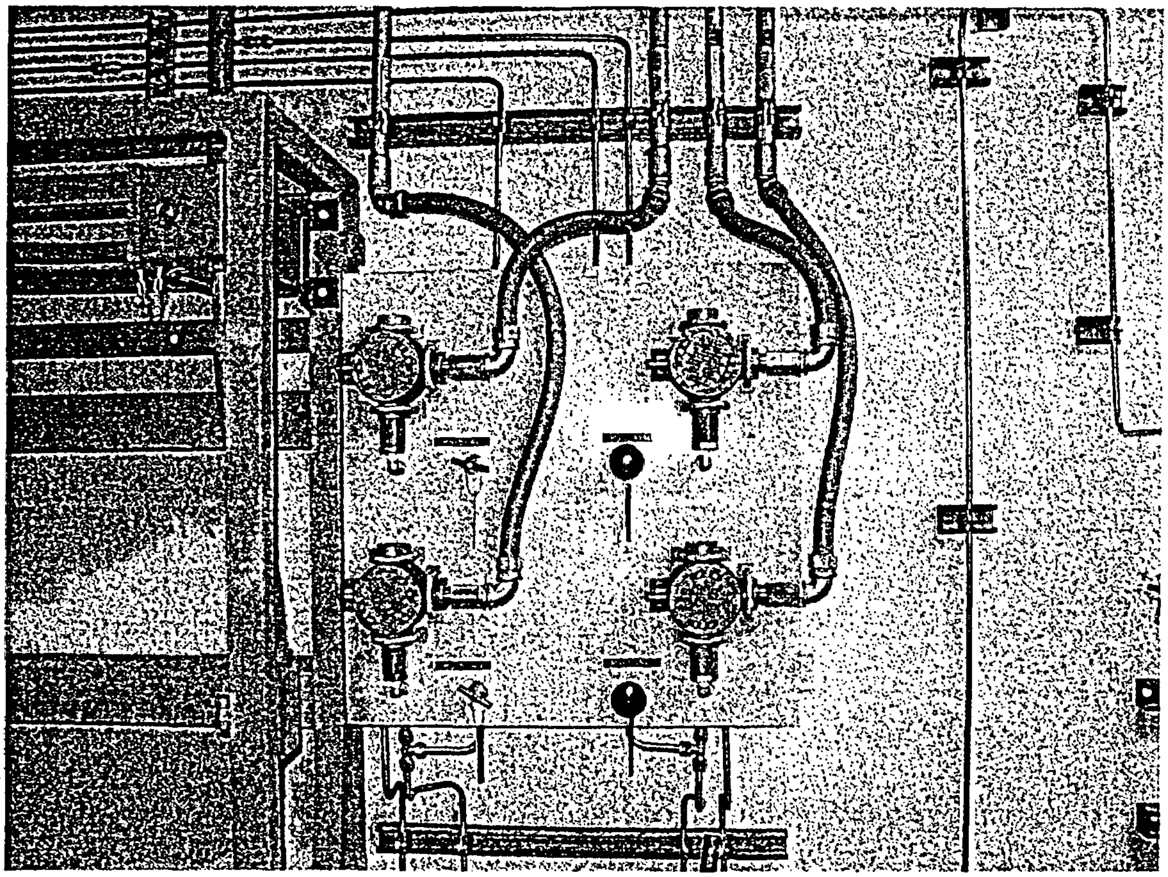
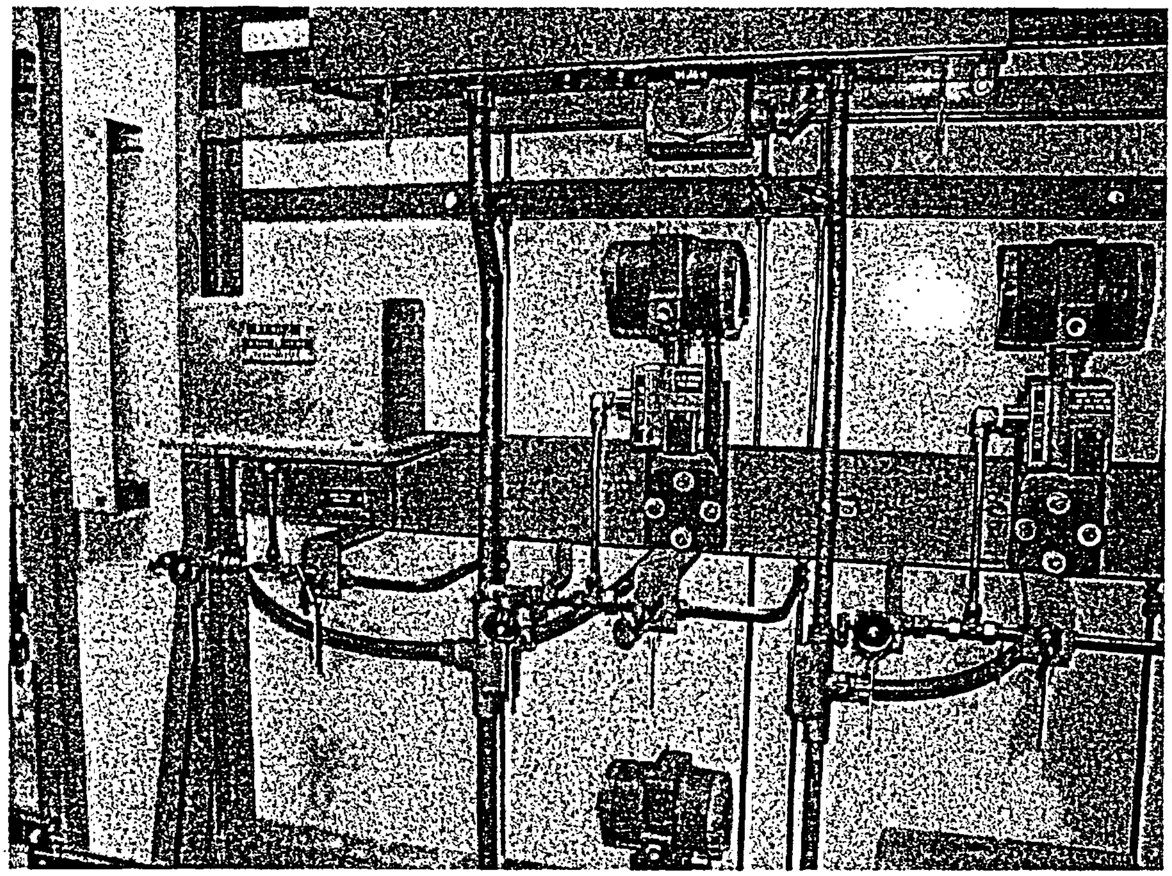


Figure Att.7-5

Boundary 7 – Typical Transmitter Support Arrangement

Rack 1A PT –101 –2 -3

(North End of Turbine Building)



BOUND. 7

WALKDOWN DATA SHEET

SHEET 1 OF 9

System EPRI/MPR

Equip. Class Piping and Tubing Systems Line Identifier INSTRUMENT TUBING FROM NORTH WALL OF CONDENSER BAY TO PS-2-134A, PS-2-134B, PS-2-134C, PS-2-134D, PI-2-100 (ACCESSIBLE DURING PLANT OPERATION)

Bldg. TURBINE (N-W END) Floor El. 237'

P&ID No. G-191156 Spec. No.

Isometric No. 5920-FS-I1

Pipe/Tubing O.D. 1/2"φ, 3/8"φ Wall Thickness

Material STAINLESS STEEL, SWAGELOCK FITTINGS

Insulation Type/Thickness N/A

Piping System Boundary

Description TUBING RUNS FROM WALL PENETRATIONS TO PS-2-134A, PS-2-134B, PS-2-134C, PS-2-134D AND PI-2-100

Functionality Requirement

1. Pressure Boundary Integrity	(Y) circled	N		N/A

Review Criteria - Piping and Tubing

1.	No visible damage	(Y) circled	N	U	N/A
2.	No significant visible rust/corrosion deterioration	(Y) circled	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	(Y) circled	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing)	(Y) circled	N	U	N/A NOTE 1.
5.	No unusual pipe or tubing attachments	(Y) circled	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	(Y) circled	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	Y	N	U	(N/A) circled
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	(Y) circled	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	(Y) circled	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing	(Y) circled	N	U	N/A
11.	No large eccentric masses	(Y) circled	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	(Y) circled	N	U	

Are the criteria met? (Y) circled N U

ABS Consulting

WALKDOWN DATA SHEET

Bou No. 7

SHEET 2 OF 9

System EPR/ MPR Equip Class Piping and Tubing Systems

Line Identifier TUBING RUNS FROM N. WALL OF CONDENSER BAY TO PS-2-134A, PS-2-134B, PS-2-134C, PS-2-134D, PI-2-100

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	(Y)	N	U	N/A
2.	No visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No unusual design	(Y)	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	(Y)	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	(Y)	N	U	N/A
6.	No visible damage	(Y)	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	(Y)	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	(Y)	N	U	N/A NOTE 2
9.	Does the load path appear adequate	(Y)	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)		(Y)	N	
	Are the above criteria met?	(Y)	N	U	

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	No other concerns	(Y)	N	U	N/A
	Is equipment free of interaction effects?	(Y)	N	U	

Is the piping/tubing system seismically adequate? (Y) N U

Comments 1. MAX. SPAN FOR 1/2"φ TUBING IS APPX. 4', FOR 3/8"φ APPX. 3'.

2. TUBING IS SUPPORTED BY CLAMPS ATTACHED TO P1001 MEMBERS. P1001 MEMBERS HAVE SMALL CLIP ANGLES WELDED TO ENDS, CLIPS ARE BOLTED TO CONCRETE CEILING/WALLS WITH 1/4"φ BOLTS. BOLTS ARE EITHER WEDGE ANCHORS OR SHOT-IN ANCHORS, ANCHORS JUDGED ADEQUATE DUE TO LIGHT LOADS AND RANDOM FIELD TUG TESTS (SIM. TO CONDUIT TUG TEST IN GIP).

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

BOUND. 7

WALKDOWN DATA SHEET

SHEET 3 OF 9

System EPR/MPR

Equip. Class Piping and Tubing Systems Line Identifier PIPING AND TUBING FROM WEST WALL OF CONDENSER BAY TO PT-110-4 (ACCESSIBLE DURING OPERATION)

Bldg. TURBINE (N-WEND) Floor El. 237' LUBE OIL ROOM

P&ID No. G-191156 Spec. No.

Isometric No. 5920-FS-I1

Pipe/Tubing O.D. 1/2", 3/8" Wall Thickness

Material SS, SWAGELOCK FITTINGS.

Insulation Type/Thickness N/A

Piping System Boundary

Description FROM PENETRATION THROUGH WALL TO PT-110-4. PT-110-4, PIPING AND TUBING ARE MOUNTED TO EAST WALL OF LUBE OIL ROOM.

Functionality Requirement

1.	Pressure Boundary Integrity	(Y)	N	N/A

Review Criteria - Piping and Tubing — NOTE 1.

1.	No visible damage	(Y)	N	U	N/A
2.	No significant visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	(Y)	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing)	(Y)	N	U	N/A
5.	No unusual pipe or tubing attachments	(Y)	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	(Y)	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	Y	N	U	(N/A)
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	(Y)	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	(Y)	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing	(Y)	N	U	N/A
11.	No large eccentric masses	(Y)	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	(Y)	N	U	

Are the criteria met? (Y) N U

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ATT. 7. SHT. 11

BOUND. 7

WALKDOWN DATA SHEET

SHEET 4 OF 9

System EPRI MPR   Equip Class Piping and Tubing Systems

Line Identifier PIPING AND TUBING FROM WEST WALL OF CONDENSER BAY TO PT-110-4

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	(Y)	N	U	N/A
2.	No visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No unusual design	(Y)	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	(Y)	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	(Y)	N	U	N/A
6.	No visible damage	(Y)	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	(Y)	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	(Y)	N	U	N/A
9.	Does the load path appear adequate	(Y)	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)	(Y)	N		

Are the above criteria met? (Y) N U NOTE 2.

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	No other concerns	(Y)	N	U	N/A

Is equipment free of interaction effects? (Y) N U NOTE 3.

Is the piping/tubing system seismically adequate? (Y) N U

Comments 1. PIPING IS SOCKET WELDED STAINLESS STEEL, A SHORT SECTION OF TUBING RUNS FROM PIPE TO PT-110-4
2. PIPE IS ADEQUATELY SUPPORTED TO WALL WITH U-BOLT SUPPORTS BOLTED TO WALL W/ EXPANSION ANCHORS.
3. BLOCK WALL ON N. SIDE OF LUBE OIL ROOM JUDGED ADEQUATE TO AVOID INTERACTIONS. FALL PATH IS BLOCKED BY STRUCT. MEMBERS. IF WALL WERE TO FALL, PIPING/TUBING ARE NOT IN FALL PATH.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE   Date: 6-20-03

Evaluated by: [signature]   Date: 6-20-03

ABS Consulting

Bound. 7

WALKDOWN DATA SHEET

SHEET 2 OF 9

Equipment ID No. PT-110-4 Equip. Class Instruments on Racks

Equipment Description MS PRESSURE TRANSMITTER PT-110-4

Equipment Location: Bldg. TURBINE Floor El. 237' Room, Row/Col LUBE OIL ROOM

Manufacturer, Model, Etc. ROSEMOUNT

Drawing No. ____

Functionality Requirement

1. Function Required MAINTAIN PRESSURE BOUNDARY (Y) N U

Review Criteria

1. Is instrument rack of good seismic design for function above (mounting details, load paths, steel frame and sheet metal structurally adequate, etc.) (Y) N U N/A
2. No other instrument rack concerns (Y) N

Are the criteria met? (Y) N U N/A

Anchorage

1. Does strength appear adequate (Y) N U N/A
2. Does stiffness appear adequate (Y) N U N/A
3. No other concerns (Y) N N/A
4. Prepare and attach a sketch Y N (N/A)

Are anchorages adequate based on judgment (Y) N U

Interaction Effects

1. Vulnerable components free from damaging impact by nearby equipment, structures, etc. (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls (Y) N U N/A NOTE 2
3. No other concerns (Y) N

Is equipment free of interaction effects? (Y) N U

Comments TRANSMITTER IS SEISMICALLY ADEQUATE.

1. STANDARD ROSEMOUNT BASE IS BOLTED TO EAST WALL OF ROOM USING EXPANSION ANCHORS (AT LEAST 3 VISIBLE).

(CONTINUED ON SH. 2)

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, P.E Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

1173875-R-002, R0
ATT. 7. SHT. 13

BOUND. 7

WALKDOWN DATA SHEET

SHEET 6 OF 9

System EPR/MPR

Equipment ID No. PT-110-4 Equip. Class Instruments on Racks

Comments/Outliers 2. BLOCK WALL ON NORTH SIDE OF LUBE OIL ROOM JUDGED ADEQUATE TO AVOID INTERACTIONS. FALL PATH IS BLOCKED BY HORIZONTAL STRUCT. MEMBERS. IF WALL WERE TO FALL, TRANSMITTER AND ATTACHED TUBING WOULD NOT BE IN FALL PATH.

1173875-R-002, R0
ATT. 7 . SHT. 14

Bovdo. 7

WALKDOWN DATA SHEET

SHEET 7 OF 9

Equipment ID No. RACK FOR PS-2-134C, PS-2-134D Equip. Class Instruments on Racks

Equipment Description PS-2-134C, PS-2-134D

Equipment Location: Bldg. TURBINE Floor El. 237' Room, Row/Col ____

Manufacturer, Model, Etc. N/A

Drawing No. ____

Functionality Requirement

1. Function Required MAINTAIN PRESSURE BOUNDARY OF INSTRUMENTS AND ATTACHED TUBING — (Y) N U

Review Criteria

1. Is instrument rack of good seismic design for function above (mounting details, load paths, steel frame and sheet metal structurally adequate, etc.) — (Y) N U N/A NOTE 1.
2. No other instrument rack concerns — (Y) N

Are the criteria met? — (Y) N U N/A

Anchorage

1. Does strength appear adequate — (Y) N U N/A
2. Does stiffness appear adequate — (Y) N U N/A
3. No other concerns — (Y) N N/A
4. Prepare and attach a sketch — Y N (N/A)

Are anchorages adequate based on judgment — (Y) N U NOTE 1.

Interaction Effects

1. Vulnerable components free from damaging impact by nearby equipment, structures, etc. — (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls — (Y) N U N/A
3. No other concerns — (Y) N

Is equipment free of interaction effects? — (Y) N U

Comments RACK IS SEISMICALLY ADEQUATE. RACK IS LIGHTLY LOADED
1. RACK CONSISTS OF PLATE ANCHORED TO WALL WITH 2 1/2"φ SHELL ANCHORS AND BOLTED TO ADJACENT RACK RK16 (W/ 2 BOLTS & NUTS). RK16 IS ADEQUATELY ANCHORED AT THE BASE. RK16 DOES NOT HAVE ANY ITEMS MOUNTED TO IT. INSTRUMENTS ARE ADEQUATELY MOUNTED TO PLATE USING 4 BOLTS.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

1173875-R-002, R0
ATT. 7. SHT. 15

Procedure 1173875-P-002
Revision 0
June 12, 2003
Page A11 of 12

BOUND. 7

WALKDOWN DATA SHEET

SHEET 8 OF 9

Equipment ID No. LOCAL PANEL FOR PI-2-100 Equip. Class Instruments on Racks

Equipment Description A MS LINE PRESSURE GAUGE

Equipment Location: Bldg. TURBINE Floor El. 237' Room, Row/Col ____

Manufacturer, Model, Etc. N/A

Drawing No. ____

Functionality Requirement

1. Function Required MAINTAIN PRESSURE BOUNDARY OF GAUGE AND ATTACHED TUBING — (Y) N U

Review Criteria

1. Is instrument rack of good seismic design for function above (mounting details, load paths, steel frame and sheet metal structurally adequate, etc.) — (Y) N U N/A NOTE 1.
2. No other instrument rack concerns — (Y) N

Are the criteria met? — (Y) N U N/A

Anchorage

1. Does strength appear adequate — (Y) N U N/A
2. Does stiffness appear adequate — (Y) N U N/A
3. No other concerns — (Y) N N/A
4. Prepare and attach a sketch — Y N (N/A)

Are anchorages adequate based on judgment — (Y) N U NOTE 1.

Interaction Effects

1. Vulnerable components free from damaging impact by nearby equipment, structures, etc. — (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls — (Y) N U N/A
3. No other concerns — (Y) N

Is equipment free of interaction effects? — (Y) N U

Comments RACK IS SEISMICALLY ADEQUATE.
1. RACK CONSISTS OF A PLATE MOUNTED TO THE WALL WITH HORIZONTAL P1001 MEMBERS. ANCHORAGE JUDGED ADEQUATE DUE TO LIGHT WEIGHT AND LOW MASS OF GAUGE.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

1173875-R-002, R0
ATT. 7. SHT. 16

Bound. 7

WALKDOWN DATA SHEET

SHEET 9 OF 9

Equipment ID No. PANEL 1 FOR PS-2-134A, PS-2-134B Equip. Class Instruments on Racks

Equipment Description INST. RACK FOR PS-2-134A AND PS-2-134B

Equipment Location: Bldg. TURBINE Floor El. 237' Room, Row/Col ____

Manufacturer, Model, Etc. N/A

Drawing No. ____

Functionality Requirement

1. Function Required MAINTAIN PRESSURE BOUNDARY OF INSTRUMENTS & ATTACHED TUBING (Y) N U

Review Criteria

1. Is instrument rack of good seismic design for function above (mounting details, load paths, steel frame and sheet metal structurally adequate, etc.) (Y) N U N/A NOTE 1.
2. No other instrument rack concerns (Y) N

Are the criteria met? (Y) N U N/A

Anchorage

1. Does strength appear adequate (Y) N U N/A
2. Does stiffness appear adequate (Y) N U N/A
3. No other concerns (Y) N N/A
4. Prepare and attach a sketch Y N (N/A)

Are anchorages adequate based on judgment (Y) N U NOTE 1.

Interaction Effects

1. Vulnerable components free from damaging impact by nearby equipment, structures, etc. (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls (Y) N U N/A
3. No other concerns (Y) N

Is equipment free of interaction effects? (Y) N U

Comments RACK IS SEISMICALLY ADEQUATE.

1, RACK CONSISTS OF PLATE MOUNTED TO WALL WITH BRACKETS AND 2 1/2"φ SHELL ANCHORS. INSTRUMENTS ARE MOUNTED TO RACK WITH U-BOLTS THROUGH RACK PLATE. RACK IS LIGHTLY LOADED

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

Attachment 8

Walkdown Information for Boundary Piping 8

Steam to Turbine Bypass Valves (Boundary)

(4 pp including this page)

8-1 Piping Description

Boundary 8 – This seismic boundary piping consists of the 16" diameter main steam bypass piping, from the main steam lines downstream of the outboard MSIVs to the turbine bypass valve chests, Z-1-1B and Z-1-1A, with 10" piping beyond to condenser nozzle 41. The piping is located within the Turbine Building. The extent of the piping is shown in Figure Att.8-1.

Walkdown Status: Piping to be walked down during RFO-24

8-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156, G-191167	14, 7.1, 7.4
Piping Drawings	G-191180, G-191181, G-191182, G-191183,	14, 8.1, 8.2, 8.3, 8.4
Piping Isometric Drawings & supports	5920-FS-I1, 5920-FS-I2, 5920-FS-I3, Note 1	14, 10.11, 10.15,
Equipment Drawings	5920-150 sh 1 & 2, 5920-190, 5920-12577, 5920-12550, 5920-12586, 5920-12584, sht. 1, 2, 3,4, 5, 5920-12585, 5920-12543, G-191721, vender manual GEK-11387, GEK-17999A	14,
Active Valve Drawings	see Calc 1173875-C-004	Ref. 18
Is line seismically analyzed ?	Yes, ENVY Calc. 317, Rev. 1 CCN # 1	Ref. 16

Note:

1. Details shown on Grinnell Pipe support sketches Nos. 100 to 221 and 228 to 245 fro drwg G-191182 for support mark nos. MSH-1 to 120 and MSH-126 to –143.

2. Revised turbine trip loads evaluated in Ref. 18.

8-3 Active Valve Discussion

Refer to Ref. 18

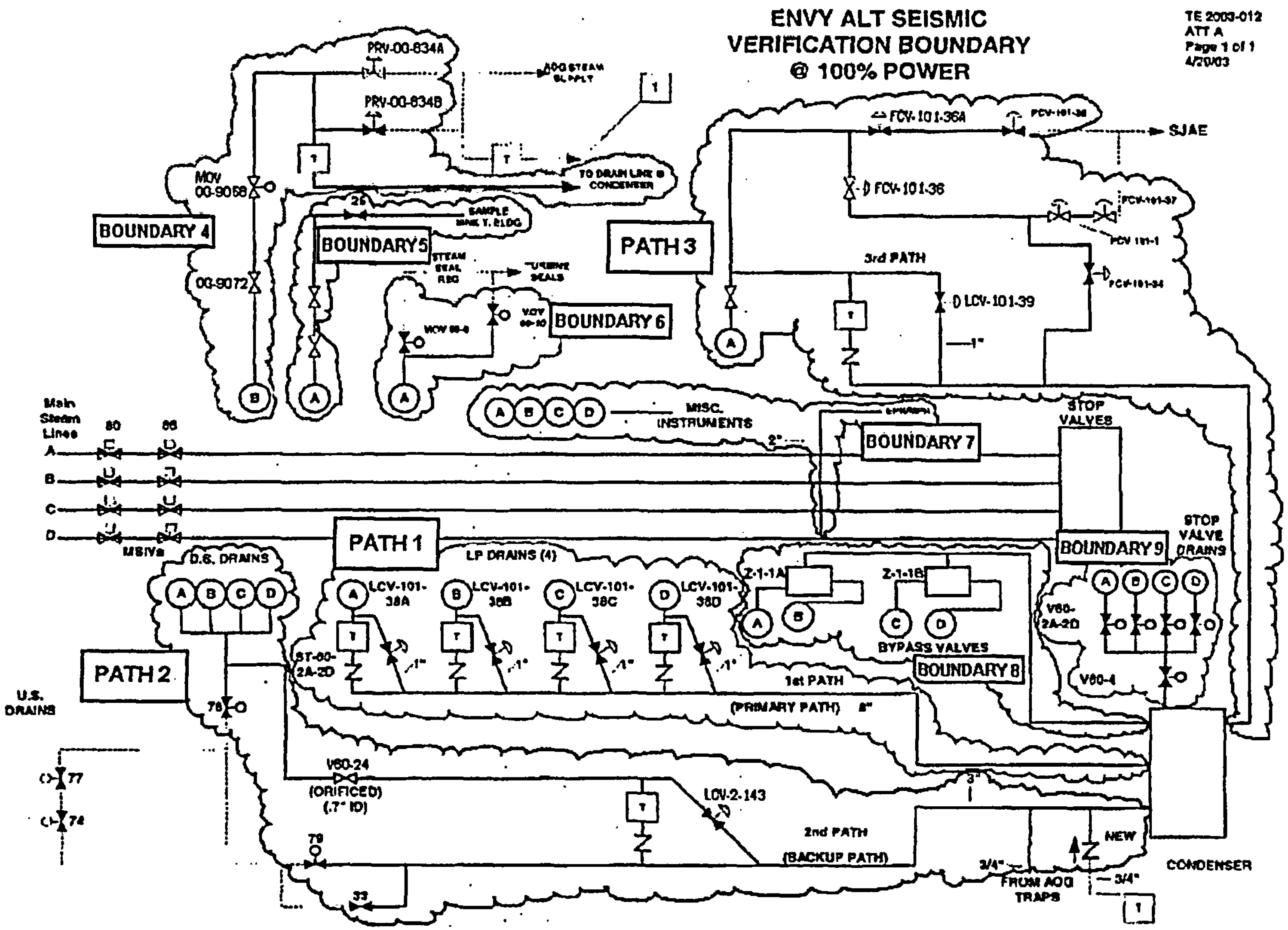
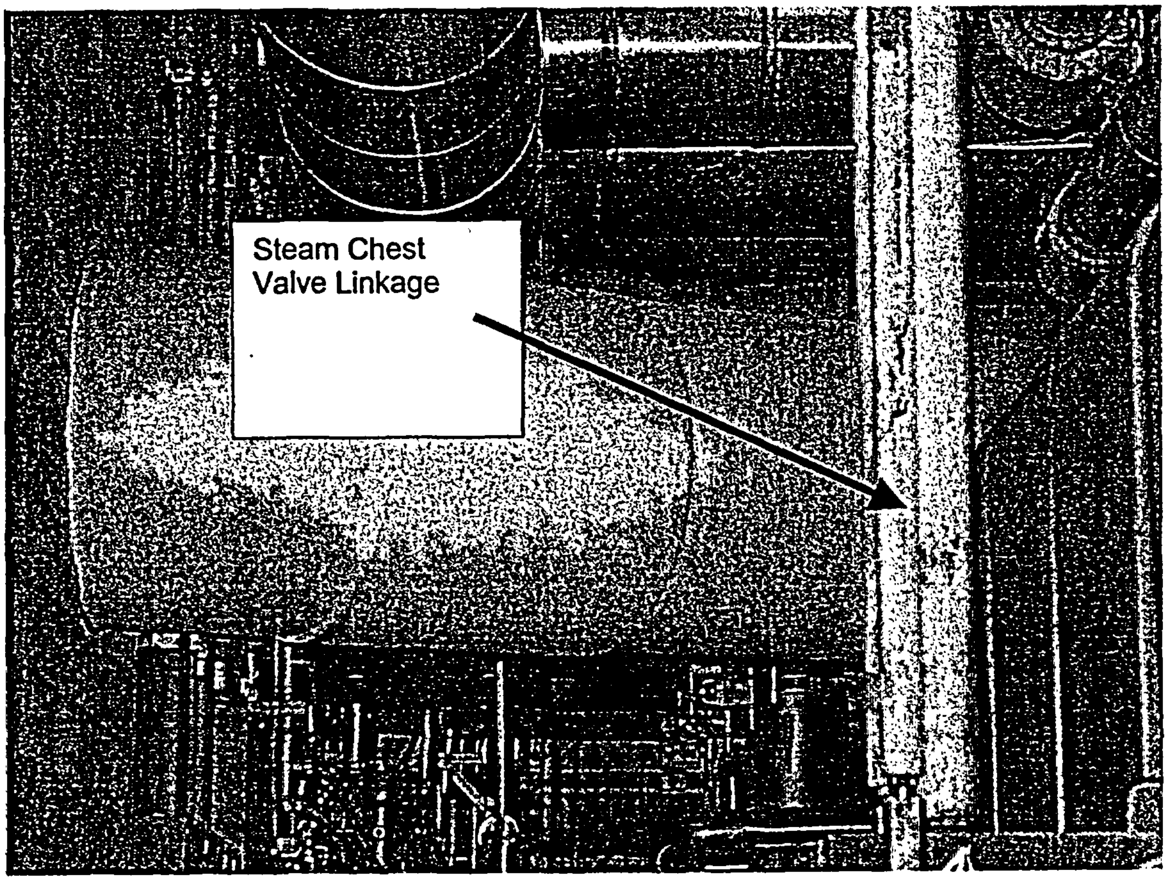


Figure Att.8-1: Path 1 Piping Definition

Figure Att.8-2
Boundary 8 Piping: Linkage on Steam Chest



Attachment 9

Walkdown Information for Boundary Piping 9

Stop Valve Drains (Boundary)

(8 pp including this page)

9-1 Piping Description

Boundary 9 – This seismic boundary piping consists of turbine stop valve drain small bore piping to isolation valves V-60-2A-D to V-60-4. The piping extends beyond these valves to the condenser through 2½" MSD-6 to condenser penetration #33. The piping is located within the Turbine Building. The extent of the piping is shown in Figure Att.9-1.

Walkdown Status: Piping to be walked down during RFO-24

9-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156	14, 7.1
Piping Drawings	G-191182, G-191183, 5920-FS-1300	14, 8.3, 8.4
Piping Isometric Drawings & supports	5920-FS-I1, Note 1	14, 10.12
Equipment Drawings	5920-4208R2, 5920-5446R1, 5920-3410R5	14, 11.15, 11.16, 11.17
Active Valve Drawings	N/A	
Is line seismically analyzed ?	No	

Note:

1. Single welded steel frame for V60-2 valve support. Piping deadweight supports by field.

9-3 Active Valve Discussion

NONE

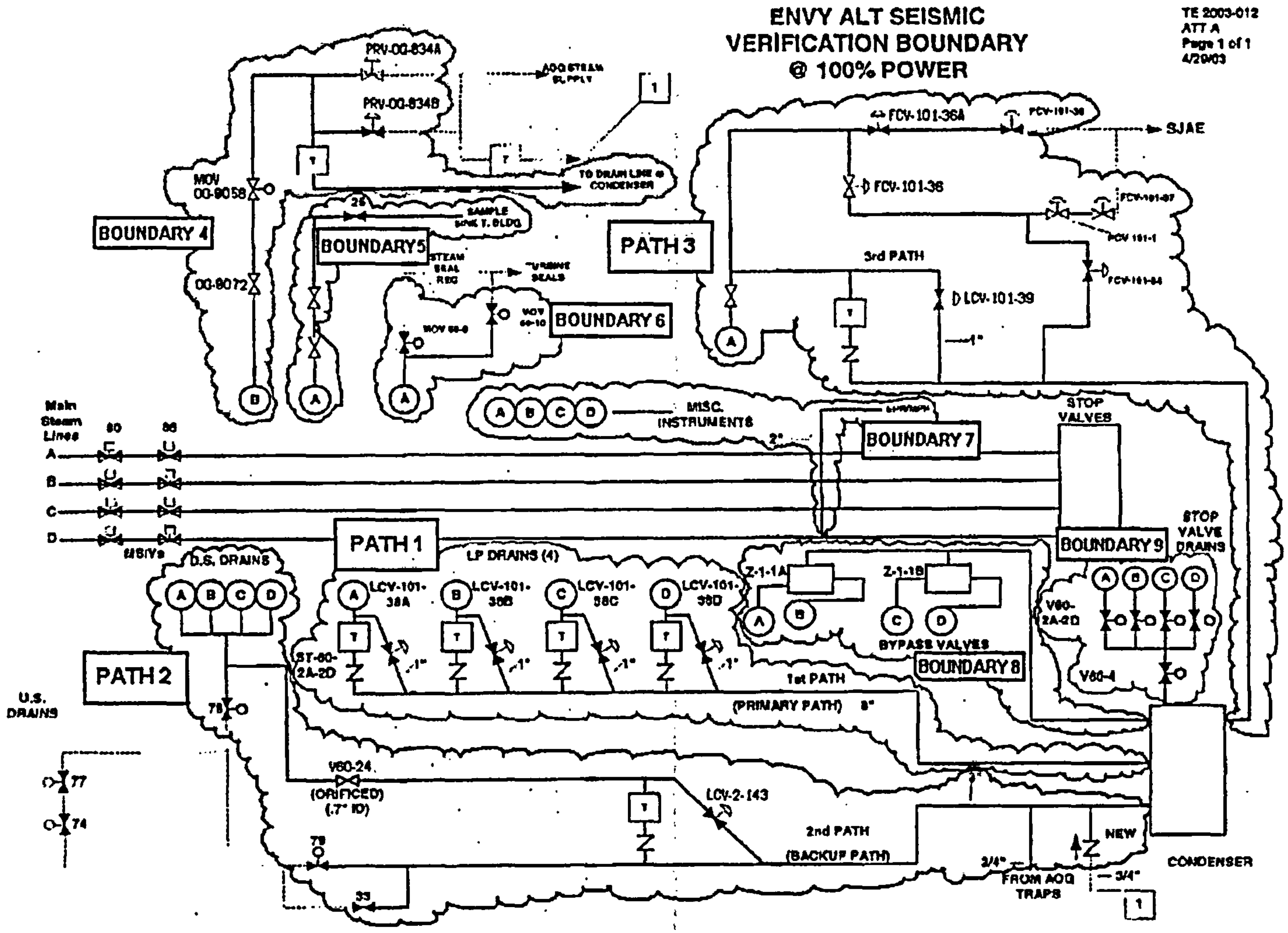


Figure Att.9-1: Boundary 9 Piping Definition

Figure Att.9-2: Boundary 9 – Stop Valves Drains – Full Iso

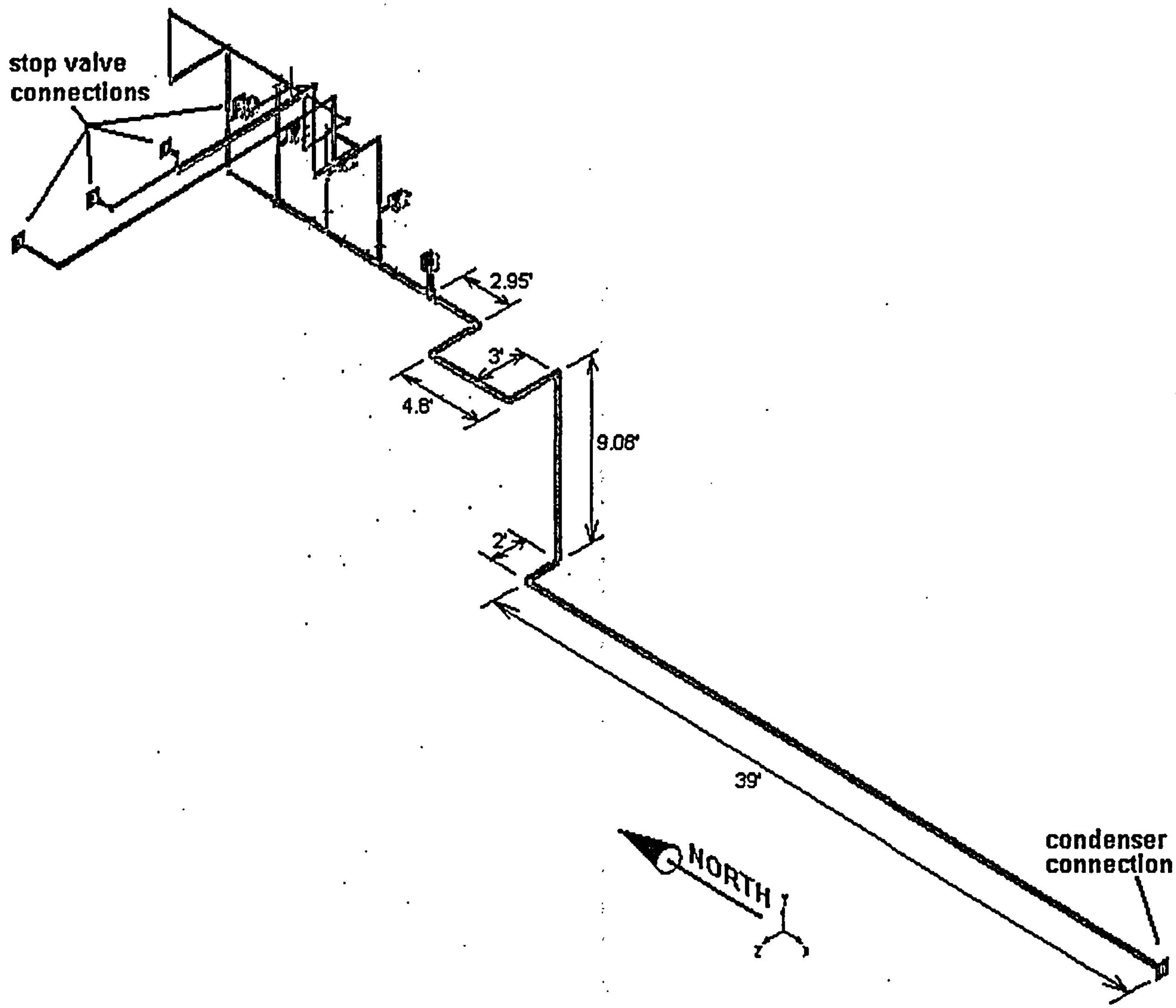


Figure Att.9-3: Boundary 9 – Stop Valves' Drains – Partial Iso (stop valve connections to V60-4)

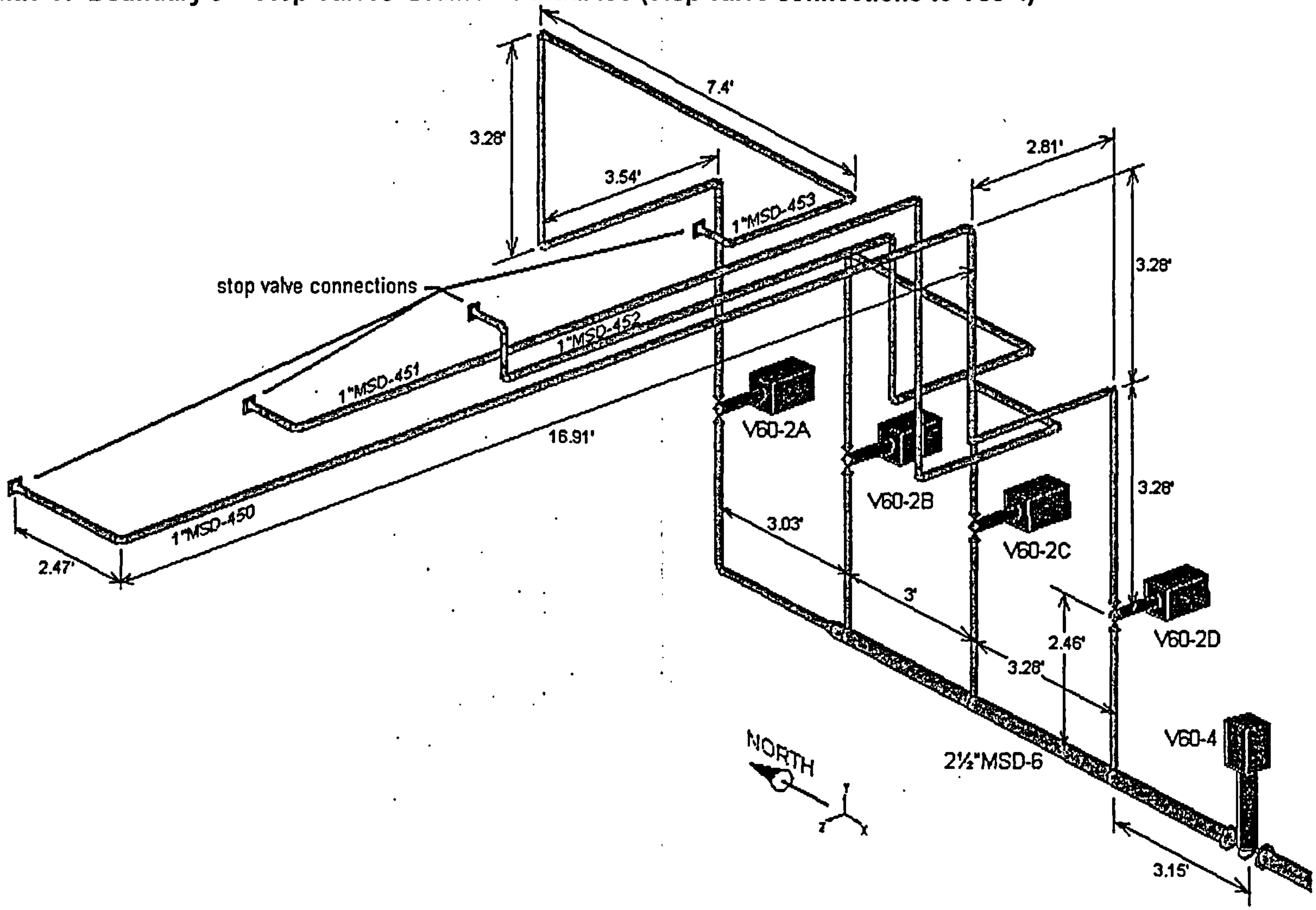


Figure Att.9-4: Boundary 9 – Stop Valves' Drains – Partial Iso (V60-4 to condenser connection)

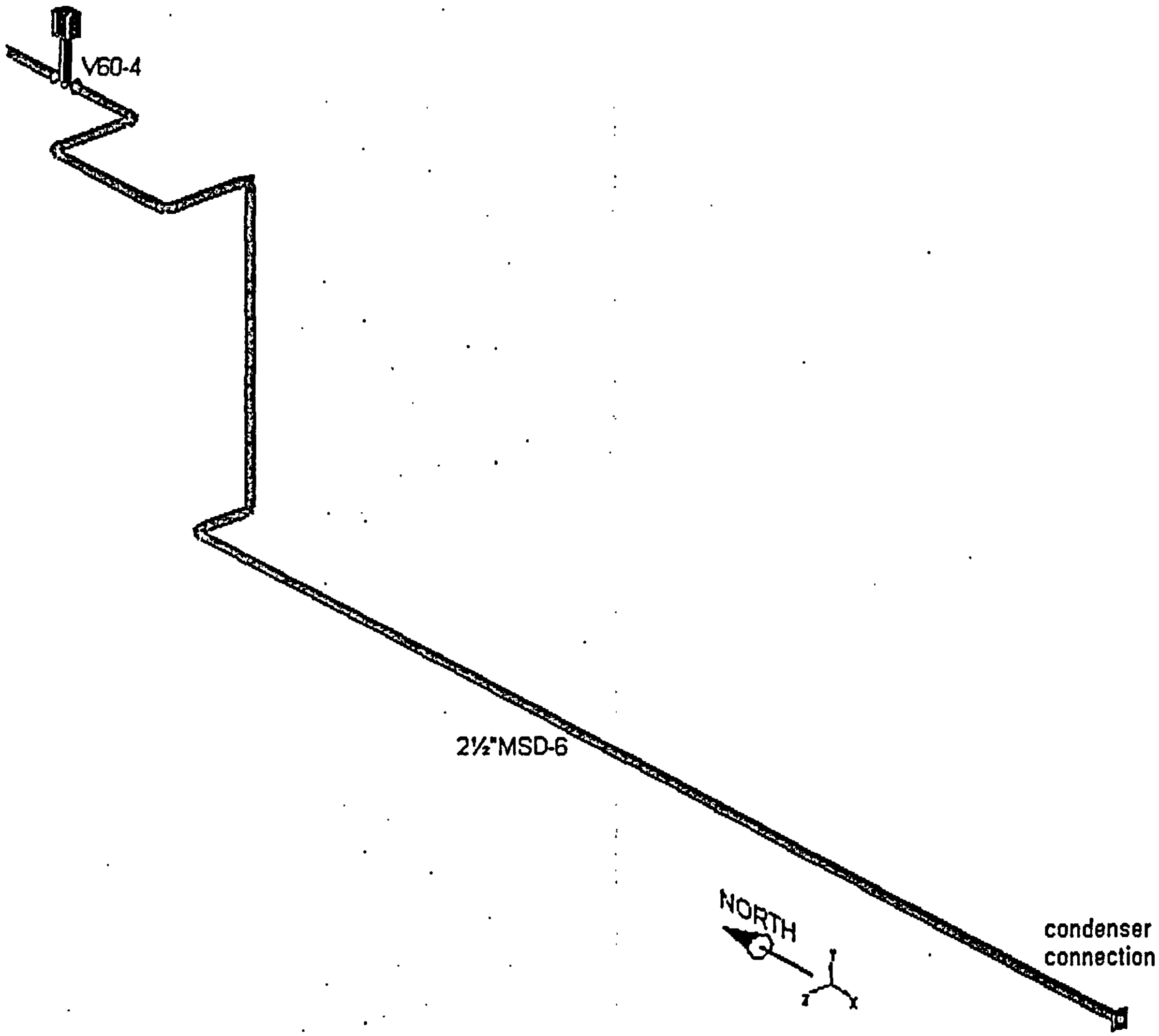


Figure Att. 9-5
Boundary 9 Piping: MOV V60-2A

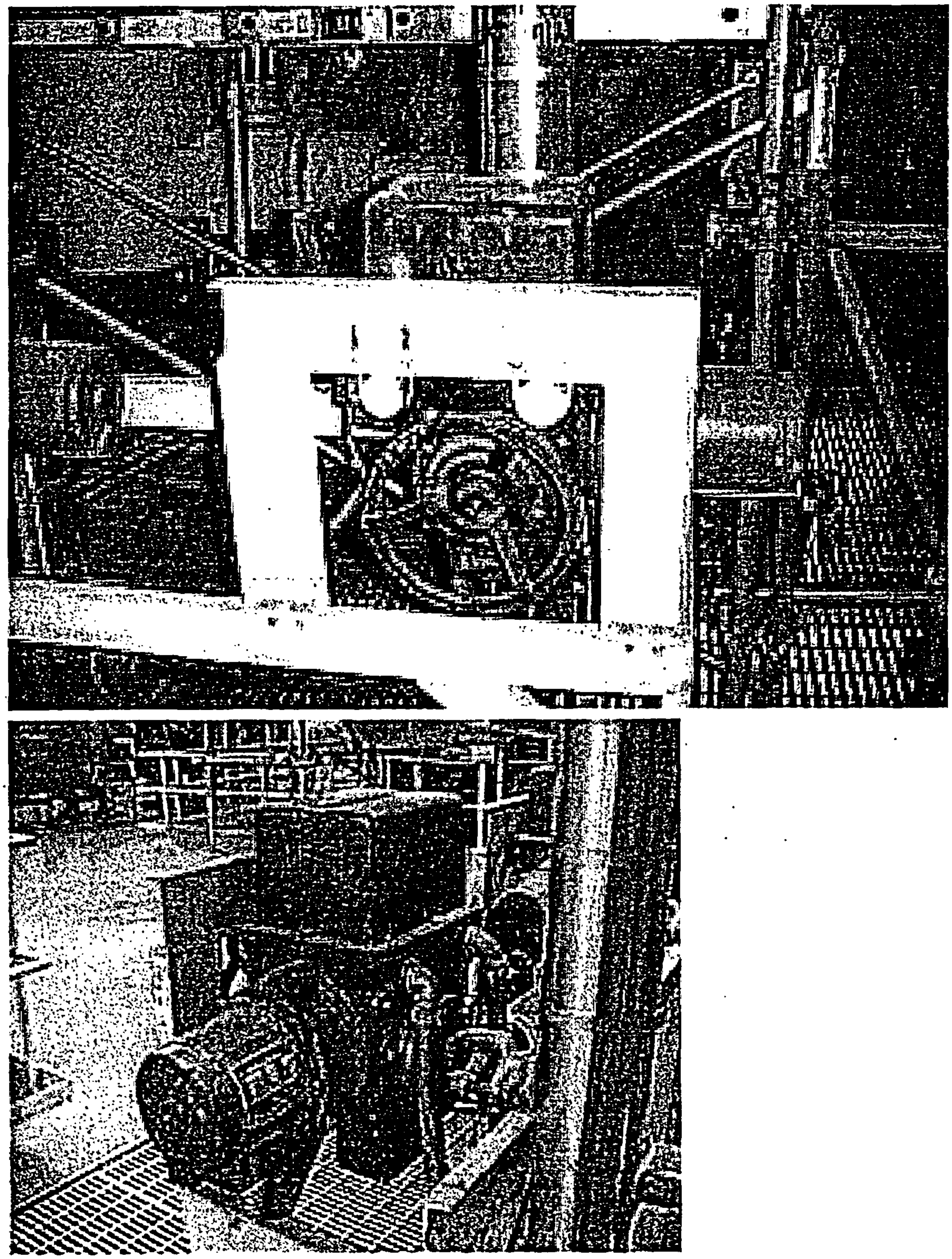
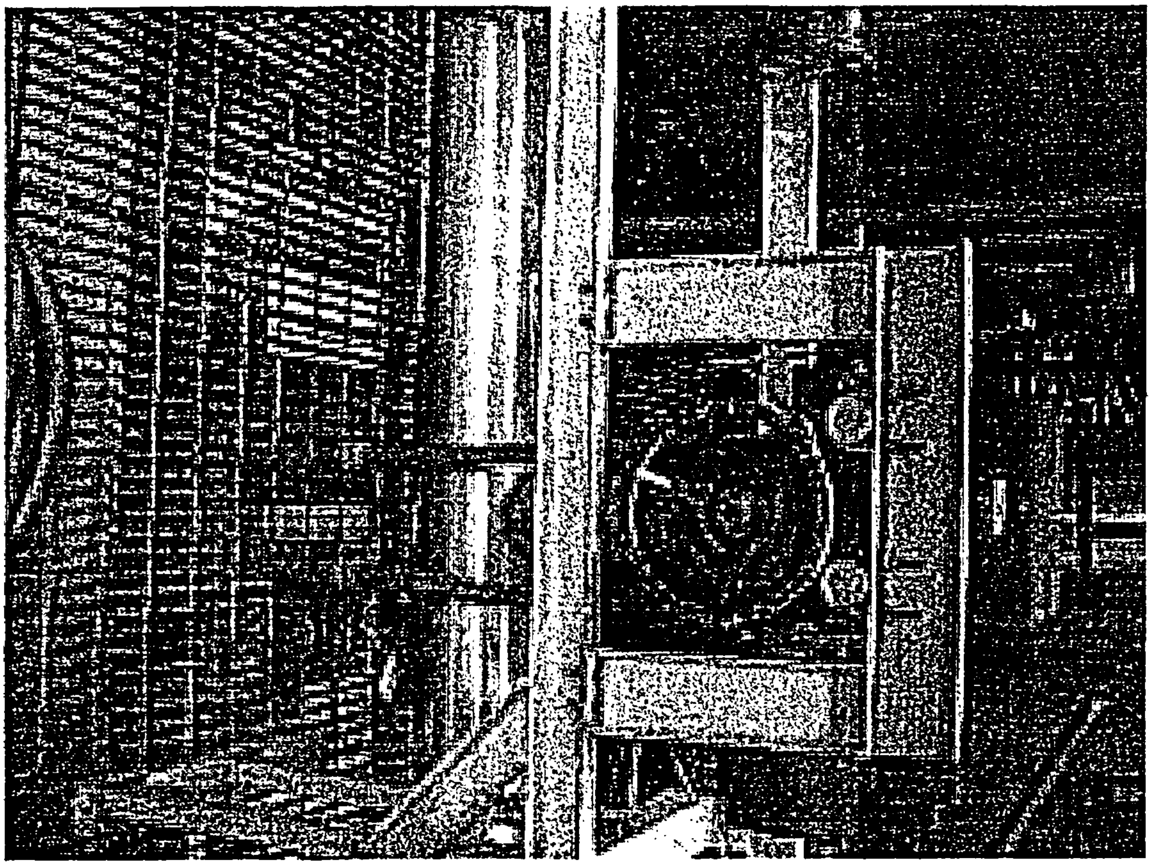
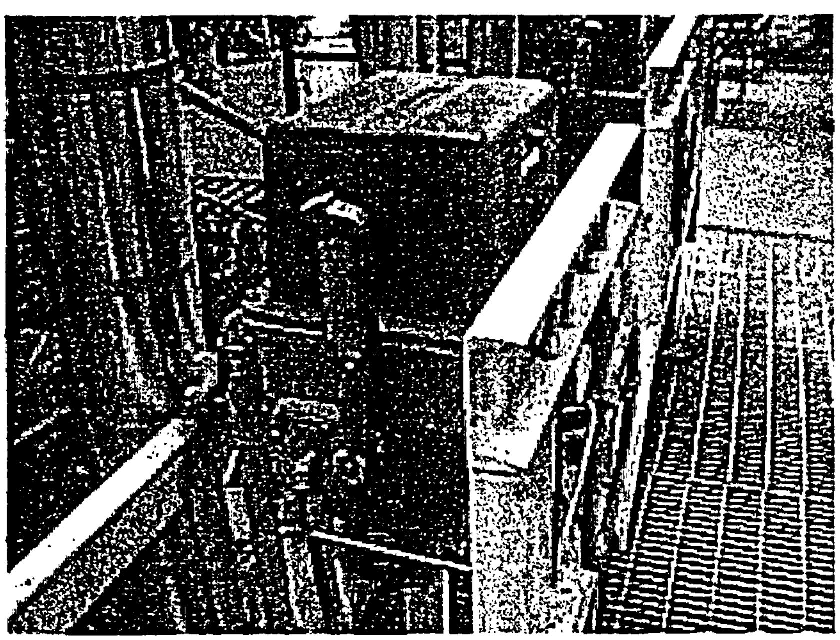


Figure Att. 9-6
Boundary 9 Piping. MOV V60-2C





Attachment 10

Walkdown Information for Boundary Piping 10

MS Piping (MSIVs to Stop Valves) (Boundary)

(2 pp including this page)

10-1 Piping Description

Boundary 10 – This seismic boundary piping consists of the 18 MS piping from the outboard MSIVs to the turbine stop and main steam control valves. The piping is located within the Turbine Building.

Walkdown Status: Piping to be walked down during RFO-24

10-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191156	21, 7.1
Piping Drawings	G-191182, G-191183	21, 8.3, 8.4
Piping Isometric Drawings	See Boundary Line 8	
Equipment Drawings	See Boundary Line 8	
Active Valve Drawings	See 1173875-C-003	Ref. 19
Is line seismically analyzed ?	Yes, see ENVY Calc 317, Rev. 1, CCN # 1	Ref. 16

10-3 Active Valve Discussion

Refer to Ref. 19

Attachment 11

Walkdown Information for Boundary Piping 11

HPCI/RCIC Steam Supply Drains (Boundary)

(19 pp including this page)

11-1 Piping Description

Boundary 11 – This seismic boundary piping consists of HPCI and RCIC steam supply drain piping, to condenser connection no. 56. The piping is located within the Reactor Building (HPCI, RCIC rooms, portion of Reactor Building Torus area) and the Turbine Building. The extent of the piping is shown in Figure Att.11-1.

Walkdown Status: Portions of the piping were walked down in June of 2003. The remaining inaccessible piping in the Turbine Building will be walked down during RFO-24.

11-2 Applicable Drawings

Type	Number	Reference
P&ID	G-191169, G-191174 both sh 1/2	14, 7.6, 7.5
Piping Drawings	G-191208, G-191223	14
Piping Isometric Drawings & supports	VYI-HPCI-Part 3a, Sh1 and 2, VYI-HPCI/RCIC Drain	14, 10.2, 10.3, 10.1
Equipment Drawings		
Active Valve Drawings	None	
Is line seismically analyzed ?	Yes, refer to ENVY Calc VYC-0519, Rev. 0, CCN 01	Ref. 17

Note:

1. Pipe support function and location indicated on iso VYI-HPCI/RCIC Drain

11-3 Active Valve Discussion

None

Figure Att.11-1: Boundary 11 Piping Definition

Portion of Piping in RCIC Room (Downstream of FCV-13- 35)

(Walkdown performed in June of 2003)

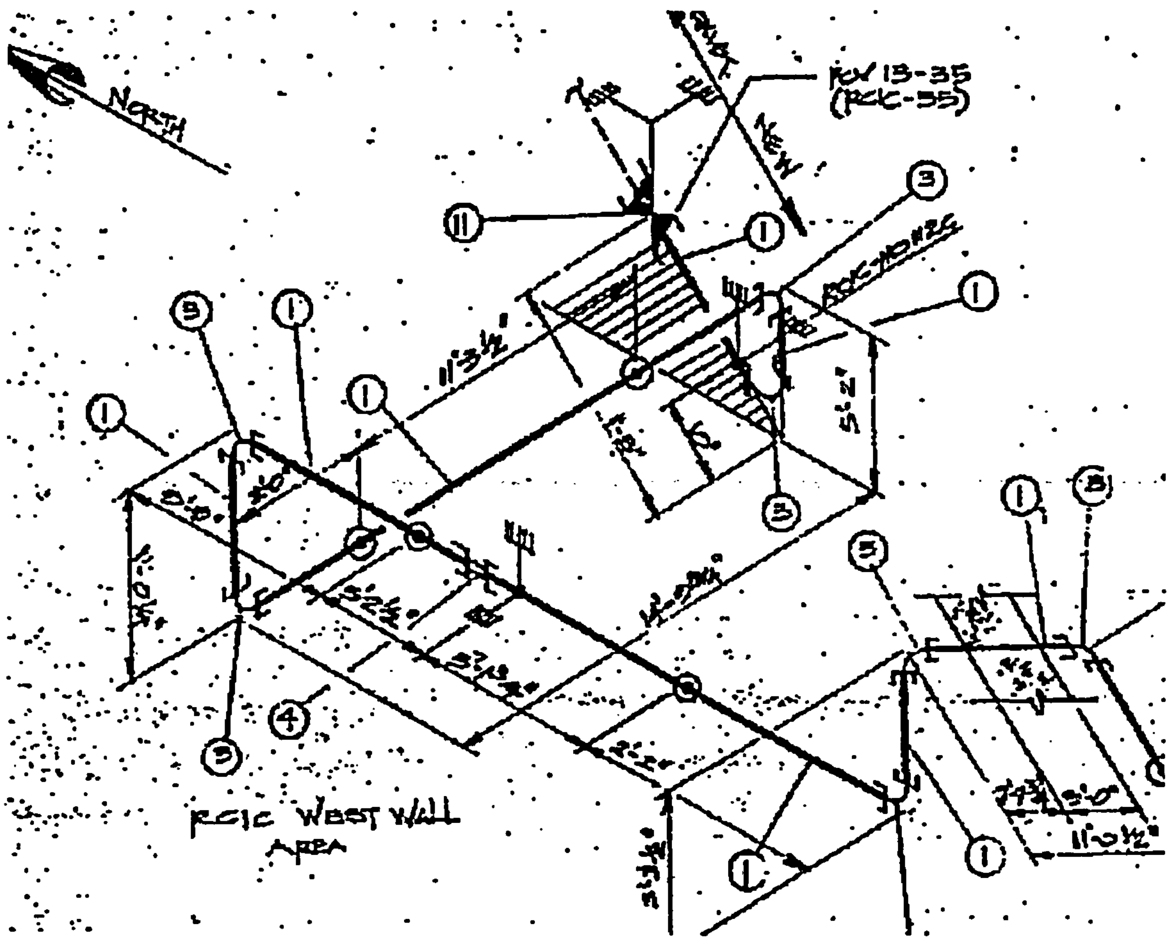


Figure Att.11-2: Boundary 11 Piping Definition (Continued)

Portion of Piping in HPCI Room (Downstream of FCV-43)

(Walkdown performed June 2003)

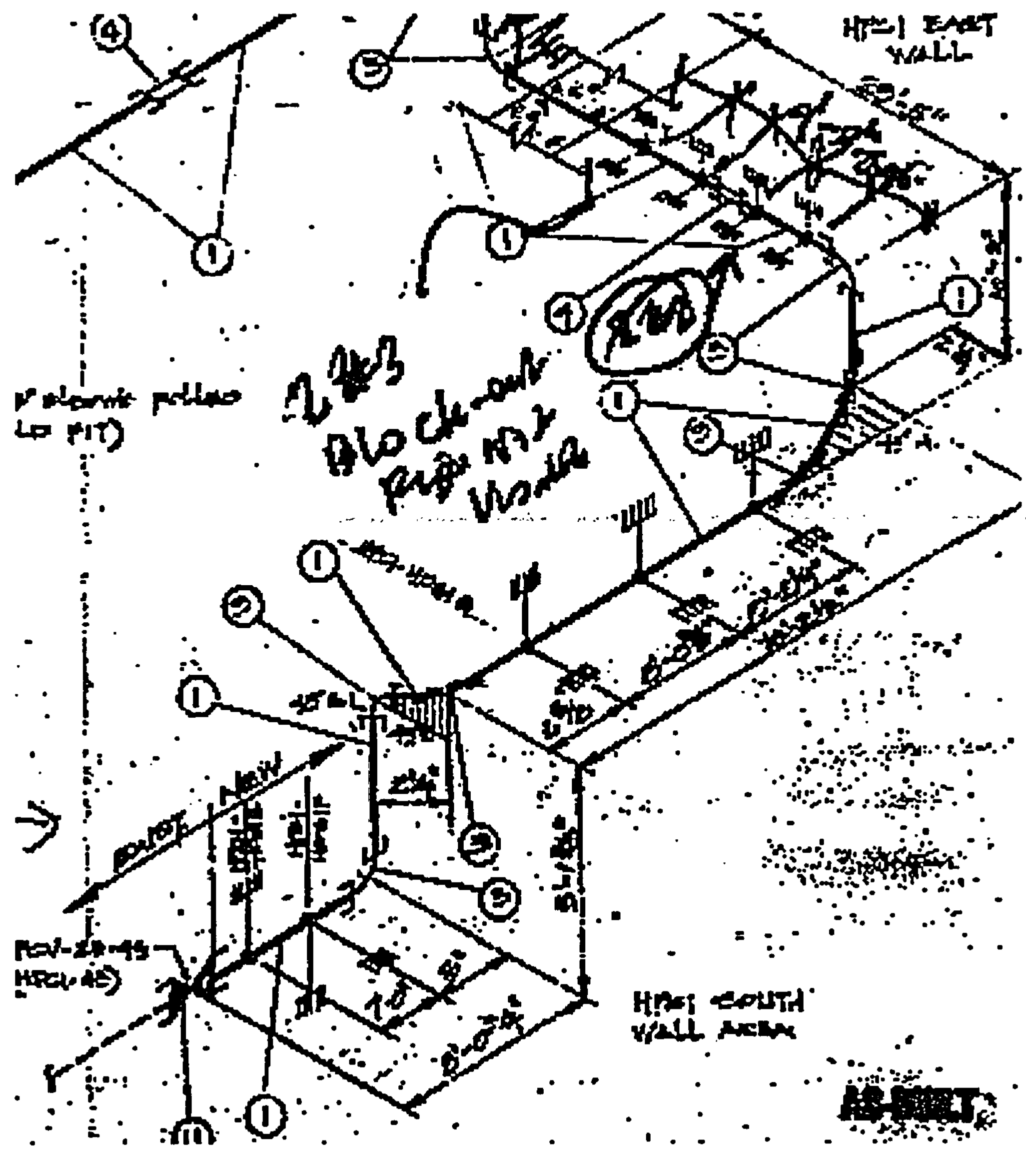
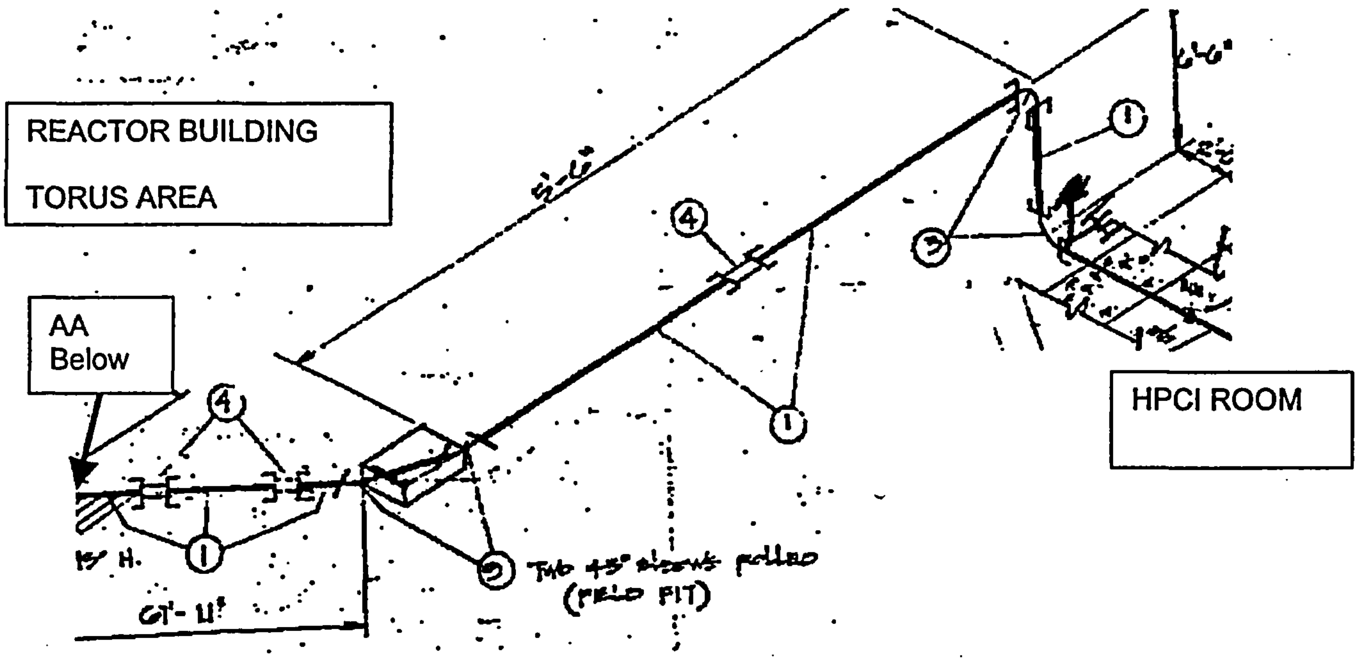


Figure Att.11-3: Boundary 11 Piping Definition (Continued)

Portion of Piping in RB Torus Area (Walkdown performed June 2003)



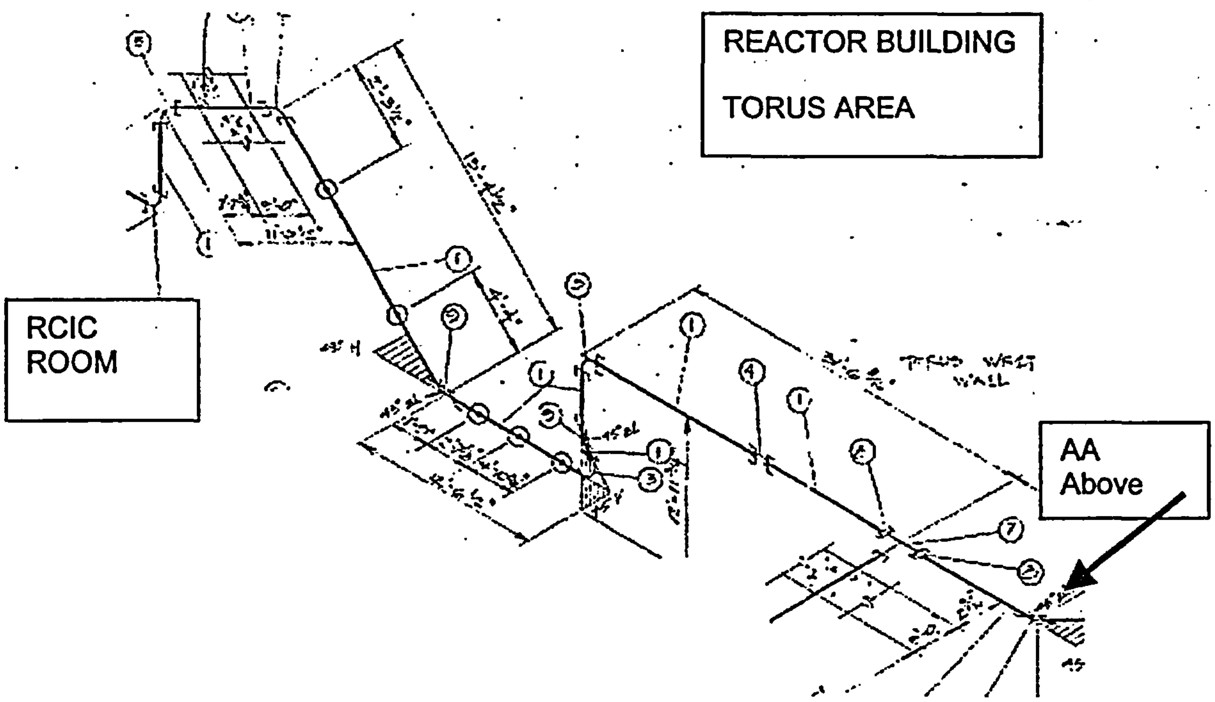


Figure Att.11-4: Boundary 11 Piping Definition (Continued)

Portion of Piping in Turbine Building

(Walkdown required during RFO-24)

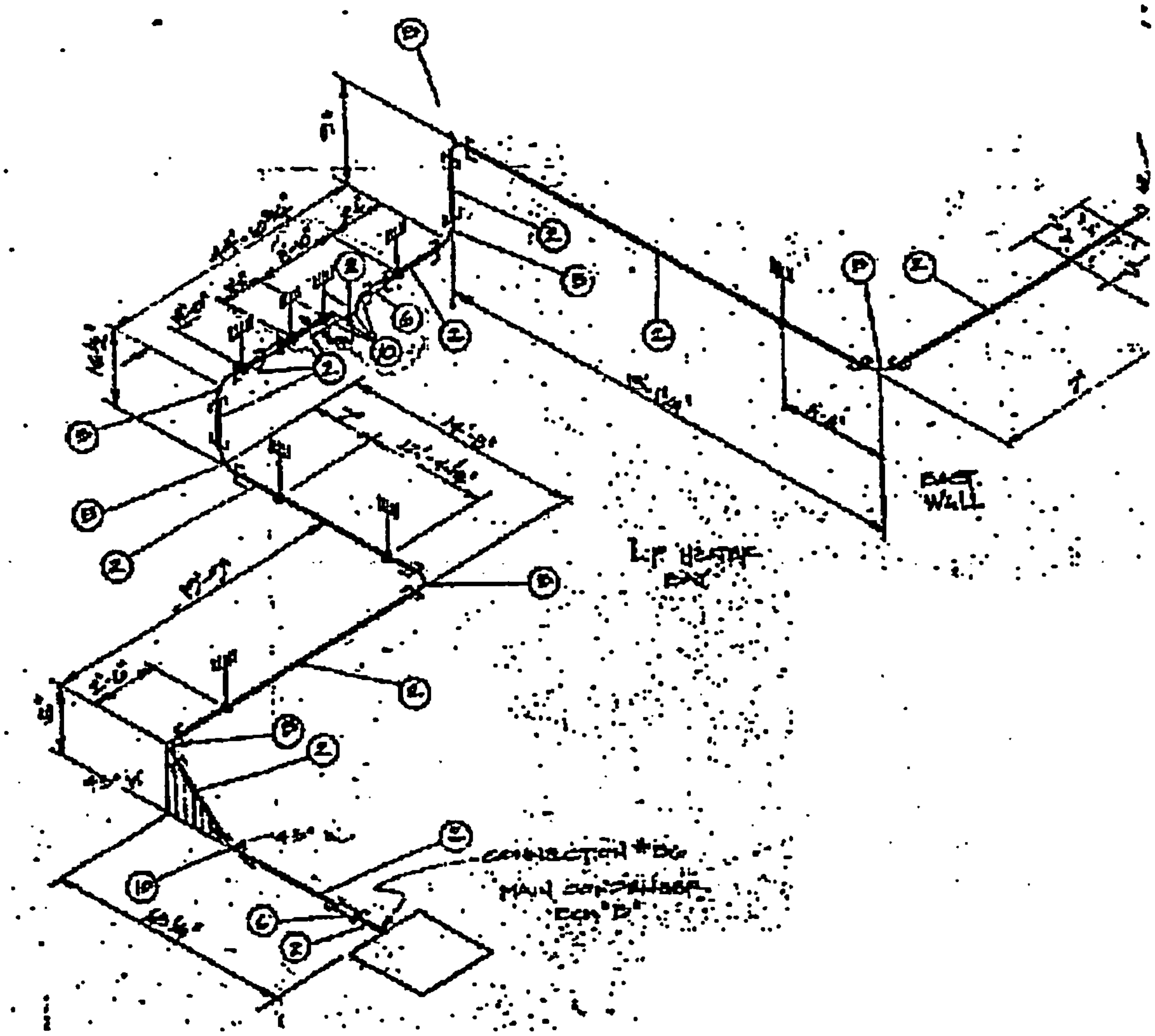


Figure Att.11-5

HPCI/RCIC – Typical Pipe Support on drain piping in HPCI Room of RB. Support has U-bolt for vertical and lateral guide

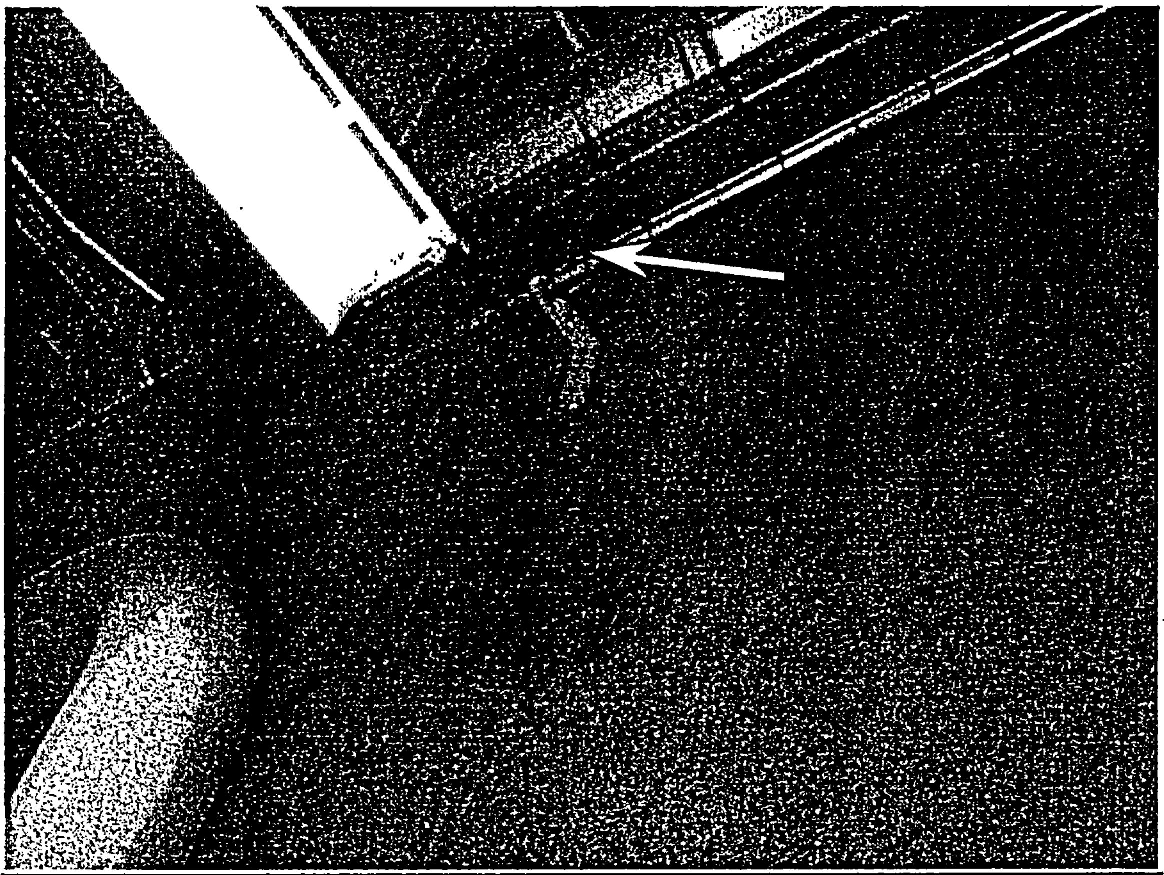


Figure Att.11-6

HPCI/RCIC – Operator Supports, Valves FCV-23-42 and -43

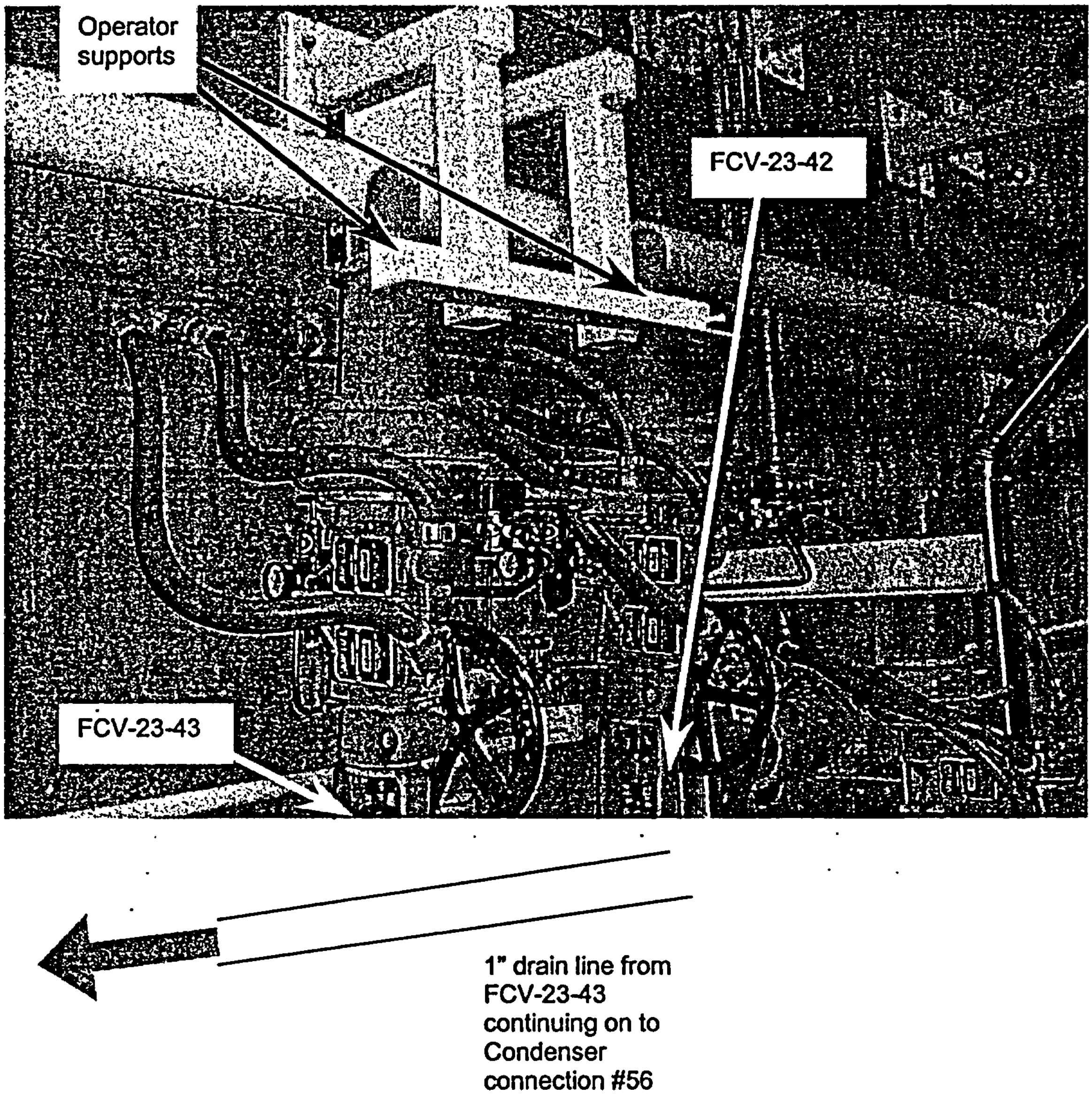
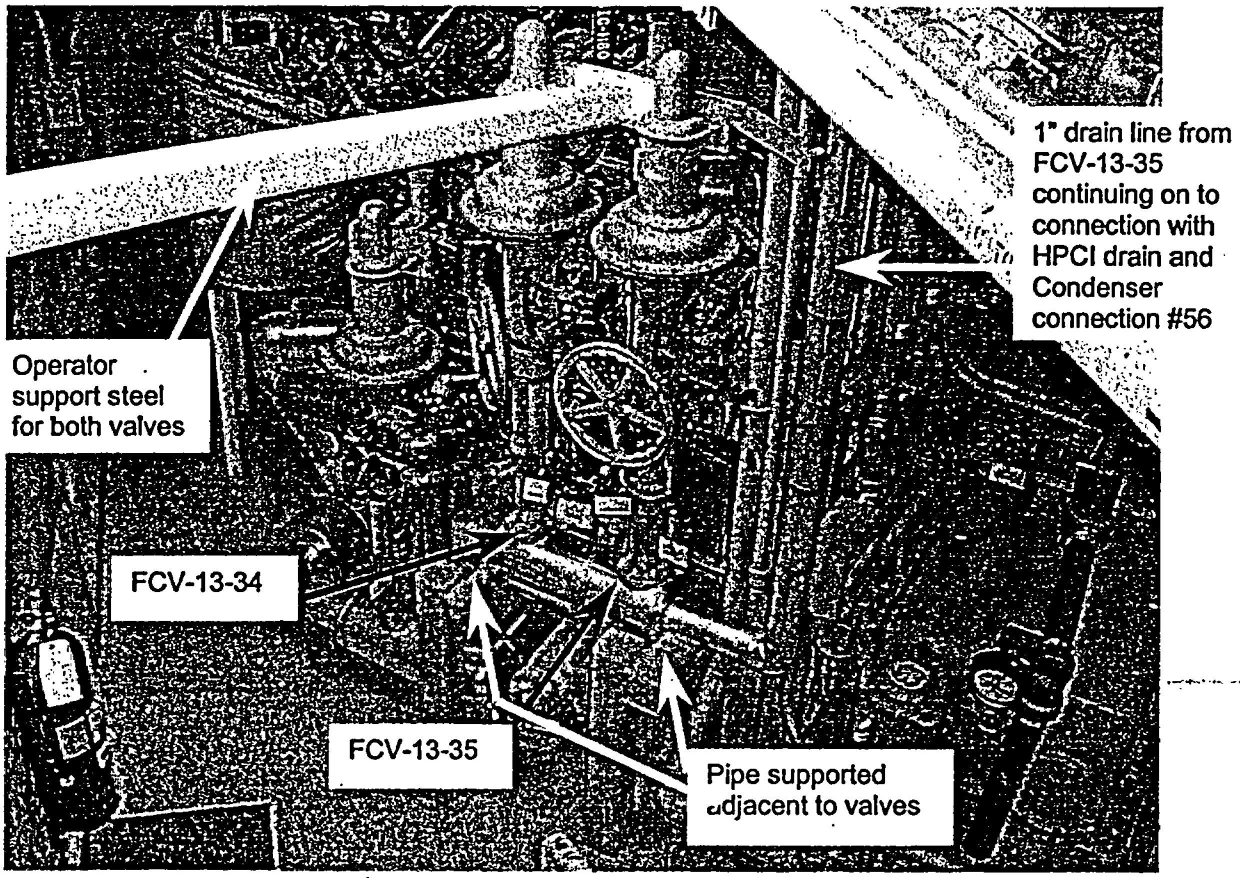


Figure Att.11-7

HPCI/RCIC – Operator Supports, Valves FCV-13-34 and -35



WALKDOWN DATA SHEET

BOUND. 11.

SHEET 1 OF 16

System HPCI DRAIN

Equip. Class Piping and Tubing Systems Line Identifier 1", 2" MSD

Bldg. REACTOR HPCI ROOM EL. 213' FLOOR TORUS COMPARTMENT Floor El. EL. 213'

P&ID No. G191162, G191167 SH. 1, G191174 Spec. No.

Isometric No. VYI-HPCI-PART 3A, SH 1 & 2
VYI-HPCI/RCIC DRAIN

Pipe/Tubing O.D. 1", 2" Wall Thickness SCH. 80

Material A335 P11

Insulation Type/Thickness 2" TO 3" THICK CALCIUM SILICATE

Piping System Boundary

Description PORTION OF HPCI DRAIN LINE ACCESSIBLE DURING PLANT OPERATION. SEE ATTACHED MARKED-UP P&ID.
REF. 17 IS STRESS ANALYSIS FOR PORTION OF LINE

Functionality Requirement

1. Pressure Boundary Integrity	(Y) circled	N		N/A

Review Criteria - Piping and Tubing

1.	No visible damage	(Y) circled	N	U	N/A
2.	No significant visible rust/corrosion deterioration	(Y) circled	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	(Y) circled	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing) NOTES 1., 3, 4	Y	N	(U) circled	N/A OUTLIER NO. 11-1
5.	No unusual pipe or tubing attachments	(Y) circled	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	(Y) circled	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	(Y) circled	N	U	N/A
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	(Y) circled	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	(Y) circled	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing (NO TUBING)	Y	N	U	(N/A) circled
11.	No large eccentric masses	(Y) circled	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	(Y) circled	N	U	

Are the criteria met? (Y) circled N U

WALKDOWN DATA SHEET

BOUND 11

SHEET 2 OF 16

System HPCI DRAIN Equip Class Piping and Tubing Systems

Line Identifier 1", 2" MSD

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	(Y) NOTE 3	N	U	N/A
2.	No visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No unusual design	(Y)	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	(Y)	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	(Y)	N	U	N/A
6.	No visible damage	(Y)	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	(Y)	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	(Y)	N	U	N/A
9.	Does the load path appear adequate	(Y)	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)	(Y)	N		

Are the above criteria met? (Y) N U

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	No other concerns	(Y)	N	U	N/A

Is equipment free of interaction effects? (Y) N U

Is the piping/tubing system seismically adequate? Y N (U) OUTLIER NO. 11-1

Comments 1. TYPICAL SPANS IN HPCI ROOM ARE 8' TO 9'. SLIGHTLY IN EXCESS OF 7' ANSI B31.1 RECOMMENDED, BUT JUDGED ADEQUATE BASED ON EXISTING ANALYSIS RESULTS AND OVERALL SUPPORT CONFIGURATION.

2. LARGE CONC. BLOCK BLOCKOUT EXISTS IN N. WALL OF HPCI RM. PIPE GOES THROUGH PENETRATION IN WALL. WALL IS SEISMICALLY ADEQUATE BASED ON EXIST. CALC. (REF. ENG CALC, REF. 15)

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

WALKDOWN DATA SHEET

BOU NO. 11

SHEET 3 OF 16

System HPCI DRAIN Equip Class Piping and Tubing Systems

Line Identifier 1" - 2" MSD

Comments/Outliers

3. PIPING GOES THROUGH N. WALL OF HPCI RM. INTO TORUS COMPARTMENT. A 2-WAY U-BOLT SPT. ATTACHES TO PIPE AS IT COMES THROUGH WALL. SPANS IN TORUS COMPARTMENT IN VICINITY OF BLOCKOUT ARE APPX. 12'. TYP. SUPPORTS ARE U-BOLTS ON SHORT CANTILEVER ANGLES.

4. PIPING RUNS HORIZONTALLY IN TORUS COMPARTMENT ALONG WALL APPX. 18' ABOVE FLOOR. ONE SECTION OF PIPE IS INACCESSIBLE FOR INSPECTION OF SUPPORT SPANS FROM FLOOR AND FROM EXIST. LADDER & PLATFORM. OUTLIER NO. 11-2 SUPPORT SPANS ARE UNKNOWN.

RECOMMENDED RESOLUTION: ERECT SCAFFOLDING OR LADDERS IN AREA TO DETERMINE SPANS.

BOUND. 11

WALKDOWN DATA SHEET

SHEET 4 OF 16

System RCIC DRAIN

Equip. Class Piping and Tubing Systems Line Identifier 1" MSD

Bldg. REACTOR Floor El. RCIC CORNER RM EL. 213' TORUS COMPARTMENT

P&ID No. G191174 SHT. 1. Spec. No. CS-1

Isometric No. VYI-HPCI/RCIC DRAIN

Pipe/Tubing O.D. 1" Wall Thickness SCH 80

Material A335 P22

Insulation Type/Thickness 2" TO 3" TK CALCIUM SILICATE

Piping System Boundary

Description PORTION OF RCIC DRAIN LINE. ACCESSIBLE DURING PLANT OPERATION. SEE ATTACHED MARKED-UP P&ID.

Functionality Requirement

1.	Pressure Boundary Integrity	(Y)	N		N/A

Review Criteria - Piping and Tubing

1.	No visible damage	(Y)	N	U	N/A
2.	No significant visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	(Y)	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing) NOTE 1.	(Y)	N	U	N/A
5.	No unusual pipe or tubing attachments	(Y)	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	(Y)	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	(Y)	N	U	N/A
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	(Y)	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	(Y)	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing (NO TUBING)	Y	N	U	(N/A)
11.	No large eccentric masses	(Y)	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	(Y)	N	U	

Are the criteria met? (Y) N U

WALKDOWN DATA SHEET

BOUND: 11

SHEET 5 OF 16

System RCIC Drain Equip Class Piping and Tubing Systems

Line Identifier 1" MSD

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	(Y)	N	U	N/A
2.	No visible rust/corrosion deterioration	(Y)	N	U	N/A
3.	No unusual design	(Y)	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	(Y)	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	(Y)	N	U	N/A
6.	No visible damage	(Y)	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	(Y)	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	(Y)	N	U	N/A
9.	Does the load path appear adequate	(Y)	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)	(Y)	N		
	Are the above criteria met?	(Y)	N	U	

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	(Y)	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	No other concerns	(Y)	N	U	N/A
	Is equipment free of interaction effects?	(Y)	N	U	

Is the piping/tubing system seismically adequate? (Y) N U

Comments 1. SPANS APPX. SAME AS B31.1 RECOMMENDED.
2. TYPICAL SUPPORTS ARE ANGLE CANTILEVER WITH U-BOLT
& CONC EXPANSION ANCHORS (2 PER SUPPORT, TYP.)

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

WALKDOWN DATA SHEET

BOOK 11 SHEET 12 OF 16

System HPCI DRAIN P&ID No. G-181165

Valve. ID No. FCV-23-42 Equip. Class Valves

Valve Description AOV-F Isometric No. VYI-HPCI RCIC DRAIN

Valve Location: Bldg. REACTOR Floor El. 213'-9" Room, Row/Col HPCI ROOM

Manufacturer, Model, Etc. ______

Drawing No. ______

Functionality Requirement

1. Valve state change required	Y	(N) circled	U	

Review Criteria

1. Does valve operator meet pipe centerline dimension restriction	(Y) circled	N	U	N/A NOTE 2.
2. Do valve power and control utilities have adequate slack	(Y) circled	N	U	N/A
3. Valve operator is not supported independently of pipe	(Y) circled	N	U	N/A NOTE 1.
Are the criteria met?	(Y) circled	N	U	

Interaction Effects

1. Vulnerable valve components free from impact by nearby equipment or structures	(Y) circled	N	U	N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls	(Y) circled	N	U	N/A
3. Are any required electrical controls free of water spray interactions	(Y) circled	N	U	N/A
4. No other concerns	(Y) circled	N		N/A
Is equipment free of interaction effects?	(Y) circled	N	U	
Is equipment seismically adequate?	(Y) circled	N	U	

Comments 1. TOP OF VALVE OPERATOR IS INDEPENDENTLY SUPPORTED FROM PIPE WITH A RIGID U-BOLT SUPPORT (TWO WAY HORIZONTAL SUPPORT). PIPE IS 1"φ, HOWEVER PIPE IS ALSO RIGIDLY SUPPORTED IN THE VICINITY OF THE VALVE IN BOTH HORIZONTAL AND VERTICAL DIRECTIONS. JUDGED ADEQUATE SINCE BOTH VALVE OPERATOR AND PIPE ARE WELL SUPPORTED.
2. ℄ PIPE TO TOP OF OPERATOR IS APPX. 55". THIS IS GREATER THAN LIMIT OF 45" FOR DIAPHRAGM VALVES, BUT JUDGED ADEQUATE SINCE OPERATOR AND PIPE ARE WELL SUPPORTED.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature], SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

1173875-R-002, R0
ATT. 11. SHT. 16

WALKDOWN DATA SHEET

BOUND. 11 SHEET 13 OF 16

System HPCI DRAIN P&ID No. G-191169

Valve. ID No. FCV-23-43 Equip. Class Valves

Valve Description AOV Isometric No. VYI-HPCI RCIC DRAIN

Valve Location: Bldg. REACTOR Floor El. 213'-9 Room, Row/Col HPCI ROOM

Manufacturer, Model, Etc. ______

Drawing No. ______

Functionality Requirement

1. Valve state change required Y (N) U

Review Criteria

1. Does valve operator meet pipe centerline dimension restriction (Y) N U N/A NOTE 2.
2. Do valve power and control utilities have adequate slack (Y) N U N/A
3. Valve operator is not supported independently of pipe (Y) N U N/A NOTE 1.

Are the criteria met? (Y) N U

Interaction Effects

1. Vulnerable valve components free from impact by nearby equipment or structures (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls (Y) N U N/A
3. Are any required electrical controls free of water spray interactions (Y) N U N/A
4. No other concerns (Y) N N/A

Is equipment free of interaction effects? (Y) N U

Is equipment seismically adequate? (Y) N U

Comments 1. SEE NOTE 1 FOR FCV-23-42
2. SEE NOTE 2 FOR FCV-23-42
THIS VALVE IS THE SAME AS FCV-23-42

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

117875-R-002, R0
ATT. 11, SHT 17

WALKDOWN DATA SHEET

BOUND, 11 SHEET 14 OF 16

System RCIC DRAIN P&ID No. G-191174

Valve. ID No. FCV-13-34 Equip. Class Valves

Valve Description AOV Isometric No. VYI-HPCI-RCIC-DRAIN

Valve Location: Bldg. REACTOR Floor El. 213'-9" Room, Row/Col RCIC CORNER RM

Manufacturer, Model, Etc. __________

Drawing No. __________

Functionality Requirement

1. Valve state change required Y (N) U

Review Criteria

1.	Does valve operator meet pipe centerline dimension restriction	(Y)	N	U	N/A NOTE 2.
2.	Do valve power and control utilities have adequate slack	(Y)	N	U	N/A
3.	Valve operator is not supported independently of pipe	(Y)	N	U	N/A NOTE 1.
	Are the criteria met?	(Y)	N	U	

Interaction Effects

1.	Vulnerable valve components free from impact by nearby equipment or structures	(Y)	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3.	Are any required electrical controls free of water spray interactions	(Y)	N	U	N/A
4.	No other concerns	(Y)	N		N/A

Is equipment free of interaction effects? (Y) N U

Is equipment seismically adequate? (Y) N U

Comments 1. TOP OF OPERATOR IS INDEPENDENTLY SUPPORTED FROM PIPE WITH A RIGID U-BOLT SUPPORT (TWO WAY HORIZONTAL). PIPE IS ALSO RIGIDLY SUPPORTED IN VICINITY OF VALVES (TYP. SPT. RCIC-HD-112C). JUDGED ADEQUATE SINCE BOTH VALVE OPERATOR AND PIPE ARE WELL SUPPORTED.
2. ℄ PIPE TO TOP OF OPERATOR IS APPX. 55". THIS IS GREATER THAN LIMIT OF 45" FOR DIAPHRAGM VALVES IN DATA BASE, BUT JUDGED ADEQUATE SINCE OPERATOR AND PIPE ARE WELL SUPPORTED.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

1173875-R-002, R0
ATT. 11, SHT. 18

WALKDOWN DATA SHEET

SHEET 15 OF 16

BOUND 11

System RCIC DRAIN P&ID No. G-191174

Valve. ID No. FCV-13-35 Equip. Class Valves

Valve Description AOV Isometric No. VYI-HPCI/RCIC DRAIN

Valve Location: Bldg. REACTOR Floor El. 213'-9" Room, Row/Col RCIC CORNER ROOM

Manufacturer, Model, Etc. ______

Drawing No. ______

Functionality Requirement

1. Valve state change required Y (N) U

Review Criteria

1. Does valve operator meet pipe centerline dimension restriction	(Y)	N	U	N/A	NOTE 2
2. Do valve power and control utilities have adequate slack	(Y)	N	U	N/A	
3. Valve operator is not supported independently of pipe	(Y)	N	U	N/A	NOTE 1
Are the criteria met?	(Y)	N	U		

Interaction Effects

1. Vulnerable valve components free from impact by nearby equipment or structures	(Y)	N	U	N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls	(Y)	N	U	N/A
3. Are any required electrical controls free of water spray interactions	(Y)	N	U	N/A
4. No other concerns	(Y)	N		N/A

Is equipment free of interaction effects? (Y) N U

Is equipment seismically adequate? (Y) N U

Comments 1. SEE NOTE 1 FOR FCV-13-34
2. SEE NOTE 2 FOR FCV-13-34

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

117387S-P-002, R0
ATT. 11, SHT. 19

WALKDOWN DATA SHEET

BOUND. 11 SHEET 16 OF 16

System RCIC DRAIN P&ID No. 6-19174

Valve. ID No. FCV-13-32 Equip. Class Valves

Valve Description ______ Isometric No. VYE-HPCI/RCIC DRAIN

Valve Location: Bldg. REACTOR Floor El. 213-9 Room, Row/Col RCIC CORNER ROOM

Manufacturer, Model, Etc. ______

Drawing No. ______

Functionality Requirement

1. Valve state change required Y (N) U

Review Criteria

1. Does valve operator meet pipe centerline dimension restriction (Y) N U N/A NOTE 2.
2. Do valve power and control utilities have adequate slack (Y) N U N/A
3. Valve operator is not supported independently of pipe (Y) N U N/A NOTE 1.

Are the criteria met? (Y) N U

Interaction Effects

1. Vulnerable valve components free from impact by nearby equipment or structures (Y) N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls (Y) N U N/A
3. Are any required electrical controls free of water spray interactions (Y) N U N/A
4. No other concerns (Y) N N/A

Is equipment free of interaction effects? (Y) N U

Is equipment seismically adequate? (Y) N U

Comments 1. SEE NOTE 1 FOR FCV-13-34
2. SEE NOTE 2 FOR FCV-13-34

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: [signature] SCE, PE Date: 6-20-03

Evaluated by: [signature] Date: 6-20-03

ABS Consulting

Attachment A

Procedure 1173875-P-002, Revision 0

Walkdown Procedure

Seismic Adequacy Review

of MSIV Alternate Leakage Path

Piping, Tubing and Equipment

(42 pp including this sheet)

1173875-R-002, R0 ATT. A.

WALKDOWN PROCEDURE
SEISMIC ADEQUACY REVIEW
OF MSIV ALTERNATE LEAKAGE PATH
PIPING, TUBING AND EQUIPMENT

VERMONT YANKEE NUCLEAR POWER STATION

PROCEDURE NO.: 1173875-P-002

REVISION NO.: 0

DATE: June 13, 2003

PREPARED BY/DATE: [signature] 6-13-03

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APPROVED BY/DATE: [signature] 6/13/03

ABS Consulting

SHT. ATT. A. -2

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Revision	Description of Revision	Date Approved
0	Original Issue	June 13, 2003

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ATTACHMENTS

1.0 SCOPE

This procedure describes the activities and required procedures for implementation of a data gathering and screening walkdown for seismic adequacy review of the Main Steam Isolation Valve (MSIV) leakage path piping, tubing and equipment. The scope includes seismic verification of piping that will provide the alternate path for MSIV leakage to reach the condenser.

The purpose of this activity is to gather and document the information required to verify that pressure and functional integrity of this piping and equipment will be maintained during and after a seismic event.

2.0 RESPONSIBILITIES

The project manager shall be responsible for ensuring the implementation of this procedure.

The project manager shall be responsible for ensuring that the seismic review team members are trained in accordance with this procedure prior to performing the walkdown. This will be documented on the training verification form included as Attachment C to this procedure.

The project manager shall be responsible for organizing and directing the walkdowns in accordance with this procedure. The individual seismic review team members shall be responsible for the actual performance of the walkdowns and documentation of the results.

3.0 DEFINITIONS

A. SEISMIC REVIEW TEAM

The Seismic Review Team (SRT) engineers performing the walkdowns, evaluation and analysis must be degreed engineers, with considerable experience in structural and/or earthquake engineering applicable to nuclear power plants. The SRT engineers shall successfully complete a training course on the background for, the philosophy behind, and the use of these seismic evaluation guidelines. At least two SRT engineers shall comprise a team of which at least one shall be a licensed professional engineer.

As a group, the SRT shall possess knowledge in the performance of equipment, systems, and structures during strong-motion earthquakes in industrial process and power plants. They shall also understand conduct of nuclear plant walkdowns; nuclear design codes and standards; and seismic design, analysis, and test qualification practices for nuclear power plants.

The core SRT may be supplemented by additional personnel for the purpose of documenting field conditions not shown on plant drawings. The qualifications for these personnel will be determined by the project manager.

Each engineer involved in the walkdown or evaluation shall submit a resume of qualifications and experience per Attachment B. In addition, documentation of having completed the required training shall also be on file.

B. EVALUATION

An assessment of the seismic adequacy of the as-installed piping, pipe supports, tubing and equipment will be performed using the Walkdown Data Sheets included as Attachment A. These worksheets were developed based on the observed failure modes of piping and equipment in power and industrial facilities resulting from actual strong motion earthquakes.

C. OUTLIER

As-installed piping, tubing and equipment that do not meet the review criteria of this procedure shall be documented as outliers. Outliers may require further detailed evaluation using analysis, seismic experience data, testing or other methods.

4.0 METHODOLOGY

Very few components of nuclear plant systems are unique to nuclear facilities. Nuclear plant systems include electrical panels and switchgear, air compressors, tanks, piping, conduit, and many other items that are common components of conventional power plants and industrial facilities. The seismic experience database was developed to address the problem of seismic qualification for equipment that was purchased as common "off the shelf" items or for commodities that require an upgrade in seismic classification. By reviewing the performance of facilities that contain equipment similar to that found in nuclear plants, conclusions can be drawn about the performance of nuclear plant equipment during and after a design basis earthquake. Typical sources of seismic damage for different classes of equipment and piping have been obtained and are explained in detail in References 6 and 9.

Visual and design document review examination of piping systems are to be performed to assess valve and other component vulnerabilities and potential for pipe failure. Seismic inertial effects in welded steel piping systems are not considered to be primary failure initiators. Inadequate piping system flexibility and excessive relative support deflections are the more likely contributors to seismically-induced failures than dynamic shaking effects for welded steel pipe. Impact of valve operators on adjacent structures or equipment is the only credible valve failure mode of concern for seismic loads. Items to be observed in the walkdown are:

1. Preferably, the piping systems should not be fabricated with threaded or Victaulic or other mechanical friction-type of connections. These details produce a non-ductile system that is sensitive to inertia loads and certain support configurations for strong motion earthquakes. When observed, these details need to receive special attention.

2. The use of cast iron pipe is a potential problem since it does not have the strength or ductility of steel, and usually has low capacity connections.

3. Branch lines out to their first support could be a potential concern if they do not have adequate flexibility. The necessary flexibility can come from either the supports or the pipe routing. Short, straight branch lines that are connected to

relatively rigid anchor points are candidates for failure if the major run pipe is not restrained from motion close to the branch.

4. The connection of pipe into vessels, heat exchangers, and other equipment anchor points could be of concern if the details used could transmit excessive loads to the nozzles. This situation could result from

   a. Flexibility in the equipment support with the pipe system being rigidly supported near the equipment.

   b. Long unsupported runs of pipe adjacent to the equipment, particularly if heavy in-line components are mounted near the equipment.

   c. Pipe support failure near the equipment. Any indication of potential weak links in these supports should be noted for further evaluation.

5. Proximity of valve operators to structures, components, or other subsystems should be examined. The principal concern for active valves is that the operator support may be bent so that the valve will not change position on demand. For active and passive valves, an additional concern is fracture of the top works that could breach the pressure boundary.

6. Multiple failure of threaded rod supports (unzipping) on non-seismic piping could, in instances of long runs of pipe, potentially result in piping failure and subsequent flooding problems.

7. The use of vibration or shock isolation systems on equipment to which piping attaches could adversely affect the seismic performance of the piping system if the pipe segments to the first support on either side of this component are not flexible enough to accommodate the equipment motion.

8. The piping details across seismic gaps or between two buildings should be reviewed. Insufficient flexibilities in the routing detail could affect the pipe integrity for seismic differential building motions.

9. The increased pipe seismic responses may produce seismic interaction concerns. The following conditions should be reviewed during the walkdowns:

   a. Supports should be reviewed to insure they can accommodate motions in directions other than the primary load path. This concern is applicable to the clevis ends of struts and snubbers, and is not a concern unless there exist follow-on consequences, such as seismic missiles or seismic interaction.

   b. Relatively flexible piping spans should be reviewed for potential seismic interaction ramifications.

   c. Supports that only restrain dead weight loads and do not restrict the pipe from sliding off should be evaluated.

5.0 PROCEDURE

5.1 EQUIPMENT, PIPING, TUBING AND SUPPORTS

Equipment, piping and tubing systems in the seismic experience database have performed very well in earthquakes, even though they were typically designed for dead weight and operating loads only, with little or no consideration for seismic loads (Reference 7). Earthquake experience database methods provide the basis for review of the MSIV alternate leakage path piping and equipment.

Application of earthquake experience data for evaluation of piping and equipment must: (1) demonstrate database representation, and (2) address known seismic vulnerabilities of piping and components. Earthquake experience has identified conditions that have resulted in failure of piping and tubing systems and components. Instances of seismic damage to database piping have been the result of seismic anchor movement (SAM), seismic systems interaction (and impact), and corrosion. The database has demonstrated that inertial failures of piping are not credible as long as standard industrial or better design practices are employed.

5.1.1 Database Representation of Piping

In order to assure database representation of piping systems, the following conditions must be met:

1. The design basis ground spectra for the nuclear facility must be less than the bounding spectrum per Reference 2.

2. Piping installations must follow industry-standard practices (e.g., ANSI B31.1, Reference 11). Spans between supports should meet the ANSI recommended spans given in Table 5-1.

3. The piping system must not display known seismic vulnerabilities or employ seismically sensitive characteristics, such as brittle joints or mechanical couplings that could be adversely affected by differential movement.

Piping and pipe supports should be reviewed for the following to assure database representation:

- The piping configuration must have adequate flexibility to accommodate its thermal loading. The concern is that piping that appears highly stressed due to normal operating loads may perform poorly under an additional seismic load.
- Visible damage to piping or supports (e.g., broken supports, loose U-bolts) may adversely affect piping seismic performance.
- Unusual conditions (non-standard fittings, unusual pipe attachments, unusual support design, customized parts used in place of catalog parts, pipe supports that have been modified) should be considered as potential outliers. Judgment should be used to evaluate if these conditions represent a deviation from piping systems in the experience database.
- Brittle connections (e.g., threaded joints, cast iron fittings) should be considered as potential outliers. The experience database has demonstrated the seismic vulnerability of these connections. Un-reinforced branch connections should be reviewed since they may represent a deviation from normal industrial installation practices.
- The adequacy of pipe support installation (e.g., spring hanger settings, sliding supports which may have been restrained to preclude pipe sliding, one-way guide supports which may not restrain the pipe from sliding off under lateral seismic loads) should be reviewed by the SRT.
- Friction clamps should not be oriented in such a way that only the clamping or frictional forces developed by the clamps resist gravity loads.

5.1.2 Seismic Anchor Movement

The experience database includes several instances of seismic damage to piping and supports that were attributed to seismic anchor movement. Damage was the result of excessive movement of terminal end equipment, differential movement between pipe

supports in adjacent buildings, and excessive movements imposed on branch lines by flexible headers.

As a result of these instances of damage, the following attributes must be evaluated by the seismic review team during their piping walkdown.

- Piping configurations at building joints and between buildings should have adequate flexibility to accommodate seismically-induced differential building movement.

- Fittings which can be adversely affected by seismically-induced differential movement (e.g., bellows, flexible hoses) should be evaluated for adequate flexibility.

- Piping attached to unanchored or poorly anchored equipment should be considered an outlier. Stiff piping attached to flexible equipment should be evaluated to verify that the piping will not act as an equipment anchorage. In addition, the piping configuration should have adequate flexibility to accommodate equipment that may vibrate significantly during normal operation.

- Conditions where stiffly supported branch lines are attached to flexibly supported (e.g., rod-hung) main lines or headers should be considered as potential outliers. The seismic review team should evaluate this configuration for potential damage due to seismically induced differential movement.

5.1.3 Seismic Interaction Concerns for Piping

Guidelines for evaluating potential interaction hazards to items, including piping systems, are presented in Section 6. Particular attention should be given to hazardous interactions to piping with threaded or bolted connections for possible breach of pressure boundary. In addition, interactions involving impact of valve operators, vents and drains, and fragile appurtenances, should be evaluated in detail.

5.1.4 Pipe and Pipe Support Corrosion

The experience database includes instances of seismic damage to piping and supports that were attributed to excessive corrosion. Therefore, the seismic review team should

evaluate piping and pipe supports for rust or corrosion deterioration. The seismic review team should review the piping system for both internal and external corrosion.

The seismic review team should visually inspect the piping and supports to ensure they are free of significant external corrosion. Significant corrosion refers to metal thickness loss of more than about 20%. A surface discoloration or thin layer of rust does not harm structural integrity. The seismic review team should look for metal flaking, scaling, evidence of pipe leakage, pipe repair, rust staining on insulation and similar features that could indicate significant external corrosion.

Flow-induced vibrations, erosion, water hammer, metallurgical conditions and other factors can cause internal degradation and corrosion of piping systems. Significant degradation can make the piping system vulnerable to seismic damage. The seismic review team should review existing plant documentation for evidence of significant internal degradation. The review team should check for ongoing inspection and evaluation programs at the plant that address potential internal degradation issues.

5.1.5 Active Valves

Valves required to function to establish pressure boundaries shall be reviewed using the guidelines of Reference 3. The walkdown data sheets in Attachment A shall be used to document the review. Screening guidelines for air-operated valves, spring-operated pressure relief valves and piston-operated valves of light weight construction are provided in Figure 5-1. Screening guidelines for motor-operated valves and substantial piston-operated valves are provided in Figure 5-2. Evaluation of active valves should include review of all power and control utilities (such as solenoid valves and supply tubing) to insure adequate slack is provided to accommodate anticipated seismic motions. Supports located on the valve operator should be accompanied by supports on the valve body or piping adjacent to the valve body. The valve body and operator should be supported by a common structure to prevent differential displacement. Piping or tubing less than 1 inch in diameter with in-line eccentric masses such as motor or air operated valves should be supported at or near the valve.

5.1.6 Equipment Verification

Equipment that requires seismic verification includes the main condenser and equipment within the pressure boundary of the piping and tubing being reviewed. This includes equipment that acts as terminal anchor points (such as instrument racks and panels), transmitters, gauges and instrumentation. Equipment shall be reviewed using the general guidance of References 3 and 8, as applicable. The following general procedure shall be used for equipment review:

- The functional requirements for the component being evaluated shall be established. The required function may be pressure boundary retention, active change of state, structural integrity, etc.
- Review the equipment to establish representation in the earthquake experience database, using References 3, 6 and 10 as applicable. This includes a check that the equipment is typical of equipment in industrial and power applications.
- Review the equipment for known failure modes and sources of seismic damage that may affect the functional requirement established for the equipment and subcomponents.
- Check for unusual or non-typical arrangements of the devices within the equipment or of items external to the equipment.
- Assess the anchorage and presence of an adequate load path. Where judged appropriate, prepare field data on component anchorage.
- Check for seismic interaction hazards (such as proximity impact, failure and falling of components and un-reinforced block walls) in the vicinity of the equipment. Guidelines for evaluating seismic interaction hazards are presented in Section 6.

The details of the procedure vary according to the type of equipment and location within the plant. The extent of review and information gathering for active components, pressure boundary components and equipment required for structural integrity shall be determined based on the judgment and experience of the seismic review team.

5.1.7 Selective Analytical Review

A sampling of the piping configurations and pipe supports shall be selected for analytical review if it is considered appropriate by the SRT.

The sample size shall be determined by the SRT, based on the diversity, complexity and extent of the systems or areas being evaluated. Supports which are heavily loaded or which appear to have marginal anchorages shall be selected.

Detailed sketches of the sample piping and supports shall be included in the field walkdown notes. Sketches shall include the location, support configuration, dimensions, connection details, anchorage attributes, member sizes, and tributary lengths. The data sheet shall include notes describing the basis for selection of each sample. Any additional information that may be considered relevant to the seismic ruggedness of the sample support shall be noted.

5.2 ANCHORAGE

Anchorage of pipe supports shall be visually inspected in accordance with the guidelines of Reference 3. The extent of tightness testing to be performed for expansion anchor bolts shall be determined by the SRT based on accessibility of equipment and the extent of estimated loadings.

5.2.1 Expansion Anchor Bolts Inspection Guidelines

Expansion anchors shall be evaluated in the plant to ensure that proper installation has been obtained. The sample size of this evaluation shall be of sufficient quantity to satisfy the SRT engineers that proper installation has been achieved. This visual inspection shall include the following:

- A washer is installed between the equipment base and the bolt head or nut. If the equipment base is made of structural steel plate, then a washer is not needed if the bolt-hole diameter in the structural steel plate appears to be no greater that the nominal bolt diameter plus 1/16 inch.

- The concrete is sound with no significant cracks in the vicinity of the anchor bolt.

- The gap between the equipment base and the concrete surface is less than or equal to 1/4 inch.
- The bolt spacing is greater than about 10 times the bolt diameter.
- The distance between the bolt and any free concrete surface is greater than approximately 10 time the bolt diameter.
- The bolt is installed with at least the minimum embedment.

For shell type anchors, the minimum embedment is ensured if the shell does not protrude above the surface of the concrete. For non-shell type anchors, the minimum embedment is ensured if the projection of the bolt above the surface conforms with the following:

Bolt Diameter (Inches)	Allow. Bolt Projection (Inches)
3/8	1/2
1/2	5/8
5/8	7/8
3/4	1-1/2
1	1-1/2

5.2.2 Cast-In-Place Anchor Bolts Inspection Guidelines

Cast-in-place bolts shall be evaluated to ensure that proper installation has been obtained. This visual inspection shall include the following:

A washer is installed between the equipment base and the bolt head or nut. If the equipment base is made of structural steel plate, then a washer is not needed if the bolt-hole diameter in the structural steel plate appears to be no greater than the nominal bolt diameter plus 1/16 inch.

The concrete is sound with no significant cracks in the vicinity of the anchor bolt.

The gap between the equipment base and the concrete surface is less than or equal to 1/4 inch.

The bolt spacing is greater than about 10 times the bolt diameter.

The distance between the bolt and any free concrete surface is greater than approximately 10 times the bolt diameter.

5.2.3 Welded Anchorages Inspection Guidelines

Welded anchorages shall be evaluated to ensure that proper installation has been obtained. This visual inspection shall include the following:

- Check for weld burn-through on thin sections.
- Limit weld thickness, t, to thickness of thinner part being connected.
- If plug welds are found and required to take tension loads, they are to be considered as an outlier.

TABLE 5-1

NOMINAL SUGGESTED SPANS PER ANSI B31.1

Nominal Pipe Size (inch)	Outside Pipe Diameter (inch)	Nominal Suggested Maximum Span (feet)	
		Water Service	Steam, Gas or Air Service
1	1.315	7	9
2	2.375	10	13
3	3.50	12	15
4	4.50	14	17
6	6.625	17	21
8	8.625	19	24
10	10.75	21	26
12	12.75	23	30
16	16.00	27	35
20	20.00	30	39
24	24.00	32	42
30	30.00	33	44

Note: Does not apply where there are concentrated loads between supports such as flanges, valves, etc.

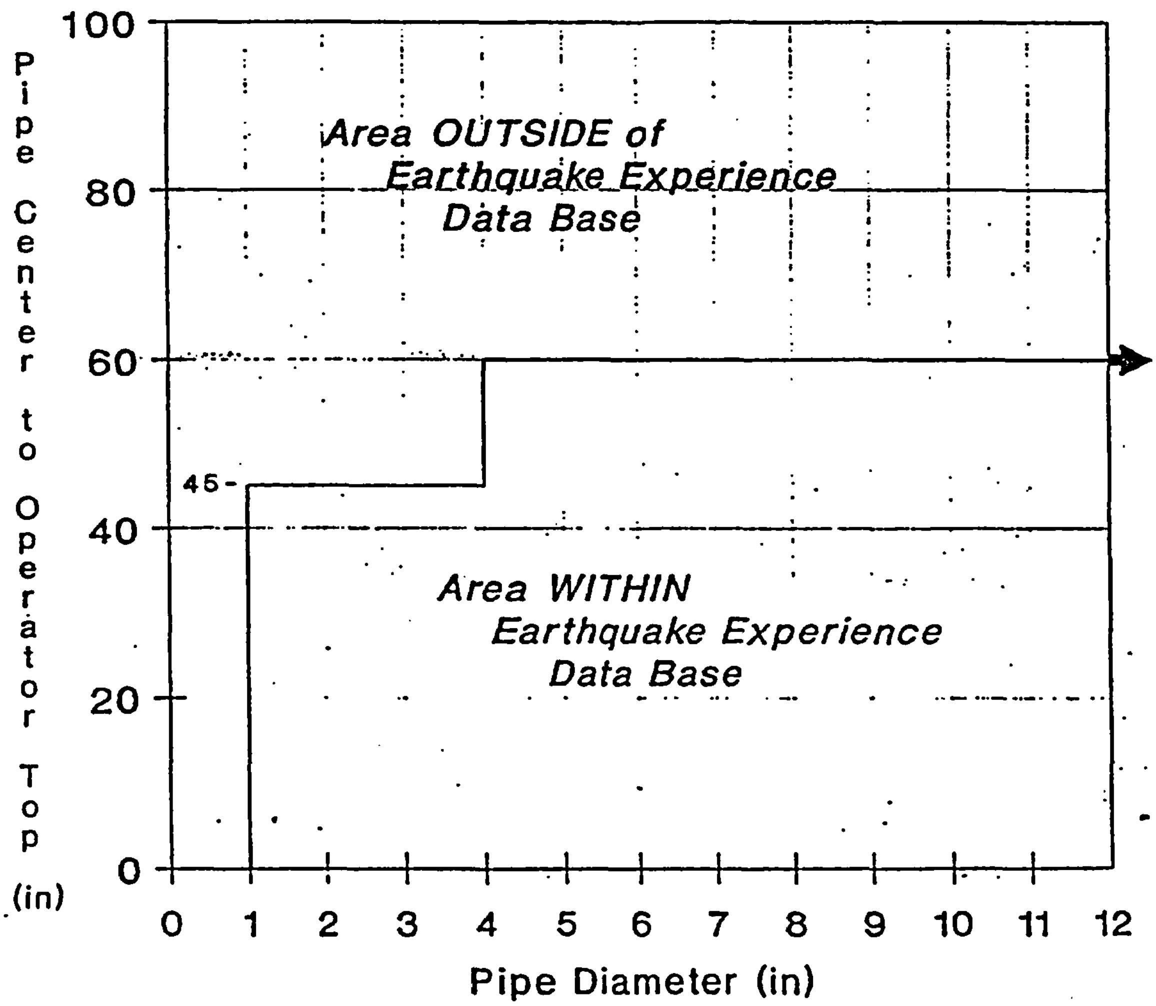
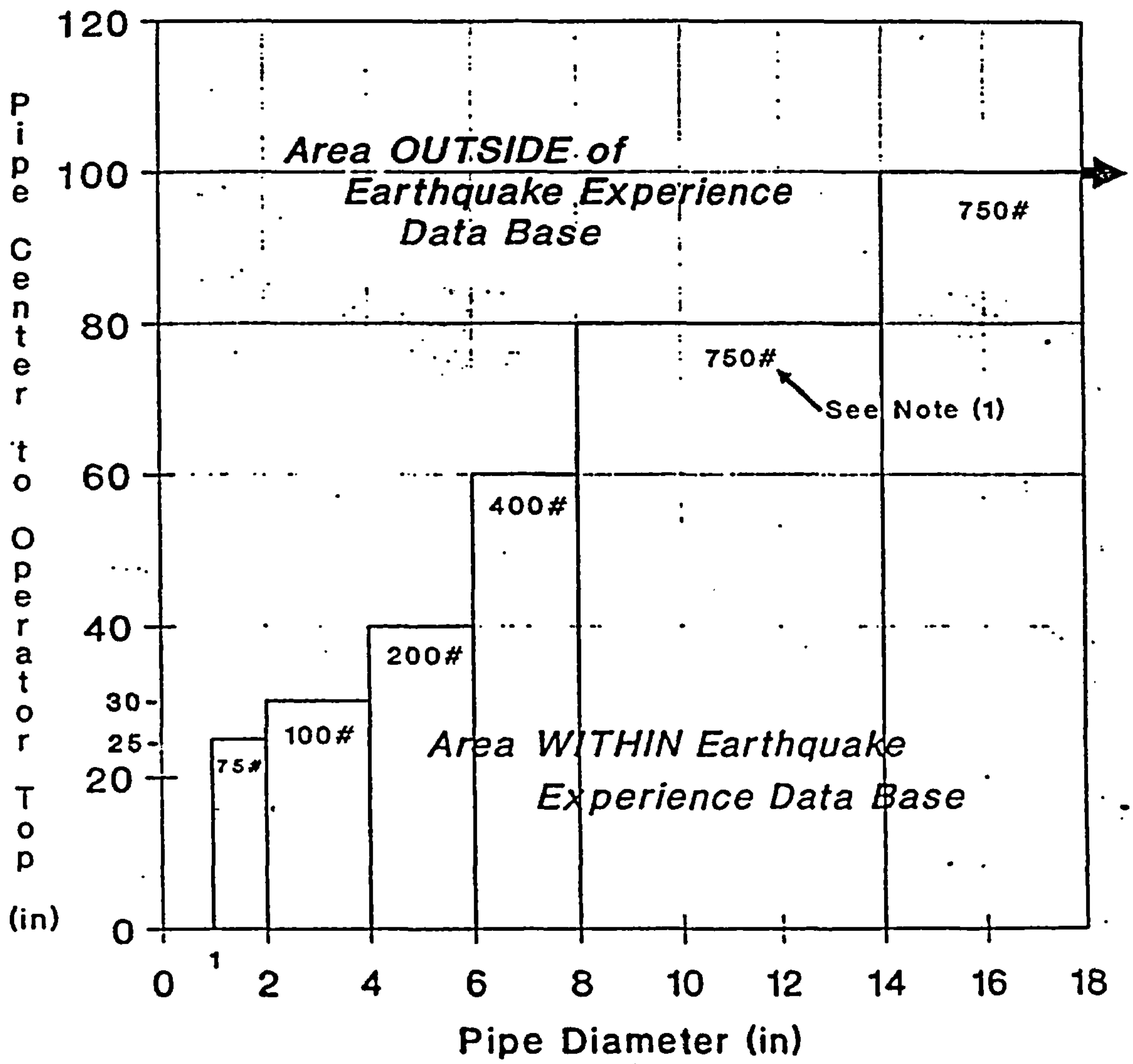


Figure 5-1: Limits of experience data for air-operated diaphragm valves, spring-operated pressure relief valves and piston-operated valves of light weight construction.



(1) Approximate Maximum Operator Weights Given for Various Ranges of Pipe Diameter

Figure 5-2: Limits of experience data for motor operated valves, and substantial piston-operated valves.

6.0 SEISMIC INTERACTION REVIEW

Guidelines for evaluating seismic interaction are included in Appendix D of the SQUG GIP (Reference 3). The seismic interaction review is a visual inspection of structures, piping, or equipment adjacent to the equipment under evaluation. The seismic interaction review also includes the identification of all seismically induced failures or displacements of any adjacent structures, piping, or equipment that could adversely affect the capability of the equipment under consideration. Particular attention should be given to adjacent non-safety-related structures, piping, and equipment.

The review team should identify and evaluate all credible and significant interaction hazards in the immediate vicinity of the equipment being evaluated. Evaluation of interaction effects shall consider detrimental effects on the capability of equipment and systems to function, taking into account equipment attributes such as mass, size, support configuration, and material hardness in conjunction with the physical relationships of interacting equipment, systems, and structures. In the evaluation of proximity effects and overhead or adjacent equipment failure and interactions, the effects of intervening structures and equipment that would preclude impact should be considered.

Damage from interaction in earthquakes results from unusual circumstances or from generic, simple details such as open hooks on suspended lights. In the interaction review, the SRT should look for (1) unusual impact situations, and (2) lack of proper anchorage or bracing of adjacent equipment.

The seismic review team should identify and evaluate all credible interactions that may result in damage to pressure boundary components and result in loss of function of the piping, tubing and equipment under review.

7.0 REQUIRED DOCUMENTATION

The results of the walkdown shall be documented by notes and observations recorded on the Walkdown Data Sheets from Attachment A. The Walkdown Data Sheets shall be signed and dated by all members of the seismic review team.

The qualification and training of the individual seismic review team members shall be documented on Attachments B and C.

8.0 QUALITY ASSURANCE

All work performed for this walkdown shall be done in accordance with the latest revision of the ABS Consulting Quality Assurance Manual (Reference 4).

9.0 REFERENCES

1. USNRC, "Generic Letter 87-02, Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46," February 1987.

2. SSRAP Report, "Use of Seismic Experience Data to Show Ruggedness of Equipment in Nuclear Power Plants," Senior Seismic Review and Advisory Panel, Revision 4.0, February 28, 1991.

3. Bishop, Cook, Purcell, and Reynolds; EQE Incorporated; MPR Associates, Inc.; Stevenson and Associates; URS Corporation/John A. Blume and Associates, "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Revision 2 Corrected 2/28/91.

4. ABS Consulting, "Quality Assurance Manual," Revision 6, December 9, 2002.

5. EPRI Report NP-5228, "Seismic Verification of Nuclear Plant Equipment Anchorage," Electric Power Research Institute, Palo Alto, CA, prepared by URS Corporation/John A. Blume & Associates, Engineers, Revision 1, June 1991.

6. EPRI Report NP-7149, "Summary of the Seismic Adequacy of Twenty Classes of Equipment Required for Safe Shutdown of Nuclear Plants," Electric Power Research Institute, Palo Alto, CA, prepared by EQE, Inc., March 1991.

7. EQE Incorporated, "Piping Seismic Adequacy Criteria Recommendation Based on Performance during and after Earthquakes", 2 Volumes. Prepared for the Electric Power Research Institute, RP-2635-1, February 1987.

8. EPRI NP-604, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin," Electric Power Research Institute, Palo Alto, CA, prepared by NTS Engineering, Long Beach, California, and RPK Consulting, Yorba Linda, CA, Revision 1, July 1991.

9. EQE Incorporated, "Power Piping During and After Earthquakes," Vol. 1. Prepared for the Electric Power Research Institute, San Francisco, CA, 1986.

10. GE Nuclear Energy Document NEDIC-31858P-A, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems," August 1999.

11. ASME/ANSI B31.1, "Power Piping," 1967, 1977 & later Editions.

ATTACHMENT A

WALKDOWN DATA SHEETS

WALKDOWN DATA SHEET

SHEET __ OF __

System ______________________________

Equip. Class Piping and Tubing Systems Line Identifier ______________________________

____

Bldg. ______________________________ Floor El. ______________________________

P&ID No. ______________________________ Spec. No. ______________________________

Isometric No. ______________________________

____

Pipe/Tubing O.D. ______________________________ Wall Thickness ______________________________

Material ______________________________

Insulation Type/Thickness ______________________________

Piping System Boundary

Description ______________________________

____

____

Functionality Requirement

1.	Pressure Boundary Integrity	Y	N		N/A

Review Criteria - Piping and Tubing

1.	No visible damage	Y	N	U	N/A
2.	No significant visible rust/corrosion deterioration	Y	N	U	N/A
3.	No potentially brittle connections (threaded joints, expansion joints, etc.)	Y	N	U	N/A
4.	Do the support spans appear to follow requirements (ANSI B31.1 for piping, 6'-0" max. for tubing)	Y	N	U	N/A
5.	No unusual pipe or tubing attachments	Y	N	U	N/A
6.	No heavy valves, flanges etc. supported by small bore vent and/or drain pipes	Y	N	U	N/A
7.	Does the piping configuration at building joints appear to have adequate flexibility to accommodate seismic induced differential movement	Y	N	U	N/A
8.	No fittings (bellows, flexible hoses, etc.) which can be adversely affected by seismic induced differential movements	Y	N	U	N/A
9.	No stiff branch piping attached to the main line with potentially significant movements	Y	N	U	N/A
10.	No excessive sagging, crimping or damage to tubing	Y	N	U	N/A
11.	No large eccentric masses	Y	N	U	N/A
12.	No other concerns (if no, comment on separate sheets and attach)	Y	N	U	

Are the criteria met? Y N U

WALKDOWN DATA SHEET

SHEET __ OF __

System ______________________ Equip Class Piping and Tubing Systems

Line Identifier ______________________

Review Criteria - Supports

1.	No seismically vulnerable supports details: One-way stanchions, brackets, etc. allowing piping to slide off Friction beam clamps without restraining straps Short fixed end threaded rods	Y	N	U	N/A
2.	No visible rust/corrosion deterioration	Y	N	U	N/A
3.	No unusual design	Y	N	U	N/A
4.	No customized parts used in place of catalog parts, which appear inadequate	Y	N	U	N/A
5.	Free of support details which appear to have been inappropriately altered	Y	N	U	N/A
6.	No visible damage	Y	N	U	N/A
7.	No inappropriate support settings (bottomed spring hangers, etc.)	Y	N	U	N/A
8.	Do concrete anchors appear to be adequate (Bolt centerline distance to: edges, adjacent bolts, abandoned holes, etc.)	Y	N	U	N/A
9.	Does the load path appear adequate	Y	N	U	N/A
10.	No additional concerns (If no, document comments on separate sheet and attach)	Y	N		

Are the above criteria met? Y N U

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	Y	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
3.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

Is the piping/tubing system seismically adequate? Y N U

Comments ______________________

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All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: ______________________ Date: ______________________

Evaluated by: ______________________ Date: ______________________

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WALKDOWN DATA SHEET

SHEET __ OF __

System ______________________ Equip Class Piping and Tubing Systems

Line Identifier ______________________

Comments/Outliers ______________________

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WALKDOWN DATA SHEET

SHEET __ OF __

System ______________________________ Equip Class Piping and Tubing Systems

Line Identifier ______________________________

Comments/Outliers ______________________________

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WALKDOWN DATA SHEET

SHEET __ OF __

System ______________________ P&ID No. ______________

Valve. ID No. ______________________ Equip. Class ___Valves___

Valve Description ______________________ Isometric No. ______________

Valve Location: Bldg. ______________ Floor El. ________ Room, Row/Col ______

Manufacturer, Model, Etc. ______________________

Drawing No. ______________________

Functionality Requirement

1.	Valve state change required	Y	N	U	

Review Criteria

1.	Does valve operator meet pipe centerline dimension restriction	Y	N	U	N/A
2.	Do valve power and control utilities have adequate slack	Y	N	U	N/A
3.	Valve operator is not supported independently of pipe	Y	N	U	N/A
Are the criteria met?		Y	N	U	

Interaction Effects

1.	Vulnerable valve components free from impact by nearby equipment or structures	Y	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
3.	Are any required electrical controls free of water spray interactions	Y	N	U	N/A
4.	No other concerns	Y	N		N/A

Is equipment free of interaction effects?	Y	N	U
Is equipment seismically adequate?	Y	N	U

Comments ______________________

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All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: ______________________ Date: ______________

Evaluated by: ______________________ Date: ______________

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WALKDOWN DATA SHEET

SHEET __ OF __

System ______________________________

Valve. ID No. ______________________________ Equip. Class ____________________

Comments/Outliers ____

WALKDOWN DATA SHEET

SHEET __ OF __

Pump. ID No. ______________________ Equip. Class ___Pump___

Pump Description ______________________

Pump Location: Bldg. __________ Floor El. ________ Room, Row/Col. ________

Functionality Requirement

1. Function required Y N U

Review Criteria

1. Is pump of good seismic design for function above (driver/pump on common base, shaft restraint, nozzle loadings, utility line slack etc.) Y N U N/A
2. No other concerns Y N

Are the criteria met? Y N U N/A

Interaction Effects

1. Vulnerable pump components free from impact by nearby equip. or structures Y N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls Y N U N/A
3. Are any required electrical controls free of water spray interactions Y N U N/A
4. No other concerns Y N U

Is equipment free of interaction effects? Y N U N/A

Anchorage

1. Does strength appear adequate Y N U N/A
2. No vibration isolators Y N U N/A
3. Does load path appear adequate Y N U N/A
4. No other concerns Y N
5. Prepare and attach a sketch. Y N

Are anchorages adequate based on judgment? Y N U

Comments ______________________

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All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: ______________________ Date: ______________

Evaluated by: ______________________ Date: ______________

WALKDOWN DATA SHEET

SHEET __ OF __

Support/Anchorage Sketch ____________________

Equip. ID No. ____________________ Equip. Class ____________________

Equipment Description ____________________

Equipment Location: Bldg. __________ Floor El. __________ Room, Row/Col. __________

Sketch By: ____________________ Date: __________

Verified By: ____________________ Date: __________

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WALKDOWN DATA SHEET

SHEET __ OF __

Vessel ID No.______________________________ Equip. Class Horizontal Vessels

Vessel Description ______________________________

Vessel Location: Bldg. ____________________ Floor El. _____ Room, Row/Col ____

Manufacturer, Model, Etc. ______________________________

Drawing No. ______________________________

Functionality Requirement

1.	Pressure Boundary Integrity	Y	N	U	

Review Criteria

1.	Is vessel of good seismic design for function above (Vessel to support connections, support system design, differential story support etc.)	Y	N	U	N/A
2.	No other vessel concerns	Y	N		
	Are the criteria met?	Y	N	U	N/A

Anchorage

1.	Does strength appear adequate	Y	N	U	N/A
2.	Does load path appear adequate	Y	N	U	N/A
3.	No other concerns	Y	N		N/A
4.	Prepare and attach a sketch	Y	N		
	Are anchorages adequate based on judgment	Y	N	U	

Interaction Effects

1.	Vulnerable pressure boundary appurtenances free from damaging impact by nearby equipment, structures, etc.	Y	N	U	N/A
2.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
3.	No other concerns	Y	N		
	Is equipment free of interaction effects?	Y	N	U	

Comments ______________________________

____

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: ______________________ Date: ______________

Evaluated by: ______________________ Date: ______________

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WALKDOWN DATA SHEET

SHEET __ OF __

Equipment ID No. ____________________ Equip. Class Instruments on Racks

Equipment Description ____________________

Equipment Location: Bldg. __________ Floor El. ____ Room, Row/Col ____

Manufacturer, Model, Etc. ____________________

Drawing No. ____________________

Functionality Requirement

1. Function Required Y N U

Review Criteria

1. Is instrument rack of good seismic design for function above (mounting details, load paths, steel frame and sheet metal structurally adequate, etc.) Y N U N/A
2. No other instrument rack concerns Y N

Are the criteria met? Y N U N/A

Anchorage

1. Does strength appear adequate Y N U N/A
2. Does stiffness appear adequate Y N U N/A
3. No other concerns Y N N/A
4. Prepare and attach a sketch Y N N/A

Are anchorages adequate based on judgment Y N U

Interaction Effects

1. Vulnerable components free from damaging impact by nearby equipment, structures, etc. Y N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls Y N U N/A
3. No other concerns Y N

Is equipment free of interaction effects? Y N U

Comments ____________________

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: ____________________ Date: __________

Evaluated by: ____________________ Date: __________

WALKDOWN DATA SHEET

SHEET __ OF __

Equipment ID No. ______________________ Equip. Class __________

Equipment Description ______________________________

Equipment Location: Bldg. ______________ Floor El. _____ Room, Row/Col _____

Manufacturer, Model, Etc. ______________________________

Drawing No. ______________________________

Functionality Requirement

1. Function Required(Specify)______________________ Y N U

Review Criteria

1. Is component of good seismic design for function above Y N U N/A

(specify)______________________________

Are the criteria met? Y N U N/A

Anchorage

1. Does strength appear adequate Y N U N/A
2. Does stiffness appear adequate Y N U N/A
3. No other concerns Y N N/A
4. Prepare and attach a sketch Y N

Are anchorages adequate based on judgment Y N U

Interaction Effects

1. Vulnerable components free from damaging impact by nearby equipment, structures, etc. Y N U N/A
2. No collapse of overhead equipment, distribution systems, or masonry walls Y N U N/A
3. No other concerns Y N

Is equipment free of interaction effects? Y N U

Comments ______________________________

____

____

All aspects of the equipment's seismic adequacy have been addressed.

Evaluated by: ______________________ Date: ______________

Evaluated by: ______________________ Date: ______________

ATTACHMENT B

SEISMIC REVIEW TEAM QUALIFICATION SHEET

Seismic Review Team Qualification Sheet

1.0 Name: ______________________________

2.0 Company: ______________________________

3.0 Position: ______________________________

4.0 Education: ______________________________

5.0 Professional engineers registration: ______________________________

6.0 Engineering discipline: ______________________________

7.0 Areas of expertise: ______________________________

	Experience	Years Experience
7.1	Knowledge of failure modes	________
7.2	Knowledge of nuclear design standards & nuclear seismic design practice	________
7.3	Seismic capability evaluations	________
7.4	Knowledge of equipment	
	- Nuclear	________
	- Heavy industrial process plants	________
	- Fossil fuel power plants	________
7.5	Conduit/Cable tray evaluations	________

8.0 Training Courses ______________________________

9.0 Other qualifications ______________________________

____

Signature: ______________________________ Date: ______

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ATTACHMENT C

TRAINING SESSIONS RECORDS

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Training Sessions Records

Instructor:

Designated Attendees:

Print or Type Name	Initial *	Signature *	Date

* My signature/initials attest to my having read the training materials and having a general understanding of the subject matter. As of now, any questions I might have had regarding session subject matter have been answered to my satisfaction.