SARGENT & LUNDY ENGINEERS CHICAGO	Calcs. For MECHANICAL COMPONENT 2MS31 SUPPORT NUMBER: M09-MS14-2821X REV.	Calc. No. 839-2MS31
	☐ Safety-Related ☒ Non-Safety-Related	Rev. 0 Date 11-23-81
		Page 1 of

Client	COMMONWEALTH EDISON CO.	Prepared by BmDmadugula	Date 11-23-81
Project	LA SALLE UNIT 2	Reviewed by [signature]	Date 11-23-81
Proj. No.	4267-00/4267-10	Approved by [signature]	Date 12-10-81

SP. # R-1373

MECHANICAL COMPONENT SUPPORT DOCUMENTATION SHEET

☒ HAND PREPARED DESIGN CALCULATION

The review of this hand prepared design calculation was accomplished by one or a combination of the following (as checked):

☒ A detailed review of the original calculation

○ A review by an alternate, simplified or approximate method of calculation

○ A review of a representative sample of repetitive calculation

○ A review of the calculation against a similar calculation previously performed

DESIGN LOAD:
(A) 1387/-87 (Fx)
(E) 1744/-444
(D) 1822/-522 ← GOVERNS
(T) HYDRO TEST -80

LOAD TYPE:

[B] DESIGN, [A] OPERATING, [ ] HYDRO,

[ ] EMERGENCY, [D] OTHER: FAULTED

ITEMS REVIEWED	SECTION OF REVIEW MANUAL USED	REMARKS
☐ NON-VENDOR CATALOG COMPONENT SUPPORT ELEMENT		
☐ STIFFENERS		
☐ CONNECTION OF NON-VENDOR CATALOG SUPPORT ELEMENTS		
☐ WELDS OF COMPONENT SUPPORT ATTACHMENTS		
☒ EXPANSION ANCHOR PLATES		C
☐ OTHER:		
☒ DOCUMENTATION PROVIDED BY MD&D - ENTIRELY/(REMAINDER:)		

NOTATION FOR "REMARKS" COLUMN

"A" - Review Manual utilized with no supplemental hand calculations.

"B" - Review Manual utilized with supplemental hand calculations which follow

"C" - Non-Standard: hand calculations follow

Form GQ 3.08.1 Rev. 2

9512190018 951215
PDR ADOCK 05000373
P PDR

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For 2 MS 31 / M09-MS14-2821X		Calc. No. 839-2MS31
Safety-Related	X Non-Safety-Related	Rev. 0 Date 11-23-81
		Page 2 of

Client C.E.CO.	Prepared by BmDmadugula Date 11-23-81
Project LASALLE-2	Reviewed by Date
Proj. No. 4267-00 Equip. No.	Approved by Date

SP # R1373.

LOADS

	Fx (LBS)
OPERATING	1387/-87
DESIGN	1744/-444
FAULTED	1822/-522
HYDRO-TEST	-80

USE FAULTED LOAD OF 1822# AS GOVERNING LOAD, AS NO OVERSTRESS IS ALLOWED ON HILTI BOLTS.

AUX BLDG. WALL EL.731'-0" $g_V = 1.10 + 1 = 2.10$
$g_H = 1.20$

CLAMP WT = 20.5 $g_{V_1} = 2.10 \times 20.5 \approx 43^{\#}$
$g_{H_1} = 1.20 \times 20.5 = 25^{\#}$

COMPT. WTS: ITEM #(2),(3),(4), = 6.5 + 2.25 + 3.5 = 12.25# $g_{V_2} = 2.10 \times 12.25 \approx 26^{\#}$
$g_{H_2} = 1.20 \times 12.25 = 15^{\#}$

COMPT. WTS: ITEMS (5) & (6) = 21.0 + 2.0 = 23.0 $g_{V_3} = 2.10 \times 23 = 48^{\#}$
$g_{H_3} = 1.20 \times 23 = 28^{\#}$

CHECK ITEM # (6)
TENSION = 1822 + 25 + 15 = 1862#
SHEAR = 43 + 26 + 48 = 117#
MOMENT = (43+26)2.75 = 190 in lbs.

1/2"Φ × 7" HILTI BOLTS
'8D' EMBEDMENT.

TENSION PER BOLT = $\frac{1862}{4} + \frac{190}{2\times 9} = 466 + 11 = 477^{\#}$

SHEAR PER BOLT = $\frac{117}{4} = 29$

$I.A.C = \left(\frac{477}{3020}\right)^{5/3} \left(\frac{29}{2753}\right)^{5/3} = 0.05 + 0 = 0.05 < 1.0$ ∴ O.K

SARGENT & LUNDY ENGINEERS CHICAGO	Calcs. For 2MS 31		Calc. No. 839-2-MS31	
	M09- MS14 - 2821 X		Rev. 0	Date 11-23-81
	Safety–Related	X Non–Safety–Related	Page 3	of

Client C.E.Co.		Prepared by Bommadugula	Date 11-23-81
Project LA SALLE - 2		Reviewed by	Date
Proj. No. 4267-00	Equip. No.	Approved by	Date

CHECK ITEM # 5. ℄ $\frac{1}{2}$" x 12" x 12"

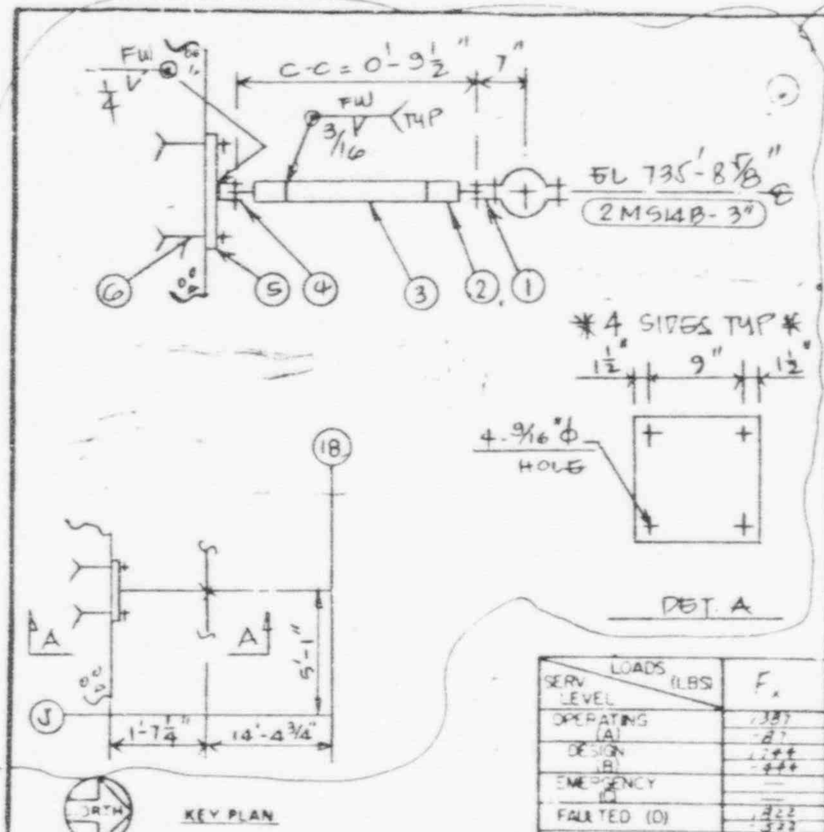
$M = 2 \times 477 \times 4.5 = 4293$ in lbs

$S = \frac{1}{6} \times 6 \times 0.5^2 = 0.25$ in^3

$f_b = \frac{4293}{0.25} = 17172 < 27000$ PSI ✓ ∴ O.K.

Form GQ-3.08.1 Rev. 2

PROJECT No.	
CALC. No.	
REV	DATE
PAGE	OF



LOADS (LBS) / SERV. LEVEL	F_x
OPERATING (A)	737 / -87
DESIGN (B)	1244 / -444
EMERGENCY (C)	
FAULTED (D)	1322 / -322
HYDRO-TEST (T)	-80

BILL OF MATERIAL

ITEM	QUAN	FIG NO OR PART NO	DESCRIPTION		COMPONENT WEIGHT LB
			COMPONENT SUPPORT ASSEMBLY CONSISTING OF		
1	1	2898-2	3"Φ PIPE CLAMP		20.5
2	2	8034-94	PS^-3 ADAPTER ASSY *		6.5 *
3			1 1/2"Φ SCH XXS, 0'-4" LG		8.25
4		8055805	PSA-3 REAR BRACKET		35
5	1		1/2 x 12 C.S. PL 1'-0" LG (SEE DETAIL "A")		21.0
6	4		1/2 x 7 HILTI KWIK BOLT		2.0
			BUNDLE & TAG FS-40		
				TOTAL WEIGHT	56 *

SD & DD COMPONENT SUPPORT REVIEW
☐ COMMENTS AS NOTED
☒ NO COMMENTS
REVIEWER [signature]
DATE 11-23-81

PROJECT No. 4267-00
CALC. No. 839-2MS31
REV 0 DATE 11-23-81
PAGE 4 OF ____

WELD NO	WELD PROCEDURE	EXAMINATION PROCEDURE

LOADS (LBS)				
DESIGN	OPERATING	HYDRO TEST	EMERGENCY	FAULTED
	SEE LOAD TABLE			

SP NO K1373
PAGE 2 OF 2

REFERENCE DRAWINGS	DWG NO	REV	DWG NO	REV	DWG NO	REV	DWG NO	REV
	M-355 SH 22	K	S-895					
			S-896					

2MS-3 NP 3-5A (X DIR)

DRAWING RELEASE RECORD — OUTPUT: 3-4-8

REV	DATE REL'D	PREPARED	REVIEWED	APPROVED	FILM
A	4 21 81	B. KAO [signature]	C. CHENG / [signature]	[signature]	
*		EOL / [signature]			

PURPOSE FOR E & F SPECS (J-2530 & J-2918)

CED G-612

EMD REVIEW

PIPE CLASS D

VICTORY G. PENACERRADA — REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS — P.E. SEAL

LA SALLE COUNTY STATION
UNIT 2
COMMONWEALTH EDISON COMPANY
CHICAGO ILLINOIS

AUXILIARY BLDG MISC PIPING SYSTEM

NO SCALE		DRAWING NO.	REV
PROJECT NO 4267	SARGENT & LUNDY CHICAGO	M09 MS-6-2821X	
		SHEET 1 OF 1	

SARGENT & LUNDY
ENGINEERS
CHICAGO

REPORT OF WALKDOWN TO VERIFY ADEQUACY OF MAIN STEAM DRAIN LINE AND CONDENSER FOR USE AS THE ALTERNATE MSIV LEAKAGE TREATMENT SYSTEM

COMMONWEALTH EDISON COMPANY

LASALLE COUNTY - UNIT 1

PROJECT NO.: 9066-151

WIN NO.: 2214

Prepared By: D. Y. Chung
D. Y. Chung

Prepared By: A. M. Al-Dabbagh
A. M. Al-Dabbagh

*Reviewed By: L. Kaushansky
L. Kaushansky

*Reviewed By: M. Amin
M. Amin

Approved By: M A Pressburger
M. A. Pressburger

*The review of this report was accomplished by performing a detailed review of the content of the report.

9509050060

APPENDIX: WALKDOWN CRITERIA FOR SEISMIC ADEQUACY VERIFICATION OF THE MAIN STEAM AND DRAIN PIPING TO THE CONDENSER

MAIN STEAM ISOLATION VALVE LEAK CONTROL SYSTEM ELIMINATION

WALKDOWN CRITERIA FOR SEISMIC ADEQUACY VERIFICATION OF THE MAIN STEAM AND DRAIN PIPING TO THE CONDENSER

1.0 Purpose and Scope

The purpose of this criteria is to give guidance and provide a checklist to be utilized in performing a walkdown to reasonably verify the seismic adequacy of the following piping, pipe supports, and equipment.

1) Downstream piping of the outboard most Main Steam Isolation Valves (MSIVs) to the MSVs, the MS By-pass Valves, and 2B21-F418 A(B).

2) A drain path from this piping to the condenser.

3) The warm-up lines to 2B21-F020.

4) Anchorage of the condenser.

5) Structural integrity of the Turbine Building.

A copy of the applicable marked up P&IDs describing the specific scope of the walkdown is attached.

2.0 Background

The approach utilized in this walkdown criteria for verifying the seismic adequacy of the subject piping is outlined in BWROG report (NEDO-31858), "For Increasing MSIV Leakage Rate Limit and Elimination of Leakage Control Systems" and is consistent with SQUG-GIP EPRI NP-6041, Revision 1, "A Methodology for Assessment of Nuclear Plant Seismic Margin".

3.0 Definitions

Class D piping:

Non-safety-related and non-seismically designed piping. The piping was designed per ASME ANSI B31.1 Power Piping Code.

Class D+ piping:

Non-safety-related and seismically designed piping. The piping was designed per ASME Boiler and Pressure Vessel, Section III, Subsection ND Code.

II Over I:

The effects of seismic induced failure of non-safety-related and non-seismically designed components on the safety-related component.

Piping Seismic Interaction:

The impact on piping components and pipe supports due to inadequate seismic clearances to the adjacent components.

4.0 Guidelines for Walkdown

The walkdown will be focused on visually identifying conditions of the piping and supporting configuration which may result in seismically induced pressure boundary failure and inventory release of the main steam and drain piping. In general, these conditions may include failure of non-seismically designed piping (class D portion of the subject piping), failure of poor installation and deterioration of piping support, falling of non-seismically designed plant features that may impact the above defined piping systems (II/I), seismic interaction, and differential seismic building motion on piping systems. Therefore, the following guidelines should be used for walkdown to reasonably verify the seismic adequacy of the concerned piping and supports by visual inspection. Note that some walkdown criteria are applicable only for class D piping since the issue is not a concern for class D+ piping which was seismically designed.

4.1 Support or anchorage:

The piping support and anchorage installation should be adequate to withstand the seismic event.

- There should not be any missing or disconnected parts such as bolts, nuts, pins, welds and anchors.

- There should not be any broken, grossly deformed, cracked or disconnected support components.

- There should not be any excessive corrosion.

- There should not be any spalling of concrete.

- Stanchion supports should be properly seated.

- Supports should have enough distance to the edge (or should have a positive attachment) to avoid the potential for the pipe to fall off.

- For class D piping, heavy in-line components or long risers supported only by a spring hanger and piping sections with a series of spring hangers should be reviewed to determine that nearby rigid supports exist.

- For class D piping, a long run of pipe (4-5 vertical support spans) should be provided with at least one lateral support.

- Seismic support should be provided for class D valve operator having cantilever length exceeding the value given in Figure 1.

4.2 Seismic Interaction

4.2.1 Seismic Interaction:

Seismic interaction is the impact of adjacent equipment or structures on piping and supports due to their relative motion during seismic excitation. This relative motion can be the result of the movement of the piping itself or any adjacent piping, equipments or structures. When sufficient anchorage, bracing, or other means are provided to preclude large deflections, seismic interaction effects are not typically a concern. As reported in EPRI NP-5617, 1988, "Piping Performance During Earthquake", there were 73 recordable piping seismic interactions in a worldwide survey of piping failure in power plants and other facilities in 29 strong motion earthquakes from 1923 to 1985. There were no apparent piping pressure boundary failure due to pipe/pipe or pipe/structural component seismic impact. The only three failures were due to the excessive seismic movement (12") and impact of three Motor/Air Operated Valves (MOV/AOV) on the surrounding structure.

The above document recommended that Motor/Air Operated Valves (MOV/AOV) should be checked for seismic interaction with the surrounding equipment or structures.

In addition, the walkdown team should identify any potential seismic impact near piping branch connection. Movement restriction, interference at the branch line of a flexible header piping should be avoid.

4.2.2 II Over I Review.

Piping and supports can be damaged and unable to accomplish their safe shutdown function due to impact caused by failure of overhead or adjacent equipment, systems, or structures. This II over I effect can occur from adjacent components or those overhead such as: (1) mechanical and electrical equipment; (2) raceway, and HVAC systems; (3) architectural features; and (4) operation, maintenance, and safety equipment. It is the intent of this walkdown that realistic hazards be identified and failure of non-seismic equipment and systems located over piping and supports should not be arbitrarily assumed. For each segment depicted on single line drawing, the walkdown team shall document the judgement by noting specific valid concerns or why there is no concern. Potential shielding of piping from II over I hazards should be considered.

In addition, the walkdown team should identify the part of the piping which may extend into non-category I buildings for ~ther II over I assessment.

4.3 Differential Seismic Motions

Piping which crosses independently founded structures or similar conditions which impose differential motions should be reviewed to ensure that adequate piping flexibility exists to preclude failure. It should be noted that the differential seismic motions have been incorporated in the piping design as the Seismic Anchor Movement (SAM) loads for Class D+ piping. Therefore, only class D piping needs to be reviewed for items 4.3.2, 4.3.3, and 4.3.4 above.

The following conditions should be reviewed for the effect of potential seismic movements imposed on the piping.

4.3.1 Excessive Movement of Terminal End Equipment:

Piping performance can be ensured by verifying that adequate anchorage is provided to terminal end equipment such as pumps, tanks, heat exchangers, etc.

4.3.2 Differential Movement Between Pipe Supports in Adjacent, Uncoupled Buildings:

Differential displacement concerns can be identified by reviewing potential relative displacements and assuring that the piping has adequate flexibility.

4.3.3 Excessive Movements Imposed on Small Branch Lines by Flexible Headers.

For rigidly attached branch piping, the effects of the movements of a flexible header should be reviewed.

4.3.4 Flexibility of Adjacent Lines

Small bore piping or tubing which are connected to equipment, valve or instrumentation can potentially fail if there is insufficient flexibility to accommodate relative seismic motion between the equipment and the adjacent support or structures. Straight, in-line connections in particular are prone to failure. The scope of review of such line flexibility extends from the equipment to the first support of the attached lines.

4.4 Condenser Walkdown

Document review will be conducted to demonstrate that the condenser is within the bounds of design characteristics found in selected conventional power plant condensers which have demonstrated good seismic performance. If the condenser is found to be out of the design characteristics found in the selected power plant condensers, additional check will be performed to seismically qualify the condenser.

The walkdown should verify that the condenser has adequate anchorage.

4.5 Turbine Building

The qualification of the turbine building will be accomplished through design document rev

5.0 Walkdown Checklist

A walkdown checklist is attached to provide a convenient summary for the walkdown engineers.

Checklist for Piping/Piping Supports Walkdown

Piping Line No.: ______________________________ Pipe Class: __________________

Single Line Dwg. No: __________________________ Subsystem No.: _______________

1. Inadequate seismic condition for pipe support and anchorage	Y	N	NA	Comment
• Missing or unconnected parts (bolts, nuts, pins, welds, anchors etc.)?				
• Broken, cracked, grossly deformed support components?				
• Excessive corrosion in support or anchorage?				
• Concrete spalling at support anchorage?				
• Stanchion with no contact?				
• Potential pipe fall-off from support?				
• Spring support for heavy in-line component or long riser without nearby rigid support?(Class D only).				
• Is the support configuration at valve which has operator cantilever length exceed the value given in Figure 1 adequate? (Class D only).				
• Long run of pipe (4-5 vertical support spans) without a lateral support? (Class D only).				
• Is there any other concern?				

Checklist for Piping/Piping Supports Walkdown

Piping Line No.: ____________________ Pipe Class: ____________

Single Line Dwg. No: ____________________ Subsystem No.: ____________

2. Seismic Interaction	Y	N	NA	Comment
• Is there a potential seismic impact of MOV/AOV with other plant features such as structure, cable trays, conduits, HVAC ducts and hangers?				
• Is there a potential seismic impact or movement restriction at piping branch connection?				
• Is there any other concern?				
3. II over I Review	**Y**	**N**	**NA**	**Comment**
• Is there a nearby cantilevered piping component with heavy mass?				
• Is there any valid concern of any potential falling hazards to the piping or equipment?				
• If so, is a potential shielding considered?				
• Is there any other concern?				

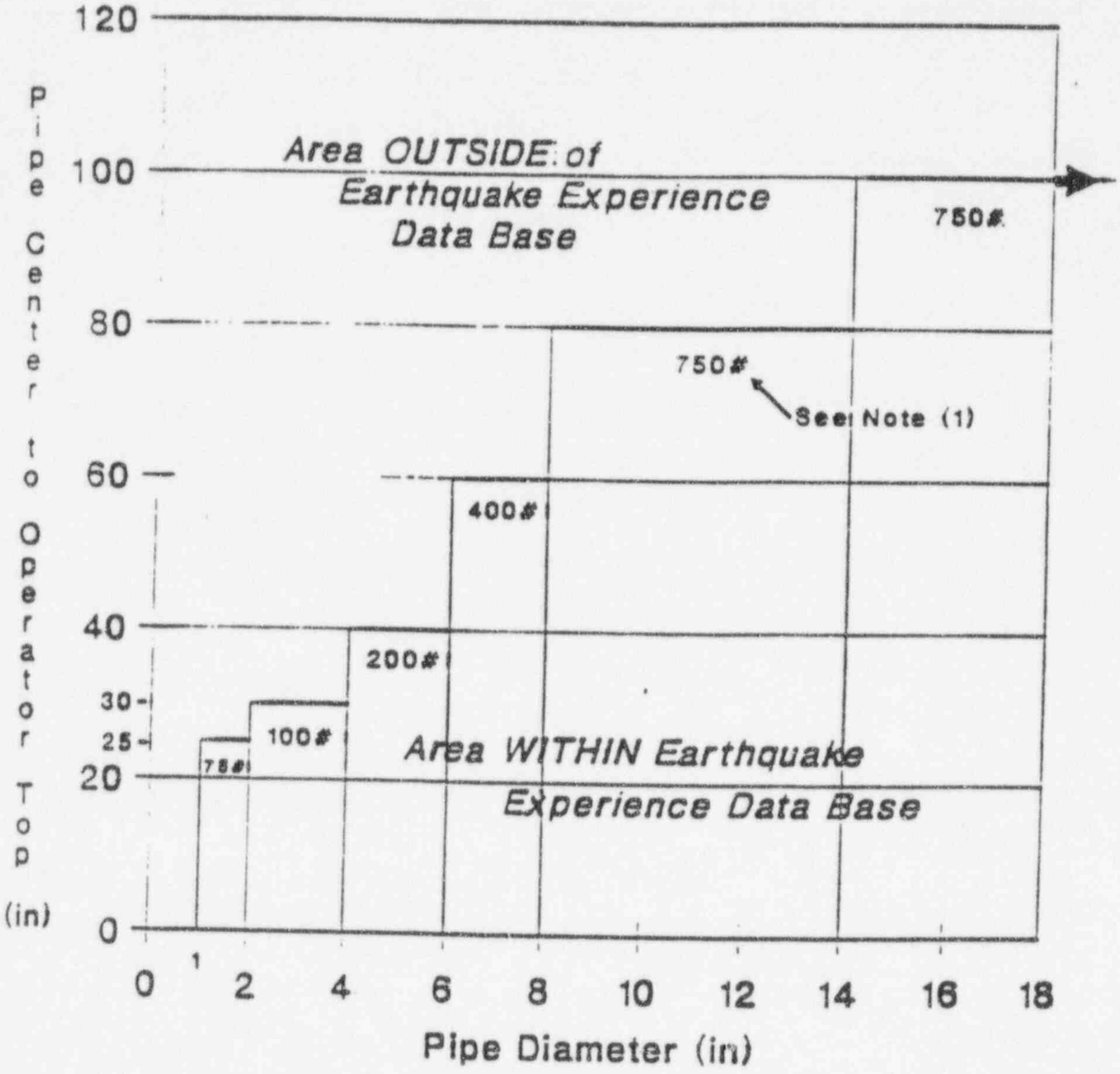
Checklist for Piping/Piping Supports Walkdown

Piping Line No.: ______________________ Pipe Class: ____________

Single Line Dwg. No: ______________________ Subsystem No.: ____________

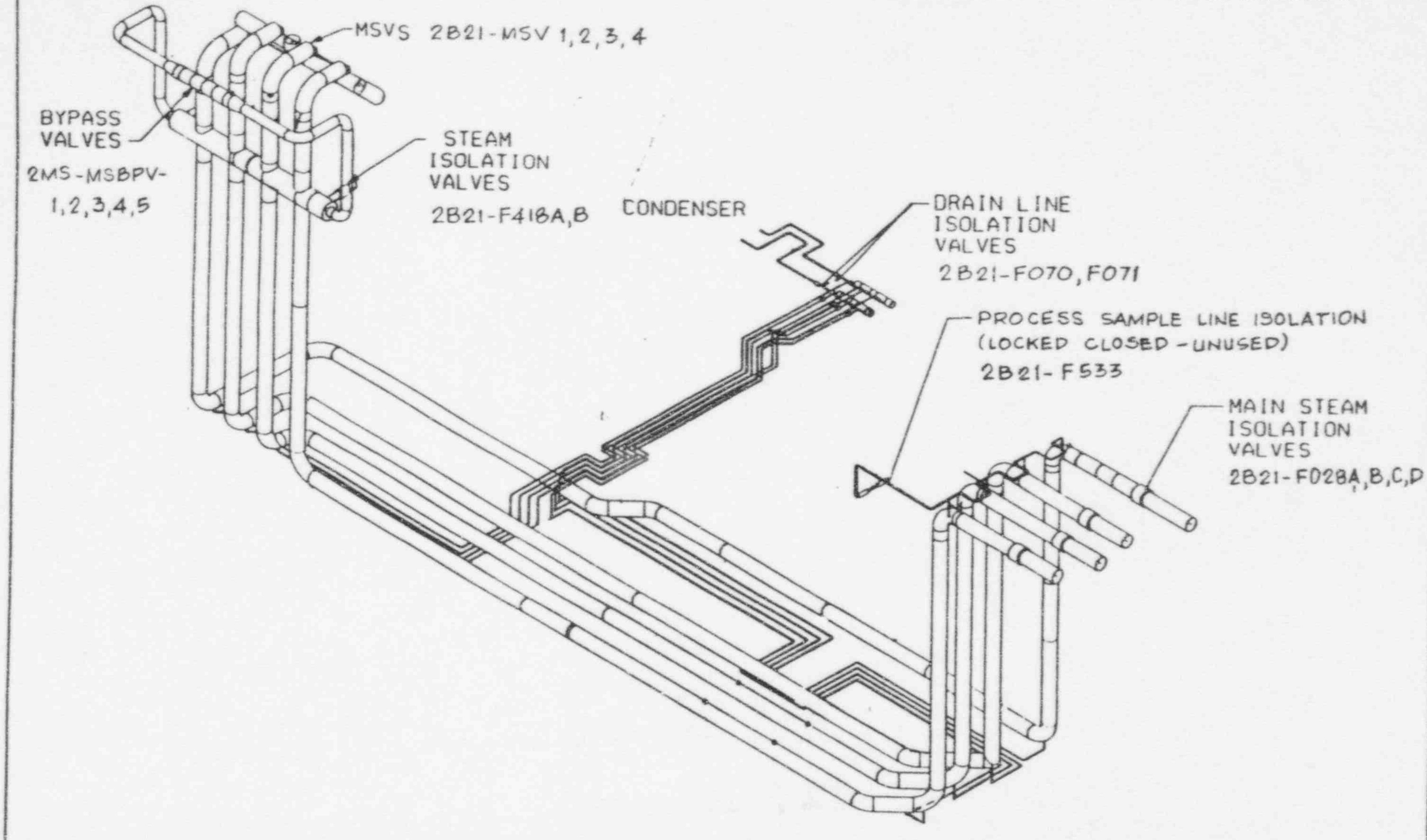
4. Differential seismic motions	Y	N	NA	Comment
• Terminal end equipment such as pumps, tanks, heat exchanger, etc. with inadequate anchorage or supported on a vibration isolator?				
• Is flexibility of tubing or small bored piping connecting to valve, instrumentation or equipment adequate? (Class D only)				
• Adjacent pipe supports or anchors attached to adjacent, uncoupled buildings with inadequate piping flexibility? (Class D only)				
• Rigidly supported branch piping close to the flexible header?(Class D only).				
• Is there any other concern?				
5. Anchorage of the condenser	**Y**	**N**	**NA**	**Comment**
• Is strength assessment based on: • Judgement? • Specific analysis? • Other?				
• Is strength adequate?				
• Is stiffness adequate?				
• Is there any other concern?				
5. Other concern				

Heavy Valve Operator
Cantilever Limits



(1) Approximate Maximum Operator Weights Given for Various Ranges of Pipe Diameter

Figure - Valve Operator Cantilever Length Limits



ISOMETRIC VIEW OF LEAKAGE CONTROL PATH AND BOUNDARIES

UNIT 2 SHOWN (UNIT 1 IS MIRROR IMAGE)

SEISMICALLY ANALYZED PIPING