

Following the applicants presentation, Mr. Peter Yanev, representing EQE presented information on the application of experience data to seismic interaction at Millstone 3. An outline of Mr. Yanev's presentation is included as Enclosure 3. Mr. Yanev explained that the SQUG has demonstrated the feasibility of using data on the performance of equipment in past earthquakes to address effects of use of different standards in operating and new plants for the seismic qualification of equipment. Mr. Yanev discussed the data base for damage caused by seismic interaction gathered from plants on the west coast and in Chile. Information was presented leading to the conclusions that:

- out of 10 earthquakes, 60 facilities, and thousands of seismic interactions, there are 13 instances of seismic interaction leading to damage;
- a thorough seismic interaction study such as that being conducted for Millstone 3 would have found and corrected the 13 interactions.

Following the presentation by EQE the applicant continued with discussion of specific application of this program to Millstone 3. It was explained that a series of three walkdowns would be performed on Category I cubicle areas to determine potential seismic interactions. Documentation of walkdown results would include interaction review sheets which also address disposition. The data base would be used to determine if equipment upgrade was warranted for observed potential interactions. A completed report of the Seismic Interaction Review Program for the Intake Structure was presented as an example. This report is included as Enclosure 4.

The applicant also noted during the meeting that the program only addresses seismic interaction and not other affects such as HELB; and that Millstone 3 will only apply the program to structural integrity of Category 2 piping and equipment and not functional capability.

Upon completion of the applicants presentation, Mr. Ted Ankrum, representing NRC, I&E, stated that this approach does not appear to conform to a commitment in the FSAR and that this matter had been referred by IE to NRR (DL) for resolution. Further, IE involvement would be limited to field confirmation, if required, of whatever decision NRR reaches. The applicant stated that this approach is not contrary to the FSAR commitment and it is a justifiable approach.

Original signed by:  
Elizabeth L. Doolittle

E. L. Doolittle, Project Manager  
Licensing Branch No. 1  
Division of Licensing

Enclosures: As stated

DISTRIBUTION:  
See attached page

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PDR ADOCK 05000423  
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LB#1:DL  
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07/17/85

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07/18/85

LB#1:DL  
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07/18/85



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

JUL 2 1985

Docket No.: 50-423

APPLICANT: Northeast Nuclear Energy Company  
FACILITY: Millstone Nuclear Power Station, Unit 3  
SUBJECT: SUMMARY OF MILLSTONE 3 SEISMIC II/I MEETING

On June 21, 1985, a meeting was held with Northeast Nuclear Energy Company in Bethesda, Maryland. The NRC staff was represented by members of the Division of Licensing; Division of Engineering, Equipment Qualification Branch, Mechanical Engineering Branch, Structural and Geotechnical Engineering Branch; Division of Systems Integration, Auxiliary Systems Branch and I&E Quality Assurance Branch. The applicant was represented by members of Northeast Utilities Service Company (NUSCO), Stone & Webster Engineering Corporation (S&W) and EQE, Inc. A list of attendees is included as Enclosure 1.

The purpose of this meeting was to discuss the non-seismic/seismic interaction program for Millstone 3.

The applicant began by discussing the program development including background, application and regulatory developments. A copy of the outline is included as Enclosure 2. The applicant explained that prior to 1979 its approach was to install seismic Category II equipment in Category I areas according to seismic Category I criteria. Most large equipment was installed to this criteria. Subsequently, for economic and manpower reasons, the applicant changed its approach to install Category II equipment in Category I areas according to nonseismic Category II criteria with the intention of walking down these areas and upgrading equipment to Category I standards as required. This approach was applied to smaller equipment such as field run piping, conduit, lighting fixtures and space heaters.

During the period from 1980 to 1981, the Seismic Qualification Utility Group (SQUG) was established. Although this program was acceptable to NRC for seismic qualification of equipment in operating plants, this approach was not intended for application to piping in plants under construction.

Mr. J. F. Opeka  
Northeast Nuclear Energy Company

Millstone Nuclear Power Station  
Unit No. 3

cc:  
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ENCLOSURE 1

MEETING ATTENDANCE LIST

JUNE 21, 1985

<u>Name</u>	<u>Organization</u>
E. Doolittle	NRR/LB#1
J. Youngblood	NRR/LB#1
N. Romney	NRR/EOB
G. Lear	NRR/SGEB
P. Kuo	NRR/SGEB
E. Imbro	IE/QAB
G. Ankrum	IE/QAB
D. Terao	NRR/MEB
H. Brammer	NRR/MEB
R. Goel	NRR/ASB
J. Wermiel	NRR/ASB
P. Yanev	EQE Inc.
P. Quinlan	NUSCO
R. Joshi	NUSCO
R. Laudenat	NUSCO
C. Gladding	NUSCO
G. Milley	S&W
L. Kelly	S&W



ENCLOSURE 2

SEISMIC INTERACTION PROGRAM

MILLSTONE UNIT 3

- I. INTRODUCTION - R.G. JOSHI, NUSCO
- II. PROGRAM DEVELOPMENT - P.J. QUINLAN, NUSCO
- III. SEISMIC INTERACTION DATABASE - P. YANEV, EQE INC.
- IV. PROGRAM DESCRIPTION - P.J. QUINLAN
- V. PROGRAM VERIFICATION - P.J. QUINLAN

I. INTRODUCTION

- o PURPOSE OF MEETING - PROVIDE THE STAFF A BRIEF  
DESCRIPTION OF THE SEISMIC INTERACTION PROGRAM

## II. PROGRAM DEVELOPMENT

- o PROGRAM BACKGROUND
- o PROGRAM APPLICATION
- o REGULATORY DEVELOPMENTS

### PROGRAM BACKGROUND

- o ORIGINAL DESIGN BASIS - PHYSICAL SEPARATION
- o AVAILABLE APPROACHES TO 2 OVER 1 ISSUE
- o NUSCO SEP PLANTS INVOLVED WITH SQUG

### PROGRAM APPLICATION

- o EARTHQUAKE EXPERIENCE DATA REVIEWED FOR APPLICABILITY TO MILLSTONE 3
- o SEISMIC INTERACTION WALKDOWN PROGRAM DEVELOPED TO RESOLVE 2 OVER 1 ISSUE
- o DISTINCTION BETWEEN SQUG AND MILLSTONE 3 SEISMIC INTERACTION PROGRAM
- o PRACTICAL APPROACH - LESS CONGESTION - BETTER PRODUCT



### REGULATORY DEVELOPMENTS

- o HR DENTON LETTER TO SQUG 4/20/84
- o NUREG 1061
- o ASME CODE CASE N-411

### III. SEISMIC INTERACTION DATABASE

- o HISTORY OF DATABASE
- o SQUG PROGRAM
- o CONTENT OF DATABASE
- o APPLICABILITY TO MILLSTONE 3
- o SYNOPSIS OF EQE REPORT FOR MILLSTONE 3

#### IV. PROGRAM DESCRIPTION

- o METHODOLOGY
- o CRITERIA

### METHODOLOGY

- o CUBICLE APPROACH
- o SERIES OF WALKDOWNS
- o PROGRAM CONTROL
- o DOCUMENTATION OF WALKDOWN
- o REVIEWER QUALIFICATIONS

### CRITERIA

- o DISTINCTION BETWEEN TYPES OF SEISMIC INTERACTIONS
  - GRAVITY MISSILES
  - ZONE OF INFLUENCE
- o DISTINCTION BETWEEN FAILURE MODES
  - INERTIA INDUCED
  - DIFFERENTIAL DISPLACEMENT INDUCED



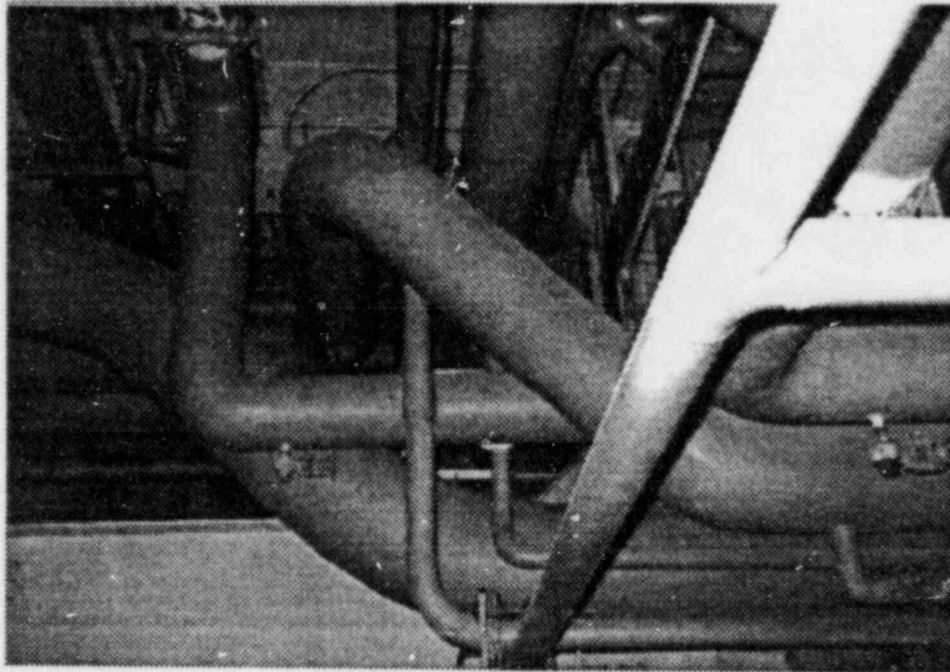
V. PROGRAM VERIFICATION

- o EQE INC. REVIEW
- o NUSCO PROGRAM REVIEW
- o NUSCO SELECTED WALKDOWNS

ENCLOSURE 3

**THE APPLICATION OF EXPERIENCE DATA  
TO SEISMIC INTERACTION AT THE  
MILLSTONE III NUCLEAR POWER PLANT**

EQE Project No. 8421-01



**Presented at:**

**NRC**

**Bethesda, MD**

**June 21, 1985**

**for**

**Northeast Utilities Service Company**

**P.O. Box 270**

**Hartford, CT 06141-0270**

**Peter I. Yanev**

**EQE Incorporated**

**121 Second Street**

**San Francisco, CA 94105**

THE SQUG PROGRAM ON EQUIPMENT QUALIFICATION IS  
EXTRAORDINARILY SUCCESSFUL, COST-EFFECTIVE AND  
PRACTICAL

---

- DIFFERENT STANDARDS ARE USED IN OPERATING AND NEW  
PLANTS FOR THE SEISMIC QUALIFICATION OF EQUIPMENT
- NRC IDENTIFIED UNRESOLVED SAFETY ISSUE (USI) A-46  
TO ASSESS ANY EFFECTS DUE TO THIS DIFFERENCE
- THE SEISMIC QUALIFICATION UTILITY GROUP (SQUG) IS  
THE FOCUS OF INDUSTRY EFFORTS ON USI A-46
  - N. SMITH, CECO, CHAIRMAN
- SQUG HAS DEMONSTRATED THE FEASIBILITY OF USING  
DATA ON THE PERFORMANCE OF EQUIPMENT IN PAST  
EARTHQUAKES TO ADDRESS USI A-46, IN LIEU OF  
USING TESTING OR ANALYSIS
  - ACCEPTED BY NRC
- SQUG SUCCESS IS DUE TO:
  - A WILLINGNESS TO INVOLVE NRC OPENLY AND FROM  
A VERY EARLY STAGE, INCLUDING VISITS TO DATA  
BASE SITES IN CALIFORNIA AND CHILE
  - THE REAL EARTHQUAKE ISSUES HAVE BEEN OVERSTATED  
IN NUCLEAR DESIGN
  - A WILLINGNESS TO ADDRESS THE FEW REAL ISSUES  
FOUND (FOR EXAMPLE, RELAY CHATTER AND ANCHORAGE)

**OUR PRIMARY CONCLUSIONS ARE:**

---

- **OUT OF 10 EARTHQUAKES, 60 FACILITIES, AND THOUSANDS OF SEISMIC INTERACTIONS, THERE ARE 13 INSTANCES OF SEISMIC INTERACTION LEADING TO DAMAGE**
- **A THOROUGH SEISMIC INTERACTION STUDY SUCH AS THAT BEING CONDUCTED FOR MILLSTONE III WOULD HAVE FOUND AND CORRECTED THE 13 INTERACTIONS**

**THE FUNCTIONS OF THE SEISMIC EXPERIENCE DATA  
BASE ARE:**

---

- **TO PROVIDE A REALISTIC ASSESSMENT OF THE  
EARTHQUAKE RISK TO POWER FACILITIES**
- **TO DETERMINE WHAT TYPES OF SEISMIC DAMAGE  
TYPICALLY OCCUR IN POWER FACILITIES**
- **TO DETERMINE TENDENCIES FOR SEISMIC DAMAGE  
TO VARIOUS TYPES OF FACILITIES AND THEIR  
STRUCTURES, EQUIPMENT, AND SYSTEMS**
- **TO DETERMINE WHAT IS TYPICALLY NOT DAMAGED**



THE CURRENT SEISMIC EXPERIENCE DATA BASE  
CONTAINS DATA FROM:

---

- TEN STRONG MOTION EARTHQUAKES
- SIXTY FACILITIES
  - 17 POWER PLANTS WITH 53 UNITS
- HUNDREDS OF STRUCTURES
- THOUSANDS OF EQUIPMENT INSTALLATIONS
- THOUSANDS OF PIPES, CABLE TRAYS, ETC.

★ THE SEISMIC EXPERIENCE DATA BASE INCLUDES THE FOLLOWING 63 FACILITIES:

<u>EARTHQUAKE</u>	<u>FACILITIES</u>	<u>RANGE OF PGA* (G)</u>
1. SAN FERNANDO, 1971, M=6.5	4 POWER PLANTS 4 SUBSTATIONS 1 HOSPITAL	0.20 - 0.50
2. POINT MUGU, 1973, M=5.7	1 POWER PLANT 1 SUBSTATION	0.10 - 0.20
3. FERNDALE, 1971, M=5.5	1 POWER PLANT	0.35
4. SANTA BARBARA, 1978, M=5.7	1 POWER PLANT 1 SUBSTATION	0.28 - 0.35
5. IMPERIAL VALLEY, 1979, M=6.6	3 POWER PLANTS	0.25 - 0.50
6. HUMBOLDT COUNTY, 1980, M=7.0	1 POWER PLANT	0.25
7. COALINGA, 1983, M=6.7	5 PETROCHEMICAL PLANTS 4 NATURAL GAS PLANTS 3 WATER PUMPING PLANTS 3 SUBSTATIONS	0.25 - 0.60
8. MORGAN HILL, 1984, M=6.2	1 CHEMICAL PLANT 2 ELECTRONICS FACILITIES 2 WINERIES 1 PUMPING PLANT 3 COMMERCIAL FACILITIES	0.10 - 0.50
9. CHILE, 1985, M=7.8	5 POWER PLANTS 3 SUBSTATIONS 2 REFINERIES 1 CHEMICAL PLANT 3 WATER TREATMENT PLANTS 5 COMMERCIAL FACILITIES	**
10. CHILE 1985, M=7.2	1 POWER PLANT	**

\* PGA = Peak Ground Acceleration or ZPA

\*\* Values not yet established; vary between 0.20 and 0.70

\* PGA = Peak Ground Acceleration or ZPA

\*\* Values not yet established; vary between 0.20 and 0.70

THE SEISMIC EXPERIENCE DATA BASE INCLUDES 17 POWER PLANTS  
WITH 53 UNITS:

<u>EARTHQUAKE</u>	<u>POWER PLANT</u>	<u>NO. OF UNITS</u>	<u>PGA (G)</u>
1. SAN FERNANDO, 1971, M=6.5	VALLEY	4	0.40
	BURBANK	7	0.35
	GLENDALE	5	0.30
	PASADENA	4	0.20
2. POINT MUGU, 1973, M=5.7	ORMOND BEACH	2	0.20
3. FERNDALE, 1975, M=5.5	HUMBOLDT BAY	3	0.35
4. SANTA BARBARA, 1978, M=5.7	ELLWOOD	1	0.35
5. IMPERIAL VALLEY, 1979, M=6.6	EL CENTRO	4	0.51
	DROP IV	2	0.40
	MAGMAMAX	1	0.25
6. HUMBOLDT CO., 1980, M=7.0	HUMBOLDT	3	0.27
7. CHILE, 1985, M=7.8	LAS VENTANAS (LV)	2	**
	LAGUNA VERDE	2	**
	RAPEL	5	**
	RENCA	2	**
	LV COPPER	1	**
8. CHILE, 1985, M=7.2	RAPEL	5	**
TOTALS:	17	53	

\*\*Values not yet established; vary between 0.20 and 0.70

THE TYPICAL CALIFORNIA DATA BASE FACILITY IS DESIGNED TO  
COMPARATIVELY LOW EQUIVALENT STATIC LOAD CRITERIA

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- STEEL STRUCTURES

- 0.20g STATIC EQUIVALENT SHEAR LOAD AT BASE OF STRUCTURES; NO DYNAMIC ANALYSES CONDUCTED

- CONCRETE STRUCTURES

- 0.13g, OR LESS, STATIC EQUIVALENT SHEAR LOAD AT BASE OF STRUCTURE; NO DYNAMIC ANALYSES CONDUCTED

- EQUIPMENT AND ANCHORAGE

- 0.20g STATIC FORCE APPLIED AT CENTER OF GRAVITY; NO SEISMIC CONSIDERATIONS FOR STRUCTURAL INTEGRITY AND OPERABILITY; NO SEISMIC QUALIFICATION CONSIDERATIONS

- PIPING

- GENERALLY NO SEISMIC DESIGN CRITERIA AT ALL; VERY FEW HIGH PRESSURE LINES WERE DESIGNED FOR 0.20g STATIC LATERAL LOADS APPLIED IN ONE DIRECTION AT A TIME; A FEW SEISMIC STOPS AND SNUBBERS WERE OBSERVED

THE OVERALL PERFORMANCE OF THE DATA BASE GENERATING UNIT  
IS IMPRESSIVE. ALL UNITS WITH PGAs TO 0.35g REMAINED  
OPERATING

Power Plant and Unit	Size MW	Vintage	Peak Ground Acceleration (g)	Performance During Earthquake		
				Remained on Line	Tripped Off Line, But Still Operating	Lost Station Power
<u>El Centro (Imperial Valley, 1979)</u>						
Unit 1*	20	1948	0.50			
Unit 2*	30	1952	0.50			
Unit 3	44	1957	0.50	-	X	-
Unit 4	80	1968	0.50	-	-	X
<u>Valley (San Fernando, 1971)</u>						
Unit 1	100	1954	0.40	-	-	X
Unit 2*	100	1954	0.40			
Unit 3	160	1955	0.40	X	-	-
Unit 4	160	1956	0.40	-	-	X
<u>Burbank (San Fernando, 1971)</u>						
Olive:						
Unit 1	44	1958	0.35	-	X	-
Unit 2	44	1961	0.35	-	X	-
Magnolia:						
Unit 1*	10	1940s	0.35			
Unit 2	10	1940s	0.35	X	-	-
Unit 3	20	1950s	0.35	X	-	-
Unit 4*	30	1950s	0.35			
Unit 5*	20	1968	0.35			
<u>Humboldt Bay (Ferndale, 1975)</u>						
Unit 1	50	1956	0.30	-	X	-
Unit 2	50	1958	0.30	-	X	-
Unit 3	65	1963	0.30			
<u>Glendale (San Fernando, 1971)</u>						
Unit 1*	20	1941	0.30			
Unit 2*	20	1947	0.30			
Unit 3	20	1953	0.30	X	-	-
Unit 4	44	1959	0.30	X	-	-
Unit 5	44	1964	0.30	X	-	-
<u>Humboldt Bay (Humboldt, 1980)</u>						
Unit 1	50	1956	0.27	Unit 1	X	50
Unit 2	50	1958	0.27	Unit 2	X	50
Unit 3	65	1963	0.27	Unit 3		65



THE OVERALL PERFORMANCE OF THE DATA BASE GENERATING UNIT  
IS IMPRESSIVE. ALL UNITS WITH PGAs TO 0.35g REMAINED  
OPERATING

<u>Power Plant and Unit</u>	<u>Size MW</u>	<u>Vintage</u>	<u>Peak Ground Acceleration (g)</u>	<u>Performance During Earthquake</u>		
				<u>Remained on Line</u>	<u>Tripped Off Line, But Still Operating</u>	<u>Lost Station Power</u>
<u>Pasadena (San Fernando, 1971)</u>						
Unit 1	45	1955	0.20	X	-	-
Unit 2**	45	1957	0.20			
Unit 3	71	1965	0.20	X	-	-
Unit 4**	45	1949	0.20			

+ Excludes the Chile (1985) earthquake.

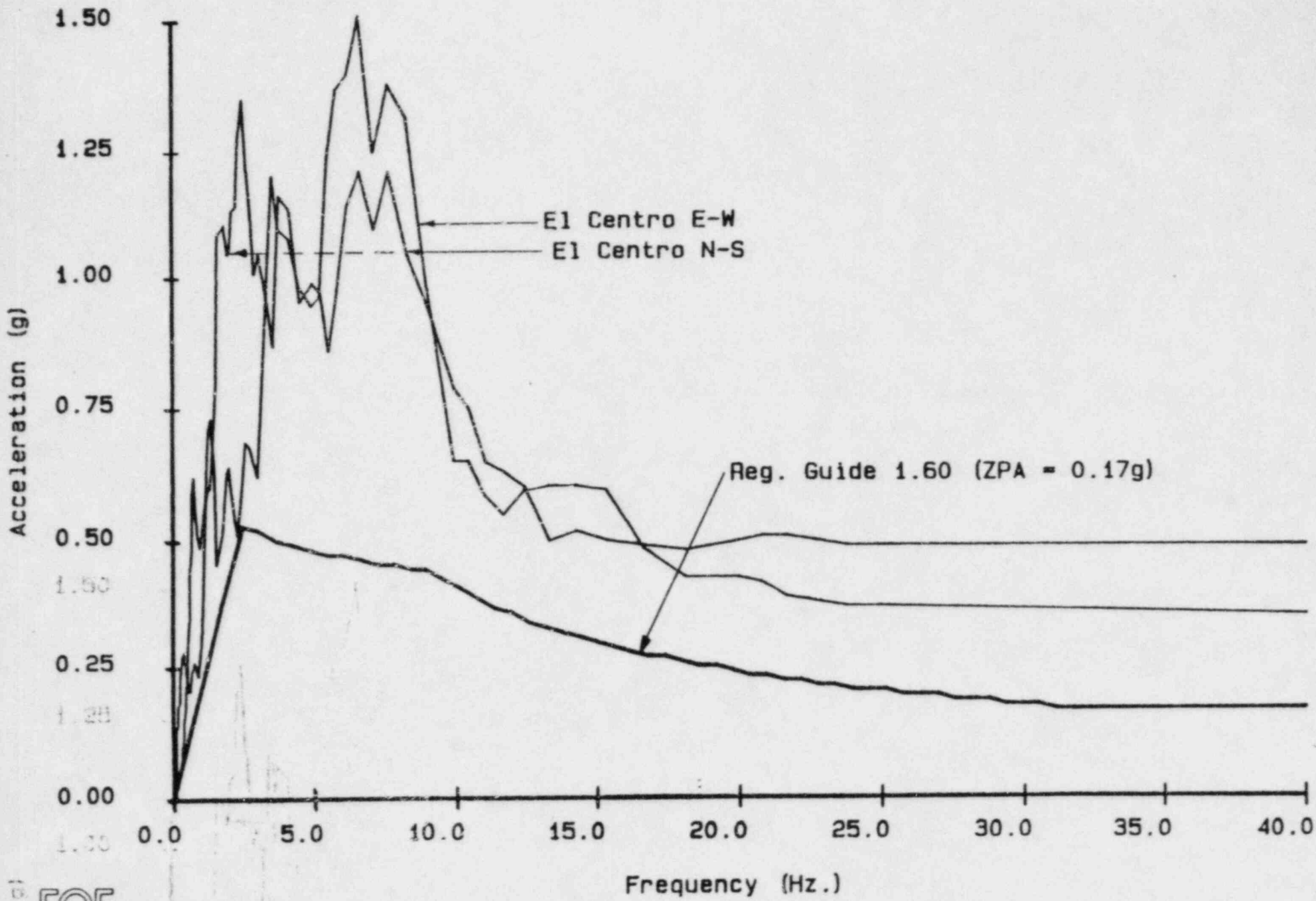
\* Not operating at time of earthquake.

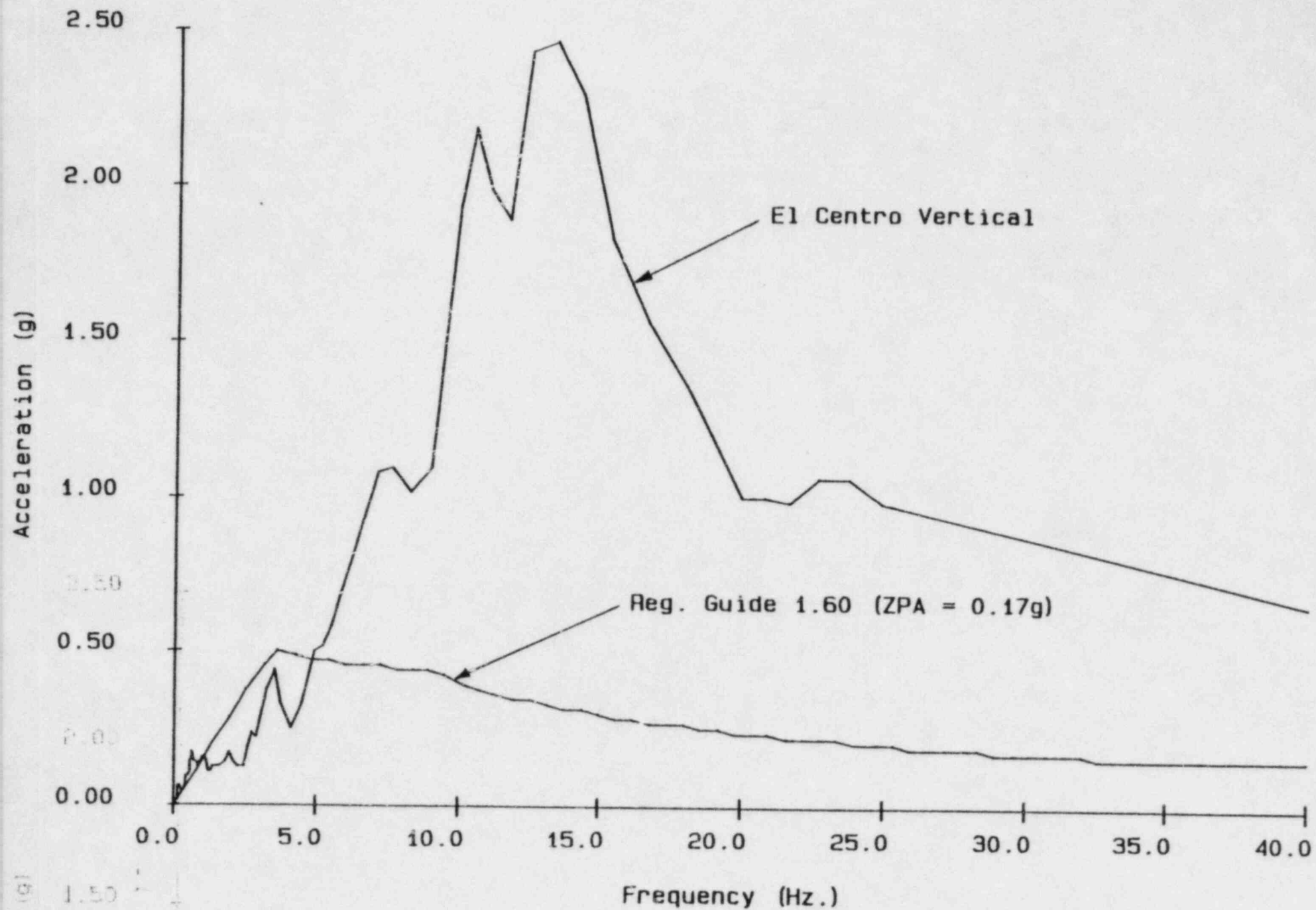
\*\* On hot standby at time of earthquake.

**FOR THE MILLSTONE III SEISMIC INTERACTION STUDY  
WE REVIEWED:**

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- **FACILITIES THAT WERE AFFECTED BY STRONGER EARTHQUAKES THAN THE MILLSTONE III SSE**
- **FACILITIES DESIGNED UNDER SEISMIC DESIGN CRITERIA THAT ARE MUCH LOWER THAN THE MILLSTONE III CRITERIA**
- **FACILITIES AT WHICH MOST ASPECTS OF SEISMIC INTERACTION WERE NOT CONSIDERED, UNLIKE MILLSTONE III**





**THE FOLLOWING SEISMIC INTERACTION ISSUES WERE  
ADDRESSED IN THIS PROJECT:**

---

- **IMPACT OF ADJACENT PIPING, CONDUIT, CABLE  
TRAYS AND DUCTING**
- **SLIDING OR OVERTURNING OF EQUIPMENT**
- **FALLING OF WALL-MOUNTED AND CEILING-  
MOUNTED EQUIPMENT AND FIXTURES**

THE FOLLOWING SEISMIC INTERACTION SCENARIOS  
WERE FOUND AT THE DATA BASE FACILITIES  
(EXCLUDING THE CHILE EVENTS)

<u>Earthquake</u>	<u>Facility</u>	<u>Pipe/Valve Structure</u>	<u>Unanchored Equipment</u>	<u>Anchored Equipment</u>	<u>Falling Ceiling or Wall Fixtures</u>
San Fernando	Burbank Power Plant				
	Glendale Power Plant				
	Olive View Sanatorium		x	x	x
	Pasadena Power Plant				
	Rinaldi Receiving Station			x	
	Saugus Substation				
	Sylmar Converter Station		x	x	x
Point Mugu	Valley Steam Plant	x			
	Vincent Substation				x
Point Mugu	Ormond Beach Gen. Station	x			
	Santa Clara Substation				
Humboldt County	Humboldt Bay Power Plant				
Santa Barbara	Ellwood Peaker Power Plant				
	Goleta Substation				
Ferndale	Humboldt Bay Power Plant				
Imperial Valley	El Centro Steam Gen. Plant	x	x	x	
	Magnamax Geothermal Plant				
Coalinga	Amador Gas Metering Station				
	Chevron Cleaning Plant			x	
	Coalinga Feed Yard		x	x	
	Coalinga Nose Dehydration Station		x	x	
	Coalinga Substation 1			x	
	Coalinga Substation 2			x	
	Coalinga Water Filtration Plant		x	x	
	Gates Substation				
	Kettleman Gas Compressor Station				x
	Main Oil Pumping Plant		x	x	x
	Pleasant Valley Pumping Plant				
	San Luis Canal Pumping Stations		x		x
	Shell Dehydration Plant			x	
	Shell Water Treatment Plant		x	x	
Morgan Hill	Union Oil Butane Plant		x		
	Evergreen Community College				x
	IBM - Santa Teresa Laboratory				x
	Los Banos Substation				
	Metcalf Substation				
	Mirassou Winery		x		
	San Martin Winery		x		
	United Technologies Plant		x		
	Wiltron Electronics Facility		x		



AS A MINIMUM 290 PIPING INTERACTIONS OCCURRED IN ONE  
PORTION OF THE EL CENTRO POWER PLANT IN 1979

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<u>TYPE OF INTERACTION</u>	<u>NO. OF INTERACTIONS</u>
INSULATED PIPE SAME SIZE	77
INSULATED PIPE DIFFERENT SIZES	27
NON-INSULATED PIPE SAME SIZE	32
NON-INSULATED PIPE DIFFERENT SIZES	20
INSULATED/NON-INSULATED PIPE SAME SIZE	31
INSULATED/NON-INSULATED PIPE DIFFERENT SIZES	31
INSULATED PIPE/STRUCTURE	44
NON-INSULATED PIPE/STRUCTURE	21
VALVE/STRUCTURE	*4
VALVE/PIPE	<u>3</u>
TOTAL NUMBER OF INTERACTIONS IDENTIFIED:	290

\*Includes one failure of a cast-iron valve operator yoke due to impact with an adjacent steel column.



THE FOLLOWING INSTANCES OF DAMAGING INTERACTIONS WERE FOUND IN THE DATA BASE FACILITIES (EXCLUDING THE CHILE EVENTS):

---

SEISMIC INTERACTION CATEGORY	INSTANCES OF DAMAGING INTERACTION
IMPACT OF ADJACENT PIPING, CONDUIT, CABLE TRAYS, DUCTING	4
SLIDING OR OVERTURNING EQUIPMENT	4
FALLING WALL- OR CEILING-MOUNTED FIXTURES	5

**OUR RECOMMENDATIONS FOR ELIMINATING DAMAGING INTERACTIONS FROM SLIDING OR OVERTURNING EQUIPMENT ARE:**

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*Walkdown criteria for NU:*

- **NON-CATEGORY 1 EQUIPMENT ADJACENT TO CATEGORY 1 EQUIPMENT SHOULD BE CHECKED TO INSURE THAT SOME ANCHORAGE IS PROVIDED**
- **IF OVERTURNING IS NOT A CREDIBLE HAZARD, IMPACT FROM SLIDING EQUIPMENT SHOULD NOT BE CONSIDERED CREDIBLE IF THE SEPARATION BETWEEN THE EQUIPMENT AND THE TARGET EXCEEDS 12 INCHES**

**OUR RECOMMENDATIONS FOR ELIMINATING DAMAGING INTERACTIONS FROM FALLING CEILING- AND WALL-MOUNTED EQUIPMENT ARE:**

---

- **SEISMIC LOADS SHOULD BE CONSIDERED IN THE INSTALLATION OF SUSPENDED CEILING IN CATEGORY 1 AREAS**
- **LIGHT FIXTURES SUSPENDED OVER IMPACT-SENSITIVE CATEGORY 1 EQUIPMENT SHOULD BE PROVIDED WITH RESTRAINT AGAINST FALLING**
- **CEILING- OR WALL-MOUNTED EQUIPMENT DOES NOT PRESENT A CREDIBLE FALLING HAZARD IF IT CAN BE EXCITED MANUALLY TO SEISMIC RESPONSE LEVELS DURING THE PLANT WALKDOWN**

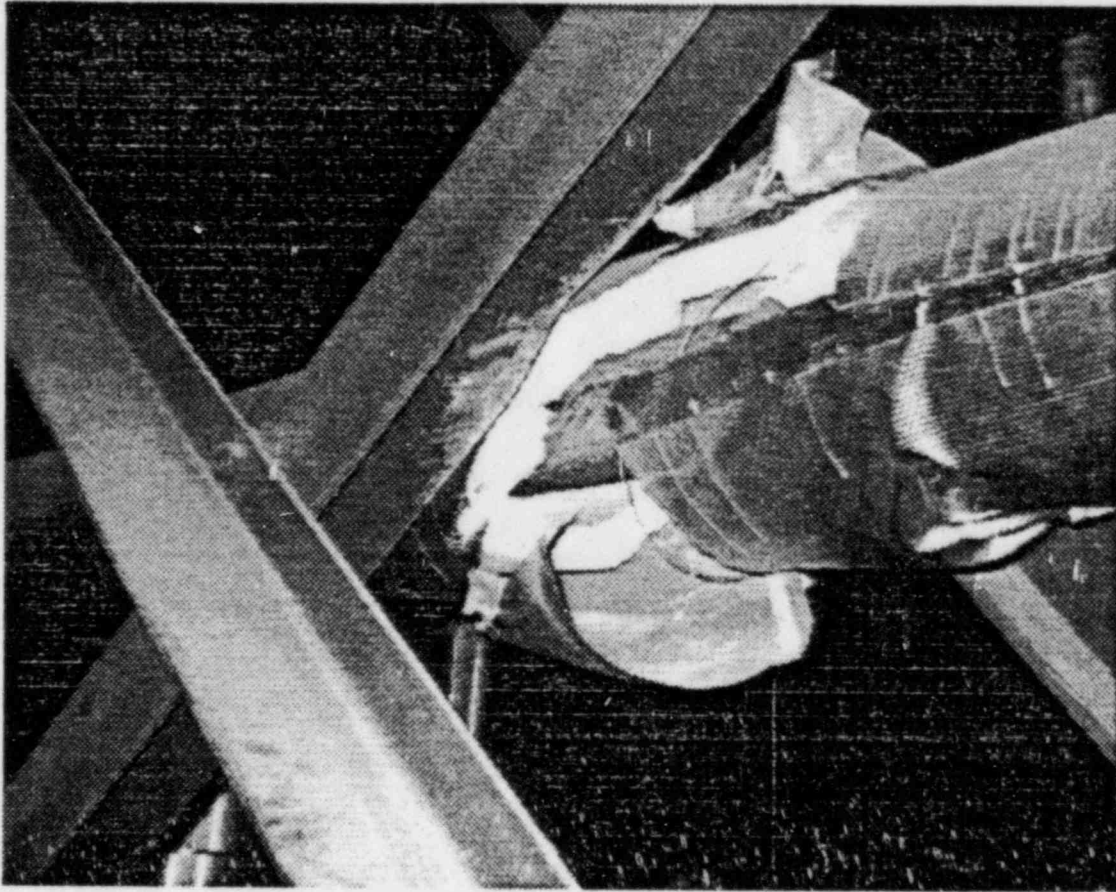
OUR RECOMMENDATIONS FOR ELIMINATING DAMAGING  
INTERACTION FROM PIPING IMPACT ARE:

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- THE IMPACT OF CATEGORY 1 PIPING ON ADJACENT STRUCTURES SHOULD NOT BE CONSIDERED A CREDIBLE HAZARD WITH RESPECT TO LOSS OF FLUID CONTENTS OR RESTRICTION OF FLOW AREA
- THE IMPACT OF NON-CATEGORY 1 PIPING ON CATEGORY 1 PIPING SHOULD NOT BE CONSIDERED A CREDIBLE HAZARD UNLESS BOTH OF THE FOLLOWING CONDITIONS EXIST:
  - THE RATIO OF THE PIPE DIAMETERS IS GREATER THAN 3 TO 1
  - THE CATEGORY 1 PIPING HAS INSUFFICIENT FLEXIBILITY TO ACCOMMODATE THE MAXIMUM DISPLACEMENT OF THE IMPACTING NON-CATEGORY 1 PIPING
- A REASONABLE ESTIMATE OF THE MAXIMUM DISPLACEMENT (SWAY) OF PIPING IN AN EARTHQUAKE IS SIX INCHES, BASED ON PAST EXPERIENCE
- PARTICULAR ATTENTION SHOULD BE GIVEN TO ADEQUATE CLEARANCE BETWEEN PIPING ATTACHMENTS SUCH AS VALVE OPERATORS, THERMO-COUPLES AND INSTRUMENT TUBING, AND ADJACENT PIPING OR STRUCTURES
- PAST EXPERIENCE SHOWS THAT THE SUPPORT SYSTEMS FOR PIPING WILL REMAIN INTACT IN AN EARTHQUAKE EVEN IF NOT SPECIFICALLY DESIGNED FOR SEISMIC LOADS

WELDED STEEL PIPING EXHIBITS

SUPERIOR PERFORMANCE IN EARTHQUAKES



INSULATION AND BRACING DAMAGE AT  
LAS VENTANAS POWER PLANT, CHILE  
PHOTOGRAPHED ON MARCH 8, 1985  
NO DAMAGE TO PRESSURE BOUNDARY

POWER PIPING DURING & AFTER EARTHQUAKES (RP 2635-01)



**OUR PRIMARY CONCLUSIONS ARE:**

---

- **OUT OF 10 EARTHQUAKES, 60 FACILITIES, AND THOUSANDS OF SEISMIC INTERACTIONS, THERE ARE 13 INSTANCES OF SEISMIC INTERACTION LEADING TO DAMAGE**
- **A THOROUGH SEISMIC INTERACTION STUDY SUCH AS THAT BEING CONDUCTED FOR MILLSTONE III WOULD HAVE FOUND AND CORRECTED THE 13 INTERACTIONS**

HAZARD PROGRAM  
REVIEW STATEMENT

MS-3 INTAKE STRUCTURE

The above portion of the Millstone Unit 3 plant design and all associated structures, systems and components has been reviewed to assure that the dynamic and environmental effects produced by seismic-induced interactions, high energy missiles, and pipe ruptures will not reduce the safety function of adjacent plant features to an unacceptable level.

The review concludes that the installation will be adequate upon completion of the following activities:

1. Positive anchorage of all chain-hung lighting fixture S-hooks to preclude seismic-induced detachment. (ref. E&DCR F-E-38410)
2. Installation of metal hold-down straps on wall mounted emergency lighting units (battery operated), 3CW1O-4-0-EZ and 3CW2P-4-O-EZ.  
(ref. S&W Drawing No. 12179-EE-72C-2, "Lighting Fixture Support Details - Circulation Water Pumphouse").

*Thomas K. Gillespie for*  
L. KELLY  
Hazard Review Coordinator

*Thomas K. Gillespie for*  
10-31-84  
Date



SEISMIC INTERACTION REVIEW PROGRAM  
MILLSTONE - UNIT 3 NUCLEAR POWER STATION

BUILDING: Circulating and Service Water Pumphouse

DESCRIPTION:

The circulating and service water pumphouse operating floor (elev. + 14.5 feet) is divided by fire and missile protected watertight walls into two pump compartments: one for housing the nonsafety-related circulating water and screen wash pumps and associated equipment, and the other for housing the safety related service water pumps and strainers. The service water pump compartment is further divided by a fire and missile protected watertight wall into two cubicles, each cubicle containing two service water pumps and associated self-cleaning strainers. It is within these two QA Category I cubicles that the seismic interaction walkdowns were conducted.

Preliminary Walkdown Date: Week of April 16, 1984

Final Walkdown Date: Week of November 26, 1984

Walkdowns Performed By: Thomas K. Gillespie

Cubicles 201 & 202

In each service water pump cubicle there are two General Electric service water pump with drive motors and two connecting automatic water strainers. Both service water pump cubicles are essentially mirror-images to each other.

Electrical cable trays are located along the entire south walls of both cubicles. The supports for these cable trays are Seismic Category I (CAT I). There are five cable trays mounted on the cable tray supports: the top four contain safety-related cable, whereas the bottom (fifth) tray contains nonsafety-related cable. No clearance concerns were observed between the cable trays and nearby components.

Piping and conduit density is minimal throughout both cubicles. Both safety and nonsafety related piping and conduit are present in the two pump cubicles. There were three piping interaction concerns identified. Their disposition is found on Seismic Review Worksheets S-003 thru S-005.

Both safety and nonsafety-related instrumentation are present in the two pump cubicles. There was one instrumentation interaction concern identified. See Seismic Review Worksheet S-024 for the disposition of this concern.

Located at the east end of cubicle 202 and the west end of cubicle 201 are CAT I and CAT II motor control centers. All four MCC's have adequate anchorage to preclude overturning or sliding during a seismic event.

At the upper elevations of each cubicle are HVAC duct which are supported by seismic duct supports. No clearance concerns were observed between the HVAC duct/supports and nonsafety-related components in both cubicles.

Additional seismic interaction concerns which were identified were : (1) open S-hook connections, (2) unit heaters, (3) fire extinguisher supports, (4) wall-mounted (battery) lighting units, (5) loudspeakers and, (6) clearance between motor-operated valve and structural steel. See Seismic Review Worksheets S-001, S-002, S-006, S-007, S-025, and S-026 for disposition of these items.

## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-001

Cubicle: 201 & 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: All chain-hung lighting units (6 observed) have open "S" hook @ connections.

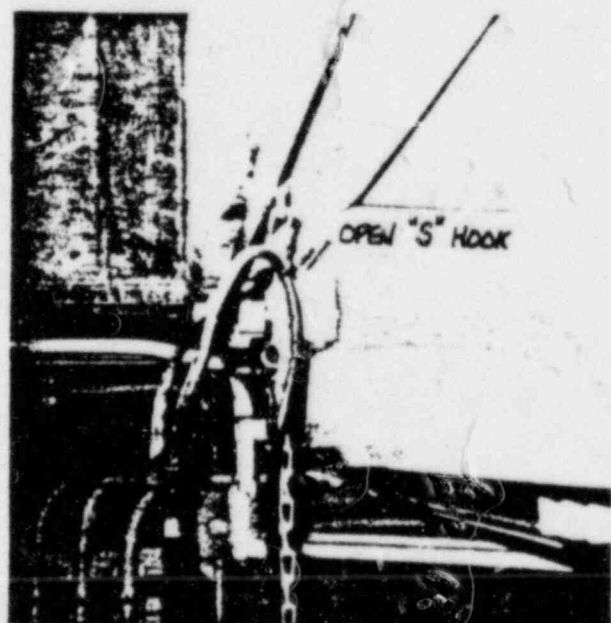
Elevation: Historical seismic data has shown that chain-hung lighting fixtures have slipped out of open "S" hook connections during a seismic event thereby resulting in a complete loss of anchorage. Lighting units then become gravity missiles targeting anything beneath them.

Resolution: As a result of this review, E&DCR F-E-38410 was written to provide details/direction for positive anchorage of "S" hook connections. Subsequently, chain-hung lighting units pose no seismic interaction concern.

Photo No. 1



Photo No. 2



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-002

Cubicle: 201 & 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Unit heaters 3HVV-UHE1A and 3HVV-UHE1B are mounted directly above safety-related components (see Photo No. 1 & 2). Loss of anchorage would result in the unit heaters becoming gravity missiles targeting the safety related components.

Evaluation: The unit heater's support has been seismically designed up to the interface with the nonsafety-related unit heater. The unit heater is attached to the seismic CAT II support using two bolts on each side of the mounting bracket (see Photo No. 3).

No credible singular failure mechanism is present in the support configuration. In the unlikely case of one of the bolts failing during a seismic event, adequate load path redundancy provided by the

Photo No. 1

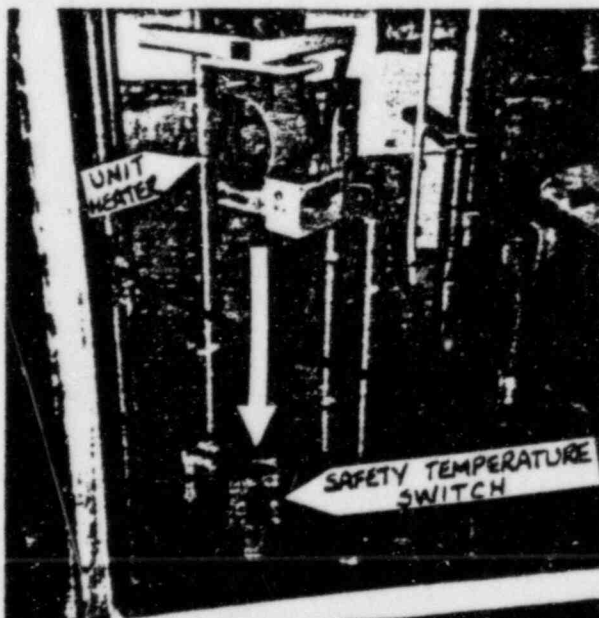
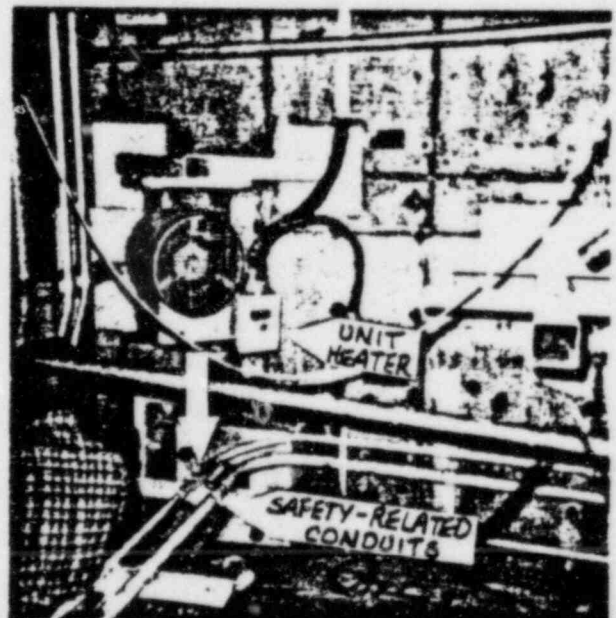


Photo No. 2





SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM  
MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Interaction No. S-002 (Con't.)

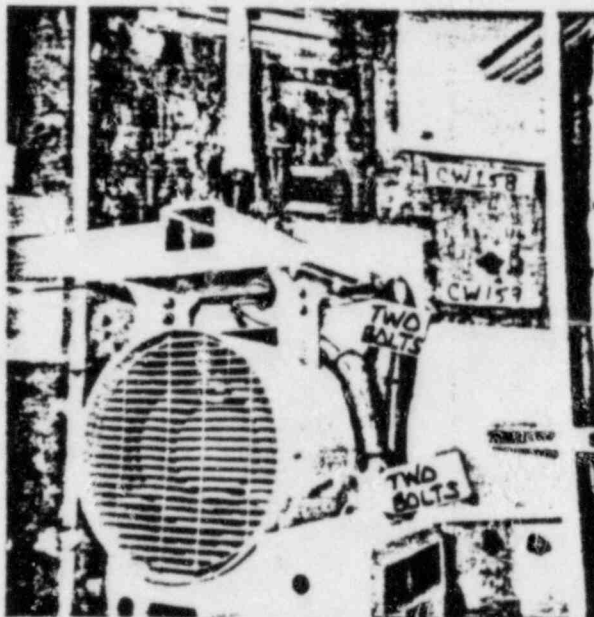
remaining three bolts precludes a complete loss of anchorage of the unit.

The unit heater and its support accommodates a high amount of lateral excitation when shaken by hand. In addition, past earthquake survival data has shown that ceiling-mounted equipment such as unit heaters have not lost their anchorage during seismic events.

Resolution:

Unit heaters will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of nearby safety-related components will occur.

Photo No. 3



# SEISMIC REVIEW WORKSHEET

## SEISMIC INTERACTION REVIEW PROGRAM

### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-003

Cubicle: 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

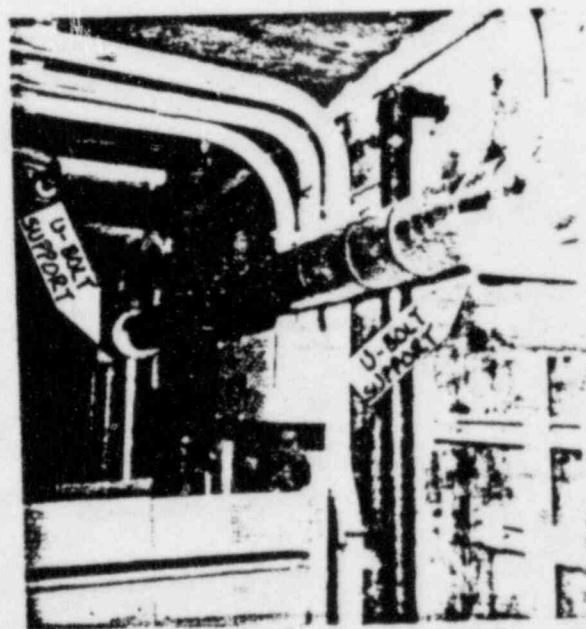
Description: Nonseismically supported 1 1/2" diameter domestic water pipe is unusually close to safety-related conduit 3CC8820G (see Photo No. 1). The available clearance between the two components is approximately 1/2" (w/insulation).

Evaluation: The safety-related conduit is restricted from movement towards the nonseismically supported 1 1/2" water pipe by a seismic U-strap/unistrut support located 7" from the potential point of interaction. The 1 1/2" water pipe is restricted from movement towards the safety-related conduit by U-bolts which secure the pipe to angle iron cantilever supports located on either side of the potential point of interaction (see Photo No. 2).

Photo No. 1



Photo No. 2



SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Interaction No. S-003 (Con't.)

Due to the close proximity and adequacy of the supports, the relative seismic movement between the components will be very small and adequate clearance will prevail during a seismic event.

Resolution: Seismic interaction between the nonseismic pipe and the safety-related conduit is precluded since adequate clearance exists. Subsequently, no impairment of the conduits safety function will occur.



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-004

Cubicle: 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: The vertical riser portion of the nonseismically supported domestic water pipe is unusually close to safety-related conduit 3CL883NG. The available clearance between the components is approximately 3/4".

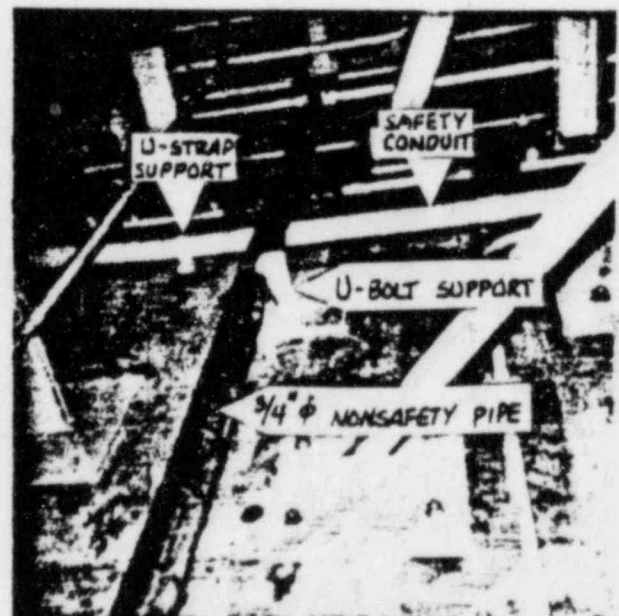
Evaluation: The 3" diameter safety-related conduit is well-supported against movement towards the 3/4" nonseismic pipe by seismic U-strap supports located on each side of the potential point of interaction (see Photo No. 1). The 3/4" nonseismically supported pipe is restricted from movement towards the safety-related conduit by a U-bolt support located approximately 16" from the potential point of interaction (see Photo No. 2).

Due to the close proximity and adequacy of the supports near the

Photo No. 1



Photo No. 2



SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Interaction No. S-004 (Con't.)

point of concern, the relative seismic movement between the components will not exceed the 3/4" available clearance between them.

Resolution: A seismic interaction between the nonseismically supported pipe and the safety-related conduits is precluded since adequate clearance exists. Subsequently, no impairment of the conduits' safety function will occur.

## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-005

Cubicle: 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Nonseismically supported 1 1/2" diameter domestic water pipe is unusually close to safety-related conduit 3CK880PG and 3CC881PM. The available clearance between the components is approximately 1/2" (see Photo No. 1).

Evaluation: The 1 1/2" diameter nonseismic water pipe is restricted from movement towards the safety-related conduits by a U-bolt support located 10" and 13" respectively from the potential point of interaction. The conduits are well-supported against movement towards the nonseismically supported pipe by a U-strap/unistrut support located 9" from the potential point of interaction. Due to the close proximity and adequacy of the supports, the relative seismic movement between the components will be very small and adequate

Photo No. 1



SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM  
MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Interaction No. S-005 (Con't.)

clearance will prevail during a seismic event.

Resolution:

A seismic interaction between the nonseismically supported pipe and the safety-related conduits is precluded since adequate clearance exists. Subsequently, no impairment of the conduit's safety function will occur.

## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-006

Cubicle: 201 and 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Portable fire extinguishers in both safety-related service water cubicles (one in each cubicle) are gravity hung onto supports mounted to the wall (see Photo No. 1). Vertical excitation from a seismic event will cause the fire extinguishers to become completely detached from their supports.

Evaluation: A complete loss of anchorage is assumed since the fire extinguishers are only held onto the support by gravity.

The fire extinguishers will not fall onto any safety-related components since all safety-related components susceptible to damage from the falling fire extinguishers are remotely located from the area (see Photos 2 and 3). In addition, the ability for

Photo No. 1



Photo No. 2





SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Interaction No. S-006 (Con't.)

each fire extinguisher to roll and hit a safety-related component after falling is restricted due to the presence of the protruding nozzle bracket around the circumference of the cylinder.

Resolution: The fire extinguishers are expected to lose their anchorage during a seismic event, however, no functional impairment of safety-related components will occur.

Photo No. 3



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-007

Cubicle: 201 & 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Emergency lighting units are wall mounted in both safety-related service water cubicles (one in each cubicle). A loss of anchorage would result in the lighting units becoming gravity missiles targeting safety-related components (see Photo No. 2).

Evaluation: The mounting brackets upon which the battery-powered lighting units rest are firmly attached to the wall using (4) - 3/4" diameter anchor bolts.

The lighting units are kept from overturning/sliding off the bracket by metal hold-down straps (see Photo No. 1 and Figure No. 1).

Additionally, the front edge of the mounting bracket is bent up to form a lip which stops the lighting units from sliding off the front

Photo No. 1



Photo No. 2





## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

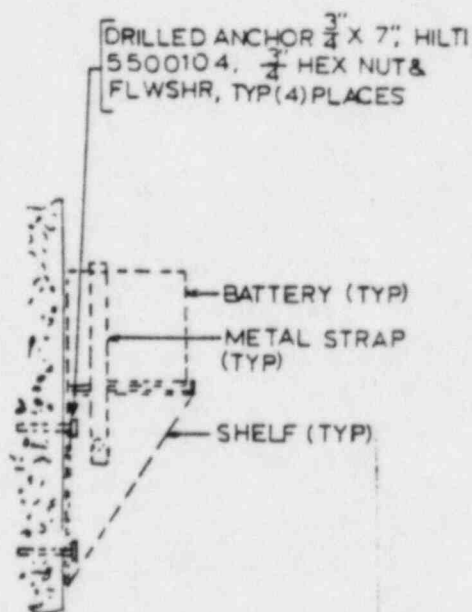
Interaction No. S-007 (Con't.)

of the bracket.

The lighting unit and its support accommodates a high amount of lateral excitation when shaken by hand. In addition, past earthquake survival data has shown that wall-mounted equipment such as emergency lighting units have not lost their anchorage during seismic events.

Resolution: Emergency lighting units will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of nearby safety-related components will occur.

Figure No. 1



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-024

Cubicle: 201 & 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Mercury vapor lighting units are wall-mounted in both safety-related service water cubicles (see Photo No. 1). A loss of anchorage would result in the lighting units becoming gravity missiles targeting safety-related tubing and other components located below (see Photo No. 2). The same hazard concern is in each cubicle.

Evaluation: The lighting units are firmly attached to the wall using (4) - 1/4" diameter anchor bolts (see Figure No. 1).

No credible singular failure mechanism is present in the support configuration. In the unlikely case of one of the bolts failing during a seismic event, adequate load path redundancy provided by the

Photo No. 1

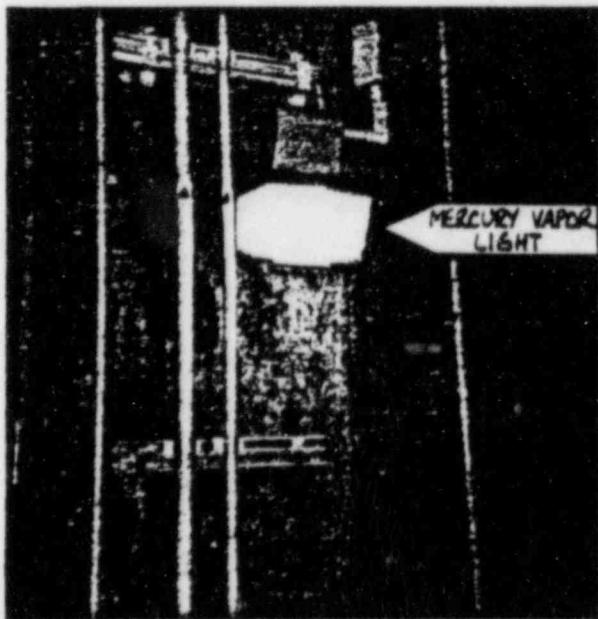
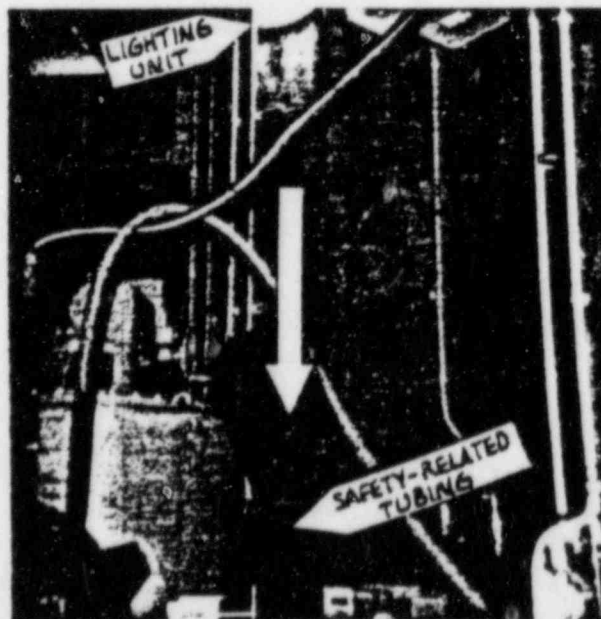


Photo No. 2



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

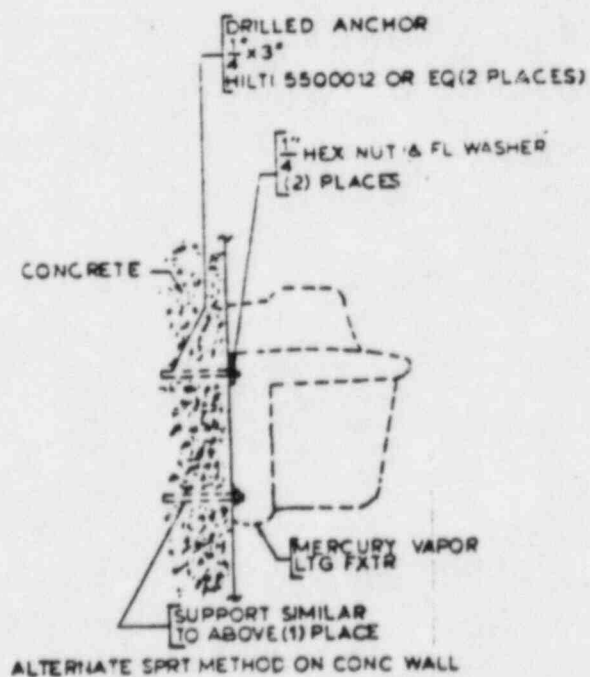
Interaction No. S-024 (Con't.)

remaining three bolts precludes a complete loss of anchorage of the unit.

Past earthquake survival data has shown that wall-mounted equipment such as lighting units have not lost their anchorage during seismic events.

Resolution: Mercury vapor lighting units will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of nearby safety-related components will occur.

Figure No. 1



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-025

Cubicle: 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: At elevation 21'-9", the safety-related limitorque motor operated valve housing is unusually close to the edges of the raised platform. The available clearances between the two components are as shown on Photo No. 1.

Evaluation: The raised platform is adequately supported using robust structural steel members with diagonal bracing (see Photo No. 2). The platform has been designed to withstand seismic loads. Likewise, the safety-related motor operated valve is very securely mounted to the 30" diameter service water pipe and has been designed and constructed to Seismic Category I standards.

Nevertheless, the acceptability of this configuration cannot be determined by a visual/judgemental assessment because of the

Photo No. 1

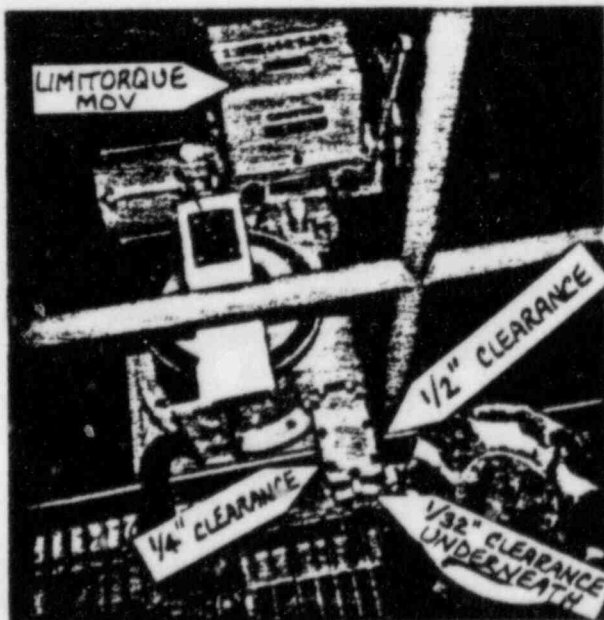
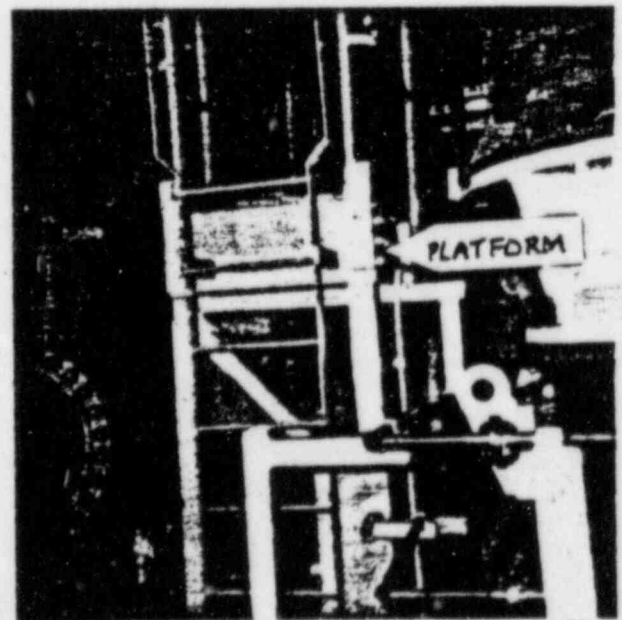


Photo No. 2



SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Interaction No. S-025 (Con't.)

tight clearances and the unpredictability of the relative seismic movement between the two components during a seismic event.

Upon further investigation, a comparison between the analyzed seismic displacements of the safety-related motor operated valve/30" diameter pipe and the raised platform reveals that adequate clearance exists between the two components during a seismic event.

Resolution

A seismic interaction between the edge of the raised platform and the safety-related motor operated valve housing is precluded due to adequate clearance between the two components. Subsequently, no impairment of the motor operated valve's safety function will occur.



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Intake Structure

Interaction No. S-026

Cubicle: 201 & 202

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Nonseismically supported loudspeakers are mounted in both service water pump cubicles which contain safety-related components (see Photos 1 & 2). A loss of anchorage would allow the loudspeakers to fall and possibly impact safety-related components.

Evaluation: The nonsafety-related loudspeaker's support is mounted to the wall using (3)-1/4" diameter anchor bolts. The loudspeaker is attached to the support using two bolts (see Photo No. 3).

No credible singular failure mechanism is present in the support. If one of the bolts should fail during a seismic event, adequate load path redundancy provided by the remaining bolts precludes a complete loss of anchorage of the unit.

Photo No. 1



Photo No. 2





## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

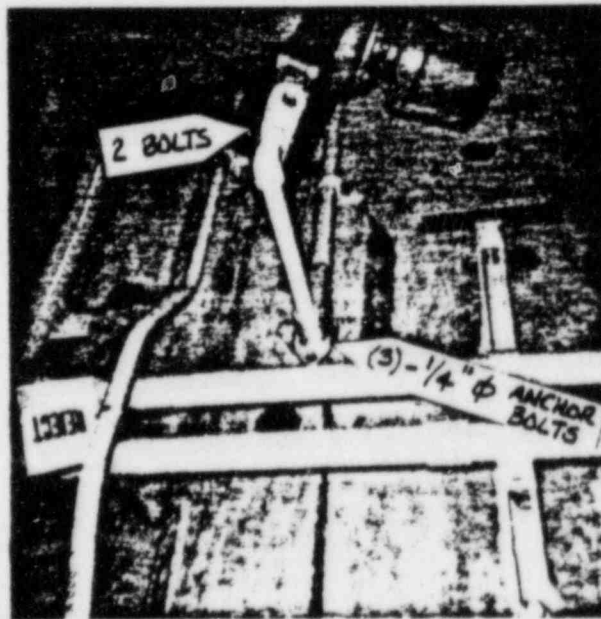
Interaction No. S-026 (Con't.)

The loudspeaker and its support accommodates a high amount of lateral excitation when shaken by hand. In addition, past earthquake survival data has shown that wall-mounted equipment such as loudspeakers have not lost their anchorage during seismic events.

Resolution:

Loudspeakers will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of safety-related components will occur.

Photo No. 3



## HAZARD PROGRAM REVIEW STATEMENT

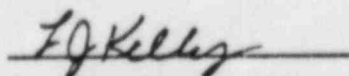
### MILLSTONE 3 HYDROGEN RECOMBINER BUILDING

The above portion of the Millstone Unit 3 plant design and all associated structures, systems, and components has been reviewed to assure that the dynamic and environmental effects produced by seismic-induced interactions, internally-generated missiles, and postulated high energy pipe ruptures will not reduce the safety functions of adjacent plant features to an unacceptable safety level.

The review concludes that the installation will be adequate upon completion of the following activities:

1. Closure of all chain-hung light fixture S-hooks to preclude seismic-induced detachment. See E&DCR # F-E-38410.
2. Completion of the installation of a emergency lighting battery pack. The hold-down strap is awaiting final attachment. An earthquake could cause damage to the building security system access control box which is located directly below.

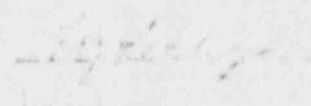
NOTE: The current level of construction activity in the building suggests that a supplementary walkdown at a later date is prudent. There are no other current concerns, however.



Lawrence J. Kelly

Hazard Review Coordinator.

Date: 01 May 85



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Hydrogen Recombiner

Interaction No. S-008

Cubicle: 183, 184 and 186

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: All chain-hung lighting units have open "S" hooks at their connections.

Evaluation: Historical seismic data has shown that chain-hung lighting fixtures have slipped out of open "S" hook connections during a seismic event thereby resulting in a complete loss of anchorage. Lighting units then become gravity missiles targeting anything beneath them.

Resolution: E&DCR F-E-38410 now provides details/direction for positive anchorage of "S" hook connections. Therefore, chain-hung lighting units pose no seismic interaction concern.

Photo No. 1



## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Hydrogen Recombiner

Interaction No. S-009

Cubicle: 184

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Nonseismically supported loudspeaker 3COP-SPKR281 is mounted directly above safety-related conduit 3CC982PC6 (see Photo No. 1). A loss of anchorage would allow the loudspeaker to fall and impact the safety-related conduit.

Evaluation: The loudspeaker's support is mounted to the wall using (3) - 1/4" diameter anchor bolts. The loudspeaker itself is attached to the support using two bolts (see Photo No. 2).

No credible singular failure mechanism is present in the loudspeaker's support configuration. If one of the bolts should fail during a seismic event, adequate load path redundancy provided by the remaining bolts precludes a complete loss of anchorage of the unit.

Photo No. 1



Photo No. 2



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SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

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Interaction No. S-009 (Con't.)

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The loudspeaker and its support accommodates a high amount of lateral excitation when shaken by hand. In addition, past earthquake survival data has shown that wall-mounted equipment such as loudspeakers have not lost their anchorage during seismic events.

Resolution: The loudspeaker will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of the safety-related conduit will occur.

## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Hydrogen Recombiner

Interaction No. S-010

Cubicle: 183-185

Reviewer: Thomas K. Gillespie

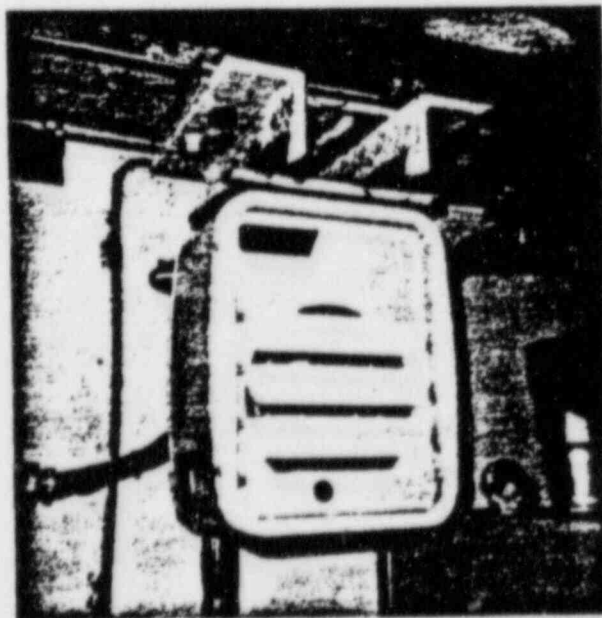
#### Problem Description/Evaluation/Resolution:

Description: A Chromolox unit heater is mounted in each of the above Hydrogen Recombiner cubicles containing safety-related components. A loss of anchorage would result in the unit heaters becoming gravity missiles possibly targeting safety-related components.

Evaluation: The unit heater's support has been designated seismic CAT II up to interface with the nonsafety-related unit heater. The unit heater is suspended from the seismic CAT II support using (4) - 3/8" diameter bolts bolted into the top of the unit heater.

No credible singular failure mechanism is present in the unit heater's support configuration. If one of the bolts should fail during a seismic event, adequate load path redundancy provided by the

Photo No. 1





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SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

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Interaction No. S-010 (Con't.)

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complete loss of anchorage of the unit.

The unit heater and its support accommodates a high amount of lateral excitation when shaken by hand. In addition, past earthquake survival data has shown that ceiling-mounted equipment such as unit heaters have not lost their anchorage during seismic events.

Resolution: The unit heaters will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of nearby safety-related components will occur.

## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Hydrogen Recombiner

Interaction No. S-011

Cubicle: 182

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: A chromolox unit heater is mounted in the sample room which contains safety-related components (see Photo No. 1). A loss of anchorage would cause the unit heater to become a gravity missile possibly targeting safety-related components.

Evaluation: The unit heater's support has been designated seismic CAT II up to the interface with the nonseismic mounting bracket. The mounting bracket is attached to the seismic CAT II support with (4) - 3/8" diameter bolts. The unit heater itself is mounted onto the mounting bracket using (4) - 3/16" diameter screws.

No credible singular failure mechanism is present in the unit heater's support configuration. If one of the bolts or screws should

Photo No. 1



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SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

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Interaction No. S-011 (Con't.)

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fail during a seismic event, adequate load path redundancy provided by the remaining three bolts and three screws precludes a complete loss of anchorage of the unit.

The unit heater and its support accommodates a high amount of lateral excitation when shaken by hand. In addition, past earthquake survival data has shown that ceiling-mounted equipment such as heaters have not lost their anchorage during seismic events.

Resolution:

The unit heater will not become detached during a seismic event since adequate anchorage is provided. Subsequently, no functional impairment of nearby safety-related components will occur.

## SEISMIC REVIEW WORKSHEET

### SEISMIC INTERACTION REVIEW PROGRAM

#### MILLSTONE - UNIT 3 NUCLEAR POWER STATION

Building: Hydrogen Recombiner

Interaction No. S-012

Cubicle: 187

Reviewer: Thomas K. Gillespie

#### Problem Description/Evaluation/Resolution:

Description: Nonsafety-related conduit 3CK978NES is unusually close to a safety-related duct. The available clearance is approximately 1-1/8" (see Photo No. 1).

Evaluation: Adequate anchorage for the conduit is provided at three locations: the junction box, the U-strap support, and at the conduit wall penetration (see Photo No. 2). The safety-related duct is seismic CAT I supported.

Due to the adequate anchorage and inherent stiffness characteristics of both components, the relative seismic displacements between the two components will not exceed the 1-1/8" available clearance between them.

Photo No. 1

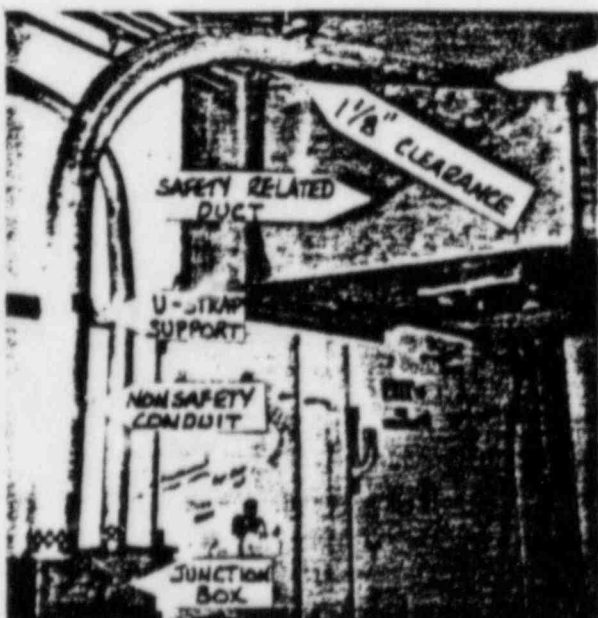
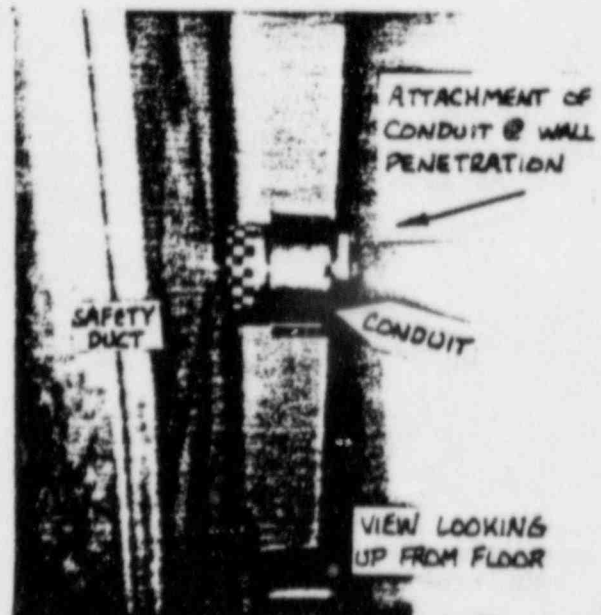


Photo No. 2



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SEISMIC REVIEW WORKSHEET

SEISMIC INTERACTION REVIEW PROGRAM

MILLSTONE - UNIT 3 NUCLEAR POWER STATION

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Interaction No. S-012 (Con't.)

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Resolution: A seismic interaction between the nonsafety-related conduit and the safety-related duct is precluded since adequate clearance is available. Subsequently, no impairment of the duct's safety function will occur.

JUL 23 1985

MEETING SUMMARY DISTRIBUTION

Docket File

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L PDR  
NSIC  
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