NUCLEAR GENERATION MEMORANDUM

Date: August 8, 994 File 0801.21
TMPE-94-0486

To: R. McKeon
Assistant Vice President & Manager, Operations

From: A. M. Alchalabi
Team Manager, Structural Support Recovery Plan

Subject: **Final Report-Structural Walkdown**

Attached, please find the final report of the structural walkdown. This report consist of the action plan, findings, recovery plan action items, walkdown checklist and the final conclusion.

Noted by: _____
K. E. Howard, Supervisor, Mechanical/Civil

Approved by: _____
J. G. Walker, Director, Plant Engineering

AMA/psl

cc: ETS
PE File
C. Halbfoster

STRUCTURAL WALKDOWN

FINAL REPORT

TASK MANAGER: ABDUL ALCHALABI

August 8, 1994

Table of Contents

MISSION STATEMENT

WALKDOWN AND VISUALLY INSPECT PLANT STRUCTURES, SUPPORTS AND COMPONENTS FOR STRUCTURAL DAMAGE. EVALUATE POTENTIAL IMPACT OF "SEISMIC ALARM".

TEAM MANAGER : ABDUL ALCHALABI

TEAM MEMBERS:
G. ABDALLAH
R. BRYER
R. BUCK
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INTRODUCTION/PURPOSE

The turbine failure and resulting events initiated the need to inspect and evaluate the structures housing and supporting the turbines, generator and exciter. As included in the Recovery Plan, the scope of this walkdown and inspection included the Turbine Building (TB), Radwaste Building (RWB), and Reactor/ Auxiliary Building (RAB) and the evaluation of the earthquake instrumentation data. In order to perform the structural walkdowns, a "Structural Walkdown Team" was formed. The walkdown team consisted of qualified Structural and Civil Engineers, members of Mechanical/Civil Group of Plant Engineering, each with an average of fifteen years of nuclear power plant experience.

The purposes of the Structural Walkdown Team are to inspect all impacted areas, observe and evaluate the damage, and recommend repairs.

The Walkdown Team performs its task per the "Walkdown Plan" which has been reviewed and approved by the Plant Manager.

During walkdown preparation, the turbine accident and the resulting events were studied to determine the most critical items to inspect. Consequently, the items in the vicinity of the accident, such as the turbine pedestal and the isolation gap between the pedestal and TB structure were inspected with specific attention. The TB roof, siding, turbine overhead crane and supporting structures were also inspected in detail for structural and missile damage.

In order to evaluate the impact on the damaged locations and determine the type of repair needed, structural design documents, drawings and design calculations were reviewed.

The structural elements were visually inspected for signs of damage or displacement. The elements examined included concrete slabs, walls, beams, columns, concrete foundations/pedestals, masonry walls, structural steel beams, columns, bracing and stair stringers, doors and frames, penetrations, anchor bolts, and isolation joints.

Walkdown teams used checklists and prepared summaries of each area inspected. These summary reports included a brief evaluation of findings. The important findings have been extracted and are discussed in the "Summary of Findings" section of this report. The detailed walkdown checklists are included as attachment to this final structural walkdown report.

Structural walkdown teams interacted with the System Walkdown teams by exchanging information and findings concerning system supports and foundation damage. In addition, specific Plant Safety personnel were supportive of walkdown efforts by notifying Structural team members of their findings and requesting evaluations. The "Summary of Findings" section of this report includes all of these findings.

All structural walkdown areas have been inspected. In addition, some critical areas which were normally inaccessible, were also inspected as the turbine and the generator components were removed. The reactor pedestal and drywell floor have also been inspected and no deterioration was noted during the inspection.

STRUCTURAL BACKGROUND INFORMATION

The turbines, turbine generator, and exciter are supported by the turbine pedestal (TP). The TP is a reinforced concrete structure measuring 214 ft.-2 in. long, 54 ft. wide and 94 ft.-6 in. high, above a bed rock supported foundation. The footings are 8 ft. thick and the pedestal walls are 8 ft.-8 in. thick. The TP is separated from the TB structure with a 1-in. wide isolation gap. Only the first floor TB slabs are directly connected to the TP structure. The TP design isolates the turbine vibrations from the rest of the TB structure. At lower elevations, the first floor slab connections to the TP are intended to improve the lateral stability of the pedestal. The isolation gap is filled with 1-in. thick Styrofoam.

The TP is designed to support not only the normal and operating loads of the turbines, generator and exciter, but also the short term abnormal loading. In the abnormal category of loading, three eighth-stage, LP turbine blades are assumed to be lost. The TP adequacy has been verified for loading of the LP turbine pedestal due to the three, eighth-stage, LP turbine blades loss. This loading condition is postulated to occur at any one of the six, eighth-stage blade locations (two eighth-stage blade locations per LP turbine), one location at a time. The turbine event resulted in a similar cyclic loading condition considered in the design of the turbine pedestal and its anchorages. Generator short circuit loading is another loading condition evaluated in the TP structural design calculations.

The TB structure is separated from the safety-related Auxiliary Building with a 4-in. wide seismic gap. The TB basement is also on rock foundation. The first floor structural slab is connected to the TP. The finished grade (583'-6") of the TB first floor is not the structural slab, but a 9-in. thick concrete slab over compacted sand which, in turn, is placed over the structural slab. These design details are shown on TB first floor structural drawings. The 9-in. slab and the sand layer distribute the concentrated loads over a larger area of the structural slab below. The knowledge of this detail is important in order to evaluate the floor cracks on the TB first floor.

The TB and RWB basement walls and floors are below the normal ground water elevations. In the past, a ground water survey study was conducted and leaking areas were mapped. As a result of this study, pressure grouting of the leaking walls and floors was performed. The repaired cracks can be identified from their appearance which verifies their continued water tightness.

The RWB houses various tanks associated with the radwaste system. The typical tank foundation is a concrete pedestal with a horizontal, flat surface. The tanks are mounted over the foundation and the space between the flat tank base and the foundation is pressure grouted. Some of the tanks are anchored while others are not anchored. As a result of the RWB basement flooding, some of the unanchored tanks in the basement were lifted off their foundations.

The RAB is safety-related structure and is separated from the non-safety-related TB structure with a seismic gap. The RAB structure is also designed to have adequate missile barrier thicknesses for potential turbine missiles. The design basis turbine missile is a 120 degree

segment of the eighth-stage, low pressure turbine wheel weighing 8650 lb. Four possible missile trajectories were considered in Fermi 2 UFSAR in Sections 3.5.2.1 and 10.2.3. The missile barriers are designed to stop the design basis missile for each trajectory considered.

There are two active and three passive triaxial seismic monitors mounted in the RAB at various locations between the subbasement and the fifth floor. A description and evaluation of the seismic instrumentation data is included in Hopper & Associates Report # HA-08/94-841 (Edison File No. T1-3696).

Based on the conclusion of Hopper & Associates Report, the turbine event did not compromise the structural integrity of the RAB or the equipment therein, there will be no further walkdowns in these buildings. Walkdown of the RHR Building was not required because of its distance from the TB and the fact that there was no structural damage to the RAB which is between the TB and RHR Building.

CONCLUSIONS

The structural items which were inspected in the various buildings, as described above, were not structurally compromised (i.e., they maintained their structural integrity) as a result of the turbine event. Observed indications in the structural items tend to be either superficial and cosmetic in nature, or were local damage. These items will be repaired or accepted as-is on a case-by-case basis as described in the "Summary of Findings".

Per Hopper & Associates Report # HA-08/94-841, the excitation of the seismic monitors was the result of a shock incident, not a tectonic earthquake. A shock impulse imparts short duration, high amplitude, and low energy into a structure and does not result in significant structural stresses. The structural integrity of the Reactor/Auxiliary Building and the equipment therein was not compromised.

SUMMARY OF FINDINGS

Findings Resulting from the Turbine Event

The following generic items were repeatedly observed at various places in the inspected buildings.

1. Cracks on the concrete floor slabs and walls

As a result of the leaking water and oil in the TB and RWB, the previously repaired and painted cracks were exposed. Paint and some filler material were removed due to the impact of the running water. In most places, the removed paint is wider than the actual crack width, thus giving the appearance of a larger deterioration. All of the cracks observed, with the exception of one location, were cosmetic in nature. At the southeast corner of the turbine pedestal, on the second floor level, the concrete slab has numerous cracks. These cracks are evaluated differently from the others for the following reasons:

-Most of the cracks start in the slab next to the southeast corner of the pedestal wall. It seems that the 1-in. isolation gap between the pedestal and the concrete slab at this location has not been maintained. In the vertical direction, the gap is almost non-existent. This condition probably existed from the construction time period. Viewed from below the slab, the isolation gap filler material, 1-in. thick Styrofoam, is in place and intact.

-Most of the cracks are only at the top of the slab. Only three cracks were observed from under the slab. Almost all cracks run in east-west or southeast-northwest direction.

-Even though there are indications that these cracks may have existed before the event, it seems that they have been reactivated either due to the impact of water or due to the pedestal vibrations because of the imperfect isolation between the two structures at this location.

-The slab in question is a 12-in. thick, two-way slab with reinforcement (#7, #8 and #9 bars) in both top and bottom. This slab is supported by 36 in. x 48 in. beams which do not have any indications of cracks. This slab is the only 12-in. slab in the area. All others at the east and west sides of this slab are 18 inches thick.

All cracks should be repaired by the painters prior to painting, with the exception of the cracks on the slab near the southeast corner of the pedestal. These cracks should be repaired by structural grouting methods, such as pressure grouting methods used to prevent ground water seepage in the plant. In addition, the isolation gap in this area needs to be reworked in such a way that the 1-in. separation is maintained, as designed.

2. Isolation gap deterioration, filler material damaged or missing

During the walkdowns, it was observed that most of the third floor level isolation gap filler material, Styrofoam, was either missing, dislocated or deteriorated. The same conditions were observed on the second floor at the south end, especially at the gap in the vicinity of the generator and the exciter. This filler material should be replaced. However, a better material (such as Will-Seal) may be recommended which could be installed without disturbing the dislocated Styrofoam and, in addition, could provide a more durable and watertight seal.

3. Paint and surface filler damage

This item does not have any structural significance. The paint in areas subjected to water and oil damage has lifted, exposing the concrete. There are numerous cracks on the first, second, and third floors of the TB. These cracks had been previously repaired, but due to weak bonding material, they have opened again. The first floor TB slabs are not structural slabs, as described above. There are varying thicknesses of compacted sand between the structural slabs and the top 9-in. thick slabs. All first floor slab cracks may be dismissed as non-structural and insignificant. For this reason, all paint and filler damaged areas should be repaired.

4. Construction joint filler material damage

The construction joints were formed with a typical detail, including a filler material at the top level. The first floor TB east passageway was observed to be without this filler material in some areas. This was caused by the impact of running water over the area. Even though this is a cosmetic item, it should be repaired to its original condition.

5. Missile damage

The No. 3 low pressure turbine (LP 3) blade loss has resulted in missiles impacting various TB structures. In this section, only missile damage to structures will be described and evaluated.

-LP 3, eighth-stage blade tore the turbine casing and hit a pipe support vertical member and the west reheater roof. There is also damage to the grating at the platform nearby. The details are described in the walkdown data sheets. This missile seems to be the most significant one exiting the turbine outer casing compared to the other missiles generated during the event. The blade missile mass and its trajectory have been compared to the design basis missile as described in UFSAR Sections 3.5.2.1 and 10.2.3. The missile weight in this event was less than 150 lb., much smaller than the missile weight of 8650 lb. considered in the design of missile barriers. The trajectory of the missile was close to trajectory #1 of the UFSAR evaluation in elevation, but it did not travel far enough to hit the missile barrier since it was stopped by the west reheater concrete roof. In addition, even without considering any missile barriers in place,

the actual trajectory of this missile was such that it would not have hit the safety-related RAB. Instead it would have passed south of these buildings traveling almost in an east-to-west direction.

Considering the thickness of the impacted roof slab (3'-6"), the relatively small depth of the damage (1/2" per the walkdown report), and the fact that there is no observed reinforcement bar damage, it is concluded that the overall integrity of the slab is intact. The concrete should be repaired and the damaged platform components replaced.

-Turbine missile damage , internal to the turbine casing and condenser shell. The missile blades have caused damage to the LP3 turbine lower casing, on the north side. These blades have gouged, dented or tore the turbine lower casing. The missile blades, after hitting the turbine components, along their trajectory down, have also damaged the condenser structural components and ended up in the condenser tubing. An important structural observation was that, the only missile damage observed was caused by direct missile hits both in the turbine and in the condenser. These were located in the northern half of LP3 and below. All of these significant hit locations are being addressed per the TSR-26566 and TSR-26567. No other structural missile damage was found in any other areas. The missile damage areas are found to be localized at the hit vicinity, without significant impact to the overall strucural integrity of the components and the structure itself.

-The third floor TB slabs in the vicinity of the exciter have a number of gouges (up to about 1/4 in. deep) which resulted from projected and/or falling missiles. The concrete should be repaired.

-TB overhead crane east runway girder was hit by a suspected exciter missile and the 1-in. thick web plate of the girder was deformed. A close inspection of the damaged area was performed. No overall girder movement was identified. It was concluded that the impact was absorbed by the local plastic deformation of the web material. A design calculation, DC-5882 Volume I, has been issued evaluating the present condition of the girder. This calculation concluded that the overall girder strength was still adequate to support the design loading. However, additional safety measures were taken to inspect the alignment of the rails and a thorough maintenance inspection of the crane components was performed.

-The 18-gauge thick metal roof deck plate of the TB was perforated by a small missile which was probably an exciter component. The size of this perforation is about 1/2 in. x 1 in. The search for this missile on the turbine roof and on the ground west of the TB was unsuccessful. The hole in the roof has been repaired. There were two other minor hit marks on the roof decking; however, no perforation was observed at these locations.

-The 18-gauge insulated siding of the TB was examined. There were no observed perforations or gouges in the siding.

The following specific items were observed in the inspected buildings.

1. Radwaste tanks lifted off their foundations

The flooding of the RWB basement, up to 5'-6" from the floor level, resulted in three tanks floating. The tanks are identified as Waste Sample Tanks with PIS Nos. G1101A004A (Tank A) and G1101A009 (Tank C) and the Evaporator Feed Surge Tank with PIS No. G1101A030. These tanks were not anchored; instead, their flat bases were supported by grouted, flat, concrete foundations. Since these tanks did not contain liquid to the flood level, buoyancy forces overcame the weight forces and lifted the tanks off their bases. The evaluation and restoration of these tanks and the associated piping has been completed.

2. Exciter and generator foundation damage

The exciter was displaced with accompanying disturbance of its foundation, anchors and stool pieces between the exciter and the concrete foundation. The exciter has been removed from its TP location. Structural repairs shall be performed in the exciter foundation area. The new exciter will be located in the lower floor , so no new anchorage preparation is required in the damaged area. The damage is local to the exciter anchor area and the overall pedestal slab is still structurally adequate.

The brushgear, located north of the exciter, has no anchorage or foundation damage. The connection between the brushgear and the exciter may have been disengaged so that exciter forces were not transferred back to the brushgear.

The generator foundation and its anchorage are in good condition. The generator has been removed and the whole supporting concrete structure including its anchorages were inspected and found in good condition.

3. Turbine pedestal and bearing beam inspection

The turbine is supported along the east and west sides by the reinforced concrete pedestal. This pedestal is isolated from the turbine building structure, from third floor down to the first floor level. The inspection of the turbine pedestal did not indicate any structural damage. The isolation gap around the pedestal was intact. No anchorage or grout deterioration was observed. The turbine pedestal cross beams, located under the bearing beams, were also inspected on both north and south sides of the LP3, after the expansion joint was partially removed. The pedestal wall and beam surfaces were found in good condition. The keys under the bearing beams , on the north and south sides of LP3, were also visually inspected with no observation of damage.

The bearing beams for LP turbine were also inspected. The bearing beams are box beams made of steel plates, spanning approximately 35 ft., with a width of over 8 ft. and a height of over 15 ft. The bearing beam side plates have vertical stiffener sections. The bearing beams transfer the bearing forces to the turbine pedestal. Although the main structural components of the beams (the top, side and bottom plates of the box sections) were undamaged, there were weld and base metal cracks noted on all bearing beams #2, # 3, # 4 and mainly #5. These cracks are documented in Sargent & Lundy Report SLAM-029 (Edison File No. T1-3686). The locations of these cracks are identical at each beam, between vertical stiffener members which have sudden cross sectional transitions. These cracks were likely to have been caused by the turbine accident. The worst tear locations are on the south of LP3 (Bearing beam #5). The structural details at these locations are now being modified to reduce the stress concentations which may have contributed to the tears. New welds are made and bearing beams are repaired per TSR-26565.

There was no indication of any plastic deformation of these beams as the gap between the bottom of the bearing beam and the top of the concrete cross beams was not changed. (The alignment key at the midspan of the beam at this location has a 3/8 in. vertical gap which was found unaffected from the event.) In addition, the "dogbone" (expansion joint between the turbine and the condenser) did not have any tears due to the differential movement of the bearing beam (turbine) and the condenser.

As a result of the described findings, it is concluded that the overall structural integrity of the bearing beams was not compromised. After the local stiffener repairs, they will be restored and able to perform better under vibratory loading.

4. Stator cooling lines support damage

Two stator cooling line supports were found damaged. The system walkdown team also observed the same failures. These supports will be repaired.

5. Main condenser tubing and shell damage

The main condenser shell and its foundation and tubing were inspected. Except for missile damage caused by LP3 turbine blades, no other structural damage was observed. It must be noted that the inspection inside the condenser specifically concentrated under LP3. All missile damaged areas were mapped and are being repaired as dispositioned in TSR-26567. As detailed in the previous missile damage section, the overall structural integrity of the condenser remains intact. The local damage due to direct missile hits is being repaired.

Findings not directly related to the turbine event

During the extensive walkdowns conducted, the following damage was observed. These are not related to the turbine event; however, they are being addressed and repaired.

1. Reactor feed pump suction line strainer footing grout damage

2. Recombiner rooms equipment footing grout damage

3. Condensate filter demineralizer D influent line piping support damage

4. Chemistry lab door misalignment

5. Off-gas condensate drains from the east and west condensers loose anchorage

6. Miscellaneous cosmetic floor and wall cracks - to be repaired as the areas are being painted

ATTACHMENT # 1

STRUCTURAL SUPPORT ACTION PLAN

FERMI 2

STRUCTURAL SUPPORT
ACTION PLAN

MARCH 31, 1994
REV. 2

TEAM MANAGER Abdul Alchalabi 3/31/1994
ABDUL ALCHALABI DATE

APPROVAL Robert McKeon 4/3/94
ROBERT MCKEON DATE

STRUCTURAL INSPECTION ACTION PLAN

Mission Statement:

Walkdown and visually inspect plant structures, supports and components for structural damage. Evaluate potential impact of "Seismic Alarm."

Team Manager: Abdul Alchalabi

Team Members:

G. Abdallah
R. Bryer
R. Buck
A. Burg
H. Sahiner

A. Walkdown/Inspection of Structures

A1. Turbine Pedestal Structure

The turbine and its associated equipment (exciter brush gears, generator, etc.) are independently supported by their own pedestal. Third floor slab is supported independently of the Turbine Pedestal by its own structural framing.

The inspection plan will include all of the structural elements associated with Turbine Pedestal and associated equipment.

- Visual inspection of turbine generator and exciter connections to the concrete structure. The initial local damage assessment must be performed prior to the disturbance of connections and debris.
- Visually inspect concrete pedestal all around interior and exterior (where possible) from basement (El. 564') to third floor (El. 643'-6").
- Visually inspect steel wall and its concrete support on south and turbine shield wall on north side.
- Visually inspect isolation joints and concrete on both sides of joints of third floor.
- Inspection will also include areas under checker plates.

A2. Turbine Building Structure

Perform an overall walkdown of Turbine Building structure including:

- Foundation slabs, floor slabs, walls, columns, beams, siding, roof, and structure.
- Inspect structure for possible turbine missile damage.
- Inspect turbine slab near the isolation gap.
- Inspect flooded area for water damage.
- Inspect equipment foundation for grout/anchorage damage.
- Inspect Turbine Building overhead cranes support structures.
- Inspect stairway, platforms, specifically at concrete attachment locations.
- Inspect condenser structure, its foundation, shell, stiffeners.

A3. Reactor/Auxiliary Building Structure

- Inspect QA1 equipment anchorage. Extent of the walkdown will be determined based on seismic data evaluation by the Consultant.
- Performed a walkdown in Reactor/Auxiliary Building specifically in areas adjacent to Turbine Building on 12/29/93 and found no signs of damage or displacement.
- Accessible areas were selected for a walkdown as representative of the Reactor/Auxiliary Building structure. The walkdown was completed on 1/24/94. No evidence of structure damage or distress were found.
- Perform visual inspection of drywell concrete floor slab and Reactor pedestal.
- The need for further walkdown will be determined based on seismic data evaluation by Consultant.

A4. Radwaste Structure

Perform an overall walkdown of Radwaste Building structure including:

- Foundation slabs, floor slabs, walls, columns, beams and other related structures.
- Inspect flooded area for water damage.
- Inspect equipment foundation for grout/anchorage damage.
- Inspect stairway, platforms, hoists, specifically at concrete attachment locations and others.
- Inspect tanks located in the basement for structural integrity
- Coordinate with Radwaste Recovery Team for inspection of all flooded area.

A5. RHR

Due to distance from the Turbine Building, RHR is excluded from the walkdown. It will be reviewed later based on seismic data interpretation.

A6. Inspection of the Turbine Support Steel Structures

The LP and HP Turbine Support steel structures will be inspected including:

- o Bearing support beams and bearing boats.
- o LP Frame body support beams.
- o Turbine support feet over the concrete pedestal wall.
- o Turbine alignment keys.

The above listed structures will be visually inspected for:

- o Welded connections integrity per inspection criteria.
- o Bolted connections for loose or broken bolts, enlarged bolt holes, etc.
- o Steel plates, shapes for permanent deformations, cracks and tears.
- o Other unusual or unexpected conditions.

(SEE SKETCH NEXT PAGE)

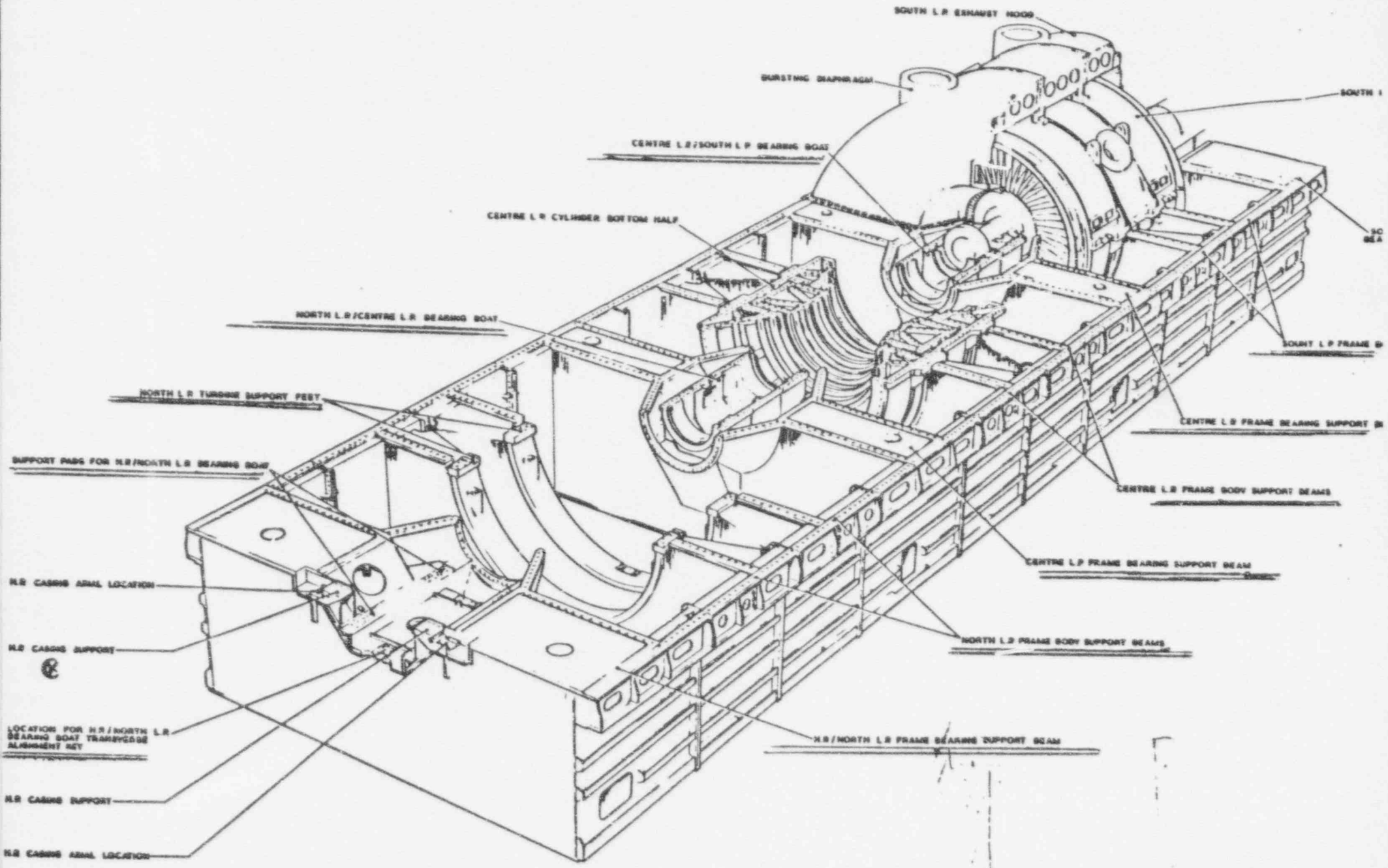
B. System Supports and Components Inspection/ Evaluation

System Engineering will perform system walkdowns. The structural team will inspect and evaluate the system support findings.

C. Evaluation of Potential Impact of Seismic Alarm

Detailed data evaluation documentation activities are underway and a formal assessment report is now being prepared by the consultant with a currently scheduled February 4, 1994 completion date.

D. Prepare a final walkdown report documenting the walkdown/evaluation results upon completion.



Items to be installed are underlined

FIG.2 L.P TURBINE

B. System Supports and Components Inspection/ Evaluation

System Engineering will perform system walkdowns. The structural team will inspect and evaluate the system support findings.

C. Evaluation of Potential Impact of Seismic Alarm

Detailed data evaluation documentation activities are underway and a formal assessment report is now being prepared by the consultant with a currently scheduled February 4, 1994 completion date.

D. Prepare a final walkdown report documenting the walkdown/evaluation results upon completion.

4

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines:_____
Elevation:_____
Elements examined:
Concrete slab:_____
Concrete walls:_____
Concrete beam:_____
Concrete column:_____
Concrete pedestal:_____
Masonry wall:_____
Structural steel : Beams, Columns, Bracing, Stair stringers:_____
Doors:_____
Penetrations:_____
Anchor Bolts:_____
Drawing reference:_____
Comments:_____

Name:_____ Date:_____
Name:_____ Date:_____

RAB: 1/14/94
file: P/CHKLIST

ATTACHMENT # 2
RECOVERY PLAN
ACTION ITEMS

- Work Requests and TSRs listed in this section will be tracked as part of the overall Recovery Plan.

Structural Support

Team Manager: A. Alchalabi

ACTION	RESPONSIBLE WORK GROUP	DATE WALKDOWN COMPLETED	COMMENTS
1. Prepare a final walkdown report documenting the walkdown/evaluation results upon completion.	Mech/Civil Final report issued 8/8/94 - TMPE-94-0486		

Turbine Pedestal Structure

2. Visual inspection of turbine generator and exciter connections to the concrete structure.		Feb. 11, 1994 June 30, 1994	Exciter connection complete. Turbine & Generator connections complete.
3. Visually inspect concrete pedestal all around interior and exterior from basement (El. 564'-0") to third floor (El. 643'-6")		Feb. 11 1994 March 23, 1994, June 30, 1994	All of accessible areas were inspected. Additional areas adjacent to bearing support beams were inspected.
4. Visually inspect steel wall and its concrete support on south side of turbine and shield wall on north side.		Jan. 28, 1994	No damage.
5. Visually inspect isolation joints and concrete on both sides of joints of third floor.	Maintenance WR #000Z940534	Jan. 25, 1994	Joint filler missing.
6. Inspection will include all areas under the checker plates.	WR #000Z944112	Feb. 11, 1994 June 30, 1994	Inspection of all areas under checker plates has been completed. Exciter, generator and turbine included. Concrete damage found only around exciter, under checker plates.

Turbine Building Structure

7. Inspect slabs, floor slabs, columns, beams, siding, roof and structure.		Jan. 18, 19, 20, 24, 28, 31, 1994 March 22, 30, 1994	No damage to structural steel or concrete. Missile damage on roof west of exciter. Repair completed.
8. Inspect structure for possible missile damage.	Maintenance WR #000Z940533 WR #000Z944090	Jan. 5, 7, 28, 1994	Grating damage above west MSR. Superficial concrete damage repair .
9. Inspect turbine slab near the isolation gap.	Maintenance WR #000Z940564 & 000Z944099	Jan. 5, 28, 1994	Repair crack on 2nd floor turbine slab, near SE corner of pedestal.
10. Inspect flooded area for water damage	Mods. WR #'s Basement 000Z941451 1st floor 000Z941452 2nd floor 000Z934493 3rd floor 000Z934494	Jan. 18, 19, 20, 24, 28, 31, 1994 March 22, 30, 1994	Basement, 1st, 2nd, and 3rd floors need painting due to water damage.
11. Inspect equipment foundation for grout/anchorage damage.		Jan. 18, 19, 20, 24, 28, 31, 1994 March 22, 30, 1994	No damage.
12. Inspect Turbine Building overhead crane support structures.		Jan. 7, 1994	Local damage on east crane girder due to missile. Analyzed per DC 5882. No repair.
13. Inspect stairway, platforms, specifically at concrete attachment locations.		Jan. 18, 19, 20, 24, 28, 31, 1994 March 22, 30, 1994	No damage.
14. Inspect condenser structure, its foundation, shell, stiffeners.	Condenser Group TSR 26567	Jan. 4, 12, 20, 1994 May 17, 1994	No damage to foundation. Missile damage under LP3 turbine area.

Reactor/Auxiliary Building Structure

15. Inspect QA1 equipment anchorage. Extent of the walkdown will be determined based on seismic data evaluation by the consultant.		Feb. 4, 1994	Based on the consultant's evaluation (report #HA-08/94-841) no further walkdown is required other than what is listed in item 16 below.
16. Perform a walkdown in Reactor/Auxiliary Building specifically in areas adjacent to Turbine Building.		Jan. 19, 1994	Inspected HPCI, CRD pump Rm, SE quad. and east half of Rx./Aux. building from El. 540'-0" to El. 659'-6". No anchorage or structural damage.
17. Perform visual inspection of drywell concrete floor slab and Reactor pedestal.		June 30, 1994	No damage.

Radwaste Structure

18. Perform walkdown of slabs, floor slabs, walls, columns, beams and other related structures.		Jan. 24, Feb. 12, March 30, April 29, All in 1994	No damage.
19. Inspect flooded area for water damage.	Mods. WR #000Z934495	Feb. 12, March 30, All in 1994	Basement floor needs painting.
20. Inspect equipment foundation for grout/anchorage damage.		Jan. 24, Feb. 12, March 30, April 29, All in 1994	No damage.
21. Inspect stairway, platforms, hoists, specifically at concrete attachment locations and others.		Jan. 24, Feb. 12, March 30, April 29, All in 1994	No damage.
22. Inspect tanks located in the basement for structural integrity.		Jan. 24, Feb, 12, March 30, April 29, All in 1994	Structural integrity of tanks is maintained.
23. Coordinate with the Radwaste Recovery Team for inspection of all flooded areas.		April 29, 1994	Coordination complete.

Turbine Support Steel Structures

24. Inspect bearing support beams and bearing boats.	Turbine Group TSR 26565 TSR 26566	June 30, 1994	Cracks were found in bearing support beams. Missile damage on bearing support beam side plates near north side of LP3.
25. Inspect LP frame body support beams.		June 30, 1994	No damage.
26. Inspect turbine support feet over the concrete pedestal wall.		June 30, 1994	No damage.
27. Inspect turbine alignment keys.	Turbine Group WR #000Z944112	June 30, 1994	Generator key cosmetic grout repair.
28. Inspect welded connection integrity per inspection criteria.	Turbine Group & Condenser Group TSR's 26565, 26566, 26567	June 30, 1994	Various damage due to missile hit. Ref. Item #14, 24.
29. Inspect bolted connections for loose or broken bolts, enlarged bolt holes, etc.	Turbine Group & Condenser Group TSR's 26566, 26567	June 30, 1994	Some missile damage. Ref. Item #14, 24.
30. Inspect steel plates, shapes for permanent deformations, cracks and tears.	Turbine Group & Condenser Group TSR's 26565, 26566, 26567	June 30, 1994	Some damage due to missile hit. Ref. Item #12, 14, 24.

Evaluation of Potential Impact of Seismic Alarm

31. Issue final assessment report		August 8, 1994	The consultant's evaluation concluded that the turbine failure was a shock incident, resulting in dynamic response phenomena of two single cycle waves propagating through the building foundation without exciting the structure above. The report also concluded that the structural integrity of the Rx/Aux building was not compromised or the equipment therein. (Hopper & Associates report #HA-08/94-841) Edison File No. T1-3696.

ATTACHMENT # 3
WALKDOWN CHECKLISTS

- The item numbers referenced on walkdown checklist pages correspond to the item numbers in Attachment #2 -Recovery Plan Action Items.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 10, 11 & 13 NO WR REQ.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: O to Z BETWEEN J & P, ZZ9 BETWEEN M & P, 3 to 9 BETWEEN P & R & 0 to 1 BETWEEN P & S
Elevation: 563'-0" & 564'-0"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal:
Masonry wall: SHIELDING WALLS 29 & 43 & 43A
Structural steel : Beams, Columns, Bracing, (Stair stringers) T7, T17 & T16
Doors: TB-1, TB-6 TB-8 & TB-15
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 5A721-2210 & 7A721-2017A

Comments:
NO DAMAGE WAS NOTED TO ANY OF THE STRUCTURAL MEMBERS DUE TO THE TURBINE EVENT OF DEC. 25, 1993. NOTE: SOME MINOR GROUND WATER INFILTRATION BUT NOT A PROBLEM AT THIS TIME.

Name: R.Y. Buck RB Date: 30 MARCH 94
Name: [illegible] Date: 3/29/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 10, 11 & 13 NO. WR. Req.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: 1 to B and R6 to S
Elevation: 555'-0" & 552'-0" & 564'-0"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: TANK G1101A0 & ✓
Masonry wall: 236, 41A, & 45 ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: STAIRS T3 & T-2 & T1-13 ✓
Doors: TB-2 ✓
Penetrations:
Anchor Bolts: FOR TANKS & PUMPS & STAIRS. ✓
Drawing reference: 7A721-2015A

Comments:
NO STRUCTURAL DAMAGE ~~DE~~ DUE TO THE TURBINE EVENT OF DEC. 25, 1993 WAS OBSERVED.
NOTE: SOME GROUND WATER WAS OBSERVED ON EAST WALL (COL. ROW 5) BETWEEN COLUMN ROWS 4 & 6.

Name: R. V. Buck RVB Date: 22 MARCH 94
Name: Abdul Vibhalab Date: 3/22/94

RAB: 1/14/94
file: P/CHKLIST .

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 10, 11, & 13 NO WR Req.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: S TO YE & 12 TO 14 ; S5 R & 10 TO 14 AND R TO 9'-0" WEST OF R & 12 TO 14.
Elevation: 564'-0"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal:
Masonry wall: 287 & 282 ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: STAIR T1 ✓
Doors: TB-4 ✓
Penetrations:
Anchor Bolts: FOR TANKS & PUMPS
Drawing reference: 7A721-2015A & 6A721-2140

Comments:
NO STRUCTURAL DAMAGE TO THIS AREA DUE TO THE TURBINE EVENT OF DEC. 25, 1993.
NOTE: A VERY SMALL AMOUNT OF GROUND WATER WAS EVIDENT ON THE FLOOR SLAB AT COLUMN LINES T & U BETWEEN COLUMNS 12 & 14.

Name: R.Y. BUCK RYB Date: 22 MARCH 94
Name: Abdul Kherbat Date: 3/22/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 10, 11 & 13 NO WR. Req.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: North of Col line (12). West half of P-R/9 thru P-R/12
Elevation: 564'-0"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: No Pedestals in this area
Masonry wall: No masonry walls in this area.
Structural steel : Beams, Columns, Bracing, Stair stringers: ✓ Pipe support in Bsmt.
Doors: ✓ RB-1 watertight door for D/S - Drain line
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 5A721-2210, 7AT21-2030 AND 7AT21-2015A

Comments: Contaminated area East of N-12/N-14 was not inspected (sumps) No ground water infiltration through the floor or the walls. Some older cracks on the floor slabs No new cracks observed. In addition the seismic gap cover plates near col. lines: 12-13 / H-J were inspected. No indication of relative displacement.

Name: H. Sahiner
Date: 1/18/94
Name: R. K. Buck
Date: 18 JAN 94

RAB: 1/14/94
file: P/CHKLIST .

SUMMARY OF TURBINE HOUSE BASEMENT STRUCTURAL WALKDOWN

Only a small portion of the Turbine House basement was available for this walkdown on January 18, 1994. The structural items listed on the structural walkdown checklist for this date were examined. The areas observed were bounded by column lines 12 to 14 and P to J, Column line 14 to 12'-6" north of Column line 19 and J to L, Column line 19 to 12'-6" north of Column line 19 and L to V, and the west half of the area between Column lines P and R from Column line 14 to 9 (Ref. Dwg. A-2030 and 2015A). The remainder of the Turbine House basement area will be examined when it becomes accessible and the results compiled separately.

Results

1. Concrete slabs, walls beams and columns
   None of these structural concrete elements show signs of any distress or damage other than normal concrete shrinkage cracks. No ground water infiltration was observed which would indicate damage to exterior walls and floor slabs.

2. Structural Steel Members
   The structural steel members used in the stairs T2 and pipe supports for the liquid processing drain lines were examined for damage and distress. No damage was observed to any of these members nor were any structural bolts, concrete anchors or pipe clamps loose or missing.

3. Doors
   The watertight door RB-1, which separates the Turbine House from the Auxiliary Building, had no signs of damage nor was there any indications it could not function as it was designed. The cover plates, which cover the 4 inch seismic gap between the Turbine House and the Auxiliary Building, around the opening at door RB-1 were examined for signs of damage or displacement, neither of which were found.

4. Penetrations
   Wall and ceiling penetration seals were found to be intact and in good condition.

5. Anchor Bolts
   Wedge anchors and embedded anchors for electrical, mechanical and miscellaneous attachments showed no signs of failure, slippage or nut loosening.

Conclusion:

No structural damage to this area of the Turbine Hosue Basement was found due to the December 25, 1993, Turbine event.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 10, 11 & 13 NO WR. Req.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other Under main condenser
Area column lines: K-M/3-10
Elevation: 567'-6" - thru - 580'-0"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam:
Concrete column:
Concrete pedestal: ✓ Condenser footing
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations: ✓ circ. water pipes & (joints (flexible) betw. flanges
Anchor Bolts:
Drawing reference: 5A721-2210

Comments: Walkdown performed for the structural integrity inspection of the main condenser included the concrete pedestal and foundation slab and condenser footing. Walkdown report is attached.
No problems were found. Two small cracks were old and insignificant from structural point of view. (For details see report)

Name: H. Schiner Date: 1/20/94
Name: R.V. Buck Date: 20 JAN 94

RAB: 1/14/94
file: P/CHKLIST

TO: W. TERRASI

FROM: PHIL MCCOMISH
RON BUCK

DATE: JAN. 4, 1994

SUBJECT: STRUCTURAL INTEGRITY INSPECTION OF THE MAIN CONDENSER

AS YOU REQUESTED MR. BUCK AND I VISUALLY INSPECTED THE ACCESSIBLE PORTION OF THE MAIN CONDENSER TO VERIFY THAT IT WAS ACCEPTABLE TO PERFORM A MAIN CONDENSER FLOODUP.

STEAM SPACE MCCOMISH VISUALLY INSPECTED THE NORTH END FROM THE 20" MANWAY ON JAN. 3, 1994 NO DEBRIS OR DAMAGE EVIDENT. DUE TO TEMPERATURE/HUMIDITY CONDITIONS, VISIBILITY WAS LIMITED.

WE SAW ONE LARGE PIECE OF DEBRIS ON THE SOUTHWEST TUBE BUNDLE. THERE WAS ALSO POSSIBLE TUBE DAMAGE ON ONE TUBE ON THE EAST SIDE OF THE SOUTHEAST BUNDLE.

WATERBOXES MODIFICATIONS IS ALMOST COMPLETED PLANKING AND BUILDING DAMS IN TO CATCH ANY LEAKAGE. THERE ARE RUST STAINS ON THE LOWER EAST SIDE TUBES OF THE SOUTHEAST BUNDLE AND ONE STAIN COMING FROM THE APPROXIMATE LOCATION OF THE DAMAGE MENTIONED IN THE PARAGRAPH ABOVE. WE WILL CATCH THE LEAKAGE, AND SEE IF IT CONTINUES. IF IT DOES, AN ATTEMPT WILL BE MADE TO PLUG THESE TUBES BEFORE THE FLOOD UP.

BASEMENT VISUALLY INSPECTED THE BOTTOM, SIDES, FOUNDATION CIRC. WATER EXPANSION JOINTS, AND STRUCTURAL SUPPORT FOR THE MAIN CONDENSER. TWO SMALL CRACKS WERE FOUND ON THE EDGE OF ONE CONCRETE PIER ON THE EAST SIDE. THESE WERE OLD, AND HAD BEEN SEEN BY MCCOMISH BEFORE.

FIRST FLOOR STEAM TUNNEL VISUALLY INSPECTED INLET WATER BOXES, AND PIPING GOING IN TO THE MAIN CONDENSER. ONLY VERY LIMITED ACCESS IS AVAILABLE. NO DAMAGE NOTED. DID NOTE SOME MOVEMENT ON MAIN STEAM BYPASS LINES, BUT THIS IS EXPECTED.

SECOND FLOOR STEAM TUNNEL VISUALLY INSPECTED THE MAIN CONDENSER EXPANSION JOINTS FROM THE TOP OF THE FEEDWATER HEATER ON THE EAST SIDE, AND FROM THE FLOOR ON THE WEST SIDE. (NOTE IT IS ALMOST IMPOSSIBLE TO INSPECT THE NORTH AND SOUTH ENDS OF EACH DOGBONE, THIS WILL HAVE TO BE EVALUATED FURTHER). NO EXCESSIVE MOVEMENT, RIPPING, OR OVERHEATING WAS NOTED. PIPING, WALLS, AND PENETRATIONS WERE NORMAL.

AS EXPECTED THERE WAS A GOOD DEAL OF INSULATION DEBRIS, AND SOME DAMAGED AND/OR MISSING INSULATION WHICH SHOULD BE FIXED.

BOTTOM LINE IS THAT NO PROBLEMS WERE FOUND WITH CONDENSER STRUCTURAL INTEGRITY.

CC W. MILLER
J. WALKER
D. PETTINARI
K. HOWARD
L. FRON
J. NOLLOTH
J. ODONNELL
G. CARTER
P. FALLON
R. DELONG
E. KOKOSKY

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 7, 10, 11 & 13
WR. 000294 1452

Building: AB RB TWB (TB)
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other
Area column lines: All floor except oil tank rooms (5-8/J-K) and
Elevation: 583'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: ✓
Masonry wall: ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: ✓
Doors: ✓
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 5A721-2211

Comments: The walkdown of 1st FL. T.B. was completed on Jan. 19, 94. No structural damage due to turbine event. Various small floor cracks, paint damage on floor construction joints, filler material absent from some joints. Details listed on the following sheets.

Name: H. Sahiner Date: 1/19/94
Name: R.Y. Buck Date: 19 JAN 94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF TURBINE BLDG. FIRST FLOOR STRUCTURAL WALKDOWN

1. Oil Analysis Lab Door (T1-33) - NW corner of TB1. This door does not close properly. Mortar cracked locally on the south of the lintel location. However, this is not related to the turbine event. Probably the reason is the initial door jam installation. Top south corner of jam rubbing against the door. This is an item that needs to be fixed. No structural connection established between the door and the event.

2. Floor cracks - There are numerous cracks, which existed previously, have the paint cracked or removed due to water running over the slab during turbine event. Most of these cracks are randomly located. Some patterns were observed. These were mainly on the corners of pedestals bases of equipment foundations. However, the main floor slab drawings 6C721-2030 identifies that, unless noted otherwise, all slabs are 9" thick, installed with minimum reinforcement to prevent shrinkage cracks. There is a varying thickness of sand (or Kcrete) layer between the 9" thick slab and the main slab structure (4 ft. - 6 ft. thick) which is the essential component at elevation 580'-0". The cracks that we observed on 583'-6" elevation are on the 9" slab, not the main slab. These are mainly hairline type, shrinkage cracks or caused by their vibration through machine foundations (such as SJAE or compressors at the north end). The main load supporting slabs can be inspected only from the basement level looking up. No cracks were noted on these slabs during basement floor inspection.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 7, 10, 11 & 13
WR 000E 941952

Building: AB RB RWB (TB)
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other
Area column lines: 10 & 11 BETWEEN M & 20' EAST OF N
Elevation: 583'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal:
Masonry wall: SHIELDING WALLS 78, 78A, 79, 79A, 80, 80A, 81 & 81A
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors: T1-27 & T1-28
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 5A721-2211 & 7A721-2015

Comments:
THIS AREA HAS NO DAMAGE OR DISTRESS TO STRUCTURAL MEMBERS DUE TO THE TURBINE EVENT OF DEC. 25, 1993.

Name: R.Y. Byck RB Date: 30 MARCH 94
Name: Abdul Abdulab Date: 3/30/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 10, 11 & 13 NO WR Req.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other – OIL STORAGE AREA
Area column lines: S to B & J to K
Elevation: 580'-0"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: OIL TANKS & MOTOR & PUMPS
Masonry wall: 239 & 241 ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: GRATING & HANDRAIL ✓
Doors: T1-3 & T1-22 ✓
Penetrations:
Anchor Bolts: PUMPS & TANKS & GRATING SUPPORTS ✓
Drawing reference: 6A7A721-2015

Comments:
NO STRUCTURAL DAMAGE TO THIS AREA OF THE TURBINE HOUSE 1ST FLOOR WAS FOUND DUE TO THE DECEMBER 25, 1993 TURBINE EVENT.

Name: R.Y. BUCK RY Buck Date: 22 MARCH 94
Name: Abdul Alkalah Date: 3/22/94

RAB: 1/14/94
file: P/CHKLIST .

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 8, 10, 11, #13
WR 00002934493

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st (2nd) 3rd 4th 5th (Mezz.) Other
Area column lines: M-N & 3-11, J/K-N, 10-11 ; J-N, 11-12/13
Elevation: 613'-6" , 626'-6"
Elements examined:
- Concrete slab: ✓
- Concrete walls: ✓
- Concrete beam: ✓
- Concrete column: ✓
- Concrete pedestal: —
- Masonry wall: —
- Structural steel : Beams, Columns, Bracing, Stair stringers: ✓
- Doors: —
- Penetrations: ✓
- Anchor Bolts: ✓
- Drawing reference: A-2212, A-2004-2

Comments: See attached page.

Name: A.P. Burg A.P. Burg Date: 1-28-94
Name: G.I. ABDALLAH G Abdallah Date: 1-31-94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF BALANCE OF TURBINE BUILDING STRUCTURAL WALKDOWN

A structural walkdown of the remaining areas of the Turbine Building 2nd floor and mezzanine was performed on January 27, 28 1994. The structural items checked on the first page were examined. The areas examined include elevation 613'-6" from column lines M to N and 3 to 11, J-K to N, 10 to 11, and the 4' wide pipe space along the west side of the pedestal; and elevation 626'-6" from column lines J to N and 11 to 12-13.

Results

1. Walls - The walls have numerous hairline cracks as well as wider cracks, similar to other Turbine Building walls. There are vertical cracks along construction joints. The cracks are assumed to have been present prior to the turbine incident because they are painted over in some locations near the base of the wall, and there is evidence of minor chipping along the cracks' lengths. Hairline cracks are a common phenomenon in concrete structures due to shrinkage .

2. Slabs - The slabs have numerous hairline cracks as well as a few wider cracks. The wider cracks have been painted over in most cases but the paint has chipped out of the cracks. In some cases, evidence of paint remains in the depressed areas indicating that they are old cracks.

3. Grout pads - Equipment foundation grout pads have a few hairline cracks but are generally sound.

4. Anchor bolts - Wedge anchors and embedded anchors for equipment foundations, pipe support base plates, electrical boxes, and miscellaneous attachments were evaluated for loose nuts and evidence of failure. The anchors appeared sound without evidence of failure or slippage.

5. Penetrations - A cursory review of penetrations was performed. There were no indications of breaks in the penetration seals.

6. Steel ladder- The structural steel shows no evidence of misalignment or deformation. Bolted connections are acceptable. Wedge anchors are acceptable with no evidence of failure.

7. Columns - Columns were generally sound with few indications of hairline cracks.

In conclusion, the structural items which were examined do not appear to have been detrimentally affected by the turbine incident. The indications which were observed are assumed to have existed prior to the turbine incident.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM #1 NO WR Rqd.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd 3rd 4th 5th (2nd Fl. Mezz.) Other
Area column lines: J-K, 5 - 10
Elevation: 632'-3"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam:
Concrete column: ✓
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations:
Anchor Bolts: ✓
Drawing reference: C-2056, 7, 8

Comments: Concrete was in very good condition with a minimal number of surface cracks. Anchor bolts observed sound and their nuts were tight. There were no apparents indications resulting from the 12-25-93 Turbine incident.

Name: A.P. Burg A.P. Burg Date: 5-4-94
Name: G I Al Talbot Date: 5-4-94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. (Other) Turbine Pedestal Structure & Turbine Support Steel.
Area column lines: See Comments below. Item numbers correspond to Action numbers on report.
Elevation: _____
Elements examined: Item No. 2
Concrete slab: _____ 6
Concrete walls: _____ 26
Concrete beam: _____ 29
Concrete column: _____
Concrete pedestal: Around generator, main turbine
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: 2 - Generator, turbine connections to the concrete structure.
6 - Areas under checker plates - completed (around generator, turbine & exciter) And Item #26.
No damage to any items listed above. Except for exciter area which will be fixed with the new exciter EDP. In addition the minor dent due to the missile hit to the generator East checker plate angle embedment is insignificant. Concrete chip under angle frame is cosmetic. Turbine support foot over pedestal wall is OK.

Name: H. Sahiner Date: 5/17/94
Name: A. Alchalabi Date: abdul Alchalabi 5/17/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:

Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz (Other)
Area column lines: Condenser structure from dogbone to top of tubes level.
Elevation: Item #14
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: X
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: The condenser structural components inspection mainly under LP3. All damage was associated with the missile hits. The documentation and repair of this area is included in TSR-26567.

WR# 00Z942484

Name: H. Sabiner Date: 5/17/94
Name: R. Buck Date: 17 May 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:

Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. (Other)
Area column lines: Turbine LP3 areas, sides, body beams, down to dog bone level.
Elevation: 643' down to dog bone level (~628') Items: 24, 25, 27, 28, 29, 30
Elements examined:

- Concrete slab: _____
- Concrete walls: _____
- Concrete beam: _____
- Concrete column: _____
- Concrete pedestal: _____
- Masonry wall: _____
- Structural steel : Beams, Columns, Bracing, Stair stringers: Steel surfaces
- Doors: _____
- Penetrations: _____
- Anchor Bolts: _____
- Drawing reference: _____

Comments: Items 24, 25, 27, 28, 29, 30. Walkdown resulted in TSR-26566 which documents all the damage observations and the repairs required. WR# 00Z942484

Name: H. Sahiner Date: 5/17/94
Name: R. Buck Date: 17 MAY 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:

Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz (Other)
Area column lines: TURBINE BEARING BEAMS & BEARING BOATS
Elevation: Approx 628' → 643' Item No.'s - 24, 28, 30
Elements examined:

- Concrete slab: _____
- Concrete walls: _____
- Concrete beam: _____
- Concrete column: _____
- Concrete pedestal: _____
- Masonry wall: _____
- Structural steel : Beams, Columns, Bracing, Stair stringers: X
- Doors: _____
- Penetrations: _____
- Anchor Bolts: _____
- Drawing reference: _____

Comments: Item #24 - Structural steel, welds. Walkdown report and assesment is documented in Deco File No: T1-3686 (S&L Report). The repair will be per TSR - 26565.
This inspection covers items #28 & #30 for bearing beams.

WR# 00Z 942484

Name: H. Sahiner Date: 5/17/94
Name: R. Buck Date: 17 May 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:

Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other Turbine Support Steel Structure Items # 24 → 30
Area column lines: _____
Elevation: _____
Elements examined: W.R.# 000Z 942484 (TSR-26565)
Concrete slab: 000Z 944446 (TSR-26566)
Concrete walls: 000Z 942884
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: X
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: All bearing beams - cracks observed. TSR-26565 issued for repair, Ref. TI-3686 for walkdown findings. For LP3 structure, only missile damage observed. Walkdown report documented in TSR-26566. Turbine alignment keys on concrete beams are O.K. Detailed walkdown for LP3 turbine only. Overall structural integrity is not imparted. Missile damage will be repaired per TSR.

Name: H. Sahiner Date: 6/30/94
Name: R.V. Buck Date: 30-June 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Checklist # 2, 3, 6

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: Pedestal Elev. 643'-6" → 628'
Elevation:
Elements examined:
- Concrete slab: ✓
- Concrete walls: ✓
- Concrete beam: ✓
- Concrete column:
- Concrete pedestal: ✓
- Masonry wall:
- Structural steel : Beams, Columns, Bracing, Stair stringers:
- Doors:
- Penetrations:
- Anchor Bolts: ✓
- Drawing reference:

Comments: Turbine and generator connections to concrete, after generator is removed. Under the checker plates after checker plates are removed. Top surface of bearing beams #5 and #4, also pedestal wall joining the bearing beams (near bearing beam #5) were inspected. Except for superficial grout shrinkage cracks, no structural damage was observed on the reinforced concrete. Pedestal concrete structure is sound.

Name: H. Sahiner Date: 6/30/94
Name: R. V. Buckley Date: 30 June 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data: May 5 and 6 → walkdown dates

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. (Other) Condenser - Item # 14
Area column lines: Main Condenser - lower area over tube sheets and
Elevation: South Condenser hood, to the dogbone elevation.
Elements examined:

Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: Steel shell & stiffeners
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: Condenser steel shell structure, its stiffeners and bracing were found in good condition. However, under LP3, local damage from turbine missile impact was observed. TSR modification TSR-26567 was issued. Work Req # 942961 will repair these damaged areas. The overall structural integrity of the condenser steel structure was intact.

Name: H. Sabiner Date: 6/30/94
Name: K.V. Buck Date: 30-June 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM # 3
WR# 00029405 36

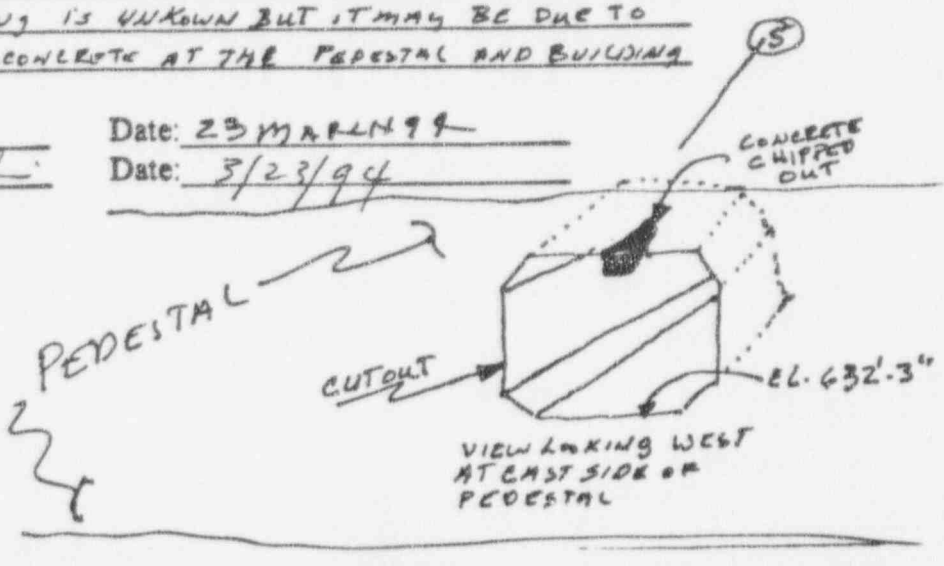
Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other – CUTOUTS IN PEDESTAL BELOW 3RD FLOOR ELEV.
Area column lines: ON 5 ROW 3' EAST OF K & WEST OF M
Elevation: TOP 635'-10" BOTTOM 632'-9" WEST SIDE ; TOP 637'-3" BOTTOM 632'-3" EAST SIDE
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: TURBINE PEDESTAL (EAST & WEST SIDE)
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: 6C721-2070 THRU 2072 & 7A721-2017-1

Comments: THE WEST SIDE CUTOUT IN THE TURBINE PEDESTAL HAS NO STRUCTURAL CONCRETE DAMAGE DUE TO THE TURBINE EVENT OF DEC. 25, 1995. THE EAST SIDE CUTOUT IN THE TURBINE PEDESTAL HAS COSMETIC CONCRETE DAMAGE IN THE NORTH OF THE CUTOUT. A PIECE OF CONCRETE APPROX. 8"x8"x3" DEEP HAS CHIPPED OUT (SEE SKETCH BELOW) THE CAUSE OF THIS CHIPPING IS UNKNOWN BUT IT MAY BE DUE TO OVER POURING OF ORIGINAL CONCRETE AT THE PEDESTAL AND BUILDING ISOLATION JOINT.

Name: R.V BUCK KB Date: 23 MARCH 94
Name: Abdel Abdelaziz Date: 3/23/94

RAB: 1/14/94
file: P/CHKLIST



STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. (Other) TURBINE PEDESTAL BELOW 3RD FL. ELEV. 637'-6"
Area column lines: K 5,6,8&9 AND M 5,6,8&9
Elevation: ⏚ 637'-6"
Elements examined:
Concrete slab: ITEM # 3 NO WR. Required
Concrete walls:
Concrete beam:
Concrete column:
Concrete pedestal: ✓ CUTOUT FOR LUBOIL LINES.
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations:
Anchor Bolts:
Drawing reference: 6C721-2079, 2080, 2071 & 2072, & T1-1026 & T1-054

Comments: The cutouts at K8&M8 were inaccessable for inspection, but due to their locations and the number of pipes going through them it is unlikly that there is any damage to them due to missile impact (structural superficial) Only the cutout at K5 had ~~any~~ damage to its concrete (see page 2 for details), the rest of the cutouts,which were inspected, showed no deteriation,damage or distress.

Name: B.Y. BUCK [signature] Date: 13 MAY 94
Name: [signature] Date: 5/13/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM # 3
WR# 000299a536

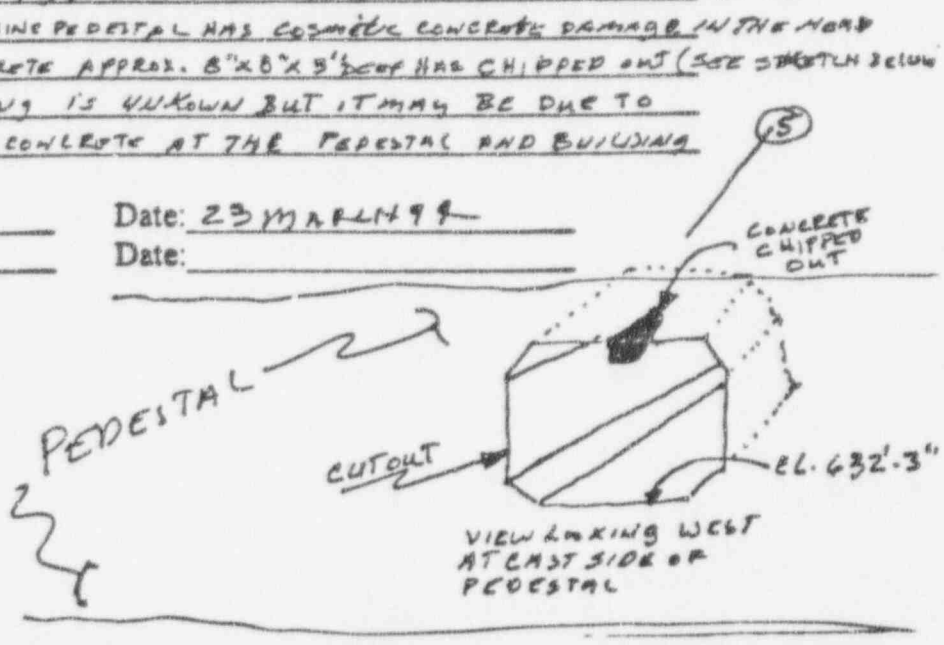
Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other – CUTOUTS IN PEDESTAL BELOW 3RD FLOOR ELEV.
Area column lines: ON SKEW 3'-0" EAST OF K & WEST OF M
Elevation: TOP 635'-10" BOTTOM 632'-9" WEST SIDE ; TOP 637'-3" BOTTOM 632'-3" EAST SIDE
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: TURBINE PEDESTAL (EAST & WEST SIDE)
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: 6C721-2070 THRU 2072 & 7A721-2017-1

Comments: THE WEST SIDE CUTOUT IN THE TURBINE PEDESTAL HAS NO STRUCTURAL CONCRETE DAMAGE DUE TO THE TURBINE EVENT OF DEC. 25, 1995. THE EAST SIDE CUTOUT IN THE TURBINE PEDESTAL HAS COSMETIC CONCRETE DAMAGE IN THE NORTH OF THE CUTOUT. A PIECE OF CONCRETE APPROX. 8"x8"x3" DEEP HAS CHIPPED OUT (SEE SKETCH BELOW) THE CAUSE OF THIS CHIPPING IS UNKNOWN BUT IT MAY BE DUE TO OVER POURING OF ORIGINAL CONCRETE AT THE PEDESTAL AND BUILDING ISOLATION JOINT.

Name: R.V BUCK KB Date: 23 MARCH 99
Name: _____ Date: _____

RAB: 1/14/94
file: P/CHKLIST .



STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM # 27
WR # 000E744112

Walkdown Data:

Turbine Pedestal & Turbine Support steel Structures.

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. (Other)
Area column lines: Generator alignment keys
Elevation: _____
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: The axial key on the north side is O.K. The key on the south side is mainly O.K. However, small surface grout on the top west side of embedded plate is missing. This will be repaired with W.R.

Name: H. Sahiner Date: 5/17/94.
Name: A. Alchalabi Date: 5/17/94

RAB: 1/14/94
file: P/CHKLIST .

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 3, 4, & 27 WR# 000994 4/12

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: L-3 & L-10, L-5
Elevation: 643'-6" — and above

Pedestal - Shield Walls north & south sides.
Generator north key
Generator south key
Under generator

Elements examined:

Concrete slab: Under the generator area, by climbing up from 2nd floor.
Concrete walls: Anchors and concrete surface were found in
Concrete beam: good condition.
Concrete column:
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations:
Anchor Bolts:
Drawing reference:

Comments: Shield walls on the south of the LP3 turbine and on the north of the HP turbine were inspected. No damage was noted. The south shield wall fixed section was inspected including the generator north key. No damage was found. Near generator south key, concrete surface damage, less than ½" deep, next to embedded plate of the key support. This concrete damage will be repaired by grouting.

Name: H. Sahiner Date: 1/28/94
Name: R. Y. Buck Date: 28 JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM #7
NO WR. REQ.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: J,K-5,10 AND M,N-5,10
Elevation: 675'-6" (LOW ROOFS OVER MSR'S)
Elements examined:
Concrete slab: ✓
Concrete walls:
Concrete beam:
Concrete column:
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations: ✓
Anchor Bolts:
Drawing reference: A-2016, A-2018-1, C-2090 TO C-2093

Comments: Concrete was in very good condition with a minimal number of surface cracks. A few surface cracks emanated from the corners of rectangular penetrations through the roof slabs. This condition is normal for concrete. There were no apparent indications resulting from the 12-25-93 turbine incident. Walkdown of the bottom of the roof was performed previously.

Name: A.P. Buro O.P. Buro Date: 5-4-94
Name: G I Chetal Ch ✓ Date: 5-4-94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 2 & 6 EDP-26367

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other THE TURBINE PEDESTAL IN THE AREA UNDER THE EXCITER, EXCITER HOLDDOWN BOLTS, STUDS, ETC.
Area column lines: L 3
Elevation: 643'-6"
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: FOR TURBINE UNDER EXCITER
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: PIPING AND CONCRETE BLOCKOUT
Anchor Bolts: HOLD DOWN BOLTS FOR THE EXCITER INTO TBN. PEDESTAL.
Drawing reference: A-2017-1, A-2213, C-2070, C-2076
Comments: SEE ATTACHED PAGE FOR DETAILS.

Name: R.V. BUCK RBuck Date: 11 Feb 94
Name: G I Abdellah Date: 12 FEB 94

RAB: 1/14/94
file: P/CHKLIST .

SUMMARY OF TURBINE PEDESTAL UNDER EXCITER STRUCTURAL WALKDOWN

The structural walkdown of the Turbine pedestal under the exciter was conducted on February 11, 1994. The items which were examined were the condition of the Turbine concrete pedestal at elevation 641'-5" (Ref. dwg. C-2076), the 4-12" dia., 1-6" dia. and 1-9" dia. piping penetrations and the 4'-0" x 1'-3" concrete blockout penetration, the east and west exciter stool holddown bolts and leveling grout and the metal supports for the checker plates surrounding the exciter.

RESULTS

1. Turbine Pedestal

   No damage was noted to the Turbine concrete pedestal itself except for minor concrete spalling at the 4'-0" x 1'-3" blockout. Some local concrete repair will be required for exciter bolt anchorage into the pedestal.

2. Penetrations

   The six pipes and their pipe sleeves are undamaged. The penetration seals at these six locations will require repair and/or replacement. The concrete blockout will require minor surface repair as noted in item 1 above.

3. Exciter holddown bolts and leveling grout

   The west exciter stool has loose holddown bolts, minor cracking in the grout between the stool and the pedestal and major cracks and spalling in the grout at the very north end of the stool. The east stool has all of its holddown bolts broken and all of the grout between the stool and pedestal has been broken and cracked. This east stool has moved from its original design location.

4. Metal supports for supporting checker plates

   Only one checkered plate embedded angle support has been damaged, which is located about midway of the exciter and on the east side.

Conclusion

All of the items listed above and their degraded condition are due to the Turbine event of December 25, 1993.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 7, 8, 9, 10, & 13

Walkdown Data:

WR # 000Z940523
000Z944090
000Z934494

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: J-N, 0-10
Elevation: 643'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: —
Concrete column: ✓
Concrete pedestal: —
Masonry wall: —
Structural steel : Beams, Columns, Bracing, Stair stringers: ✓
Doors: ✓
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: A-2213

Comments: See attached sheet.

Name: A.P Burg A.P. Burg Date: 1-31-94
Name: G.I. ABDALLAH G Abdallah Date: 1-31-94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF BALANCE OF TURBINE BUILDING STRUCTURAL WALKDOWN

A structural walkdown of the remaining areas of the Turbine Building 3rd floor was performed on January 27, 28 1994. The structural items checked on the first page were examined. The areas examined include elevation 643'-6" from column lines J to N and 0 to 10.

Results

1. Walls - The walls have numerous hairline cracks as well as wider cracks, similar to other Turbine Building walls. There are vertical cracks along construction joints. The cracks are assumed to have been present prior to the turbine incident because they are painted over in some locations near the base of the wall, and there is evidence of minor chipping along the cracks' lengths. Hairline cracks are a common phenomenon in concrete structures due to shrinkage .

2. Slabs - The slabs have numerous hairline cracks as well as a few wider cracks. The wider cracks have been painted over in most cases but the paint has chipped out of the cracks. In some cases, evidence of paint remains in the depressed areas indicating that they are old cracks. Portions of the TB slab near the exciter have gouges due to falling or propelled debris from the generator or exciter. The gouges are up to about 1/4" in depth and have a surface area of less than eight square inches. There are about six gouges total. An approximately 4" x 7" x up to 1/2" deep gouge exists on the underside of the low roof over the west moisture separator reheater above the midwest platform at the low pressure stop and intercept valves. The gouge is apparently a result of an ejected turbine blade.

3. Grout pads - Equipment foundation grout pads have a few hairline cracks but are generally sound.

4. Anchor bolts - Wedge anchors and embedded anchors for equipment foundations, pipe support base plates, electrical boxes, and miscellaneous attachments were evaluated for loose nuts and evidence of failure. The anchors appeared sound without evidence of failure or slippage.

5. Penetrations - A cursory review of penetrations was performed. There were no indications of breaks in the penetration seals.

6. Steel platforms above MSRs- The structural steel shows no evidence of misalignment or deformation. Bolted connections are acceptable. Wedge anchors are acceptable with no evidence of failure. A portion of the grating on the midwest platform at the low pressure stop and intercept valves is damaged from an ejected turbine blade. The deformed grating is about one square foot in area.

7. Columns - Columns were generally sound with few indications of hairline cracks.

SUMMARY OF BALANCE OF TURBINE BUILDING STRUCTURAL WALKDOWN

In conclusion, the structural items which were examined do not appear to have been detrimentally affected by the turbine incident. The indications which were observed, except for the gouges resulting from falling or ejected turbine parts, are assumed to have existed prior to the turbine incident.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 7, 8, 11, 13
WR# 00934494

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: N-S, O-17; J-N, 10-17
Elevation: 643'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: —
Concrete column: ✓
Concrete pedestal: —
Masonry wall: ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: ✓
Doors: —
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: A-2017, A-2017-1, A-2213

Comments: See attached sheets.

Name: A.P. Burg A.P. Burg Date: 1-20-94
Name: G.I. ABDALLAH G I Abdallah Date: 1-20-94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF TURBINE BUILDING 3RD FLOOR STRUCTURAL WALKDOWN

A structural walkdown of the 3rd floor Turbine Building was performed on January 18, 19, 1994. The structural items checked on the first page were examined. Areas of the 3rd floor which were off limits due to evaluation of the turbine incident were not examined. These areas are bounded by column lines J to N and 0 to 10.

Results

1. Walls - The walls have numerous hairline cracks as well as wider cracks, up to about .050". Many of the wider cracks in exterior walls were previously patched. There are vertical cracks along construction joints. The wider cracks tend to emanate at the junction of the wall and floor slab and run generally diagonally up the walls, sometimes as high as 20 to 25 feet, but generally only 7 to 10 feet. The cracks are assumed to have been present prior to the turbine incident because they are painted over near the bottom of the walls, and there is evidence of minor chipping along the cracks' lengths. Hairline cracks are a common phenomenon in concrete structures due to shrinkage .

2. Slabs - The slabs have numerous hairline cracks as well as wider cracks, especially in the corridor region along R-line between column lines 3 and 8. The wider cracks have been painted over in most cases but the paint has chipped out of the cracks. Evidence of paint remains in the depressed areas indicating that they are old cracks.

> Note: There are numerous cracks, wider than hairline, along column line R between lines 4 and 6, and running east-west, which were specifically questioned by the NRC. They are old cracks because of the paint which can be seen in depressed areas next to the cracks from which the subsequent paint layer has chipped. Similar surface cracks can be seen on the underside of the slab from the 2nd floor. The cracks originally might have been hairline cracks which propagated due to heavy floor loads and slab vibration due to reciprocating equipment. They do not appear to be cracks which propagate through the concrete. It should be understood that concrete slabs are designed under the assumption that the concrete between the first rebar layer and the surface is cracked.

3. Grout pads - Equipment foundation grout pads had a few hairline cracks but are generally sound.

4. Anchor bolts - Wedge anchors and embedded anchors for equipment foundations, rack mounts, pipe support base plates, electrical boxes, and miscellaneous attachments were evaluated for loose nuts and evidence of failure. The anchors appeared sound without evidence of failure or slippage.

SUMMARY OF TURBINE BUILDING 3RD FLOOR
STRUCTURAL WALKDOWN

5. Masonry walls - Masonry walls were generally cracked at their junction with concrete walls due to mortar shrinkage and concrete vibrations as experienced during prior walkdowns when the turbine equipment was operating. The walls are generally sound with few mortar joint cracks.

6. Penetrations - A cursory review of penetrations was performed. There are no indications of breaks in the penetration seal.

7. Steel stairs and platforms - The structural steel shows no evidence of misalignment or deformation. Bolted connections are acceptable. Wedge anchors are acceptable with no evidence of failure.

In conclusion, the structural items which were examined do not appear to have been detrimentally affected by the turbine incident.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 18, 19, 20 & 21 NO WR. Req.

Walkdown Data:

Building: AB RB (RWB) (TB)
Floor: SB B 1st (2nd) 3rd 4th 5th (Mezz.) Other
Area column lines: J-5, 0-3; N-5, 3-17; J-K, 3-17; K-N, 11-17; J-5, 14-17
Elevation: 613'-6" 628'-6"
Elements examined:

Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: —
Masonry wall: ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: ✓
Doors: —
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: A-2212, A-2016, A-2016-1

Comments: See attached sheets.

Name: A.P. Burg A.P. Burg Date: 1-24-94
Name: G.I. ABDALLAH G.I. Abdallah Date: 1-24-94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF TURBINE BUILDING 2ND FLOOR STRUCTURAL WALKDOWN

A structural walkdown of the 2nd floor Turbine Building and 2nd floor mezzanine of Radwaste Building was performed on January 19, 20, 1994. The structural items checked on the first page were examined. Areas of the 2nd floor Turbine Building which were off limits due to evaluation of the turbine incident were not examined. These areas are bounded by column lines K to N and 3 to 11. They will be examined when accessible and their results compiled separately.

Results

1. Walls - walls have numerous hairline cracks as well as wider cracks, similar to the 3rd floor. Many of the wider cracks in exterior walls were previously patched. There are vertical cracks along construction joints. The wider cracks run generally diagonally up the walls, sometimes as high as 20 to 25 feet. The cracks are assumed to have been present prior to the turbine incident because they are painted over near the bottom of the wall[illegible] there is evidence of minor chipping along the cracks' lengths. Hairline crac[illegible] common phenomenon in concrete structures due to shrinkage .

2. Slabs - The slabs have numerous hairline cracks as well as a few wider cracks. The wider cracks have been painted over in most cases but the paint has chipped out of the cracks. Evidence of paint remains in the depressed areas indicating that they are old cracks.

> Note: There ar[illegible]cks, wider than hairline, in the slab at the southeast corner of the turbine pedestal, near column lines M and 3, which run diagonally towards the southeast and which were specifically questioned by the NRC. The cracks originally might have been hairline cracks due to stress risers at the corner of the slab which propagated due to slab vibration from reciprocating equipment. The cracks do not propagate through the concrete. This portion of the slab is supported by beams underneath which run east-west and north-south. It should be understood that concrete slabs are designed under the assumption that the concrete between the first rebar layer and the surface is cracked.

3. Grout pads - Equipment foundation grout pads had a few hairline cracks but are generally sound.

4. Anchor bolts - Wedge anchors and embedded anchors for equipment foundations, rack mounts, pipe support base plates, electrical boxes, and miscellaneous attachments were evaluated for loose nuts and evidence of failure. The anchors appeared sound without evidence of failure or slippage.

SUMMARY OF TURBINE BUILDING 2ND FLOOR
STRUCTURAL WALKDOWN

5. Masonry walls - Masonry walls were generally cracked at their junction with concrete walls due to mortar shrinkage and concrete vibrations as experienced during prior walkdowns when the turbine equipment was operating. The walls are generally sound with few mortar joint cracks.

6. Penetrations - A cursory review of penetrations was performed. There are no indications of breaks in the penetration seals.

7. Steel stairs and platforms - The structural steel shows no evidence of misalignment or deformation. Bolted connections are acceptable. Wedge anchors are acceptable with no evidence of failure.

In conclusion, the structural items which were examined do not appear to have been detrimentally affected by the turbine incident.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM #7 NO WR. Req.

Walkdown Data:

Building: AB RB RWB (TB)
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other

ALL FOUR TB. HS. EXTERIOR WALL INSULATED METAL SIDING ABOVE 3RD FLOOR

Area column lines: _____
Elevation: _____
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: 6A721-2036 THRU 2039

Comments: THE EXTERIOR WALL INSULATED METAL SIDING ABOVE THE 3RD FLOOR (EL. 643'-6") ON THE TURBINE HOUSE DOES NOT HAVE ANY DAMAGE DUE TO THE DECEMBER 25, 1993 TURBINE EVENT.

Name: R.Y. BUCK RBuck Date: 28 JAN 94
Name: K. SAHINER Date: 28 JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM # 7
NO WR Req.

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz Other - TB ROOF
Area column lines: BETWEEN COL. ROWS 5 & 6 AND APPROX. 10' WEST OF K ROW.
Elevation: 716'-8" REF. DWG. 7A721-2019
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: A MINOR DENT OR SCRAPE, APPROX. 4 INCHES SQUARE, IN THE METAL DECKING OF THE ROOF SYSTEM. THERE IS NO PENETRATION INTO THE ROOFING SYSTEM, JUST EVIDENCE OF SOME OBJECT HITTING THE ROOM SIDE OF THE METAL DECKING. IT IS UNKNOWN AT THIS TIME IF THIS DENT WAS CAUSED BY THE TURBINE EVENT OF 28 DEC 1993.

Name: R.Y. BUCK. RBuck Date: 28 JAN 94
Name: H Sahiner HSahiner Date: 2/10/94

RAB: 1/14/94
file: P/CHKLIST .

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM #7

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other – TB ROOF
Area column lines: APPROX. 20' WEST OF COL. ROW K AND 22' NORTH OF COL. 8.
Elevation: ± 710'-8" REF. DWG. 7A721-2019
Elements examined:

Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: AN OBJECT HAS PENETRATED THE METAL ROOF DECKING AND TAPERED INSULATION BUT HAS NOT PENETRATED THE ENTIRE ROOFING SYSTEM CAUSING IT TO LEAK WATER. THE OBJECT CAME FROM THE INSIDE OF THE BUILDING AND APPEARS TO BE STUCK IN THE TAPERED INSULATION. THE HOLE W THE METAL DECK AND TAPERED INSULATION APPEARS TO BE ABOUT 3 INCHES SQUARE. IT IS UNKNOWN AT THIS TIME IF THIS HOLE IS A RESULT OF THE DEC. 25 1993 TURBINE EVENT.

Name: R. V. BUCK RBuck Date: 28 JAN 94
Name: H. Salmon HSalmon Date: 2/10/94

RAB: 1/14/94
file: P/CHKLIST .

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM #7

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other- TB ROOF
Area column lines: NEAR K COL. ROW ≈ 20' SOUTH OF 3 COL LINE.
Elevation: ≈ 710'-8" REF DWG. 7A721-2019
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: NEAR COL ROW K AND ≈ 20' SOUTH OF COL. LINE 3 THERE IS A ELLIPTICAL HOLE APPROX. 1/2" WIDE BY 1" LONG WHICH PENETRATES THE ROOFING SYSTEM. THIS HOLE WAS MADE BY AN OBJECT TRAVELING FROM THE INSIDE OF THE BUILDING TO THE EXTERIOR OF THE BUILDING. THE OBJECT WHICH CAUSED THIS PENETRATION WAS NOT FOUND AND IT IS UNKNOWN AT THIS TIME IF THIS PENETRATION IS A RESULT OF THE RECENT TURBINE EVENT OF DEC 25, 1993.

Name: R.V. BUCK Rbuck Date: 28-JAN 94
Name: H. Salvinar Date: 2/10/94

RAB: 1/14/94
file: P/CHKLIST .

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEM #7

Walkdown Data:

Building: AB RB RWB TB
Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other -TB ROOF
Area column lines: NEAR COL. LINES 5 & 7 ON THE N ROW
Elevation: ≈ 710'-8" REF DWG. 7A721-2019
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments: THE ROOF 4"DIA. SUMPS AT 7'-0" SOUTH OF COL. LINE 5 AND 4' WEST OF N. COL. LINE AND 11'-0" SOUTH OF COL. LINE 7 AND 4' WEST OF N. COL. LINE ARE LEAKING WATER DOWN ON THE TB HS. 3 FLOOR. THESE LEAKS ARE NOT DUE TO THE RECENT TURBINE EVENT OF DEC 25, 1993.

Name: R.V. BUCK RBuck Date: 28 JAN 94
Name: H. Saliner Date: 2/10/94

RAB: 1/14/94
file: P/CHKLIST .

Summary of Turbine House Roof and Siding Above Third Floor Turbine Area Structural Walkdown

The structural walkdown of the Turbine House roof and siding was conducted on January 28, 1994. The roofing system and insulated wall siding above and around the turbine on the Turbine House third floor was examined.

1. Roof

   This roofing system consists of 18 gauge metal decking which supports tappered insulation and four plys of pitch and slag roofing. Two locations were observed as being dented or marked on the underside (room side) of the metal decking, neither of which penetrated the roofing system causing it to leak rain water. One location has a hole about 1/2" wide by 1" long, through the roofing system which permitted rain water to leak onto the third floor slab. This 1/2" x 1" object was searched for but never found. The cause of these three damaged locations is unknown but because they were not identified before the Turbine event of December 25, 1993, by plant operators or personnel a good possibility is that they were caused by some missile generated from the exciter during the Turbine event.

   Two 4" diameter roof sump drain lines were observed to be leaking rain water down on to the Turbine third floor. The leakage of these lines was not due to the Turbine event of December 25, 1993.

2. Insulated Metal Siding

   The insulated metal siding around this third floor area had no indication of any damage due to the Turbine event of December 25, 1993.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 18, 19, 20 & 21 NO W.R. REQ.

Building: AB RB (RWB) TB
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: L to V AND 14 to 19 EXCEPT MEETINGS AND RESTRICTED AREAS.
Elevation: 557'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: AROUND TANKS AND EQUIPMENT
Masonry wall: ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: STAIRS RA1
Doors: RAB-8, RAB-6, RAB-24, RAB-22 AND RAB-1
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 7A721-2030

Comments: EXCEPT FOR THE EVAPORATOR FEED SURGE TANK G1101A030, WASTE SAMPLE TANKS G1101A004B, G1101A004A AND G1101A009 PEDESTALS WHICH WILL REQUIRE CONCRETE REPAIR BECAUSE THESE TANKS HAVE MOVED FROM THEIR DESIGN LOCATION, ALL THE STRUCTURAL ELEMENTS EXAMINED AND NOTED ABOVE DO NOT SHOW ANY DAMAGE OR DISPLACEMENT DUE TO THE DEC. 25, 1993 TURBINE EVENT.

Name: R.Y. BUCK R Buck Date: 12 FEB 94
Name: G.I. ABDALLAH G Abdallah Date: 12 FEB 94

RAB: 1/14/94
file: P/CHKLIST .

SUMMARY OF RADWASTE BASEMENT FLOOR ELEV. 557'-6" STRUCTURAL WALKDOWN

The structural walkdown of the radwaste basement was conducted on February 12, 1994. The items listed and checked on the structural walkdown checklist were examined. The entire radwaste basement (Col. lines L to V and 14 to 19) was examined except for the rooms housing the following equipment:

Spent Resin Slurry Recirc. Pump - G1118C063
Spent Resin Slurry Recirc. Pump - G1118C062
Concentrates Feed Tank - G1115A035
Spent Resin Slurry Tank - G1118A034
Chemical Waste Tank - G1101A023
and the mezzanine floors at elevation 565'-6"

These rooms and mezzanine floors were inaccessible due to high radiation posting or the rooms were still full of water. These rooms and mezzanine comprise approximately 5% of the radwaste basement area and their structural condition is being considered equivalent to the area which was walked down and examined.

RESULTS

1. Concrete walls, slabs, beams and columns:

   None of these structural concrete elements show signs of any distress or damage other than normal concrete shrinkage cracking. No ground water infiltration was observed which would indicate damage to exterior walls and floor slabs.

2. Concrete Pedestals around Tanks and Equipment:

   The concrete pedestals for tanks with plant identification system numbers (P.I.S.) G1101A030, G1101A004A, G1101A004B and G1101A009 will require concrete repair because these tanks have been moved on their pedestals due to the flooding caused by the December 25, 1993, Turbine event. All other pedestals and pads for tanks and equipment do not show any signs of damage or distress.

3. Masonry Walls:

   All masonry walls, which are used to separate room in this area, do not show signs of damage or distress.

4. Stairs - RA1:

The stairs RA1 shows no evidence of distress or deformation. The stairs bolted connections and concrete anchors have tight connections with no signs of movement or distress.

5. Doors:

Water tight doors RAB-8, 6, 24, 22, and 1 along with room man doors were found to be operable and in good condition to perform their intended functions.

6. Penetrations:

All wall and ceiling penetrations were found to be intact and in good condition. The rooms which were still flooded with water had no leakage through the penetrations, which is an indication that the penetration seals were acceptable and in serviceable condition.

7. Anchor Bolts:

Wedge anchors and embedded anchors for equipment foundations, electrical and mechanical attachments and miscellaneous attachments showed no signs of failure, slippage or nuts loosening.

Conclusion:

The only damage to structural elements in the Radwaste Basement which are a direct result of the December 25, 1993, Turbine event are to the four tank pedestals identified in item 2 of the results.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 18, 19, 20 & 21
WR # 000293449S

Building: AB RB (RWB) TB
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: R to S & 17 to 19, P to R & 14 to 16, T to U & 14 to 16
Elevation: 557-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: ✓
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors: RAB-22, RAB-21 & RAB-20
Penetrations: ✓
Anchor Bolts: ✓ FOR CHEM. WASTE TANK, CENT. FEED TANK, COND. Feed TANK & SPENT RESIN SLURRY Feed TANK
Drawing reference: 7A721-2030

Comments:
THESE AREAS HAVE NO STRUCTURAL DAMAGE OR DISTRESS TO ANY OF THE STRUCTURAL MEMBERS DUE TO THE TURBINE EVENT OF DEC. 25, 1994

Name: B.Y. Buck Rosal Date: 29 APRIL 94
Name: H. Saliner Date: 4/29/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 18, 19, 20 & 21 NO WR. Req.

Building: AB RB (RWB) TB
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other
Area column lines: P & V BETWEEN 19 & 12'N. & 19 AND 16 & 17 BETWEEN 12'E. & P & 22'E. & P
Elevation: 583'-6" & 589'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: ✓ RECIPROCATING DRIVE UNITS G1106D05R
Masonry wall:
Structural steel : Beams, Columns, Bracing, (Stair stringers) RA1
Doors: RA1-37 RA1-40 & RA1-5
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 5A721-2211 & 7A721-2031

Comments:
NO DAMAGE TO ANY STRUCTURAL MEMBER DUE TO THE TURBINE EVENT of DEC. 25, 1993.

Name: R.Y. Buck Date: 30 MARCH 94
Name: Abdul Abdulla Date: 3/30/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 18, 19, 20 & 21 No. WR. Req.

Walkdown Data:

Building: AB RB (RWB) TB
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other
Area column lines: 14 & 19 AND K & 15' EAST OF S
Elevation: 583'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: ✓
Masonry wall: ✓
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors: ✓ RAI-1, RAI-12, RAI-9
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: 7A721-2031

Comments: THE DRUM CONVEYOR ROOMS AND RECIPROCATING DRIVE UNITS ROOM WERE EXCLUDED FROM THIS WALK DOWN DUE TO INACCESSIBILITY.

Name: R.V. BUCK R Buck Date: 19 JAN 94
Name: H. SAHINER Date: 19 JAN 94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF RADWASTE BUILDING FIRST FLOOR STRUCTURAL WALKDOWN

The Radwaste Building first floor (Ref. Dwg. 7A721-2031) structural walkdown was conducted on January 19, 1994. The structural items listed on the structural walkdown checklist, for this date, were examined. The entire first floor, except for the Drum Conveyor rooms and Reciprocating Drive Unit room, which were inaccessible, was examined.

RESULTS

1. Concrete slabs, walls, beams, columns and pedestals

   None of these structural concrete elements show signs of any distress or damage other than normal concrete shrinkage cracks.

2. Masonry Walls

   All masonry walls, which are used to separate rooms on this floor, do not show signs of damage or distress.

3. Doors

   All doors were found to be operable and in good working condition to perform their intended functions.

4. Penetrations

   All wall,, floor and ceiling penetrations were found to be intact and in serviceable condition.

5. Anchor Bolts

   Wedge anchors and embedded anchors for equipment foundations, electrical and mechanical attachments and miscellaneous attachments showed no signs of failure, slippage or nuts loosening.

CONCLUSION:

The Radwaste Building first floor experienced no damage, to the structural elements which were examined by this walkdown, due to the Turbine event of December 25, 1993.

STRUCTURAL WALKDOWN CHECKLIST

PAGE 53

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 18, 19, 20 & 21 NO WR. Req.

Walkdown Data:

Building: AB RB (RWB) TB
Floor: SB B 1st (2nd) 3rd 4th 5th (Mezz) Other
Area column lines: S-T, 14-17 ; K-V, 14-19 ;
Elevation: 613'-6" 601'-6"
Elements examined:
Concrete slab: ✓
Concrete walls: ✓
Concrete beam: ✓
Concrete column: ✓
Concrete pedestal: —
Masonry wall: ✓
Structural steel : Beams, Columns, Bracing, Stair stringers: ✓
Doors: —
Penetrations: ✓
Anchor Bolts: ✓
Drawing reference: A-2212

Comments: See attached sheets.

Name: A.P Burg A.P. Burg Date: 1-24-94
Name: G.I ABDALLAH G.I Abdallah Date: 1-24-94

RAB: 1/14/94
file: P/CHKLIST

SUMMARY OF RADWASTE BUILDING 2ND FLOOR AND MEZZANINE STRUCTURAL WALKDOWN

A structural walkdown of the Radwaste Building 2nd floor and mezzanine was performed on January 21, 1994. The structural items checked on the first page were examined. The areas examined include elevation 613'-6" from column lines S to T and 14 to 17 and elevation 601'-6" from column lines K to V and 14 to 19. Radiation and contaminated areas on both levels were not examined.

Results

1. Walls - The walls have numerous hairline cracks as well as wider cracks, similar to the Turbine Building walls. Many of the wider cracks in exterior walls were previously patched. There are vertical cracks along construction joints. Some of the cracks in exterior walls show large stained areas directly under the cracks which is indicative of leaching. The cracks are assumed to have been present prior to the turbine incident because they are painted over near the bottom of the walls, and there is evidence of minor chipping along the cracks' lengths. Hairline cracks are a common phenomenon in concrete structures due to shrinkage .

2. Slabs - The slabs have numerous hairline cracks as well as a few wider cracks. The wider cracks have been painted over in most cases but the paint has chipped out of the cracks. Evidence of paint remains in the depressed areas indicating that they are old cracks.

3. Grout pads - Equipment foundation grout pads had a few hairline cracks but are generally sound.

4. Anchor bolts - Wedge anchors and embedded anchors for equipment foundations, rack mounts, pipe support base plates, electrical boxes, and miscellaneous attachments were evaluated for loose nuts and evidence of failure. The anchors appeared sound without evidence of failure or slippage.

5. Masonry walls - Masonry walls were generally sound with few mortar joint cracks. The is some evidence of mortar shrinkage cracks at concrete interfaces. A large vertical crack, from the ceiling to about midheight, in the wall between column lines 18 and 19 near column line N appears to be a shear crack. It goes through the mortar as well as the blocks.

6. Penetrations - A cursory review of penetrations was performed. There are no indications of breaks in the penetration seals.

7. Steel stairs and platforms - The structural steel shows no evidence of misalignment or deformation. Bolted connections are acceptable. Wedge anchors are acceptable with no evidence of failure.

SUMMARY OF RADWASTE BUILDING 2ND FLOOR AND MEZZANINE STRUCTURAL WALKDOWN

In conclusion, the structural items which were examined do not appear to have been detrimentally affected by the turbine incident.

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:

Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

Building: AB (RB) RWB TB

Floor: SB B 1st 2nd 3rd 4th 5th Mezz. Other Pedestal/Drywell #17

Area column lines: _____

Elevation: 572'-1" Pedestal slab and wall up to ~585' Elev.

Elements examined:

- Concrete slab: ✓
- Concrete walls: ✓
- Concrete beam: _____
- Concrete column: _____
- Concrete pedestal: ✓
- Masonry wall: _____
- Structural steel : Beams, Columns, Bracing, Stair stringers: _____
- Doors: _____
- Penetrations: _____
- Anchor Bolts: _____
- Drawing reference: _____

Comments: Pedestal walls and the joint between the undervessel floor slab and the pedestal wall were inspected. The Westinghouse camera was used to focus on the specific areas to be inspected. No concrete surface damage or joint separation/cracks were observed in areas subject to inspection. Independent QA inspections for drywell shell also support the same conclusion.

Name: H. Sahiner Date: 6/30/94

Name: R.V Buck Date: 30 JUNE 94

RAB: 1/14/94

file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Walkdown Data:

ITEMS 15 & 16 NO W.R. Req.

Building: AB (RB) RWB TB
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: SE QUAD.
Elevation: EL 562-0
Elements examined:
Concrete slab: GOOD CONDITION, NO FRESH CRACKS
Concrete walls:
Concrete beam:
Concrete column:
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors: RD-7, NO SIGN OF DISTRESS ON FRAME OR DOOR
Penetrations: ALL PENETRATIONS IN DIAGONAL WALL HAVE TIGHT SEALS.
Anchor Bolts:
Drawing reference:

Comments:
SNUBBER E21-3150-609, NO SIGNS OF DAMAGE OR MOVEMENT.

Name: RA Bryan Date: 4/9/94
Name: R Burch Date: 19-JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

PAGE 58

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 15 & 16 NO WR. REQ.

Walkdown Data:

Building: AB (RB) RWB TB
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other
Area column lines: A9-A4, G9 to G11
Elevation: 583-6"
Elements examined:
Concrete slab: _____
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: _____
Structural steel : Beams, Columns, Bracing, Stair stringers: T3100 E060
Doors: _____
Penetrations: _____
Anchor Bolts: _____
Drawing reference: _____

Comments:
SOUTH CRD PANELS. ALL ANCHORS ARE SOUND, NO SIGN OF DISPLACEMENT

STEEL HOIST FRAME OVER SDT HATCH. ALL CONNECTIONS ARE TIGHT.

Name: R E Bruyere Date: 1/19/94
Name: R Bauch Date: 19 JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 15 & 16 No WR. Req'd.

Walkdown Data:

Building: AB (RB) RWB TB
Floor: SB B 1st (2nd) 3rd 4th 5th Mezz. Other
Area column lines: _____
Elevation: 613'-6"
Elements examined:
Concrete slab: NO SIGNS OF FRESH CRACKS.
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: AROUND RWCU ROOM, NO CRACKS
Structural steel: Beams, Columns, Bracing, Stair stringers: _____
Doors: R2-8, AIR LOCK DOOR, NO SIGNS OF DISTRESS
Penetrations: WALL PENT. S.OF B12, TIGHT SEALS
Anchor Bolts: SEE NOTE BELOW
Drawing reference: _____

Comments:
EECW HTEX P4400-B002, ANCHOR BOLTS SHOW NO SIGN OF DISTRESS
EECW " P4400 B001 " " " " "

Name: RG Burger Date: 4/19/94
Name: KBurch Date: 19JAN94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Items 15 & 16 N.I. WR. Rep.

Walkdown Data:

Building: AB (RB) RWB TB
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: _____
Elevation: 643'-4"
Elements examined:
Concrete slab: NO EVIDENCE OF NEW CRACKS
Concrete walls: _____
Concrete beam: _____
Concrete column: _____
Concrete pedestal: _____
Masonry wall: E of B17 to B13, NO SIGNS OF PAINT OR MORTAR CRACKS
Structural steel : Beams, Columns, Bracing, Stair stringers: _____
Doors: _____
Penetrations: FLOOR PENETRATIONS SEAL F-17, ALL SEALS ARE TIGHT
Anchor Bolts: SEE NOTE BELOW
Drawing reference: _____

Comments:
HYDROGEN RECOMBINER T4804-2001, ANCHOR BOLTS ALL TIGHT

Name: RA Boyer Date: 1/19/94
Name: KBurd Date: 01/19/94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 15 & 16 NO WR. Kag.

Walkdown Data:

Building: AB (RB) RWB TB
Floor: SB B 1st 2nd 3rd (4th) 5th Mezz Other
Area column lines: F1 TO F9
Elevation: 659'-6"
Elements examined:
Concrete slab: NO SIGNS OF FRESH CRACKS
Concrete walls: SPENT FUEL POOL EAST WALL, NO DISTRESS
Concrete beam:
Concrete column:
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations:
Anchor Bolts: SEE NOTE BELOW
Drawing reference:

Comments:
STAND BY LIQUID CONTROL TANK C41001-A001 ANCHOR BOLTS & CONCRETE PAD ARE SOUND.

Name: RG Bryan Date: 4/19/94
Name: K Burch Date: 19 JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

I Items 15 & 16 No WR Req'd

Walkdown Data:

Building: (AB) RB RWB TB
Floor: (SB) B 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: HPCI Room
Elevation: El 340-0
Elements examined:
Concrete slab: NO SIGN OF CRACKS OR GROUND WATER INFILTRATION
Concrete walls: NO CRACKS IN PAINT OR CONCRETE
Concrete beam:
Concrete column:
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations:
Anchor Bolts: SEE BELOW
Drawing reference:

Comments:
HPCI SKID ALL ANCHOR BOLTS ARE TIGHT

Name: RG Bayer Date: 1/19/94
Name: [signature] Date: 19-JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 15 & 16 N1 WR. Req.

Walkdown Data:

Building: (AB) RB RWB TB
Floor: SB (B) 1st 2nd 3rd 4th 5th Mezz. Other
Area column lines: ~~562-0~~ CRD PUMP ROOM
Elevation: 562-0
Elements examined:
Concrete slab: NO SIGN OF DISTRESS
Concrete walls:
Concrete beam:
Concrete column:
Concrete pedestal:
Masonry wall:
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors:
Penetrations:
Anchor Bolts:
Drawing reference:

Comments:
CRD PUMP C1106-C001B SKID ANCHOR BOLTS ARE ALL TIGHT, NO SIGNS OF DISTRESS

Name: R.G. Bayer Date: 1/19/94
Name: K Bruch Date: 19 JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Page 64

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

Items 15 & 16 No WOR. Req.

Walkdown Data:

Building: (AB) RB RWB TB
Floor: SB B (1st) 2nd 3rd 4th 5th Mezz. Other
Area column lines: H9 - H17, G9 - G15
Elevation: 5'-8 3/4"
Elements examined:
Concrete slab: NO NEW CRACKS
Concrete walls:
Concrete beam:
Concrete column: G.1-11, G.1-12, No CRACKS OR PAINT CHIPS
Concrete pedestal:
Masonry wall: NO CRACKS
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors: T1-32, NO SIGN OF DISTRESS R1-8, TIGHT SEAL OK
Penetrations: GROUT WALL 9-10, ALL PENETRATIONS TIGHT
Anchor Bolts: SEE COMMENT BELOW
Drawing reference:

Comments:
RBCCW PUMPS P4200 - C001 → C003
ANCHORS ALL TIGHT
RBCCW HEAT EXCHANGERS, ALL ANCHORS SOUND
NO SIGN OF PAINT CRACKING

Name: RG Burger Date: 4/19/94
Name: K Buell Date: 19-JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

PAGE 65

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

ITEMS 15 & 16 NO WR Req.

Walkdown Data:

Building: (AB) RB RWB TB
Floor: SB B 1st (2nd) 3rd 4th 5th Mezz. Other
Area column lines: NEAR G-12
Elevation: 613'-6"
Elements examined:
Concrete slab: PAINT SEAL IS SOUND, NO FRESH CRACKS
Concrete walls: H9 TO H11, NO SIGN OF DISTRESS
Concrete beam:
Concrete column: G10, NO PAINT CRACKS OR STRUCTURAL DISTRESS
Concrete pedestal:
Masonry wall: NEAR H10 to H11, NO PAINT OR MORTAR CRACKS
Structural steel : Beams, Columns, Bracing, Stair stringers:
Doors: 32-14, FIRE DOOR, NO SIGNS OF DISTRESS
Penetrations: CABLE RISER PENETRATIONS NEAR H9, ALL SEALS TIGHT
Anchor Bolts: SEE BELOW
Drawing reference:

Comments:
RBHVAC COOLER T410D-B003, B002, ALL ANCHORS TIGHT

Name: RA Bruen Date: 1/19/94
Name: KB Burch Date: 19 JAN 94

RAB: 1/14/94
file: P/CHKLIST

STRUCTURAL WALKDOWN CHECKLIST

Walkdown Guideline:
Visually examine structural elements for signs of damage or displacement. The following evidence may indicate that the structural member experienced some distress:

1. Concrete members: Look for fresh cracks, concrete spalling, crushed concrete, cracks in painted surfaces
2. Structural steel: Look for signs of impact, chipped paint, dents, bending, twisting, warping, loose bolts, cracked welds.
3. Penetrations: Look for breaks in the penetration seal due to displacement of pipes or conduit.
4. Masonry walls: Look for fresh cracks in mortar joints and blocks, paint chips.
5. Doors: Look at alignment of door with frame.
6. Anchorages: Look for loose or missing nuts or bolts, stripped threads, grout damage.

I Tama
15 & 16
No WR Rq.

Walkdown Data:

Building: (AB) RB RWB TB
Floor: SB B 1st 2nd (3rd) 4th 5th Mezz. Other
Area column lines: CONTROL ROOM
Elevation: _____
Elements examined:
- Concrete slab: _____
- Concrete walls: _____
- Concrete beam: _____
- Concrete column: _____
- Concrete pedestal: _____
- Masonry wall: STACKED BOND JOINTS ARE ALL SOUND
- Structural steel : Beams, Columns, Bracing, Stair stringers: _____
- Doors: _____
- Penetrations: _____
- Anchor Bolts: _____
- Drawing reference: _____

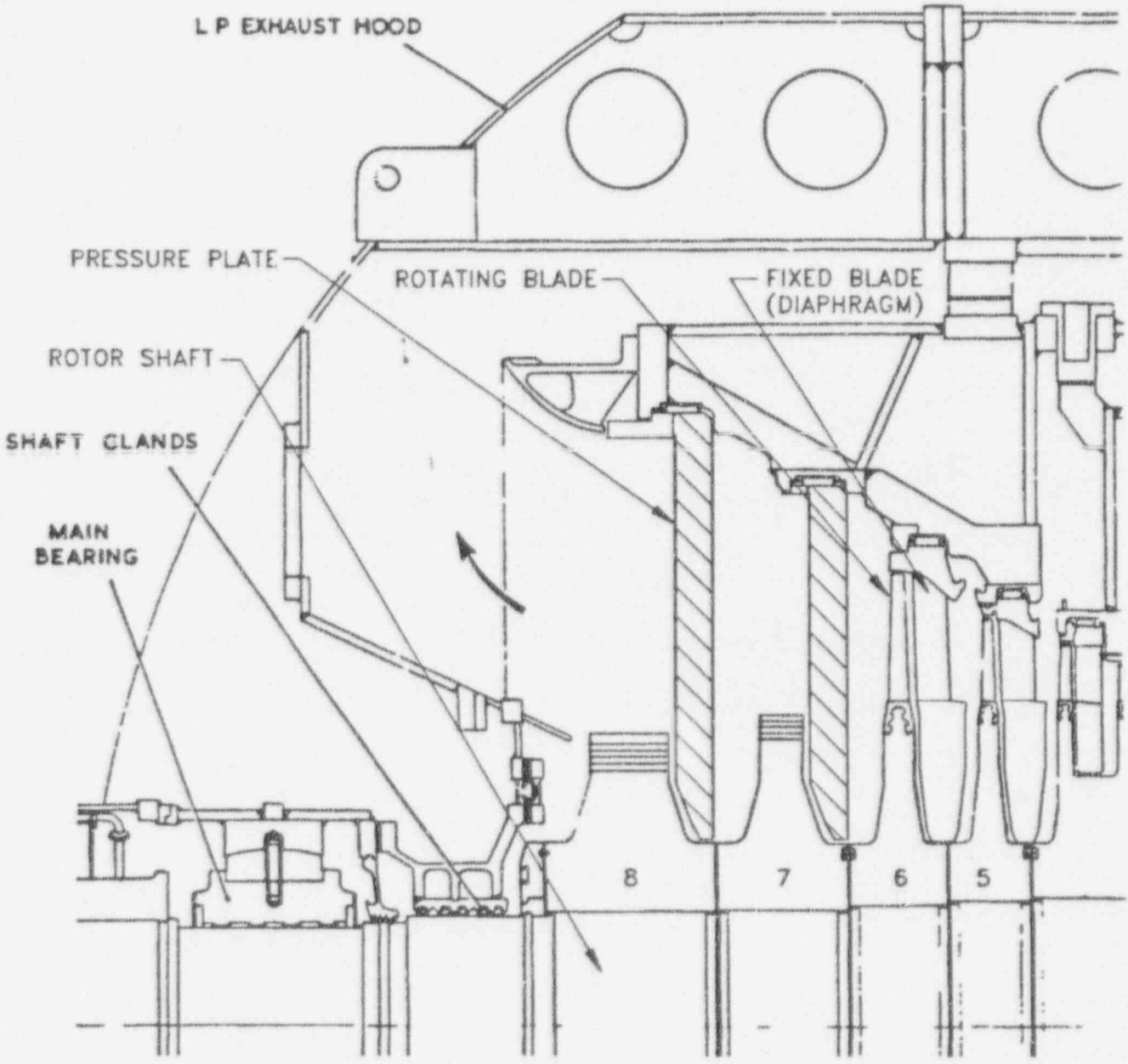
Comments:
ALL ARCHITECTURAL FEATURES (SUSPENDED CEILING, METAL FACADE AROUND CONTROL PANELS) ARE ALL SOUND
NO SIGNS OF MOVEMENT

Name: RG Bryan Date: 1/19/94
Name: KBauch Date: 19 JAN 94

RAB: 1/14/94
file: F/CHKLIST

ATTACHMENT 7

FERMI 2
LP STAGE 7 & 8
PRESSURE PLATE INSTALLATION



ATTACHMENT 8

HOPPER AND ASSOCIATES ENGINEERS

PROFESSIONAL ENGINEERING SUPPORT TO INDUSTRY

TI-3680
199989

HOPPER AND ASSOCIATES
ENGINEERS

300 Vista Del Mar
Redondo Beach, CA 90277
(310) 373-5573
FAX: (310) 791-7308

February 4, 1994
HA-02/94-775

Detroit Edison Company
Enrico Fermi 2 Site
6400 North Dixie Highway
Newport, MI 48166

Attention: Mr. Bob Bryer, Senior Engineer

Subject: Fermi 2 Turbine Failure - Post Event Earthquake Instrumentation Data Evaluation

Gentlemen:

As you requested, we have completed the subject and enclose a report elucidating our work. The turbine failure at Fermi 2 on December 25, 1993, should not be compared with a tectonic earthquake, and globally, the Reactor/Auxiliary building did not experience OBE excitation levels. Please allow this letter to summarize our findings and observations.

The earthquake recording system in the Fermi 2 Reactor/Auxiliary Building adjacent to the Turbine Generator Building was activated during the December 25, 1993, Turbine Failure Event by an excitation having an acceleration amplitude exceeding the active earthquake instrumentation trigger activation level. Subsequently, two relatively large amplitude but small duration acceleration pulses were recorded approximately two and sixty-three seconds after instrumentation activation. Both of these recorded tremors exhibit those characteristics associated with a surface wave emanating from an adjacent surface impulse load and are not structurally significant.

Two active and three passive triaxial earthquake recording devices are mounted in the Reactor/Auxiliary Building at various locations between the sub-basement and the fifth floor. These devices provide consistent records that show surface tremors passed through the Reactor/Auxiliary Building foundation without globally exciting the structure as a tectonic earthquake event would have.

Although the data show that the Reactor/Auxiliary Building did not experience any significant dynamic excitation, the two impulsive waves passing through the foundation occasioned localized safe shutdown earthquake exceedence indications in the foundation instrumentation as would be anticipated. For this reason, the post event earthquake instrumentation data was evaluated in accordance with those provisions established as though there had been an earthquake.

The enclosed report describes data reduction, analysis, and interpretation of time histories and response spectra from the earthquake instrumentation. Also, the satisfactory performance of all Reactor/Auxiliary Building systems and components during and after the event and acceptable inspection of the structures after the event are documented.

If questions arise, please contact the undersigned.

Very truly yours,

David M. Hopper
Professional Engineer

Enclosure

HOPPER AND ASSOCIATES
ENGINEERS

FERMI 2 TURBINE FAILURE

POST EVENT EARTHQUAKE INSTRUMENTATION DATA EVALUATION

Prepared for: Detroit Edison Company
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February 4, 1994

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Fermi 2 History

The Enrico Fermi Unit 2 Nuclear Power Plant is a 1,203-MV gross Boiling Water Reactor located outside Detroit, Michigan on Lake Erie. Fermi 2 has been in commercial operation since 1988, using a turbine manufactured by English Electric of Rugby, England, now part of G.E.C.-Alsthom. The facility site is located on stable land, and few large intensity earthquakes have occurred in the facility vicinity throughout documented history.

1.2 Turbine Failure

At approximately 13:15 on December 25, 1993, the turbine at the Enrico Fermi Unit 2 Nuclear Power Plant failed. The turbine failure included thrown blades, severed cooling system piping, turbine lubricating system failures, and a hydrogen explosion. Vibration imbalance in the main turbine generator activated a turbine alarm. Almost simultaneously, numerous alarms were received, including seismic event, additional turbine alarms, and reactor scram. Upon receiving the reactor scram alarm, the operator immediately began shutdown procedures of the turbine and reactor.

1.3 Shock Incident

Personal observations attest to a loud noise followed by a rumbling sound which lasted two to three minutes. The seismic event alarm and the reactor scram alarm were noticed concurrent with the loud noise and rumbling. Although the root failure cause is unclear at this time, the rumbling sound was attributed to vibration.

The passive peak shock record plates on the second and fifth floors of the Reactor/Auxiliary building recorded insignificant accelerations, or accelerations below the Operating Basis Earthquake (OBE).

The active strong motion time history accelerometers in the HPCI room and at the reactor pressure vessel (RPV) pedestal base recorded measurable accelerations. The accelerometers were preset to activate at a 0.01 g level. Subsequent to this activation, two impulsive acceleration excitation spikes were recorded after approximately two and sixty-three seconds. The passive peak shock record plates in the sub-basement of the Reactor/Auxiliary building (HPCI room) also recorded measurable accelerations.

Instrumentation data from both active and passive sensors were evaluated and compared to those excitation levels in the Fermi 2 Updated Final Safety Analysis Report (UFSAR) to verify the continuing structural integrity of the Reactor/Auxiliary building and the equipment inside the building.

1.4 Seismic Event Procedure Requirements

Section 3.7.4.4 of the UFSAR states an earthquake has occurred if the seismic trigger is activated. If the seismic event exceeds the OBE, the reactor must be shut down as quickly as possible. Before normal operation can commence, the UFSAR requires data reduction, analysis, and interpretation of time histories and response spectra from instrumentation; and structure, system, and component inspection.

1.5 Results

Globally, the building did not experience an OBE event, and consequently, the Reactor/Auxiliary building was never exercised near OBE excitation levels as evidenced by the insignificant accelerations measured on the second and fifth floors of the building. Likewise, the equipment on the second and higher floors was never exercised near OBE excitation levels.

Below the second floor, at the RPV pedestal, the active instrumentation show OBE exceedences at high frequencies and both active and passive instrumentation exhibit OBE exceedences in the HPCI room. However, no anomalies were observed during the event, and a cursory inspection of both building and equipment after the event indicates there to be no apparent problems.

The two distinct tremors recorded by the active instrumentation mounted to the structural foundation exhibit those characteristics that would be anticipated from a surface wave system emanating from an impact at an adjacent surface location. These waves locally pass through the structural foundation with the path of the particle motion theoretically describing a single retrograde ellipse. They possess none of the energy characteristics of tectonic earthquake waves and do not result in the global structural excitation experienced during a traditional seismic event.

2.0 HISTORY

2.1 Seismic Events

2.1.1 Previous Seismic Events

Fermi 2 is located in a relatively seismic stable area. Approximately fifteen intensity VI (Modified Mercalli Scale) or greater earthquakes have occurred within a two hundred mile radius in the last two hundred years (Figure 2.1.1.1). Additionally, nine earthquakes of intensity V or less have occurred within a fifty mile radius of the facility (Figure 2.1.1.2). Although the Fermi 2 OBE is associated with an intensity VI seismic event, it is unlikely the facility will experience such an earthquake within its lifetime.

2.1.2 December 25, 1993

The National Geophysics Data Center and the National Oceanic and Atmospheric Administration show no seismic activity for December 25, 1993, within a five hundred km (310 mile) radius of Detroit. The center has immediate knowledge of all seismic activity in the Detroit vicinity of intensity III or greater.

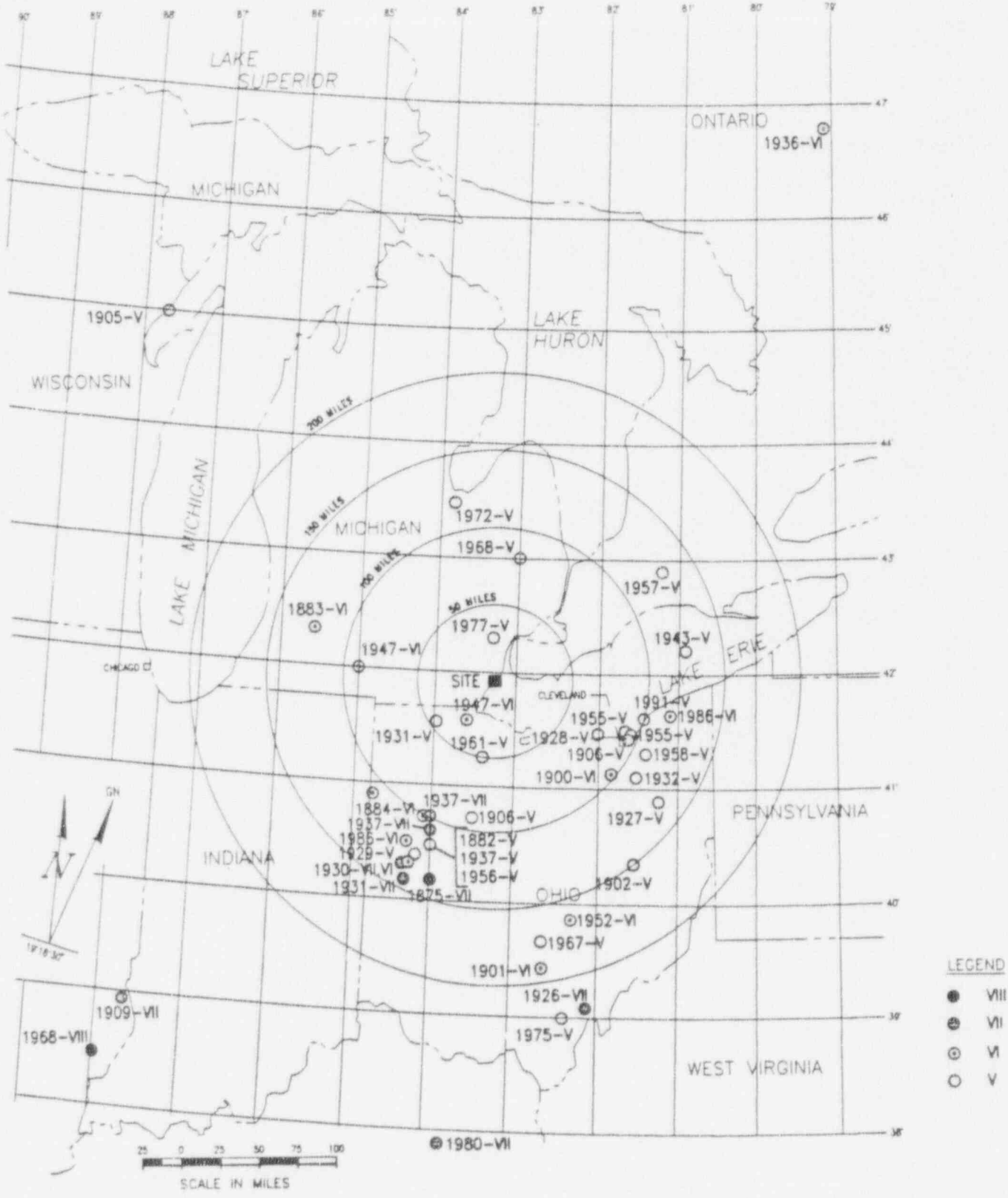
The most recent seismic event within two hundred miles of the facility site had an intensity of approximately I and occurred in April of 1993. The passive peak shock recorder plates were calibrated and installed in July of 1993 (second and fifth floors) and September of 1993 (HPCI room). This evidence indicates the passive plate records contained only the turbine failure incident.

2.2 Sequence of Events

2.2.1 Turbine Failure and Damage

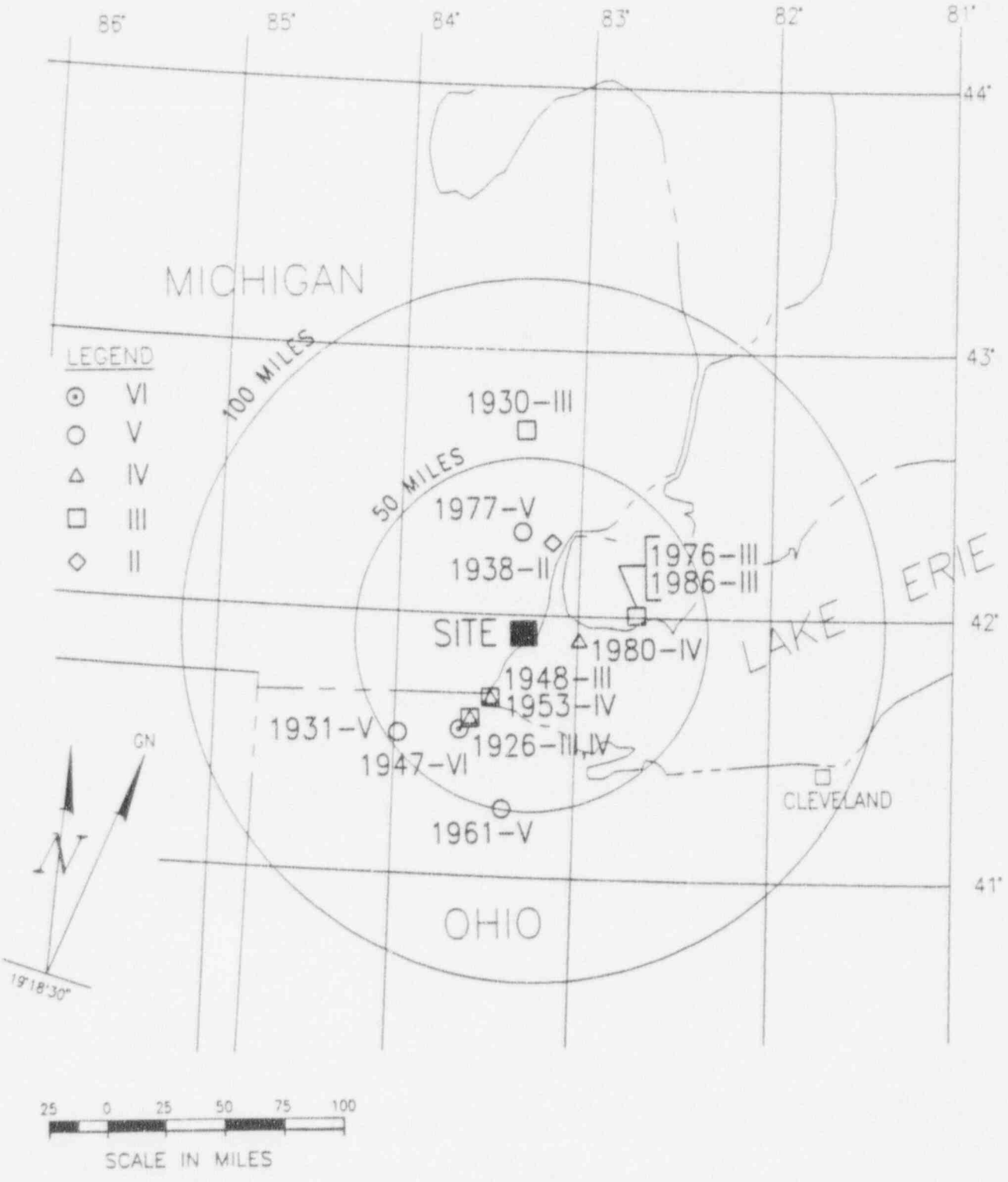
It is beyond the scope of this document to chronically arrange the events of the turbine failure on December 25, 1993.

At approximately 13:15 of December 25, 1993, the number 3 low-pressure turbine at Fermi 2 failed catastrophically. The turbine threw several blades. One blade ripped through the steel turbine casing. The other blades are believed to be in-



Epicenter Map, Detroit Area, Intensity V or Greater, 200 Mile Radius

Figure 2.1.1.1



Epicenter Map, Detroit Area, All Earthquakes, 50 Mile Radius

Figure 2.1.1.2

side the condenser. Vibration caused measurements in excess of 37.5 mils peak-to-peak at the turbine bearings, recorded by the Diagnostic Vibration Analysis (DVA) System.

A small hydrogen explosion occurred near the number 9 bearing, and the resulting fire charred the shield wall. The fire or the steam from the turbine casing activated the fire protection system. Approximately six hundred thousand gallons of water poured into the turbine building. Additionally, a 2" cooling system pipe was severed, adding more water. The turbine lubricating system also failed, and approximately seventeen thousand gallons of oil poured onto the floor. The ensuing mixture drained into the turbine building basement.

Turbine vibration tore couplings, sheared bolts, and loosened the excitor from the main turbine generator.

2.2.2 Shutdown

The turbine failure activated the turbine, seismic event, and reactor scram alarms, and both the turbine and the reactor proceeded to shutdown. All safety systems responded to achieve a satisfactory shutdown of the turbine and the reactor. The event was declared an alert at approximately 13:52 due to fire potential, and later downgraded to an unusual event.

2.2.3 Observations

No personnel were in the vicinity of the turbine failure. Almost all personnel nearby heard a loud noise, followed by a rumbling, which lasted two to three minutes. Some personnel felt vibrations through the building. Almost simultaneously, personnel in the buildings heard the reactor scram alarm. Those near the turbine building reported heavy smoke.

Several personnel were directed to inspect the turbine building for fire. They noted damaged parts on the third floor, and a small fire at the generator brushes, which they extinguished with a CO2 fire extinguisher.

Remaining personnel proceeded in duties as directed to facilitate the reactor shutdown.

2.2.4 Human Sensitivity to Vibration

Work conducted by numerous researchers have established physiological limits of human perceptibility to vibration. The studies demonstrate humans can detect vibrations well below the current instrument sensitivity at Fermi 2 (Figure 2.2.4.1).

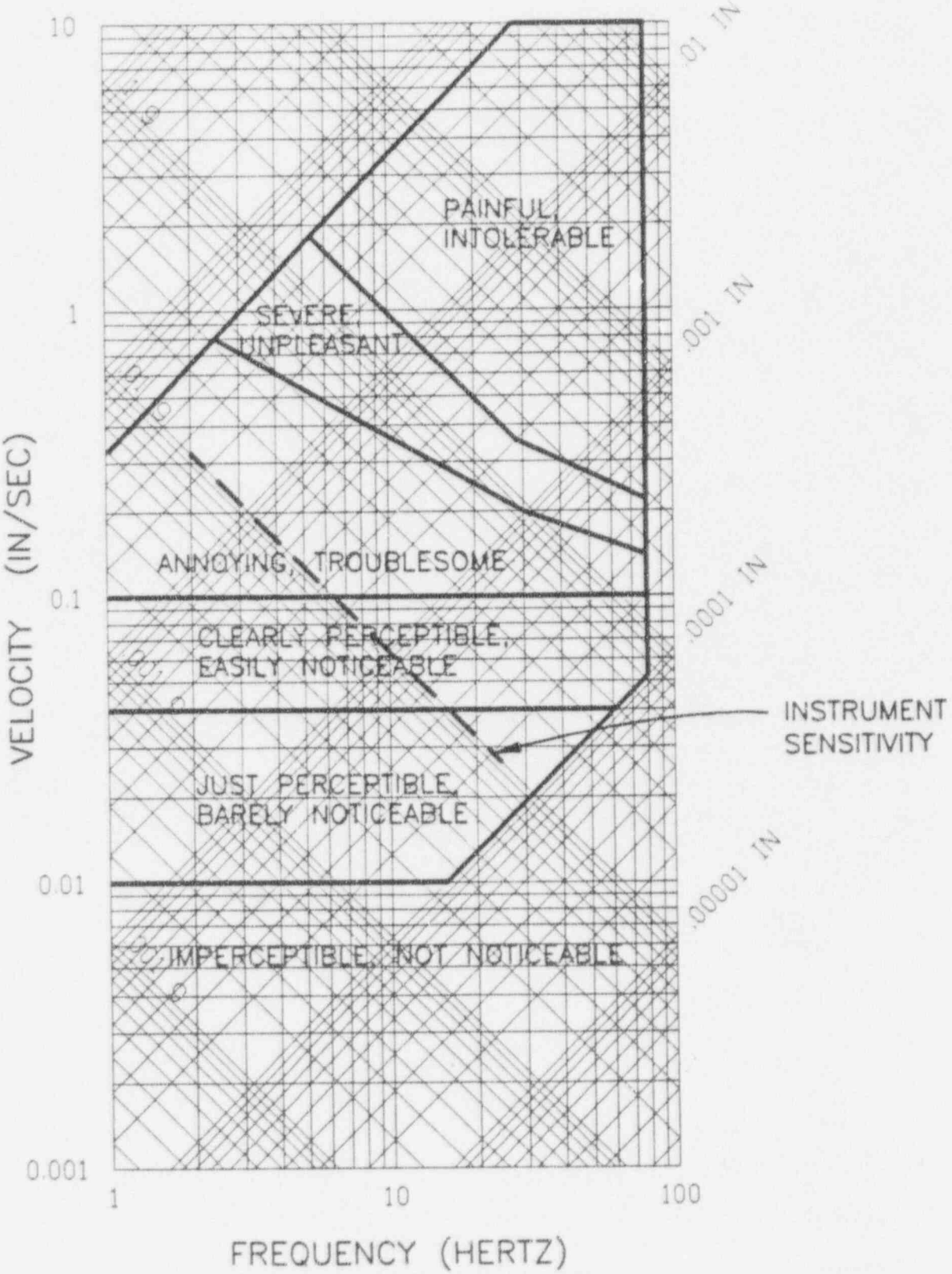
2.2.5 Fermi 2 Seismic Event Procedure Requirements

The turbine failure activated the seismic alarm and necessitated the reactor shutdown. The Fermi 2 UFSAR includes a required response when the seismic event alarm is activated (Figure 2.2.5.1). If the seismic event exceeds the OBE, the reactor must be shutdown as quickly as possible. The decision to shutdown involves examining the active traces from the HPCI room, utilizing the playback mode of recording instrumentation, and removing the HPCI room record plates and examining the data compared to the OBE. If the seismic event produced a horizontal acceleration greater than 0.05 g, or the relevant OBE is exceeded, the facility is shutdown, and further operation is not resumed until analysis and/or refurbishing of necessary structures, systems, or components is completed.

The turbine failure necessitated the reactor shutdown immediately, precluding the shutdown operating decision described above.

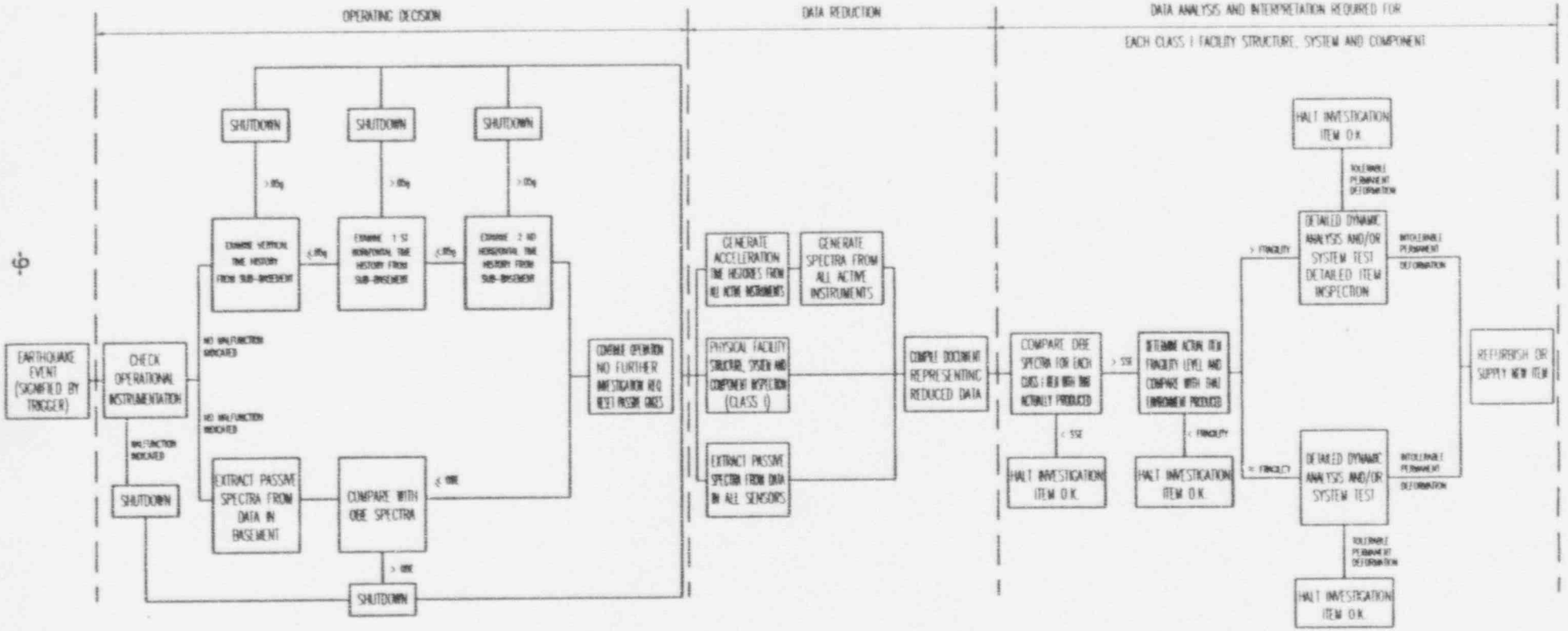
Additionally, the UFSAR requires data reduction, analysis, and interpretation of accelerometer time histories and response spectra from active instruments; response spectra from passive instruments; and physical facility structures, systems, and components inspection. If the event does not exceed Safe Shutdown Earthquake (SSE) validation levels, the item is considered safe for further operation. If the event exceeds validation levels, further investigation is required

Investigation may include establishing realistic equipment fragility levels, detailed dynamic response analysis, or inspection. The investigation results in the item proclaimed acceptable, or the item refurbished, for normal facility operation to commence.



Human Vibration Sensitivity

Figure 2.2.4.1



Data Analysis Flowchart

Figure 2.2.5.1

3.0 DATA

3.1 Instrumentation and Location

3.1.1 Passive Sensors

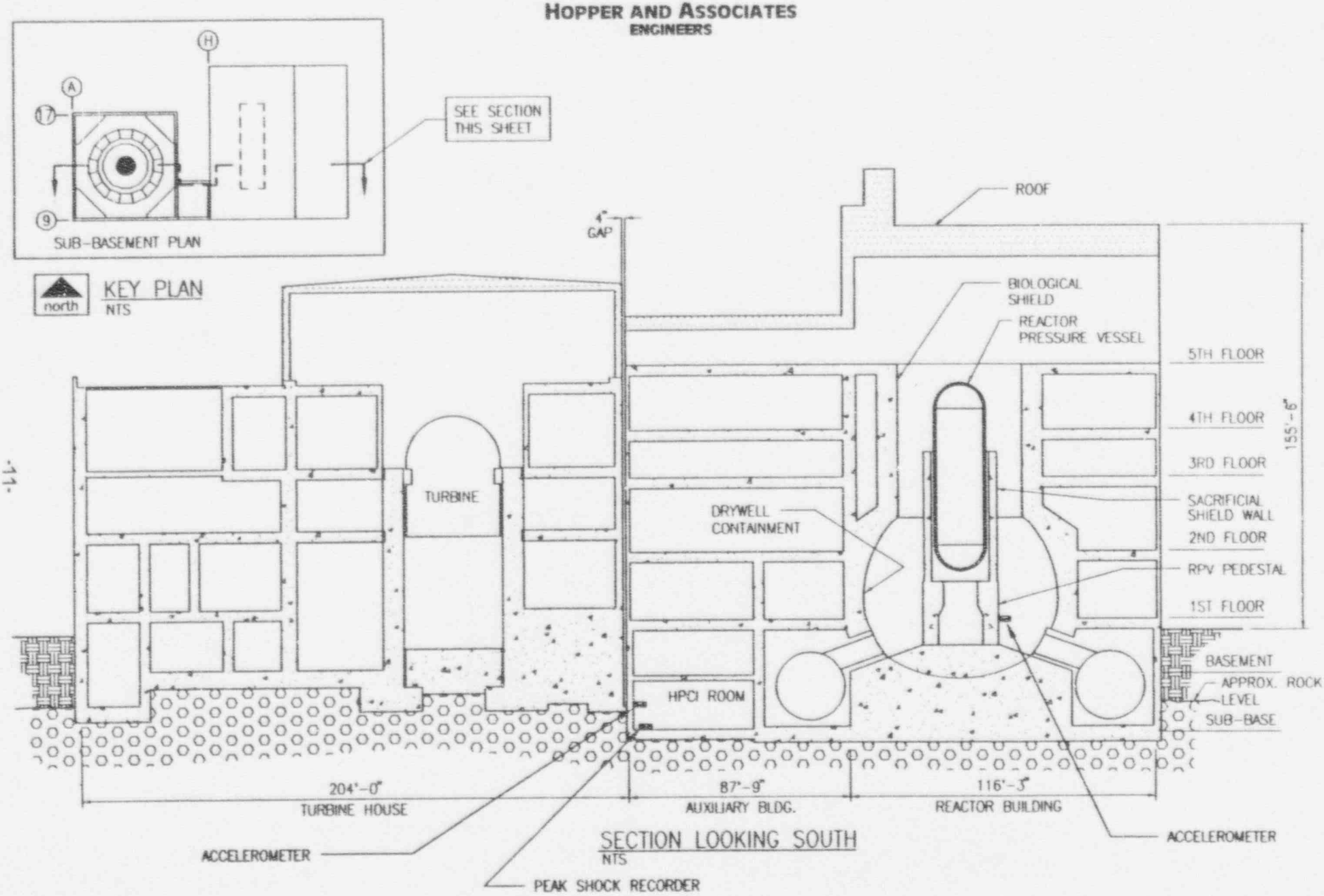
Engdahl PSR1200 peak shock recorders are the passive recording instrumentation located in the Reactor/Auxiliary building. The sensors record various ground motion and in-structure response shock spectra in three orthogonal directions. The sensors contain twelve reeds, each with a diamond tipped stylus, which etches a scribe mark on a metal record plate. Each reed is tuned to a predominant structural frequency, ranging from approximately two to twenty-five Hz. The record plate and the scribe mark provide a permanent indication of the dynamic excitation at a particular frequency. Reed deflection is calibrated as a linear function of acceleration. After a seismic event, the plates are removed and the reduced data establishes the response spectra.

Three Engdahl recorders are located in the Reactor/Auxiliary building, in the HPCI room, the second floor, and the fifth floor (Figures 3.1.1.1 through 3.1.1.3). The recorders are positioned to measure accelerations in the vertical, north/south, and east/west directions at each sensor.

Passive sensors are calibrated and the plates replaced after a seismic event or approximately every 18 months. The plates for the Reactor/Auxiliary building were last calibrated and replaced in July of 1993 on the second and fifth floors, and September of 1993 in the HPCI room.

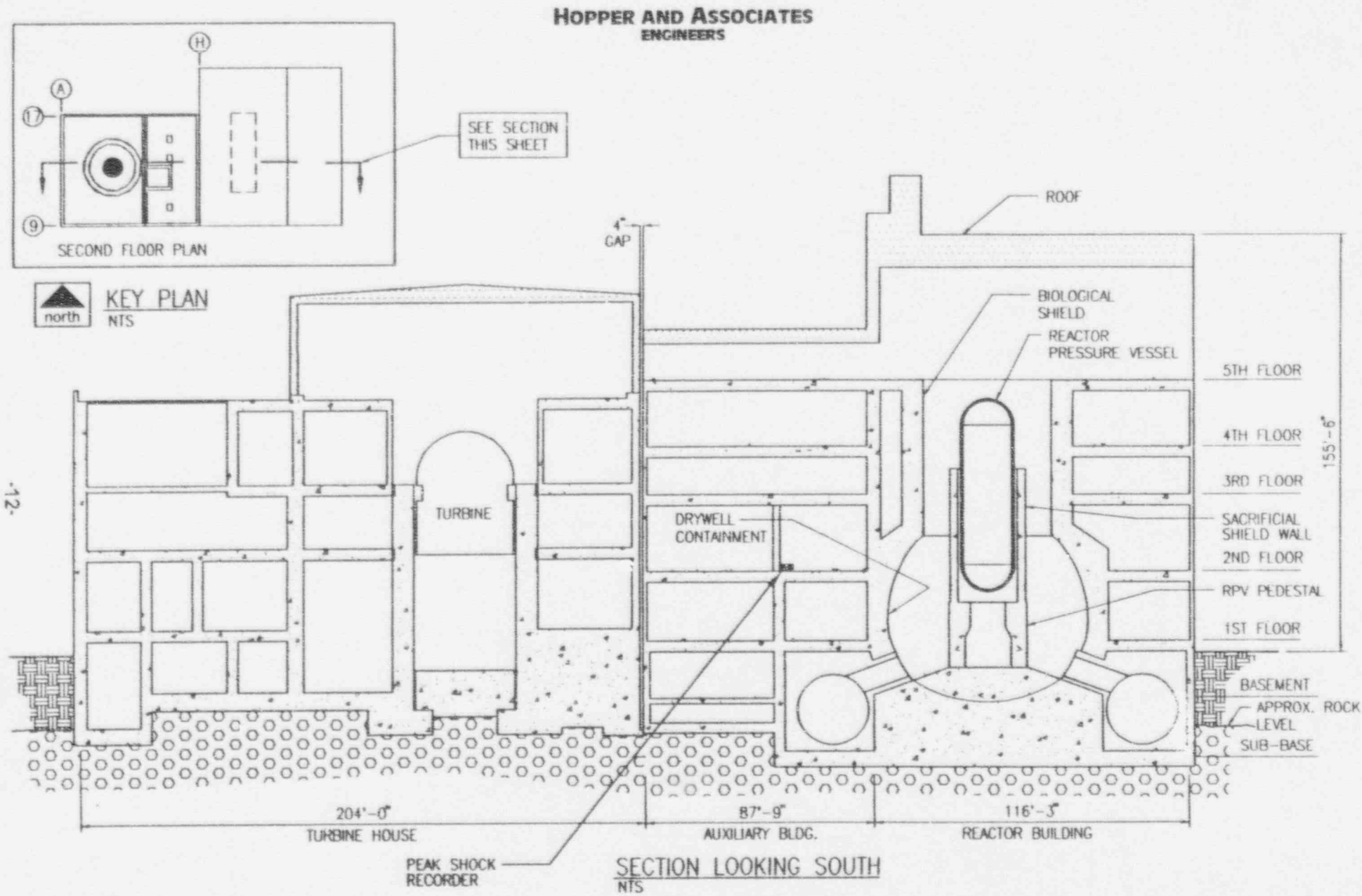
3.1.2 Active Sensors

Teledyne/Geotech Model 37800 strong motion triaxial time history accelerometers are the active recording instrumentation located in the Reactor/Auxiliary building. The active system includes the accelerometer sensors, seismic triggers, MTS-100B monitor and recorder, PMO-101/201 playback system, and an alarm panel. The accelerometers have a preset event trigger at 0.01 g, which energizes and activates the recording system. The system records over a frequency range of 0 to 40 Hz for a specified time length after motion has stopped. The output



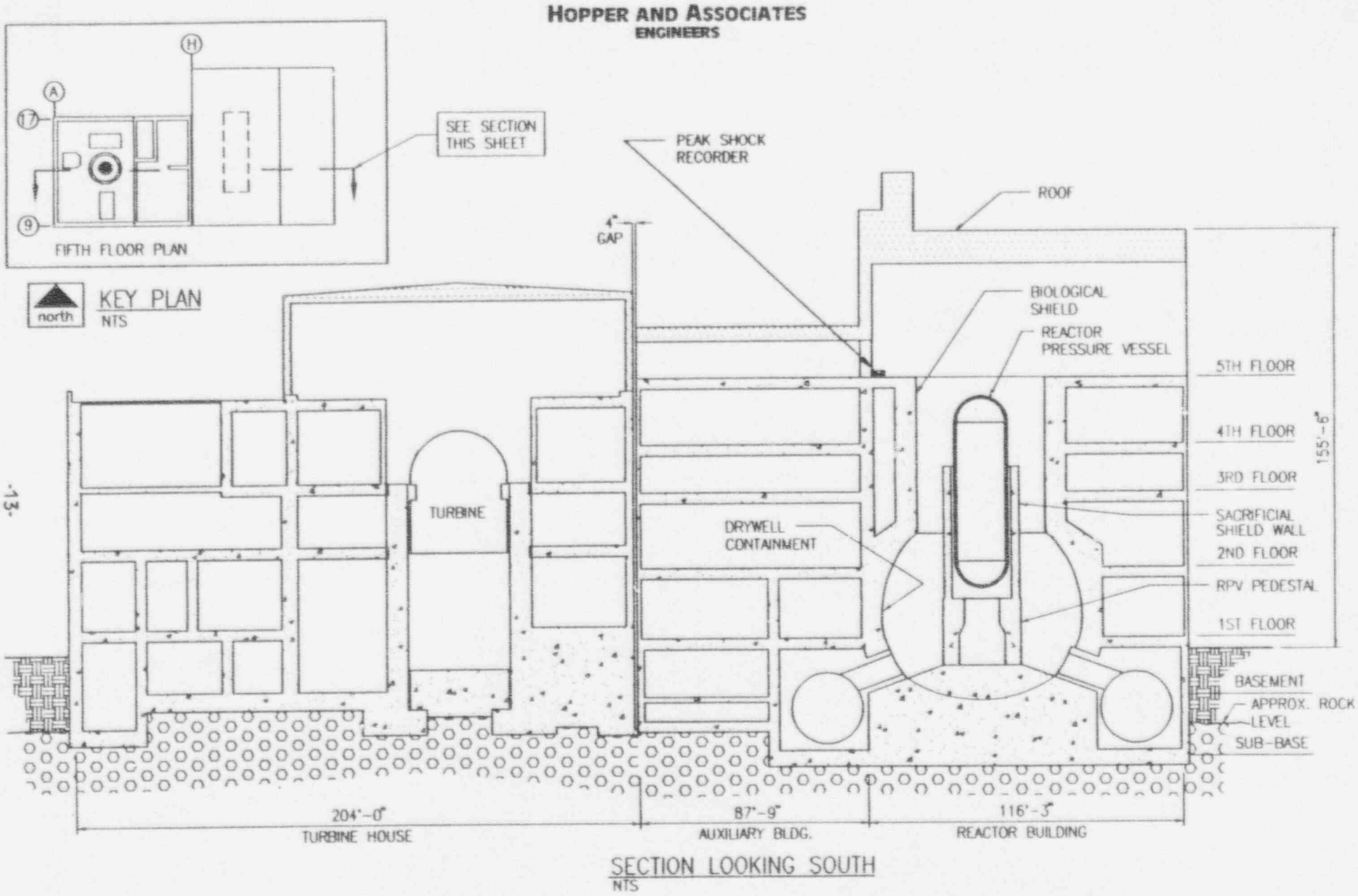
Passive and Active Instrumentation Location at HPCI Room and RPV Pedestal

Figure 3.1.1.1



Passive Instrumentation Location at Second Floor

Figure 3.1.1.2



Passive Instrumentation Location at Fifth Floor

Figure 3.1.1.3

produces a time history strip chart and a magnetic data tape of the event. The active instrumentation provides time histories from which response spectra may be generated.

Two Teledyne/Geotech accelerometers are located in the Reactor/Auxiliary building, in the HPCI room sub-basement and at the RPV pedestal (Figure 3.1.1.1). The accelerometers measure longitudinal, transverse, and vertical acceleration, which correspond to the vertical, north/south, and east/west directions of the passive recorders.

3.2 Data Reduction

3.2.1 Passive Sensors

The record plates from the three passive sensors in the Reactor/Auxiliary building were removed for data reduction. The plates were inspected for scribe marks, and the calculated accelerations were plotted against the relevant OBE and SSE response spectra (Tables 3.2.1.1 through 3.2.1.9 and Figures 3.2.1.1 through 3.2.1.9). Additionally, the instrument sensitivity was plotted. The passive sensor is capable of measuring accelerations greater than 0.01 g. The Engdahl peak shock recorders have 2% damping, and have $\pm$ 3% accuracy at 1 g.

The sensors were last calibrated and the plates replaced in July of 1993 (second and fifth floors) and in September of 1993 (HPCI room).

3.2.2 Active Sensors

Subsequent to the activation of the instrumentation, two distinct tremors were recorded. The first event occurred at approximately two seconds, with a duration of approximately 0.1 second, and the second event occurred at approximately one minute, also with a duration of approximately 0.1 second.

Time history acceleration data recorded by the two active sensors in the Reactor/Auxiliary building were digitized by Detroit Edison Company (Figures 3.2.2.1 through 3.2.2.6). A simple Fortran routine was used to produce the response spectra. The generated response spectra were plotted against the relevant OBE and SSE response spectra (Figure 3.2.2.7 through 3.2.2.12).

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2.11	2.5	0.098	0.349	0.034
2	2.54	4.25	0.167	0.528	0.088
3	3.45	4.5	0.177	0.865	0.153
4	4.07	6.25	0.25	1.24	0.31
5	5.1	2.5	0.10	1.98	0.19
6	6.36	1.0	0.04	3.14	0.12
7	7.95	0.25	0.01	5.18	0.05
8	10.16	0.25	0.01	7.26	0.07
9	12.75	0.5	0.02	13.61	0.27
10	15.58	0.25	0.01	18.10	0.18
11	20.33	-		30.66	
12	25.25	-		46.98	

D30-N005 Passive Instrumentation, Vertical Direction Records - HPCI Room

Table 3.2.1.1

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2	-		0.357	
2	2.5	0.5	0.02	0.52	0.01
3	3.17	-		0.84	
4	4.15	-		1.35	
5	4.95	-		1.90	
6	6.4	-		3.26	
7	7.75	-		4.69	
8	9.8	1.0	0.04	7.38	0.29
9	12.65	-		12.39	
10	15.9	-		18.11	
11	20.29	-		29.40	
12	25.41	-		45.50	

D30-N005 Passive Instrumentation, North/South Direction Records - HPCI Room

Table 3.2.1.2

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	1.96	2.75	0.108	0.376	0.041
2	2.39	6.0	0.236	0.556	0.131
3	3.16	6.5	0.256	0.89	0.23
4	3.96	3.2	0.126	1.29	0.16
5	5.05	2.0	0.079	2.10	0.17
6	[illegible]	-		3.18	
7	7.9	3.25	0.128	4.86	0.62
8	9.89	-		7.58	
9	12.27	-		11.58	
10	15.7	0.5	0.02	18.87	0.37
11	19.67	1.5	0.059	30.08	1.78
12	25.71	-		48.78	

D30-N005 Passive Instrumentation, East/West Direction Records - HPCI Room

Table 3.2.1.3

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2.05	-		0.322	
2	2.45	-		0.494	
3	3.21	-		0.784	
4	3.96	-		1.243	
5	4.86	-		1.918	
6	6.35	-		3.101	
7	7.84	-		4.9	
8	10.08	-		7.85	
9	12.59	-		11.7	
10	15.98	-		19.23	
11	20.49	-		29.85	
12	25.18	-		45.72	

D30-N601 Passive Instrumentation, Vertical Direction Records - Second Floor

Table 3.2.1.4

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	1.99	-		0.362	
2	2.59	0.13	**0.005**	0.536	**0.003**
3	3.11	-		0.821	
4	3.93	-		1.31	
5	5.03	-		1.99	
6	6.39	-		3.21	
7	7.96	-		4.86	
8	10.13	-		7.44	
9	12.54	-		12.31	
10	15.88	-		18.35	
11	19.91	-		28.73	
12	25.04	-		47.04	

D30-N601 Passive Instrumentation, North/South Direction Records - Second Floor

Table 3.2.1.5

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2.14	-		0.372	
2	2.54	-		0.524	
3	3.29	-		0.831	
4	3.95	-		1.32	
5	5.12	-		1.95	
6	6.33	-		3.17	
7	7.78	-		4.82	
8	9.92	-		7.48	
9	12.91	-		12.27	
10	15.89	-		18.61	
11	20.19	-		29.63	
12	25.53	-		45.99	

D30-N601 Passive Instrumentation, East/West Direction Records - Second Floor

Table 3.2.1.6

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2	-		0.306	
2	2.58	-		0.508	
3	3.25	0.15	0.006	0.819	0.005
4	4.05	-		1.29	
5	5.05	-		2.01	
6	6.5	-		3.16	
7	7.85	-		5.5	
8	9.8	-		7.06	
9	12.8	-		11.96	
10	15.8	-		20.42	
11	20.2	-		28.99	
12	25.2	-		44.42	

D30-N006 Passive Instrumentation, Vertical Direction Records - Fifth Floor

Table 3.2.1.7

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2.14	-		0.4	
2	2.38	-		0.518	
3	3.2	-		0.843	
4	4	-		1.29	
5	5.1	-		2.07	
6	6.45	-		3.28	
7	7.95	-		4.84	
8	10.05	-		7.75	
9	12.57	0.13	**0.005**	11.90	**0.06**
10	15.7	-		19.05	
11	20.3	-		29.2	
12	25.2	-		47.07	

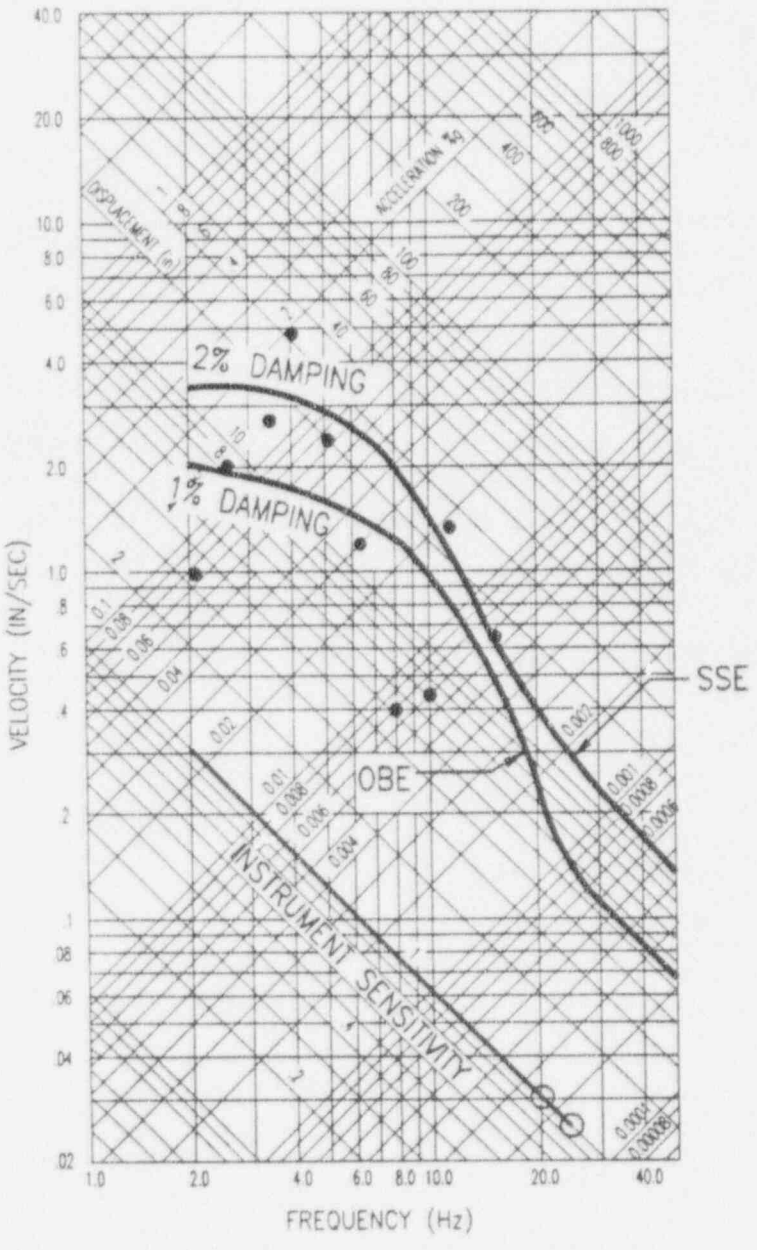
D30-N006 Passive Instrumentation, North/South Direction Records - Fifth Floor

Table 3.2.1.8

Reed No.	Hz	Measured mm	Inch	g/Inch	g
1	2.11	-		0.371	
2	2.58	-		0.522	
3	3.25	-		0.833	
4	4.15	-		1.33	
5	4.9	-		1.85	
6	6.3	0.25	0.01	3.11	0.03
7	7.9	-		4.84	
8	10.2	-		7.31	
9	12.5	-		11.68	
10	15.8	0.125	0.005	17.62	0.09
11	20.1	-		28.59	
12	25.1	-		48.21	

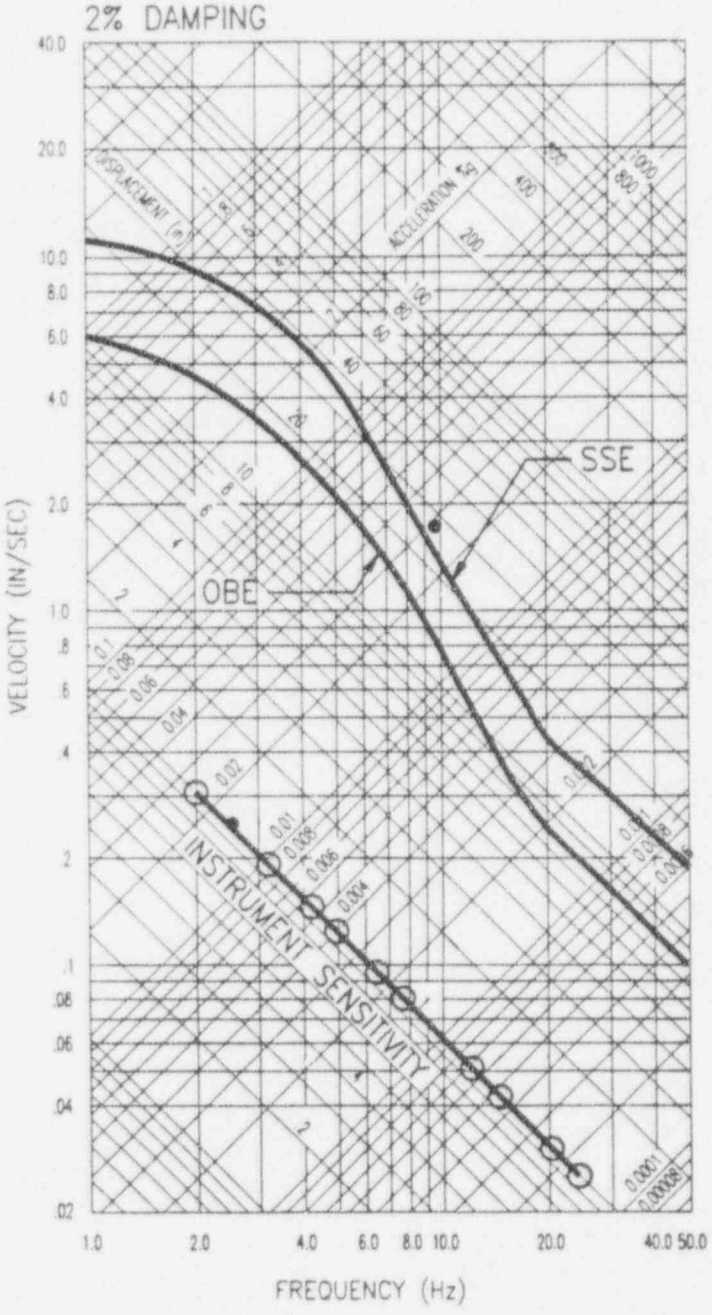
D30-N006 Passive Instrumentation, East/West Direction Records - Fifth Floor

Table 3.2.1.9



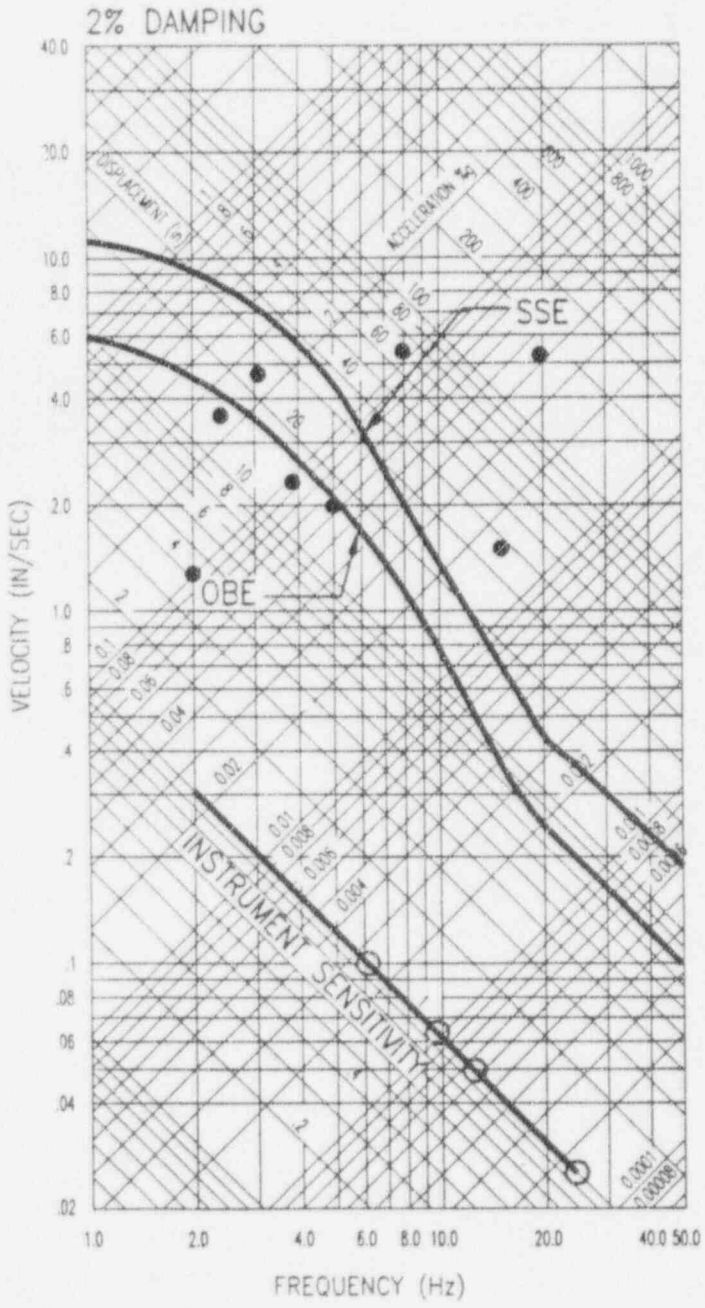
D30-N005 Passive Instrumentation, Vertical Response Spectra - HPCI Room

Figure 3.2.1.1



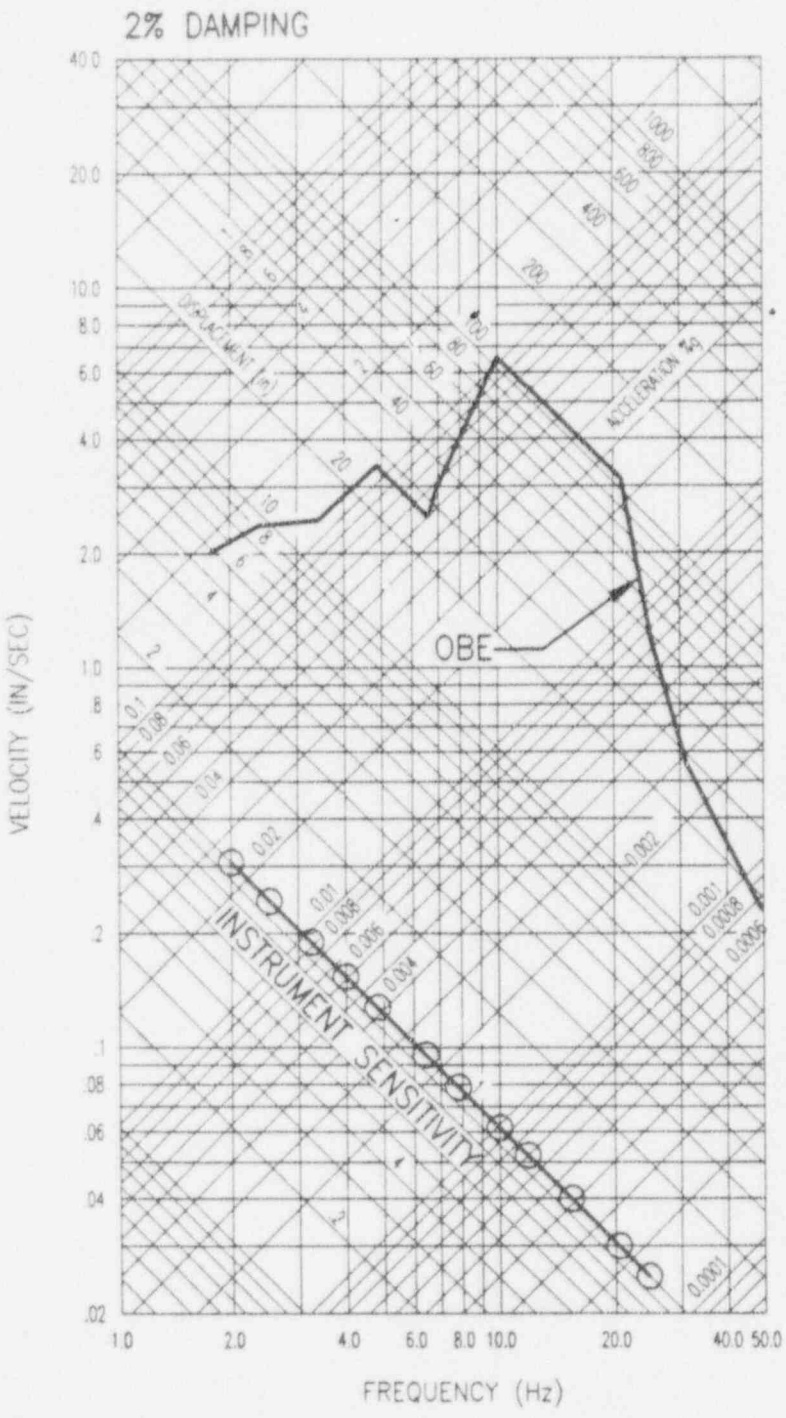
D30-N005 Passive Instrumentation, North/South Response Spectra - HPCI Room

Figure 3.2.1.2



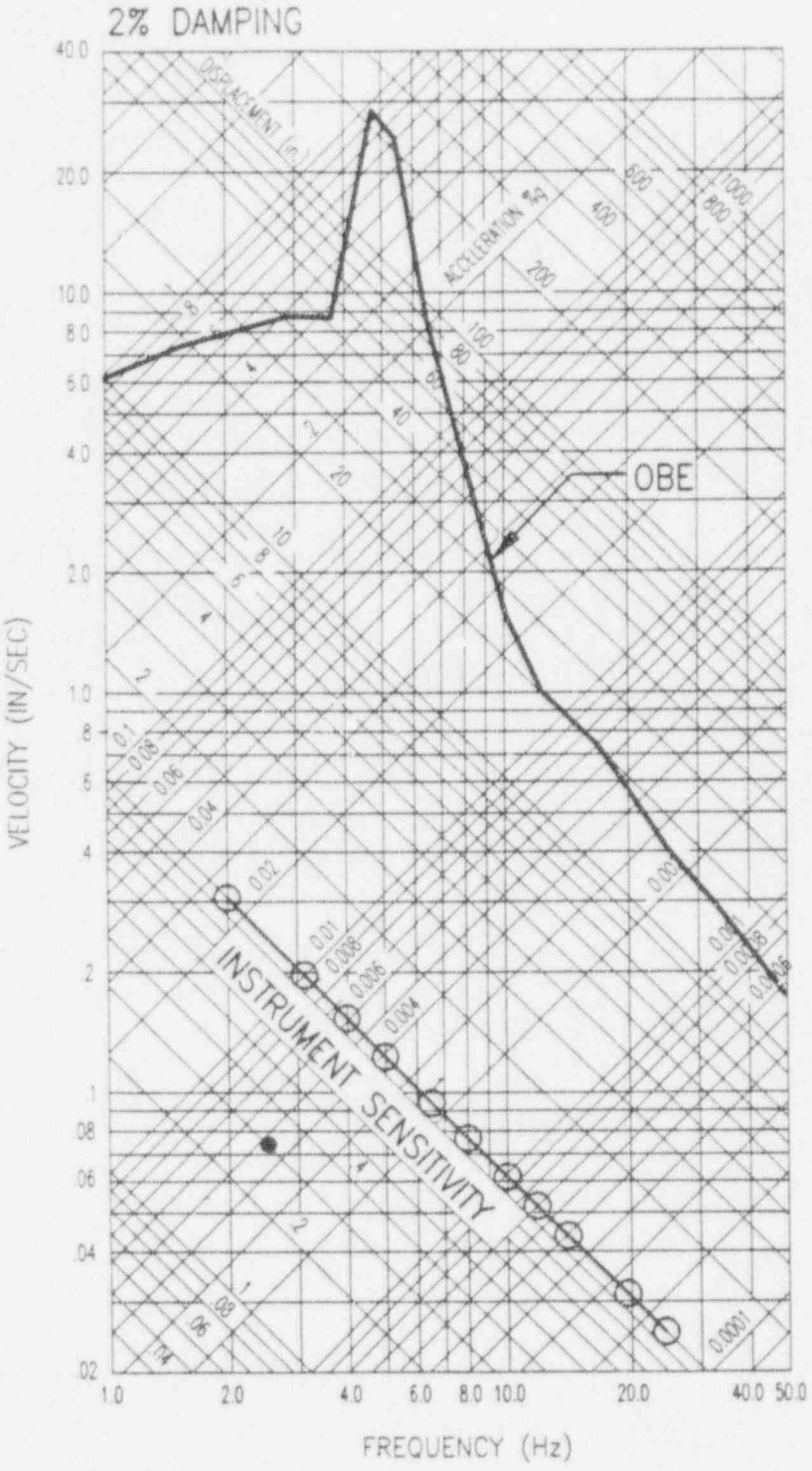
D30-N005 Passive Instrumentation, East/West Response Spectra - HPCI Room

Figure 3.2.1.3



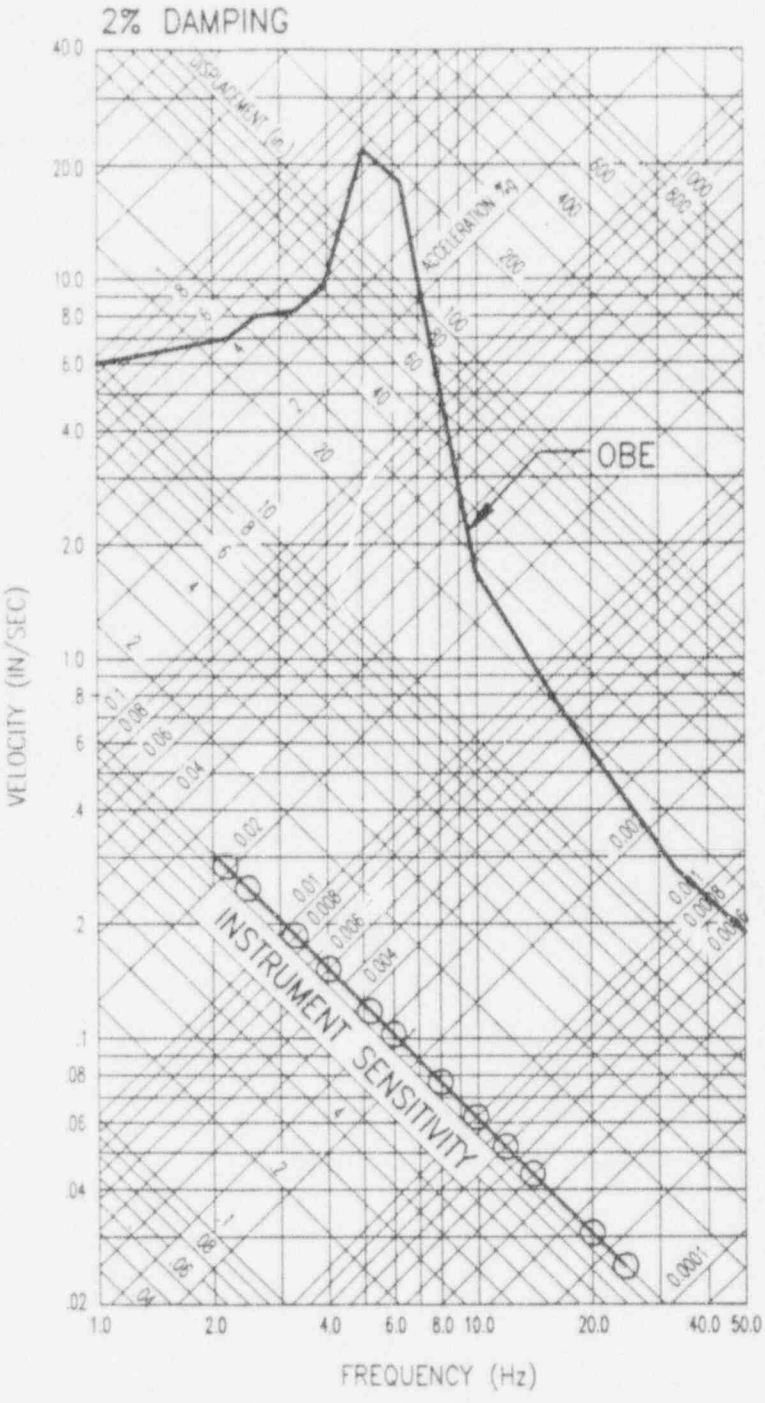
D30-N601 Passive Instrumentation, Vertical Response Spectra - Second Floor

Figure 3.2.1.4



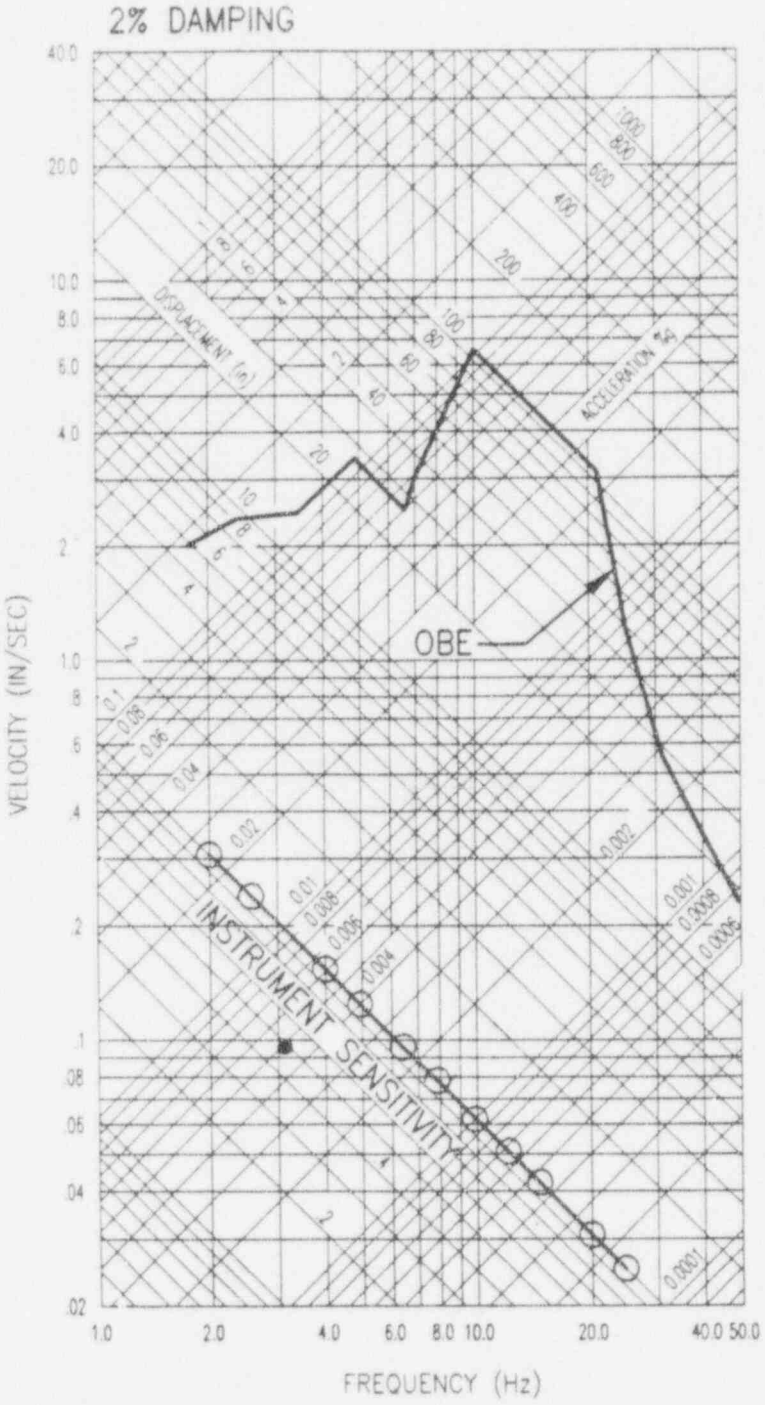
D30-N601 Passive Instrumentation, North/South Response Spectra - Second Floor

Figure 3.2.1.5



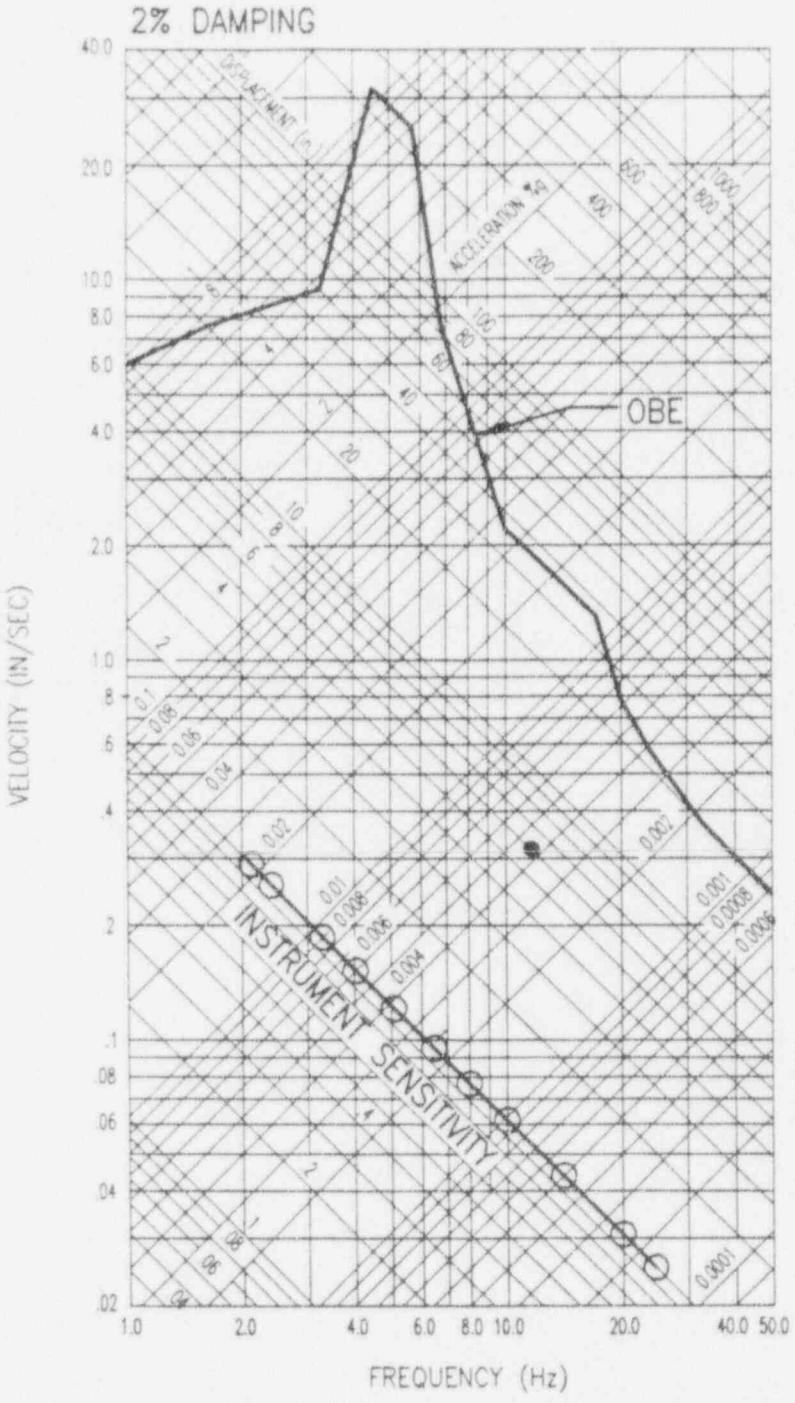
D30-N601 Passive Instrumentation, East/West Response Spectra - Second Floor

Figure 3.2.1.6



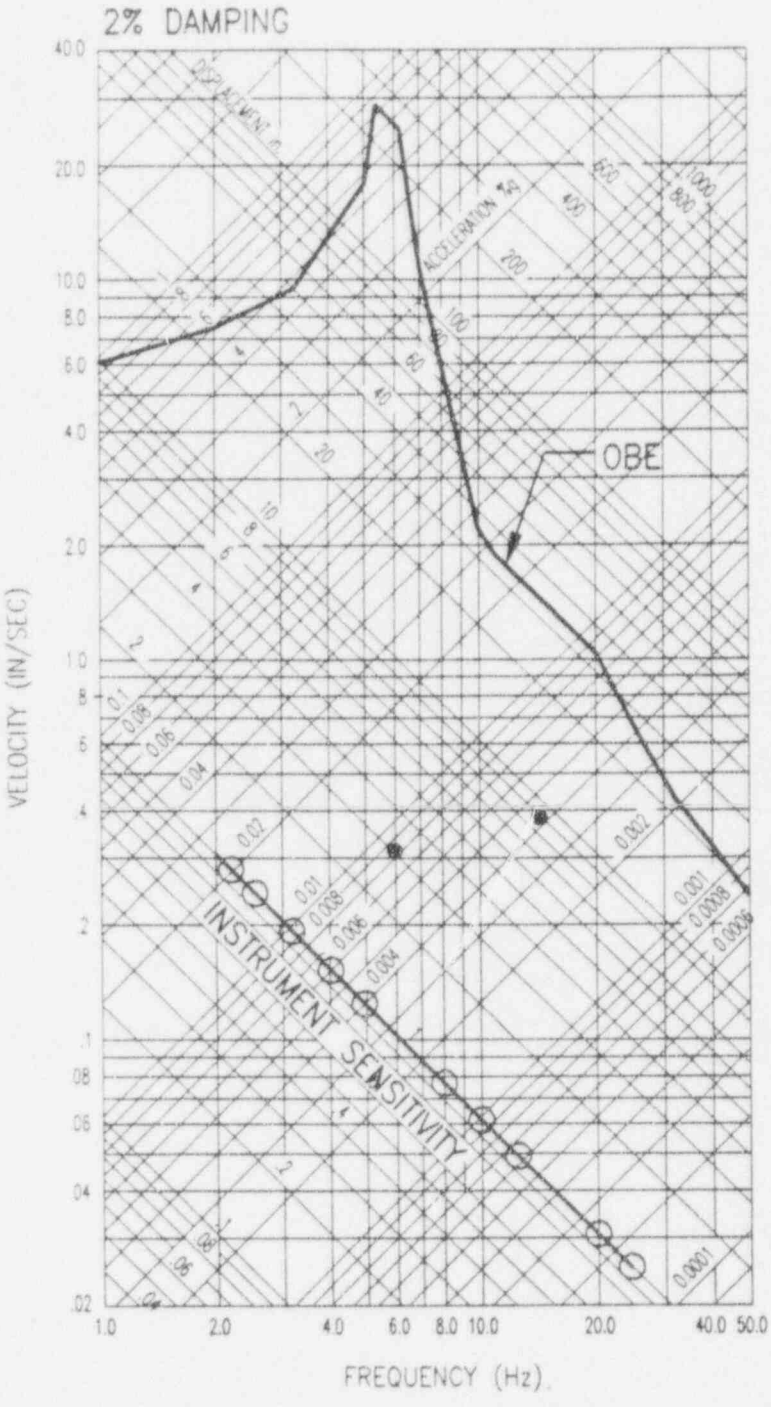
D30-N006 Passive Instrumentation, Vertical Response Spectra - Fifth Floor

Figure 3.2.1.7



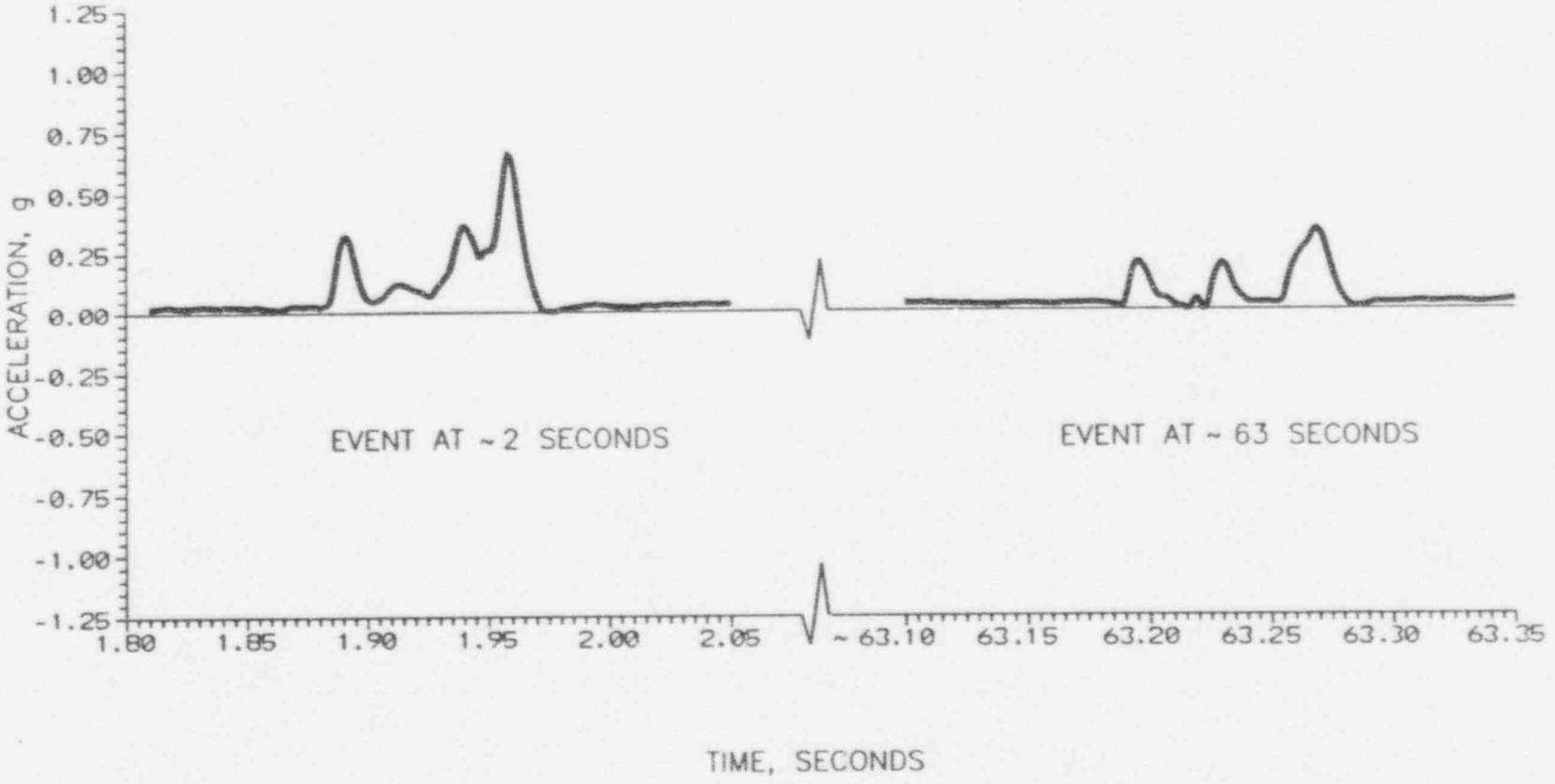
D30-N006 Passive Instrumentation, North/South Response Spectra - Fifth Floor

Figure 3.2.1.8



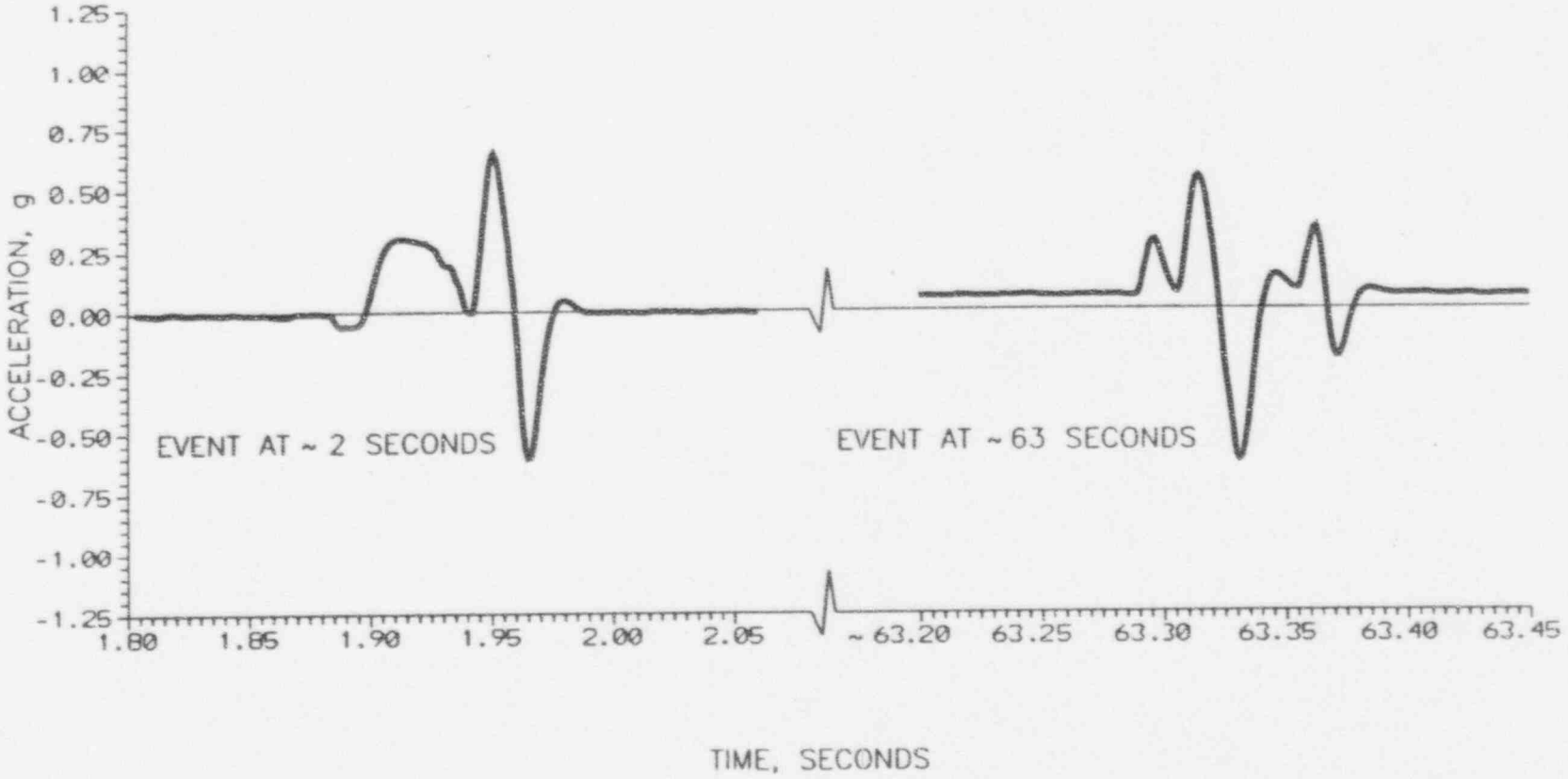
D30-N006 Passive Instrumentation, East/West Response Spectra - Fifth Floor

Figure 3.2.1.9



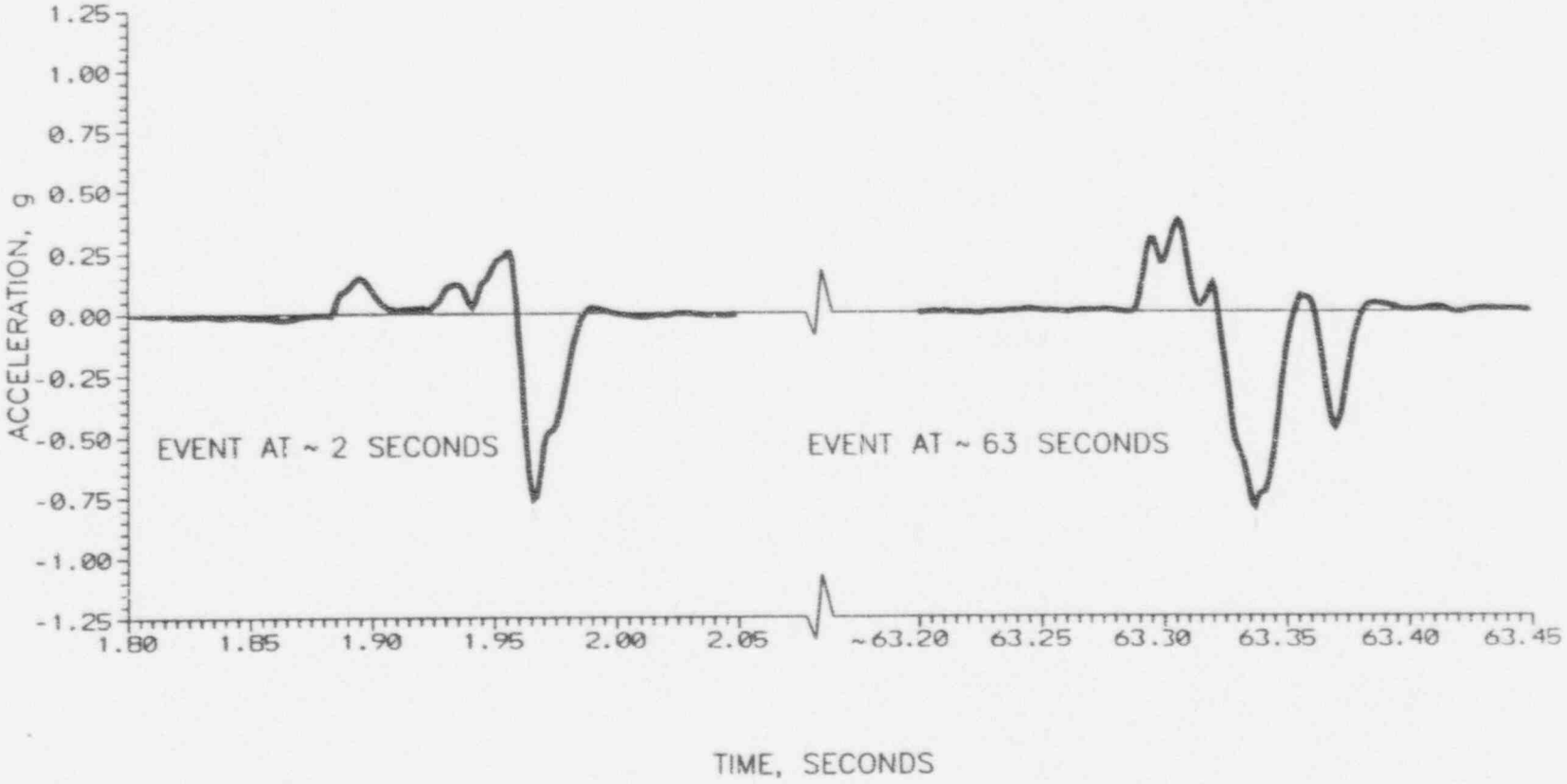
D30-N003 Accelerometer, Vertical Direction Time History - HPCI Room

Figure 3.2.2.1



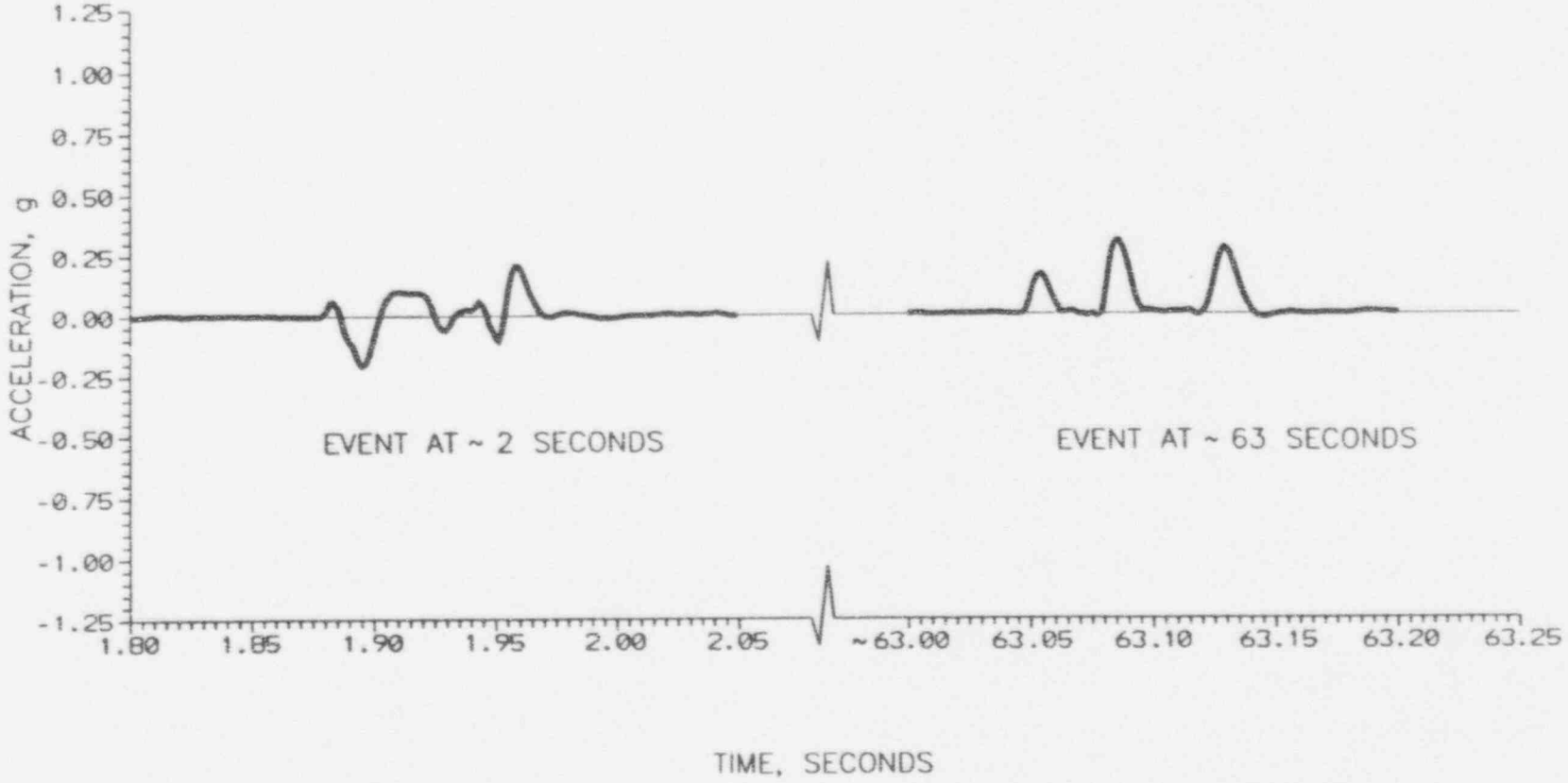
D30-N003 Accelerometer, North/South Direction Time History - HPCI Room

Figure 3.2.2.2



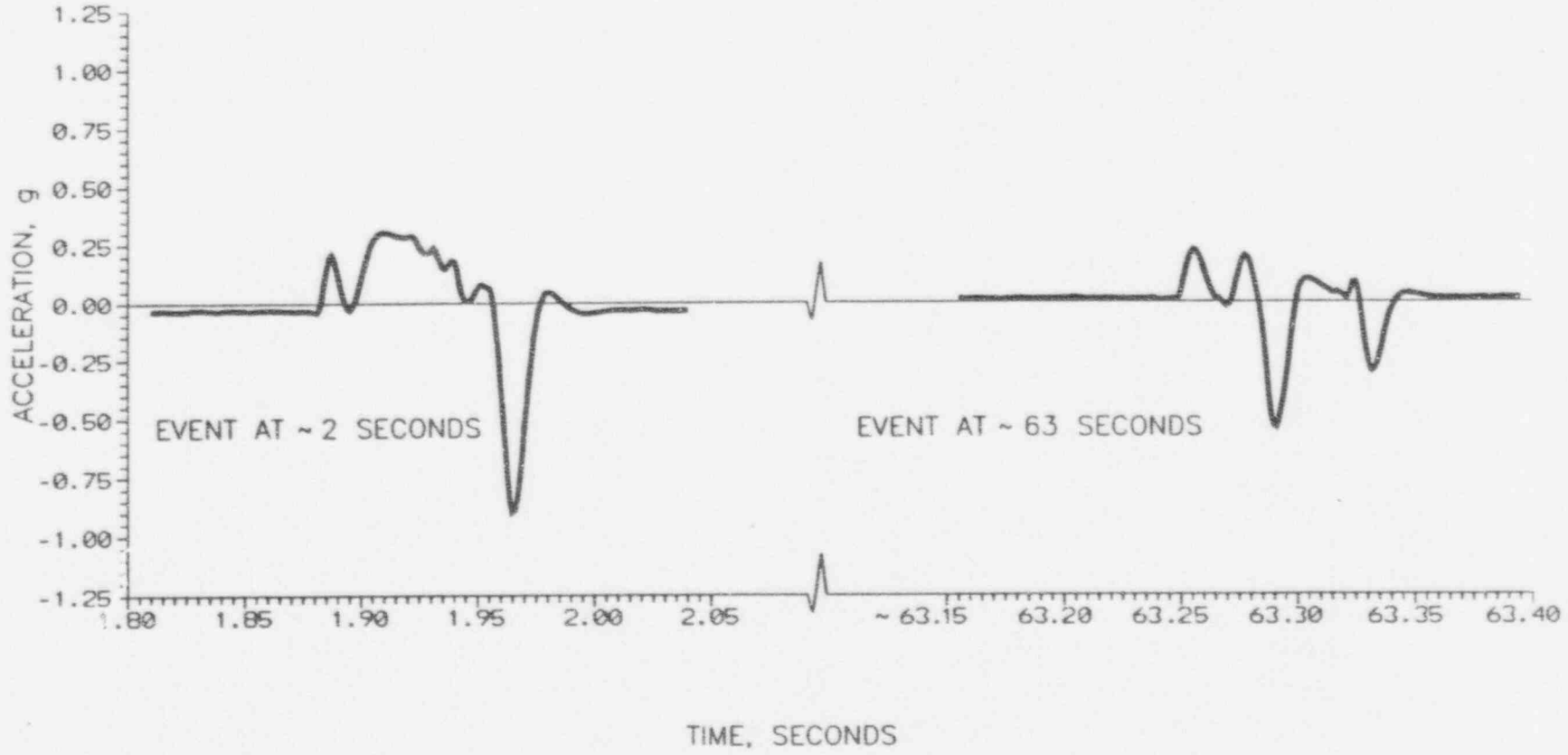
D30-N003 Accelerometer, East/West Direction Time History - HPCI Room

Figure 3.2.2.3



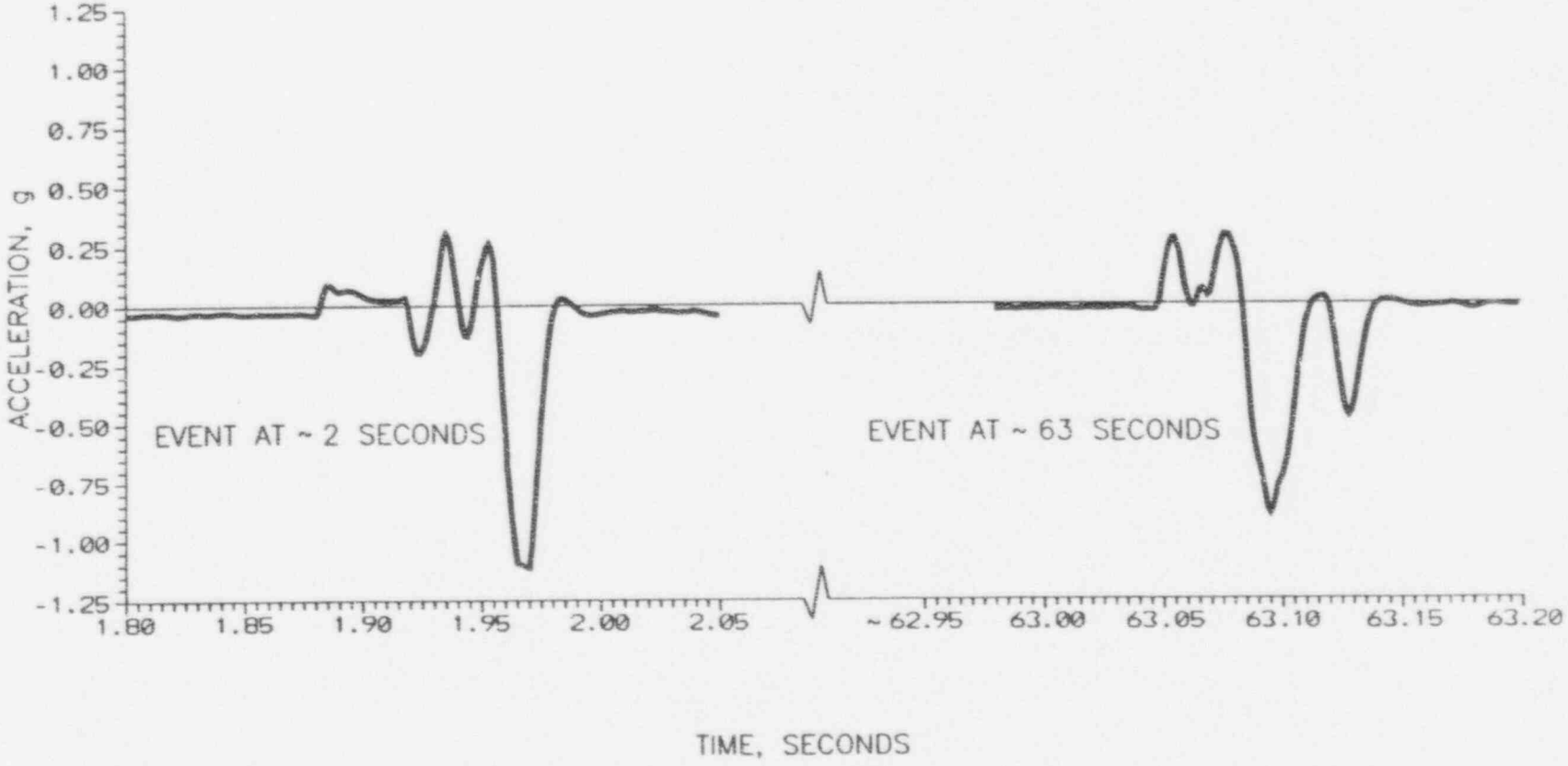
D30-N002 Accelerometer, Vertical Direction Time History - RPV Pedestal

Figure 3.2.2.4



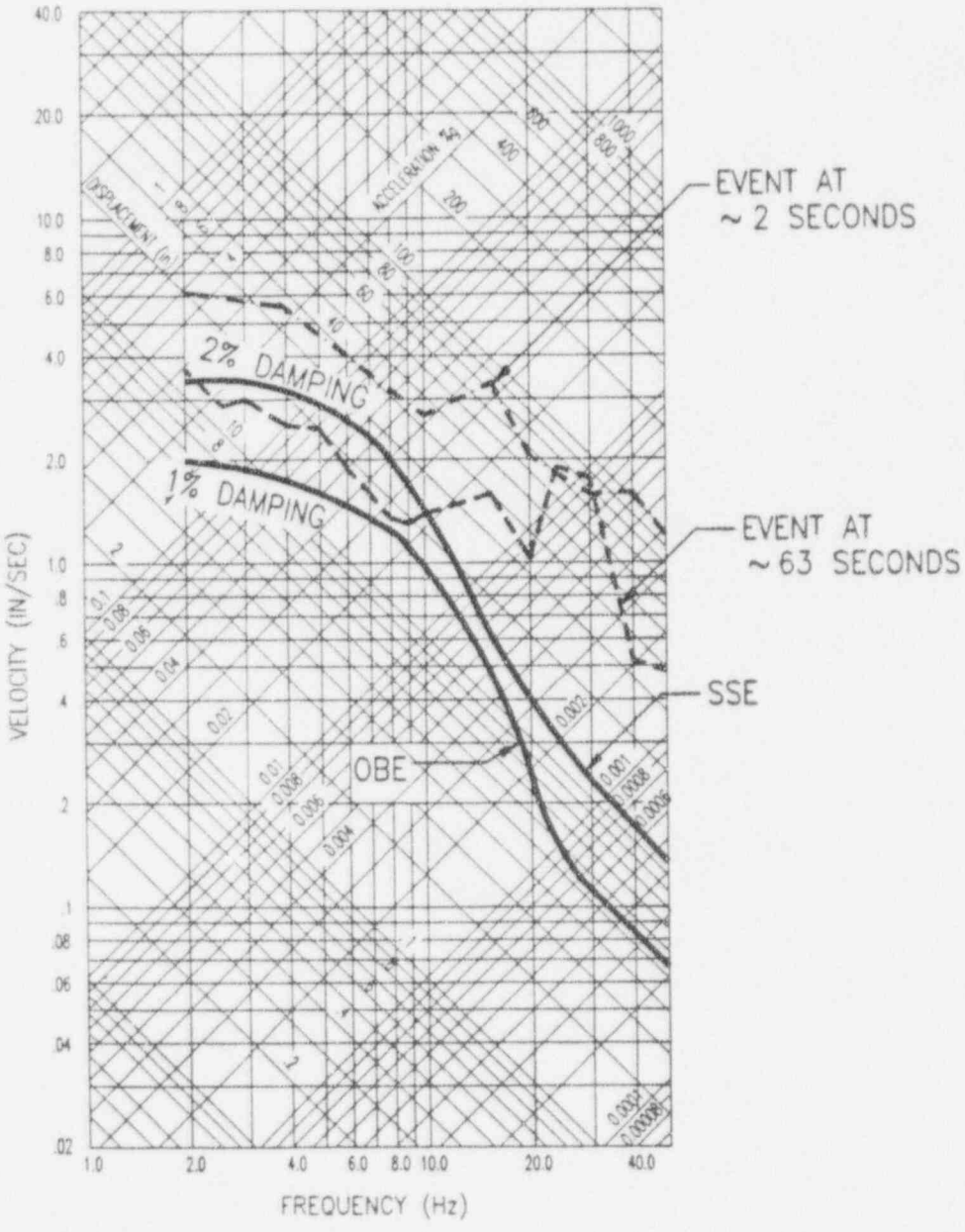
D30-N002 Accelerometer, North/South Direction Time History - RPV Pedestal

Figure 3.2.2.5



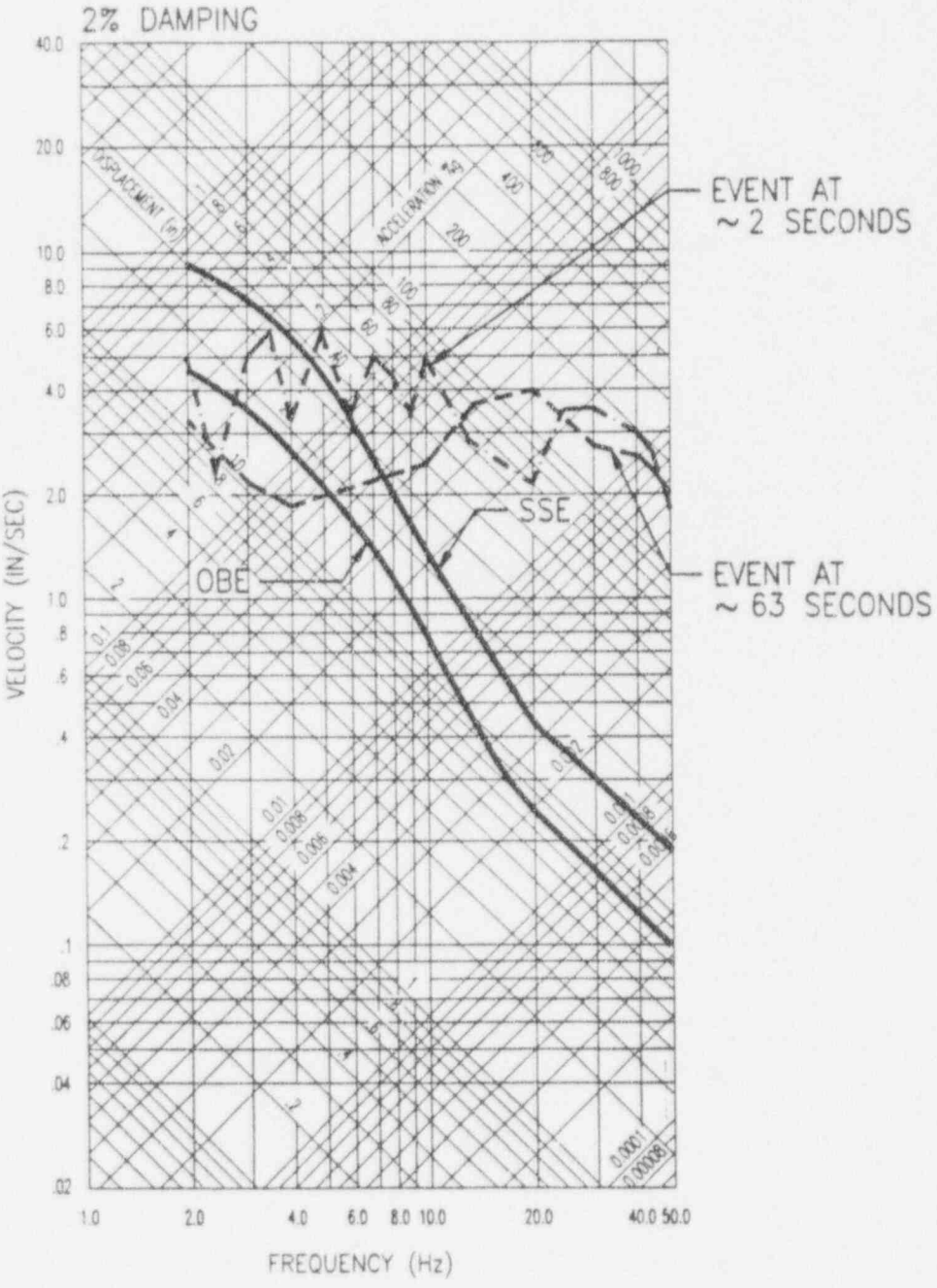
D30-N002 Accelerometer, East/West Direction Time History - RPV Pedestal

Figure 3.2.2.6



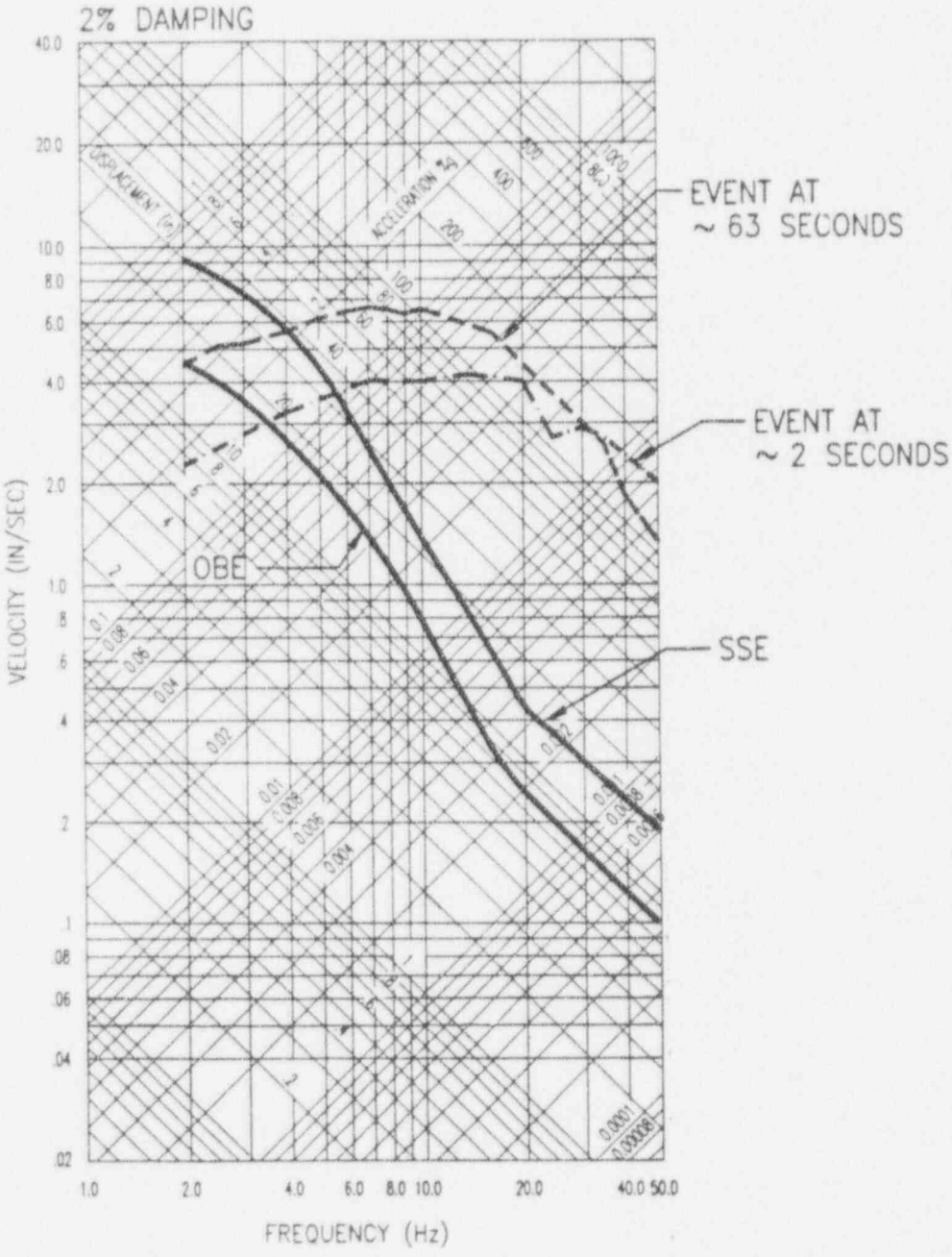
D30-N003 Accelerometer, Vertical Response Spectra - HPCI Room

Figure 3.2.2.7



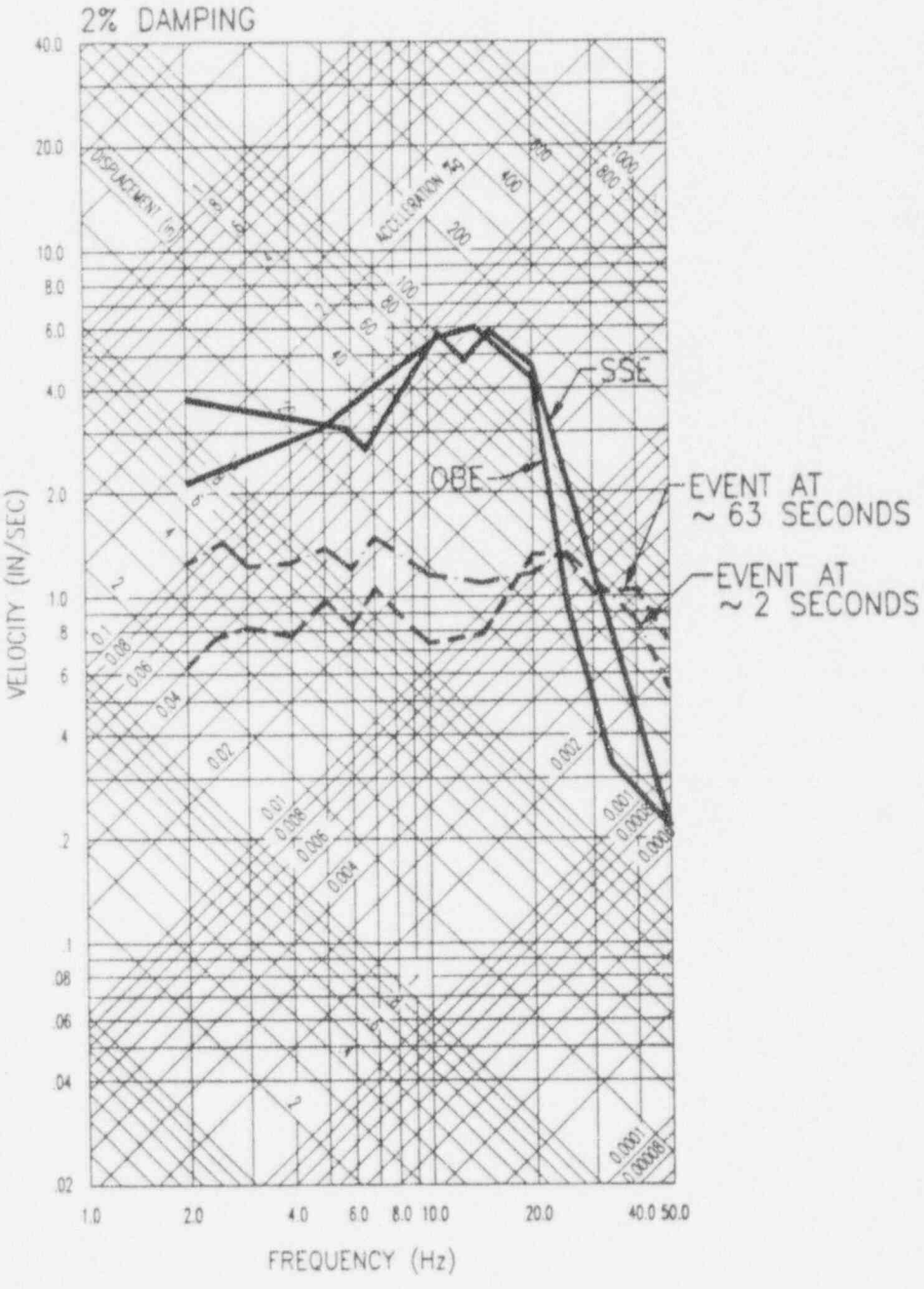
D30-N003 Accelerometer, North/South Response Spectra - HPCI Room

Figure 3.2.2.8



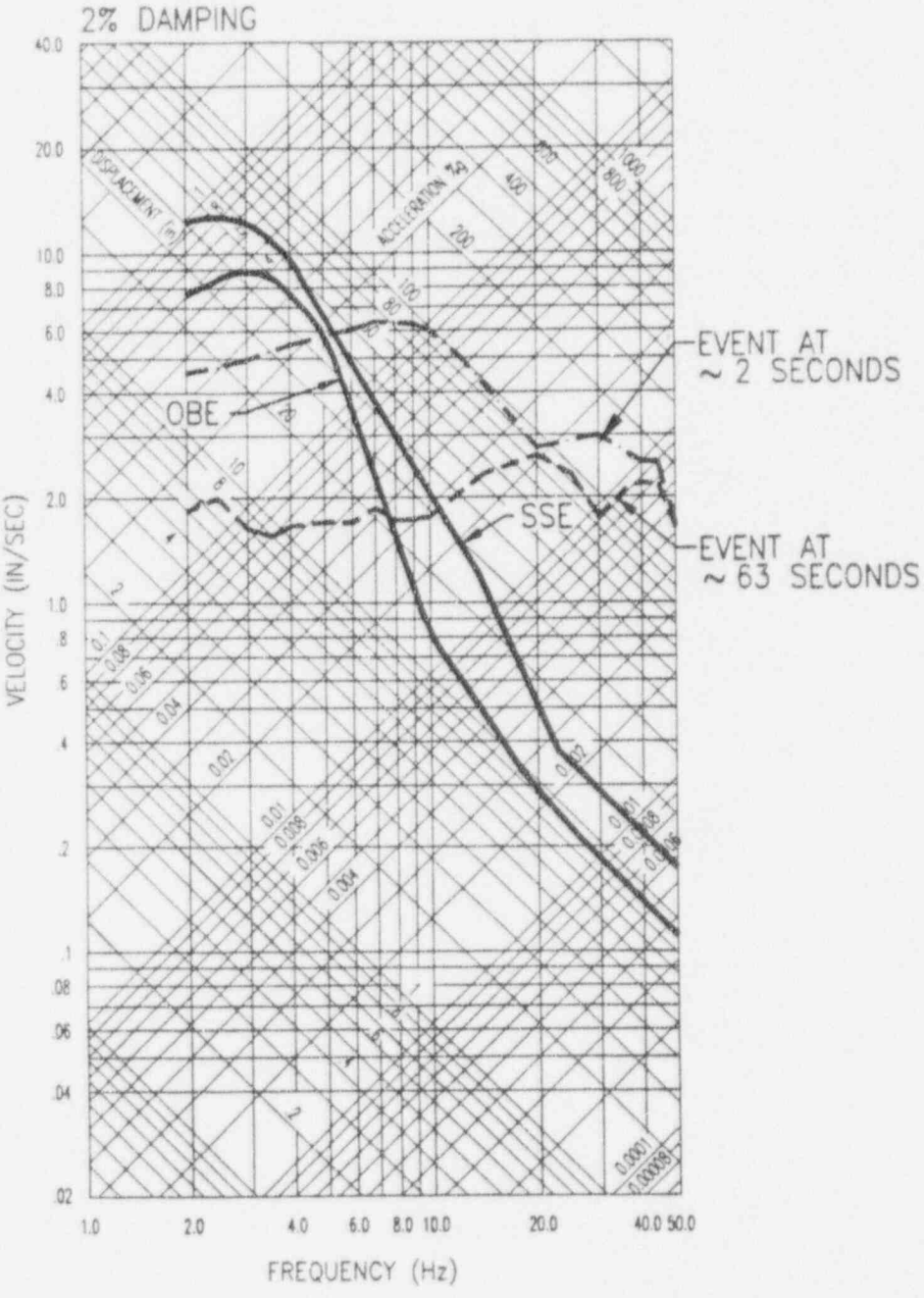
D30-N003 Accelerometer, East/West Response Spectra - HPCI Room

Figure 3.2.2.9



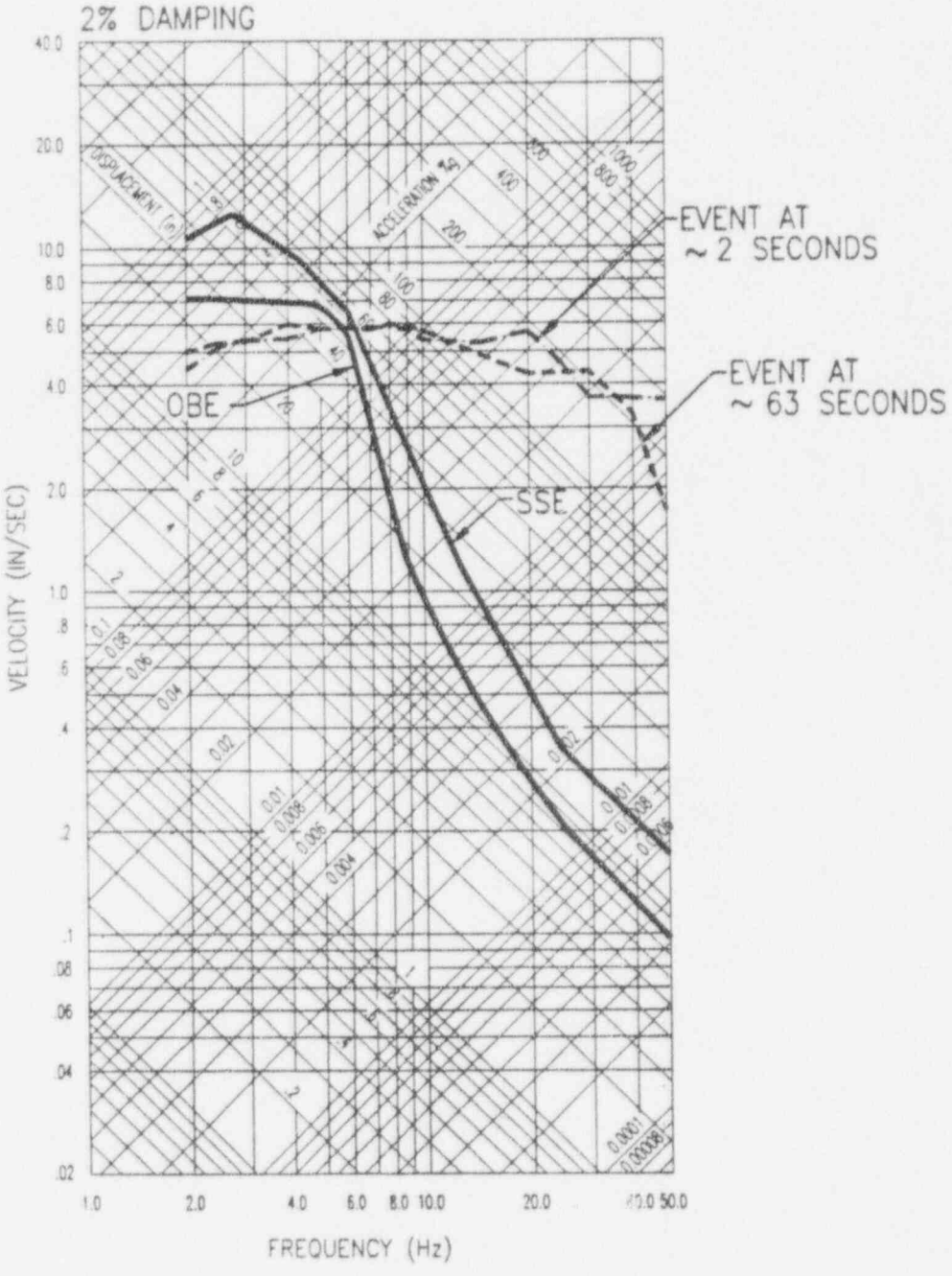
D30-N002 Accelerometer, Vertical Response Spectra - RPV Pedestal

Figure 3.2.2.10



D30-N002 Accelerometer, North/South Response Spectra - RPV Pedestal

Figure 3.2.2.11



D30-N002 Accelerometer, East/West Response Spectra - RPV Pedestal

Figure 3.2.2.12

3.2.3 Active and Passive Data Correlation Comparison

The HPCI room passive instrumentation data for the vertical and east/west directions exhibited similar data trends and acceleration magnitudes compared to the active instrumentation. However, precise amplitude correlation at all frequencies was not possible.

Reasons for the anomalies likely are associated with the short duration of the events, and the intrinsic differences between the recording methods of the two instrumentation systems.

To fully understand the discrepancies, a further comprehensive study would need to be undertaken. However, the phenomenological similarity of the data is sufficient quantitatively to establish essential structural and equipment response characteristics at this time.

3.3 Results

The turbine failure on December 25, 1993, did not result in a significant Reactor/Auxiliary building dynamic excitation or a building global exceedence of the OBE. This was demonstrated by the insignificant accelerations recorded by the passive sensors on the second and fifth floors of the Reactor/Auxiliary building.

Below the second floor in the foundation, the building and equipment experienced local OBE and SSE exceedences recorded by the active and passive sensors located at the RPV pedestal and the HPCI room sub-basement.

The active instrumentation at the RPV pedestal exhibit OBE and SSE exceedences at higher frequencies in all directions. The RPV pedestal sensor in the vertical direction is less severe than the HPCI room vertical direction, while the other directions are similar.

Instrumentation in the HPCI room also experienced local OBE and SSE exceedences. The active instrumentation exhibit OBE and SSE exceedences in the vertical direction, and OBE exceedences in the high frequencies in the north/south and east/west directions. The passive exhibit OBE exceedences in the low and high frequencies. The HPCI room vertical and east/west passive plates show very similar data trends and acceleration magnitudes compared to the HPCI room active vertical and east/west data records.

Generally, the event at time two seconds was more severe than the event at time one minute.

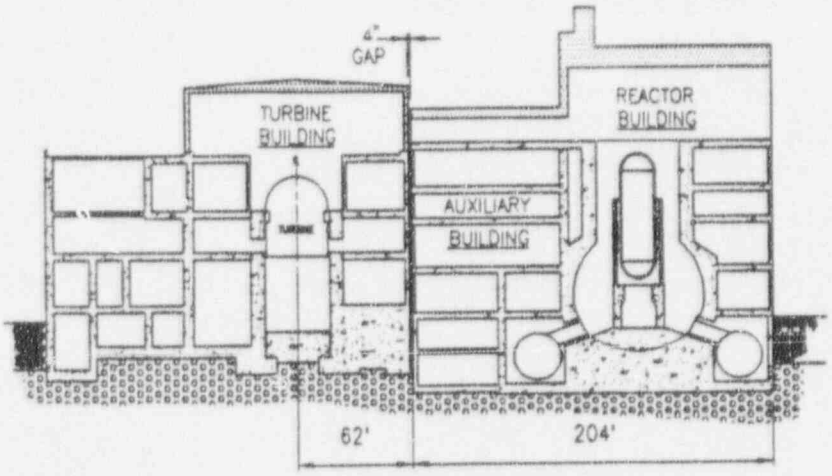
All equipment in the building functioned as expected during the turbine failure and reactor shutdown. An inspection after the event produced no indications of structural damage. Furthermore, the extant safe shutdown equipment adequacy was proven by the satisfactory safe shutdown experience.

4.0 CONCLUSION

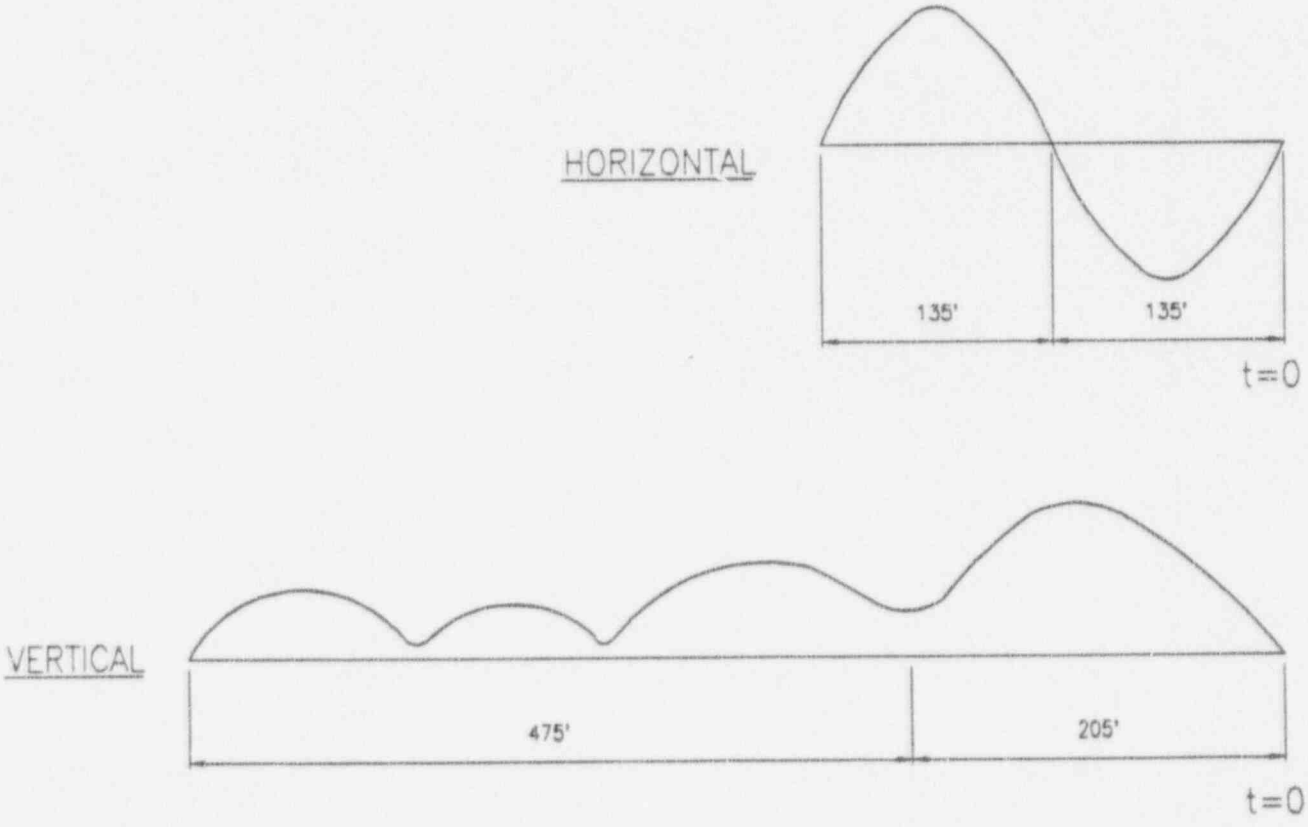
The turbine failure at Fermi 2 on December 25, 1993, should not be compared with a tectonic earthquake, and globally, the Reactor/Auxiliary building did not experience OBE excitation levels. The turbine failure was a shock incident, resulting in dynamic response phenomena or two single cycle waves propagating through the building foundation without exciting the structure above (Figure 4.0.1).

An earthquake imparts long duration, broad range frequencies, and high energy into a structure, while a shock impulse imparts short duration, high amplitude, and low energy into a structure. Industry standards recognize shock impulses do not cause significant structural stresses (Figure 4.0.2).

The shock wave length resulting from the turbine event at Fermi 2 was small compared to the building, and therefore produced local high accelerations, but the short duration, low energy, and small deformations associated with these high frequency accelerations did not compromise the structural integrity of the Reactor/Auxiliary building or the equipment therein.



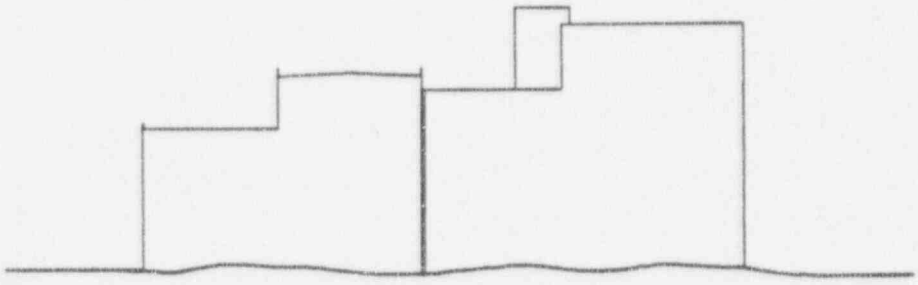
SECTION LOOKING SOUTH



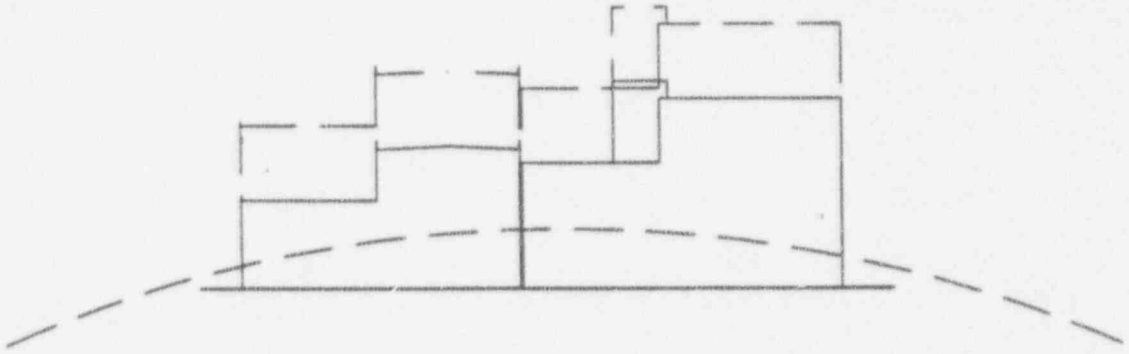
Schematic Representation of Shock Impulse Wave Length

Compared to Building Dimension

Figure 4.0.1



IMPULSE TREMOR



EARTHQUAKE

Schematic Representation of Impulse Tremor Versus

Earthquake Wave - Vertical Direction

Figure 4.0.2

5.0 REFERENCES

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5) The Ralph M. Parsons Company; Enrico Fermi 2 Atomic Power Plant; Recommended Earthquake Recording System; Job No. 4577-3; January 1972.

6) Engdahl Enterprises; Seismic Instruments for Nuclear Power Plants; November 1977.

7) Detroit Edison Company; Written Observations from Fermi 2 Personnel; December 25, 1993.

8) The Cleveland Electric Illuminating Company; Seismic Event Evaluation Report; Perry Nuclear Power Plant Docket Nos. 50-440, 50-441; February 1986.

9) Detroit Edison Company; Vendor Manuals VMCI-143.1 and VMCI-143.3; December 18, 1989.

ATTACHMENT 9

DTC: TDPMEC

DSN: DC-5882 VOL I

DPN: REV: 0