

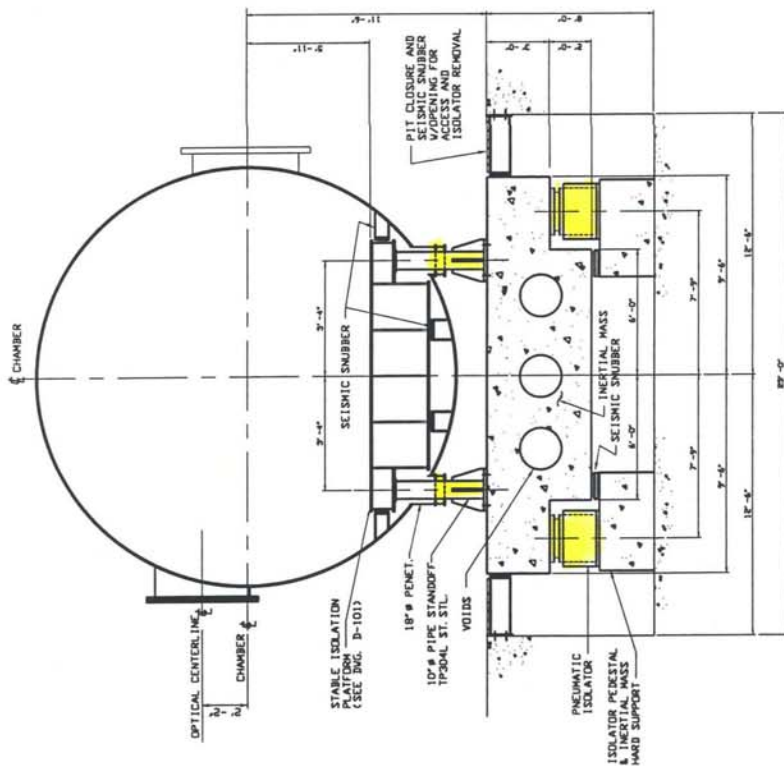
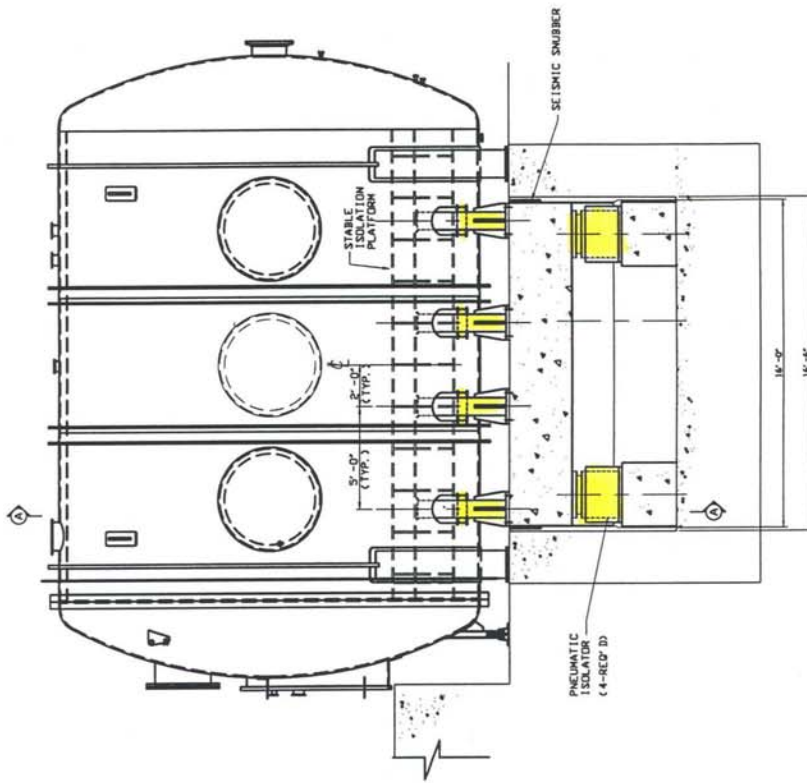
*Vibration Isolation System  
for  
Thermal-Vacuum Test Chamber*

*at*

*Aerojet  
Azusa, California*

*Advanced Sensor Integration and Test Facility Team*

Fabreeka was awarded the contract to design and supply the external vibration isolation system and support foundation for the thermal-vacuum test chamber at Aerojet in Azusa, CA.



SECTION A-A

NOTES:

1. INERTIAL MASS CONCRETE AND REINFORCING SHALL BE IN ACCORDANCE WITH VIBRATION ISOLATION SYSTEM SUPPLIER REQUIREMENTS.
2. ISOLATION PEDESTALS SHALL BE CAST WITH A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI. REBAR SHALL BE ASTM A615 GR. 60.
3. SEE DWG. D-104 FOR INTERFEROMETER PLATFORM.
4. STRUCTURAL STEEL OUTSIDE OF CHAMBER TO BE ASB.

ALL INFORMATION INCLUDES HEREIN CONSIDERS PROPRIETARY AND CONFIDENTIAL. IT IS TO BE USED OR REPRODUCED WITHOUT WRITTEN PERMISSION.

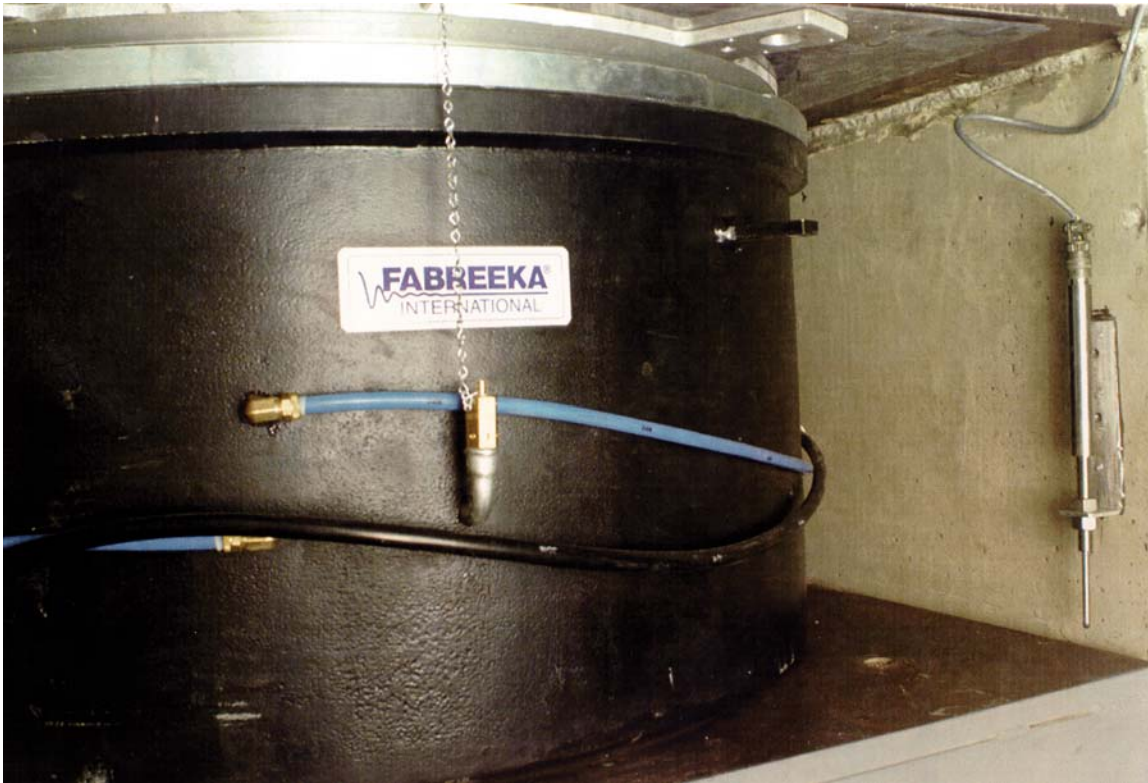
MODIFICATION MAY BE MADE BY THE ENGINEER OR HIS STRUCTURE ENGINEER. ALL CHANGES MUST COMPLY WITH THE SPECIFICATIONS.

CHAMBER ELEVATION  
VIBRATION ISOLATION DETAILS

NO	REVISION DESCRIPTION	BY	DATE	CHK	DATE	RELEASED	DATE
B	RELOCATED STANDOFF'S	DEV	08/11/09	JKP	08/11/09	JKP	
A	INITIAL ISSUE	DEV	08/11/09	JKP	08/11/09	JKP	

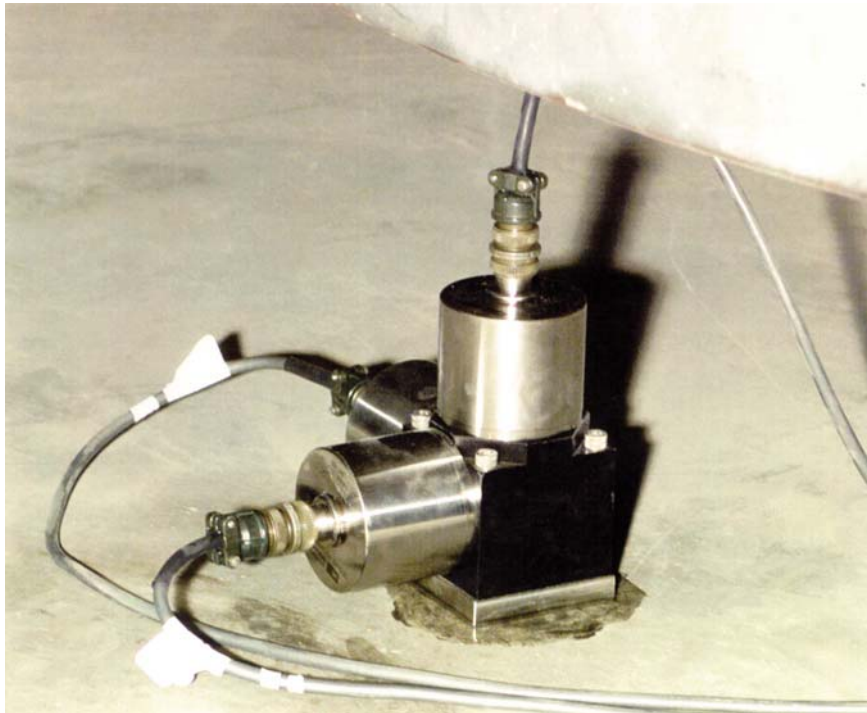
<b>PIT-DES MOINES, INC.</b> THERMAL VACUUM CHAMBER AZUSA, CALIFORNIA ACROLET VIBRATION ISOLATION SYSTEM FABRICATED AT P11		DRAWN BY J. R. T. 10/6/99 CHECKED H.P.P. 09/09/99 D-103 CONTRACT 49003
<b>PDM</b> PDM Engineering Construction A Division Of Pitt-Des Moines, Inc. Houston, Texas		



Four (4) pneumatic isolators support the inertia mass and standoffs with the payload platform (inside the vacuum chamber). Each isolator can lift 120,000 lbs.



An LVDT (displacement transducer) is installed at each corner of the inertia mass. The LVDT's monitor the exact position of the mass/standoffs and platform to within 0.001 inch.



Highly accurate, low frequency seismometers were installed at several locations on and off the chamber, mass and facility floor in a triaxial format. The seismometers monitor the vertical and two horizontal axes simultaneously and provide real-time, RMS velocity in each axis at each location.

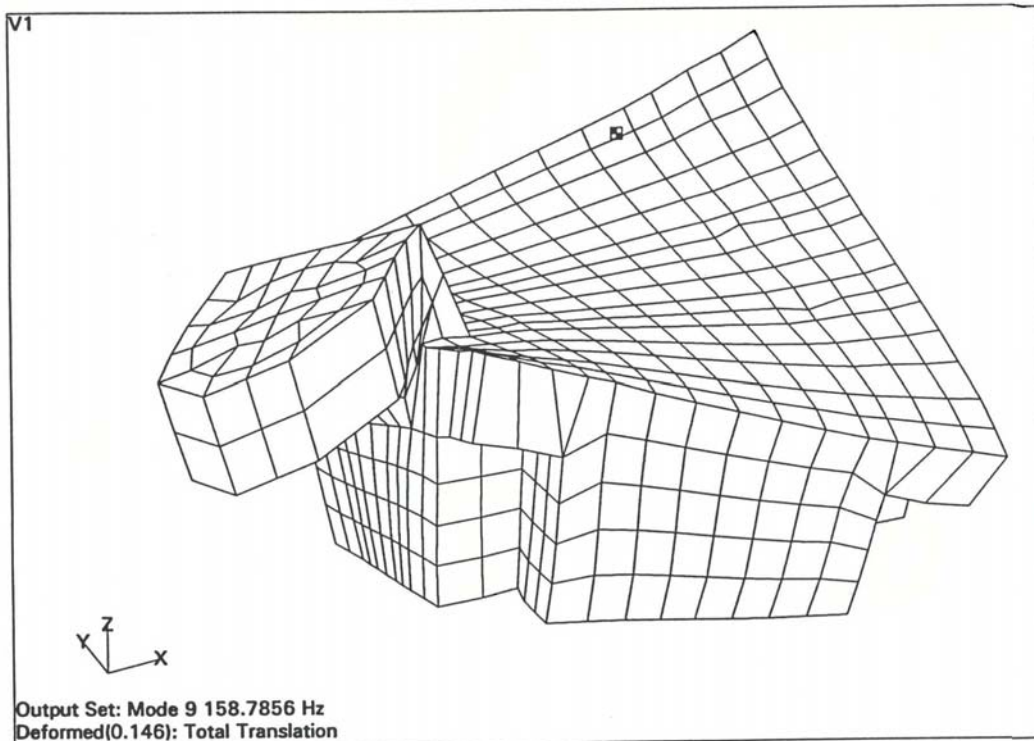


Fabreeka supplied the LVDT position monitoring system and triaxial seismometer sensors with rack mountable displays. The positioning monitoring panel indicates the height at each corner of the isolated mass. The patch panel below allows Aerojet to choose which seismometer (Vertical, Horizontal N/S or Horizontal E/W) for any location they wish to read the RMS velocity.

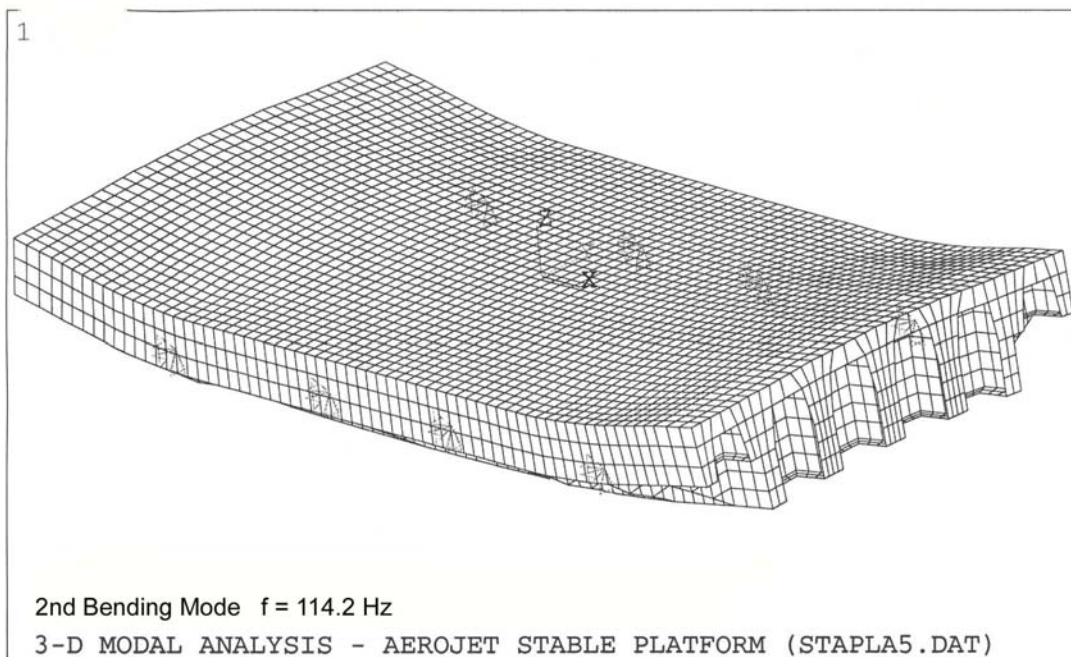


End view of inertia mass. Note that the vacuum chamber is installed on support piers at each side of the mass. (See drawings for more detail.) The standoffs are anchored to the top of the mass and connect to the chamber using the flexible, vacuum compatible seals.

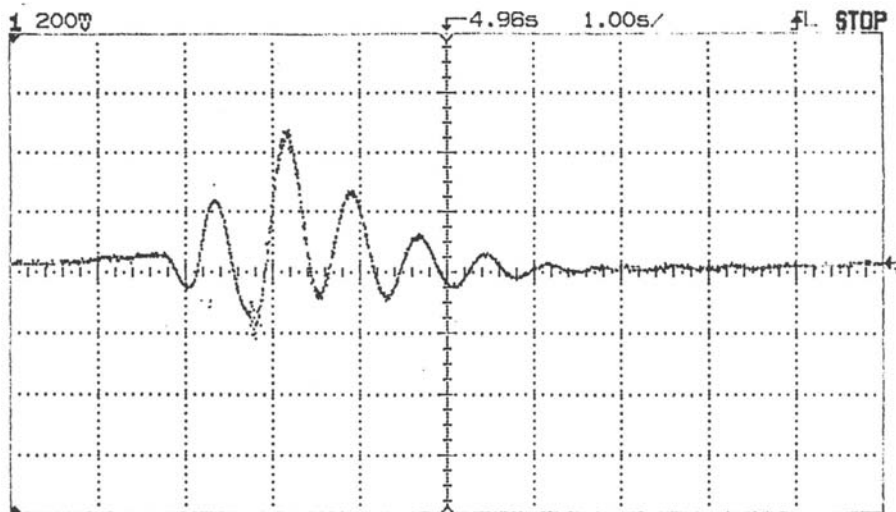
The chamber is 19' in diameter and over 25' long.



Dynamic analysis (NASTRAN) of the inertia mass. The bending mode shape of the structure is exaggerated for presentation purposes. The 9<sup>th</sup> mode (3<sup>rd</sup> bending mode) of the mass is shown as 158.78 Hz.



The rigid platform inside the chamber was also analyzed and modeled before being fabricated. The platform is supported by the standoffs through a vacuum compatible, flexible seal. The standoffs are then attached to the mass. The 2<sup>nd</sup> bending mode (8<sup>th</sup> mode) of the platform is 114.20 Hz.



Chan	State	Volts/Div	Position	Couplg	BW Lim	Invert	Probe
Chan 1	On	200.0mV	31.25mV	DC	Off	Off	1:1
Chan 2	Off	50.00mV	-96.88mV	DC	Off	Off	1:1

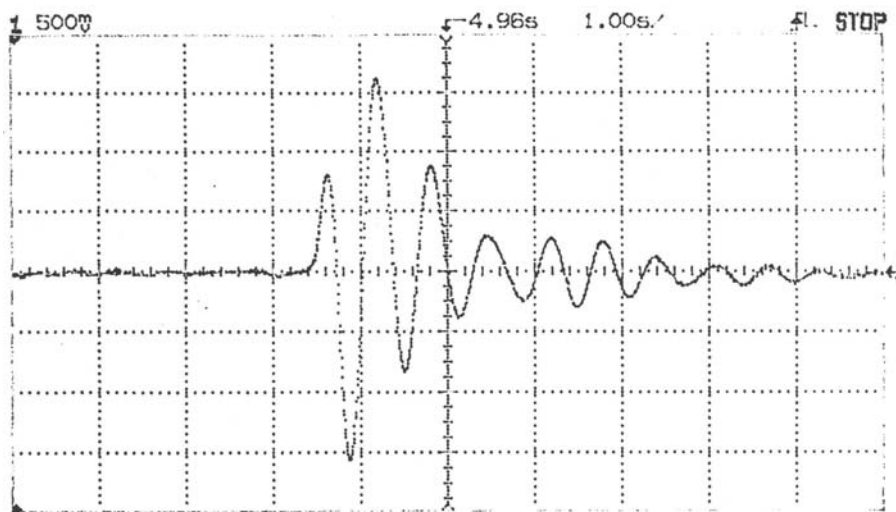
Horizontal	Mode	Main Time/Div	Main Delay	Time Ref	Delayed Time/Div	Delayed Delay
Horizontal	Normal	1.000 s/	4.960 s	Cntr	-----	-----

Trigger	Mode	Source	Level	Holdoff	Slope	Couplg	Reject	Noise/Flt
Trigger	AutoLv1	Line	62.50mV	200.0ns	Pos	DC	Off	Off

Display Mode: Normal

Vertical test data of the isolation system taken on site. The vertical natural frequency of the system is 1.3 Hz.



Chan	State	Volts/Div	Position	Couplg	BW Lim	Invert	Probe
Chan 1	On	500.0mV	-15.63mV	DC	Off	Off	1:1
Chan 2	Off	50.00mV	-96.88mV	DC	Off	Off	1:1

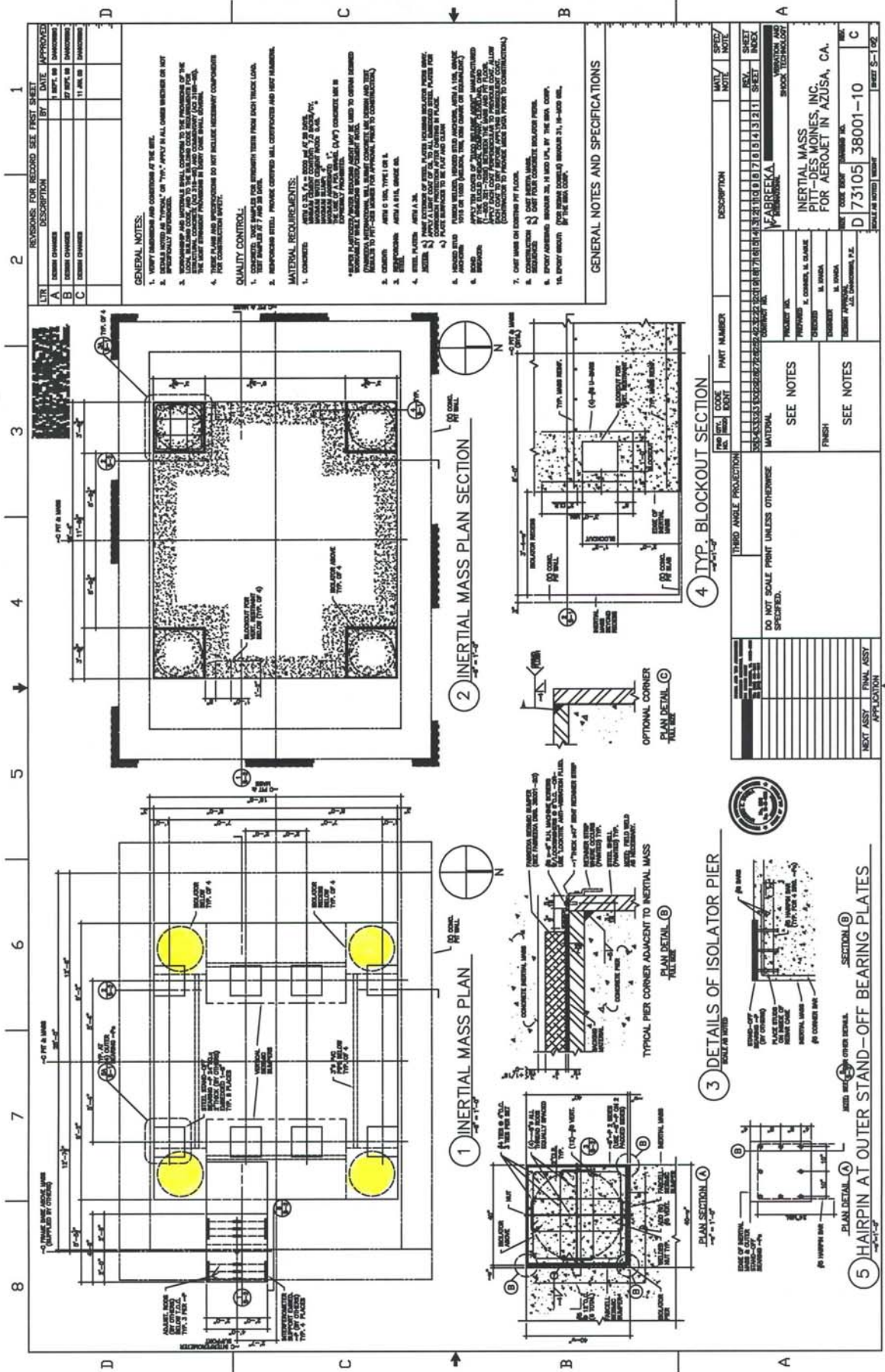
Horizontal	Mode	Main Time/Div	Main Delay	Time Ref	Delayed Time/Div	Delayed Delay
Horizontal	Normal	1.000 s/	4.960 s	Cntr	-----	-----

Trigger	Mode	Source	Level	Holdoff	Slope	Couplg	Reject	Noise/Flt
Trigger	AutoLv1	Line	62.50mV	200.0ns	Pos	DC	Off	Off

Display Mode: Normal

Horizontal test data of the isolation system taken on site.  
The horizontal natural frequency of the system is 1.33 - 1.49 Hz.



REV.	DESCRIPTION	DATE	APPROVED
1	REVISIONS FOR RECORD SEE FIRST SHEET		
A	CONCRETE CHANGES	11/11/11	11/11/11
B	CONCRETE CHANGES	11/11/11	11/11/11
C	CONCRETE CHANGES	11/11/11	11/11/11

**GENERAL NOTES:**

- VERIFY DIMENSIONS AND CONDITIONS AT THE SITE.
- DETAILS NOTED AS "TYPICAL" OR "TYP." APPLY IN ALL UNLESS OTHERWISE SHOWN OR NOT SPECIFICALLY NOTED.
- CONCRETE SHALL BE PLACED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL BUILDING CODE, AND THE BUILDING CODE REQUIREMENTS FOR THE LOCAL JURISDICTION. (CONCRETE SHALL BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE, AND THE BUILDING CODE REQUIREMENTS FOR THE LOCAL JURISDICTION.)
- THESE PLANS AND SPECIFICATIONS DO NOT INCLUDE NECESSARY COMPONENTS FOR CONNECTIONS.

**QUALITY CONTROL:**

- TEST SAMPLES FOR STRENGTH TESTS FROM EACH BATCH LOAD.
- TEST SAMPLES FOR CURING AND MOISTURE.
- INSPECTION ITEMS: PROVIDE CERTIFIED MIX, COMPACTOR AND REINFORCEMENT.

**MATERIAL REQUIREMENTS:**

- CONCRETE:
  - AREA A: 3000 PSI MIN. COMPACTED IN PLACE.
  - AREA B: 3000 PSI MIN. COMPACTED IN PLACE.
  - AREA C: 3000 PSI MIN. COMPACTED IN PLACE.
  - AREA D: 3000 PSI MIN. COMPACTED IN PLACE.
- STEEL:
  - AREA A: 60,000 PSI MIN. YIELD STRENGTH.
  - AREA B: 60,000 PSI MIN. YIELD STRENGTH.
  - AREA C: 60,000 PSI MIN. YIELD STRENGTH.
  - AREA D: 60,000 PSI MIN. YIELD STRENGTH.

**GENERAL NOTES AND SPECIFICATIONS**

1. CHIEF NAME ON EXTERIOR FACE OF FLOOR.

2. CONNECTION TO EXISTING FOUNDATION SHALL BE AS SHOWN.

3. EXISTING FOUNDATION SHALL BE AS SHOWN.

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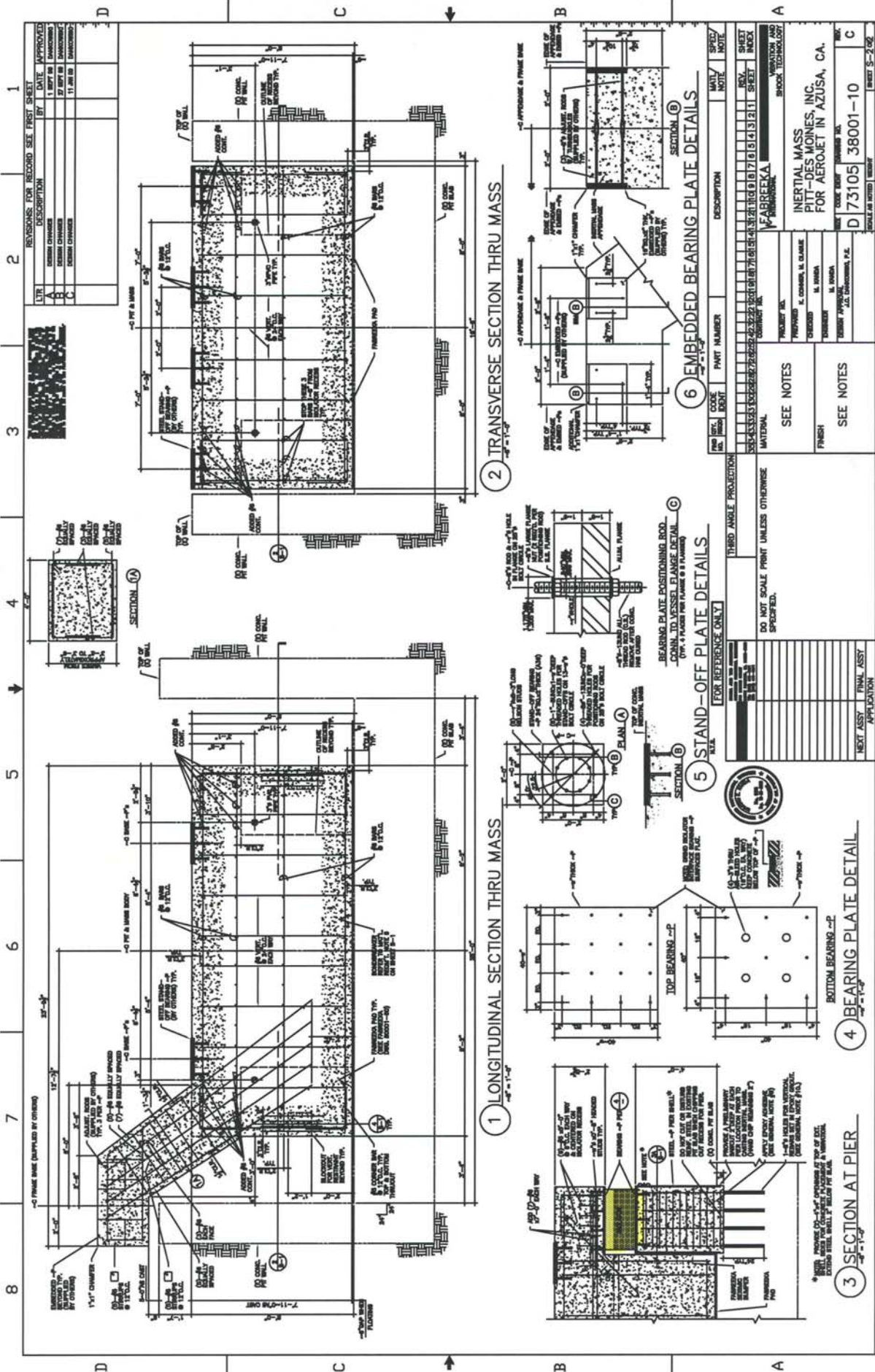
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INERTIAL MASS  
PIER - DES MOINES, INC.  
FOR AERONET IN AZUSA, CA.

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