

August 28, 2010

Mr. David Klein
Metal & Cable Corp., Inc.
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Brooks Stevens, Inc. (BSI) certifies that the "SEISMIC QUALIFICATION TESTING OF A MAGNETOMOUNT MB, MAGNETIC MOUNTING SYSTEM FOR METAL & CABLE CORP., INC." identified by report number M109-14187 was performed at DATASYST's facilities on June 15-16, 2010 in compliance with ICC-ES AC156.

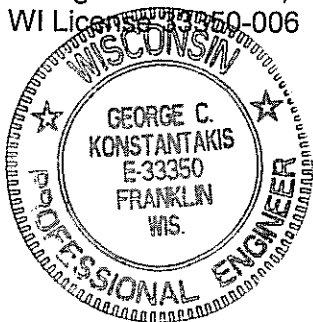
BSI has verified that the calculations performed by DATASYST are in accordance with ICC-ES AC156. This certification is based on design information, test procedures and miscellaneous information supplied to BSI by DATASYST. BSI claims no responsibility for errors resulting from misinformation or lack of information by DATASYST or METAL & CABLE CORP, INC.

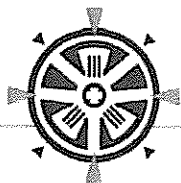
This certification does not replace the full test report that includes boundary conditions, considerations and method of testing of the components verified by DATASYST.

Brooks Stevens, Inc.



George Konstantakis, P.E.
WI License # E-33350-006





DATASYST

Engineering & Testing Services, Inc.

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SEISMIC QUALIFICATION TESTING
OF A
MAGNEMOUNT MB, MAGNETIC MOUNTING SYSTEM
FOR
METAL & CABLE CORP., INC.

TEST DATES:
JUNE 15 - 16, 2010

DATASYST PROJECT NUMBER:
M109-14187

PREPARED FOR: **DAVID KLEIN**
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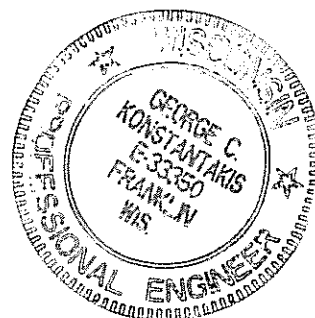


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1.0 INTRODUCTION

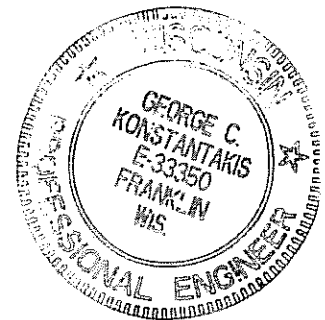
2.0 CONCLUSION

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1.0 INTRODUCTION

Metal & Cable Corp., Inc., of Twinsburg, Ohio contracted DATASYST Engineering & Testing Services, Inc. of Delafield, Wisconsin to perform ICC-ES AC156 seismic qualification testing on a Magnemount MB (Magnemount) magnetic mounting system. Testing was performed at DATASYST's facilities on June 15-16, 2010.

2.0 CONCLUSIONS

The Magnemount magnetic mounting system was subjected to a resonant frequency search from 1.3 to 33.3 Hz followed by a thirty second seismic motion test in each of the three mutually perpendicular axes. Testing was performed with the Magnemount mounted to both vertical and horizontal surfaces. All testing was performed with a 54 pound dead weight fastened to the mast which simulated an antenna or other component.

The sine surveys showed that the structure has a resonant natural frequency of 11 Hz in both of the lateral axes (X and Y) which classifies the Magnemount as a flexible structure. In the Z axis, which is parallel to the centerline of the mast, there were no resonant natural frequencies below 33.3 Hz.

Throughout the course of seismic waveform testing there were no anomalies or visual structural failures within the Magnemount. The Magnemount remained magnetically coupled to the steel fixture plate for all tests.

The Magnemount is compliant to the AC156 specification.

3.0 TEST PROCEDURES

One sample of a Magnemount magnetic mounting system was tested. The Magnemount was 24" x 24" x 37.5" high, weighed 54 pounds, and contained (24)



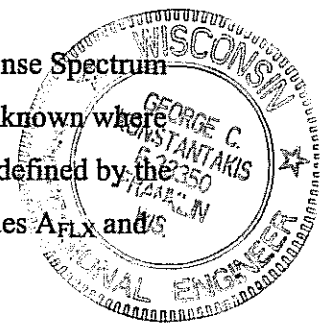
3-3/4" diameter permanent magnet mounts. For all testing, a 54 pound dead weight was fastened to the top of the mast which simulated the weight of an antenna or other component. The center of the dead weight was located 3-3/4" from the top of the mast.

An arbitrary axis system was defined for the Magnemount and is used as a reference throughout this report. In this system the X and Y axes are in the plane of the 24" x 24" aluminum base plate and the Z axis is parallel to the main axis of the mast. A photograph of the defined axis system on the Magnemount is shown in the photographs section of this report.

The Magnemount was tested in all three mutually perpendicular axes when the mount was positioned in two distinct orientations, for a total of six seismic waveform tests. The first orientation is the "vertical face mount" where the surface that test article mounts to is in a vertical plane and the mast is parallel to the ground. The second orientation is the "horizontal face mount" where the mounting face is in a horizontal plane and the mast is positioned perpendicular to the ground. The Magnemount was held to a 1/4" thick steel fixture plate using only the magnet mounting provisions of the test article. No other means were used to restrain the test article.

In each of the six test axes a 0.1g, 1.3 – 33.3 Hz, sine survey was performed to determine resonant natural frequencies of the system, followed by a 30 second seismic input. Two response accelerometers were mounted at the top of the mast to determine the resonant frequencies.

Prior to initiating the seismic waveform testing the Required Response Spectrum (RRS) was determined from the AC156 specification. Since it is unknown where the test article will be located in service the maximum RRS values defined by the specification are used. This RRS is defined by the acceleration values A_{FLX} and A_{RIG} and the defined frequency range from 1.3 to 33 Hz.



Determination of the maximum A_{FLX} and A_{RIG} values for, both the Uniform Building Code and International Building Code, are as follows:

UBC Horizontal Axes

$$A_{FLX} = 2.5 C_a (1+3(H_x/H_r), \text{ limited to } 4C_a)$$

$$A_{RIG} = C_a (1+3(H_x/H_r), \text{ limited to } 3C_a)$$

UBC Vertical Axes

Vertical values are defined as 2/3 of the lateral axes and H_x is defined as zero.

$$A_{FLX} = 2/3 (2.5C_a)$$

$$A_{RIG} = 2/3 C_a$$

The largest value of C_a is defined as 0.66. Therefore, the maximum spectral response acceleration values, according to the UBC code, are:

$$\text{Horizontal Axis } A_{FLX} = 2.64 \text{ g}$$

$$\text{Horizontal } A_{RIG} = 1.98 \text{ g}$$

$$\text{Vertical Axis } A_{FLX} = 1.10 \text{ g}$$

$$\text{Vertical Axis } A_{RIG} = 0.44 \text{ g}$$

IBC Horizontal Axes

$$A_{FLX} = S_{DS}(1+2(z/h)), \text{ limited to } 1.6S_{DS}$$

$$A_{RIG} = 0.4S_{DS}(1+2(z/h))$$

IBC Vertical Axis

Vertical values are defined as 2/3 of the lateral axes and z is defined as zero.

$$A_{FLX} = 2/3S_{DS}$$

$$A_{RIG} = 4/15S_{DS}$$

Given that $S_{DS} = 2/3 S_{MS}$, that $S_{MS} = F_a S_s$ and that the maximum site value coefficient is 1; $S_{DS} = 2/3 S_s$. The maximum value for S_s defined in the IBC is 3g, therefore $S_{DS} = 2g$. Therefore, the maximum spectral response acceleration values, according to the IBC code, are:

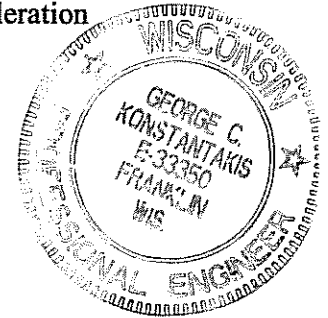
$$\text{Horizontal Axis } A_{FLX} = 3.20 \text{ g}$$

$$\text{Horizontal } A_{RIG} = 2.40 \text{ g}$$

$$\text{Vertical Axis } A_{FLX} = 1.34 \text{ g}$$

$$\text{Vertical Axis } A_{RIG} = 0.54 \text{ g}$$

Since the RRS amplitudes defined by the IBC are greater than the RRS amplitudes defined by the UBC, the IBC amplitudes are used throughout the course of testing.



Nomenclature

- A_{FLX} – Horizontal spectral acceleration calculated for flexible equipment
 A_{RIG} – Horizontal spectral acceleration calculated for rigid equipment
 C_a – UBC seismic coefficient
 F_a – IBC site coefficient
 h – Average building/structure height relative to the base
 H_x – Equipment attachment elevation with respect to grade (but not less than zero)
 H_r – Building/structure roof elevation with respect to grade
IBC – International Building Code
 S_S – Mapped spectral accelerations for short periods
 S_{DS} – Spectral response acceleration at short period
 S_{MS} – maximum considered earthquake spectral response accelerations for short period
UBC – Uniform Building Code
 z – Height of structure with respect to grade, at point of equipment attachment (but not less than zero)

Photographs of the test setups are shown in Section 6.0 Photographs of this report.



4.0 PLOTS AND DATA SUMMARY

Table of Magnemount Natural Frequencies with 54 Pound Weight at Top of Mast

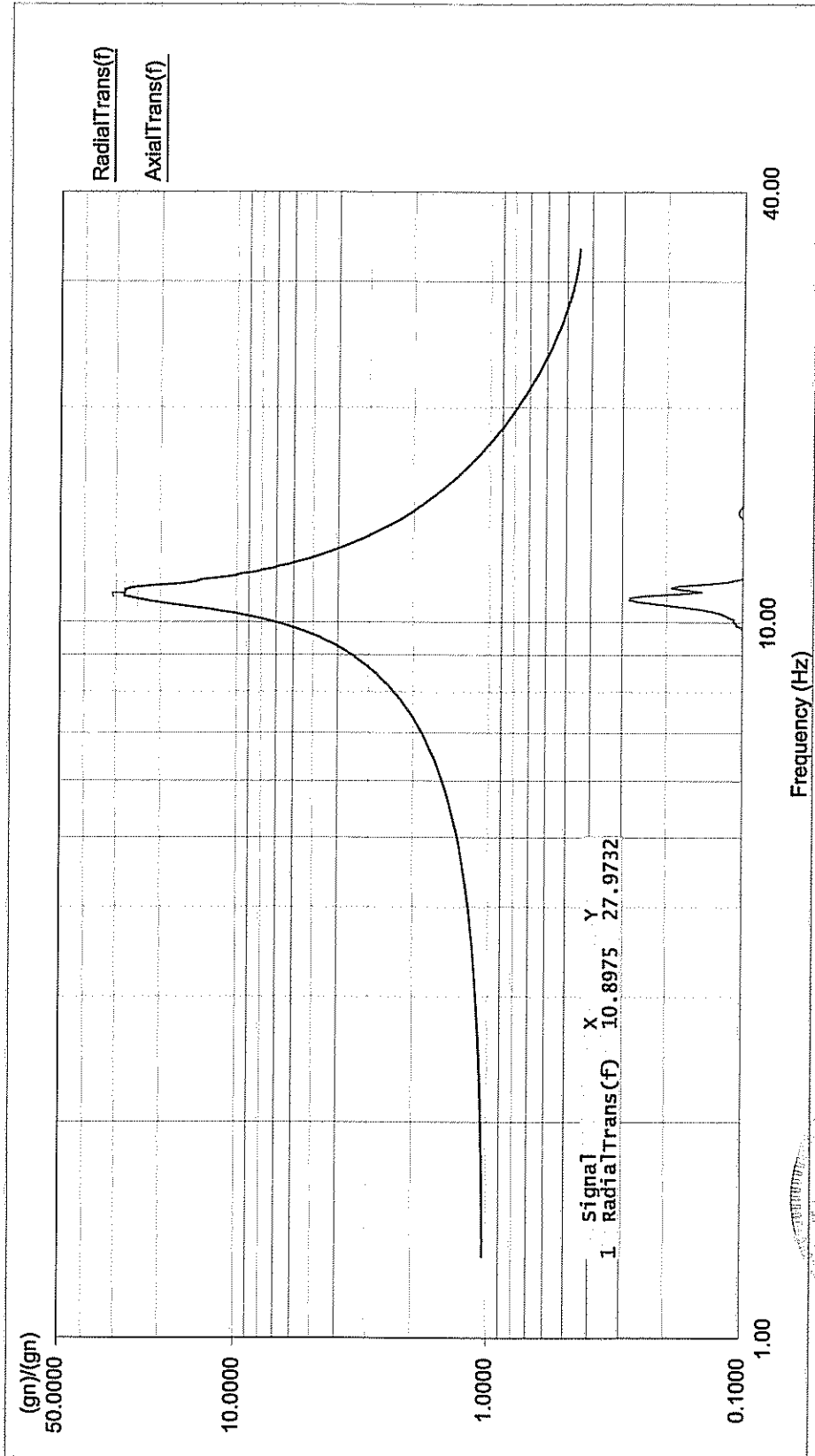
Orientation	Test Axis	Natural Frequency (Hz)
Vertical Mounting Face (Horizontal Mast)	X	10.9
Vertical Mounting Face (Horizontal Mast)	Y	11.6
Vertical Mounting Face (Horizontal Mast)	Z	None below 33.3 Hz
Horizontal Mounting Face (Vertical Mast)	X	11.0
Horizontal Mounting Face (Vertical Mast)	Y	11.0
Horizontal Mounting Face (Vertical Mast)	Z	None below 33.3 Hz



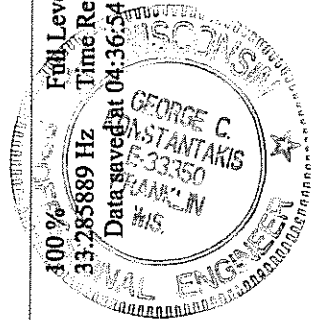
Vertical Face Mounting, X axis Sine Sweep, Transmissibility Plot

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Test Type: Swept Sine
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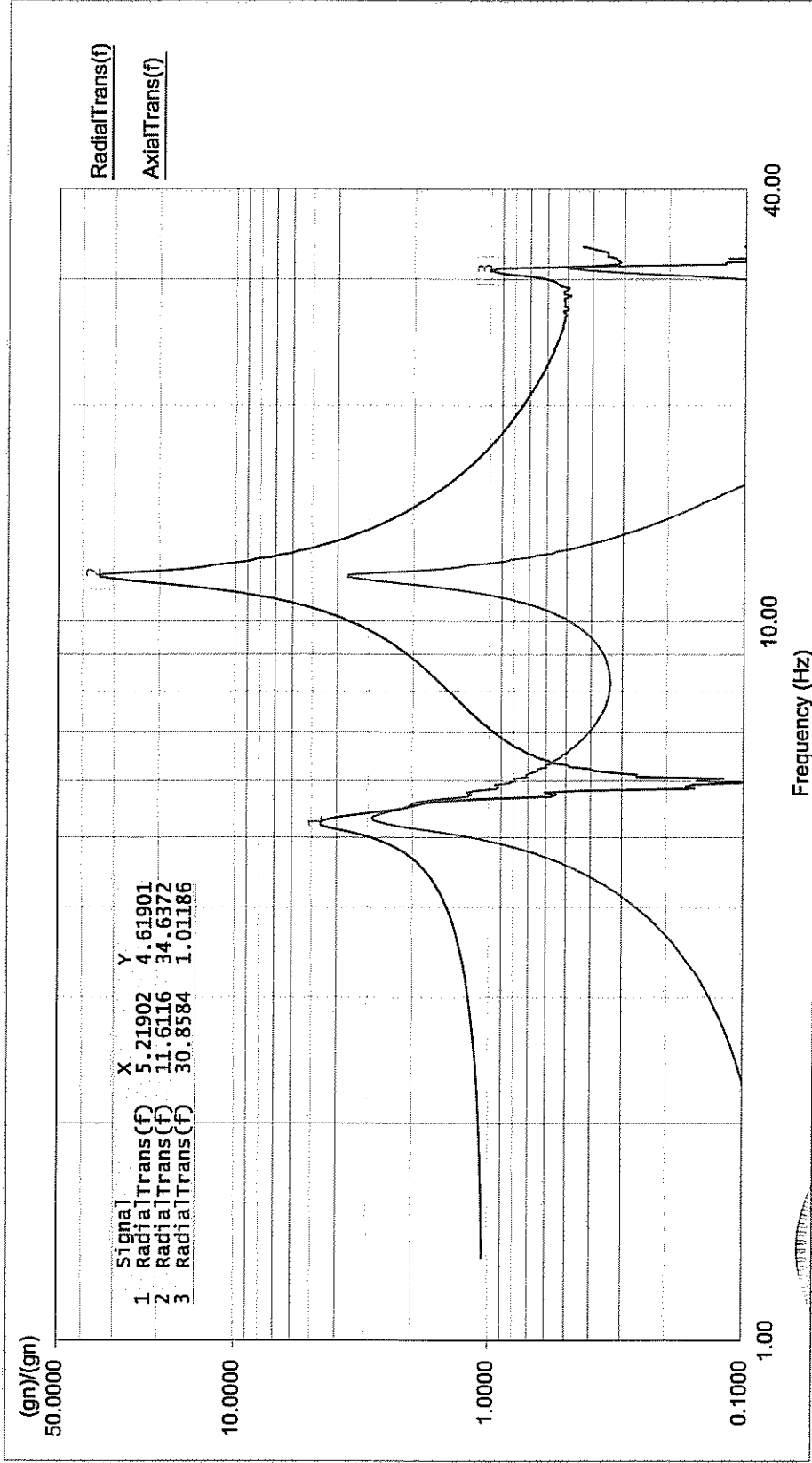
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 Sweep Rate: 1 Oct/Min
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Vertical Face Mounting, Y axis Sine Sweep, Transmissibility Plot

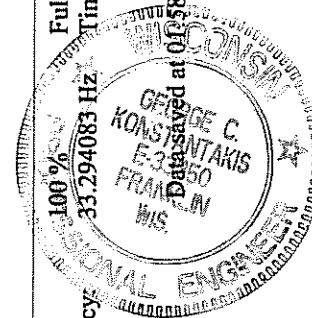
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 Profile Name: Low Level

Test Type: Swept Sine Run Folder: .\RunDefault Jun 16, 2010 13:49:49



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 Frequency: 33.294083 Hz Time Remaining: 00:00:00 Sweep Rate: 1 Oct/Min

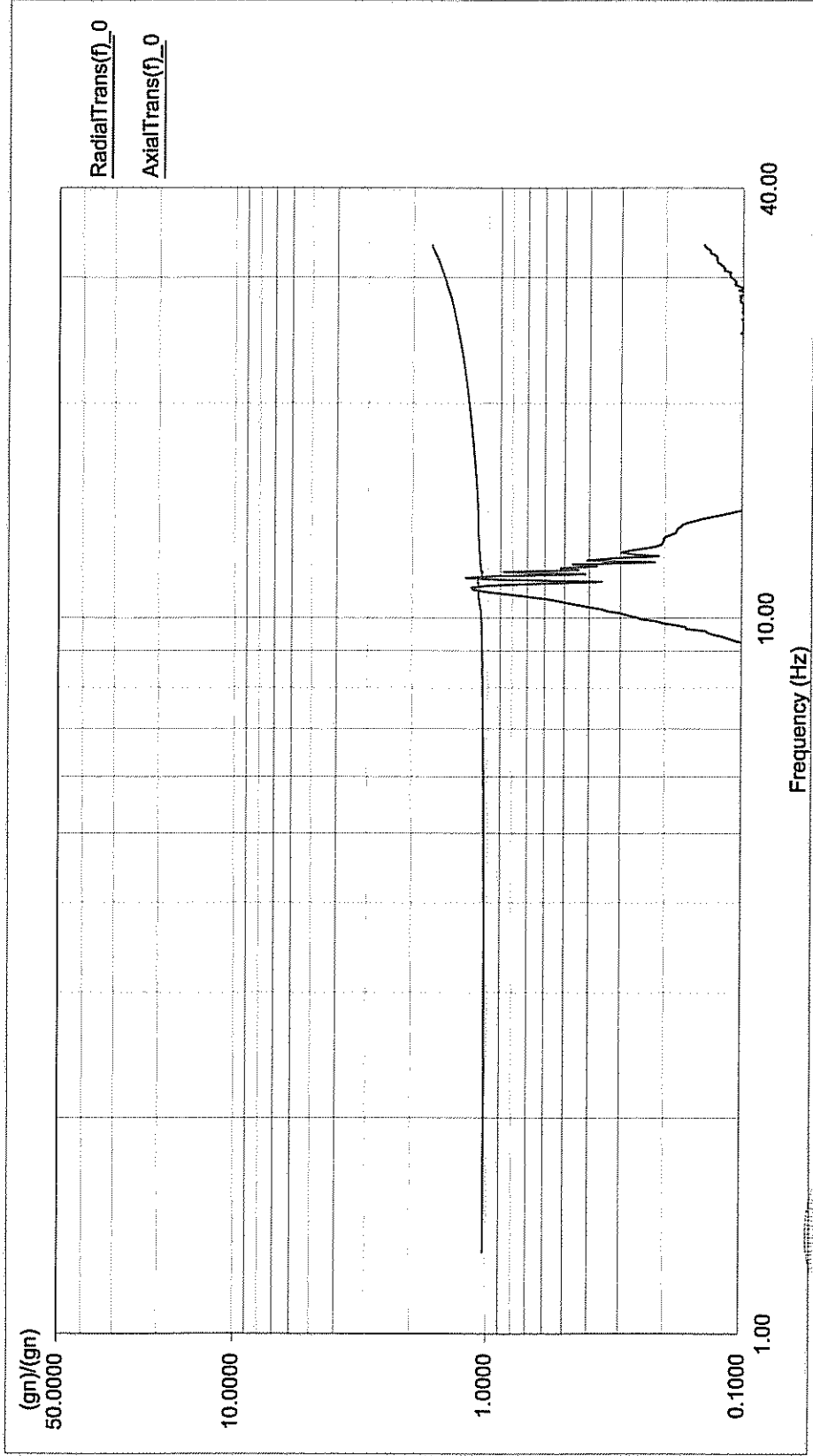
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Vertical Face Mounting, Z axis Sine Sweep, Transmissibility Plot

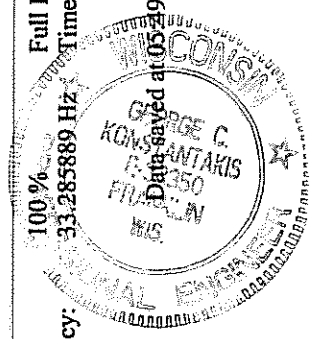
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Test Type: Swept Sine Run Folder: .Sweep(SINE)



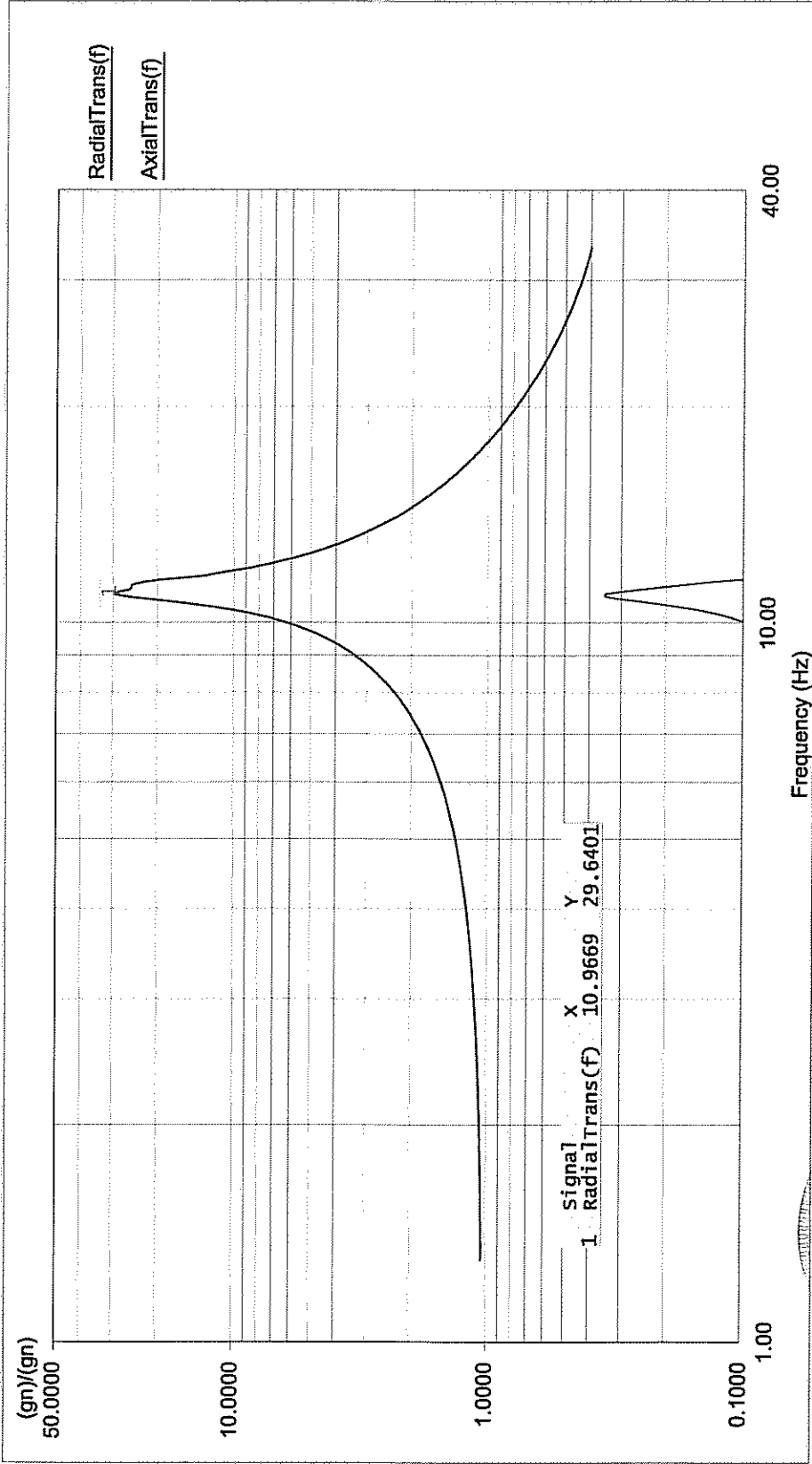
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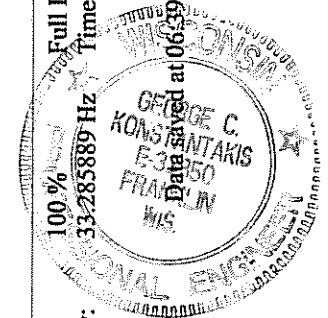


Horizontal Face Mounting, X axis Sine Sweep, Transmissibility Plot

Project File Name: Sweep.pj
 Profile Name: Low Level
 Test Type: Swept Sine
 Run Folder: .\RunDefault Jun 15, 2010 18-33-05



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 Sweep Type: Logarithmic
 Sweep Rate: 1 Oct/Min

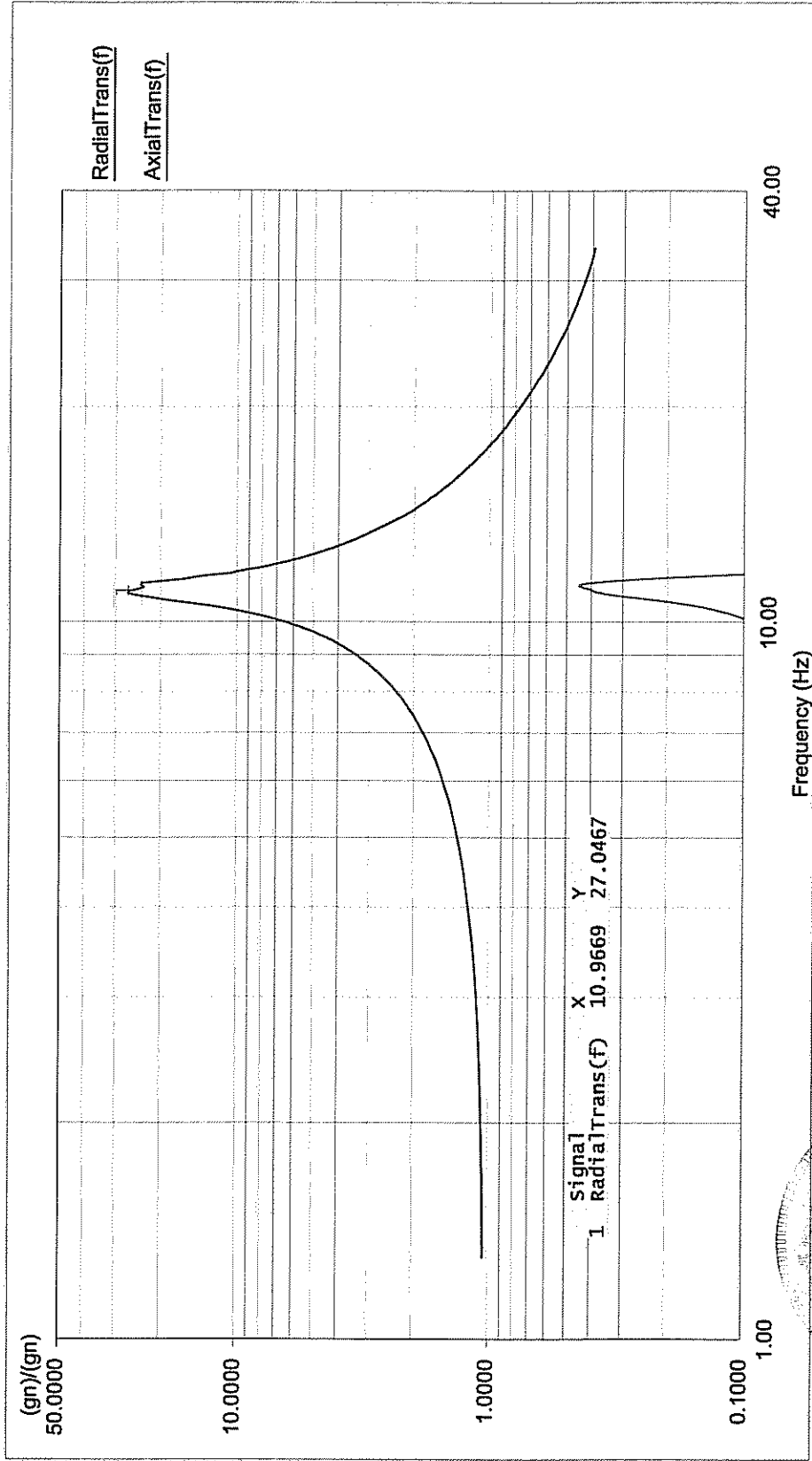


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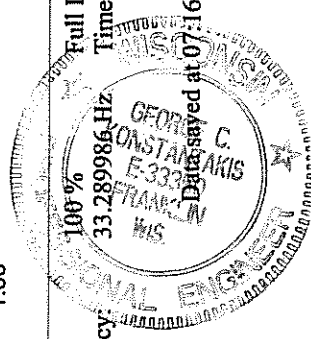
Horizontal Face Mounting, Y axis Sine Sweep, Transmissibility Plot

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 Test Type: Swept Sine
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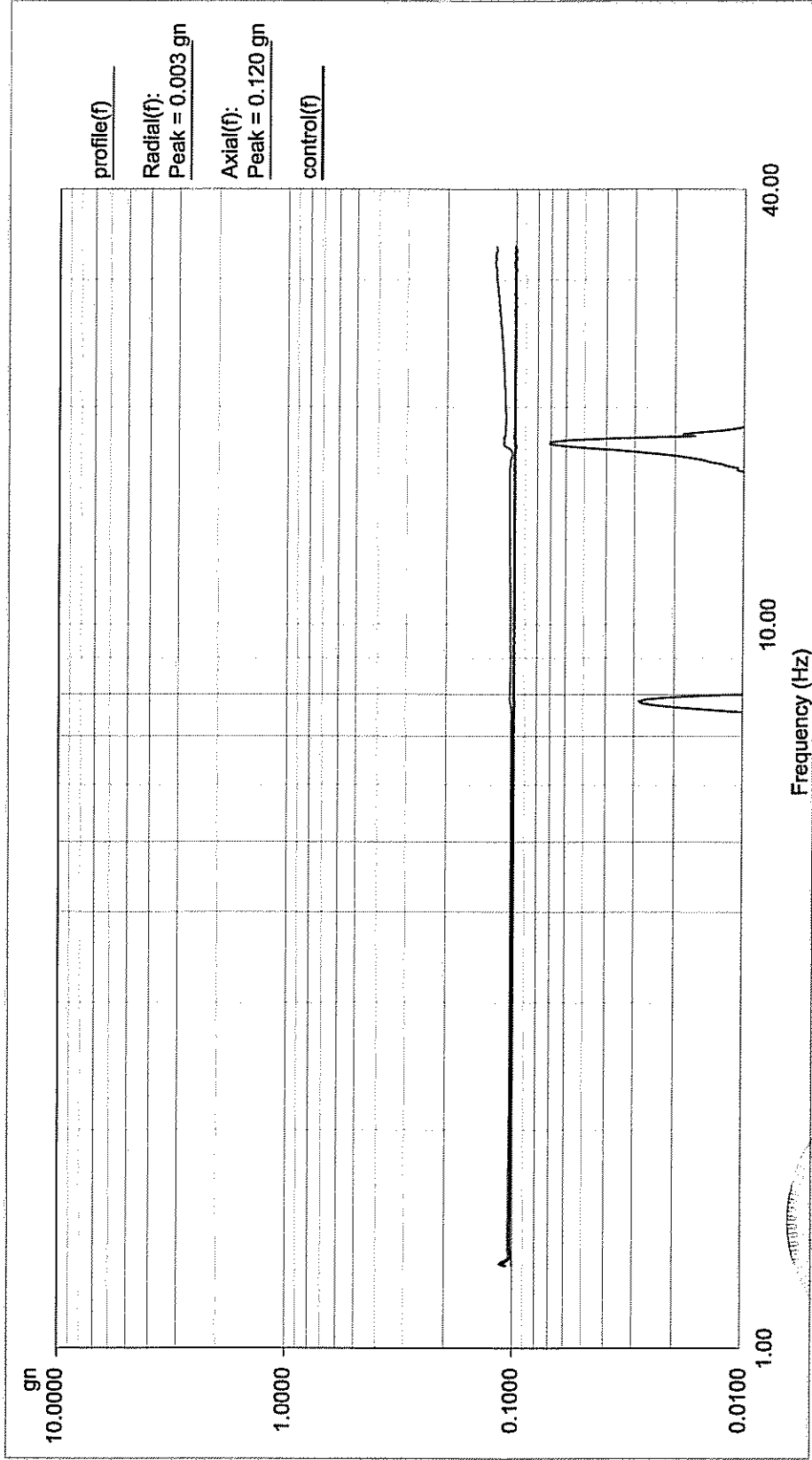
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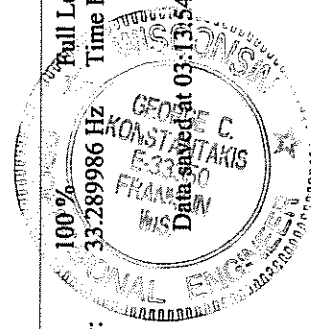
Horizontal Face Mounting, Z axis Sine Sweep, Transmissibility Plot

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 Profile Name: Low Level

Test Type: Swept Sine Run Folder: .\RunDefault Jun 16, 2010 15-07-36



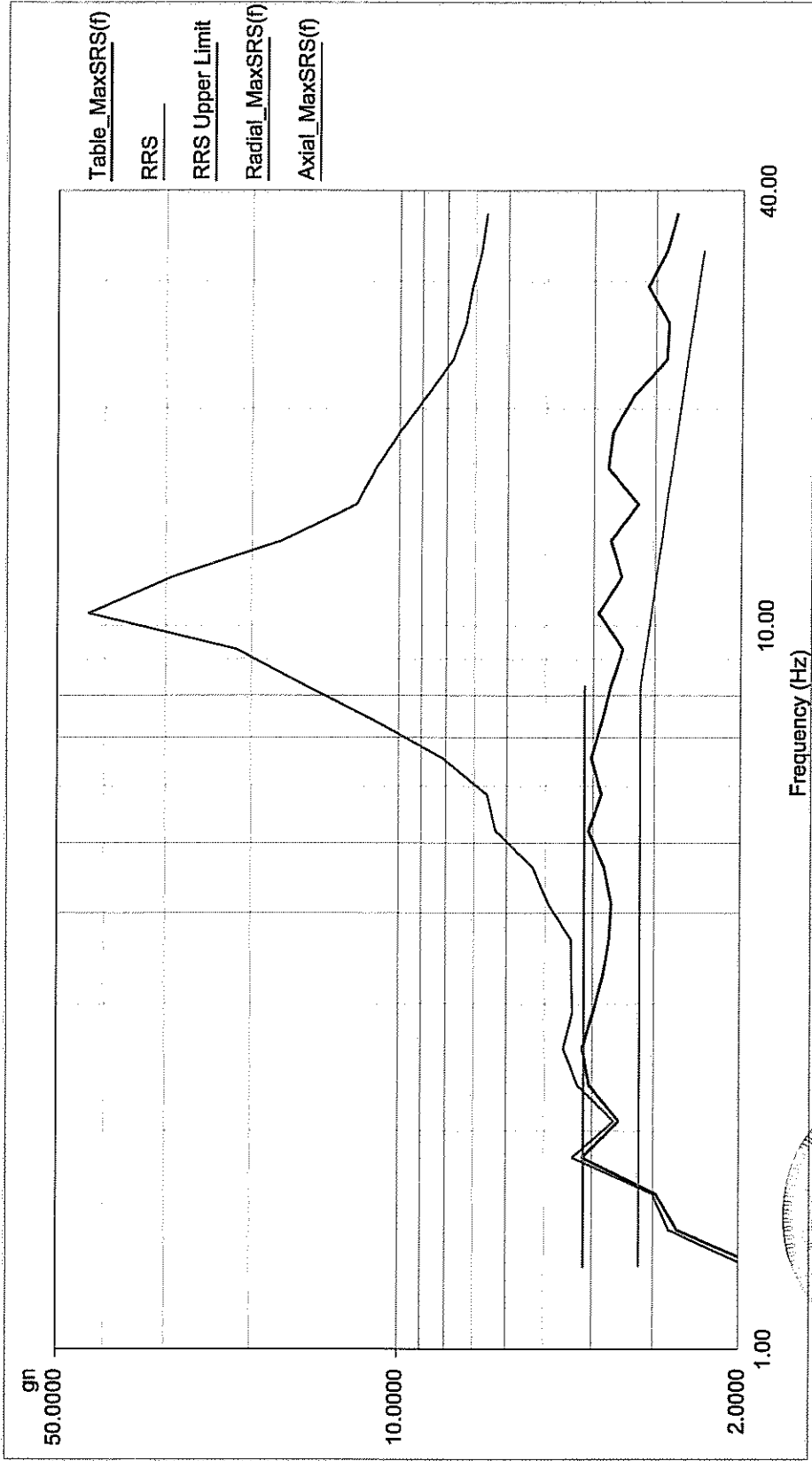
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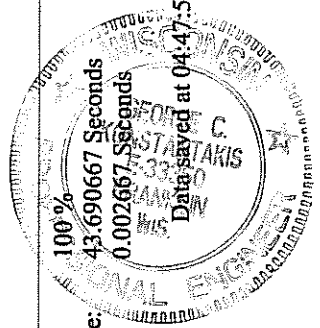
Vertical Face Mounting, X axis Seismic Test, Response Spectrums Plot

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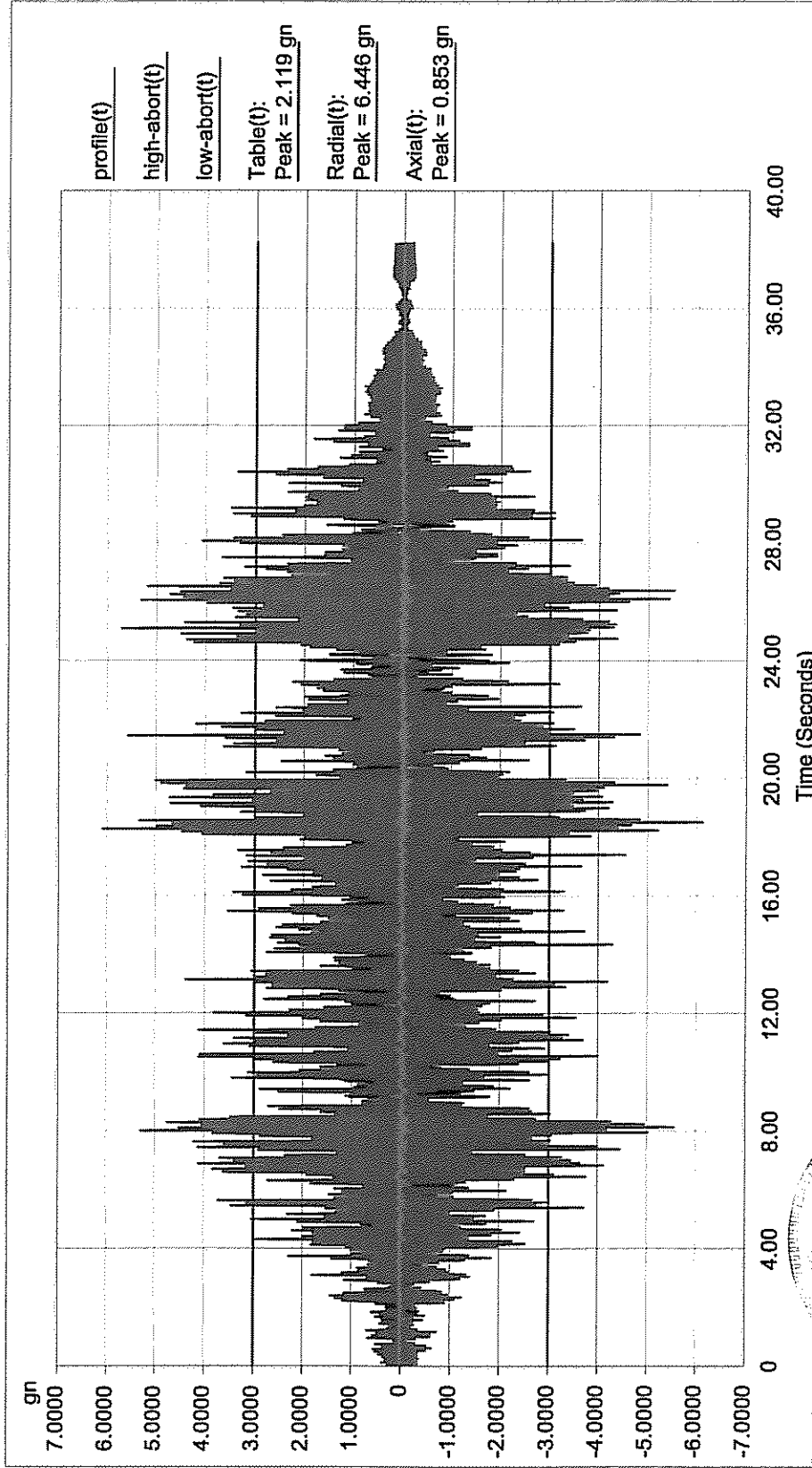
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Report created at 04:47:58 PM, Tuesday, June 15, 2010



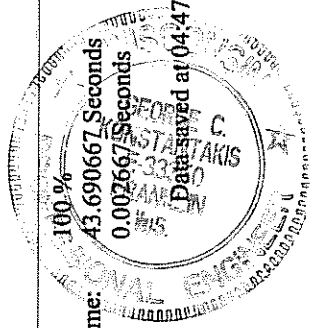
Vertical Face Mounting, X axis Seismic Test, Time Histories Plot

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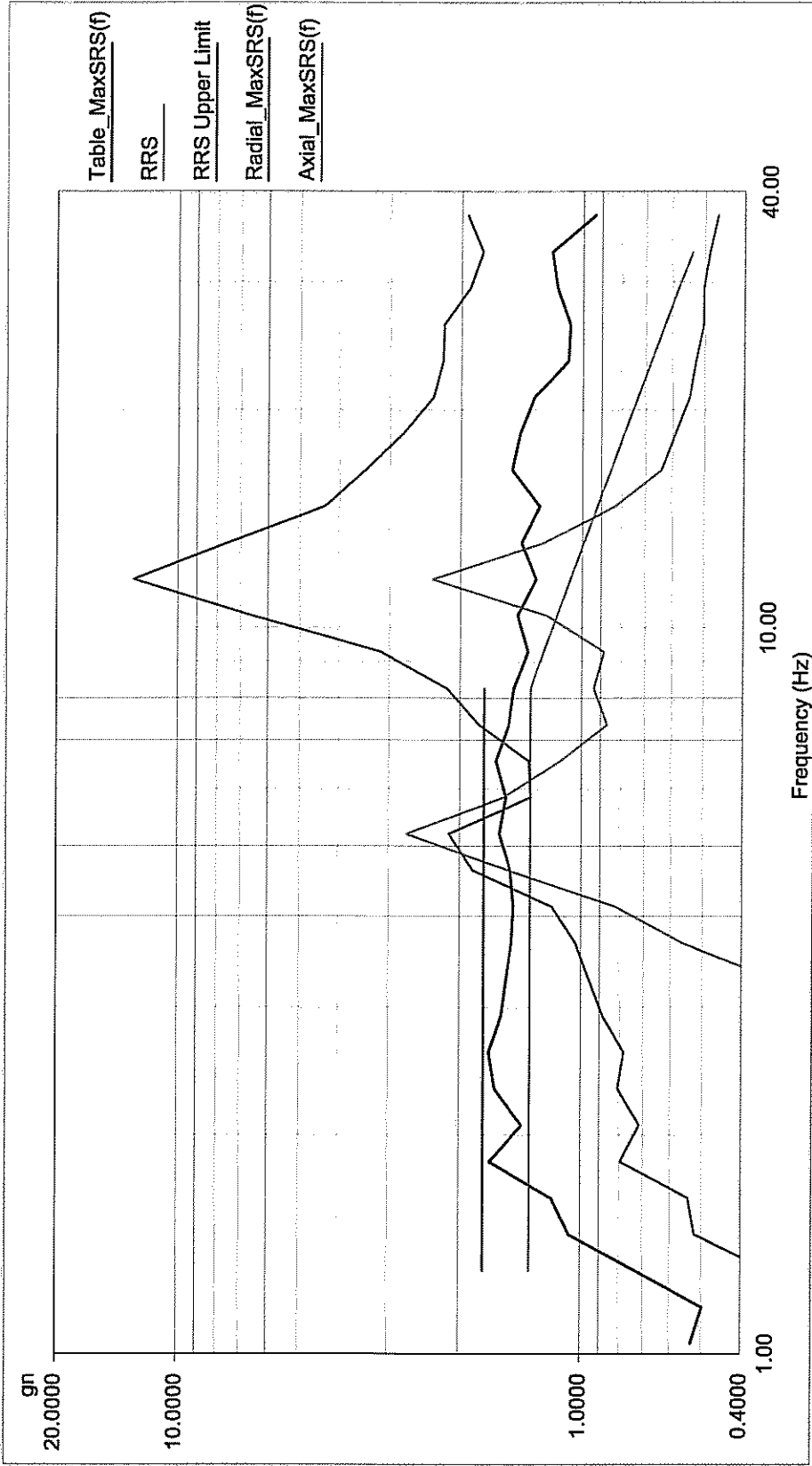
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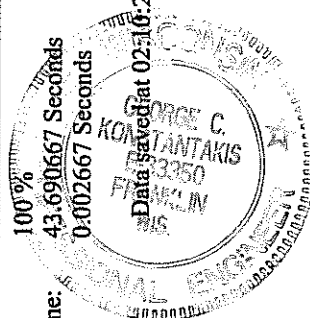
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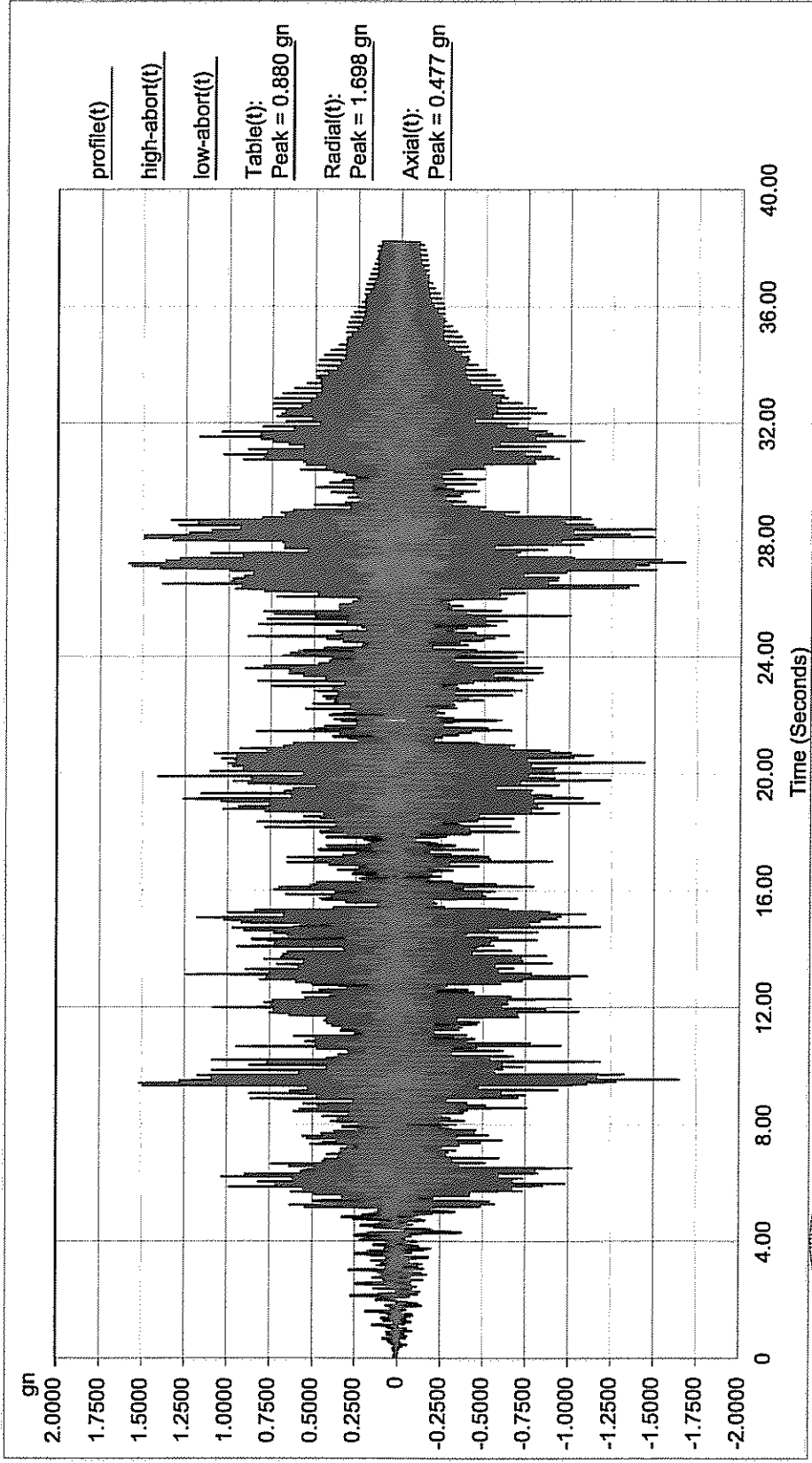
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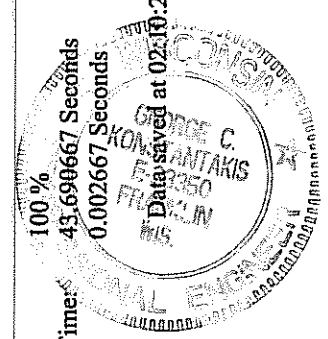
Vertical Face Mounting, Y axis Seismic Test, Time Histories Plot

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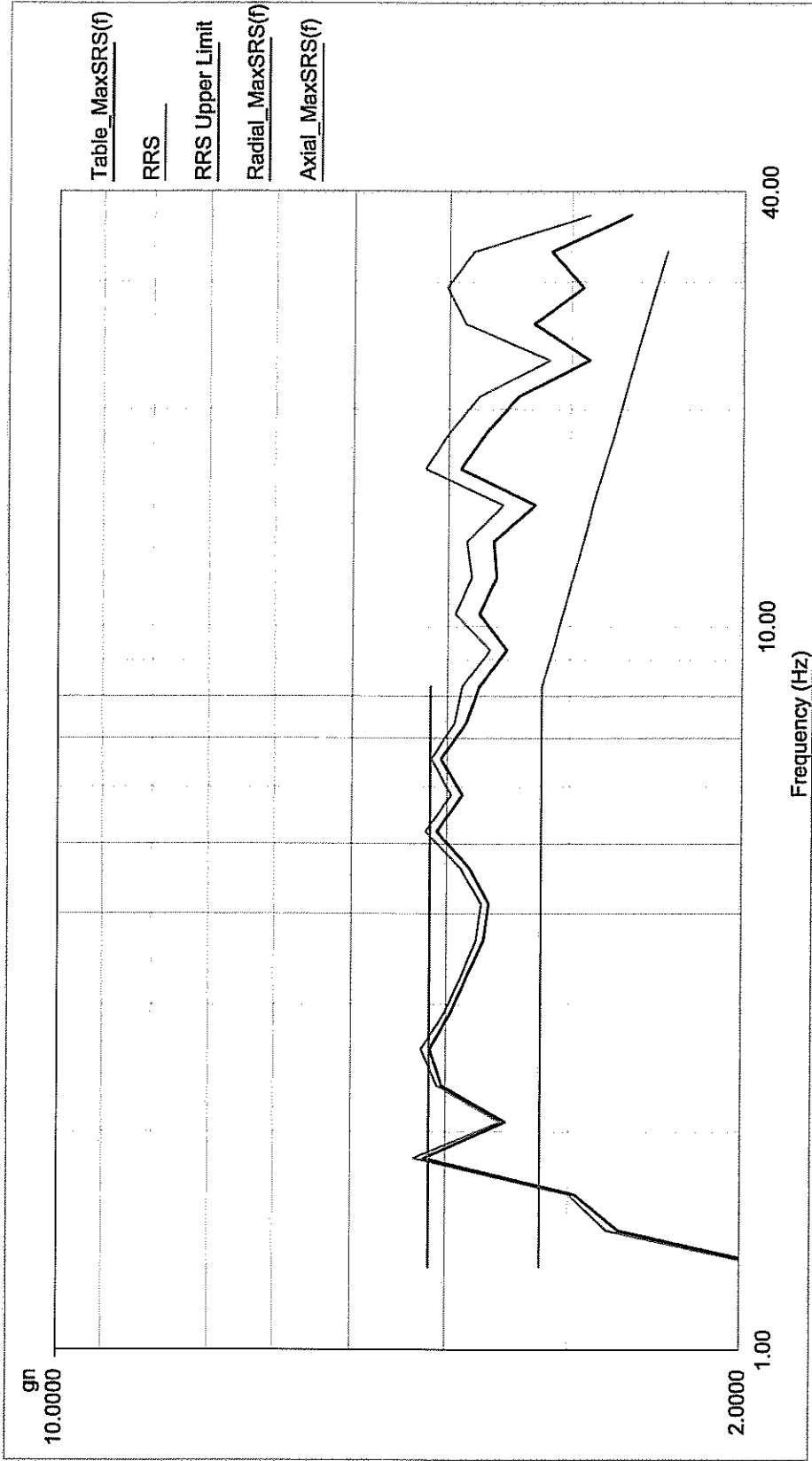
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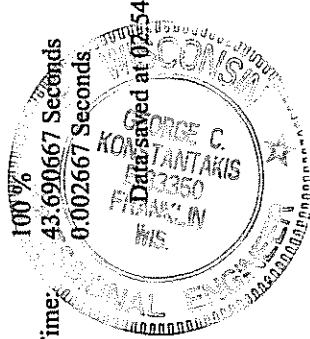
Vertical Face Mounting, Z axis Seismic Test, Response Spectrums Plot

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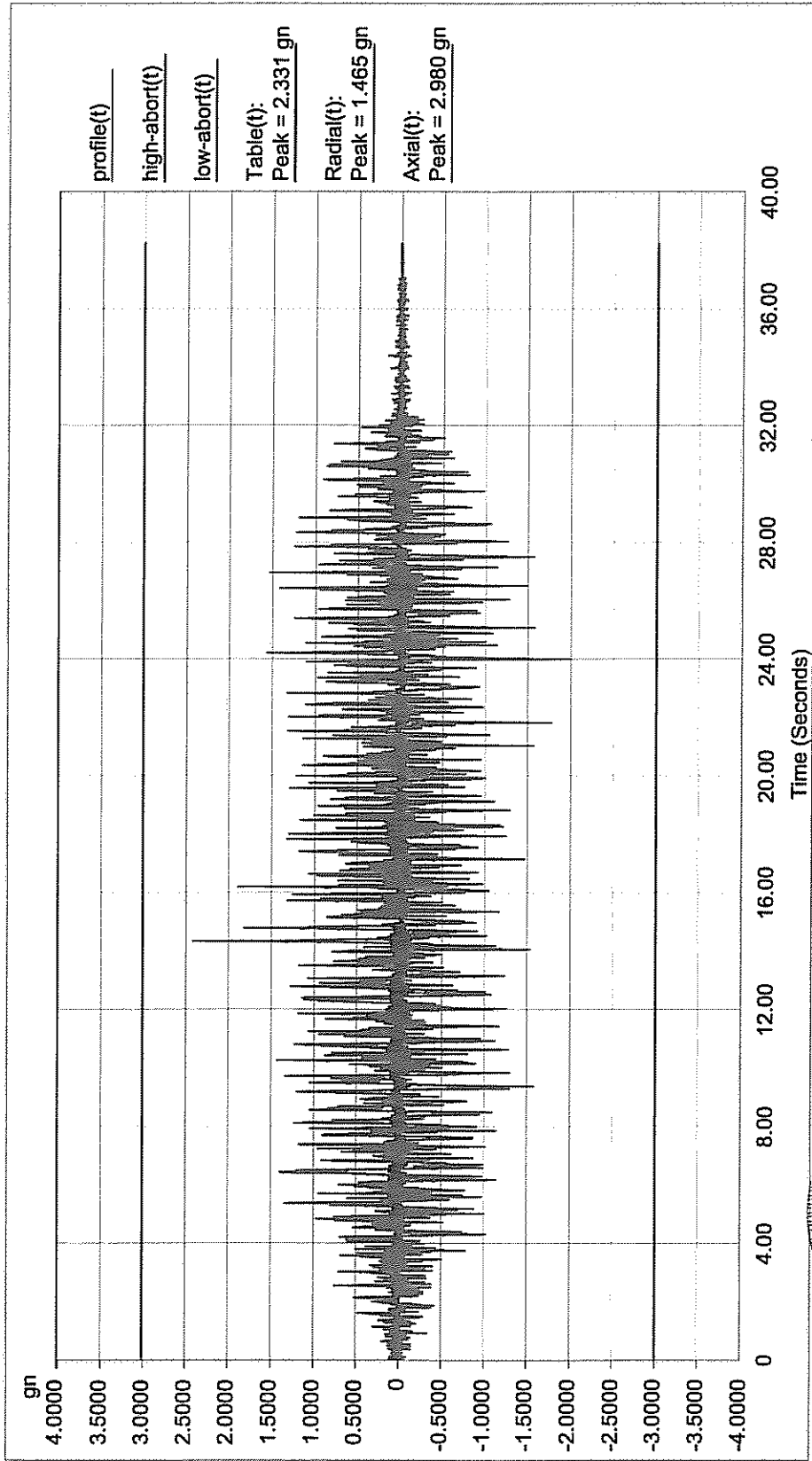
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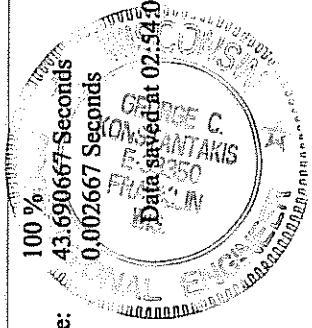


Vertical Face Mounting, Z axis Seismic Test, Time Histories Plot

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 Profile Name:



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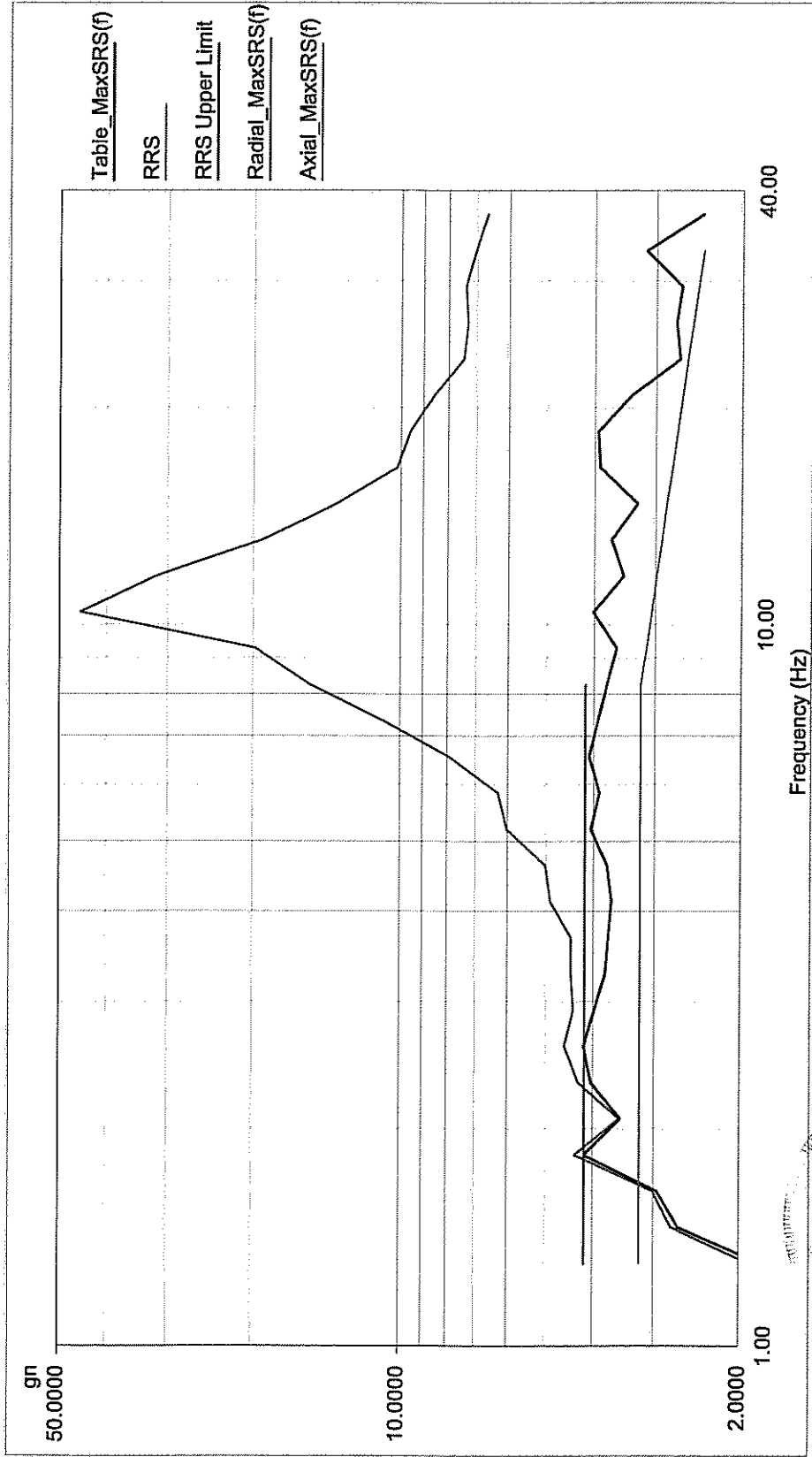


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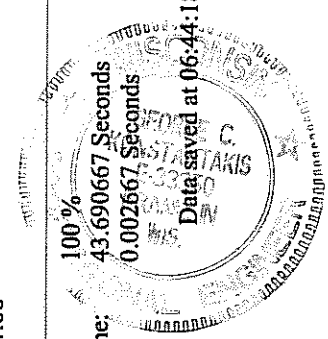
Horizontal Face Mounting, X axis Seismic Test, Response Spectrums Plot

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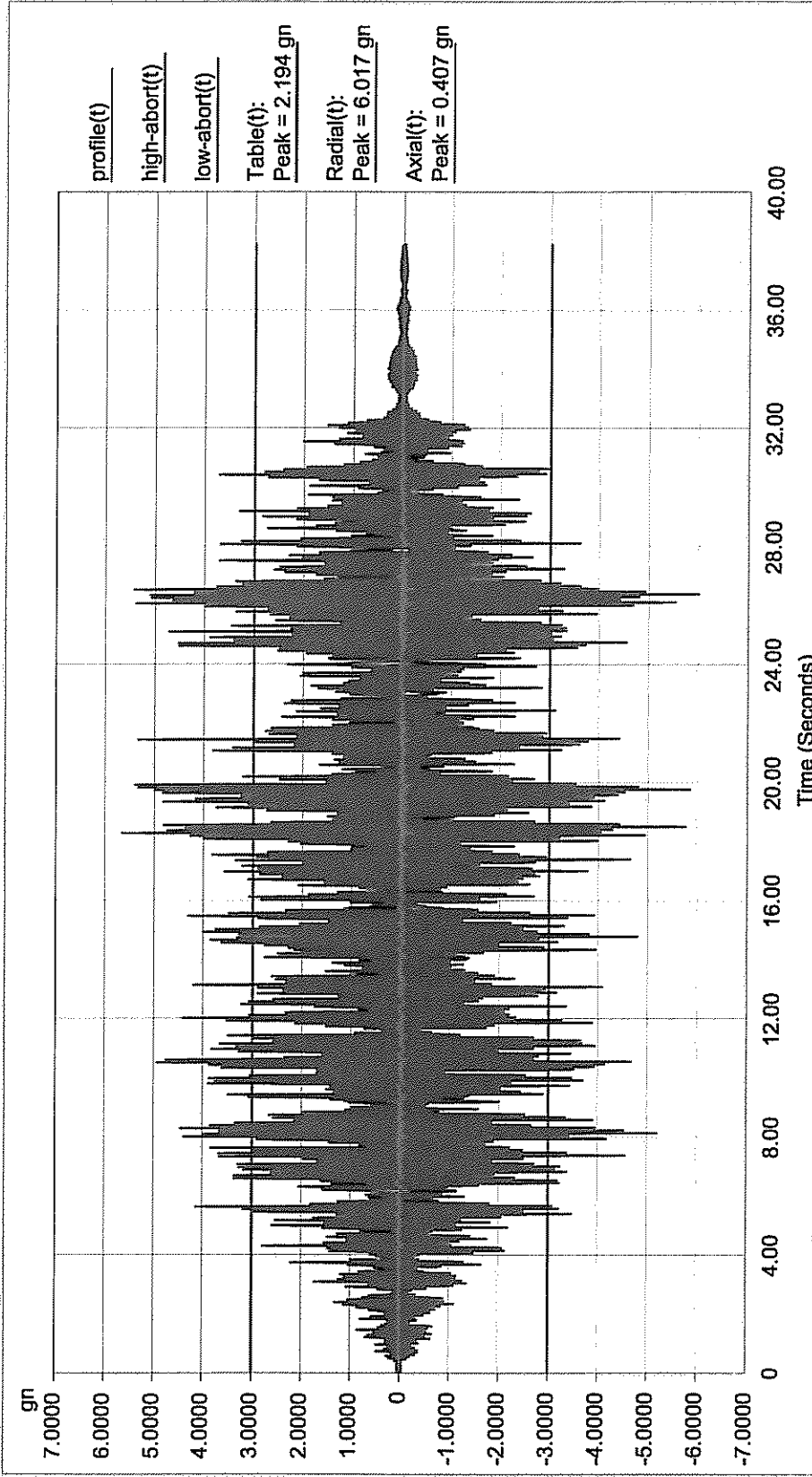
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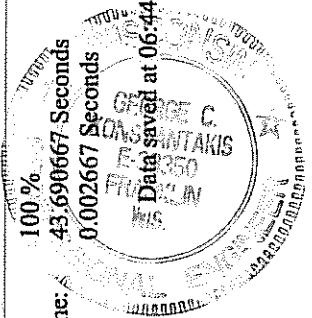
Horizontal Face Mounting, X axis Seismic Test, Time Histories Plot

Project File Name: Horizontal1.prj Test Type: Transient Time History Run Folder: .\RunDefault Jun 15, 2010 18-41-42



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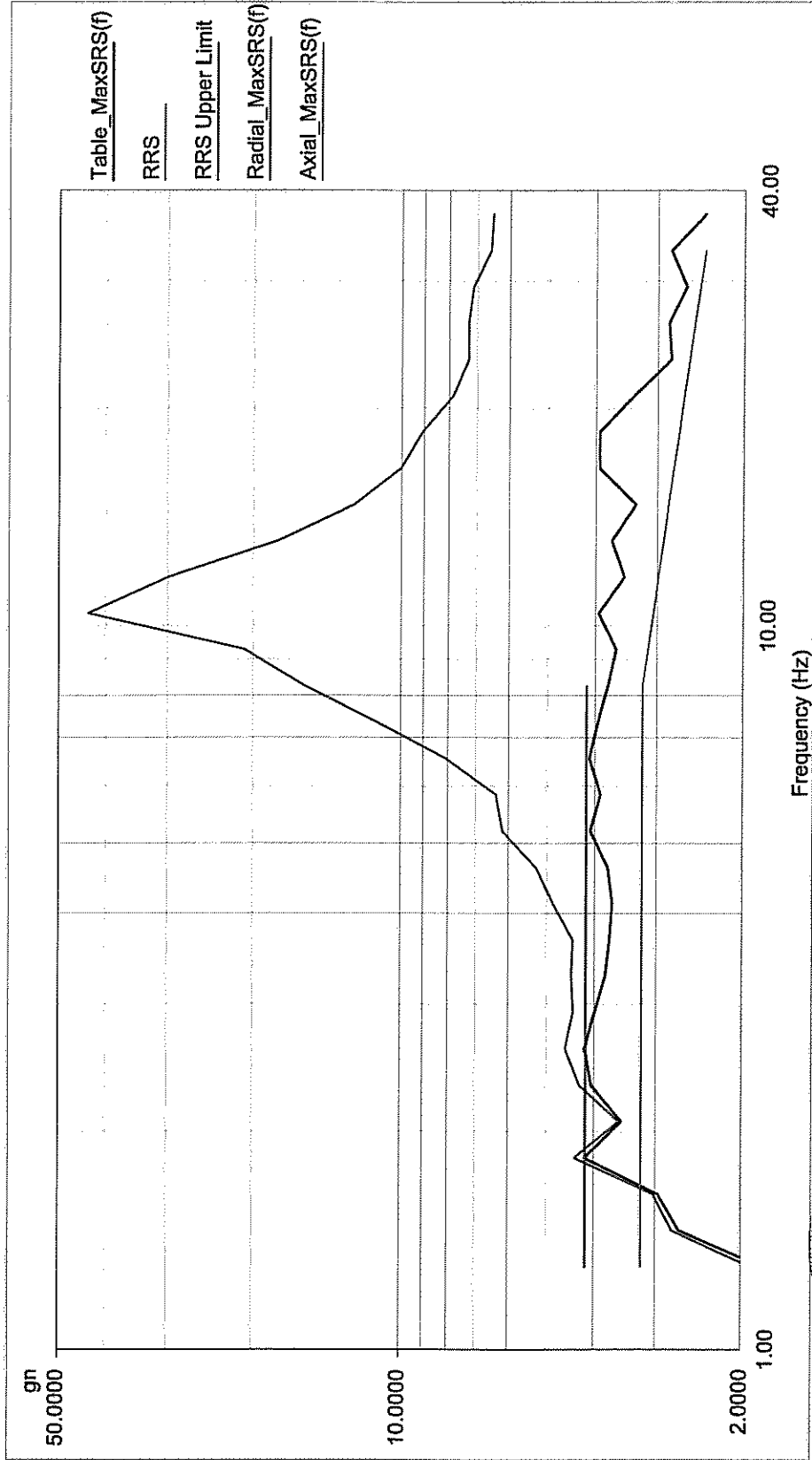


Horizontal Face Mounting, Y axis Seismic Test, Response Spectrums Plot

Project File Name: Horizontal1.prj

Profile Name: Test Type: Transient Time History

Run Folder: .\RunDefault Jun 15, 2010 19-18-13



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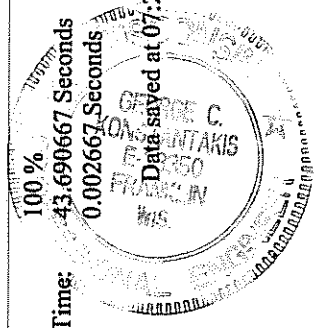
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Full Level Elapsed Pulses: 1
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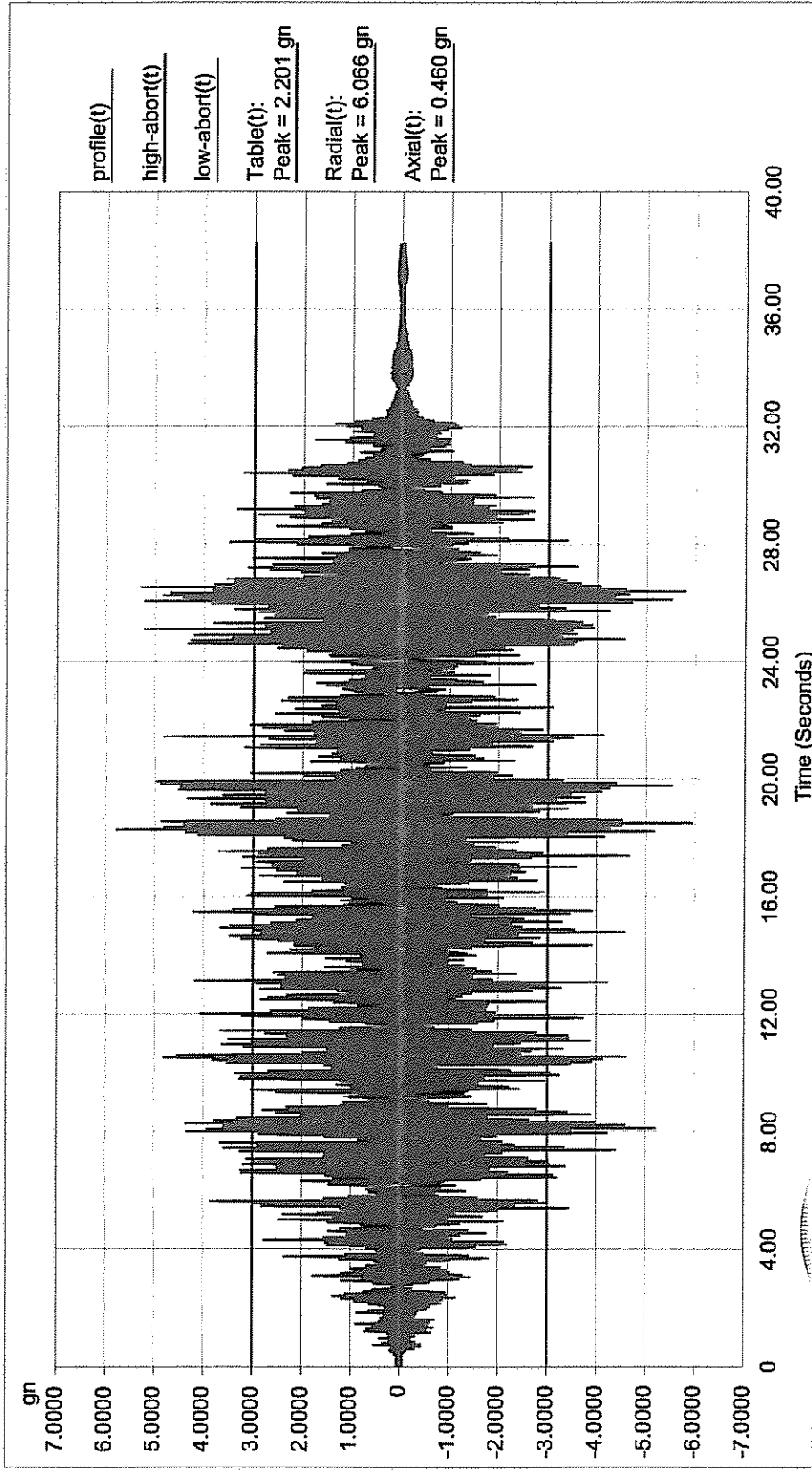
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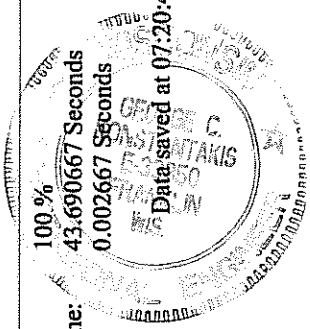
Horizontal Face Mounting, Y axis Seismic Test, Time Histories Plot

Project File Name: Horizontal11.prj Test Type: Transient Time History Run Folder: \RunDefault Jun 15, 2010 19-18-13



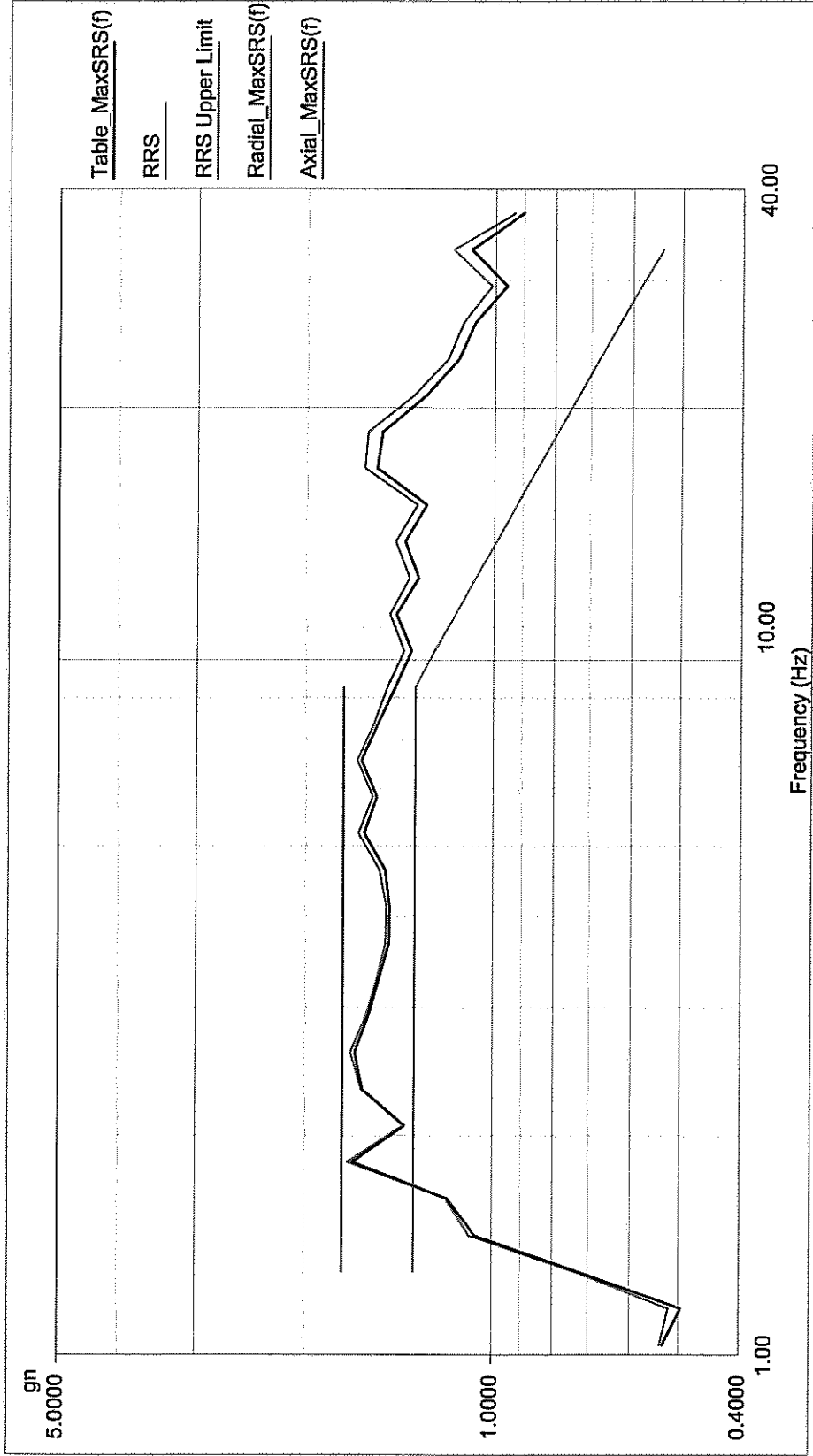
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 dT: 0.002667 Seconds Demand Peak: 1.975763

Report created at 07:20:42 PM, Tuesday, June 15, 2010



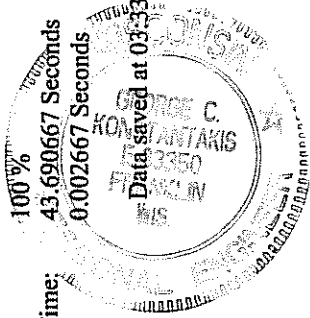
Horizontal Face Mounting, Z axis Seismic Test, Response Spectrums Plot

Project File Name: Vertical.prj Test Type: Transient Time History Run Folder: .\RunDefault Jun 16, 2010 15-31-56



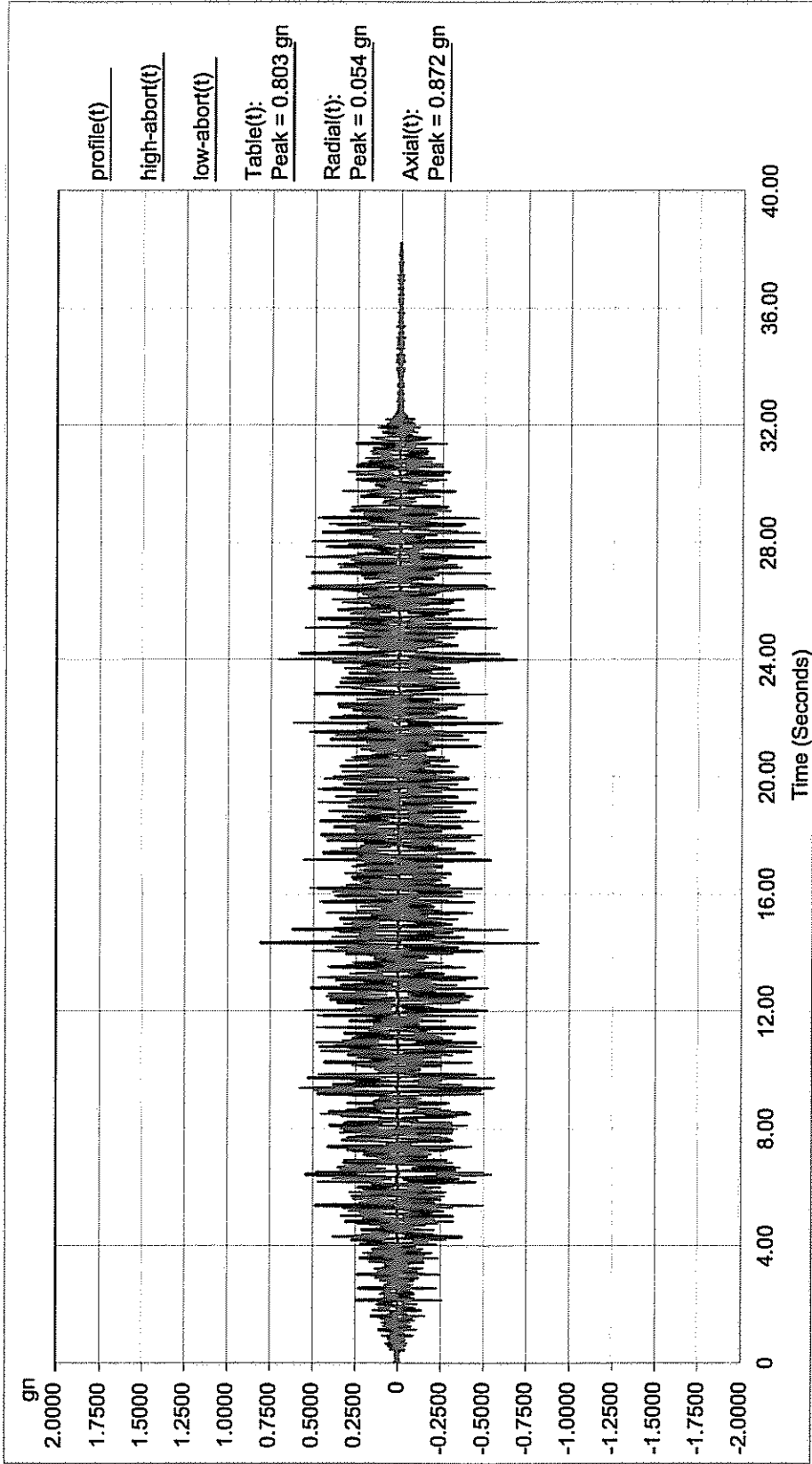
Level: 100% Block Size: 16384 Elapsed Pulses: 1 Full Level Elapsed Pulses: 1
 Frame Time: 43.690667 Seconds Control RMS: 0.151683 Demand RMS: 0.151081 Remaining Pulses: 0
 dT: 0.002667 Seconds

Data saved at 03:33:50 PM, Wednesday, June 16, 2010 Report created at 03:33:51 PM, Wednesday, June 16, 2010



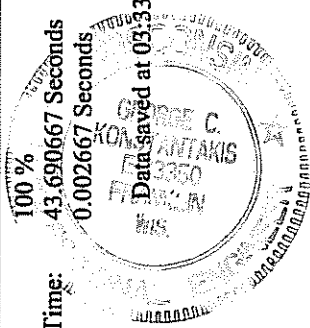
Horizontal Face Mounting, Z axis Seismic Test, Time Histories Plot

Project File Name: Vertical.prj Test Type: Transient Time History Run Folder: .\RunDefault Jun 16, 2010 15-31-56
 Profile Name:



Level: 100 % Block Size: 16384 Elapsed Pulses: 1 Full Level Elapsed Pulses: 1
 Frame Time: 43.690667 Seconds Control Peak: 0.803281 Control RMS: 0.151683 Demand RMS: 0.151081 Remaining Pulses: 0
 dT: 0.002667 Seconds Demand Peak: 0.788627

Report created at 03:33:53 PM, Wednesday, June 16, 2010



5.0 EQUIPMENT LIST



DATASYST
Engineering & Testing Services, Inc.

514 W33511 Highway 18 • Delafield, WI 53018 • 262 968-4003 • Fax: 262 968-3050 • 800 969-405C

Test Equipment List

Test Description: AC156 Testing

Project Number: M109-14187

Sample Description: Magnemount MB

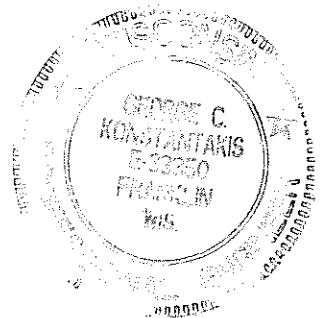
Customer: Metal & Cable Corp., Inc.

Sample Number / Serial Number: -

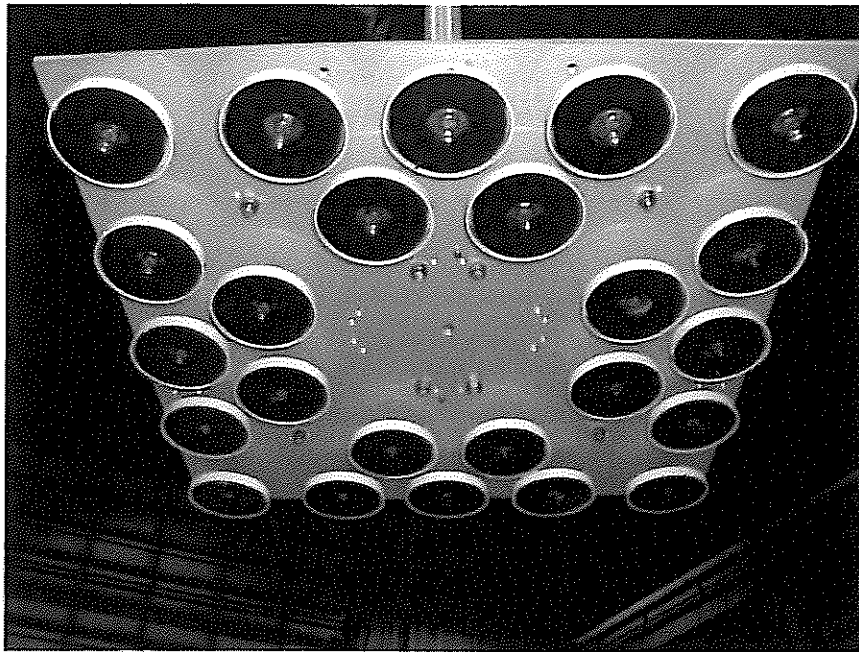
Test Dates: 6/15/2010 - 6/16/2010

Equipment	Manufacturer	Model Number	Serial Number	Calibration	
				Last	Due
Actuator	MTS	204.61	155	-	-
Hydraulic controller	MTS	407	3	-	-
Servo valve	Moog	G761-3264	9222	-	-
Servo valve	Moog	G761-3264	9227	-	-
Vibration Controller 9	Dactron	Laser	5083465	10/1/2009	10/1/2010
Signal Conditioner	PCB	482A22	1565	1/23/2009	1/23/2011
Control Accelerometer	PCB	393A03	23408	1/8/2010	2/5/2011
Response Accelerometer	PCB	393A03	9652	6/24/2009	8/26/2010
Response Accelerometer	PCB	393A03	9653	7/21/2009	8/26/2010
Scale	Triner	5401SB3	13189	-	-

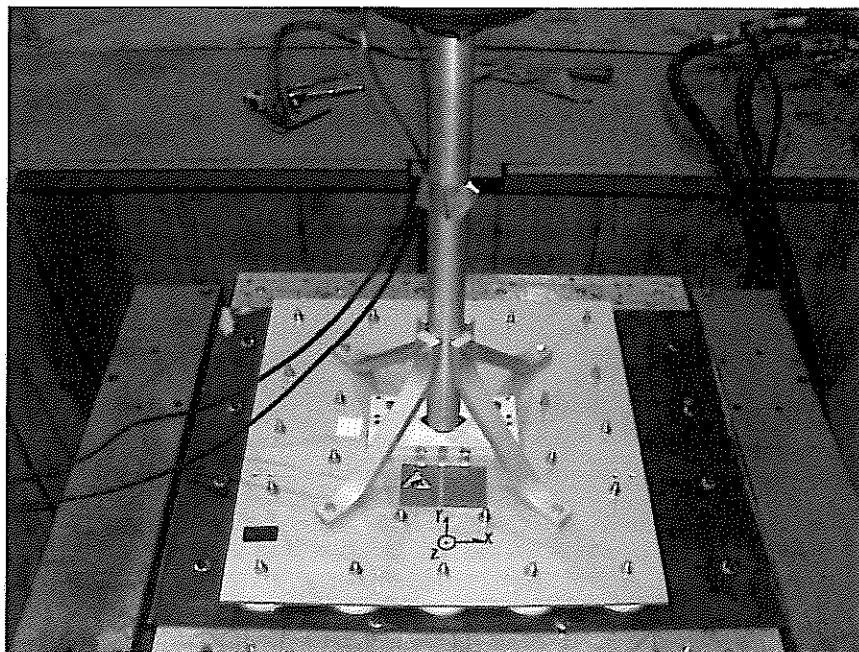
Certificates and reports of all calibrations are retained in the DATASYST Engineering & Testing Services, Inc. files and are available for inspection upon request.



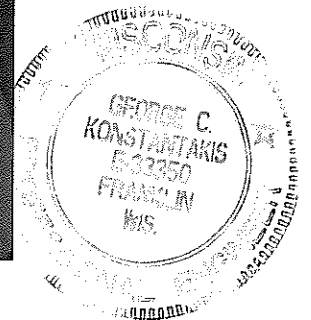
6.0 PHOTOGRAPHS

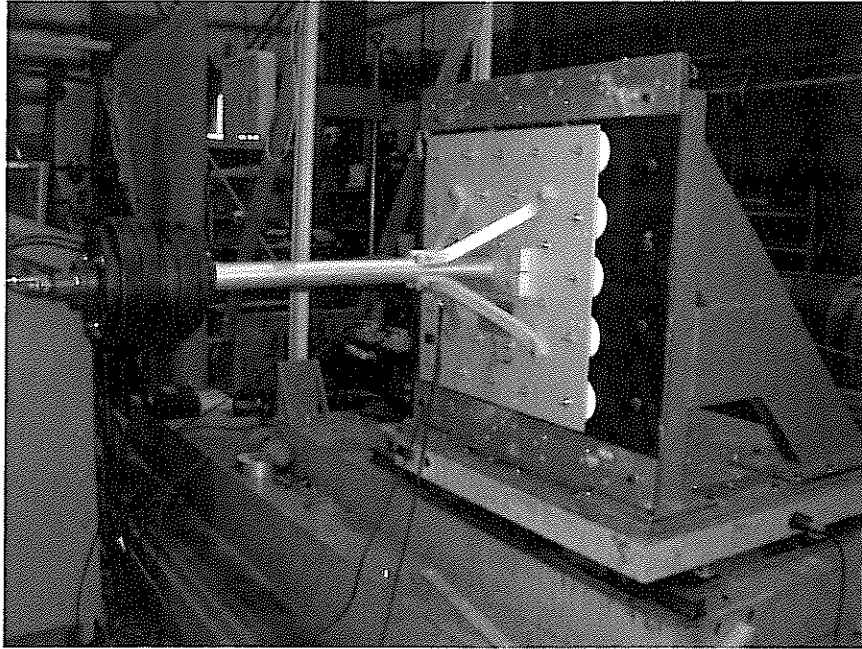


Twenty-Four Magnets on Magnemount Mounting Surface

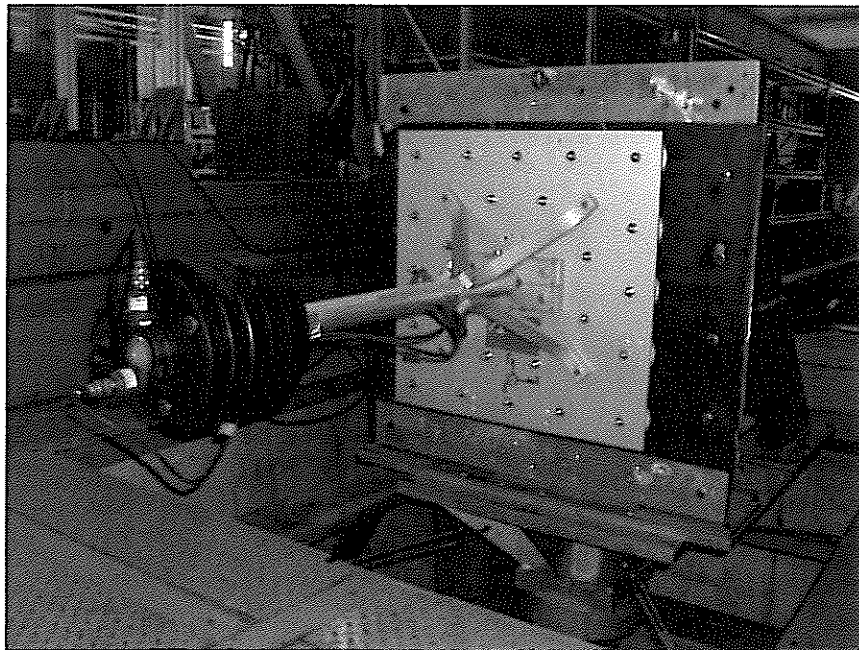


Axis Definition

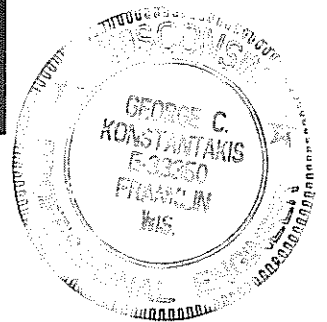


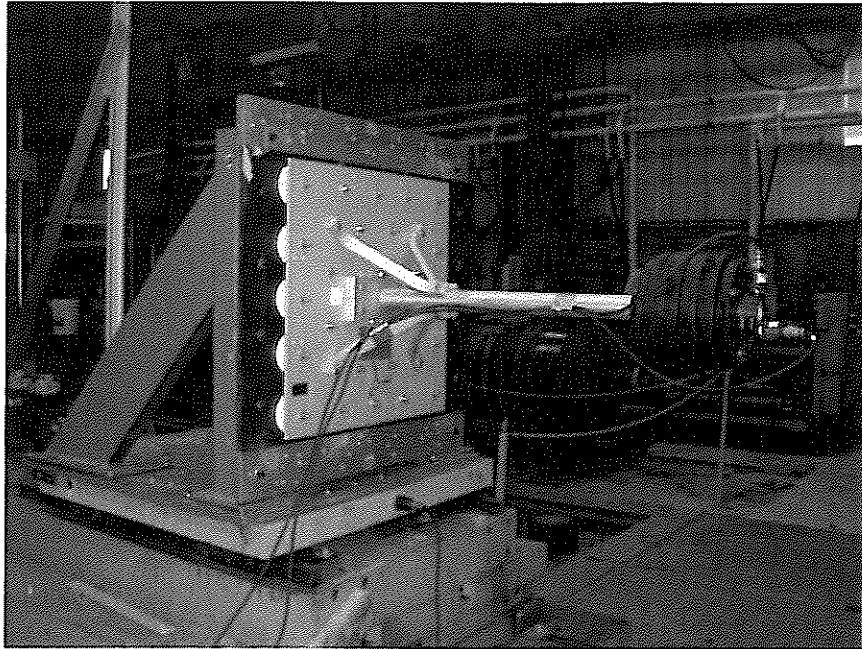


Vertical Mounting Face – X Axis Test

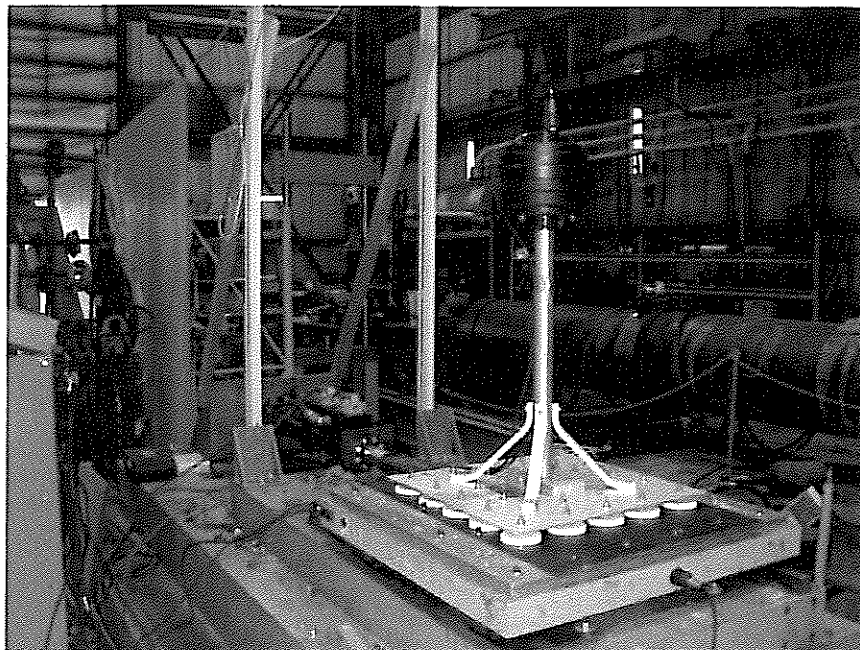


Vertical Mounting Face – Y Axis Test

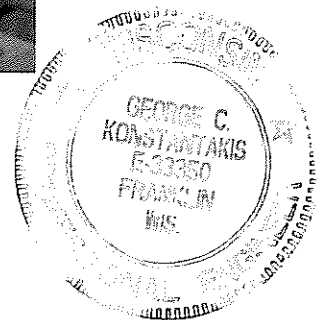


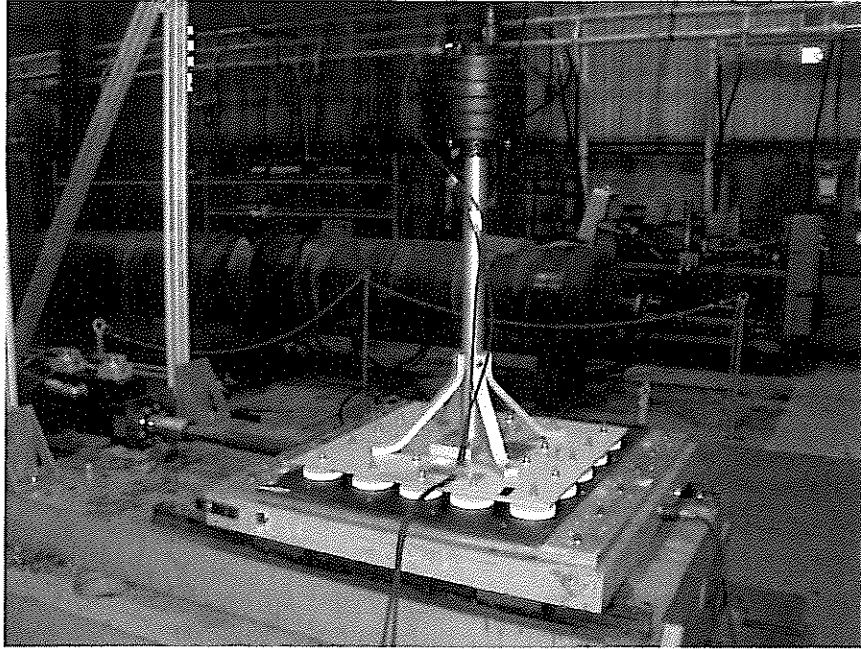


Vertical Mounting Face – Z Axis Test

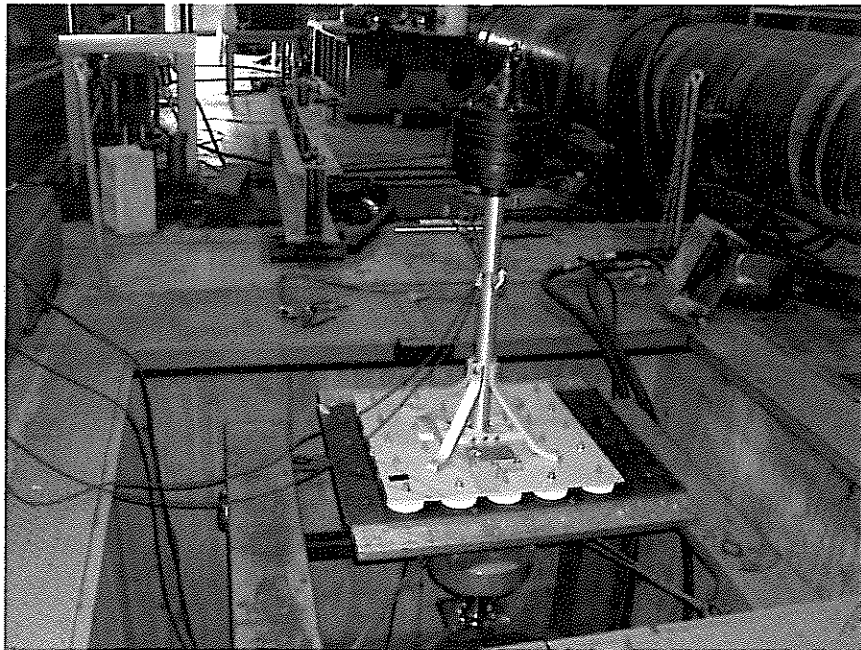


Horizontal Mounting Face – X Axis Test

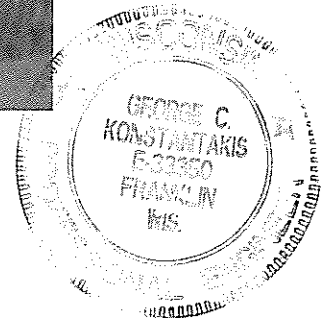


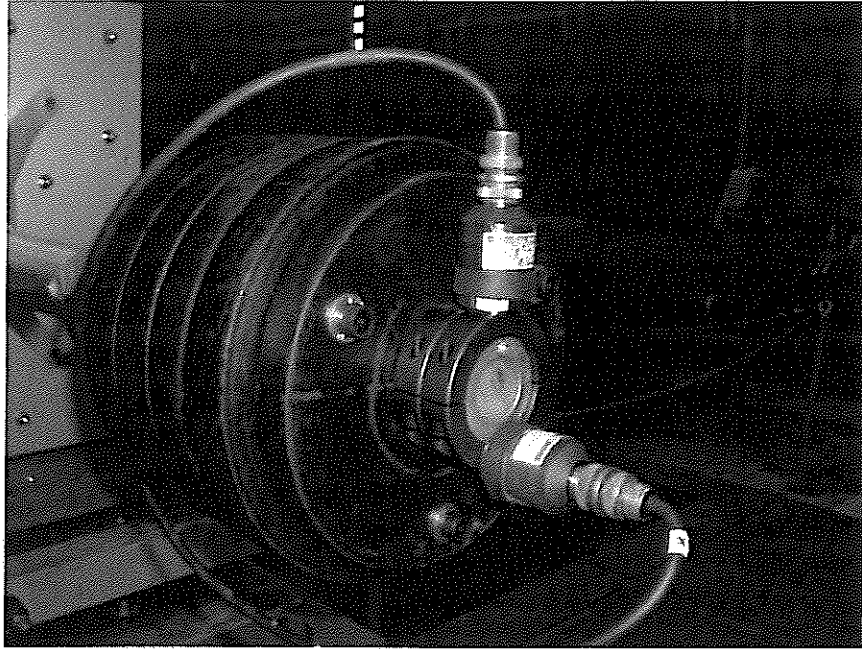


Horizontal Mounting Face – Y Axis Test



Horizontal Mounting Face – Z Axis Test





Response Accelerometers

