Bellcore GR-63-CORE Earthquake Zone 4 Report for the Cannon Cabinet Series 2000-SUK

For

Cannon Technologies Ltd.
1155 Squires Beach Road
Pickering, Ontario Canada L1W 3T9
February 5, 2002

Revision 1.0

Project Handler:

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Report of Measurements for the Cannon Cabinet Series 2000-SUK
Table of Contents

1.0 EXECUTIVE SUMMARY

1.1 Introduction

This audit report examines the Cannon Cabinet Series 2000-SUK (Part Number: CAB-458080000105NA) for conformance to Bellcore's Zone 4 Earthquake requirements of GR-63-CORE, Issue 1, October 1995. Table 1.3 is a detailed summary of the results of this testing.

1.2 Revision History

Revision Number	Description	Revision performed by
1.0	None, original	N/A

1.3 Test Result Summary

The table below summarizes the test results of the Cannon Cabinet Series 2000-SUK. The product was compared to the seismic environmental compatibility generic criteria. The details of this test are located in the appropriate Annex for the section under investigation.

Note: The information in the table below should not be used without understanding the underlying circumstances of the test results that are presented in the Annexes of this report.

TABLE 1.3 GR-63-CORE TEST RESULTS SUMMARY

Physical Compatibility GR-63-CORE:				
Test	NEBS Reference	Meets Criteria (Y/N/NA)	Test Data Annex	UL's Comments
• **Earthquake Vibration**				
• Earthquake – Physical performance	R4-44	Y	3	See enclosed results.
	R4-45	Y	3	See enclosed results.
	R4-46	Y	3	See enclosed results.
	O4-47	Y	3	See enclosed results.
• Earthquake – Functional performance	R4-48	NA	-	The test was conducted on a non-operational system.
	O4-49	NA	-	The test was conducted on a non-operational system.

2.0 ANALYSIS SCOPE

2.1 Product Description

The Cannon Cabinet Series 2000-SUK consists of a heavy steel welded frame with hinged, locking front and rear doors. Side panels are inset and screw mounted. The top is a removable perforated panel.

Refer to Annex 2 for detailed drawings of the EUT provided by Cannon. It should be noted that the cabinet tested did not incorporate the slotted mounting holes shown in sheet 3 of the enclosed drawings. Mounting holes were drilled by engineers of UL.

2.2 Modifications Necessary for Compliance

The following modifications were incorporated into the EUT in order to fully comply with the requirements of the specification: None.

2.3 EUT Configuration

The Cabinet was configured by engineers of UL in accordance with specifications provided by Cannon. A diagram illustrating the configuration of the weights in the frame is shown in Annex 2.

2.4 EUT Operation

This testing was conducted on a non-operational unit.

2.5 NEBS Testing Facilities

Test Category	NRTL / ISO 9000	Location
Physical Protection:		
• Earthquake	Y	UL; RTP, NC

3.0 Project Team

3.1 UL Technical Staff

The following personnel supervised and/or performed technical aspects of GR-63-CORE.

Michelle Henderson	(919) 549-1471 Associate Project Engineer

3.2 Cannon Technical Staff

The following personnel were present throughout this investigation to configure and insure proper assembly of the system under test and to assist UL engineers with the test procedure:

None

4.0 Analysis Criteria

The product was evaluated to the Earthquake Zone 4 requirements contained in the following document:

- GR-63-CORE, Issue 1, October 1995, Network Equipment – Building System (NEBS) Requirements: Physical Protection

ANNEX 1 - Equipment Photos

Figure 1: Test Set-Up for Side to Side Axis

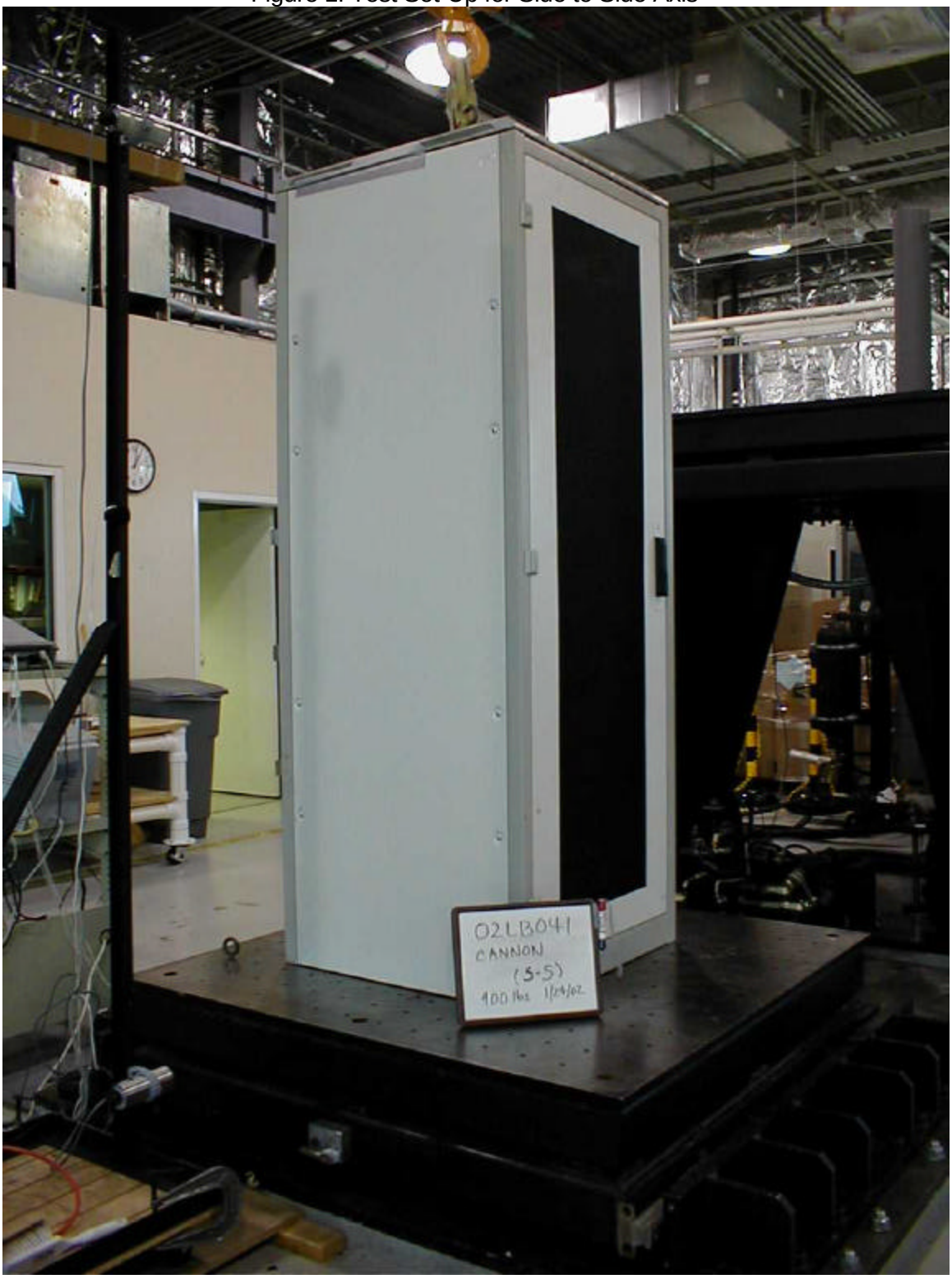
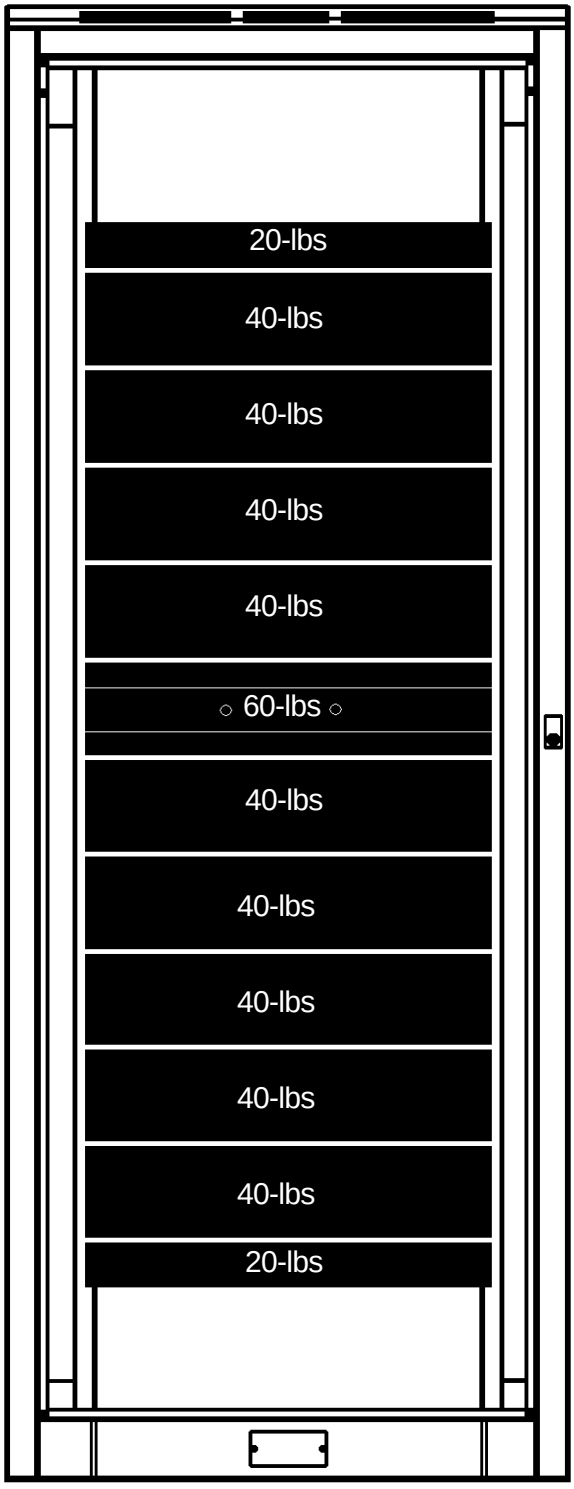


Figure 2: Test Set-Up Front to Back Axis

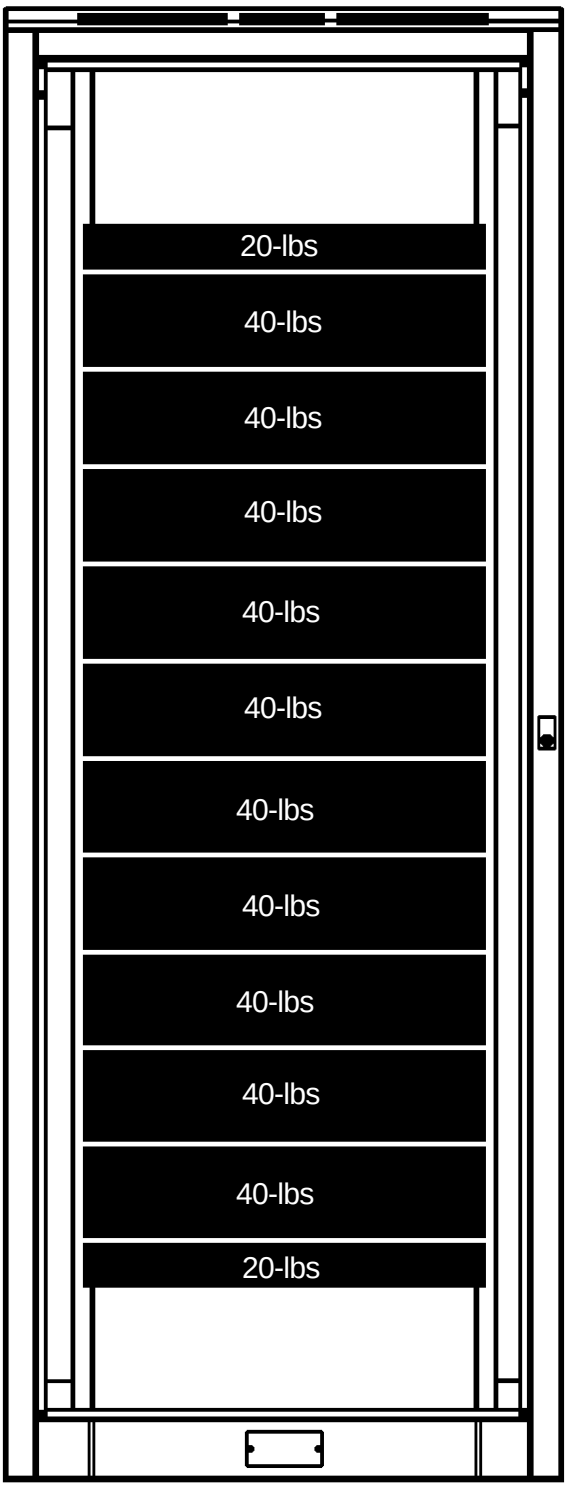
Figure 3: Test Set-Up Vertical Axis

ANNEX 2 - Product Configuration

Front of Cabinet

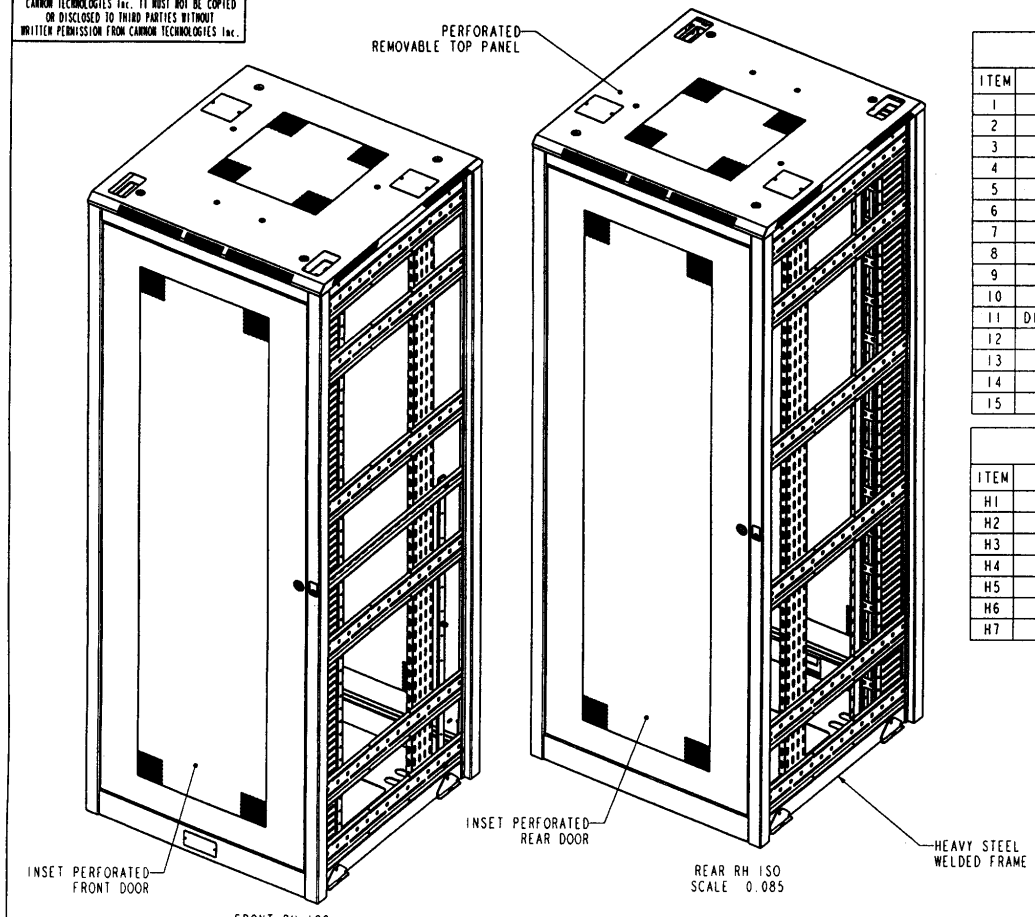


Back of Cabinet



Note: Forty pounds of weight was mounted to the top of the frame in order to simulate overhead cable weight.

IF IN DOUBT ASK



PARTS LIST

ITEM	PART/MODEL	DESCRIPTION	QTY
1	047C00001045	TRAY,CABLE,METAL,100mm,45U	2
2	098C44800101NA	DOOR,PERF,WELDED,800x44U	2
3	184C00051101NA	ASM,COVER,CUTOUT,RECEPTACLE	1
4	202C45050002NA	PANEL,BOX,INFILL,HEAVY,50mm,45U	2
5	202C45050003NA	PANEL,INFILL,HEAVY,50mm,45U	2
6	296C01000045NA	POST,MOUNTING,HEAVY,45U	2
7	314C00808001NA	ROOF,VENTED,SPECIAL,800x800	1
8	394C01008001NA	MEMBER,SUPPORT,SINGLE,SPECIAL,800	1
9	505B45808001NA	ASM,CABINET,WELDED,45Ux800x800	1
10	DIN 6797A M3	WASHER,EXT.TOOTH,STL,ZN,M3	2
11	DIN 7500 M (965) M3x8	SCR,TAPTITE,POZI,CSK,STL,ZN,M3x8	2
12	EA0191	BUTTOM,SNAP,ESD	2
13	LA0006	LABEL,ESD	2
14	PANDUIT C1.5LG6	COVER,DUCT,1-1/2"	2
15	PANDUIT G1.5X4LG6	DUCT,WIRING,1-1/2"x4"	2

PARTS LIST (HARDWARE, NOT MODELED)

ITEM	PART/MODEL	DESCRIPTION	QTY
H1	CA021	CAGE NUT TOOL	1
H2	FMN08206P	M6 S/PROOF FLANGED HEX NUT	24
H3	FMS0070612P	M6x12 POZI PAN HEAD SCREW	24
H4	KP0004	FRONT PANEL FIXINGS (50 OFF)	1
H5	KP0007	CABINET JOINING KIT	1
H6	KP0015	700-800 WIDE CABINET HARDWARE KIT	1
H7	KP0201	CABINET EARTH BONDING KIT	1

NOTES

1 ASSEMBLE COMPONENTS AS SHOWN

2 EQUIPMENT MOUNTING RAILS ARE ZINC PLATED

ECN	DRG ISSUE	DESCRIPTION	DATE
---	5	REVISE FRAME, ROOF & DOORS, ADD BUS BAR, SUPPORT MEMBER & MISC HDWR	11-Nov-01
---	4	REVISED WELDED FRAME, REPLACED SIDE PANEL W/ STD	03-Oct-00
---	3	UPDATED PARTS LIST, WAS ASM CAB-458080000103NA	22-Sep-00
---	2	WELDED FRAME & ROOF	28-Aug-00
---	1	INITIAL RELEASE	12-Aug-00

CANNON TECHNOLOGIES Inc.
PICKERING, ONTARIO, CANADA
TEL 905-426-2869
FAX 905-426-2893

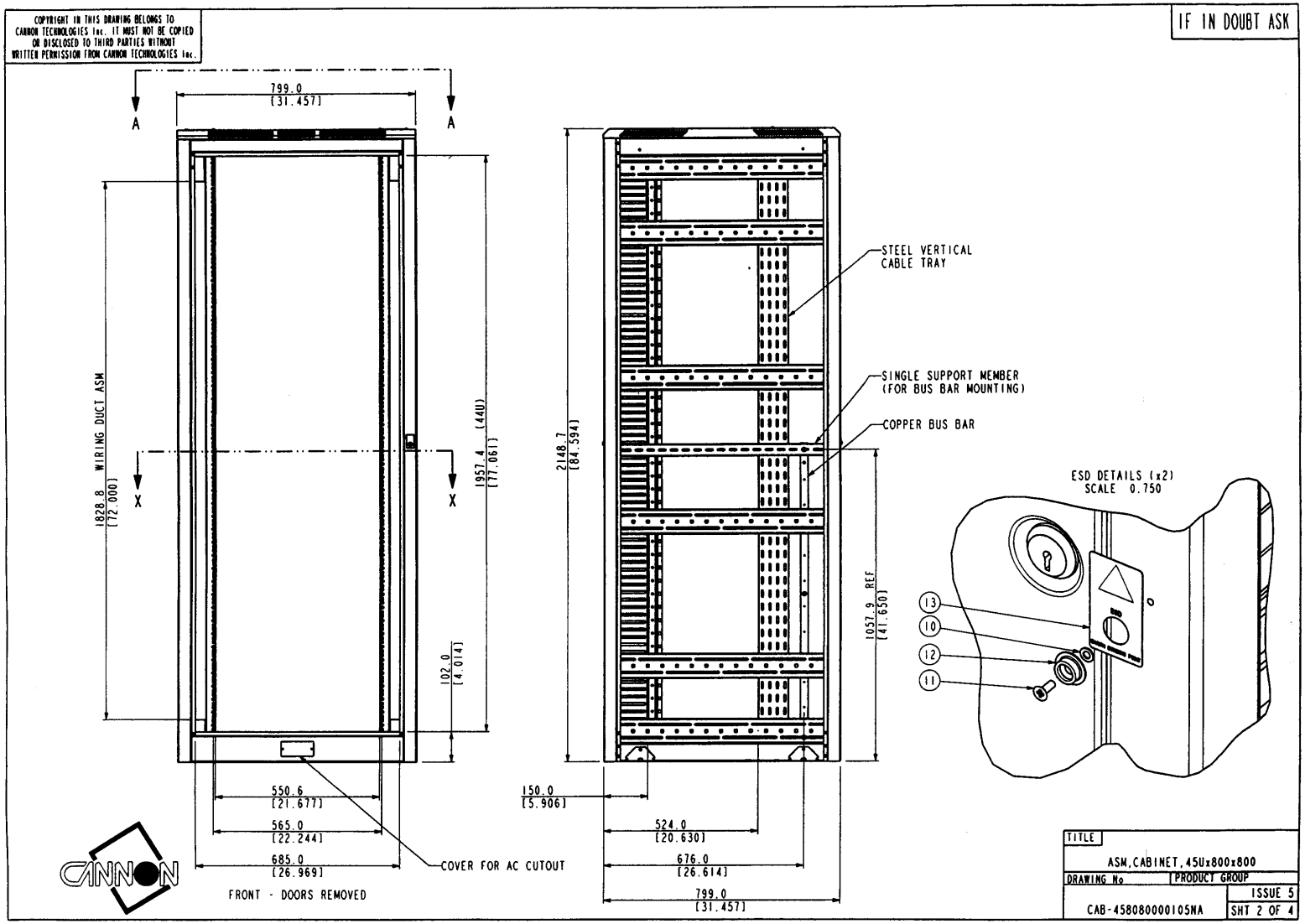
PROJECTION

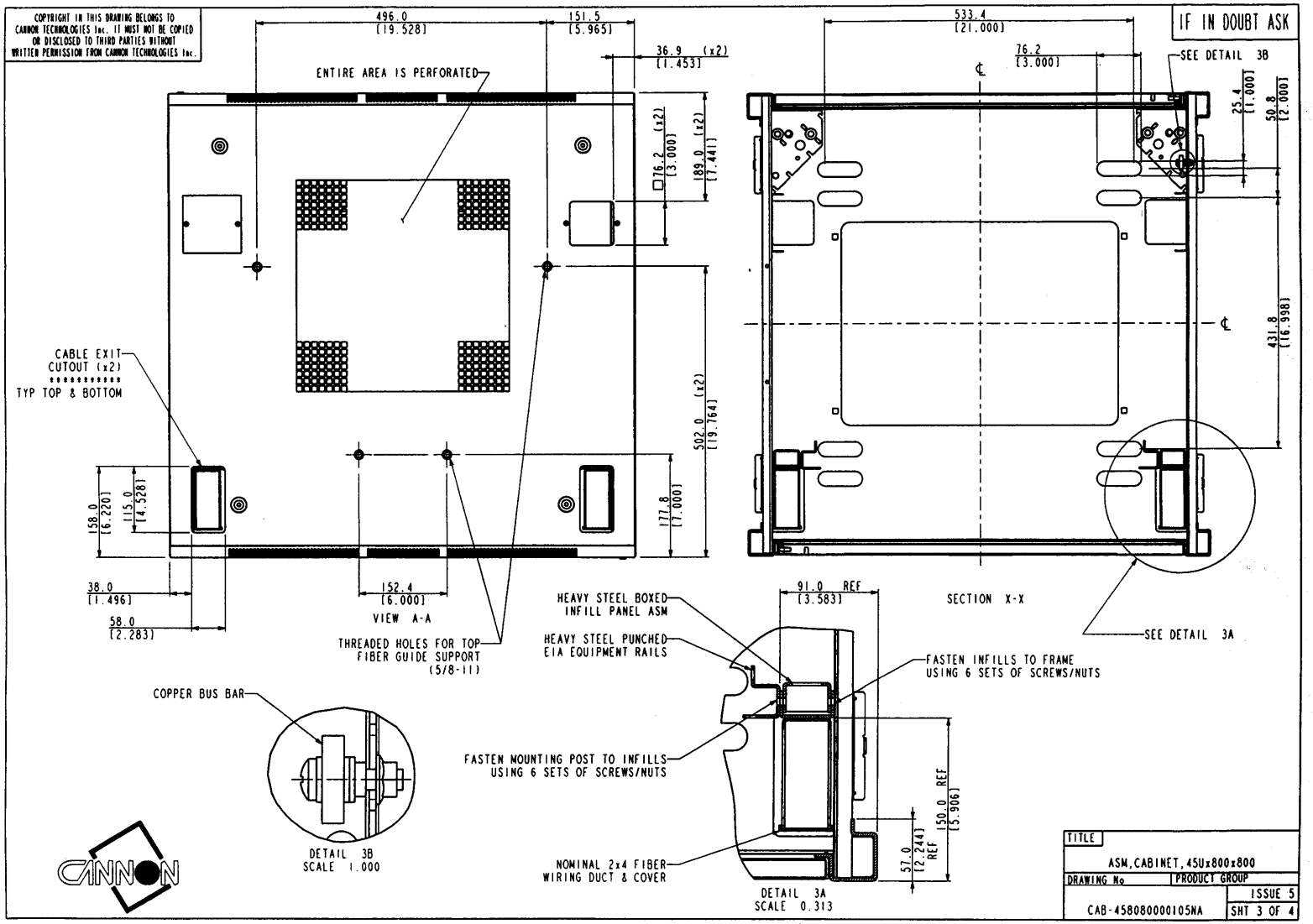
PART NUMBER: CAB-458080000105NA

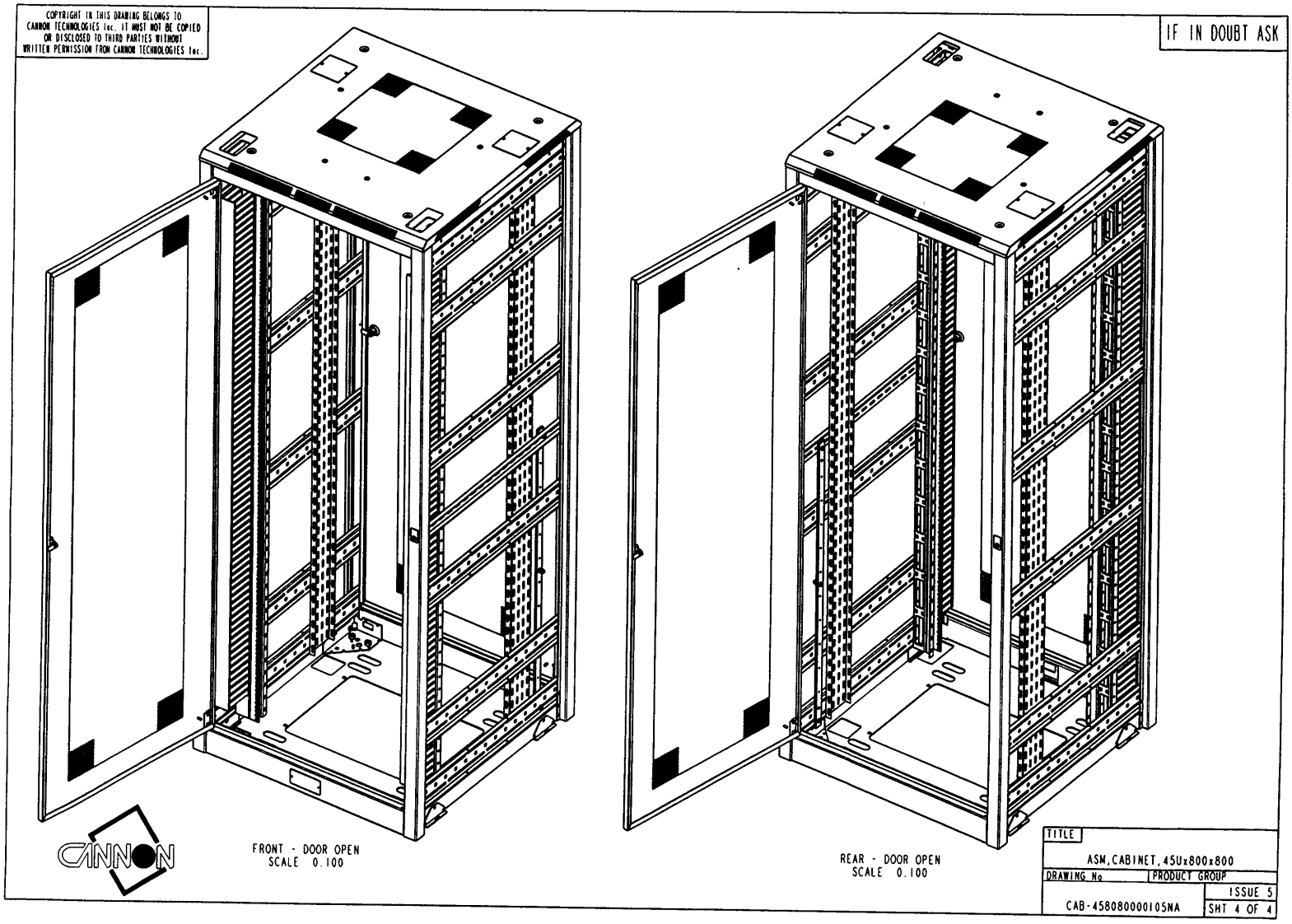
TITLE: ASM,CABINET,45Ux800x800

MATERIAL	FINISH	FIRST USED ON.	CHECKED	DRAWN	DRAWING No	PRODUCT GROUP	ISSUE
SEE PARTS LIST	SEE COMPONENTS	SYCAMORE		D.G.	CAB-458080000105NA		5
							SHT 1 OF 4

TOLERANCES EXCEPT WHERE OTHERWISE STATED
HOLE DIAMETER ±0.1
OVER 1 METRE ±1.0
0 - 6 ±0.5
6 - 30 ±0.3
30 - 180 ±0.1
ANGLE ±1.0°
SET BACK XX | INS BEND RAD XX | ALL DIMENSIONS IN MM [INCHES]


COPYRIGHT IN THIS DRAWING BELONGS TO CANNON TECHNOLOGIES Inc. IT MUST NOT BE COPIED OR DISCLOSED TO THIRD PARTIES WITHOUT WRITTEN PERMISSION FROM CANNON TECHNOLOGIES Inc.
IF IN DOUBT ASK
799.0 [31.457]
A
A
X
X
1828.8 [72.000]
WIRING DUCT ASM
1957.4 [77.061]
(44U)
102.0 [4.014]
2148.7 [84.594]
1057.9 REF [41.650]
STEEL VERTICAL CABLE TRAY
SINGLE SUPPORT MEMBER (FOR BUS BAR MOUNTING)
COPPER BUS BAR
ESD DETAILS (x2) SCALE 0.750
13
10
12
11
550.6 [21.677]
565.0 [22.244]
685.0 [26.969]
COVER FOR AC CUTOUT
FRONT - DOORS REMOVED
150.0 [5.906]
524.0 [20.630]
676.0 [26.614]
799.0 [31.457]
CANNON
TITLE
ASM,CABINET,45Ux800x800
DRAWING No
PRODUCT GROUP
ISSUE 5
CAB-458080000105NA
SHT 2 OF 4


COPYRIGHT IN THIS DRAWING BELONGS TO CANNON TECHNOLOGIES Inc. IT MUST NOT BE COPIED OR DISCLOSED TO THIRD PARTIES WITHOUT WRITTEN PERMISSION FROM CANNON TECHNOLOGIES Inc.
IF IN DOUBT ASK
496.0 [19.528]
151.5 [5.965]
36.9 (x2) [1.453]
ENTIRE AREA IS PERFORATED
533.4 [21.000]
76.2 [3.000]
SEE DETAIL 3B
25.4 [1.000]
50.8 [2.000]
□16.2 (x2) [3.000]
189.0 (x2) [7.441]
431.8 [16.998]
CABLE EXIT CUTOUT (x2) TYP TOP & BOTTOM
502.0 (x2) [19.764]
158.0 [6.220]
115.0 [4.528]
177.8 [7.000]
38.0 [1.496]
58.0 [2.283]
152.4 [6.000]
VIEW A-A
THREADED HOLES FOR TOP FIBER GUIDE SUPPORT (5/8-11)
HEAVY STEEL BOXED INFILL PANEL ASM
HEAVY STEEL PUNCHED EIA EQUIPMENT RAILS
91.0 REF [3.583]
SECTION X-X
SEE DETAIL 3A
FASTEN INFILLS TO FRAME USING 6 SETS OF SCREWS/NUTS
COPPER BUS BAR
FASTEN MOUNTING POST TO INFILLS USING 6 SETS OF SCREWS/NUTS
DETAIL 3B SCALE 1.000
NOMINAL 2x4 FIBER WIRING DUCT & COVER
57.0 [2.244] REF
150.0 REF [5.906]
DETAIL 3A SCALE 0.313
TITLE
ASM,CABINET,45Ux800x800
DRAWING No.
PRODUCT GROUP
ISSUE 5
CAB-458080000105NA
SHT 3 OF 4


COPYRIGHT IN THIS DRAWING BELONGS TO CANNON TECHNOLOGIES Inc. IT MUST NOT BE COPIED OR DISCLOSED TO THIRD PARTIES WITHOUT WRITTEN PERMISSION FROM CANNON TECHNOLOGIES Inc.
IF IN DOUBT ASK
CANNON
FRONT - DOOR OPEN
SCALE 0.100
REAR - DOOR OPEN
SCALE 0.100
TITLE
ASM,CABINET,45Ux800x800
DRAWING No
PRODUCT GROUP
ISSUE 5
CAB-4580800001O5NA
SHT 4 OF 4

ANNEX 3 – Earthquake Data

4.4.1.1 Earthquake Environment Criteria

(R4-44, [110]) – (O4-49, [115])

Test Instruments

Instrument Number	Manufacturer	Model	Range Used	Cal. Date	Cal. Due
AX0022	Data Physics	Vector	mV/G	05/07/01	05/31/02
AX0016	Dytran	3166A1	mV/G	01/08/00	01/08/03
AX0014	Dytran	3166A1	mV/G	01/08/00	01/08/03
AX0018	Dytran	3166A1	mV/G	01/08/00	01/08/03
AX0021	Dytran	3166A1	mV/G	01/08/00	01/08/03
WD0057	Chatillon	DWT 5000	5000 lb	02/23/01	02/28/02
MG1126	Senix	Ultra U	mV/inch	10/04/01	10/31/02
MG1127	Senix	Ultra U	mV/inch	10/04/01	10/31/02
Q15455-1	Microtech	SXS-FB	lbs	04/23/01	04/30/02
Q15455-2	Microtech	SXS-FB	lbs	04/23/01	04/30/02
Q15455-3	Microtech	SXS-FB	lbs	04/23/01	04/30/02
Q15455-4	Microtech	SXS-FB	lbs	04/23/01	04/30/02

Results

Sensor Description and Location

Channel	Sensor Type	Location
1	Accelerometer	Table
2	Accelerometer	Top of frame
3	Accelerometer	Middle of frame

Weight at top of framework: 40 lbs.

Weight of loaded frame: 1392 lbs.

☐ Mounting hardware was provided by the manufacturer.
☒ Mounting hardware was not provided by the manufacturer.

Describe mounting hardware: ½ x 13NC x 2-¼" lg strain bolts, 2 small round washers, 1 large round washer (1-cm thick)

4.4.1.1 Earthquake Environment Criteria (Continued)
(R4-44, [110]) – (O4-49, [115])

Results-Continued

X-AXIS (Front to Back)

Maximum displacement at top of framework: 0.67 inches

Resonant Frequency: Top 11.323 Hz Middle 11.323 Hz

☒ The resonant frequency was greater than 2 Hz.
☐ The resonant frequency was not greater than 2 Hz.

☒ The resonant frequency was greater than 6 Hz.
☐ The resonant frequency was not greater than 6 Hz.

☐ The EUT did continue to function as intended during and at the completion of testing.
☐ The EUT did not continue to function as intended during and at the completion of testing.
☒ NA – Test conducted on a non-operational unit.

If not, please describe errors _____

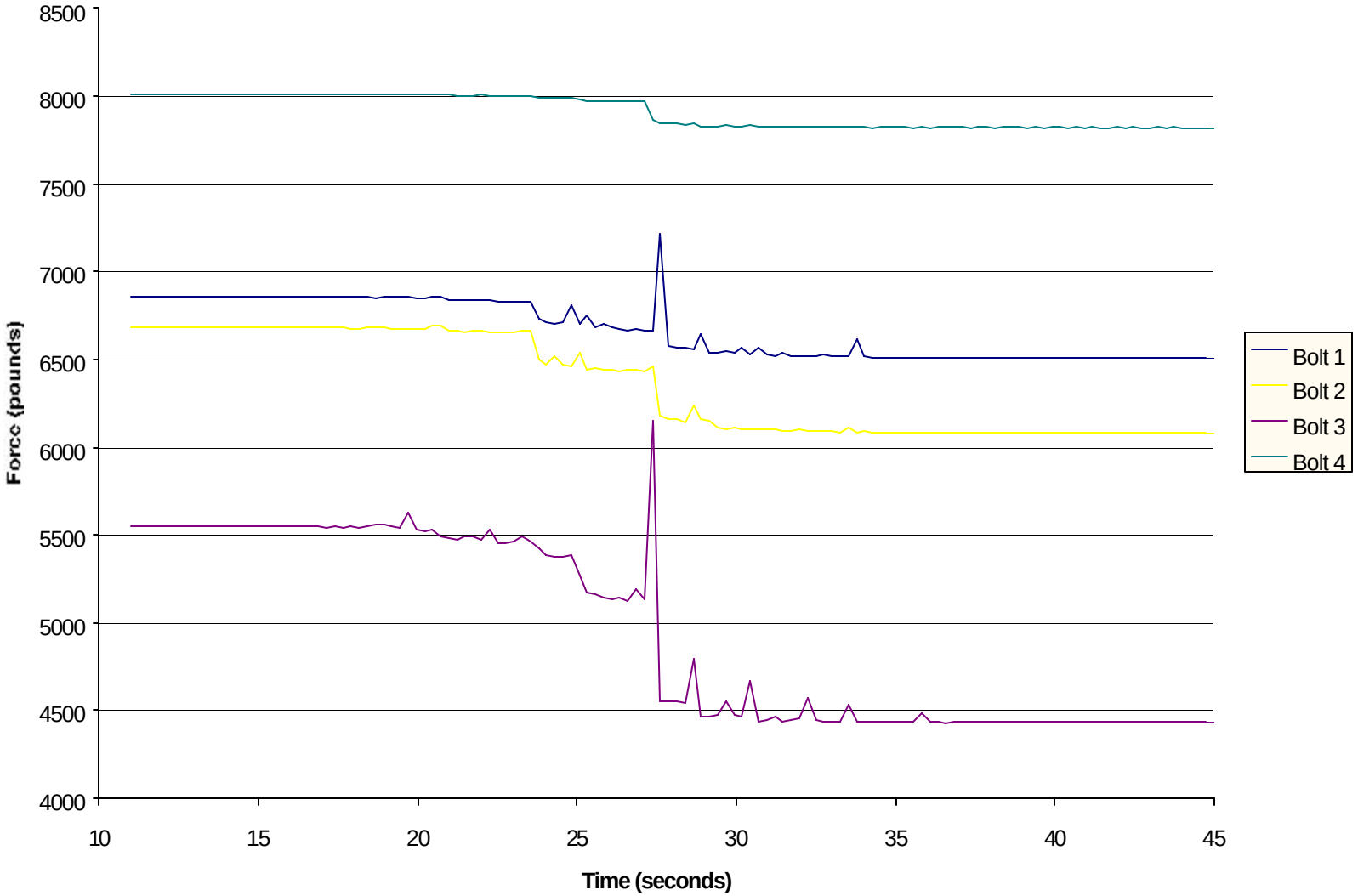
☐ The EUT did sustain any change in physical condition.
☒ The EUT did not sustain any change in physical condition.

If so, please describe change _____

Strain Bolt Data:

Bolt	Initial Bolt Load (lbs)	Peak Bolt Load (lbs)
1	6853	7211
2	6679	6690
3	5547	6151
4	8010	8012

02LB041 Cannon Front to Back



4.4.1.1 Earthquake Environment Criteria (Continued)
(R4-44, [110]) – (O4-49, [115])

Results-Continued

Y-AXIS (Side to Side)

Maximum displacement at top of framework: 1.23 inches

Resonant Frequency: Top 13.931 Hz Middle 13.931 Hz

☒ The resonant frequency was greater than 2 Hz.
☐ The resonant frequency was not greater than 2 Hz.

☒ The resonant frequency was greater than 6 Hz.
☐ The resonant frequency was not greater than 6 Hz.

☐ The EUT did continue to function as intended during and at the completion of testing.
☐ The EUT did not continue to function as intended during and at the completion of testing.
☒ NA – Test conducted on a non-operational unit.

If not, please describe errors _____

_____

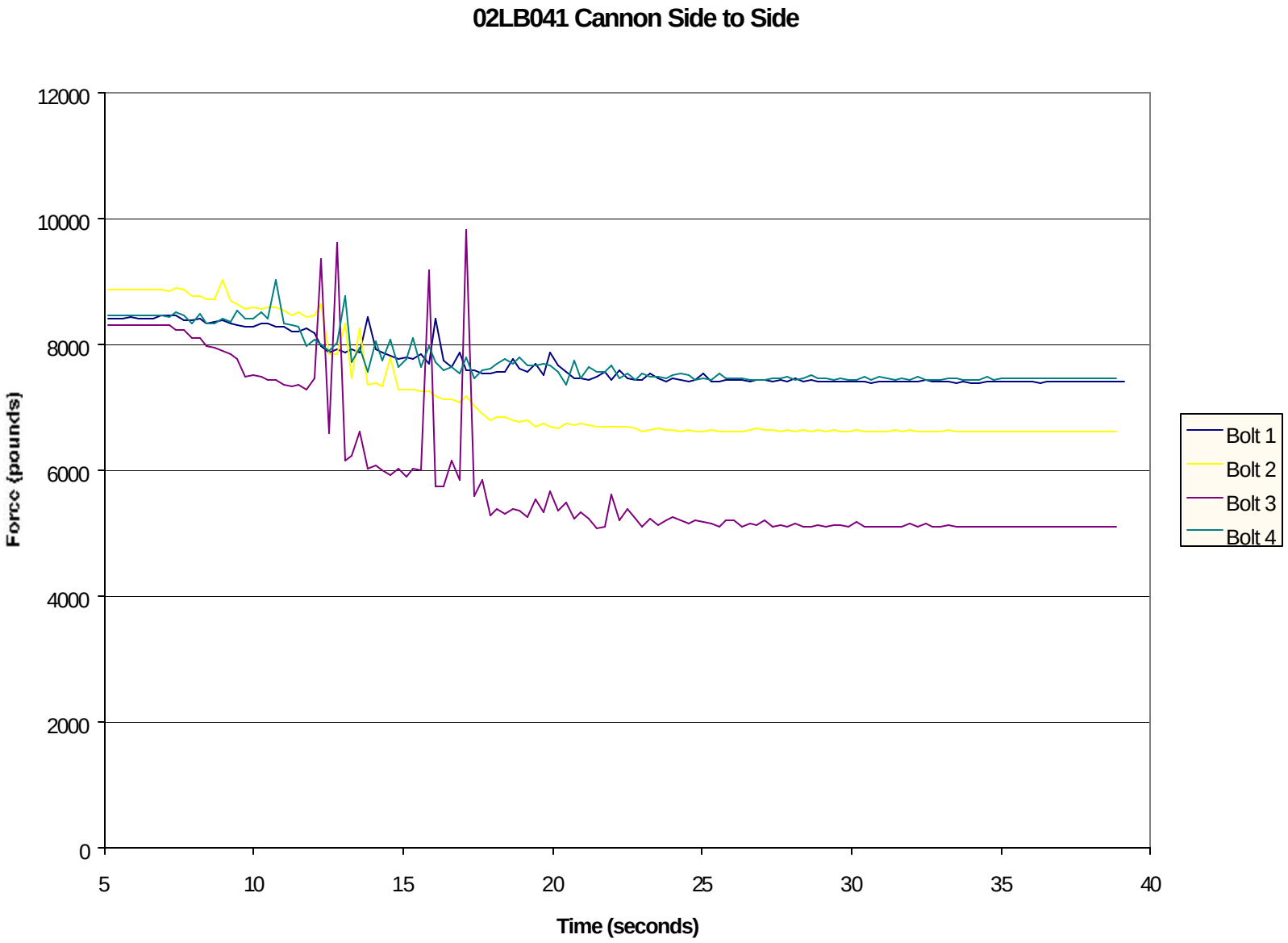
☐ The EUT did sustain any change in physical condition.
☒ The EUT did not sustain any change in physical condition.

If so, please describe change _____

_____

Strain Bolt Data:

Bolt	Initial Bolt Load (lbs)	Peak Bolt Load (lbs)
1	8410	8460
2	8870	9020
3	8300	9810
4	8450	9030


02LB041 Cannon Side to Side
12000
10000
8000
6000
4000
2000
0
Force (pounds)
5
10
15
20
25
30
35
40
Time (seconds)
Bolt 1
Bolt 2
Bolt 3
Bolt 4

4.4.1.1 Earthquake Environment Criteria (Continued)
(R4-44, [110]) – (O4-49, [115])

Results-Continued

Z-AXIS (Vertical)

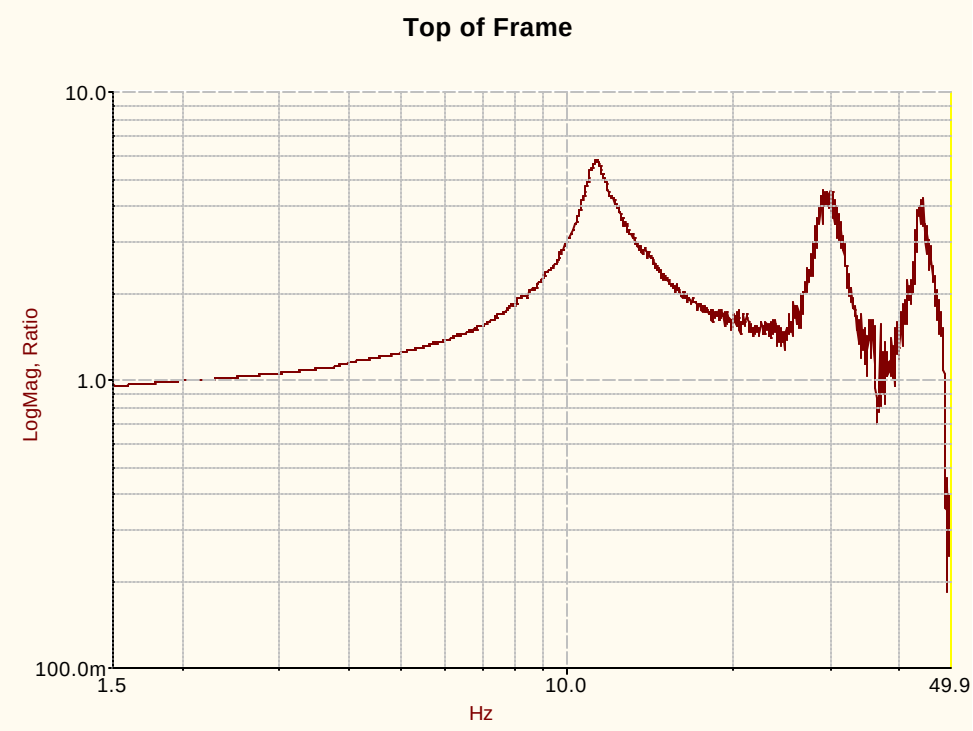
☐ The EUT did continue to function as intended during and at the completion of testing.
☐ The EUT did not continue to function as intended during and at the completion of testing.
☒ NA – Test conducted on a non-operational unit.

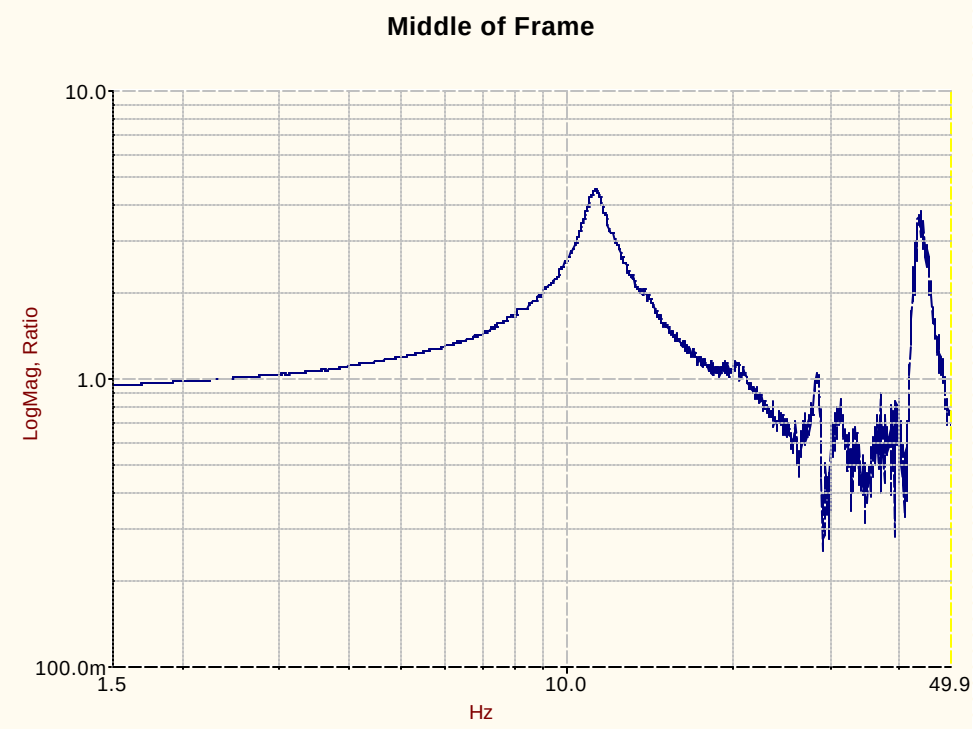
If not, please describe errors _____

☐ The EUT did sustain any change in physical condition.
☒ The EUT did not sustain any change in physical condition.

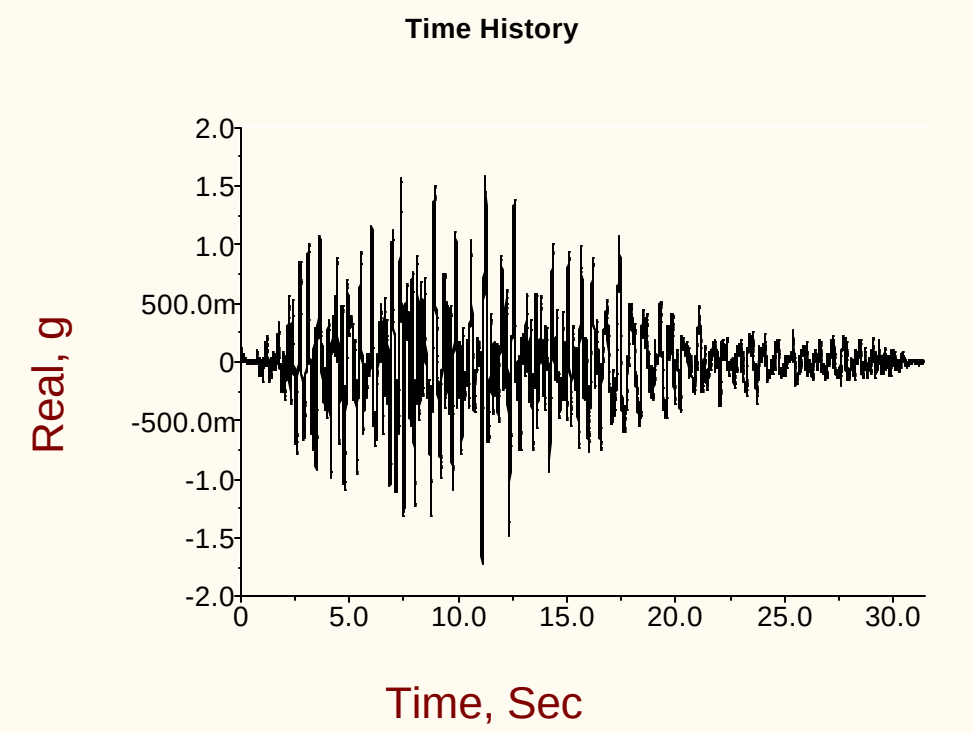
If so, please describe change _____

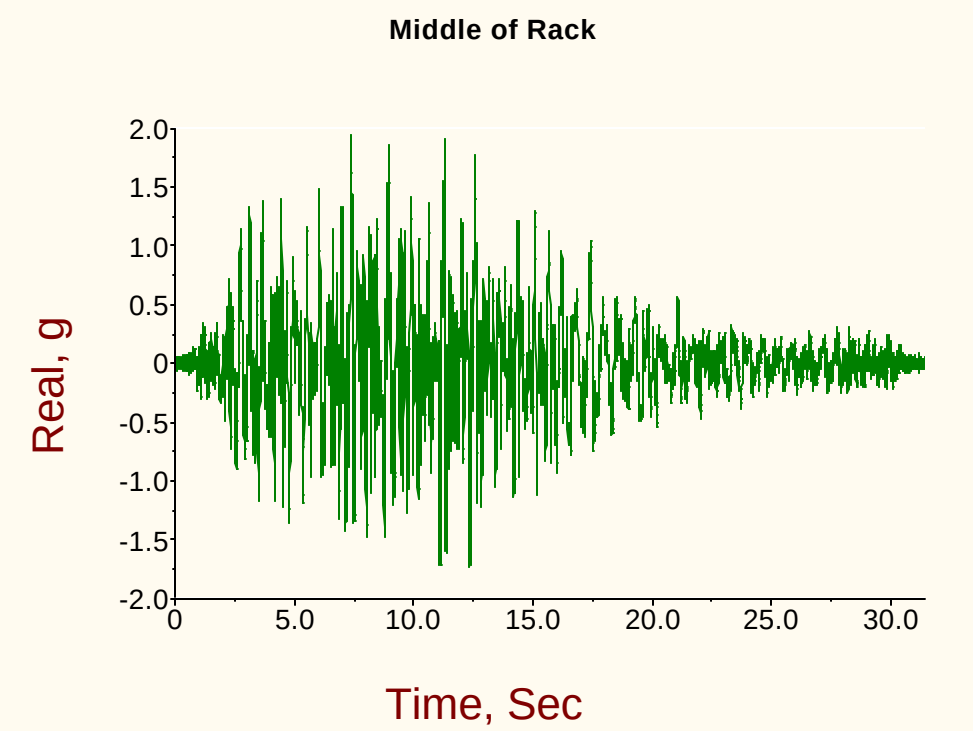
Front to Back Sine Survey

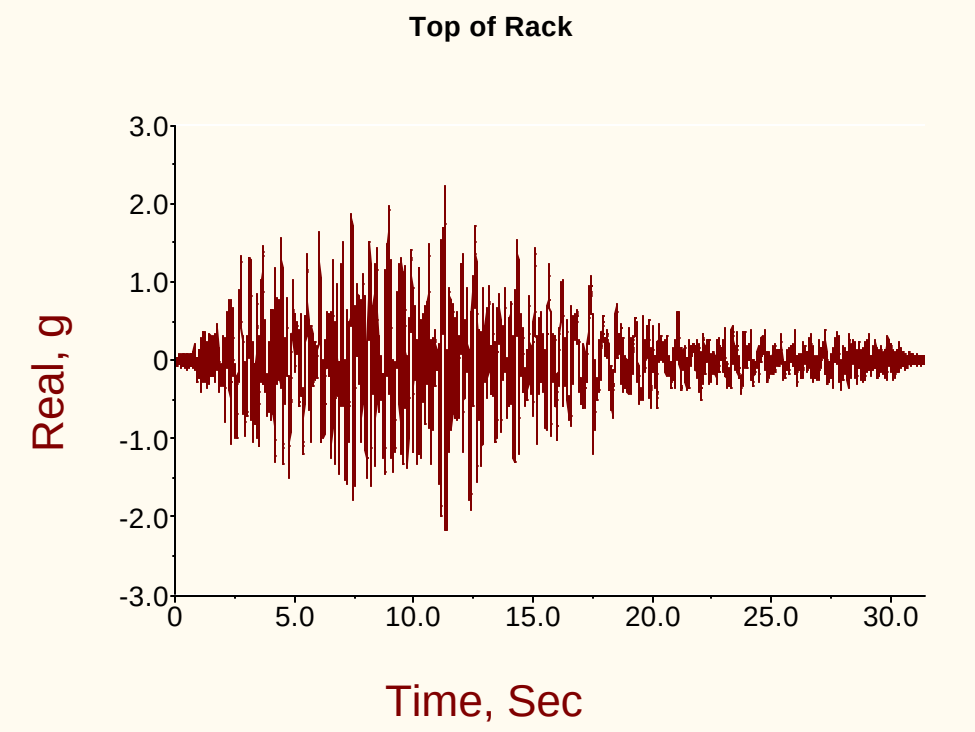




Front To Back Seismic Plots






Top of Rack
Real, g
3.0
2.0
1.0
0
-1.0
-2.0
-3.0
0
5.0
10.0
15.0
20.0
25.0
30.0
Time, Sec

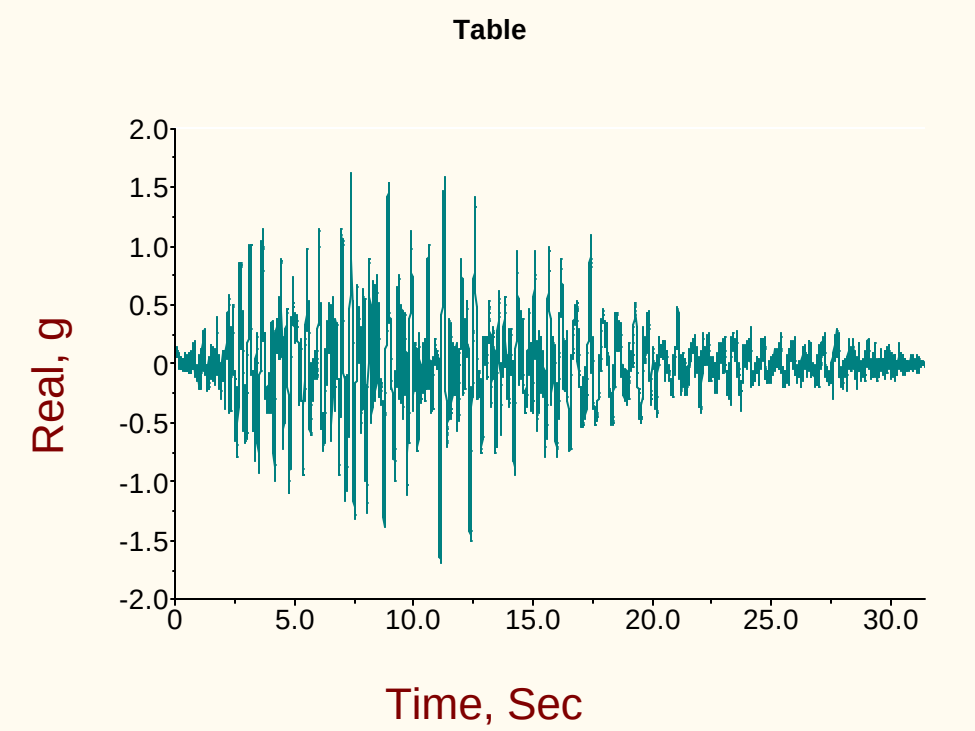
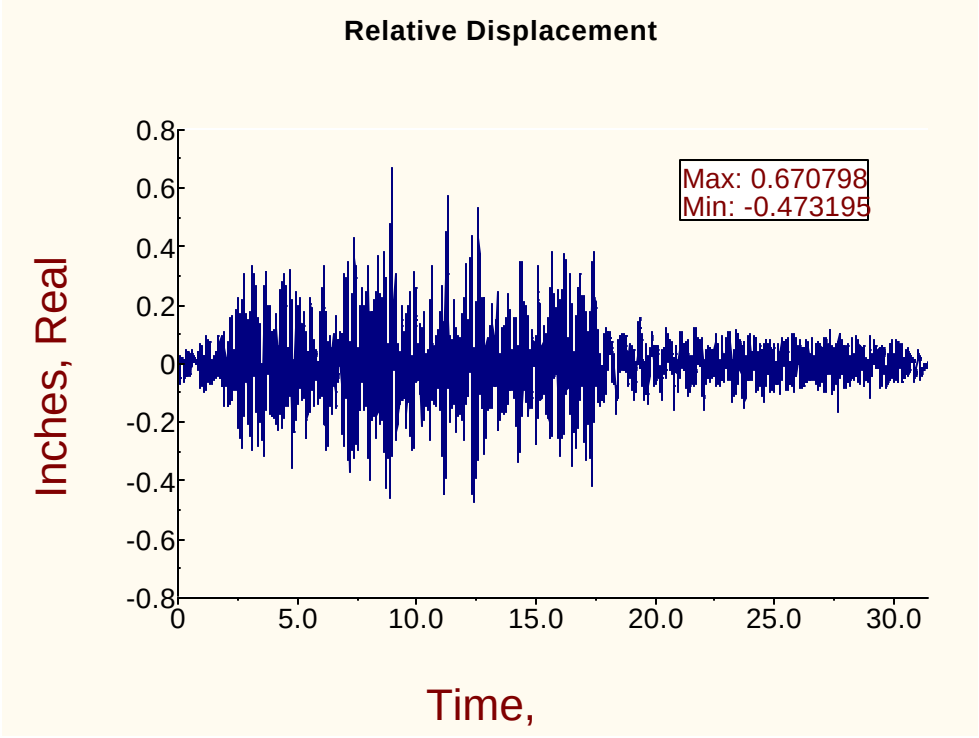
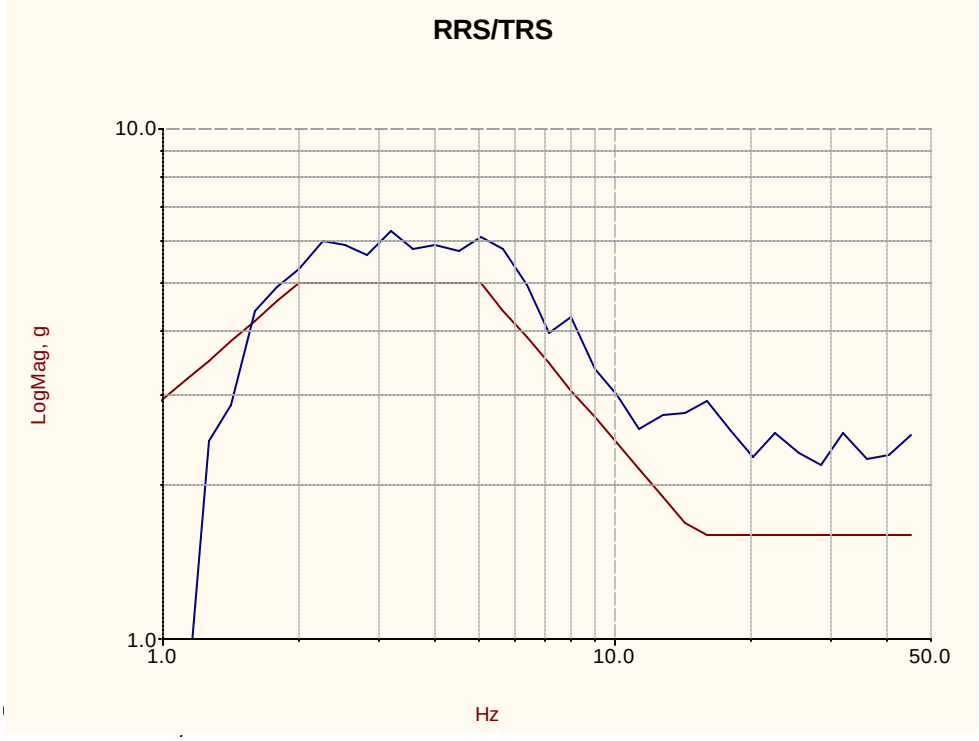
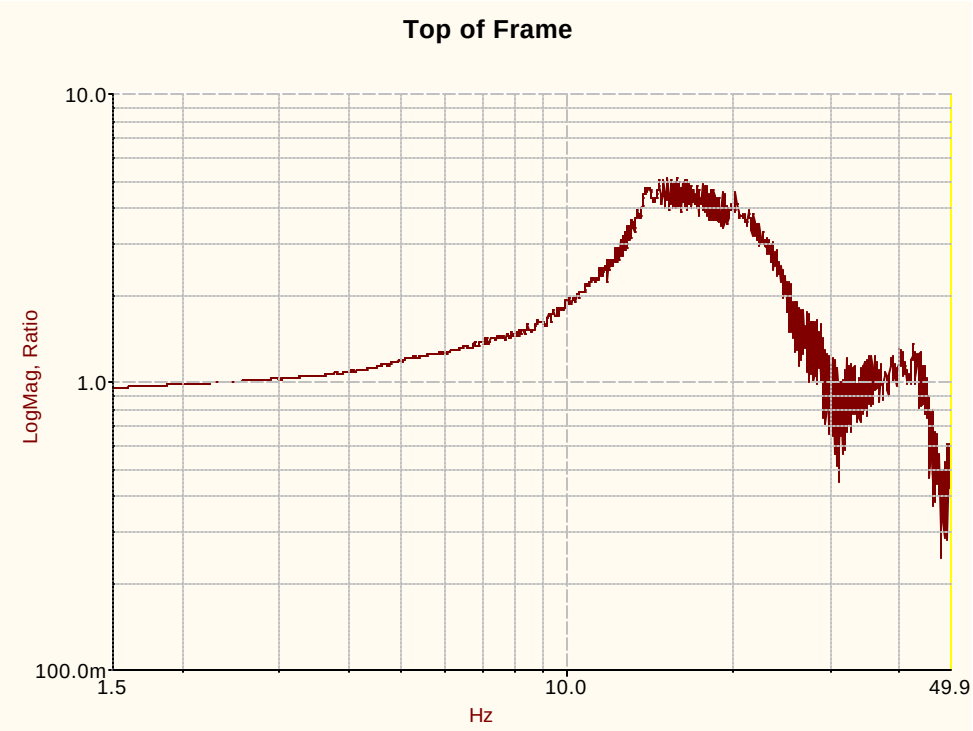


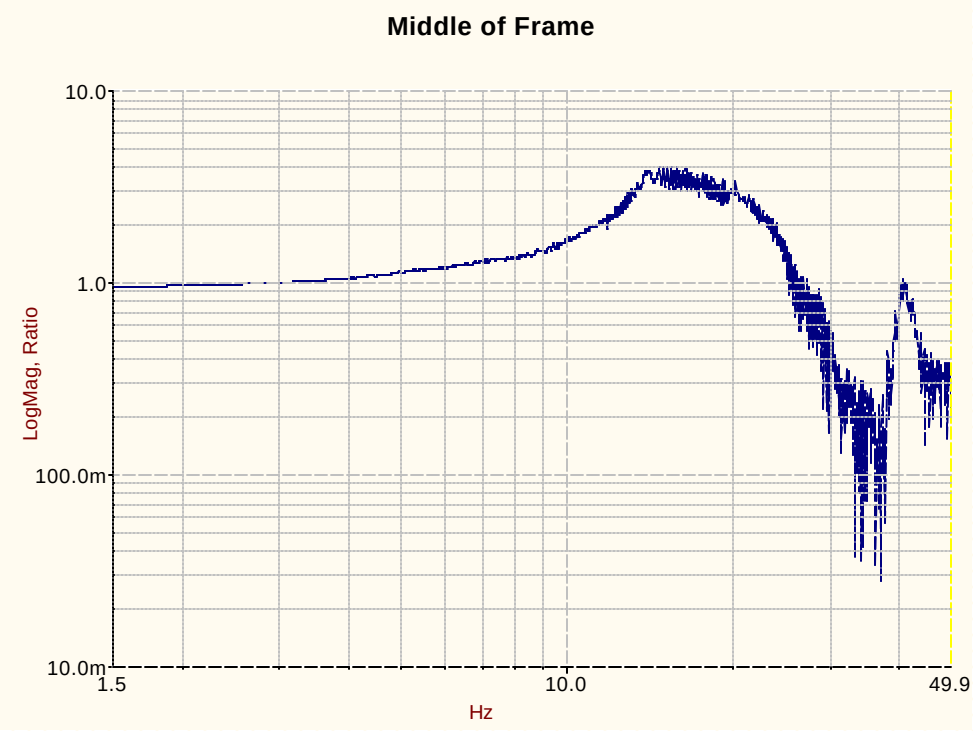
Table
Real, g
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
5.0
10.0
15.0
20.0
25.0
30.0
Time, Sec


Relative Displacement
Max: 0.670798
Min: -0.473195
Inches, Real
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
0
5.0
10.0
15.0
20.0
25.0
30.0
Time,

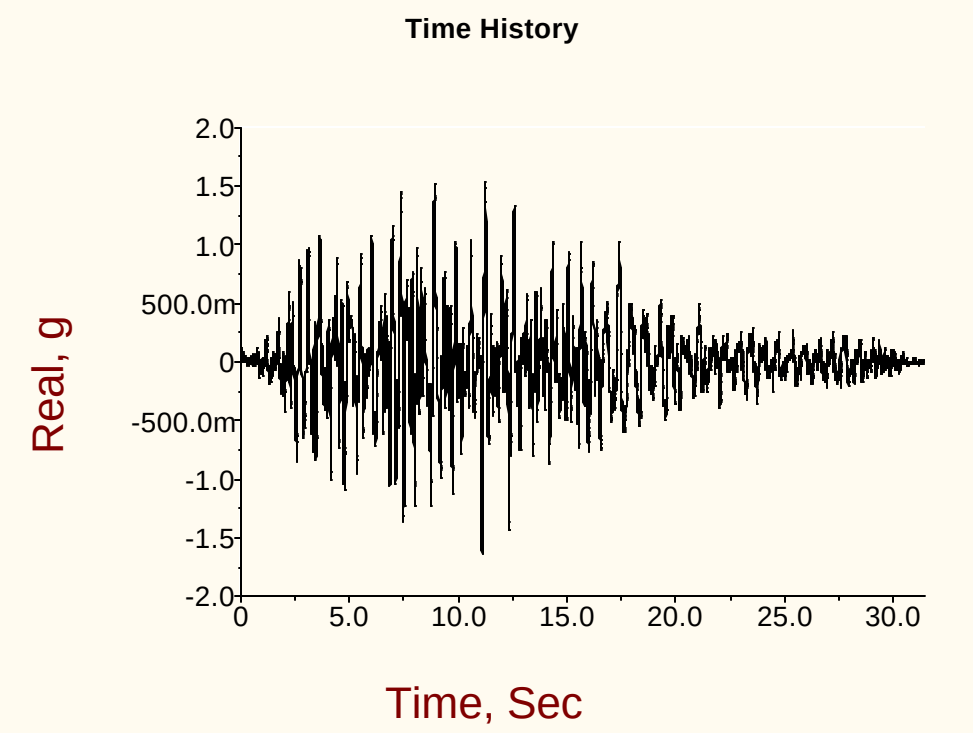

RRS/TRS
LogMag, g
10.0
1.0
1.0
10.0
50.0
Hz

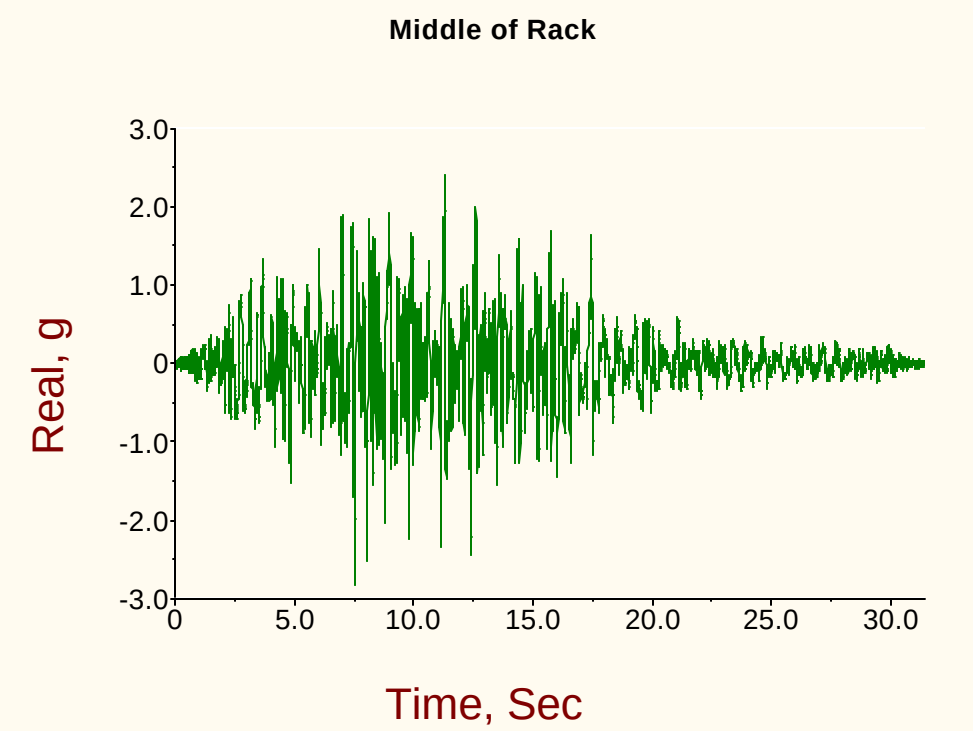
Side to Side Sine Survey

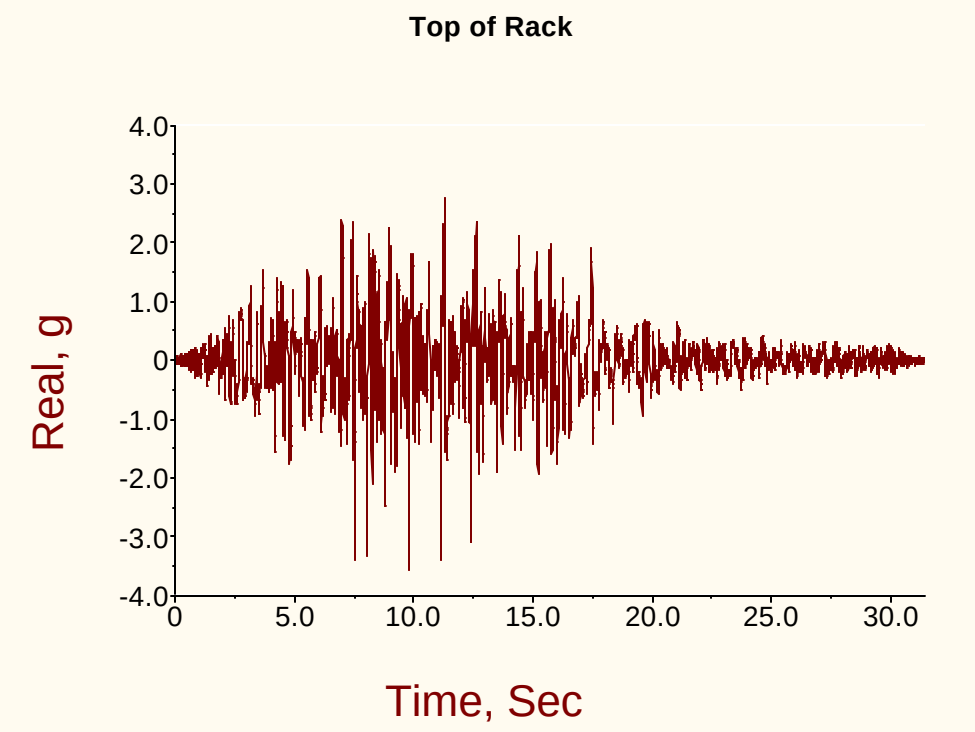




Side to Side Seismic Plots






Top of Rack
Real, g
4.0
3.0
2.0
1.0
0
-1.0
-2.0
-3.0
-4.0
0
5.0
10.0
15.0
20.0
25.0
30.0
Time, Sec

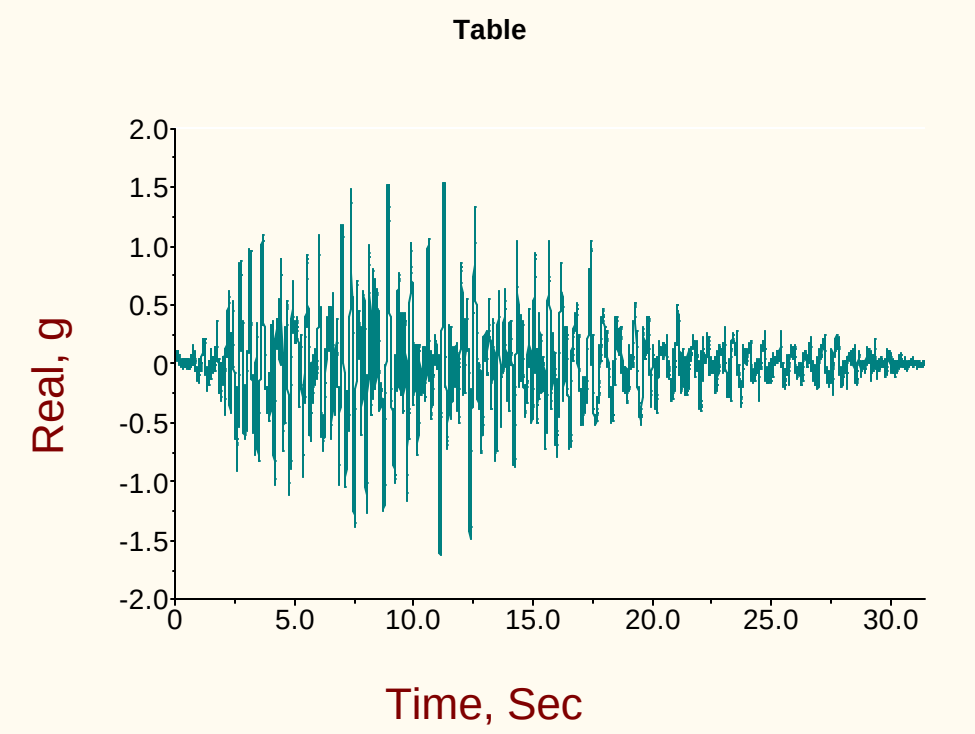
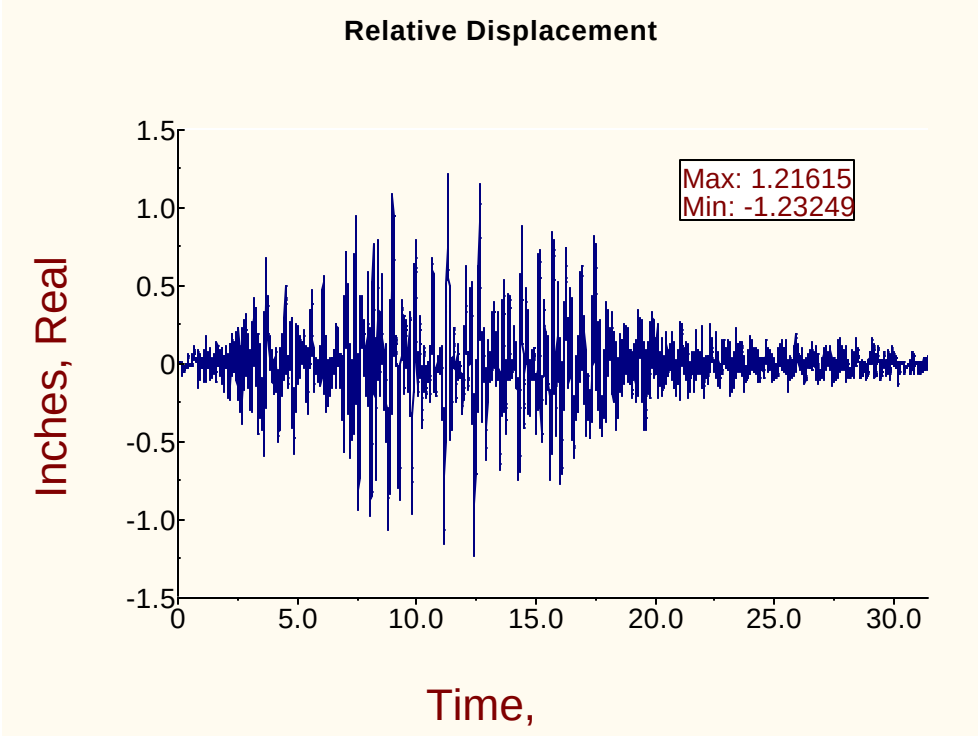
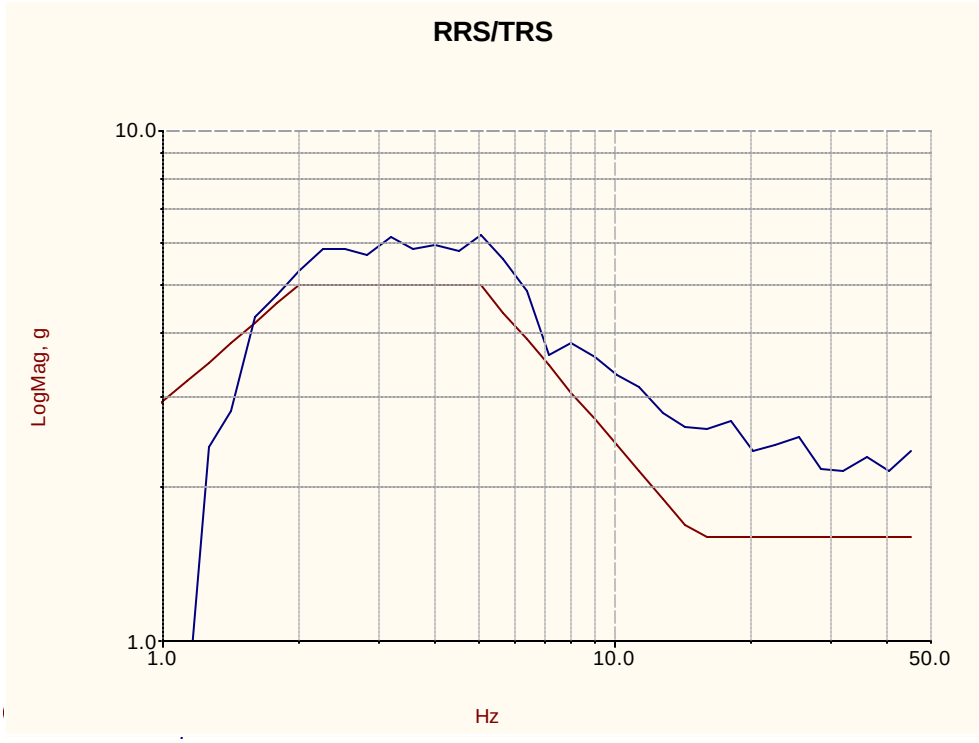
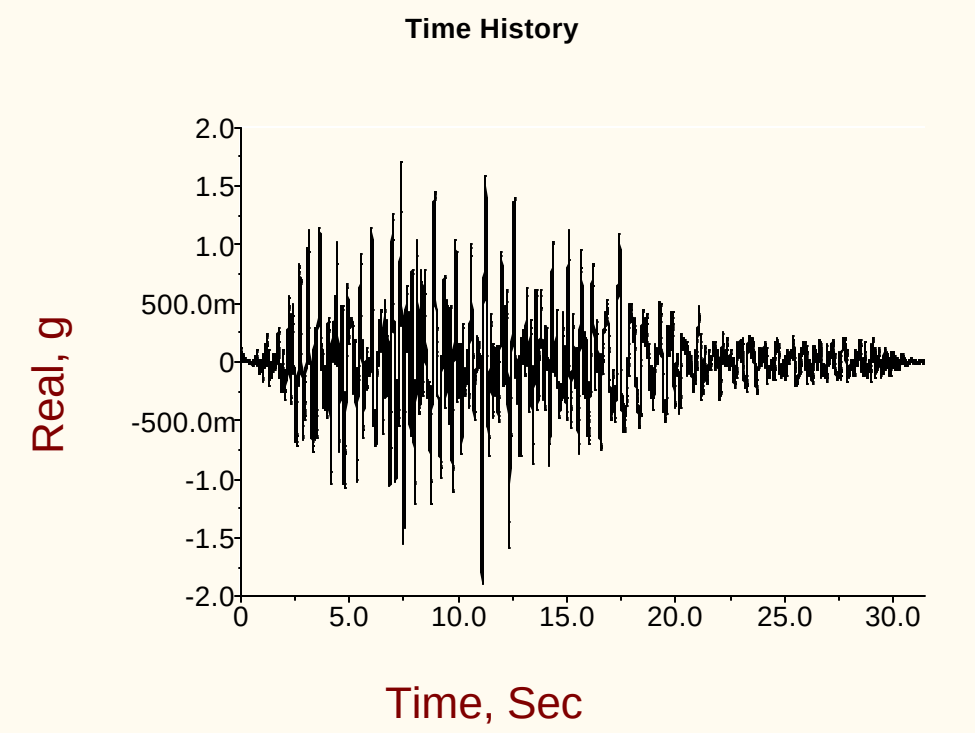


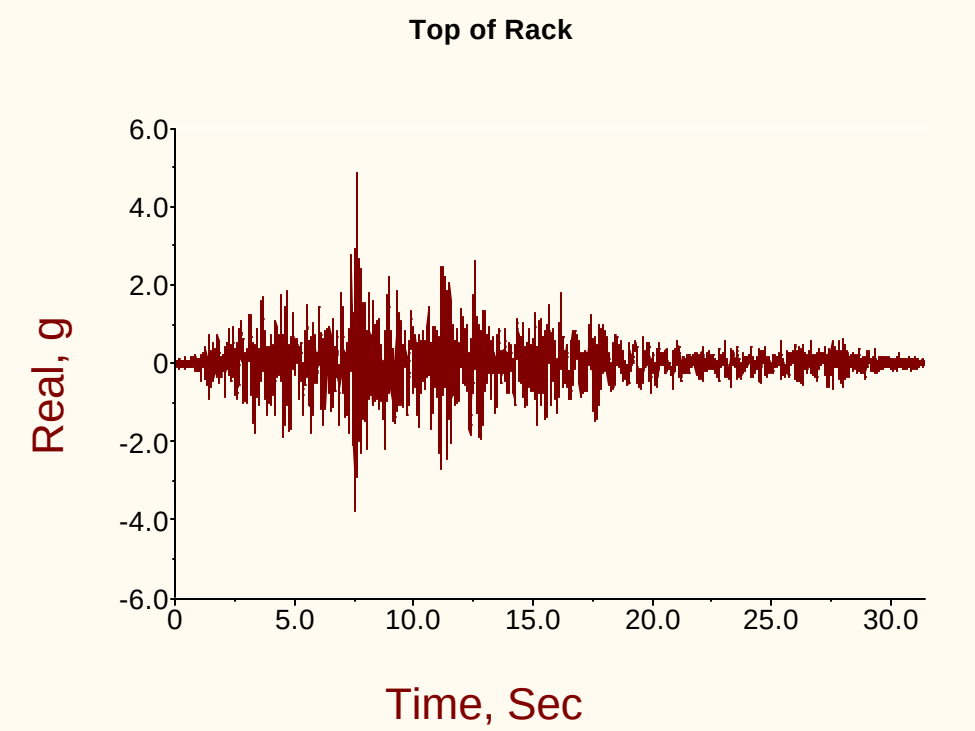
Table
Real, g
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
5.0
10.0
15.0
20.0
25.0
30.0
Time, Sec


Relative Displacement
Max: 1.21615
Min: -1.23249
Inches, Real
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
0
5.0
10.0
15.0
20.0
25.0
30.0
Time,

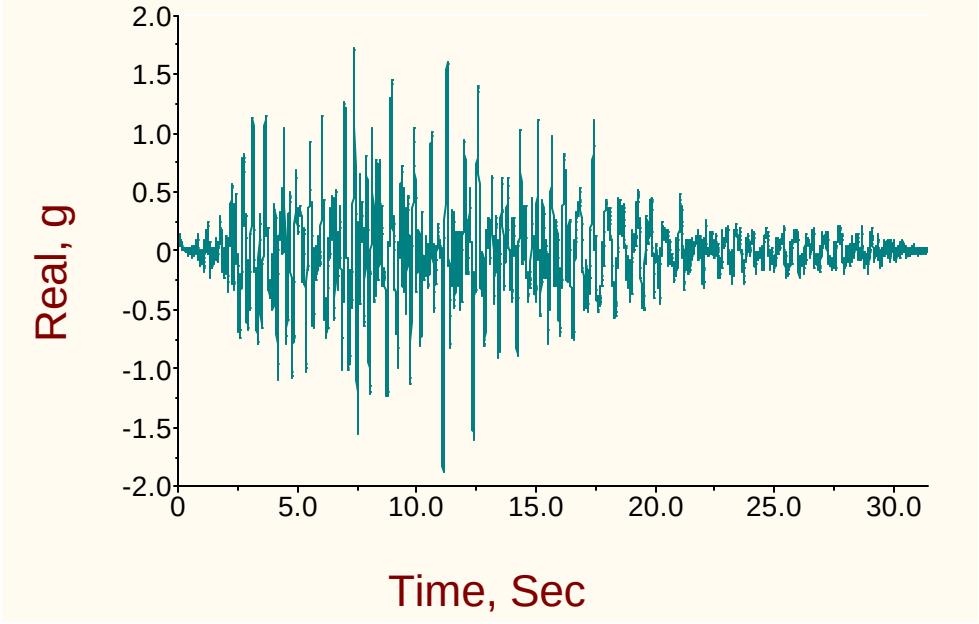

RRS/TRS
10.0
1.0
LogMag, g
1.0
10.0
50.0
Hz

Vertical Seismic Plots





Table



RRS/TRS