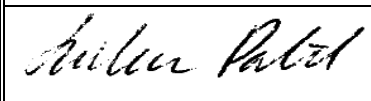
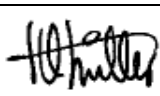
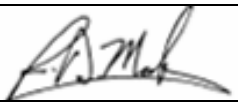
Medium Weight Shock and Vibration Test Report on 3x2x6 Composite Pump for Sims Pump Valve Company, Inc. Hoboken, NJ

NU LABORATORIES, INC.

312 Old Allerton Road, Annandale, NJ
(908)713-9300
WWW.NULABS.COM
E-Mail: sales@nulabs.com

29 December 2003

Prepared By	Checked By	Approved By
S. Patel	T. D. Miller, P.E.	R.D. McAdoo
		
30 December 2003	5 January 2004	6 January 2004

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1. PURPOSE OF TEST

The purpose of this test was to demonstrate that the 3 x 2 x 6 Composite Pump ("the Pump") complies with the requirements of MIL-S-901D for a Grade A, Class 1, Type A, unrestricted orientation, nine (9) blow, medium weight shock test, and with the requirements of MIL-STD-167-1 when subjected to vibration through the frequency range of 4 Hz to 50 Hz in each of the three (3) major axes.

2. MANUFACTURER

Sims Pump Valve Company, Inc.
1314 Park Avenue
Hoboken, NJ 07030

3. MANUFACTURER'S TYPE OR MODEL NO.

3 x 2 x 6 Composite Pump

4. SPECIFICATIONS

4.1 MILITARY

MIL-S-901D (NAVY) Military Specification, Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for

MIL-STD-167-1 (SHIPS) Military Standards Mechanical Vibrations of Shipboard Equipment

4.2 SIMS PUMP VALVE COMPANY, INC.

Purchase Order No. 1991

5. NUMBER OF ITEMS TESTED

One

6. SECURITY CLASSIFICATION OF ITEMS

Unclassified

7. DATES TESTS COMPLETED

10 December 2003 - Shock Test
12 December 2003 - Vibration Test

8. TEST CONDUCTED BY

NU Laboratories, Inc.
312 Old Allerton Road
Annandale, NJ 08801

9. TEST WITNESS

John Kozel, Sims Pump Valve Company representative.
Vladimer Spektor, Sims Pump Valve Company representative.
John Webb, Sims Pump Valve Company representative.
Paul Hinkel, NAVILP representative.
Robert Coceano, NSWCCD representative.

10. DISPOSITION OF TEST ITEMS

Returned to Sims Pump Valve Company.

11. ABSTRACT

The Pump was subjected to a total of nine (9) medium weight shock blows in accordance with the referenced test specifications. Visual inspections, performed after each shock blow, revealed no leakage or physical damage. Refer to Section 12 for additional information.

The Pump was subjected to vibration through the frequency range of 4 Hz to 50 Hz. Visual inspections, performed after each axis of vibration, revealed no obvious physical damage. Refer to Section 13 for additional information.

12. SHOCK TEST DESCRIPTION

Upon receipt, the Pump was weighed with an overhead mechanical beam scale and the weight was recorded in the test log. The weight of the Pump was 755 pounds.

A twenty-five (25) pound load was attached to the suction port of the pump to simulate five (5) feet of pipe filled with water.

A fifty-four (54) pound load was attached to the discharge port of the pump to simulate five (5) feet of pipe filled with water.

The Pump was attached to the test fixture using eight (8) 7/8"-9 Grade 5 bolts torqued to 400 ft-lbs. The entire assembly was then secured to fixture Figure 13 of MIL-S-901D on the medium weight shock machine, see Figure 1. The total weight on the anvil table was found to be 2,383 pounds.

During Blows noted as “Condition I,” the Pump was energized and operating with 440 VAC, three (3) phase, 60 Hz power and the discharge pressure adjusted to 60 psig.

During Blows noted as “Condition II,” the Pump was non-operating.

Performance determination was made by Sims Pump Valve Company and NU Laboratories, Inc.

Determination of action was made by Sims Pump Valve Company and NU Laboratories, Inc.

12.1 BLOW #1 – CONDITION I

12.1.1 Conditions: 1.25' hammer height, Group #I, 3" anvil table travel, Figure 13 of the referenced specifications.
12.1.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.1.3 Action: Testing was continued.

12.2 BLOW #2 – CONDITION II

12.2.1 Conditions: 2.25' hammer height, Group #II, 3" anvil table travel, Figure 13 of the referenced specifications.
12.2.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.2.3 Action: Testing was continued.

12.3 BLOW #3 – CONDITION I

12.3.1 Conditions: 2.25' hammer height, Group #III, 1.5" anvil table travel, Figure 13 of the referenced specifications.
12.3.2 Observations: A post-blow visual revealed no obvious physical damage.
12.3.3 Action: Testing was continued.

The entire assembly was removed from fixture Figure 13 and attached to fixture Figure 16 of MIL-S-901D with pump shaft perpendicular to the incline, see Figure 2. The total weight on the anvil table was found to be 3,473 pounds.

12.4 BLOW #4 – CONDITION I

12.4.1 Conditions: 1.5' hammer height, Group #I, 3" anvil table travel, Figure 16 of the referenced specifications.
12.4.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.4.3 Action: Testing was continued.

12.5 BLOW #5 - CONDITION II

12.5.1 Conditions: 2. 5' hammer height, Group #II, 3" anvil table travel, Figure 16 of the referenced specifications.
12.5.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.5.3 Action: Testing was continued.

12.6 BLOW #6 - CONDITION I

12.6.1 Conditions: 2.5' hammer height, Group #III, 1.5″ anvil table travel, Figure 16 of the referenced specifications.
12.6.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.6.3 Action: Testing was continued.

The entire assembly was then removed from fixture Figure 16, rotated 90° and reattached to fixture Figure 16 orientated with the pump shaft perpendicular to the incline, see Figure 3. The total weight on the anvil remained 3,473 pounds.

12.7 BLOW #7 - CONDITION I

12.7.1 Conditions: 1.5' hammer height, Group #I, 3″ anvil table travel, Figure 16, rotated 90°.
12.7.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.7.3 Action: Testing was continued.

12.8 BLOW #8 - CONDITION II

12.8.1 Conditions: 2.5' hammer height, Group #II, 3″ anvil table travel, Figure 16, rotated 90°.
12.8.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.8.3 Action: Testing was continued.

12.9 BLOW #9 - CONDITION I

12.9.1 Conditions: 2.5' hammer height, Group #III, 1.5″ anvil table travel, Figure 16, rotated 90°.
12.9.2 Observations: A post-blow visual inspection revealed no obvious physical damage.
12.9.3 Action: Testing was completed.

Refer to the Factory Test Records, Figures 4 and 5, and the Shock Acceptance Form, Figure 6, for additional information.

13. VIBRATION TEST DESCRIPTION

The Pump was removed from the medium weight shock machine and attached to the vibration machine orientated in the first major axis of test, see Figure 7.

An accelerometer was attached to the Pump to aid in the detection of response prominences.

The vibration test was performed from 4 Hz to 50 Hz in each of the three (3) major axes.

The Pump was energized and operating with 440 VAC, three (3) phase, 60 Hz power and the discharge pressure adjusted to 60 psig throughout the vibration test.

13.1 FIRST MAJOR AXIS OF VIBRATION (END TO END AXIS)

13.1.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) and from 34 Hz through 50 Hz with a vibration input of 0.006 +0.000/-0.002 inches (double amplitude) to determine response prominences. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for approximately 15 seconds. No response prominences were noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheets.

13.1.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 1. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for a period of five (5) minutes. No obvious physical damage was noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheets.

Table 1: Variable Frequency Input Amplitudes

FREQUENCY (Hz)	INPUT INCHES (DOUBLE AMPLITUDE)
4 – 15 Hz	**0.060± 0.012**
16 – 25 Hz	**0.040 ± 0.008**
26 – 33 Hz	**0.020 ± 0.004**
34 – 40 Hz	**0.010 ± 0.002**
41 – 50 Hz	**0.006 + 0.000 -0.002**

13.1.3 Endurance Vibration

Since no response prominences were noted during exploratory vibration, the endurance vibration was performed at the specified upper frequency of 50 Hz for a period of two (2) hours. Upon the completion of the two (2) hour dwell, a visual inspection performed revealed no obvious physical damage.

The frequency levels, table input vibration levels, accelerometer output vibration levels and the duration of dwell were recorded on the Vibration Test Data Sheets.

13.2 SECOND MAJOR AXIS OF VIBRATION (VERTICAL AXIS)

13.2.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) and from 34 Hz through 50 Hz with a vibration input of 0.006 +0.000/-0.002 inches (double amplitude) to determine response prominences. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for approximately 15 seconds. No response prominences were noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheets.

13.2.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 1. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for a period of five (5) minutes. No obvious physical damage was noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheets.

13.2.3 Endurance Vibration

Since no response prominences were noted during exploratory vibration, the endurance vibration was performed at the specified upper frequency of 50 Hz for a period of two (2) hours. Upon the completion of the two (2) hour dwell, a visual inspection performed revealed no obvious physical damage.

The frequency levels, table input vibration levels, accelerometer output vibration levels and the duration of dwell were recorded on the Vibration Test Data Sheets.

13.3 THIRD MAJOR AXIS OF VIBRATION (SIDE TO SIDE AXIS)

13.3.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) and from 34 Hz through 50 Hz with a vibration input of 0.006 +0.000/-0.002 inches (double amplitude) to determine response prominences. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for approximately 15 seconds. No response prominences were noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheets.

13.3.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 1. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for a period of five (5) minutes. No obvious physical damage was noted.

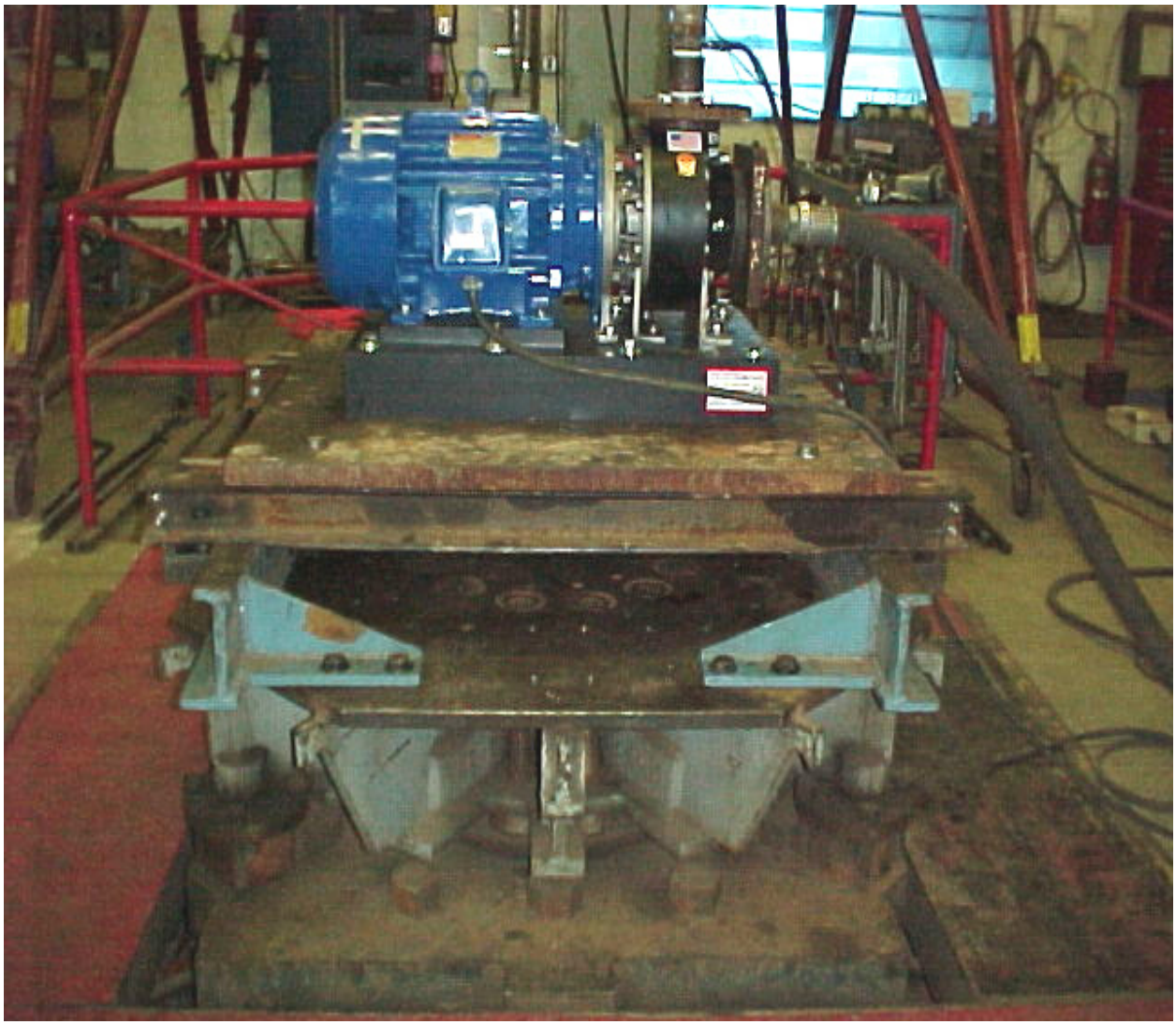
The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheets.

13.3.3 Endurance Vibration

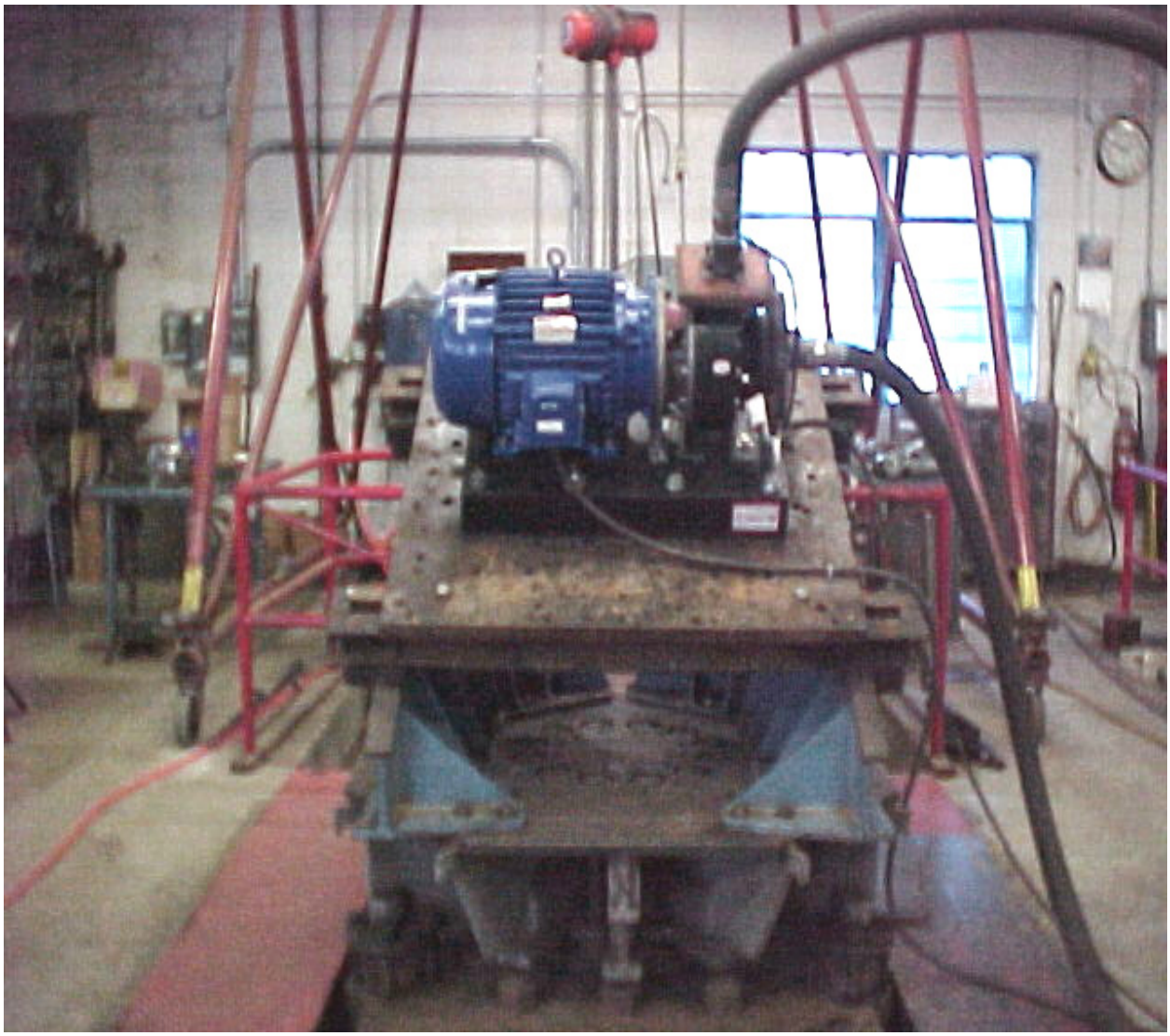
Since no response prominences were noted during exploratory vibration, the endurance vibration was performed at the specified upper frequency of 50 Hz for a period of two (2) hours. Upon the completion of the two (2) hour dwell, a visual inspection performed revealed no obvious physical damage.

The frequency levels, table input vibration levels, accelerometer output vibration levels and the duration of dwell were recorded on the Vibration Test Data Sheets.

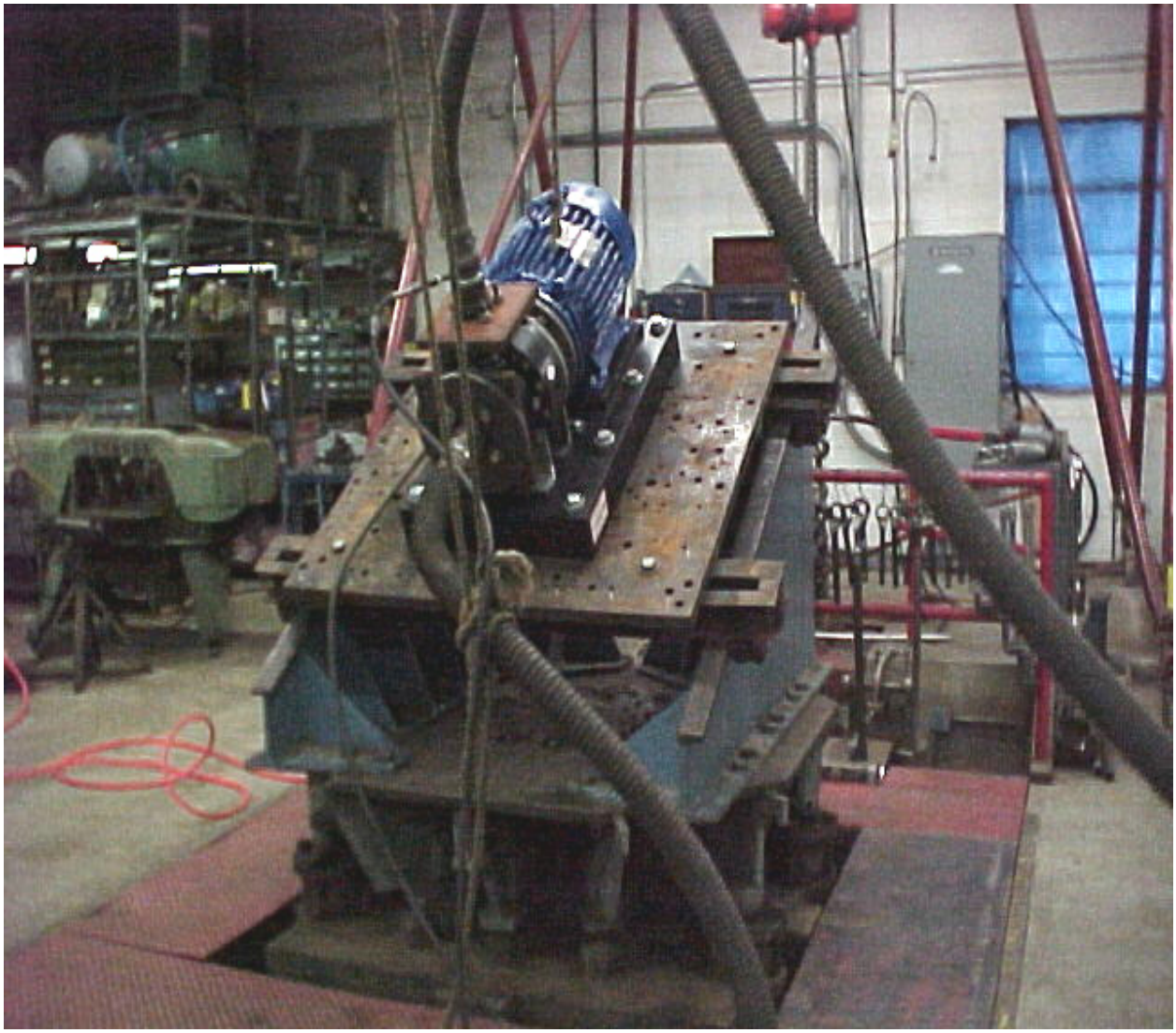
Refer to the Vibration Test Data Sheets, Figures 8 through 10, for additional information.



Vertical Shock Test Setup
Figure 1



Pump Shaft Perpendicular to Incline Shock Test Setup
Figure 2



Pump Shaft Parallel to Incline Shock Test Setup
Figure 3

FACTORY TEST RECORD: CLASS HI SHOCK			DATE 30 December 2003	TEST # 10005.1
1. ITEM NAME OF EQUIPMENT SHOCK-TESTED 3 x 2 x 6 Composite Pump		2. RATING (KW, VOLTS, GPM, CFM, ETC.)		
3. MAJOR PARTS				
PUMP, ETC.	TESTED FOR Sims Pump Valve Company, Inc.	ADDRESS 1314 Park Avenue Hoboken, NJ 07030	GOV DWG NO	IDENTIFYING #
MOTOR, ETC.	MANUFACTURER	ADDRESS	GOV DWG NO	IDENTIFYING #
STARTER, ETC.	MANUFACTURER	ADDRESS	GOV DWG NO	IDENTIFYING #
4. CONTRACT NO.	CONTRACTOR	ADDRESS		
5. TYPE OF SHOCK TEST ☒ ASSEMBLY ☐ SUB-ASSEMBLY ☐ PART				
6. TOTAL WEIGHT OF ASSEMBLY TESTED 755 lbs.	WEIGHT OF INDIVIDUAL MAJOR PARTS LBS.	MOTOR LBS.	STARTER LBS.	
7. WEIGHT CLASSIFICATION OF ITEM ☐ LIGHT ☒ MEDIUM	8. APPLICABLE MOUNTING FIGURE IN SPECIFICATION MIL-S-901 ☐ FIX 4A, FIG 5 ☐ FIX 4C, FIG 8 ☒ FIG 9-1, FIG 13 ☒ FIG 10-1, FIG 16 ☐ FIG 10-2 ☐ OTHER			

9. FOR LIGHTWEIGHT ITEMS

FIRST CONDITION				SECOND CONDITION			
BLOW	DROP	AXIS	DAMAGE INCURRED	BLOW	DROP	AXIS	DAMAGE INCURRED
	1 FT	BACK			1 FT	BACK	
	3 FT	BACK			3 FT	BACK	
	5 FT	BACK			5 FT	BACK	
	1 FT	TOP			1 FT	TOP	
	3 FT	TOP			3 FT	TOP	
	5 FT	TOP			5 FT	TOP	
	1 FT	SIDE			1 FT	SIDE	
	3 FT	SIDE			3 FT	SIDE	
	5 FT	SIDE			5 FT	SIDE	
ITEMS SUBJECT TO ABOVE TWO CONDITIONS WERE SAME ☐ DIFFERENT☐				REMARKS			

10. FOR MEDIUM-WEIGHT ITEMS

Fig. 13				Fig. 16			
BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED	BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED
1	I	1.25	No damage noted	4	I	1.5'	No damage noted
2	II	2.25'	No damage noted	5	II	2.5'	No damage noted
3	III	2.25'	No damage noted	6	III	2.5'	No damage noted
TOTAL WEIGHT ON ANVIL TABLE Figure 13- 2.383, Figure 16- 3.473 lbs			REMARKS				
TEST LABORATORY NU Laboratories, Inc.			ADDRESS 312 Old Allerton Road, Annandale, NJ 08801			TEST ENGINEER	

Factory Test Record
Figure 4

FACTORY TEST RECORD: CLASS HI SHOCK

DATE: 30 December 2003
TEST #: 10005.1

1. ITEM NAME OF EQUIPMENT SHOCK-TESTED: 3 x 2 x 6 Composite Pump
2. RATING (KW, VOLTS, GPM, CFM, ETC.):

3. MAJOR PARTS

		ADDRESS	GOV DWG NO	IDENTIFYING #
PUMP, ETC.	TESTED FOR Sims Pump Valve Company, Inc.	1314 Park Avenue Hoboken, NJ 07030		
MOTOR, ETC.	MANUFACTURER	ADDRESS	GOV DWG NO	IDENTIFYING #
STARTER, ETC	MANUFACTURER	ADDRESS	GOV DWG NO	IDENTIFYING #

4. CONTRACT NO. | CONTRACTOR | ADDRESS

5. TYPE OF SHOCK TEST ☒ ASSEMBLY ☐ SUB-ASSEMBLY ☐ PART

6. TOTAL WEIGHT OF ASSEMBLY TESTED: 755 lbs. | WEIGHT OF INDIVIDUAL MAJOR PARTS: LBS | MOTOR: LBS. | STARTER: LBS.

7. WEIGHT CLASSIFICATION OF ITEM ☐ LIGHT ☒ MEDIUM

8. APPLICABLE MOUNTING FIGURE IN SPECIFICATION MIL-S-901 ☐ FIX 4A, FIG 5 ☐ FIX 4C, FIG 8 ☒ FIG 9-1, FIG 13 ☒ FIG 10-1, FIG 16 ☐ FIG 10-2 ☐ OTHER

9. FOR LIGHTWEIGHT ITEMS

FIRST CONDITION				SECOND CONDITION			
BLOW	DROP	AXIS	DAMAGE INCURRED	BLOW	DROP	AXIS	DAMAGE INCURRED
	1 FT	BACK			1 FT	BACK	
	3 FT	BACK			3 FT	BACK	
	5 FT	BACK			5 FT	BACK	
	1 FT	TOP			1 FT	TOP	
	3 FT	TOP			3 FT	TOP	
	5 FT	TOP			5 FT	TOP	
	1 FT	SIDE			1 FT	SIDE	
	3 FT	SIDE			3 FT	SIDE	
	5 FT	SIDE			5 FT	SIDE	

ITEMS SUBJECT TO ABOVE TWO CONDITIONS WERE SAME ☐ DIFFERENT☐ | REMARKS

10. FOR MEDIUM-WEIGHT ITEMS

Fig. 13				Fig. 16,			
BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED	BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED
7	I	1.5'	No damage noted				
8	II	2.5'	No damage noted				
9	III	2.5'	No damage noted				

TOTAL WEIGHT ON ANVIL TABLE: Figure 13- 2,383, Figure 16- 3,473 lbs | REMARKS

TEST LABORATORY: NU Laboratories, Inc. | ADDRESS: 312 Old Allerton Road, Annandale, NJ 08801 | TEST ENGINEER: [signature]

Factory Test Record
Figure 5

MIL-S-901D: SHOCK ACCEPTANCE FORM

1. The item identified below has met the requirements of Military Specification MIL-S-901, based upon:

   ☒ Shock testing of the item identified below

   ❑ Previous shock testing of an item similar to the item identified below

   (shock test extension)

   ❑ Previous shock testing of an item identical to the item identified below

   (shock test extension)

2. Item (Nomenclature) Pump
3. Item (Description) 3 x 2 x 6 Composite Pump
4. Manufacturer Sims Pump Valve Company, Inc.
5. Model_____Size/Capacity _____
6. Drawing Number _____Revision and Date _____
7. Military Specification MIL-S-901D
8. Ship _____ Service _____
9. Contract No. _____
10. Shock Test Facility NU Laboratories, Inc.
11. Report No. 10005.1
12. Previous Shock test approval reference (if this form conveys shock test Extension approval) _____

13. Test Category ☐ Lightweight ☒ Medium Weight ☐ Heavyweight
14. Shock Grade ☒ A ☐ B
15. Equipment Class ☒ I ☐ II ☐ III
16. Shock Test Type ☒ A ☐ B ☐ C
17. Mounting Location ☒ Deck ☐ Hull ☐ Shell ☐ Wetted-Surface
18. Shipboard mounting plane represented during shock test:

    ☒ Base ☐ Front or Face ☐ Back
    ☐ Top ☐ Combination ☐ Other_____

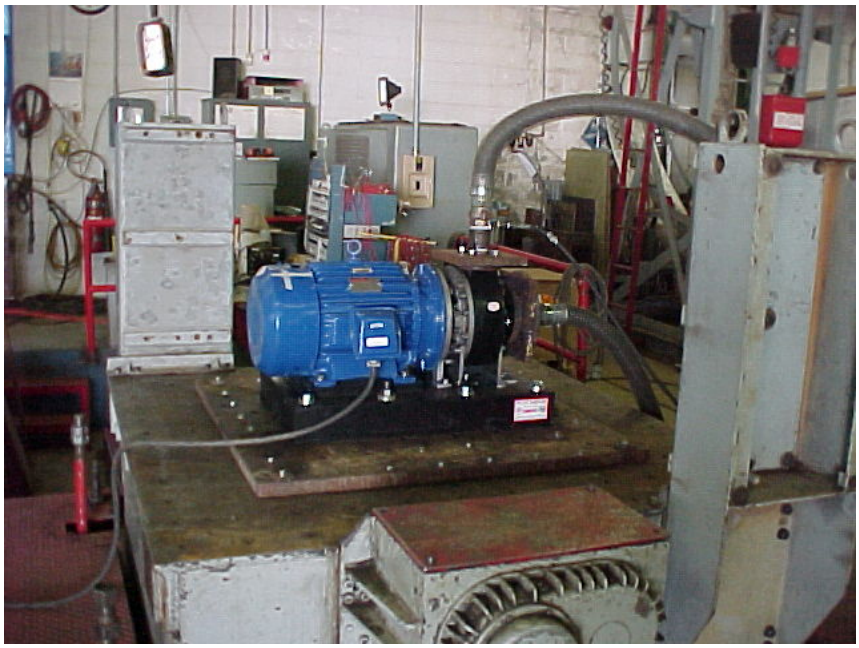
19. Mounting orientation of item relative to ship's fore-and-aft axis (for Medium weight and heavyweight test items only): Unrestricted

20. Approval Limitations: _____

21. Approved. _____ _____ _____

    AUTHORIZED SIGNATURE APPROVAL ACTIVITY DATE

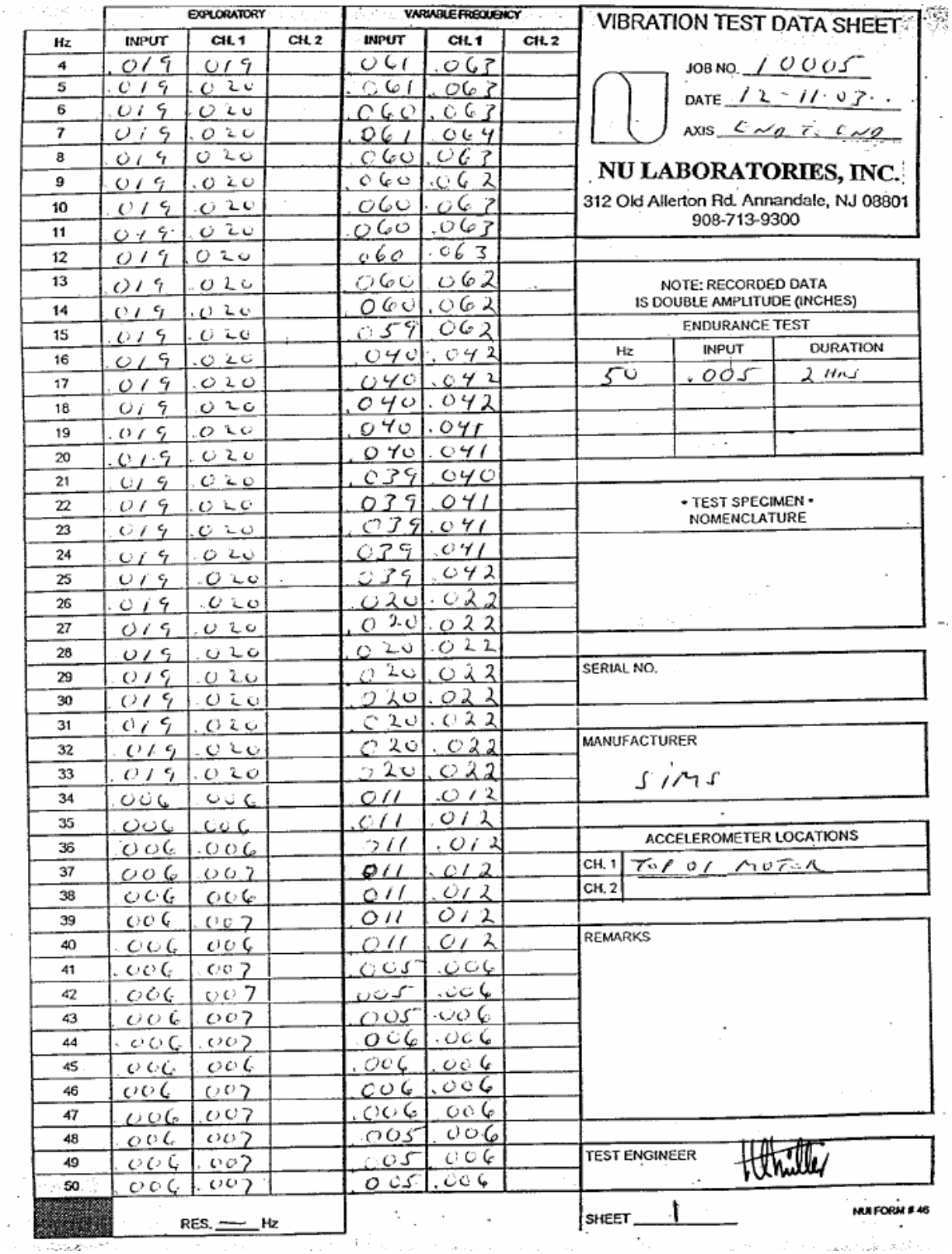
Shock Acceptance Form
Figure 6



End to End and Vertical Axes

Side to Side Axis

Vibration Test Setup
Figure 7



Hz	EXPLORATORY INPUT	EXPLORATORY CH. 1	EXPLORATORY CH. 2	VARIABLE FREQUENCY INPUT	VARIABLE FREQUENCY CH. 1	VARIABLE FREQUENCY CH. 2
4	.019	.019		.061	.063	
5	.019	.020		.061	.063	
6	.019	.020		.060	.063	
7	.019	.020		.061	.064	
8	.019	.020		.060	.063	
9	.019	.020		.060	.062	
10	.019	.020		.060	.063	
11	.019	.020		.060	.063	
12	.019	.020		.060	.063	
13	.019	.020		.060	.062	
14	.019	.020		.060	.062	
15	.019	.020		.059	.062	
16	.019	.020		.040	.042	
17	.019	.020		.040	.042	
18	.019	.020		.040	.042	
19	.019	.020		.040	.041	
20	.019	.020		.040	.041	
21	.019	.020		.039	.040	
22	.019	.020		.039	.041	
23	.019	.020		.039	.041	
24	.019	.020		.039	.041	
25	.019	.020		.039	.042	
26	.019	.020		.020	.022	
27	.019	.020		.020	.022	
28	.019	.020		.020	.022	
29	.019	.020		.020	.022	
30	.019	.020		.020	.022	
31	.019	.020		.020	.022	
32	.019	.020		.020	.022	
33	.019	.020		.020	.022	
34	.006	.006		.011	.012	
35	.006	.006		.011	.012	
36	.006	.006		.011	.012	
37	.006	.007		.011	.012	
38	.006	.006		.011	.012	
39	.006	.007		.011	.012	
40	.006	.006		.011	.012	
41	.006	.007		.005	.006	
42	.006	.007		.005	.006	
43	.006	.007		.005	.006	
44	.006	.007		.006	.006	
45	.006	.006		.006	.006	
46	.006	.007		.006	.006	
47	.006	.007		.006	.006	
48	.006	.007		.005	.006	
49	.006	.007		.005	.006	
50	.006	.007		.005	.006	

RES. ___ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10005

DATE 12-11-07

AXIS END TO END

NU LABORATORIES, INC.
312 Old Allerton Rd. Annandale, NJ 08801
908-713-9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE (INCHES)

ENDURANCE TEST

Hz	INPUT	DURATION
50	.005	2 Hrs

• TEST SPECIMEN • NOMENCLATURE

SERIAL NO.

MANUFACTURER

SIMS

ACCELEROMETER LOCATIONS

CH. 1 Top of Motor

CH. 2

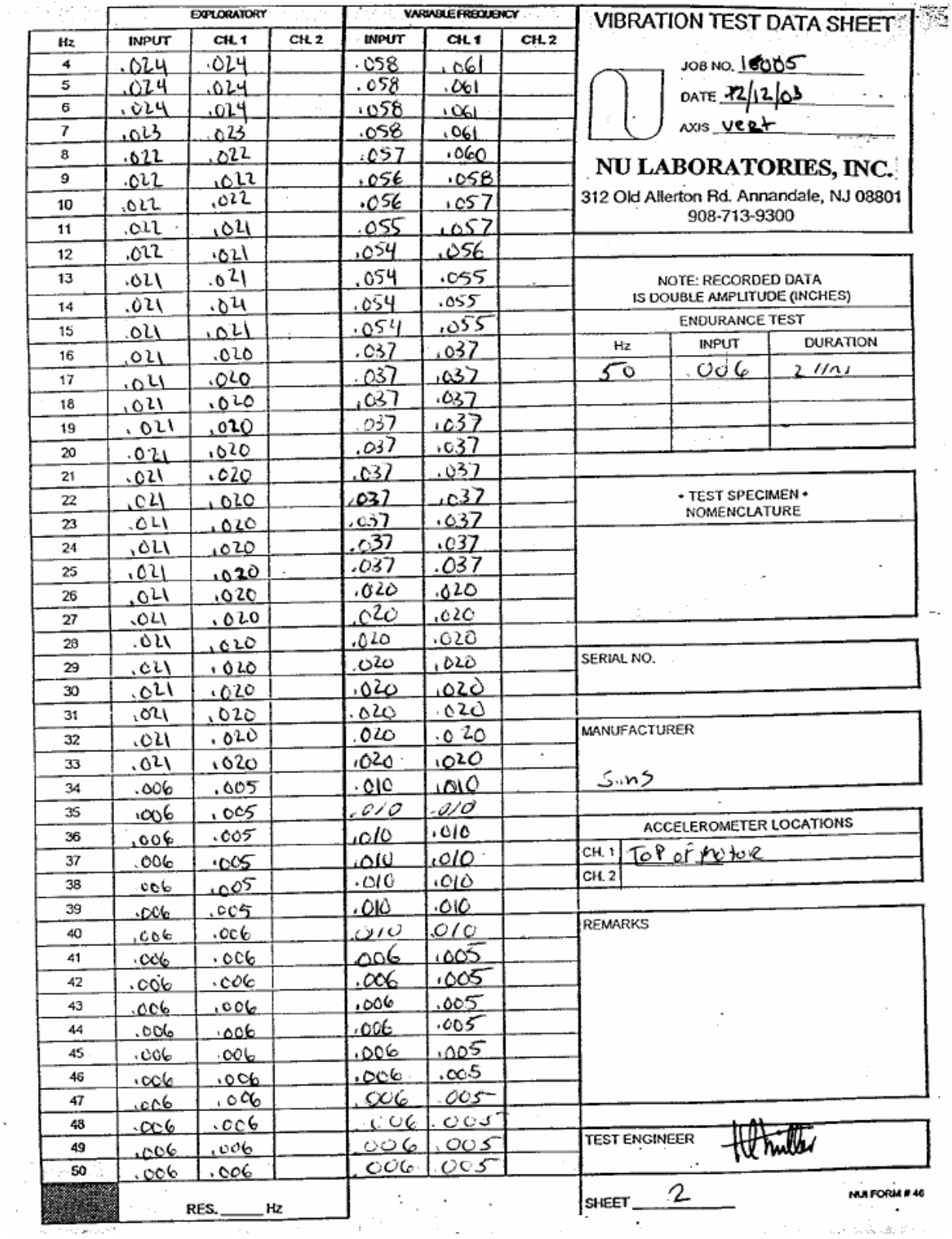
REMARKS

TEST ENGINEER

SHEET 1

NUI FORM # 46

Vibration Test Data Sheet
Figure 8



	EXPLORATORY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.024	.024		.058	.061	
5	.024	.024		.058	.061	
6	.024	.024		.058	.061	
7	.023	.023		.058	.061	
8	.022	.022		.057	.060	
9	.022	.022		.056	.058	
10	.022	.022		.056	.057	
11	.022	.021		.055	.057	
12	.022	.021		.054	.056	
13	.021	.021		.054	.055	
14	.021	.021		.054	.055	
15	.021	.021		.054	.055	
16	.021	.020		.037	.037	
17	.021	.020		.037	.037	
18	.021	.020		.037	.037	
19	.021	.020		.037	.037	
20	.021	.020		.037	.037	
21	.021	.020		.037	.037	
22	.021	.020		.037	.037	
23	.021	.020		.037	.037	
24	.021	.020		.037	.037	
25	.021	.020		.037	.037	
26	.021	.020		.020	.020	
27	.021	.020		.020	.020	
28	.021	.020		.020	.020	
29	.021	.020		.020	.020	
30	.021	.020		.020	.020	
31	.021	.020		.020	.020	
32	.021	.020		.020	.020	
33	.021	.020		.020	.020	
34	.006	.005		.010	.010	
35	.006	.005		.010	.010	
36	.006	.005		.010	.010	
37	.006	.005		.010	.010	
38	.006	.005		.010	.010	
39	.006	.005		.010	.010	
40	.006	.006		.010	.010	
41	.006	.006		.006	.005	
42	.006	.006		.006	.005	
43	.006	.006		.006	.005	
44	.006	.006		.006	.005	
45	.006	.006		.006	.005	
46	.006	.006		.006	.005	
47	.006	.006		.006	.005	
48	.006	.006		.006	.005	
49	.006	.006		.006	.005	
50	.006	.006		.006	.005	

RES. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10005

DATE 12/12/03

AXIS vert

NU LABORATORIES, INC.
312 Old Allerton Rd. Annandale, NJ 08801
908-713-9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE (INCHES)

ENDURANCE TEST

Hz	INPUT	DURATION
50	.006	2 min

* TEST SPECIMEN * NOMENCLATURE

SERIAL NO.

MANUFACTURER

Sims

ACCELEROMETER LOCATIONS

CH. 1 Top of motor

CH. 2

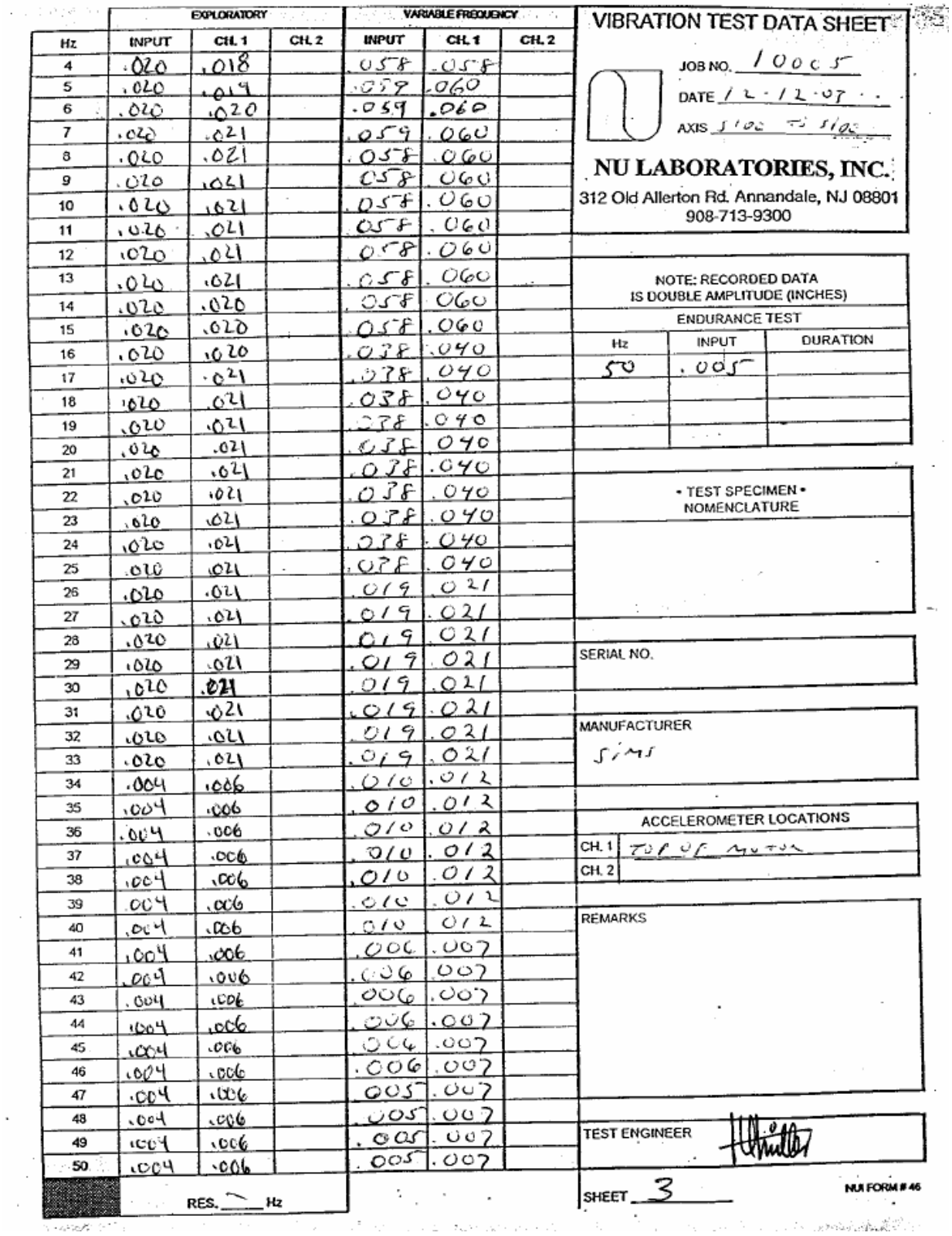
REMARKS

TEST ENGINEER

SHEET 2

NUI FORM # 46

Vibration Test Data Sheet
Figure 9



Hz	EXPLORATORY INPUT	EXPLORATORY CH. 1	EXPLORATORY CH. 2	VARIABLE FREQUENCY INPUT	VARIABLE FREQUENCY CH. 1	VARIABLE FREQUENCY CH. 2
4	.020	.018		.058	.058	
5	.020	.019		.059	.060	
6	.020	.020		.059	.060	
7	.020	.021		.059	.060	
8	.020	.021		.058	.060	
9	.020	.021		.058	.060	
10	.020	.021		.058	.060	
11	.020	.021		.058	.060	
12	.020	.021		.058	.060	
13	.020	.021		.058	.060	
14	.020	.020		.058	.060	
15	.020	.020		.058	.060	
16	.020	.020		.038	.040	
17	.020	.021		.038	.040	
18	.020	.021		.038	.040	
19	.020	.021		.038	.040	
20	.020	.021		.038	.040	
21	.020	.021		.038	.040	
22	.020	.021		.038	.040	
23	.020	.021		.038	.040	
24	.020	.021		.038	.040	
25	.020	.021		.038	.040	
26	.020	.021		.019	.021	
27	.020	.021		.019	.021	
28	.020	.021		.019	.021	
29	.020	.021		.019	.021	
30	.020	.021		.019	.021	
31	.020	.021		.019	.021	
32	.020	.021		.019	.021	
33	.020	.021		.019	.021	
34	.004	.006		.010	.012	
35	.004	.006		.010	.012	
36	.004	.006		.010	.012	
37	.004	.006		.010	.012	
38	.004	.006		.010	.012	
39	.004	.006		.010	.012	
40	.004	.006		.010	.012	
41	.004	.006		.006	.007	
42	.004	.006		.006	.007	
43	.004	.006		.006	.007	
44	.004	.006		.006	.007	
45	.004	.006		.006	.007	
46	.004	.006		.006	.007	
47	.004	.006		.005	.007	
48	.004	.006		.005	.007	
49	.004	.006		.005	.007	
50	.004	.006		.005	.007	

RES. ~ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10005

DATE 12-12-07

AXIS S100 TO S102

NU LABORATORIES, INC.
312 Old Allerton Rd. Annandale, NJ 08801
908-713-9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE (INCHES)

ENDURANCE TEST

Hz	INPUT	DURATION
50	.005	

• TEST SPECIMEN • NOMENCLATURE

SERIAL NO.

MANUFACTURER
SIMS

ACCELEROMETER LOCATIONS

CH. 1	TOP OF MOTOR
CH. 2	

REMARKS

TEST ENGINEER

SHEET 3

NUI FORM # 46

Vibration Test Data Sheet
Figure 10

LIST OF APPARATUS

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DATE	DUE DATE
Accelerometer	Endevco	2221D	JC93	2/26/03	2/26/04
Vibe Machine	L.A.B.	RVH-72-5000	51401	Functional	
Accelerometer	Endevco	2221D	EY61	10/3/03	10/3/04
Charge Amplifier	Endevco	203M	218	6/27/03	6/27/04
Charge Amplifier	Endevco	203M	729	7/8/03	7/8/04
Multimeter	Fluke	83	575011058	4/28/03	4/28/04
1 Hour Timer	Gra-Labs	300	300-87061543	4/1/03	4/1/04
Pressure Gauge	Wikia	9834150	N/A	12/21/02	12/21/03

All calibrations are traceable to the National Institute of Standards and Technology. Procedures satisfy the requirements set forth in MIL-STD-45662 or ANSI/NCSL Z540-1. Calibration records are on file at NU Laboratories, Inc.

All weights and scales are traceable to the State of NJ Office of Weights and Measures (NJSA 51:1-61; 75; NJAC 13:47E-1.2)