Medium Weight Shock and Vibration Test Report
on
8x8x13C20 Horizontal Pump w/ 20 HP Motor
for
Sims Pump Valve Co., Inc.
Hoboken, NJ

NU LABORATORIES, INC.
312 Old Allerton Road, Annandale, NJ
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21 October 2009

Prepared By	Checked By	Approved By
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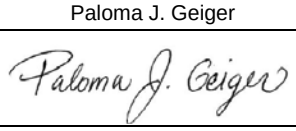	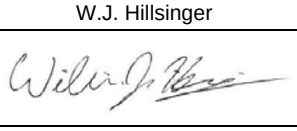	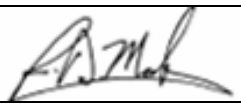
21 October 2009	21 October 2009	21 October 2009

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1. PURPOSE OF TEST

The purpose of this test is to demonstrate that the 8x8x13C20 Horizontal Pump with 20 HP Motor hereinafter referred to as the "Pump", complies with the requirements of MIL-S-901D when subjected to a nine (9) blow, Grade A, Class I, Type A medium weight shock test and with the requirements of MIL-STD-167-1 when subjected to vibration through the frequency range of 4 Hz through 50 Hz in each of the three (3) major axes.

2. MANUFACTURER

Sims Pump Valve Co., Inc.
1314 Park Ave.
Hoboken, NJ 07030

3. MANUFACTURER'S TYPE OR MODEL NO.

8x8x13C20 Horizontal Pump with 20 HP Motor
Drawing No.: NS18009-C20

4. SPECIFICATIONS

4.1 MILITARY

MIL-S-901D (NAVY) Military Specification, Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for, dated 17 March 1989

MIL-STD-167-1 (SHIPS) Military Standards Mechanical Vibrations of Shipboard Equipment, dated 1 May 1974

4.2 SIMS PUMP VALVE CO., INC.

Purchase Order No.: 9574

Drawing Number: NS18009-C20

5. NUMBER OF ITEMS TESTED

One (1)

6. SECURITY CLASSIFICATION OF ITEMS

None

7. DATE TESTING COMPLETED

9 October 2009 - Shock Testing
18 October 2009 - Vibration Testing

8. TEST CONDUCTED BY

NU Laboratories, Inc.
312 Old Allerton Road
Annandale, NJ 08801
(NAVY Certified Shock Test Facility by NAVSEA INST 9491.1C)

9. TEST WITNESSES

Vladimir Spektor, Sims Pump Valve Co., Inc. representative.

10. DISPOSITION OF TEST ITEM

The equipment was returned to Sims Pump Valve Co., Inc.

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 discrepancies. Refer to Section 13 for additional information.

The Pump was subjected to vibration through the frequency range of 4 Hz to 50 Hz in each of the three (3) major axes in accordance with the referenced test specifications. Visual inspections, performed after each axis of vibration, revealed no obvious physical damage. Refer to Section 14 for additional information.

12. LABORATORY CONDITIONS

Ambient Temperature: 66° F
Relative Humidity: 55%
Atmospheric Pressure: 28.89 in. Hg

NOTE: cited conditions are averages of all laboratory conditions recorded throughout testing.

13. MEDIUM WEIGHT SHOCK TEST DESCRIPTION

13.1 TEST SETUP

Upon receipt, a visual inspection performed on the Pump revealed no obvious physical damage or discrepancies. The Pump was weighed using a digital scale and the weight was recorded in the test log. The dry weight of the Pump was 1843 lbs.

The Pump was attached to a 40” x 55” x 1.5” test plate and the plate was secured to fixture Figure 16 of MIL-S-901D. Fixture Figure 16 of MIL-S-901D was secured to the medium weight shock machine oriented in the first major axis of test. The total weight on the anvil table was 4791.5 lbs. Refer to Table 1 for medium weight shock weights and Figure 1 for photographs of the test setup.

Table 1: Group I Medium Weight Shock Test Weights

8x8x13C20 Horizontal Pump with 20 HP Motor	**1843 lbs.**
Test Plate 40”x55”x1.5”	**938 lbs.**
Inlet and Outlet Flanges	**108 lbs.**
Two (2) Sets of Combination Channels	**234 lbs.**
One (1) Set of Standard Channels	**83 lbs.**
Eight (8) Standard Channel Clamps	**32 lbs.**
Six (6) Shipbuilding Channel Clamps	**34 lbs.**
Nine (9) T-Blocks w/ Hardware	**36 lbs.**
Nine (9) Spacers	**13.5 lbs.**
Fixture Figure 13 of MIL-S-901D	**380 lbs.**
Fixture Figure 16 of MIL-S-901D	**1470 lbs.**
Total Weight Fixture Figure 13	**3701.5 lbs.**
Total Weight Fixture Figure 16	**4791.5 lbs.**

13.2 TEST CONDITIONS

Condition A: Energized and operating, with a discharge of 11 PSIG.

Condition B: Non-operating and flooded.

13.3 BLOW #1 - CONDITION A

13.3.1 Conditions: 30° End Down Axis, 2.25’ hammer height, Group #I, 3.0" anvil table travel, fixture Figure 16 of the referenced specifications.
13.3.2 Observations: A post-blow visual inspection revealed no obvious physical damage or leakage.
13.3.3 Action: Testing was continued.

13.4 BLOW #2 - CONDITION B

13.4.1 Conditions: 30° End Down Axis, 3.75' hammer height, Group #II, 3" anvil table travel, fixture Figure 16 of the referenced specifications.
13.4.2 Observations: A post-blow visual inspection revealed no obvious physical damage or leakage.
13.4.3 Action: Testing was continued.

13.5 BLOW #3 - CONDITION A

13.5.1 Conditions: 30° End Down Axis, 3.75’ hammer height, Group #III, 1.5" anvil table travel, fixture Figure 16 of the referenced specifications.
13.5.2 Observations: A post-blow visual inspection revealed no obvious physical damage or leakage.
13.5.3 Action: Testing was continued.

The entire assembly was removed from fixture Figure 16 of MIL-S-901D, rotated and reattached to MIL-S-901D Figure 16 with the side of the Pump facing down. Refer to Figure 1. The total weight on the anvil table remained at 4791.5 pounds.

13.6 BLOW #4 - CONDITION A

13.6.1 Conditions: 30° Side Down Axis, 2.25’ hammer height, Group #I, 3.0" anvil table travel, fixture Figure 16 of the referenced specifications.
13.6.2 Observations: A post-blow visual inspection revealed no obvious physical damage or leakage.
13.6.3 Action: Testing was continued.

13.7 BLOW #5 - CONDITION B

13.7.1 Conditions: 30° Side Down Axis, 3.75' hammer height, Group #II, 3.0" anvil table travel, fixture Figure 16 of the referenced specifications.
13.7.2 Observations: A post-blow visual inspection revealed no obvious physical damage or leakage.
13.7.3 Action: Testing was continued.

13.8 BLOW #6 - CONDITION A

13.8.1 Conditions: 30° Side Down Axis, 3.75' hammer height, Group #III, 1.5″ anvil table travel, fixture Figure 16 of the referenced specifications.
13.8.2 Observations: A post-blow visual inspection revealed no obvious physical damage. Leakage around the packing seal was noted. The Sims Pump representative reported that the packing ring was not installed.
13.8.3 Action: The packing seal ring was installed per the representative’s direction. Refer to Figure 2. Testing was continued.

The entire assembly was removed from fixture Figure 16 of MIL-S-901D, and attached to fixture Figure 13 of MIL-S-901D of the referenced specifications. The total weight on the anvil table was 3701.5 pounds. Refer to Figure 1 for a photograph of the test setup and Table 1 for a breakdown of the test weights.

13.9 BLOW #7 - CONDITION A

13.9.1 Conditions: Vertical Axis, 1.75' hammer height, Group #I, 3.0″ anvil table travel, fixture Figure 13 of the referenced specifications.
13.9.2 Observations: A post-blow visual inspection revealed no obvious physical damage. It was noted that the packing was leaking with a drip rate of twenty-one (21) drops/minute.
13.9.3 Action: Testing was continued.

13.10 BLOW #8 - CONDITION B

13.10.1 Conditions: Vertical Axis, 2.75' hammer height, Group #II, 3.0″ anvil table travel, fixture Figure 13 of the referenced specifications.
13.10.2 Observations: A post-blow visual inspection revealed no obvious physical damage. It was noted that the packing was leaking with a drip rate of three (3) drops/minute.
13.10.3 Action: Testing was continued.

13.11 BLOW #9 - CONDITION A

13.11.1 Conditions: Vertical Axis, 2.75' hammer height, Group #III, 3.5″ anvil table travel, fixture Figure 13 of the referenced specifications.

13.11.2 Observations: A post-blow visual inspection revealed no obvious physical damage. It was noted that the packing was leaking with a drip rate of two (2) drops/minute.

13.11.3 Action: Shock testing was complete.

Refer to the Factory Test Record, Figure 3, and the Shock Acceptance Form, Figure 4, for additional information.

14. VIBRATION TEST DESCRIPTION

14.1 TEST SETUP

The Pump was attached to the Vibration machine oriented in the first major axis of test. Refer to Figure 5 for photographs of the test setups.

One (1) Accelerometer was attached to the plate and one (1) accelerometer was attached to the top of the Pump, oriented in the direction of vibration, to record the vibration input and to aid in the detection of response prominences.

It was noted that prior to the start of vibration testing the Pump continued to leak one (1) drop/minute when at a standstill.

14.2 TEST CONDITIONS

The pump was energized and operating, with a discharge of 11 PSIG throughout vibration testing.

14.3 FIRST MAJOR AXIS OF VIBRATION (VERTICAL)

14.3.1 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 to 50 Hz with a vibration input of 0.006 + 0.000/-0.002 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 fifteen (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 Sheet, Figure 6.

14.3.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 2. 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 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 Sheet, Figure 6.

14.3.3 Endurance Vibration

Since no response prominences were noted, 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, an external visual inspection revealed no obvious physical damage.

Table 2: Variable Frequency Test 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

14.4 SECOND MAJOR AXIS OF VIBRATION (END-TO-END)

14.4.1 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 to 50 Hz with a vibration input of 0.006 + 0.000/-0.002 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 fifteen (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 Sheet, Figure 7.

14.4.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz through 50 Hz with input amplitudes as shown in Table 2. 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 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 Sheet, Figure 7.

14.4.3 Endurance Vibration

Since no response prominences were noted, 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, an external visual inspection revealed no obvious physical damage.

14.5 THIRD MAJOR AXIS OF VIBRATION (SIDE-TO-SIDE)

14.5.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 50 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) and from 34 Hz to 50 Hz with a vibration input of 0.006 + 0.000/-0.002 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 fifteen (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 Sheet, Figure 8.

14.5.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz through 50 Hz with input amplitudes as shown in Table 2. 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 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 Sheet, Figure 8.

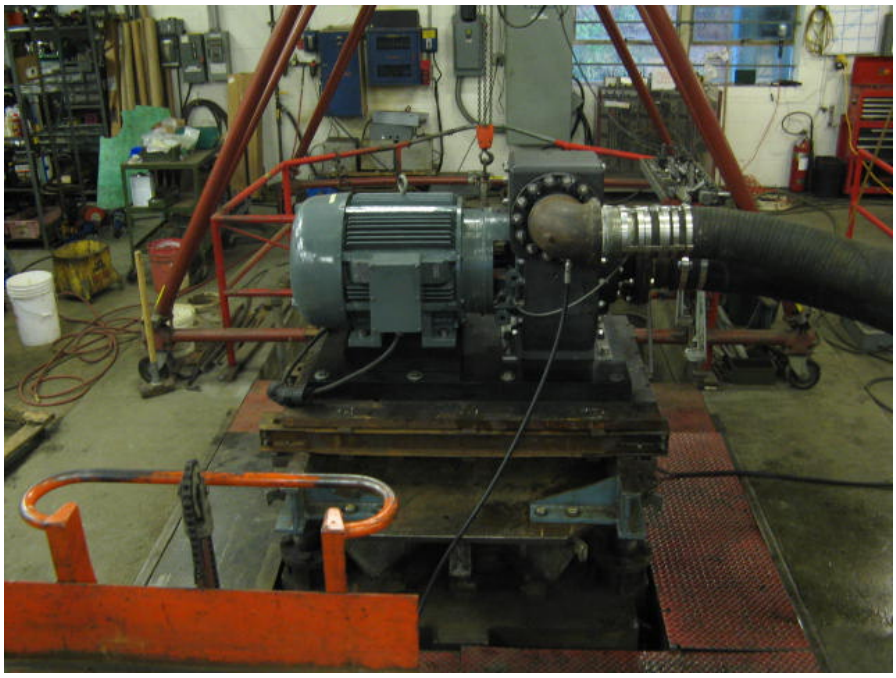
14.5.3 Endurance Vibration

Since no response prominences were noted, 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, an external visual inspection revealed no obvious physical damage.

Shock testing was complete.

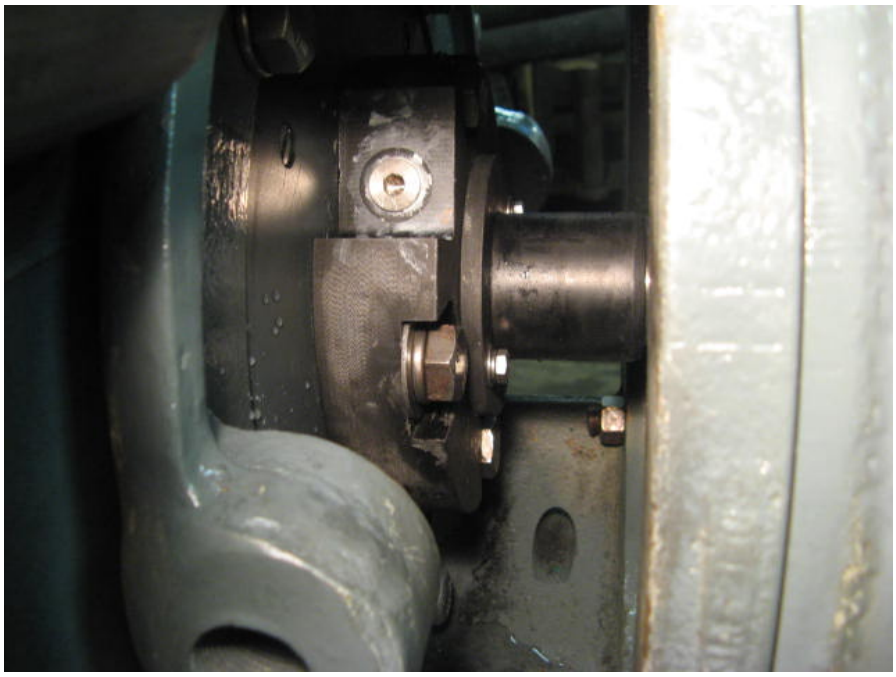
30° Side Down Axis

30° End Down Axis



Vertical Axis

Shock Test Setups
Figure 1



Post-Blow #6 Pump to Motor Packing Seal Ring
Figure 2

FACTORY TEST RECORD: CLASS HI SHOCK			DATE: 9 October 2009	TEST # 11251.1
1. ITEM NAME OF EQUIPMENT SHOCK TESTED 8x8x13C20 Horizontal Pump w/ 20 HP Motor		2. RATING (KW, VOLTS, GPM, CFM, ETC.)		
3. MAJOR PARTS				
PUMP, ETC.	MANUFACTURER Sims Pump Valve Co., Inc.	ADDRESS 1314 Park Ave. 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 1843 lbs.	WEIGHT OF INDIVIDUAL MOTOR PARTS	MOTOR	STARTER	
7. WEIGHT CLASSIFICATION OF ITEM ☐ LIGHT ☒ MEDIUM	8. APPLICABLE MOUNTING FIXTURE IN SPECIFICATION MIL-S-901 ☐ Fig 7, FIX 4A ☐ Fig 8, FIX 4C ☒ FIX 13 ☐ FIX 15 ☒ FIG 16 ☐ OTHER			

9. FOR LIGHTWEIGHT ITEMS

FIRST CONDITION				SECOND CONDITION			
BLOW	DROP	AXIS	DAMAGE INCURRED	BLOW	DROP	AXIS	DAMAGE INCURRED

ITEMS SUBECT TO ABOVE TWO CONDITIONS WERE ☐ SAME ☐ DIFFERENT	REMARKS

10. FOR MEDIUM WEIGHT ITEMS

Fig. 16				Fig. 13			
BLOW	GROUP	HAMMER DROP	DAMAGE INCURRED	BLOW	GROUP	HAMMER DROP	DAMAGE INCURRED
1	I	2.25'	No damage noted	6	III	3.75'	Refer to report
2	II	3.75'	No damage noted	7	I	1.75'	Refer to report
3	III	3.75'	No damage noted	8	II	2.75'	Refer to report
4	I	2.25'	No damage noted	9	III	2.75'	Refer to report
5	II	3.75'	No damage noted				

TOTAL WEIGHT ON ANVIL TABLE **Fig. 16:** 4791.5 lbs; **Fig. 13:** 3701.5 lbs	REMARKS	
TEST LABORATORY **NU Laboratories, Inc.**	ADDRESS **312 Old Allerton Road, Annandale, NJ 08801**	TEST ENGINEER [signature]

Factory Test Record
Figure 3

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)

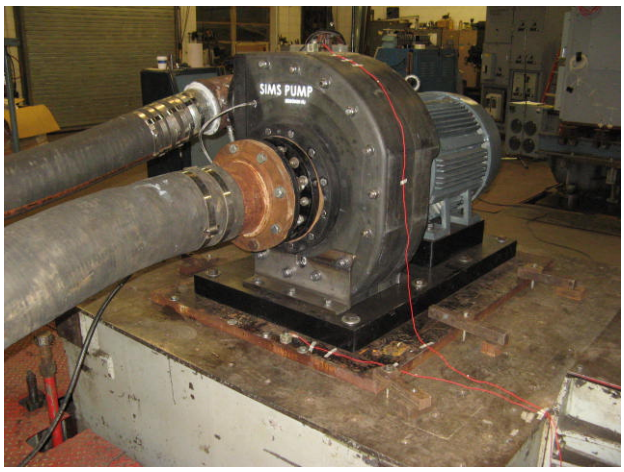
   ❑ Previous shock testing of an item identical to the item identified below (shock test extension)

2. Item (Nomenclature) Pump
3. Item (Description) 8x8x13C20 Horizontal Pump w/ 20 HP Motor
4. Tested For Sims Pump Valve Co., Inc.
5. P/N: _____ 6. S/N: _____
7. Dwg. Number: NS18009-C20 8. Revision and Date: _____
9. Military Specification MIL-S-901D
10. Ship _____ 11. Service _____
12. Contract No. _____
13. Shock Test Facility NU Laboratories, Inc.
14. Report No. 11251.1
15. Previous Shock test approval reference (if this form conveys shock test Extension approval) _____

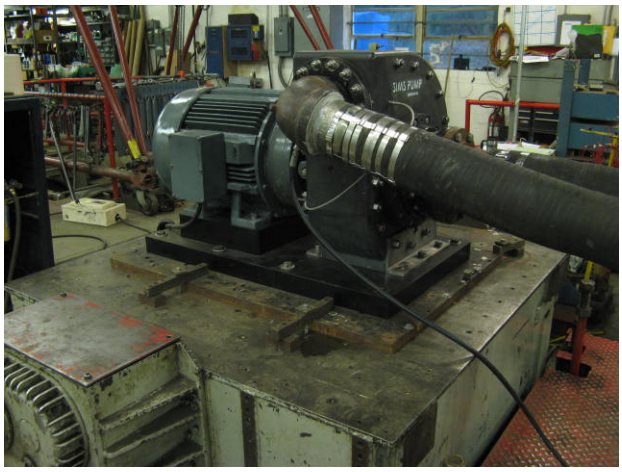
16. Test Category ☐ Lightweight ☒Medium weight ☐ Heavyweight
17. Shock Grade ☒A ☐B
18. Equipment Class ☒ I ☐ II ☐ III
19. Shock Test Type ☒ A ☐ B ☐ C
20. Mounting Location ☒ Deck ☐Hull ☐ Shell ☐ Wetted-Surface
21. Shipboard mounting plane represented during shock test:
    ☒Base ☐Front or Face ☐Back
    ☐ Top ☐Combination ☐ Other _____
22. Mounting orientation of item relative to ship's fore-and-aft axis (for medium weight and heavyweight test items only): Unrestricted
23. Approval Limitations: _____
24. Approved. _____

Authorized Signature	Approval Activity	Date
		9 October 2009

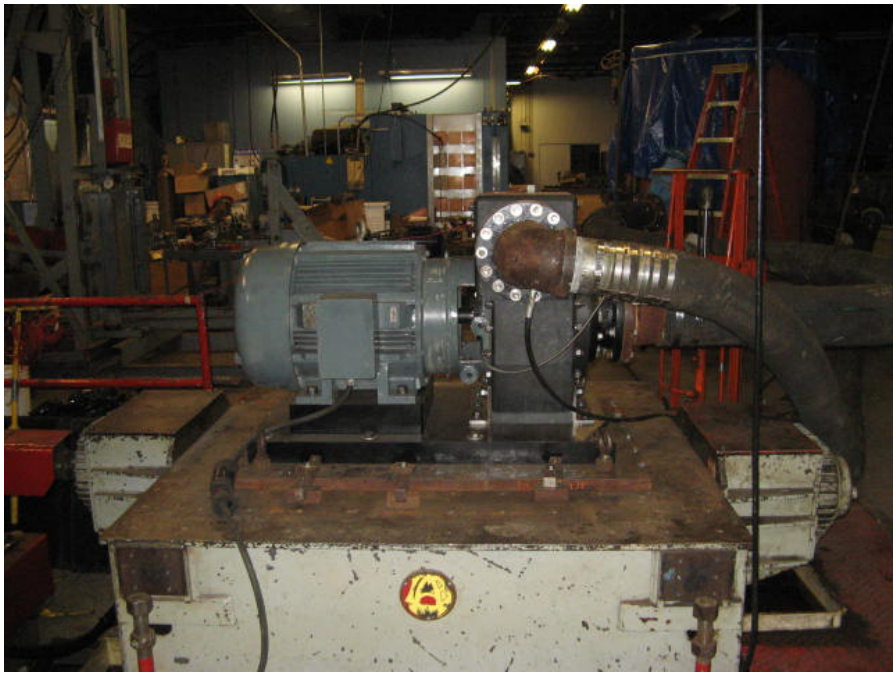
Shock Acceptance Form
Figure 4



Vertical Axis



End-to-End Axis



Side-to-Side Axis

Vibration Test Setups
Figure 5

	EXPLORATORY FREQUENCY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.020	.021		.062	.067	
5	.020	.021		.061	.066	
6	.019	.020		.061	.064	
7	.019	.020		.059	.062	
8	.019	.020		.058	.062	
9	.019	.019		.058	.061	
10	.018	.019		.057	.060	
11	.018	.019		.058	.060	
12	.019	.019		.058	.060	
13	.019	.019		.058	.060	
14	.019	.019		.057	.060	
15	.018	.019		057	.060	
16	018	.019		.040	.041	
17	.018	.019		.040	.041	
18	.019	.019		.040	.041	
19	.018	.019		.040	.042	
20	.018	.019		.040	.042	
21	.019	.019		.040	.042	
22	.018	.019		.040	.042	
23	.018	.019		.040	.042	
24	.018	.019		.040	.043	
25	.018	.019		.040	.043	
26	.018	.020		.020	.021	
27	.018	.020		.019	.021	
28	.018	.020		.019	.021	
29	.018	.020		.019	.021	
30	.018	.020		.020	.022	
31	.018	.020		.020	.022	
32	.018	.021		.020	.022	
33	.019	.021		.020	.022	
34	.006	.006		.010	.012	
35	.005	.006		.010	.012	
36	.005	.006		.010	.012	
37	.005	.006		.011	.013	
38	005	.006		.011	.012	
39	.005	.006		.011	.013	
40	.005	.006		.011	.013	
41	.005	.006		.006	.006	
42	.005	.006		.006	.006	
43	.005	.006		.006	.006	
44	.005	.007		.006	.006	
45	.006	.007		.006	.006	
46	.006	.007		.006	.006	
47	.006	.007		.006	.007	
48	.006	.007		.006	.008	
49	.006	.007		.006	.008	
50	.006	.007		.006	.008	

Res. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 11251
DATE 10-15-09
AXIS VERTICAL

NU LABORATORIES
312 OLD ALLERTON RD., ANNANDALE, NJ
08801 (908) 713-9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE

ENDURANCE

Hz	INPUT	DURATION
50	.006	2 HRS.

TEST ARTICLE IDENTIFICATION:

8 X 8 X 13 C 20
PUMP

TESTED FOR:

SIMS PUMP VALVE CO., INC.

ACCELEROMETER LOCATIONS

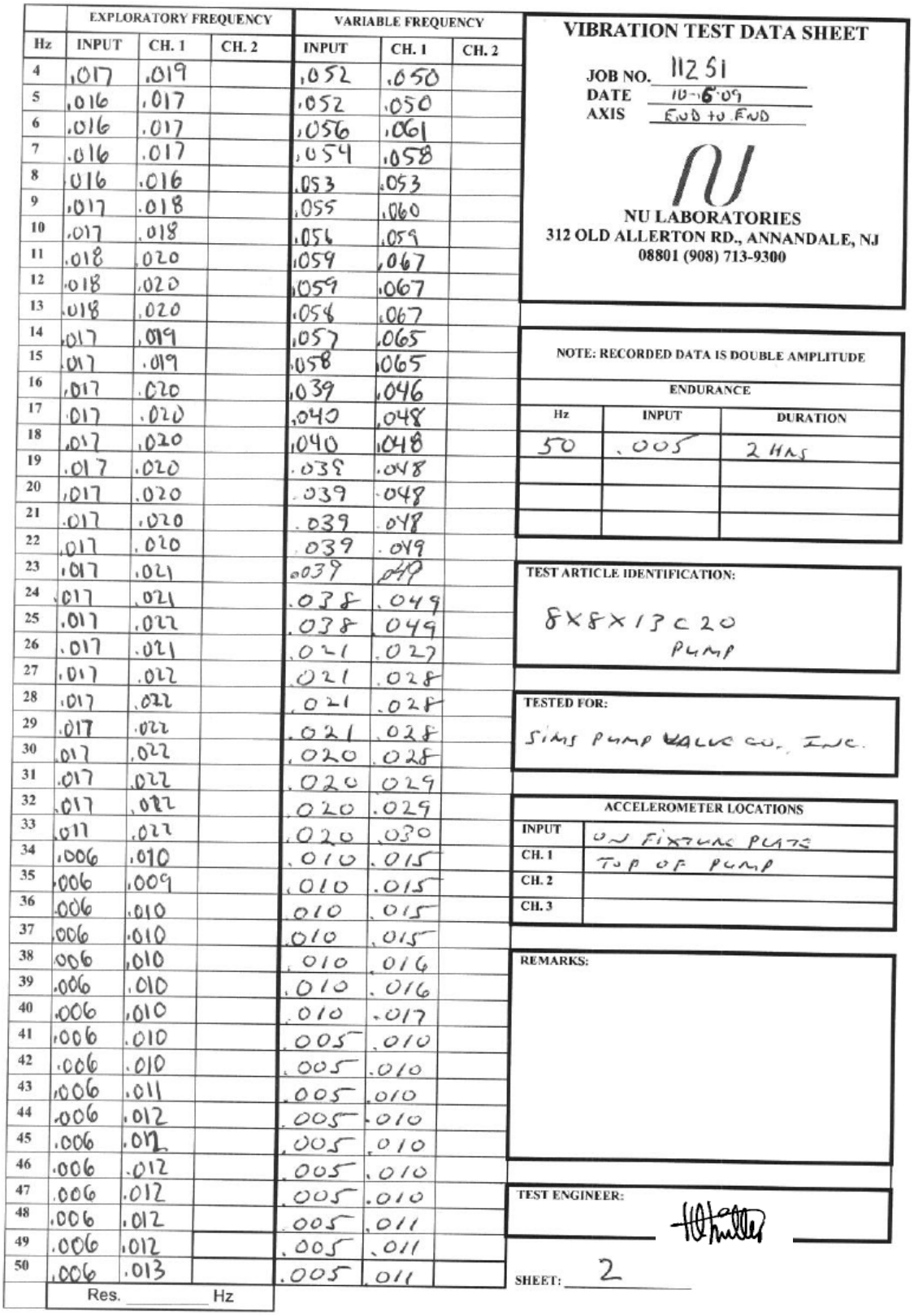
INPUT	ON FIXTURE PLATE
CH. 1	TOP OF PUMP
CH. 2	
CH. 3	

REMARKS:

TEST ENGINEER: H. Hall

SHEET: 1

Vibration Test Data Sheet
Figure 6



	EXPLORATORY FREQUENCY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.017	.019		.052	.050	
5	.016	.017		.052	.050	
6	.016	.017		.056	.061	
7	.016	.017		.054	.058	
8	.016	.016		.053	.053	
9	.017	.018		.055	.060	
10	.017	.018		.056	.059	
11	.018	.020		.059	.067	
12	.018	.020		.059	.067	
13	.018	.020		.058	.067	
14	.017	.019		.057	.065	
15	.017	.019		.058	.065	
16	.017	.020		.039	.046	
17	.017	.020		.040	.048	
18	.017	.020		.040	.048	
19	.017	.020		.038	.048	
20	.017	.020		.039	.048	
21	.017	.020		.039	.048	
22	.017	.020		.039	.049	
23	.017	.021		.039	.049	
24	.017	.021		.038	.049	
25	.017	.022		.038	.049	
26	.017	.021		.021	.027	
27	.017	.022		.021	.028	
28	.017	.022		.021	.028	
29	.017	.022		.021	.028	
30	.017	.022		.020	.028	
31	.017	.022		.020	.029	
32	.017	.022		.020	.029	
33	.017	.022		.020	.030	
34	.006	.010		.010	.015	
35	.006	.009		.010	.015	
36	.006	.010		.010	.015	
37	.006	.010		.010	.015	
38	.006	.010		.010	.016	
39	.006	.010		.010	.016	
40	.006	.010		.010	.017	
41	.006	.010		.005	.010	
42	.006	.010		.005	.010	
43	.006	.011		.005	.010	
44	.006	.012		.005	.010	
45	.006	.012		.005	.010	
46	.006	.012		.005	.010	
47	.006	.012		.005	.010	
48	.006	.012		.005	.011	
49	.006	.012		.005	.011	
50	.006	.013		.005	.011	

Res. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 11251
DATE 10-6-09
AXIS END TO END

NU LABORATORIES
312 OLD ALLERTON RD., ANNANDALE, NJ
08801 (908) 713-9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE

ENDURANCE

Hz	INPUT	DURATION
50	.005	2 HRS

TEST ARTICLE IDENTIFICATION:
8X8X13C20 PUMP

TESTED FOR:
SIMS PUMP VALVE CO., INC.

ACCELEROMETER LOCATIONS

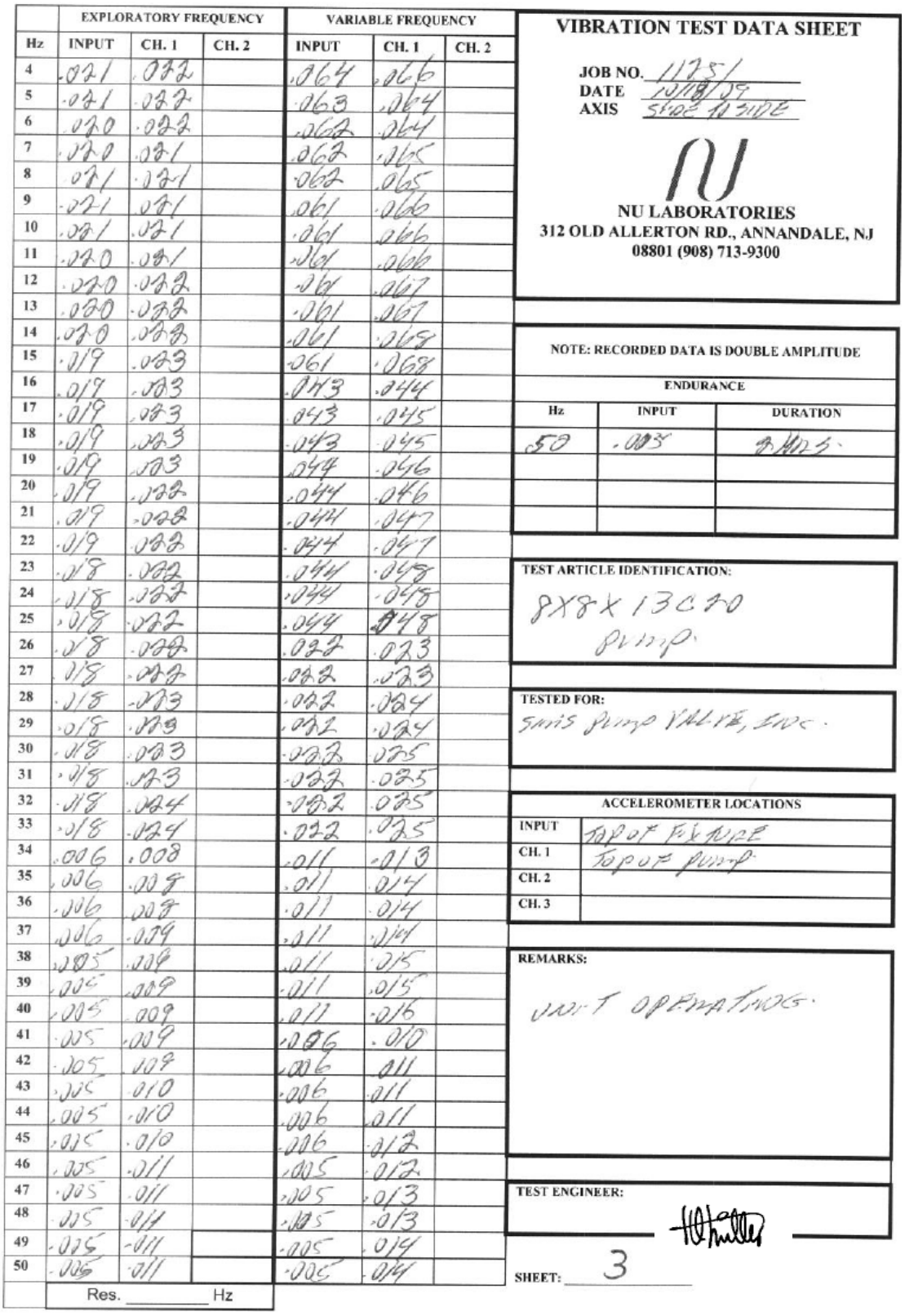
INPUT	ON FIXTURE PLATE
CH. 1	TOP OF PUMP
CH. 2	
CH. 3	

REMARKS:

TEST ENGINEER:

SHEET: 2

Vibration Test Data Sheet
Figure 7



	EXPLORATORY FREQUENCY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.021	.022		.064	.066	
5	.021	.022		.063	.064	
6	.020	.022		.062	.064	
7	.020	.021		.062	.065	
8	.021	.021		.062	.065	
9	.021	.021		.061	.066	
10	.021	.021		.061	.066	
11	.020	.021		.061	.066	
12	.020	.022		.061	.067	
13	.020	.022		.061	.067	
14	.020	.023		.061	.068	
15	.019	.023		.061	.068	
16	.019	.023		.043	.044	
17	.019	.023		.043	.045	
18	.019	.023		.043	.045	
19	.019	.023		.044	.046	
20	.019	.022		.044	.046	
21	.019	.022		.044	.047	
22	.019	.022		.044	.047	
23	.018	.022		.044	.048	
24	.018	.022		.044	.045	
25	.018	.022		.044	.048	
26	.018	.022		.022	.023	
27	.018	.022		.022	.023	
28	.018	.023		.022	.024	
29	.018	.023		.022	.024	
30	.018	.023		.022	.025	
31	.018	.023		.022	.025	
32	.018	.024		.022	.025	
33	.018	.024		.022	.025	
34	.006	.008		.011	.013	
35	.006	.008		.011	.014	
36	.006	.008		.011	.014	
37	.006	.009		.011	.014	
38	.005	.009		.011	.015	
39	.005	.009		.011	.015	
40	.005	.009		.011	.016	
41	.005	.009		.006	.010	
42	.005	.009		.006	.011	
43	.005	.010		.006	.011	
44	.005	.010		.006	.011	
45	.005	.010		.006	.012	
46	.005	.011		.005	.012	
47	.005	.011		.005	.013	
48	.005	.011		.005	.013	
49	.005	.011		.005	.014	
50	.006	.011		.005	.014	

Res. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 11251
DATE 10/18/19
AXIS SIDE TO SIDE

NU LABORATORIES
312 OLD ALLERTON RD., ANNANDALE, NJ
08801 (908) 713-9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE

ENDURANCE

Hz	INPUT	DURATION
50	.005	3 MIN.

TEST ARTICLE IDENTIFICATION:
8X8X13C70
pump

TESTED FOR:
Smiths Power Valve, Inc.

ACCELEROMETER LOCATIONS

INPUT	TOP OF FIXTURE
CH. 1	TOP OF PUMP
CH. 2	
CH. 3	

REMARKS:
UNIT OPERATING.

TEST ENGINEER:

SHEET: 3

Vibration Test Data Sheet
Figure 8

LIST OF APPARATUS

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DATE	DUE DATE
Temp/Humidity Sensor	Radio Shack	63-1013	006	6/4/09	6/4/10
Barometer	B&K	UZ001	BAR003	3/16/09	3/16/10
Pressure Gauge	Weksler	GP2-16-3	1003	12/1/08	12/1/09
Torque Wrench	Armstrong	CG3250FQARBH	5080258523	5/27/09	5/27/10
Torque Wrench	Central Tools	96355	794037102	5/27/09	5/27/10
Platform Scale	Fairbanks-Morse	1124A	G-511379	12/3/08	12/3/09
Balance Scale	Ohaus	1225	EL-330	12/3/08	12/3/09
Digital Scale	Industrial Commercial Sales	TI-500SSB-5K	5D190110000188	12/3/08	12/3/09
MW Shock Machine	New Eng. Trawler	10-T-3351-C	N/A	Functional	
Vibration Machine	LAB	RVH-72-5000	51401	Functional	
Function Generator	Ballantine	6201A6	220-104	6/4/09	6/4/10
1 hour timer	Gra-Lab	165	739	5/8/09	5/8/10
Charge Amp	Trig Tek	203M	220	3/31/09	3/31/10
Charge Amp	Trig Tek	203M	211	5/20/09	5/20/10
Accelerometer	Endevco	2221D	EM03	3/23/09	3/23/10
Accelerometer	Endevco	2221D	EY62	3/23/09	3/23/10

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)