SIMS PUMP Company

Since 1919

1314 Park av., Hoboken, New Jersey 07030
(201) 792-0600 (N.J.)
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FAX (201) 792-4803
E-mail SIMSPUMP @ aol.com
Web Site: www.simsite.com

MIL SPEC 901D and MIL-STD-167-1
NS16486-2A20
Simsite ® Structural Composite Pumps.

NAVY STANDARD COMPOSITE Pumps
Test Results
1.5 x 1 - 8, 20 HP, 3570 RPM.
120 GPM 250 Ft

SIMSITE ® NAVY Series Pumps
October 2005

SIMS Structural Composite NAVY Standard Pump
NS16486-2A20
SIZE: 1.5x1-8

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Medium Weight Shock and Vibration Test Report
on
1 ½" x 1" x 8 20 HP NS 16486-2SA20 Pump
for
Sims Pump Valve Company
Hoboken, NJ

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

25 October 2005

Prepared By	Checked By	Approved By
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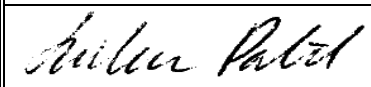	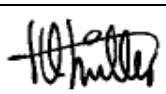	
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1. PURPOSE OF TEST

The purpose of this test was to demonstrate that the 1 ½" x 1" x 8" 20HP, NS 16486-2SA20 Pump, herein referred to as the "Pump," complied with the requirements of MIL-S-901D for a Grade A, Class I, Type A, nine (9) blow medium weight shock test and 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 Company
1314 Park Avenue
Hoboken, NJ 07030

3. MANUFACTURER'S TYPE OR MODEL NO.

1 ½" x 1" x 8" 20HP, NS 16486-2SA20 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, dated 17 March 1989.

MIL-STD-167-1 (SHIPS) Military Standards Mechanical Vibrations of Shipboard Equipment, 19 June 1987

4.2 SIMS PUMP VALVE COMPANY

Purchase Order Number: 4047

5. NUMBER OF ITEMS TESTED

One (1)

6. SECURITY CLASSIFICATION OF ITEMS

Unclassified

7. DATE TESTING COMPLETED

13 October 2005

8. TEST CONDUCTED BY

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

9. TEST WITNESSES

Vladimir Spektor, Sims Pump representative– shock only.
John Franklin, Sims Pump representative– shock only.
John Kozel, Sims Pump representative– shock only.
Eric Burachinsky, Sims Pump representative– shock only.
Robert Coseano, NSWCCD representative—shock only.

10. DISPOSITION OF TEST ITEMS

The Pump was returned to Sims Pump 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 obvious physical damage, loss in pressure, or leakage. Refer to Section 12 for details.

The Pump was subjected to vibration through the frequency range of 4 Hz to 50 Hz in each of the three (3) major axes. Visual inspections, performed after each, major axis of vibration, revealed no obvious physical damage, loss in pressure, or leakage. Refer to Section 13 for details.

12. MEDIUM WEIGHT SHOCK TEST DESCRIPTION

12.1 ACCEPTANCE CRITERIA

The Pump shall be considered to have failed the shock test if any portion of the equipment comes adrift or otherwise becomes a hazard to personnel, or equipment is not able to perform its Grade A specified function due to performance degradation in accordance with MIL-S-901D Section 3.1.10.1.

12.2 TEST SETUP

Upon receipt a visual inspection performed on the Pump revealed no obvious physical damage or discrepancy.

The Pump was weighed using a portable platform scale and the weight was recorded in the test log. The weight of the Pump was found to be 534 pounds.

The Pump was attached to a 48″ x 48″ x 1 ½” steel plate using four (4) 7/8”-8 Grade 5 bolts torqued to 150 lbs-ft. The entire assembly was then secured to fixture Figure 13 of MIL-S-901D on the medium weight shock machine orientated in the first major axis of test. A 17.6 pound dummy mass was attached to the suction side of the Pump using six (6) 1/2”-13 B7 threaded rod, nuts and washers torqued to 45 lbs-ft. A 10 pound dummy mass was attached to the discharge side of the Pump using four (4) 1/2”-13 B7 threaded rod,, washers, and nuts torqued to 45 lbs-ft. The total weight on the anvil table was found to be 2,128.5 pounds. Refer to Table 1 for the medium weight shock test weights and Figure 1 for photographs of the test setup.

Table 1: Medium Weight Shock Test Weights

Pump	**534 lbs.**
48″ x 48″ x 1 ½” Steel Plate	**970 lbs.**
Dummy Mass - Suction	**17.5 lbs.**
Dummy Mass - Discharge	**10 lbs.**
Mounting Bolts	**3 lbs.**
Two (2) Half Rails	**166 lbs.**
Eight (8) ½ Rail Shoes	**32 lbs.**
Four (4) T-Blocks	**16 lbs.**
Figure 13	**380 lbs.**
Figure 16	**1,470 lbs.**

12.3 TEST CONDITIONS

Throughout the shock test the Pump was monitored for any leaks or loss in pressure

Observations were made by Sims Pump, NSWC, and NU Laboratories, Inc. representatives.

During blows marked as "**CONDITION A**" the Pump was flooded with water, energized with 440 VAC, three (3) phase, 60 Hz power and operating with the discharge pressure adjusted to 108 psig.

During blows marked as "**CONDITION B**" the Pump flooded with water, and de-energized.

12.4 BLOW #1 - "CONDITION A"

12.4.1 Conditions: 1.25' hammer height, Group #I, 3.0" anvil table travel, Figure 13 of the referenced specifications.
12.4.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.4.3 Action: Testing was continued.

12.5 BLOW #2 - "CONDITION B"

12.5.1 Conditions 2.25' hammer height, Group #II, 3.0" anvil table travel, Figure 13 of the referenced specifications.
12.5.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.5.3 Action: Testing was continued

12.6 BLOW #3 - "CONDITION A"

12.6.1 Conditions: 2.25' hammer height, Group #III, 1.5" anvil table travel, Figure 13 of the referenced specifications.
12.6.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.6.3 Action: Testing was continued.

The entire assembly was then removed from fixture Figure 13 of MIL-S-901D, and reattached to fixture Figure 16 of MIL-S-901D of the referenced specifications, orientated with the side of the Pump facing down. The total weight on the anvil table was found to be 3,218.5 pounds. Refer to Figure 1 for a photograph of the test setup and Table 1 for a breakdown of the test weights.

12.7 BLOW #4 - "CONDITION A"

12.7.1 Conditions: 1.5' hammer height, Group #I, 3.0" anvil table travel, Figure 16 of the referenced specifications.
12.7.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.7.3 Action: Testing was continued.

12.8 BLOW #5 - "CONDITION B"

12.8.1 Conditions: 2.5' hammer height, Group #II, 3.0" anvil table travel, Figure 16 of the referenced specifications.
12.8.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.8.3 Action: Testing was continued.

12.9 BLOW #6 - "CONDITION A"

12.9.1 Conditions: 2.5' hammer height, Group #III, 1.5″ anvil table travel, Figure 16 of the referenced specifications.
12.9.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.9.3 Action: Testing was completed.

The entire assembly was removed from fixture Figure 16 of MIL-S-901D, rotated 90° and reattached to MIL-S-901D Figure 16 with the suction side of the Pump facing down; see Figure 1. The total weight on the anvil table remained at 3,218.5 pounds.

12.10 BLOW #7 - "CONDITION A"

12.10.1 Conditions: 1.5' hammer height, Group #I, 3.0" anvil table travel, Figure 16 of the referenced specifications.
12.10.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.10.3 Action: Testing was continued.

12.11 BLOW #8 - "CONDITION B"

12.11.1 Conditions: 2.5' hammer height, Group #II, 3.0" anvil table travel, Figure 16 of the referenced specifications.
12.11.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.11.3 Action: Testing was continued

12.12 BLOW #9 - "CONDITION A"

12.12.1 Conditions: 2.5' hammer height, Group #III, 1.5" anvil table travel, Figure 16 of the referenced specifications.
12.12.2 Observations: A post-blow visual inspection revealed no obvious physical damage. No leakage or loss in pressure was reported.
12.12.3 Action: Testing was continued.

Refer to the Factory Test Records, Figures 2, and the Shock Acceptance Form, Figure 3, for additional information.

13. VIBRATION TEST DESCRIPTION

13.1 TEST SETUP

Upon completion of the shock test the Pump assembly was removed from Figure 16 of MIL-S-901D and attached to the vibration machine. Refer to Figure 4 for the photographs of the test setups.

An accelerometer was attached to the Pump, orientated in the direction of vibration, to aid in the detection of response prominences.

13.2 TEST CONDITIONS

The Pump was subjected to vibration in each of the three (3) major axes in "**CONDITION A**"; the Pump was flooded with water, energized with 440 VAC, three (3) phase, 60 Hz power and operating with the discharge pressure adjusted to 108 psig.
:

13.3 FIRST MAJOR AXIS OF VIBRATION (FRONT TO BACK AXIS)

13.3.1 Exploratory Vibration

The Pump, was vibrated from 4 Hz through 50 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) to determine response prominences and from 34 Hz through 50 Hz with a vibration input of 0.006 + 0.000/-0.002 (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 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 obvious physical damage, leakage or loss in pressure 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 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

13.3.3 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 inspection was performed which revealed no obvious physical damage, leakage or loss in pressure.

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

13.4 SECOND MAJOR AXIS OF VIBRATION (VERTICAL AXIS)

13.4.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) to determine response prominences and from 34 Hz through 50 Hz with a vibration input of 0.006 + 0.000/-0.002 (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.

13.4.2 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 obvious physical damage, leakage or loss in pressure was noted.

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

13.4.3 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 inspection was performed which revealed no obvious physical damage, leakage or loss in pressure.

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

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

13.5.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) to determine response prominences and from 34 Hz through 50 Hz with a vibration input of 0.006 + 0.000/-0.002 (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.

13.5.2 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 obvious physical damage, leakage or loss in pressure was noted.

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

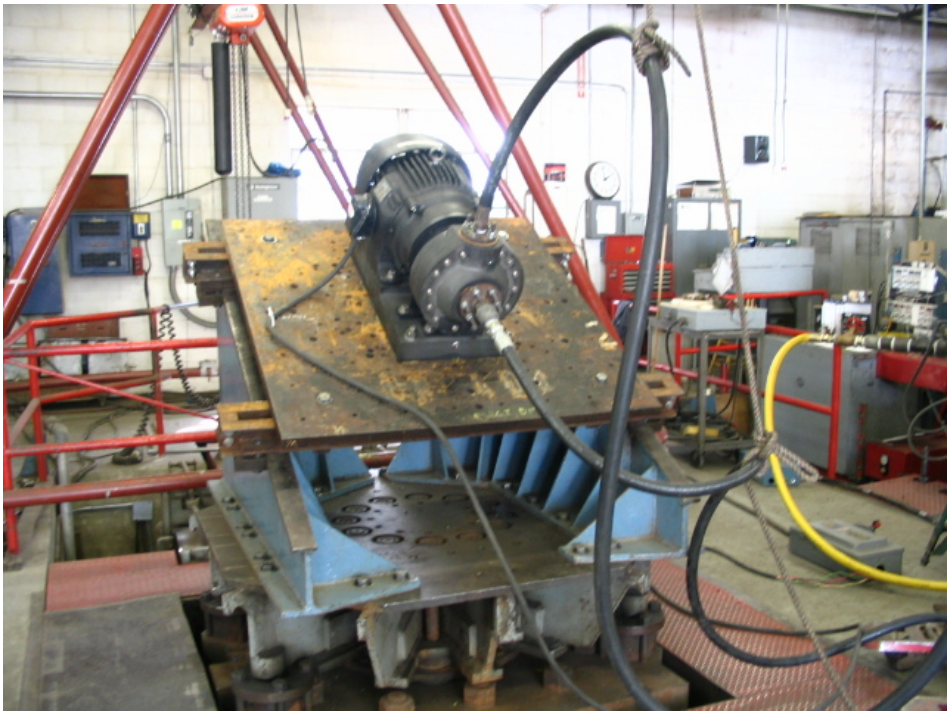
13.5.3 Endurance Vibration

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 inspection was performed which revealed no obvious physical damage, leakage or loss in pressure.

The frequency, 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 5 through 10, for additional information.
Upon completion of the vibration test visual inspection performed revealed no obvious physical damage or discrepancy.

Vertical Axis

Pump Shaft Perpendicular to Incline Axis



Pump Shaft Parallel to Incline

Shock Test Setup Photographs
Figure 1

FACTORY TEST RECORD: CLASS HI SHOCK

DATE: 14 October 2005 | TEST #: 10401.1

1. ITEM NAME OF EQUIPMENT SHOCK-TESTED: 1.5 x 1 x 8 20HP NS16486-2SA20 Pump

2. RATING (KW, VOLTS, GPM, CFM, ETC.)

3. MAJOR PARTS

PUMP, ETC.	TESTED FOR	ADDRESS	GOV DWG NO	IDENTIFYING #
	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	WEIGHT OF INDIVIDUAL MAJOR PARTS	MOTOR	STARTER
534 lbs.	LBS.	LBS.	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

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

10. FOR MEDIUM-WEIGHT ITEMS

Fig. 13 Fig. 16,				Fig. 16.			
BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED	BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED
1	I	1.25	No damage noted	6	III	2.5'	No damage noted
2	II	2.25'	No damage noted	7	I	1.5'	No damage noted
3	III	2.25'	No damage noted	8	II	2.5'	No damage noted
4	I	1.5'	No damage noted	9	III	2.5'	No damage noted
5	II	2.5'	No damage noted				

TOTAL WEIGHT ON ANVIL TABLE: Figure 13- 2,128.5, Figure 16- 3,218.5 lbs | REMARKS

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

Factory Test Record
Figure 2

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) 1.5" x 1" x 8 20HP NS 16486-2SA20 Pump
4. Tested For Sims Pump Pump Company
5. Model N/A 6. Size/Capacity _____
7. Serial Number N/A 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. 10401.1
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

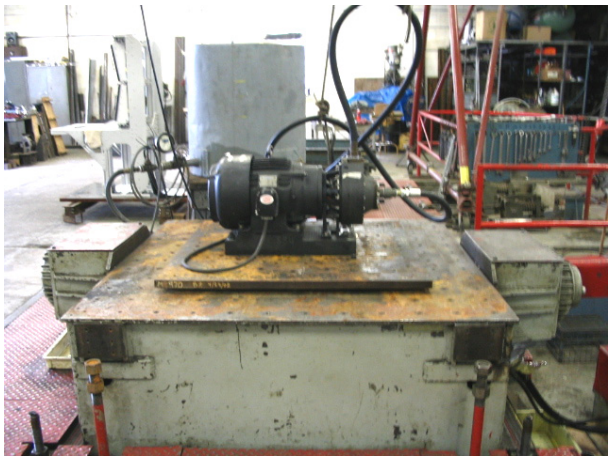
21. Shipboard mounting plane represented during shock test:

☒ Base	☐ Front or Face	☐ Back	
☐ Top	☐ Combination	☐ Other	Flanged Ends

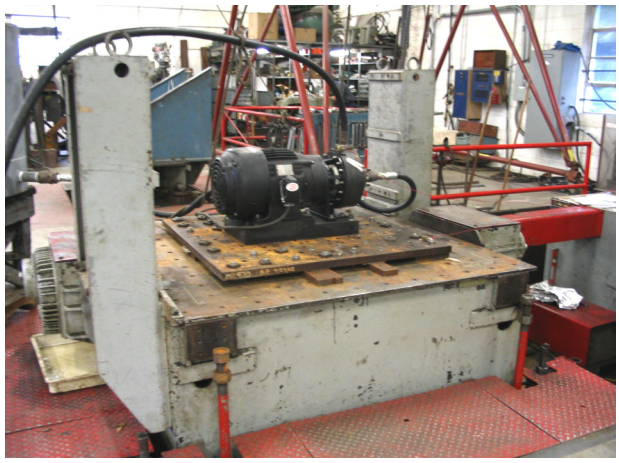
22. Mounting orientation of item relative to ship's fore-and-aft axis (for medium weight and heavyweight test items only): Unrestricted
23. Approval Limitations: _____
24. Approved. _____

Authorized Signature	Approval Activity	Date
		25 October 2005

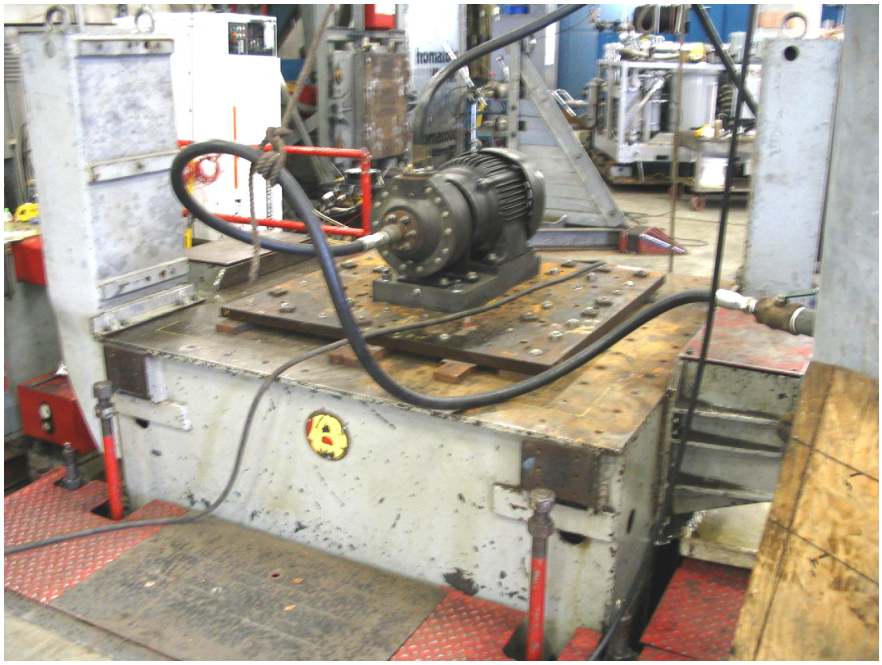
Shock Acceptance Form
Figure 3



Vertical Axis



Side to Side Axes



End to End Axis

Vibration Test Setup
Figure 4

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

RES. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10401

DATE 10/6/05

AXIS FRONT TO BACK

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
.005	.007	2 HR

• TEST SPECIMEN • NOMENCLATURE

1.5 x 1 x 8 PUMP

SERIAL NO.

NS 16486-2SA20

MANUFACTURER

SIMS

ACCELEROMETER LOCATIONS

CH. 1 TOP OF PUMP HOUSING

CH. 2

REMARKS

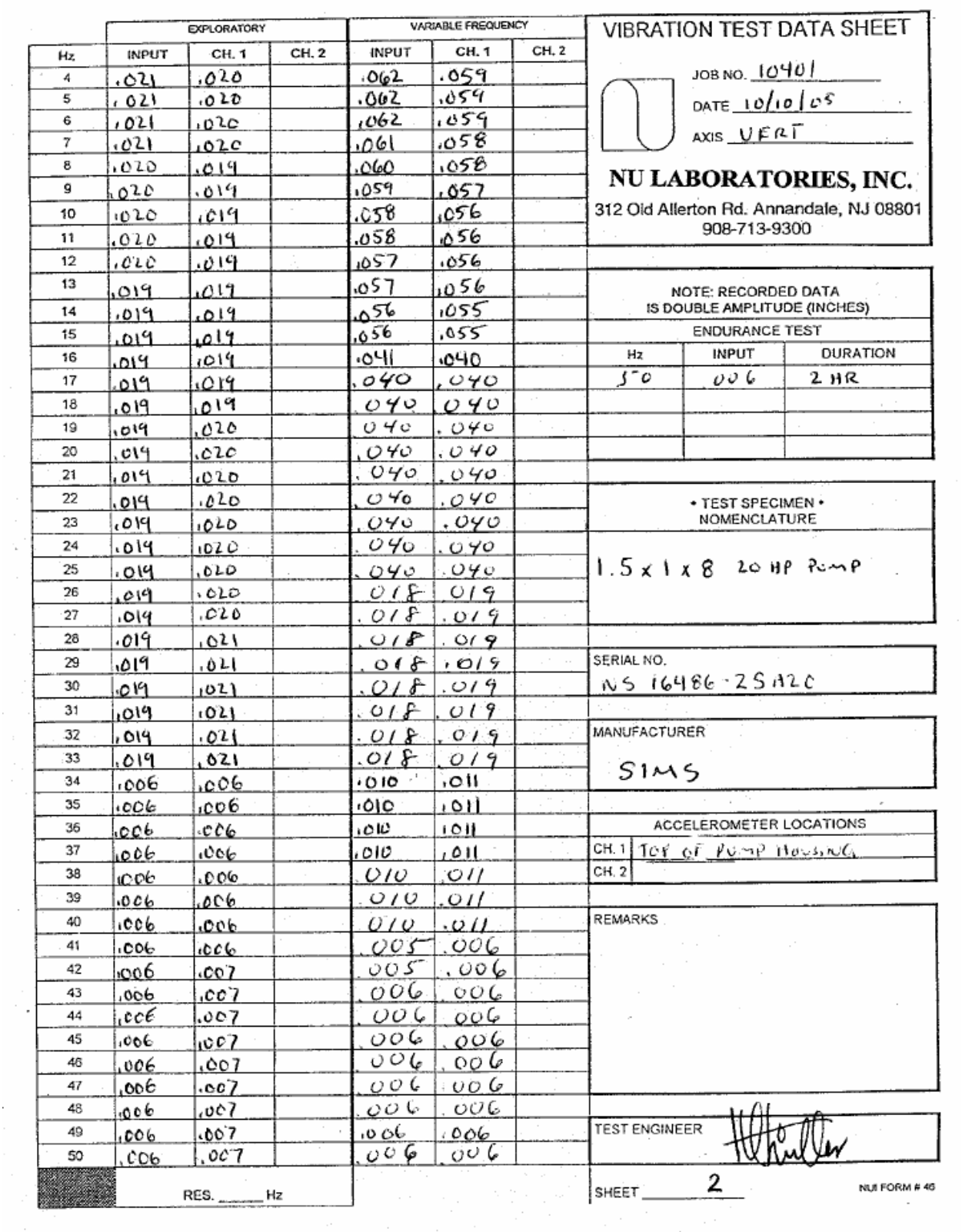
COND A: OPERATING 108 PSI THROUGHOUT TEST

TEST ENGINEER

SHEET 1

NUI FORM # 45

Vibration Test Data Sheet
Figure 5



Hz	EXPLORATORY INPUT	EXPLORATORY CH. 1	EXPLORATORY CH. 2	VARIABLE FREQUENCY INPUT	VARIABLE FREQUENCY CH. 1	VARIABLE FREQUENCY CH. 2
4	.021	.020		.062	.059	
5	.021	.020		.062	.059	
6	.021	.020		.062	.059	
7	.021	.020		.061	.058	
8	.020	.019		.060	.058	
9	.020	.019		.059	.057	
10	.020	.019		.058	.056	
11	.020	.019		.058	.056	
12	.020	.019		.057	.056	
13	.019	.019		.057	.056	
14	.019	.019		.056	.055	
15	.019	.019		.056	.055	
16	.019	.019		.041	.040	
17	.019	.019		.040	.040	
18	.019	.019		.040	.040	
19	.019	.020		.040	.040	
20	.019	.020		.040	.040	
21	.019	.020		.040	.040	
22	.019	.020		.040	.040	
23	.019	.020		.040	.040	
24	.019	.020		.040	.040	
25	.019	.020		.040	.040	
26	.019	.020		.018	.019	
27	.019	.020		.018	.019	
28	.019	.021		.018	.019	
29	.019	.021		.018	.019	
30	.019	.021		.018	.019	
31	.019	.021		.018	.019	
32	.019	.021		.018	.019	
33	.019	.021		.018	.019	
34	.006	.006		.010	.011	
35	.006	.006		.010	.011	
36	.006	.006		.010	.011	
37	.006	.006		.010	.011	
38	.006	.006		.010	.011	
39	.006	.006		.010	.011	
40	.006	.006		.010	.011	
41	.006	.006		.005	.006	
42	.006	.007		.005	.006	
43	.006	.007		.006	.006	
44	.006	.007		.006	.006	
45	.006	.007		.006	.006	
46	.006	.007		.006	.006	
47	.006	.007		.006	.006	
48	.006	.007		.006	.006	
49	.006	.007		.006	.006	
50	.006	.007		.006	.006	

RES. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10401

DATE 10/10/05

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 HR

• TEST SPECIMEN • NOMENCLATURE

1.5 x 1 x 8 20 HP Pump

SERIAL NO.

NS 16486-25M20

MANUFACTURER

SIMS

ACCELEROMETER LOCATIONS

CH. 1 Top of Pump Housing

CH. 2

REMARKS

TEST ENGINEER

SHEET 2

NUI FORM # 46

Vibration Test Data Sheet
Figure 6

	EXPLORATORY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.021	.020		.057	.055	
5	.021	.020		.057	.054	
6	.022	.021		.057	.054	
7	.022	.021		.057	.056	
8	.022	.021		.057	.056	
9	.022	.021		.057	.056	
10	.022	.022		.057	.056	
11	.022	.022		.056	.057	
12	.022	.022		.056	.057	
13	.022	.022		.056	.057	
14	.022	.022		.056	.058	
15	.021	.022		.056	.058	
16	.021	.022		.039	.041	
17	.021	.022		.039	.041	
18	.021	.022		.039	.041	
19	.021	.022		.039	.041	
20	.021	.022		.039	.041	
21	.021	.022		.039	.041	
22	.021	.022		.039	.041	
23	.021	.022		.039	.041	
24	.021	.022		.039	.041	
25	.021	.023		.039	.041	
26	.021	.023		.020	.022	
27	.021	.023		.020	.022	
28	.021	.023		.020	.022	
29	.021	.023		.020	.022	
30	.021	.023		.020	.022	
31	.021	.023		.020	.022	
32	.021	.023		.020	.022	
33	.021	.023		.020	.022	
34	.006	.006		.009	.010	
35	.006	.006		.009	.010	
36	.006	.006		.009	.010	
37	.006	.006		.009	.010	
38	.006	.006		.009	.010	
39	.006	.006		.009	.010	
40	.006	.006		.009	.010	
41	.006	.006		.001	.001	
42	.006	.006		.001	.001	
43	.006	.006		.001	.001	
44	.006	.006		.001	.001	
45	.006	.006		.001	.001	
46	.006	.006		.001	.001	
47	.006	.006		.001	.001	
48	.006	.007		.001	.001	
49	.006	.007		.001	.001	
50	.006	.007		.001	.001	

RES. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10401

DATE 10/12/05

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 HR

• TEST SPECIMEN • NOMENCLATURE

1.5 x 1 x 8 Pump

SERIAL NO.

NS 10486-25A2C

MANUFACTURER

Sims

ACCELEROMETER LOCATIONS

CH. 1 Top of Pump Housing

CH. 2

REMARKS

TEST ENGINEER

SHEET 3

NUI FORM # 46

Vibration Test Data Sheet
Figure 7

LIST OF APPARATUS

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DATE	DUE DATE
Platform Scale	Fairbanks Morse	1124A	G-511379	9/21/05	9/21/06
Charge Amplifer	Endevco	2721B	DF08	9/21/05	9/21/06
Charge Amplifer	Endevco	2721B	DF05	9/21/05	9/21/06
Power Supply	Endevco	4222	AB89	9/21/05	9/21/06
Torque Wrench	Central Tools	96355	794037102	9/06/05	9/06/06
Accelerometer	Endevco	2221D	EY61	9/21/05	9/21/06
Pressure Gauge	Helicoid	0-1000-5	22869E	8/19/05	8/19/06
Accelerometer	Endevco	2221D	EY62	1/17/05	1/17/06
Medium Weight Shock Machine	New England Trawler	10-T-3351-C	N/A	Functional	
Torque Wrench	CDI	752MFRMH	1002602828	12/08/04	12/08/05
Vibration Machine	Unholtz-Dickie	T1000.20	357	Functional	
Vibration Machine	L.A.B.	RVH-72-5000	51401	Functional	
Vibration Controller	Data Physics	DP 560	5256	9/15/05	9/15/06
Accelerometer	Endevco	2223	CB96	9/20/05	9/20/06
Accelerometer	Endevco	2223	GA33	1/21/05	1/21/06
Charge Amplifer	Tri Tek	203M	210	8/16/05	8/16/06
Charge Amplifer	Tri Tek	203M	211	3/21/05	3/21/06
1 Hour Timer	Gra-Labs	300	300-87061543	3/21/05	3/21/06

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)

PART B. Hydraulic Tests.

Figure 1. Pump on the Test Stand.

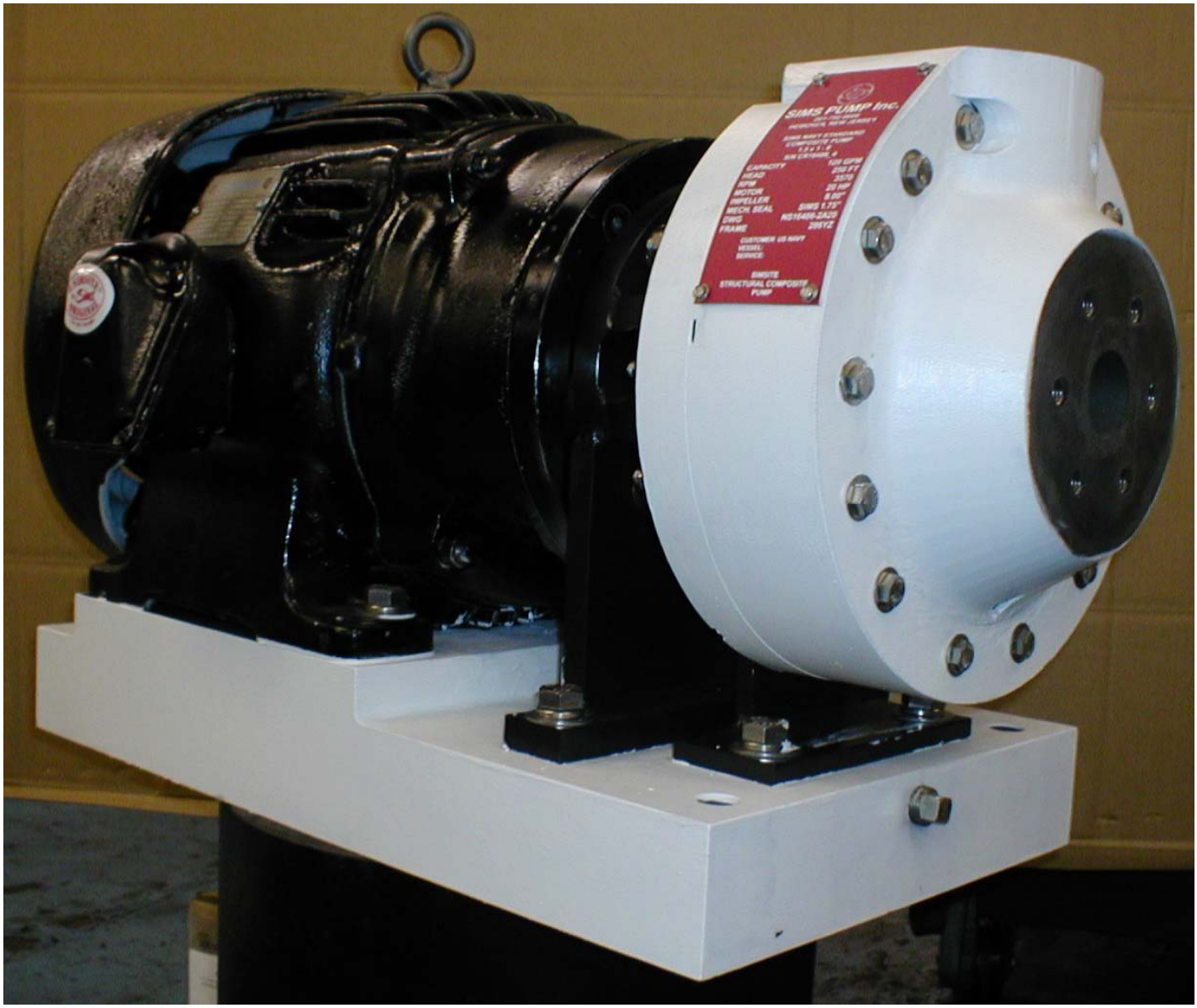


Figure 2. Pump on the Baseplate.

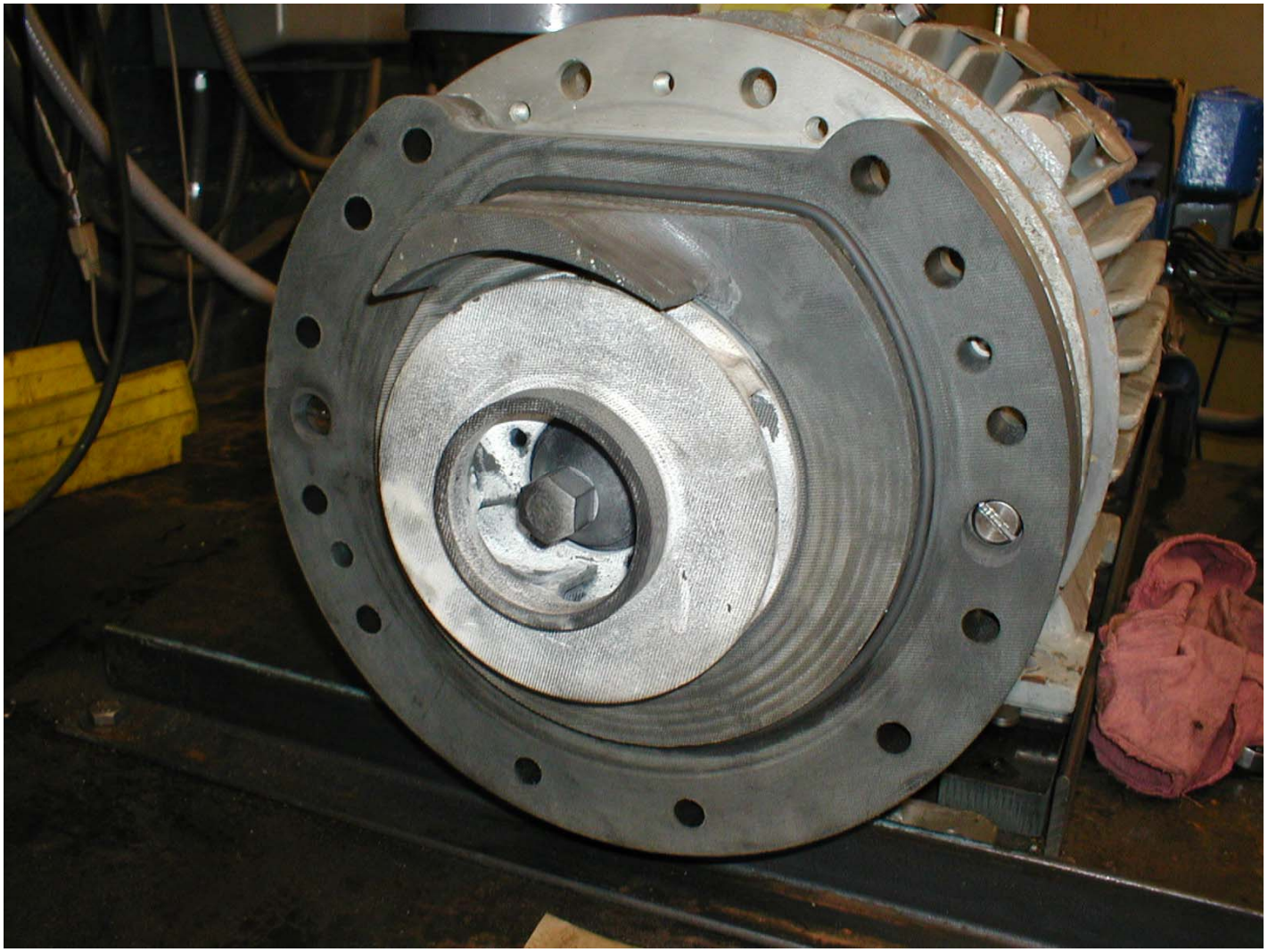


Figure 3. Post-Shock Pump inspection.

Supporting Pre-Test Data.

SIMS PUMP VALVE CO., INC.

Sims Pump **NS16486-2A20**
NAVY Standard Composite

Customer: DFAS
SIMS Order No.: CR 16486

NAVY SHOCK TEST PRETEST INSPECTION REPORT

Shock Test per U.S. Navy Mil. Spec. Mil-S-901D
Vibration Test full range (4-50 Hz.) per Mil Spec. 167 Type 1

PUMP SIZE:	1.5x1x8	IMP. DIA.:	8.00”
SERIAL NUMBER:	CR16486_1	MECH. SEAL:	SIMS ASP/1.750" BQ1VMG

MOTOR MFG.: Sterling Electric HP: 20 RPM.: 3545 FRAME: 286YZ

ENCL.: TEFC SERIAL NO.:

MOTOR: Bearing, Front 6310LL
Bearing, Back 6310LL

PICTURE TAKEN OF COMPLETE PUMP ASSEMBLY …10/18/05…….

SHAFT T.I.R. @ IMPELLER END ……under .001”…….

IMPELLER TO CASING RING CLEARANCE (Front): …….035”…….

IMPELLER TO CASING RING CLEARANCE (Back): …….028”…….

HYDROSTATIC TEST - Complete Pump - 30 Mins. @ 120 PSI

HYDRAULIC PERFORMANCE TEST - Head, Capacity, BHP …….

DATE: 01/18/05 SIGNED: VS

REMARKS:

Form: QC_PrT_11/27/03

SIMS PUMP VALVE CO., INC.

QUALITY CONTROL DEPARTMENT
HYDRO TEST REPORT Pre Test
COMPLETE PUMP WITH SEAL

PUMP NAME: NS16486-2A20 SEAL NAME: SIMS ASP/1.750" ORDER No:CR16486

WETTED END MATERIAL: Simsite 302

PRESSURE GAGE SER. No.: LOT SIZE: 1

No.	APPL. PRESSURE	TIME OF TEST	SERIAL NUMBER	LOCATION OF LEAK	TESTED BY	ACC.	REJ.	DATE
	200 psi	30 min.	CR16486_1	No leaks	VS/JW	VS		

Form: QC_HT_11-01/02

Supporting Post-Test Data.

SIMS PUMP VALVE CO., INC.

QUALITY CONTROL DEPARTMENT
HYDRO TEST REPORT Post Test
COMPLETE PUMP WITH SEAL

PUMP NAME: NS16486-2A20 SEAL NAME: SIMS ASP/1.750" ORDER No: CR16486

WETTED END MATERIAL: Simsite 302

PRESSURE GAGE SER. No.: LOT SIZE: 1

No.	APPL. PRESSURE	TIME OF TEST	SERIAL NUMBER	LOCATION OF LEAK	TESTED BY	ACC.	REJ.	DATE
	200 psi	30 min	CR16486_1	No leaks	VS/JW	VS		

Form: QC_HT_11-01/02

SIMS PUMP VALVE CO., INC.

Sims Pump NS16486-2A20
NAVY Standard Composite

Customer:
SIMS Order No.: CR16486

NAVY SHOCK
TEST
POSTTEST
INSPECTION REPORT

Shock Test per U.S. Navy Mil. Spec. Mil-S-901D
Vibration Test full range (4-50 Hz.) per Mil Spec. 167 Type 1

PUMP SIZE:	1.5x1x8	IMP. DIA.:	8.00”
SERIAL NUMBER:	CR16486-1	MECH. SEAL:	SIMS ASP/1.750" BQ1VMG

MOTOR MFG.: Sterling Electric HP: 20 RPM.: 3545 FRAME: 286YZ
ENCL.: TEFC SERIAL NO.:

MOTOR: Supplied by NAVSES Bearing, Front 6310LL
Bearing, Back 6310LL

PICTURE TAKEN OF COMPLETE PUMP ASSEMBLY …….

SHAFT T.I.R. @ IMPELLER END ……under .001”….

IMPELLER TO CASING RING CLEARANCE (Front): …….010”…….

IMPELLER TO CASING RING CLEARANCE (Back): …….021”…….

HYDROSTATIC TEST - Complete Pump - 30 Mins. @ 120 PSI

HYDRAULIC PERFORMANCE TEST - Head, Capacity, BHP …….

DATE: 12/05/05 SIGNED: VS

REMARKS:

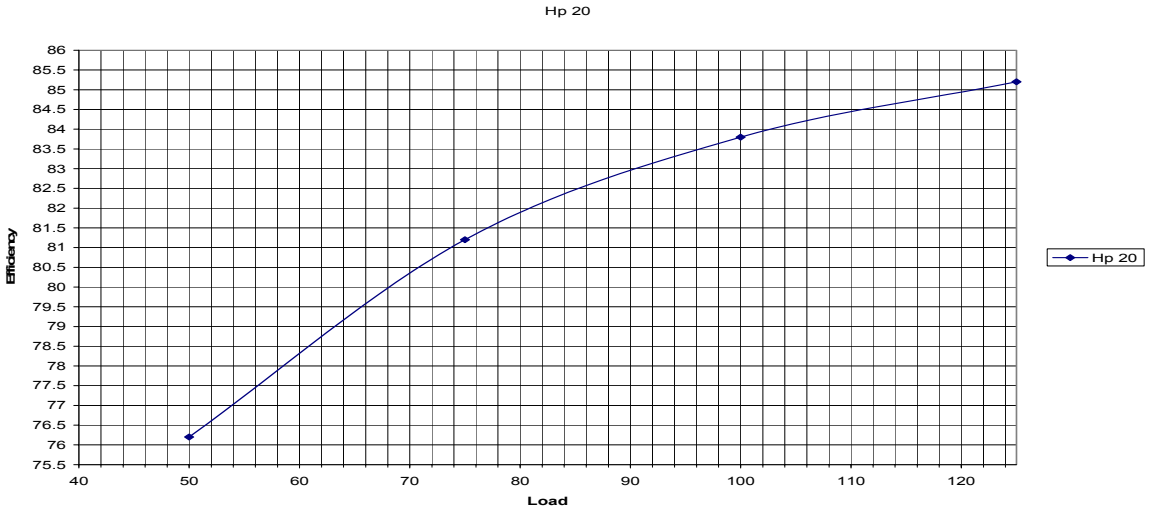
Form: QC_PoT_11/27/03

Motor Information.

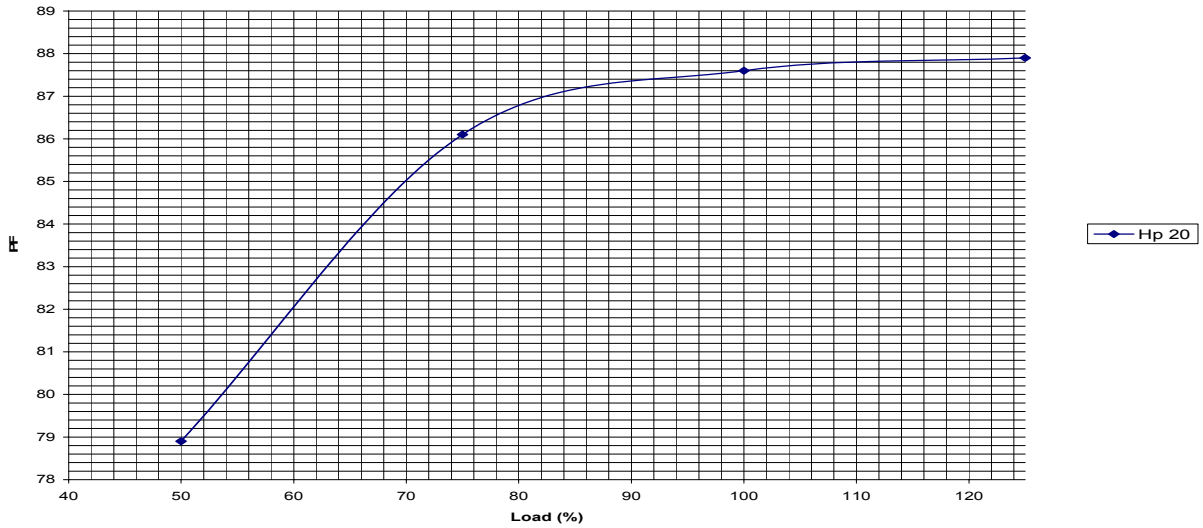
The 20 HP motor was supplied by Sterling Electric.
This motor has a ductile iron body to satisfy shock test requirements.
The motor bearings are upgraded to provide higher pump reliability.
The subject motor is rated for 3 phase 230/460 Volts power supply. The pump hydraulic testing facility is equipped with 3phase 230 Volts power. All the tests shown below were done at 238-240 Volts.
To evaluate Pump efficiency the Motor Manufacture diagrams were applied.

Supporting Data for a Electrical Motor.

Motor Efficiency vs. Load.

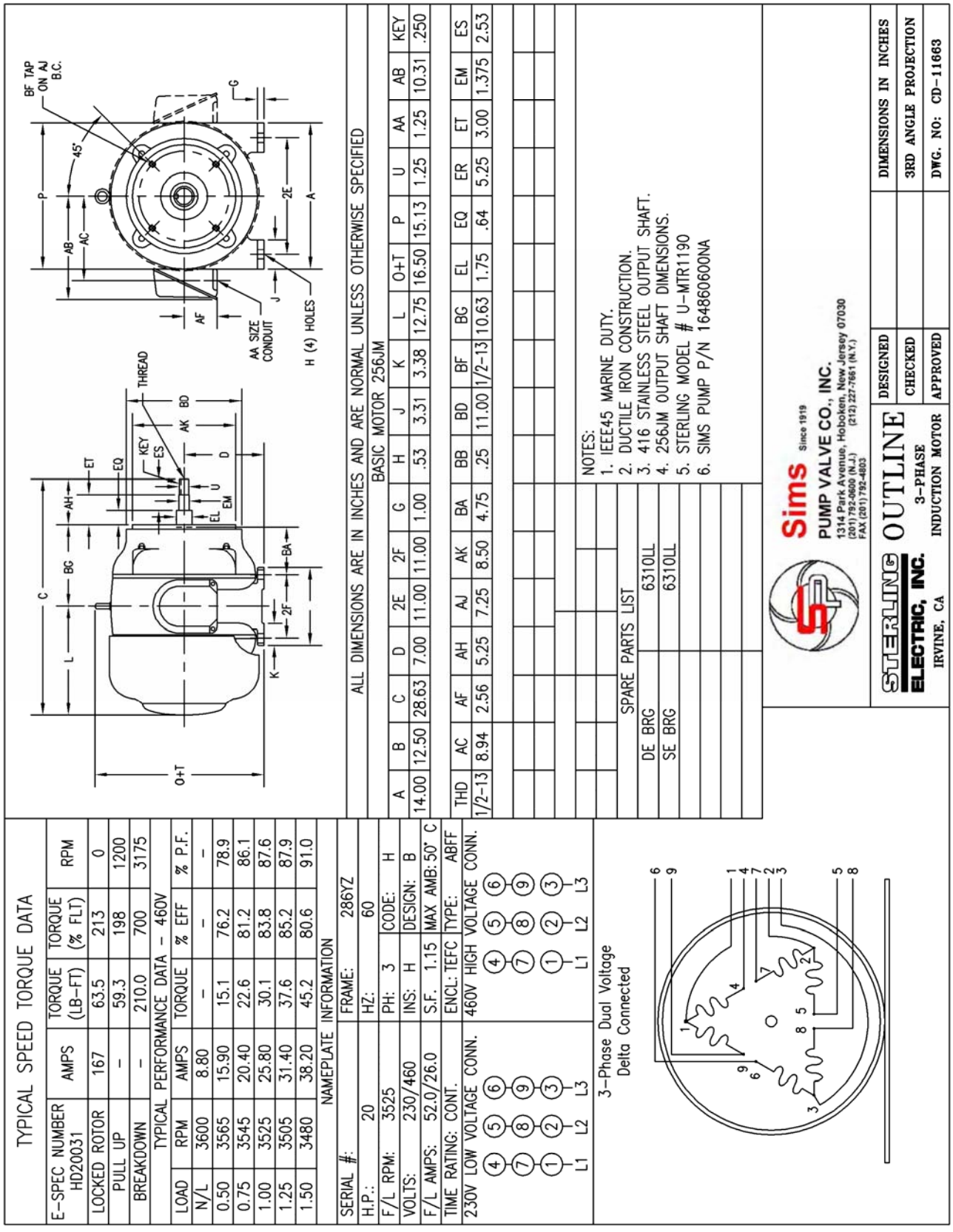


Motor Power Factor vs. Load.



AC Induction Motor Data.

18.3 Electric Motor Dimensions



SIMSITE Structural Composite Pump
NAVY Standard Composite Pump.
NS16486-2A20
1.5x1-8 20 hp 3570 rpm

General

The inspection of the subject pump was performed without incident. All tolerances were found to be within acceptable guidelines. The pump showed no visible signs of wear after Shock Test, Vibration Test and 1000 hours of performance testing.

Pump Design

The subject pump is built by SIMS Pump Co. from SIMSITE Structural Composite.
All wetted parts of the pump, except the Casing Rings and Shaft Sleeve were made from SIMSITE 302 Structural Composite. The Casing Rings and the Sleeve are made from SIMSITE 375 Structural Composite.
The Pump Baseplate is manufactured from a solid block of SIMSITE 302 Structural Composite.
The Pump is equipped with SIMSITE Mechanical Cartridge Type Seal. The Seal is specially designed for the subject pump to match the outstanding corrosion resistance of the pump.
The Seal Gland and the Sleeve are made from SIMSITE Structural Composite.

SIMSITE Structural Composite Cartridge Mechanical Seal.

The SIMSITE Structural Composite Pump is equipped with a SIMSITE Structural Composite Cartridge Mechanical Seal.
The SIMSITE Cartridge Mechanical Seal provides the following benefits when compared with standard spring loaded seals:

1. The Cartridge Seal is more reliable.
2. The Cartridge Seal is easier to install and maintain.
3. The Cartridge Seal can be inspected with out pump disassembly.
4. SIMSITE Cartridge Seals are self aligning on the shaft, and therefore do not require installation fixtures.
5. The Seal Gland and Sleeve components are made from SIMSITE Structural Composite and therefore will not corrode in seawater.

SIMSITE Structural Composite Cartridge Mechanical Seal, offers superior design and performance when compared with a standard spring loaded seal.

Pump Hydraulic Performance.

The subject Pump has a Best Efficiency Point 120 GPM - 250 FT at 3570 RPM.

The hydraulic performance test data indicates that the total dynamic head is slightly higher after 500 hours of post shock performance testing. This probably attributed to a slight Closing of the Clearance between the Impeller and Casing Rings at the end of the testing period.

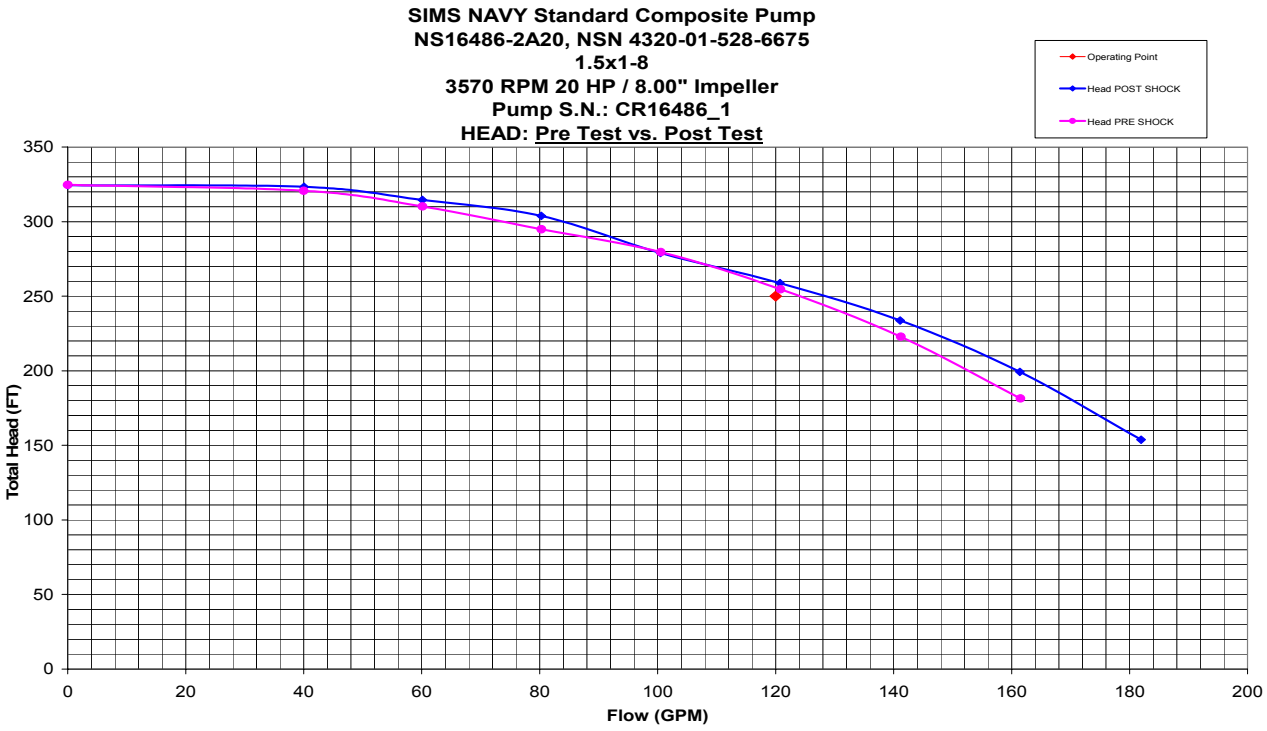
The SIMS Standard NAVY Composite Pump is a Close Coupled design.

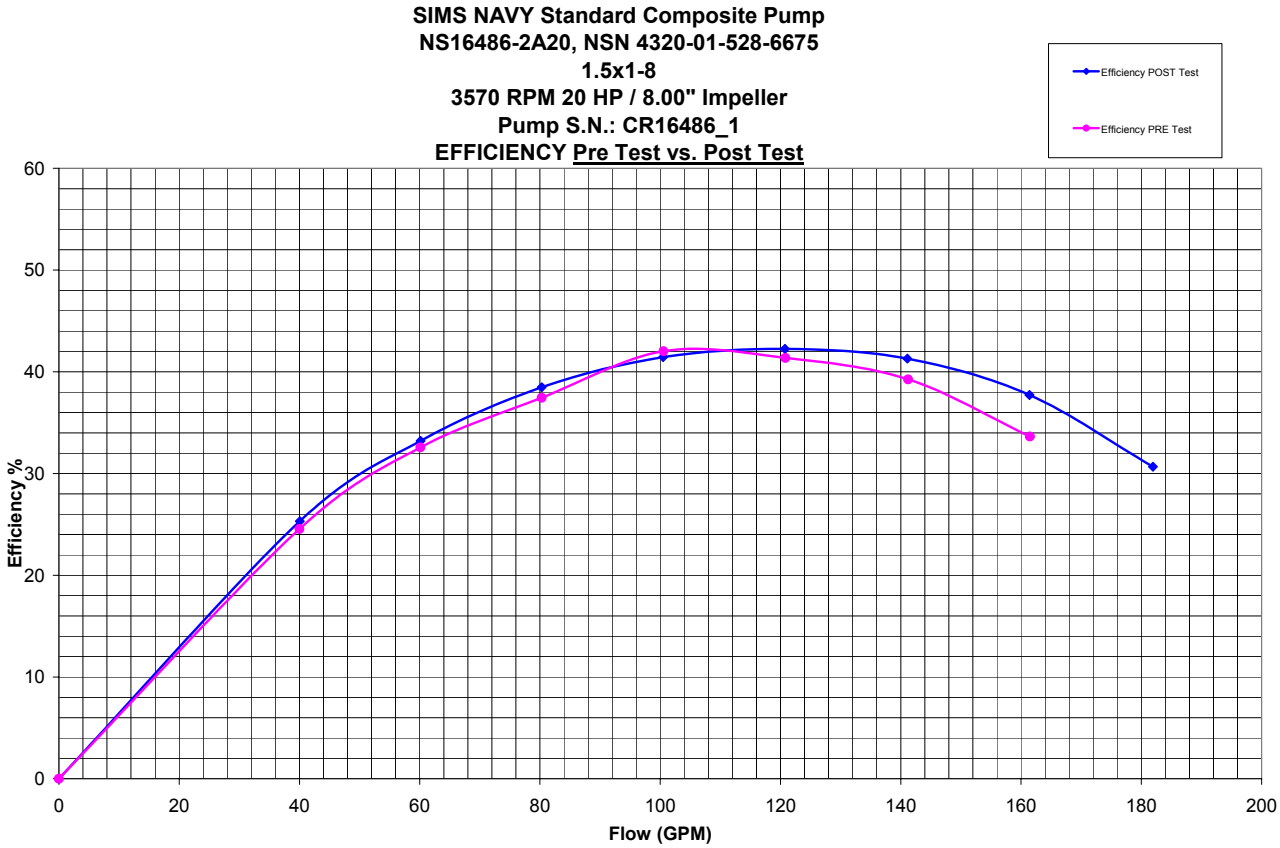
Test Horsepower was calculated using the following formula:

Horsepower = (.732/.746) x Volts x Amps x Efficiency x Power Factor,

Where Efficiency is a Motor Efficiency and is taken from a "Motor Efficiency vs. Load" diagram.
Power Factor is a Motor Power Factor and was measured during tests.

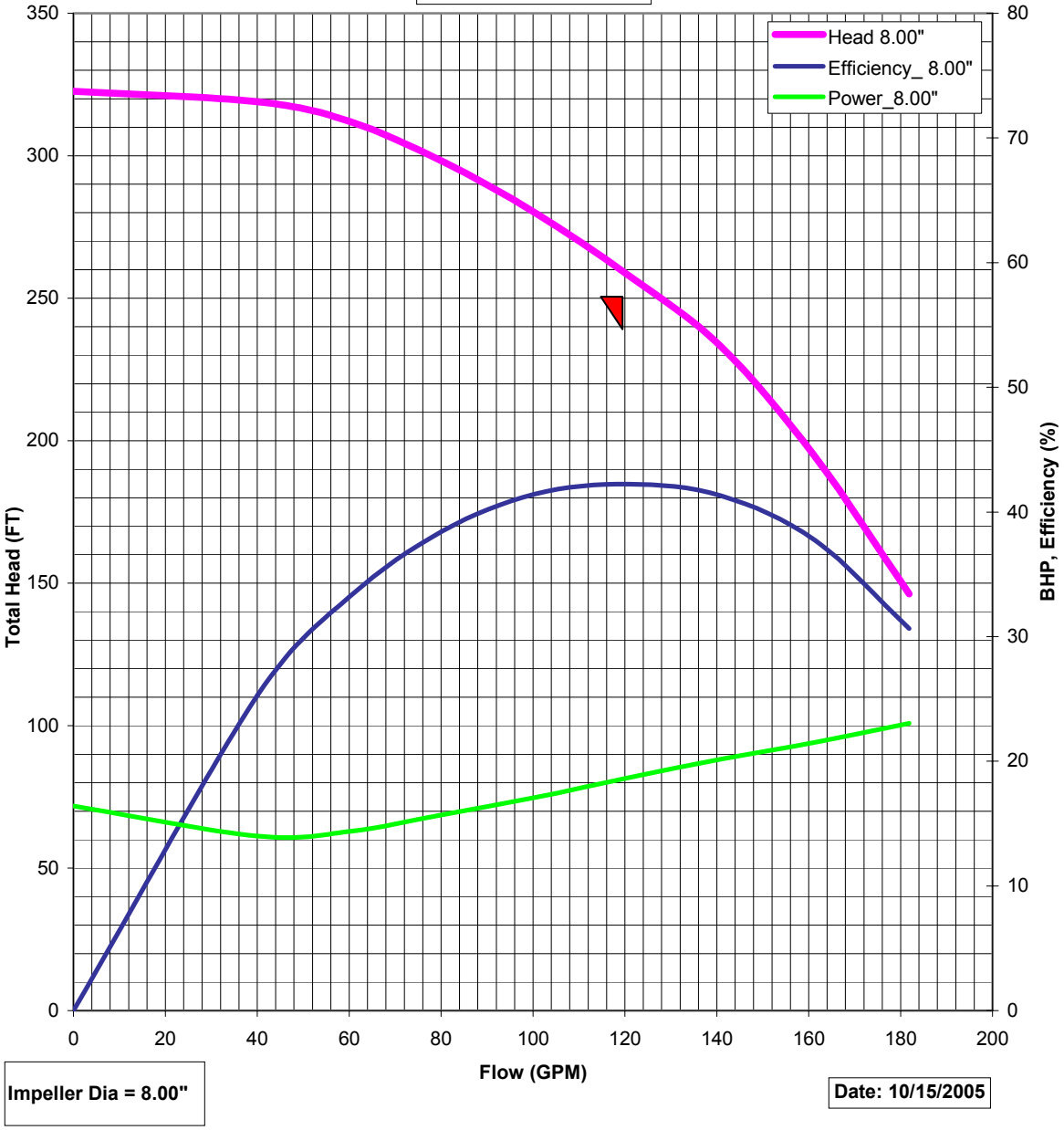
Pre-Test vs. Post Test Results





16. Performance Curve

SIMS NAVY Composite Pump
PUMP# NS16486-2A20
SIZE:1.5x1x8-2A20
NSN 4320-01-528-6675
3570 RPM 20 Hp Motor



Part List.

Part List N16486-2A20

Item	Q'ty	Description	Part Number	Material Code	
1	1	Casing	164860101NS	SMS 302	
2	1	Casing Ring	164860102NS	SMS 375	
3	1	Impeller	164860300NS	SMS 302	
4	1	Casing Cover	164860401NS	SMS 302	
5	1	Key, Sleeve	164860701NM	SMS1	
6	1	Electric Motor	164860600NA	SMSA	
7	1	Shaft Sleeve	164860700NS	SMS 375	
8	1	Cartridge Seal	164860800NA	SMSA	
9	1	Frame Adapter	164860900NM	SMS1T	
10	1	Wearing Ring	164860406NS	SMS 375	
11	1	Base Plate	164861100NS	SMS302	
12	4	Screw	164860114NN	SMSN	
14	1	Impeller Nut	164861401NS	SMS375	
15	12	Hex Head Bolt	164860103NM	SMS1	
16	24	Flat Washer	164860104NM	SMS1	
17	4	Hex Head Bolt	164860602NM	SMS1	
18	12	Lock Washer	164860105NM	SMS1	
19	4	Stud	164860802NM	SMS1	
20	2	Hex Head Bolt	164860106NM	SMS1	
21	2	Hex Head Bolt	164860902NM	SMS1	
22	1	O-Ring, Casing Cover	164860404NR	SMSB	
23	1	O-Ring, Sleeve	164860702NR	SMSB	
26	1	Key, Impeller	164860399NM	SMS1	
27	1	Casing Support	164860107NM	SMS1T	
29	1	O-Ring, Impeller	164861402NR	SMSB	
30	2	Nut	164860109NM	SMS1	
31	2	Lock Washer	164860110NM	SMS1	
32	2	Lock Washer	164861103NM	SMS1	
33	2	Flat Washer	164861104NM	SMS1	
34	2	Hex Head Bolt	164861105NM	SMS1	
38	2	Jacking Bolt	164860905NM	SMS1T	
39	1	Stud, Shaft	164860605NM	SMS1	
40	12	Nut	164860115NM	SMS1	
42	1	Plug, Drain	164860111NM	SMS1T	
43	1	O-Ring, Drain Plug	164860116NR	SMSB	
44	1	O-Ring, Vent Plug	164860117NR	SMSB	
45	1	Plug, Vent	164860113NM	SMS1T	
46	4	Hex Head Bolt	164861106NM	SMS1	
47	4	Lock Washer	164861107NM	SMS1	
48	4	Flat Washer	164861108NM	SMS1	
49	4	Lock Washer	164860603NM	SMS1	
50	4	Flat Washer	164860604NM	SMS1	
51	4	Flat Washer	164860803NM	SMS1	
53	2	Flat Washer	164860903NM	SMS1	
54	2	Lock Washer	164860904NM	SMS1	
61	1	Bearing, Motor (D.E.)	164860601NA	SMSA	
62	1	Bearing, Motor (O.D.E.)	164860602NA	SMSA	
74	4	Nut	164860804NM	SMS1	
75	4	Flat Washer	164860118NM	SMS1	
76	4	Flat Washer	164860119NP	SMSP	
77	1	Snap Ring	164860302NS	SMS 375	
78	1	Spiraltrac	164860407NT	SMSV	
79	1	Snap Ring, Spiraltrac	164860408NS	SMS 375	
80	1	Plug, Seal Cartridge	164860801NM	SMS1T	
81	4	Studs, Discharge	164860120NM	SMS1	
82	6	Studs, Suction	164860121NM	SMS1	
	1	Cartridge Seal Kit	164860001NA	SMSA	
	1	Impeller/Wear Ring Kit	164860002NA	SMSA	
	1	Complete Pump w/ Motor	NS16486-2A20	SMSA	

14. Cross Section (Detail)