

SURFACE VEHICLE RECOMMENDED PRACTICE

J577™

SEP2015

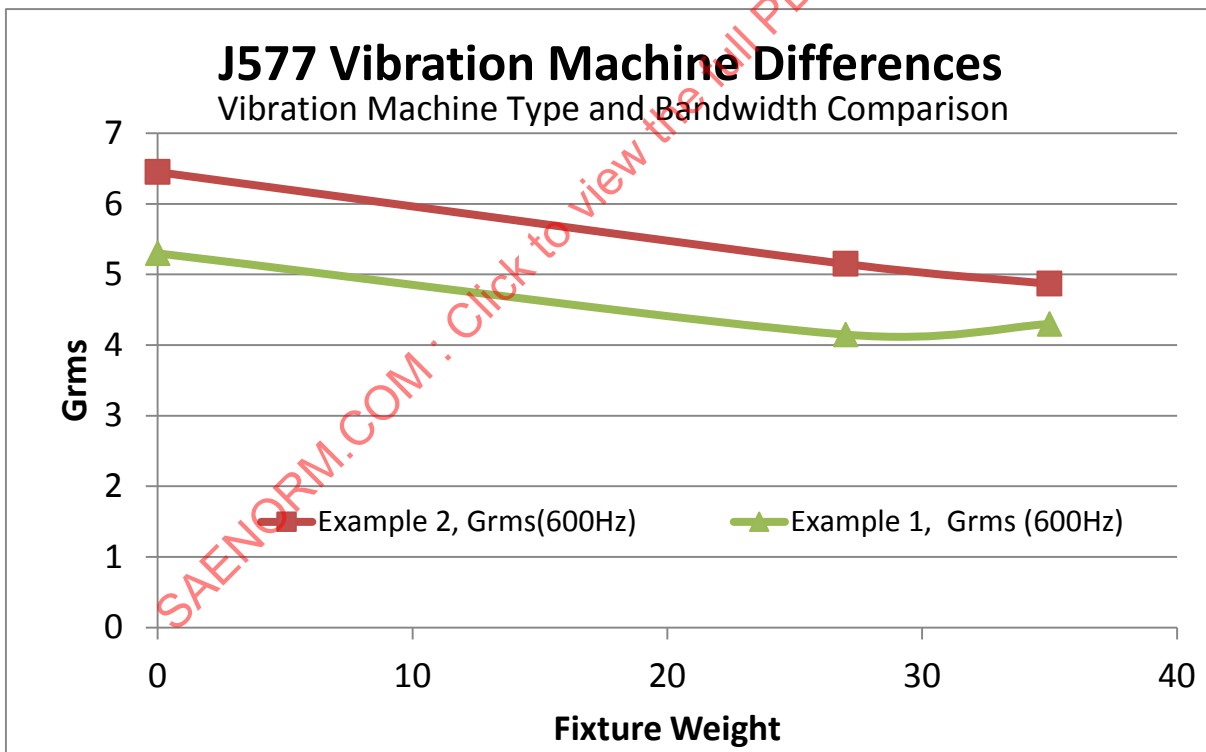
Issued 1940-01
Reaffirmed 2011-06
Revised 2015-09

Superseding J577 JUL2005

(R) Vibration Test Machine and Operation Procedure

RATIONALE

Vibration machine is designed to simulate worst case road inputs to lamps. The 2005 version of SAE J577 documented a FMVSS compatible machine that could be suitable to qualify lamps. All lamps must also pass the FMVSS requirement but technology advancements and styling progression has resulted in large lamps being used on vehicles. The larger lamp with fixture cannot be contained within the platform on the SAE J577 2005 version (Example 1). Pre re-write FMVSS requires that the fixture does not overhang the vibration machine adapter plate, which cannot be done with large lamps and the current SAE J577 machine. To update SAE J577, an example of larger vibration machine (Example 2) is given in this standard and a minimum Grms value is added to validate machine performance. The Grms value sets the minimum performance of any size vibration machine. Enlarging the vibration machine is limited by the FMVSS requirement that during calibration a force gauge must measure between 60 -70 pounds when lifting the platform over the hammer and anvil area of the machine.



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1. SCOPE

This SAE Recommended Practice provides procedures, and information to conduct vibration (impact) tests on lighting devices and their components as well as other safety equipment used on vehicles.

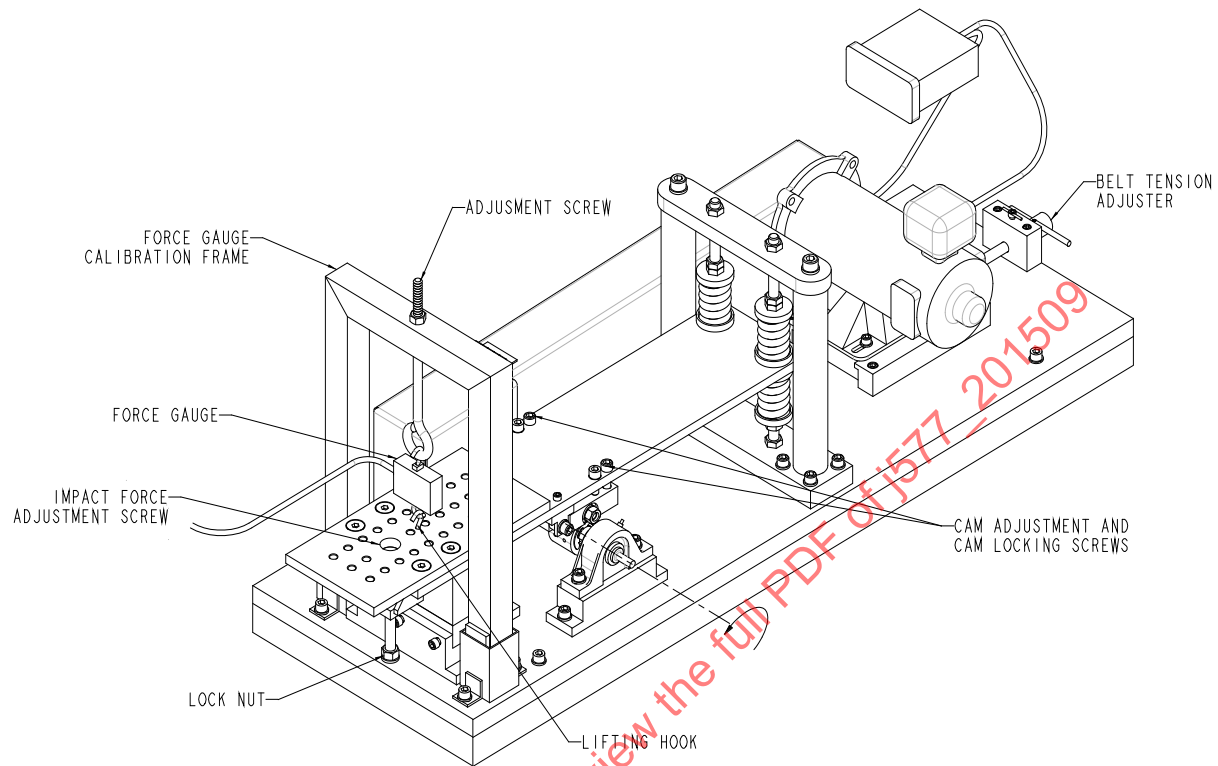


Figure 1 - Example 1 vibration test machine



Figure 2 - Example 2 vibration test machine

2. REFERENCES

2.1 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

- | | |
|------------|---|
| SAE J575 | Tests for Motor Vehicle Lighting Devices and Components |
| SAE J2139 | Tests for Lighting Devices, Reflective Devices and Components Used on Vehicles 2032 mm or more in Overall Width |
| SAE 861957 | Headlight Vibration Testing for Heavy Duty Trucks |
| SAE 840501 | Automotive Component Vibration: A Practical Approach to Accelerated Vibration Durability Testing |
| SAE 790747 | Vibration Test for Motor Vehicle Lighting Devices and Components |

2.1.2 FMVSS Publications

Available from the National Highway Traffic Safety Administration, 400 Seventh SW, Washington, DC 20024-0002.

- | | |
|-----------|--|
| FMVSS-108 | Lamps Reflective Devices, And Associated Equipment (Available as 49 CFR 571.108) |
|-----------|--|

2.2 Other Publications

U.S. Department of Agriculture General Technical Report FPL 22—An Assessment of the Common Carrier Shipping Environment

3. DEFINITIONS

3.1 ANVIL

The member located at the front of the machine on the lower base plate, that is struck by the hammer when the top plate is falling.

3.2 CAM FOLLOWER

A mechanism that contains a roller(s) that comes in contact with the cam(s) surface and thereby reduces the friction and wear on the cam by rotating rather than rubbing.

3.3 HAMMER

The member located at the front of the machine on the upper plate, that strikes the anvil when the top plate is falling.

3.4 VIBRATION TEST FIXTURE

A fixture specifically designed to support the device under test in its designed operating position during the vibration test. Size of fixture should not overhang the base plate of the vibration machine. Fixture overhang may result in excessive vibration force and a false failure.

4. LIGHTING IDENTIFICATION CODE

Not applicable.

5. TESTS

5.1 Calibration Equipment and Instrumentation

Equipment listed is a guide for standardization only. Equivalent instrumentation equipment is available, however test results should be checked for accuracy

5.1.1 Force Gage

5.1.1.1 Force/Torque Indicator with 50 x 0.02 kgf Capacity, 500 x 0.2 N, accuracy $\pm 0.2\%$ of full scale ± 1 digit.

5.1.1.2 Force Sensor with 50 x 0.02 kgf Capacity, accuracy $\pm 0.15\%$ of full scale ± 1 digit.

5.1.2 Go-No-Go Gages

5.1.2.1 Gage specified in Figures 3, below should be used to set the machine up and for recalibration.

5.2 Vibration Test

This test evaluates the ability of a device to resist damage from vibration-induced (impact-induced) stresses.

5.3 Vibration Test Procedures

5.3.1 A sample of the device, mounted in the specified vibration test fixture shall be bolted to the anvil end of the table on the vibration test machine and vibrated at $12.5 \pm .17$ Hz (750 ± 10 cpm) through a vertical distance of $3.2 \text{ mm} \pm .25$ mm. The table shall be spring mounted at one end and fitted with a steel hammer on the underside of the other end. The hammer shall contact the steel anvil once during each cycle at the completion of the fall. The impact force shall be $290 \text{ N} \pm 20 \text{ N}$ as measured with a force gauge above the anvil.

6. VIBRATION MACHINE REQUIREMENTS

The vibration system shall consist of a vibration machine and the mounting base. For large lamps and fixtures a large machine should be used to prevent the fixture from overhanging the mounting base.

NOTE: Deviation from the specifications as listed could compromise the performance of the vibration test.

6.1 A mounting base for the vibration machine should meet the specifications in drawing 230050, which can be found in the appendix of this document.

6.2 The designed machine mounting plate size for Example 1 machine is recommended to be 152.4mm x 304.8mm and 12.7mm thick. Example 2 machine shows a usable mounting plate size of 457.2mm x 660.4mm and 9.5mm thick. Any mounting plate size can be used as long as it meets the Grms energy requirement and upward force requirement. Machine mounting plate material shall be steel and be sufficiently thick to prevent flexure during the impact cycle..

- The raising and dropping of the fixture shall be accomplished with use a CAM. Dimensions of the cam are shown in Figure 4.
- Impact vibration energy is imparted to the DUT when the Hammer (located on the moving base plate) is accelerated downward and contacts the stationary Anvil.
- Motion of vibration machine is intended to be Z axis only. A mechanism, such as V block or roller bearing, shall be used to restrict motion side to side.
- Vibration machine shall use spring(s) at front and rear or midsection of the machine to set gap, levelness, and impact force.

- e. Force to lift the table at the anvil must be $290\text{N} \pm 20\text{N}$ as measured with a force gauge.
- f. Resultant energy imparted to the DUT shall be a minimum of 4.0 Grms as measured with a 200G accelerometer with a signal processing bandwidth of 600Hz.
- g. An electronic motor controller shall be used to provide accurate frequency control for the impact cycle. ($12.5\text{Hz} \pm 0.17\text{Hz}$)
- h. Fixtures mounted on the vibration machine should not be larger than the mounting plate and not weight in excess of 27 kg.
- i. The mounting base should be equipped with vibration isolation feet to reduce the coupling of vibration energy into the floor.

7. MACHINE SET-UP AND CALIBRATION

7.1 The vibration isolator system on the mounting base should be pressurized to a minimum of 275.6 kPa

7.2 Rear Spring Set-Up - Displacement is adjusted by changing the tension of the rear springs (opposite the anvil). Be sure to verify the base plate is level when adjusting the rear springs

7.3 Calibration Procedure

7.3.1 Cam Set-Up

7.3.1.1 Care should be taken to assemble the cams on the machine correctly. When viewing the cams from the pulley side of the machine, the cams should rotate clockwise.

7.3.1.2 Manually rotate the cams to Top-Dead-Center (TDC). This will provide the largest gap between the hammer and anvil.

7.3.1.3 Check the gap using the "GO-NO-GO" gage in Figure 3. Adjust the cantilevered cam followers until the "GO" portion of the gage fits between the hammer and anvil.

7.3.2 Spring Force Calibration

7.3.2.1 Rotate the cam from TDC backwards until the highest point on the cam stops at the cam follower. This is the lowest point on the cam and the hammer should be touching the anvil.

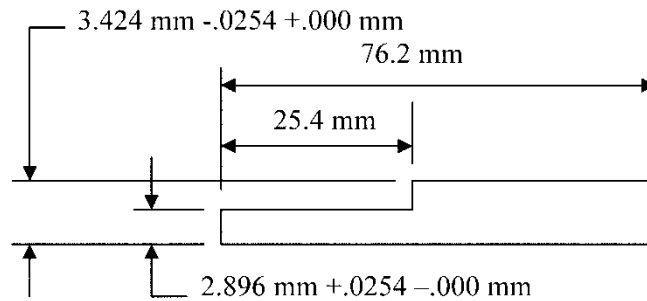
7.3.2.2 Place the calibration frame (Π shaped) in the receptacles as shown in Figure 1 and Figure 2.,. Install the lifting hook in the accelerometer-mounting hole in the fixture mounting plate directly over the center of the anvil.

7.3.2.3 Attach the force gage specified to the calibration frame and attach it to the hook installed on the fixture plate. Tighten the screw on top of the calibration frame until the gap between the hammer and anvil fits the "GO-NO-GO" gage in Figure 3.

7.3.2.4 Adjust the front spring(s) until the calibration gage indicates $290\text{ N} \pm 20\text{ N}$

8. TEST FIXTURE DESIGN

- 8.1 The weight of the DUT and the fixture shall be a maximum of 27.0 kg. The center of gravity of the fixture and the DUT should be centered as near as practicable over the anvil.



Recommended width of the gage is 25.4 mm.

Figure 3 - Gap gage

9. GUIDELINES

9.1 Preventive Maintenance and Re-calibration

- 9.1.1 Calibration of the machine should be checked after 150 hours of tests or per the companies re-calibration schedule, whichever ever is less. Repair or replacement of worn machine components requires recalibration.
- 9.1.2 The machine should be inspected before and after each test to see if there is any wear appearing on the components and that all of the springs are functioning properly.
- 9.1.3 The machine should be lubricated on a quarterly basis or per the companies preventive maintenance schedule, whichever ever is less.

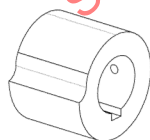
10. NOTES

10.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY THE SAE TEST METHODS AND EQUIPMENT STANDARDS COMMITTEE

251942-TT



4X DRILL & TAP FOR #10-24 UNC W/
0.031 DEEP X 90° COUNTERSINK

CAM
251942-41

(7) UNLESS OTHERWISE SPECIFIED)

SEE 251942-01 SH.T. FOR BILL OF MATERIALS
SEE 251942-01 SH.T. FOR ASSEMBLY
SEE 251942-01 SH.T. FOR ASSEMBLY
SEE 251942-01 SH.T. FOR SECTION 1, FRONT VIEW
SEE 251942-VI SH.T. FOR SECTION 1, LATERAL VIEW
SEE 251942-UV FOR VIEWS
SEE 251942-WV FOR WELDS
SEE 251942-WW FOR PARTS
SEE 251942-XX FOR PARTS
SEE 251942-YX FOR PARTS
SEE 251942-ZZ FOR PARTS

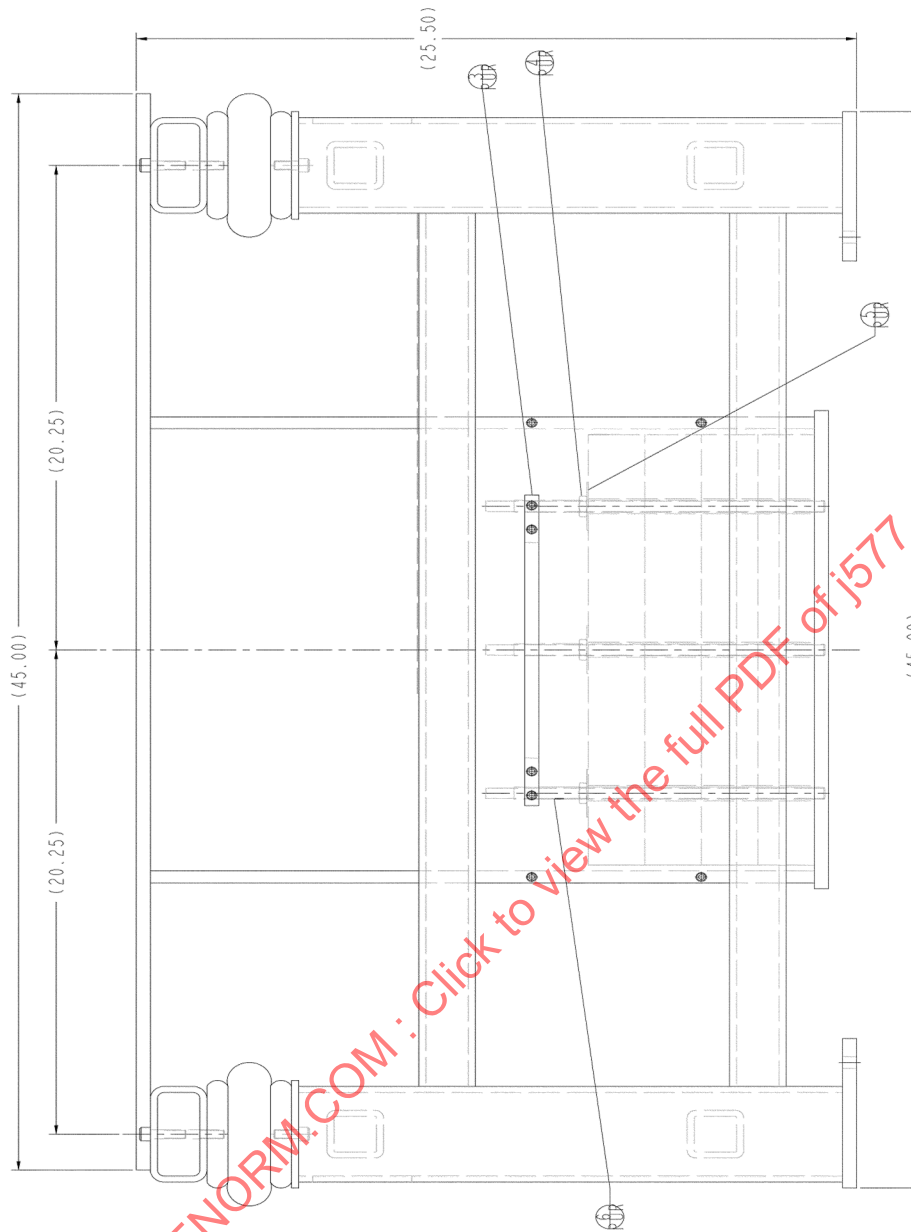
Figure 4 - CAM details

APPENDIX A

A.1 MOUNTING BASE MACHINE DRAWINGS

Table 1 - Mounting base bill of material

ITEM	ASY SHT	DTL SHT	QTY	MATERIAL	FINISH SIZE OR NAME
1	2		1	PUR	CARR LANE, SWING BOLT #CL-2-SB
2	2		4	PUR	FIRESTONE, AIRMOUNTS STYLE #16
3	2		1	PUR	McMASTER-CARR, DRAWER & DOOR PULLS #187A64
4	2		3	PUR	McMASTER-CARR, HEX THIN (JAM) NUT #91847A520
5	2		3	PUR	McMASTER-CARR, LARGE O.D. FLAT WASHER #91090A118
6	2		3	PUR & ALT	McMASTER-CARR, THREADED ROD #98847A033
7	3	5	1	WELDMENT	BASE WELDMENT ASEMBLY
8	3	6	1	WELDMENT	MOUNTING PLATE SUB-ASSEMBLY
9	3	7	2	STEEL TUBE	MOUNTING PLATE CROSSMEMBER
10	3	8	1	1018	WEIGHT RACK COVER
11	3	9	4	1018	WEIGHT
					23050-01

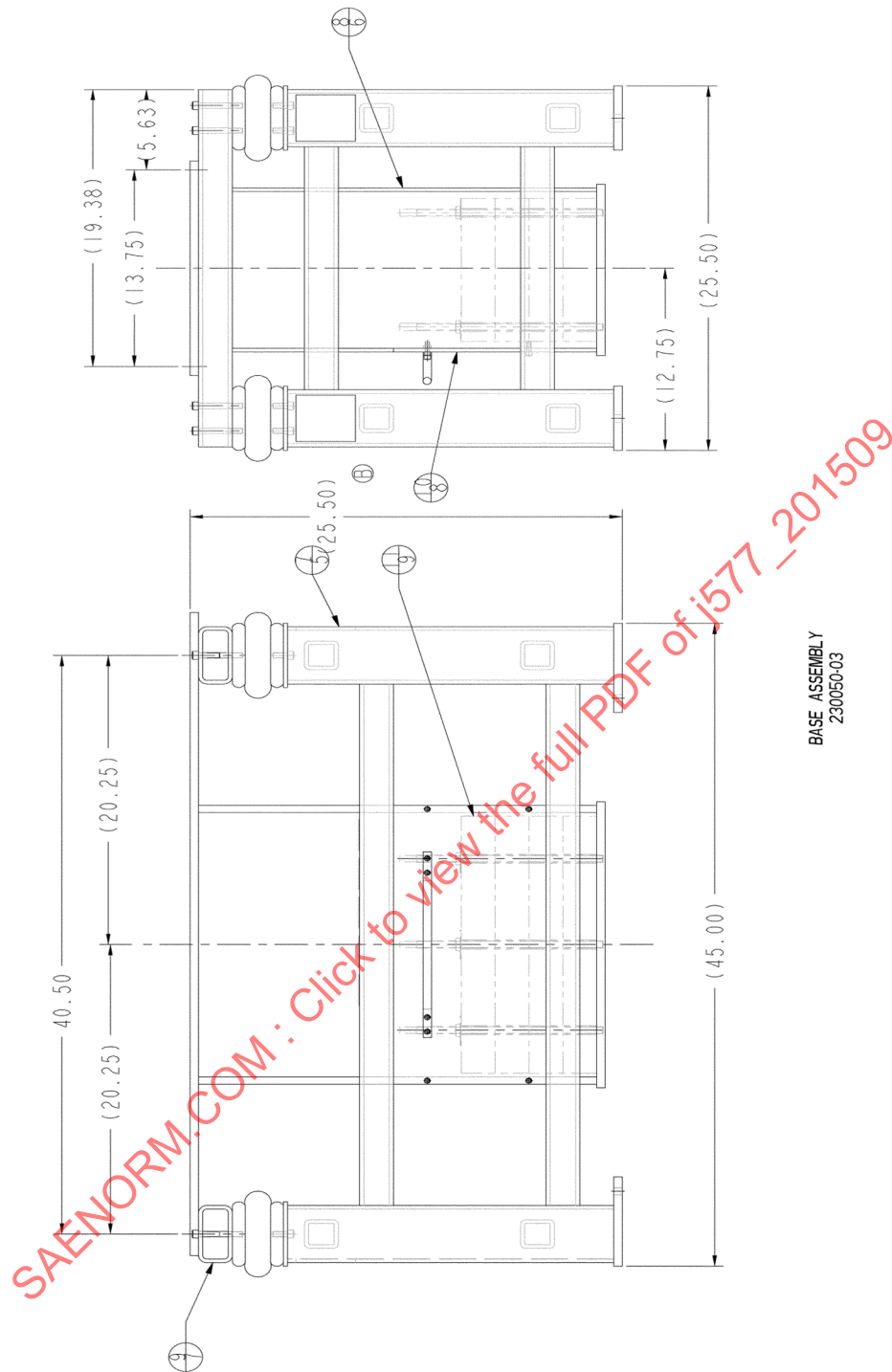


Mounting base assembly

BASE ASSEMBLY
230050-02

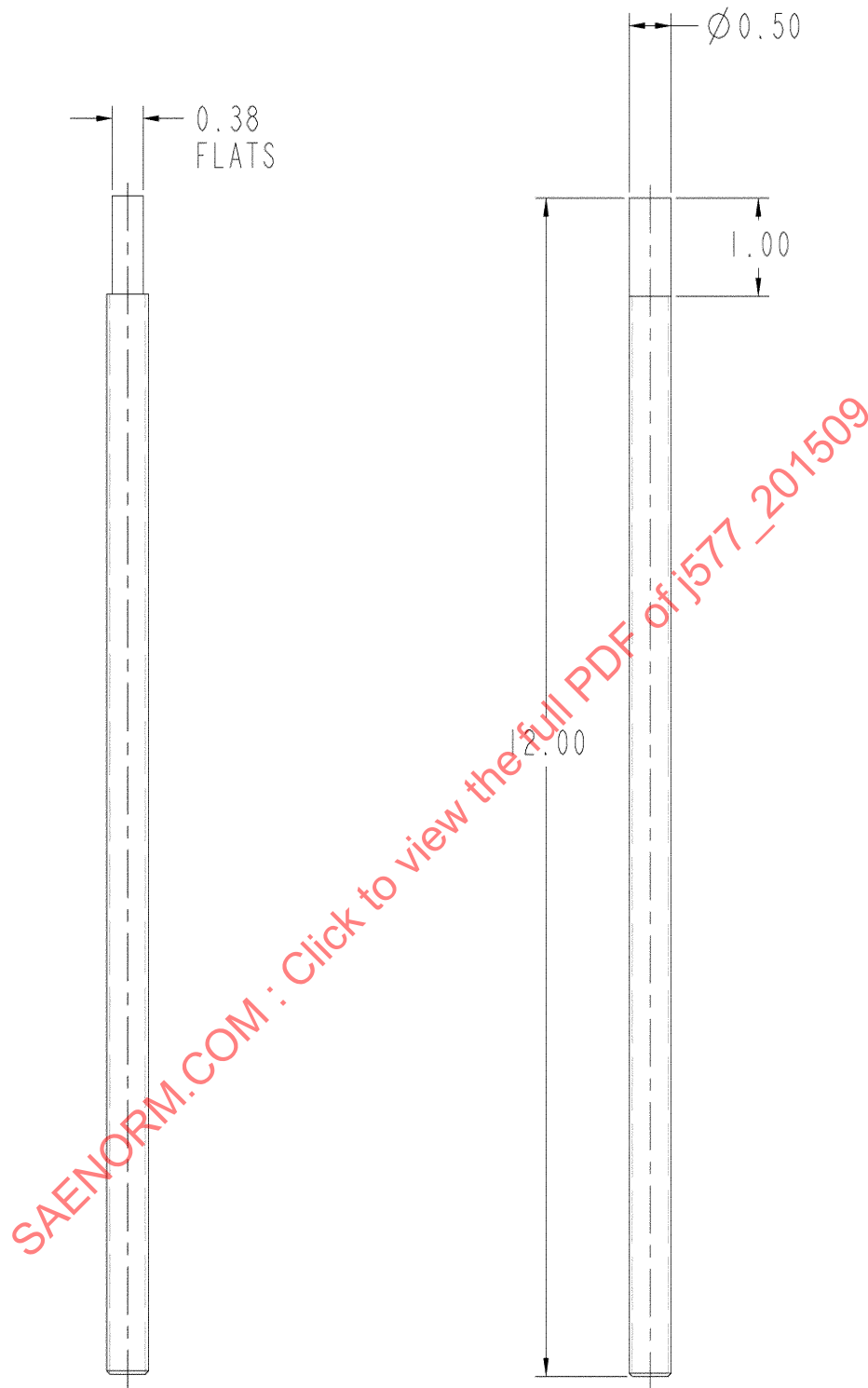
Ⓢ NOTES:

- 1) IT IS RECOMMENDED THAT THE FIRESTONE VIBRATION ISOLATORS BE INTERCONNECTED WITH EACH OTHER USING 1/4" TUBING.
- 2) THE SYSTEM SHOULD INCLUDE AN AIR INLET VALVE TO PRESSURIZE THE SYSTEM.



BASE ASSEMBLY
230050-03

Mounting base assembly



THREADED ROD

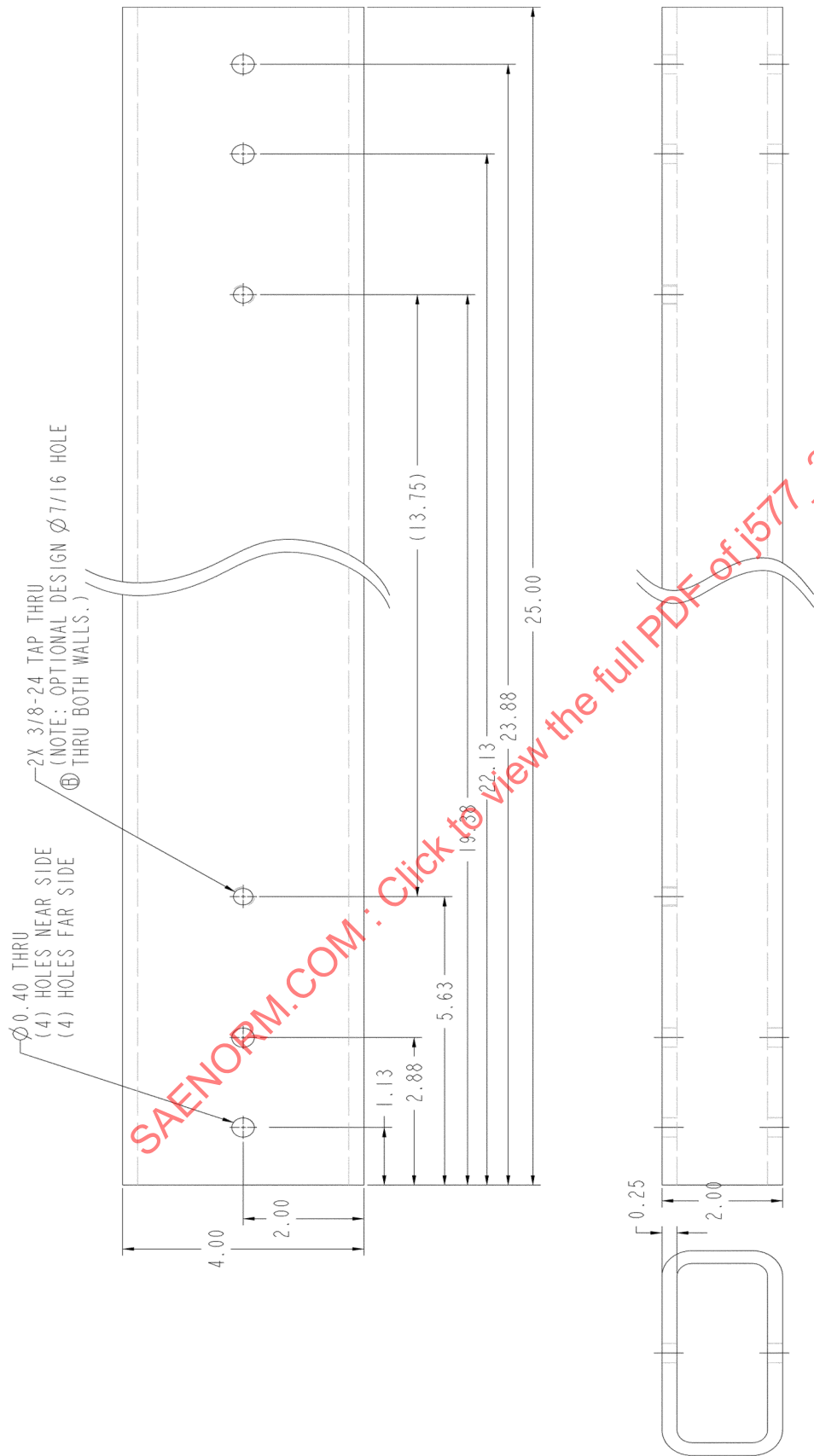
230050-04

(3) REQ'D ~PUR

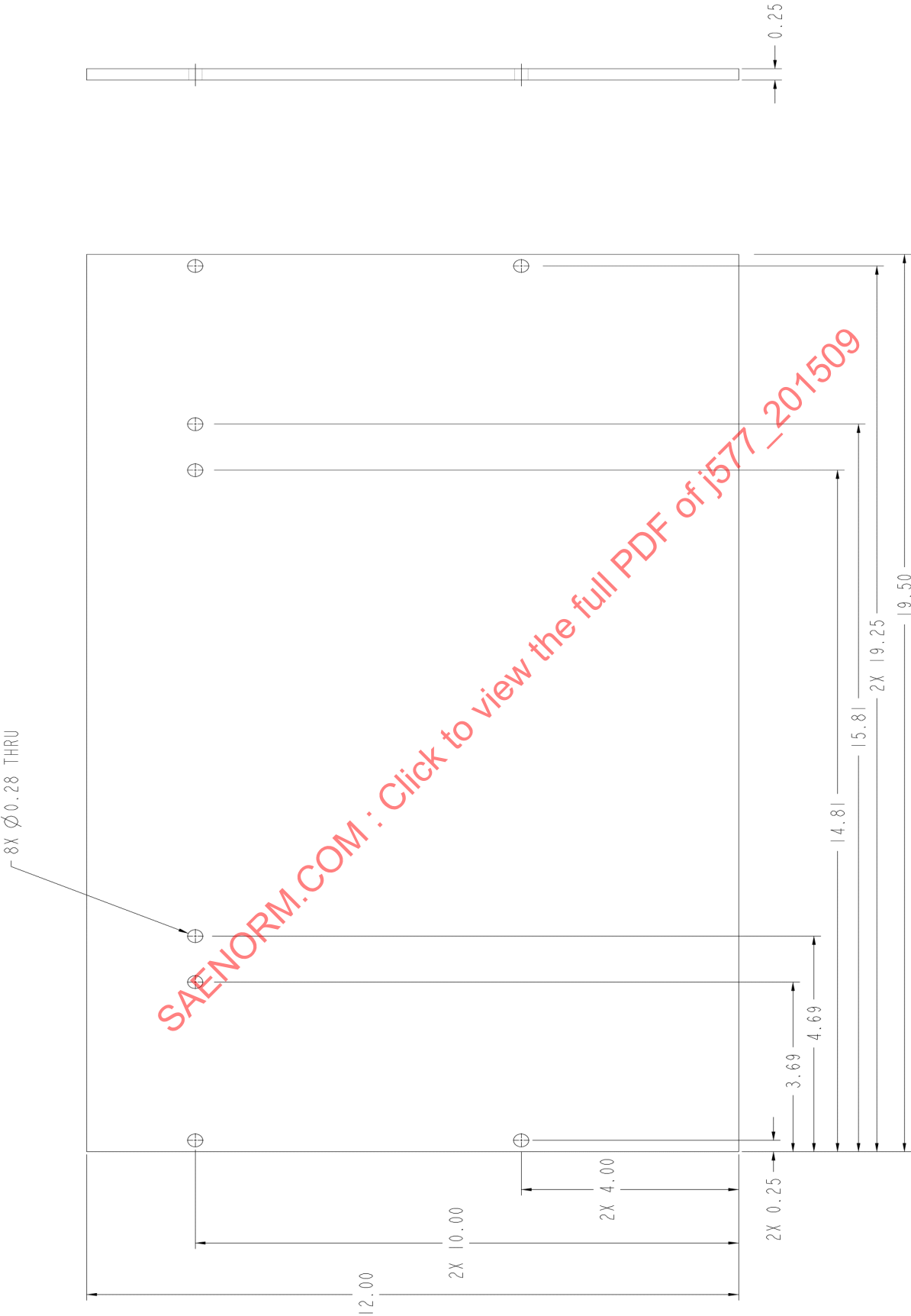
CARR LANE, THREADED ROD #98847A033

Rod weight clamp



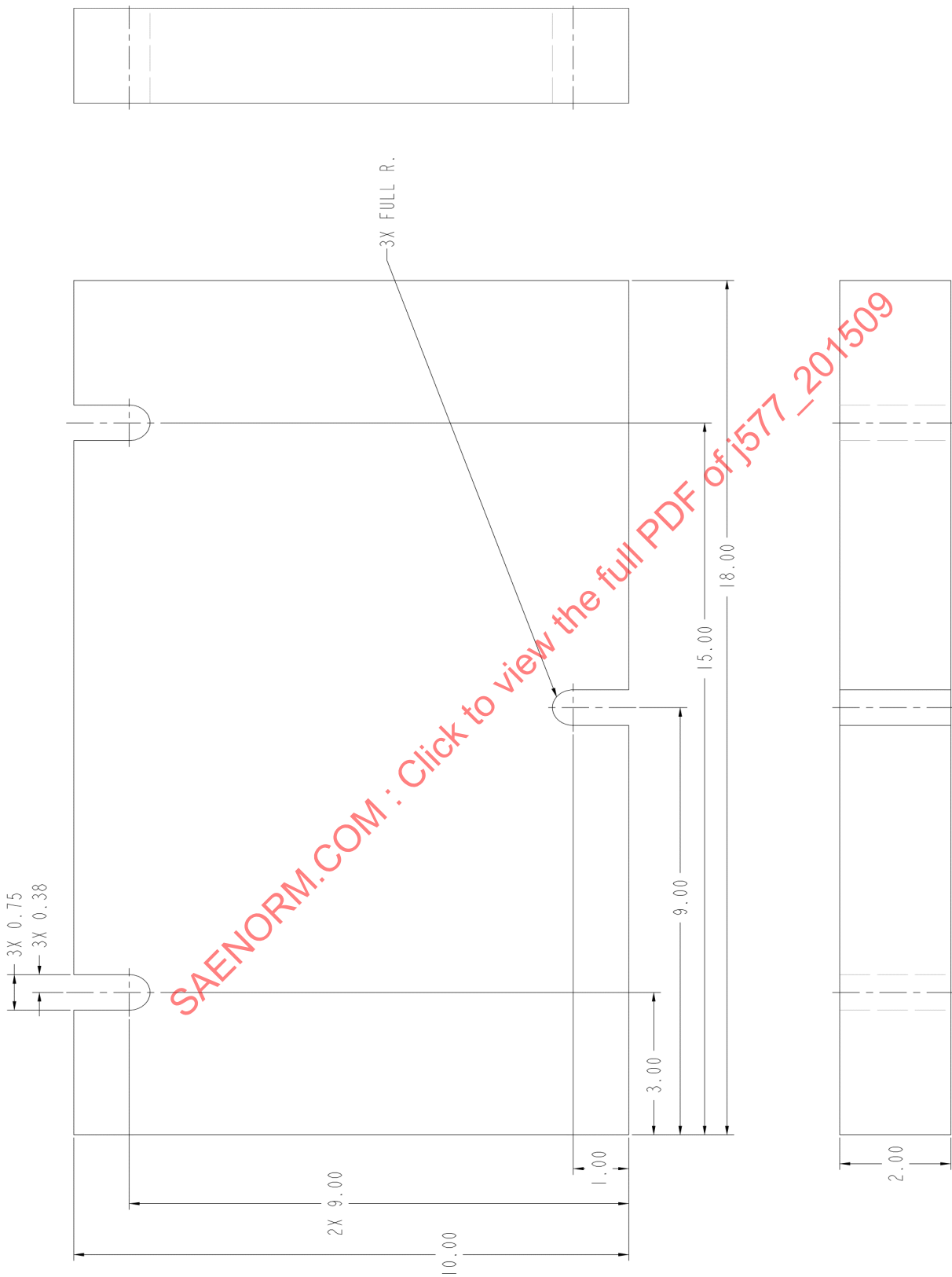


Mounting base crossmember



WEIGHT RACK COVER
230050-08
(1) REV B - 1018

Weight rack cover



WEIGHT
230050-09
(4) REV'D - 1018

Weight

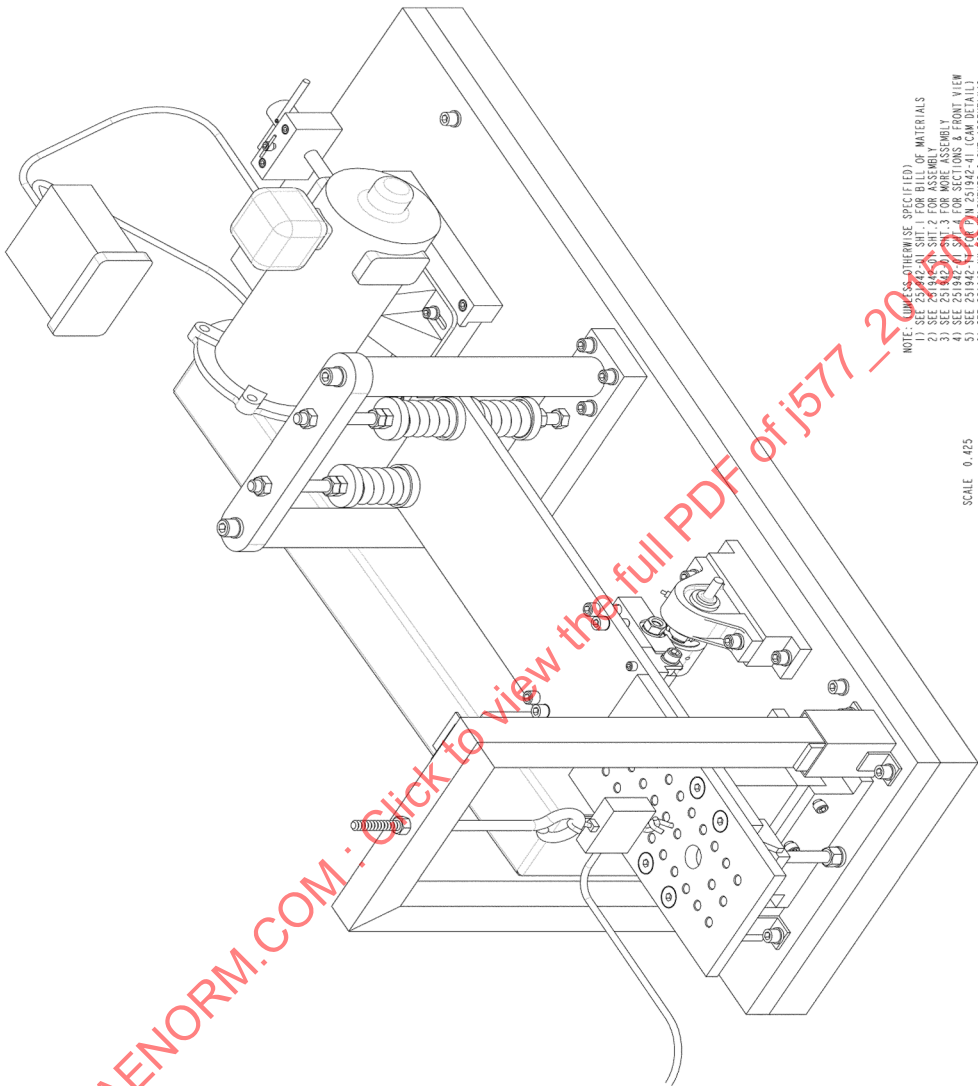
A.2 TYPE 1 MACHINE DRAWINGS

Table 2 - J577 Machine bill of material

BILL OF MATERIALS		
QTY	Part No.	Description
1	251942-01	Main Assembly
1	251942-02	Weldment Detail #2
1	251942-03	Weldment Detail #3
1	251942-04	Weldment Detail # 4
1	251942-05	Weldment Detail #5
4	251924-06	Weldment Detail #6
2	251942-07	Weldment Detail #8
1	251942-08	1.000 X 15.000 X 45.000 CRS
2	251942-09	1.670 DIA X 10.250 LG CRS
1	251942-12	1.250 SQ X 6.000 LG. # 4140 STL.
1	251942-13	1.250 X 1.500 X 6.000 LG. CRS
1	251942-14	0.750 X 1.000 X 4.125 LG. CRS
2	251942-15	FAFNIR PILLOW BLOCK #G1012KRRB, RAK 3/4
1	251942-16	0.500 X 6.000 X 26.625 LG. CRS
1	251942-17	0.750 X 2.000 X 11.000 CRS
1	251942-18	1.250 DIA X 13.375 LG. D2 58/62Rc STL.
1	251942-21	1.250 SQ. X 2.500 LG. #4140 STL.
1	251942-22	1.250 SQ. X 4.500 LG. CRS
2	251942-23	1.625 X 1.750 X 6.500 LG. CRS
1	251942-24	1.250 X 2.750 X 6.000 LG. D2 STL.
1	251942-25	1.000 X 2.875 X 11.875 LG. CRS
4	251942-26	Century Spring #11996
1	251942-27	Electric Motor, Baldor # CDP3320
1	251942-28	Bushed Gearbelt Pulley, Browning # 18LG075
1	251942-29	Bushed Gearbelt Pulley, Browning # 40LH075
1	251942-30	Timing Belt, Gates # 600L075
2	251942-31	Cam Follower, Roller Bearing Co. of America # S40L
2	251942-32	Cam follower # S32LW & Lube Fitting #36235 Roller Bearing Co. of America
4	251942-33	1.810 DIA X 0.344 LG. Tool STL
4	251942-34	1.810 DIA X 0.564 LG. Tool STL
1	251942-35	0.500 DIA X 2.250 X 4.000 LG CRS
2	251942-37	0.250 SQ. X 1.360 LG. Key
2	251942-38	E-Ring, McMaster Carr #98407A156
2	251942-40	1/8" Grease Zerk, McMaster Carr # 1095K11
2	251942-41	2.000 DIA X 1.500 LG Hardened D2 STL
1	251942-42	0.500 X 6.000 X 12.000 LG. CRS
2	251942-43	2.000 SQ. X 14 GA. Tubing X 3.000 LG
2	251942-44	1.500 SQ X 0.125 Wall Tubing X 18.000 LG.
1	251942-45	1.500 SQ X 0.125 Wall Tubing X 11.250 LG.
1	251942-46	12GA. X 17.605 X 40.908 LG. CRS

Table 2 - J577 Machine bill of material (continued)

BILL OF MATERIALS		
QTY	Part No.	Description
1	251942-47	Inline Force/Torque Indicator Mark -10, Model BGI, Series SSM100
2	251942-49	0.125 SQ. X 2.000 LG. Key
1	251942-50	Red Oak Quarter Sawn 1.625 X 15.000 X 45.000 LG.
3	251942-52	Hook, Purchased W/ P/N 251942-47
2	251942-53	0.125 X 1.000 X 1.000 Angle X 1.250 LG.
1	251942-54	2.250 X 2.188 X 7.500 LG. CRS
1	251942-56	1.250 X 4.500 X 6.000 LG. CRS
2	251942-61	1.250 SQ. X 8.000 LG. CRS
1	251942-62	Sub-Assembly
1	251942-63	1.000 X 2.000 X 3.000 LG. CRS
1	251942-65	Sub-Assembly
1	251942-66	Hinge, McMaster Carr # 16175A15
1	251942-67	0.750 X 1.000 X 4.125 LG. CRS
4	251942-68	0.125 X 1.000 X 1.000 Angle X 1.000 LG.
2	251942-69	1.250 DIA X 0.437 LG. Hardened Tool STL
1	251942-70	Sub-Assembly
1	251942-71	0.250 X 1.750 X 2.125 LG. CRS
1	251942-72	Honda ATV Valve Spring #14751-KCY-670
1	251942-73	Bushing, Browning # H 3/4
1	251942-74	Bushing, Browning # G 5/8
1	251942-75	Dart Tachometer #MDIOP
1	251942-76	Dart Pulse Generator # PU2E
2	251942-77	0.125 X 1.000 X 1.500 Angle X 1.000 LG.
2	251942-78	0.250 X 1.380 X 3.000 LG, CRS
1	251942-79	0.500 X 2.375 X 2.000 Angle X 1.500 LG.
1	251942-80	1.000 DIA X 1.500 LG. ROD
1	251942-81	0.250 DIA X 4.000 LG. ROD
1	251942-82	1/4-20UNC SHCS X 1.250 LG
1	251942-83	0.093 DIA X 1.250 LG. ROD

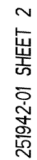


SCALE 0.425

- NOTE: DIMENSIONS OTHERWISE SPECIFIED
- 1) SEE 251942-11 SHT. 1 FOR BILL OF MATERIALS
 - 2) SEE 251942-11 SHT. 2 FOR ASSEMBLY
 - 3) SEE 251942-11 SHT. 3 FOR WELDMENT
 - 4) SEE 251942-11 SHT. 4 FOR FRONT VIEW
 - 5) SEE 251942-11 SHT. 5 FOR DETAIL VIEW
 - 6) SEE 251942-11 SHT. 6 FOR DETAIL VIEW
 - 7) SEE 251942-11 SHT. 7 FOR DETAIL VIEW
 - 8) SEE 251942-11 SHT. 8 FOR DETAIL VIEW
 - 9) SEE 251942-11 SHT. 9 FOR DETAIL VIEW
 - 10) SEE 251942-11 SHT. 10 FOR DETAIL VIEW
 - 11) SEE 251942-11 SHT. 11 FOR DETAIL VIEW

251942-01 SHEET 1

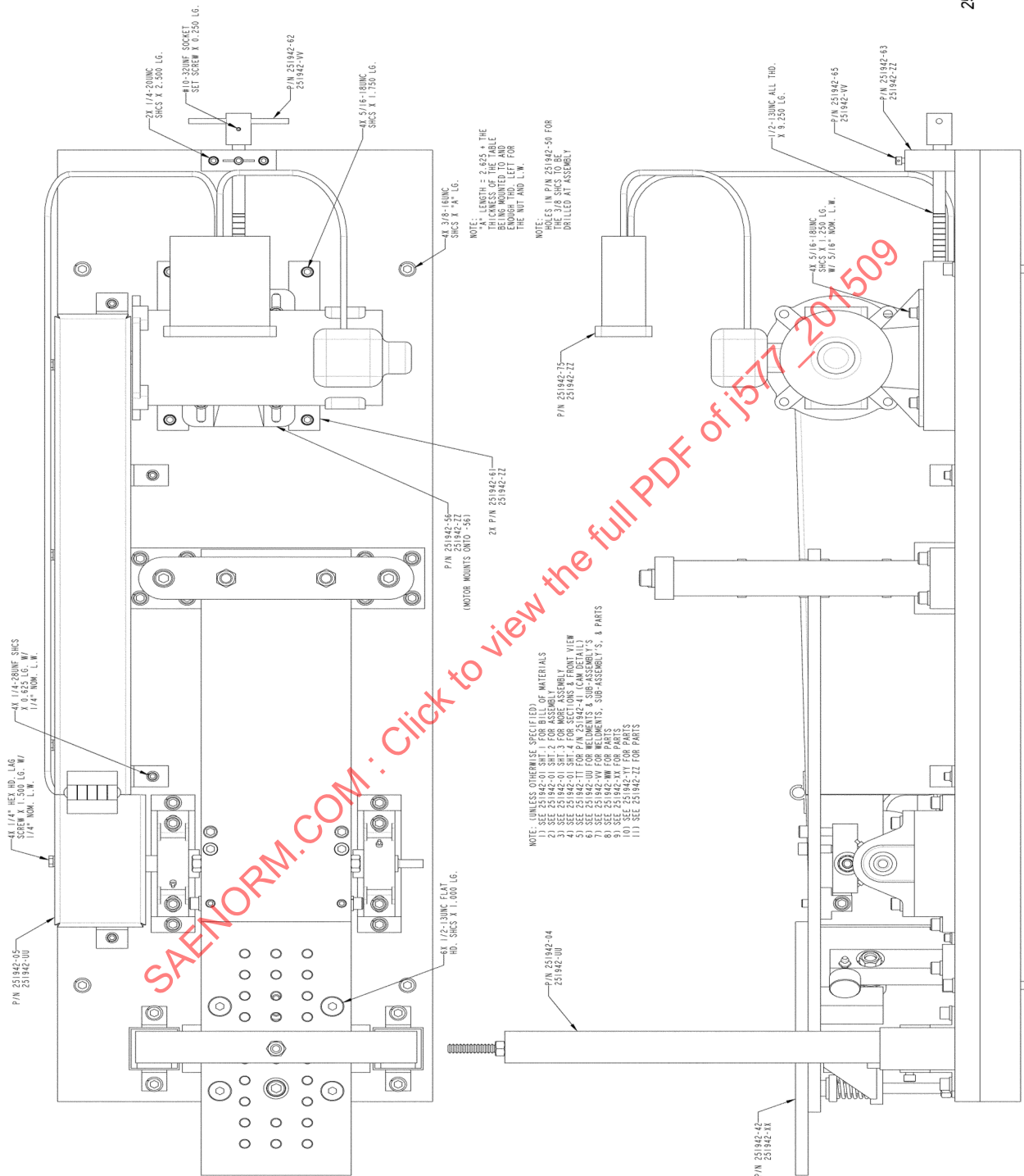
Vibration test machine assembly



NOTE: (UNLESS OTHERWISE SPECIFIED)

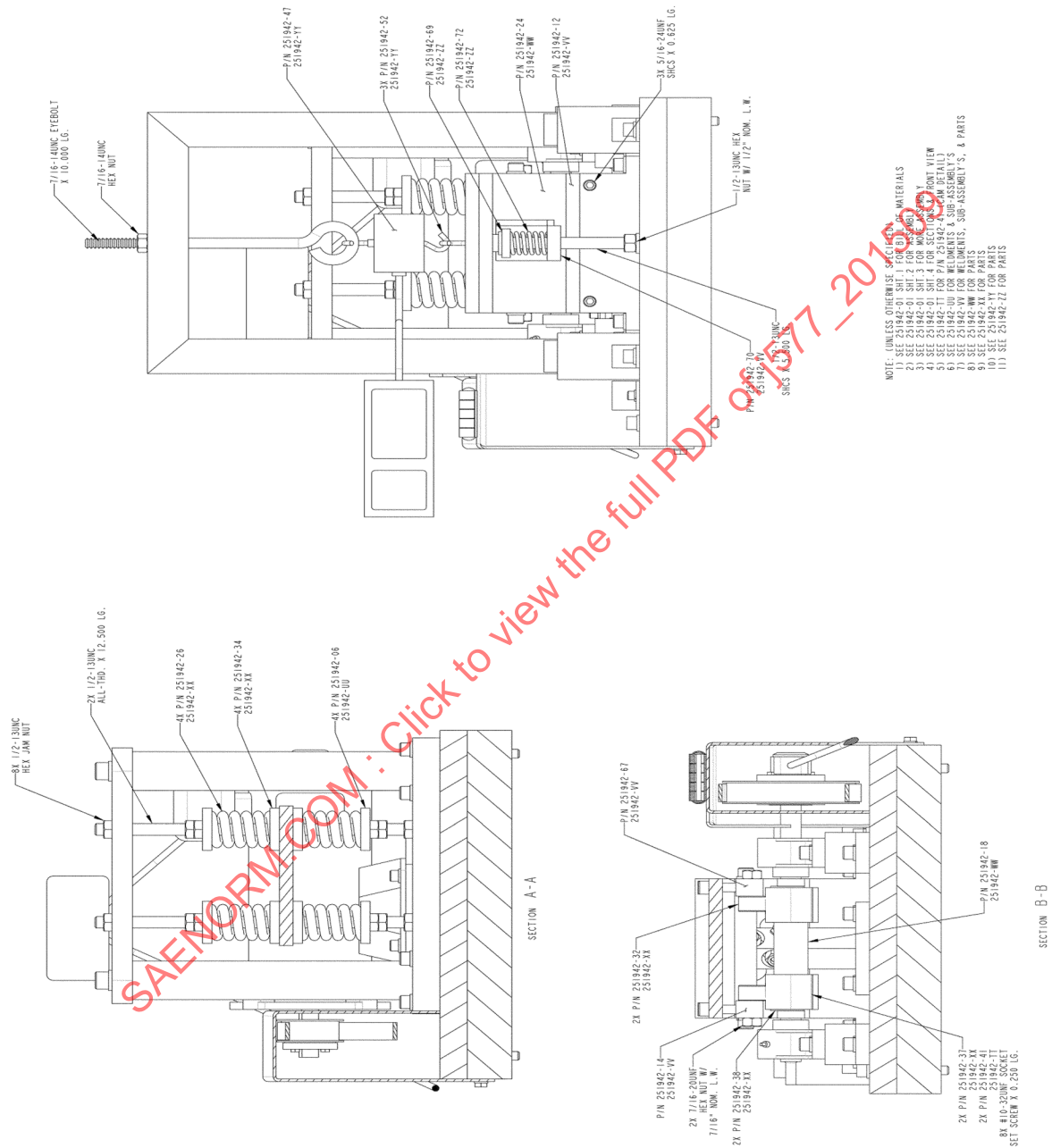
- 1) SEE 251942-01 SH-1 FOR BILL OF MATERIALS
- 2) SEE 251942-01 SH-1 FOR ASSEMBLY
- 3) SEE 251942-01 SH-1 FOR SUB-ASSEMBLY
- 4) SEE 251942-01 SH-1 FOR SECTIONS & FRONT VIEW
- 5) SEE 251942-01 SH-1 FOR P/N 251942-41 (CAM DETAIL)
- 6) SEE 251942-00 FOR MECHANISMS & SUB-ASSEMBLYS
- 7) SEE 251942-00 FOR WELLMENTS, SUB-ASSEMBLYS, & PARTS
- 8) SEE 251942-XX FOR PARTS
- 9) SEE 251942-XX FOR PARTS
- 10) SEE 251942-XX FOR PARTS
- 11) SEE 251942-XX FOR PARTS

Vibration machine top and side views



Vibration machine with calibration frame

251943-01 SHEET 4



Vibration machine cross sections