OUR EQUIPMENT. YOUR SUCCESS.

L.A.B. Equipment, Inc.

Your Only Source For Customer Focused
Shock & Vibration Test Equipment





Hydraulic Vibration Systems(HV)

~ by L.A.B. Equipment, Inc.

Impact of Damages Goods

- $18 Trillion Dollar Economy
- Durable and Non-Durable Goods
  - $4.5 Trillion/year
- Damaged Freight
  - ½ to 1 ½ % of Goods Transported
- 22 to 65 BILLION $/ Year

GDP, current prices

(billion USD)

1	United States	17,968
2	China	11,385
3	Japan	4,116
4	Germany	3,371
5	United Kingdom	2,865
6	France	2,423
7	India	2,183
8	Italy	1,819
9	Brazil	1,800
10	Canada	1,573
11	Korea	1,393
12	Australia	1,241
13	Russia	1,236
14	Spain	1,221
15	Mexico	1,161
16	Indonesia	873
17	Netherlands	751
18	Turkey	722
19	Switzerland	677
20	Saudi Arabia	632
21	Argentina	579

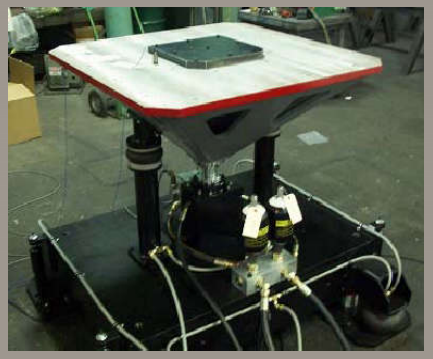
Source: IMF World Economic Outlook (WEO), October 2015





What Is A Hydraulic System?

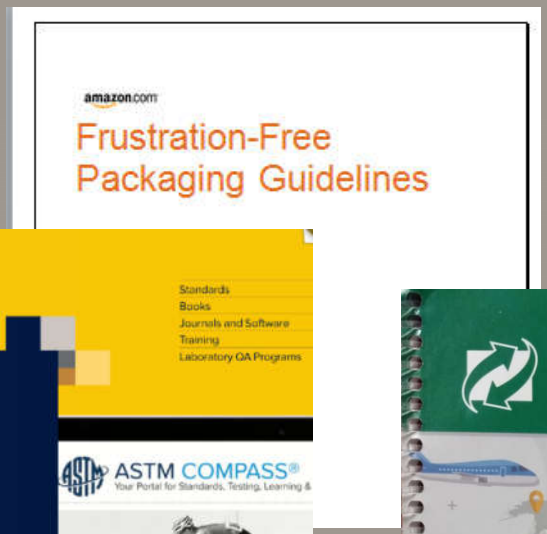
- An L.A.B. Hydraulic System is a rigid table surface supported and driven by a closed-loop servo controlled hydraulic actuator.
- The system is capable of producing single axis vibration at controlled levels of displacement, velocity or acceleration throughout a specific range of frequencies.

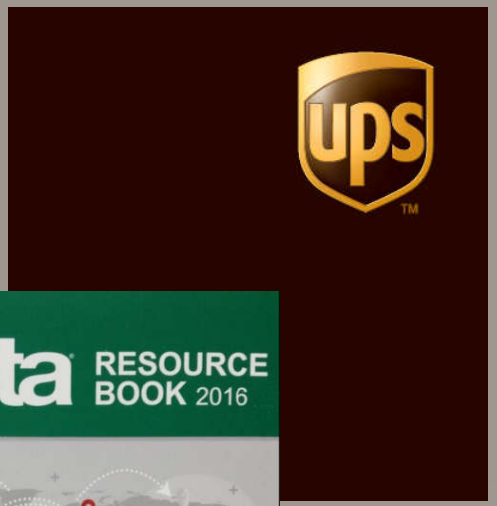


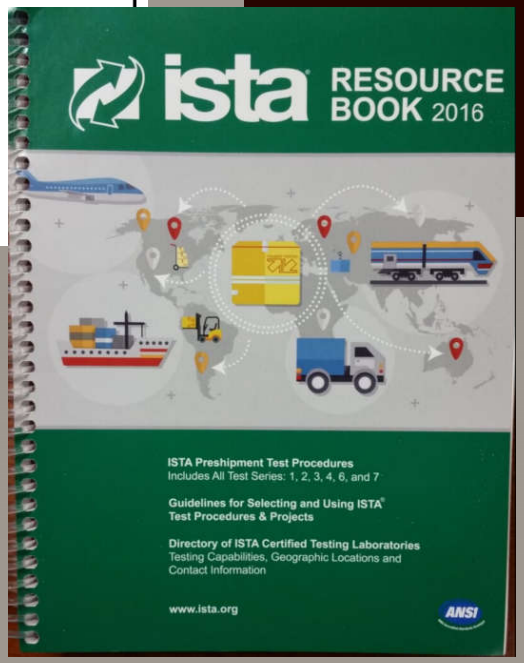




Test Standard Sources Include…



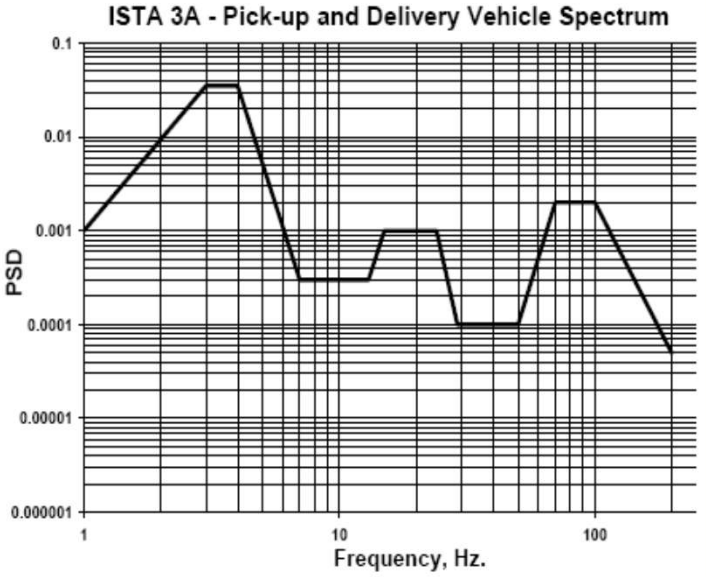




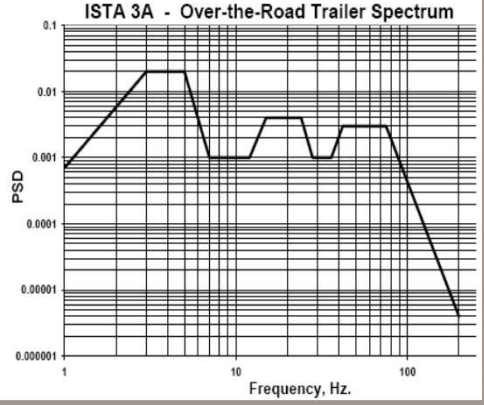
a closer look…
Procedure 3A Test Profiles (<150 Lbs.)

ista **Packaged-Products for Parcel Delivery System Shipment 70 kg (150 lb) or Less** **3A** 2008

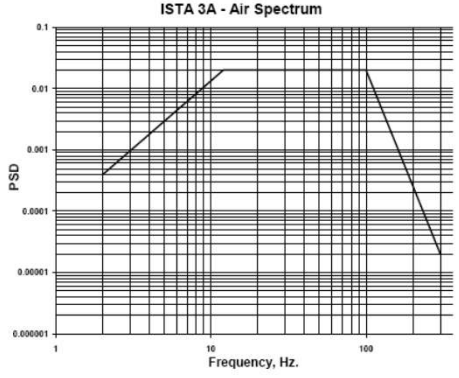
Frequency (Hz)	PSD Level, g^2/Hz
1	0.001
3	0.035
4	0.035
7	0.0003
13	0.0003
15	0.001
24	0.001
29	0.0001
50	0.0001
70	0.002
100	0.002
200	0.00005



Frequency (Hz)	PSD Level, g^2/Hz
1	0.0007
3	0.02
5	0.02
7	0.001
12	0.001
15	0.004
24	0.004
28	0.001
36	0.001
42	0.003
75	0.003
200	0.000004



Frequency (Hz)	PSD Level, g^2/Hz
2	0.0002
12	0.01
100	0.01
300	0.00001



… breakpoints "shall be programmed into the vibration controller to produce the acceleration versus frequency profile (spectrum) with an overall Grms level of 0.53"





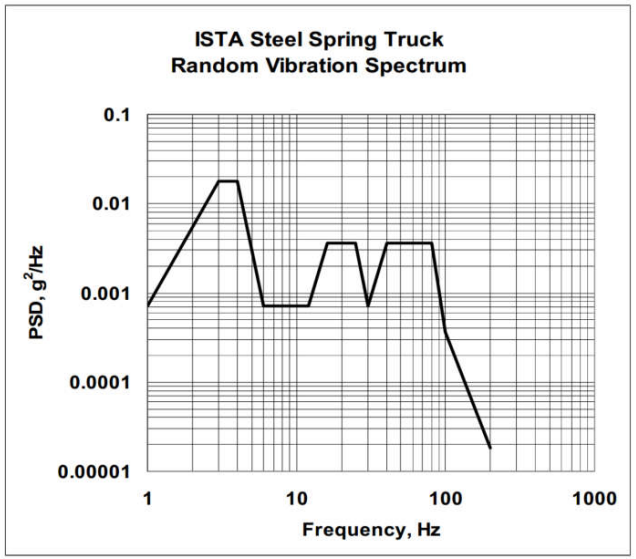
a closer look…
Procedure 3B Test Profiles (LTL)

ista **Packaged-Products for Less-Than-Truckload (LTL) Shipment** **3B 2013**

Random Vibration Spectrum

The acceleration vs. frequency spectrum to be used for the random vibration tests is shown below. The overall Grms is 0.54 and the theoretical stroke required is 1.777 in (45.13 mm) peak-to-peak.

Frequency (Hz)	PSD (g^2/Hz)
1	0.00072
3	0.018
4	0.018
6	0.00072
12	0.00072
16	0.0036
25	0.0036
30	0.00072
40	0.0036
80	0.0036
100	0.00036
200	0.000018



ASTM D-4169

Standard Practice for Performance Testing of Shipping Containers and Systems

•1. Scope

•1.1 This practice provides a uniform basis of evaluating, in
•a laboratory, the ability of shipping units to withstand the
•distribution environment. This is accomplished by subjecting
•them to a test plan consisting of a sequence of anticipated
•hazard elements encountered in various distribution cycles.
•This practice is not intended to supplant material specifications
•or existing preshipment test procedures.
•1.2 Consider the use of Practice D7386 for testing of
•packages for single parcel shipments.
•1.3 The suitability of this practice for use with hazardous
•materials has not been determined.
•1.4 The values stated in inch-pound units are to be regarded
•as standard. The values given in parentheses are mathematical
•conversions to SI units that are provided for information only
•and are not considered standard.
•1.5 *This standard does not purport to address all of the*
•*safety concerns, if any, associated with its use. It is the*
•*responsibility of the user of this standard to establish appropriate*
•*safety and health practices and determine the applicability*
•*of regulatory limitations prior to use.*

12.4 *Random Test Option*:

Test Method D4728, Method A or B.[A]
Conditioning—See Section 6.
Special Instructions—The following power spectral densities, as defined by their mode of transport, frequency and amplitude breakpoints, and test durations are recommended. The Truck test is recommended for Distribution Cycles 1, 3, 4, 5 and 6. The Rail test is recommended for Distribution Cycles 7, 8 and 11. A60 min Truck test followed by a 120 min Rail test is recommended for Distribution Cycles 9 and 10. A60 min Truck test followed by a 120 min Air test is recommended for Distribution Cycles 12 and 13.

Truck:

	Power Spectral Density Level, g^2/Hz		
	Assurance Level	Assurance Level	Assurance Level
Frequency, Hz	I	II	III
1	0.0001	0.00005	0.000025
4	0.02	0.01	0.005
16	0.02	0.01	0.005
40	0.002	0.001	0.0005
80	0.002	0.001	0.0005
200	0.00002	0.00001	0.000005
Overall, g rms	0.73	0.52	0.37
Duration, min[B]	180	180	180

Rail:

	Power Spectral Density Level, g^2/Hz		
	Assurance Level	Assurance Level	Assurance Level
Frequency, Hz	I	II	III
1	0.00002	0.00001	0.000005
2	0.002	0.001	0.0005
50	0.002	0.001	0.0005
90	0.0008	0.0004	0.0002
200	0.00002	0.00001	0.000005
Overall, g rms	0.41	0.29	0.20
Duration, min[B]	180	180	180

Air:

	Power Spectral Density Level, g^2/Hz		
	Assurance Level	Assurance Level	Assurance Level
Frequency, Hz	I	II	III
2	0.0004	0.0002	0.0001
12	0.02	0.01	0.005
100	0.02	0.01	0.005
300	0.00002	0.00001	0.000005
Overall, g rms	1.49	1.05	0.74
Duration, min[B]	180	180	180

[A] If Method B is used, the drive signal must be equalized for the specific shaker and shipping unit dynamics per Test Method D4728, Section 8.
[B] For vehicle vibration tests in multiple shipping unit orientations, the total

tered in the type of transportation being considered. The resonant frequency(ies) may shift during test due to changing characteristics of the container system. It is suggested that the dwell frequency be varied slightly during the test to detect any shift and to continue testing at the frequency of maximum response. Use the following test levels:

Assurance Level	Frequency Range, Hz	Amplitude (O-Peak), *g*		Dwell Time, min
		Rail	Truck	
I	3 to 100	0.25	0.5	15
II	3 to 100	0.25	0.5	10
III	3 to 100	0.25	0.5	5

13. Schedule F—Loose Load Vibration

13.1 The test levels and the test method for this schedule of the distribution cycle are intended to determine the ability of the shipping unit to withstand the repetitive shocks occurring during transportation of bulk or loose loads. The test levels and test method account for amplitude, direction, and duration of the repetitive shocks.

13.2 Use the following test levels:

Test Method—D999, Method A1 or A2D999.

Conditioning—See Section 6.

Special Instructions—Dwell time distributed 50 % along normal vertical shipping axis or with the predetermined bottom orientation (as specified in DC-3 and DC-13) facing down and remaining 50 % evenly along all other possible shipping orientations

Assurance Level	Dwell Time, min
I	60
II	40
III	30

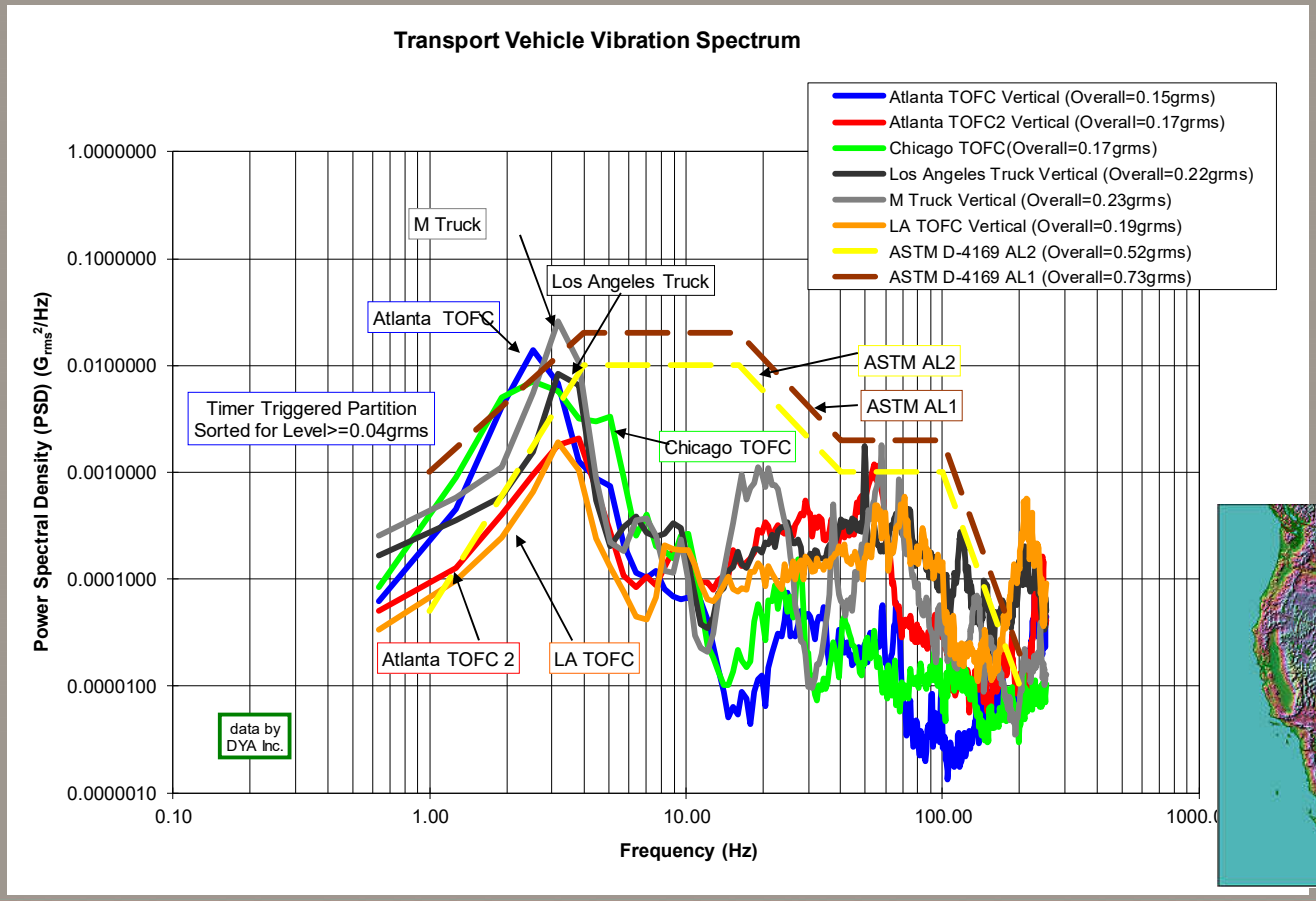
14. Schedule G—Simulated Rail Switching

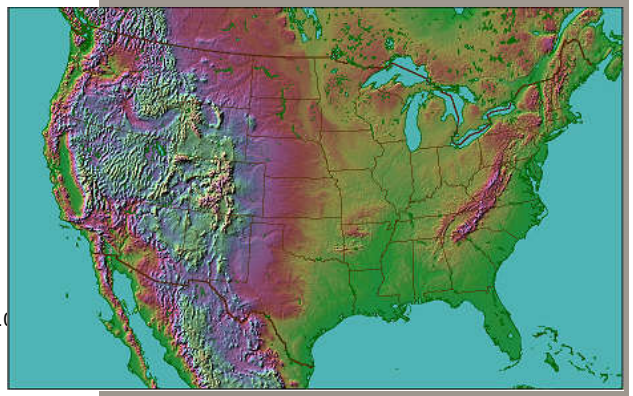
14.1 The test levels and test methods for this schedule are intended to determine the ability of the shipping unit to withstand the acceleration levels and compressive forces that might occur during rail switching operations.





Random Profiles

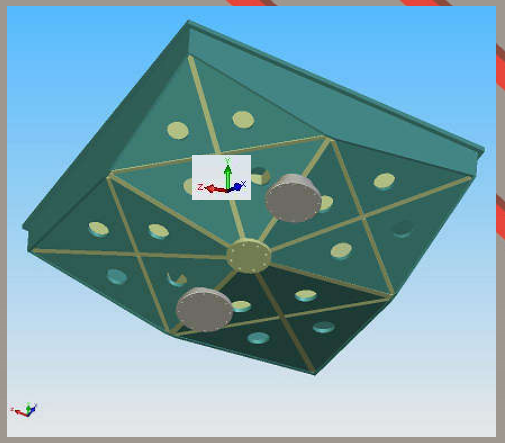




Standard System Components

- ✓ Vibration Table
- ✓ Actuator/Piston Assembly
- ✓ Hydraulic Power Supply
- ✓ Hydraulic Manifold
- ✓ Servo Valve
- ✓ Servo Controller
- ✓ Digital Vibration Control System
- ✓ 1-G Supports
- ✓ Isolated Reaction Mass

Vibration Table



- ✓ Computer-aided design
- ✓ Finite element analysis (FEA)
- ✓ Specialized in-house welding techniques
- ✓ Stress-relieved materials
- ✓ Drilled & tapped for test specimen or fixture attachment
- ✓ Uniform response across entire surface
- ✓ Broad range of sizes available





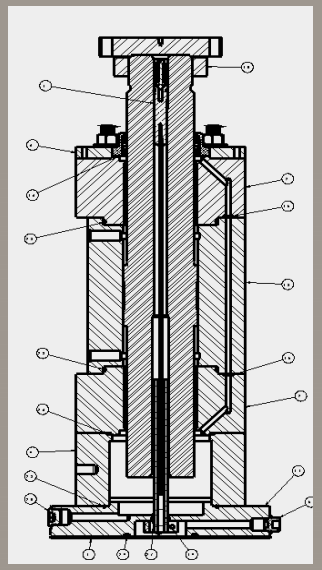
Actuator Assembly

- ✓ Double-ended and double-acting balanced hydraulic configuration
- ✓ High-pressure oil directed alternately to both ends of doubled-ended piston rod
- ✓ Linear variable differential transformer (LVDT)
- ✓ 4” diameter alloy steel piston rod
- ✓ 2” or greater thickness of all structural actuator elements
- ✓ Self-centering hydrostatic bearing
- ✓ Over-stroke damping cushions
- ✓ Low distortion
- ✓ Soft start/stop
- ✓ No high-pressure mechanical seals
- ✓ Virtually maintenance-free





Actuator Assembly

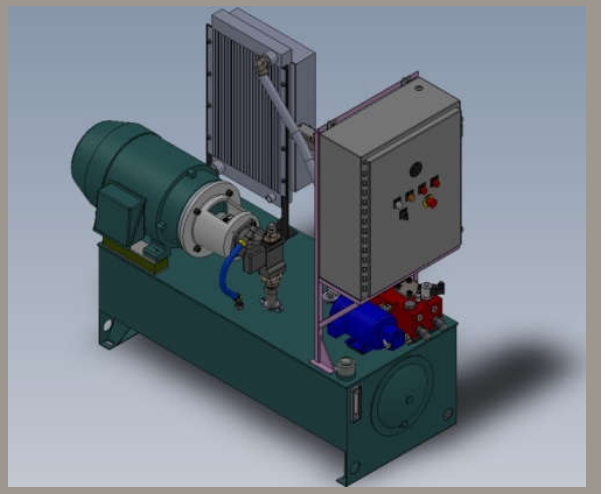


Our state-of-the-art hydrostatic bearing actuator is self-centering, with no piston rings or hi-pressure seals. Providing long-life with little maintenance and no oil leakage. This means unsurpassed control and balance for off-centered loads. L.A.B.'s actuator has minimal fatigue under life usage. No metal to metal contact between piston and bearings. The actuator cylinder is made from a high alloy steel, and the side-load capability of hydrostatic bearings will not deteriorate as velocity increases. L.A.B. hydrostatic bearings will support side-load without wear, even at very low frequency and low velocity.

Hydraulic Power Supply

L.A.B. has a better way to cool your HV System. Through efficient and practical design, L.A.B. has created a more Eco-Friendly, compact,and reliable method to cool the oil needed in an HV system. Our Air-Oil cooler eliminates the need for the customer to supply water while allowing your operational run time to be virtually at 100%. Our efficient variable displacement pumps run the oil cooler and provide the oil volume when you need it.

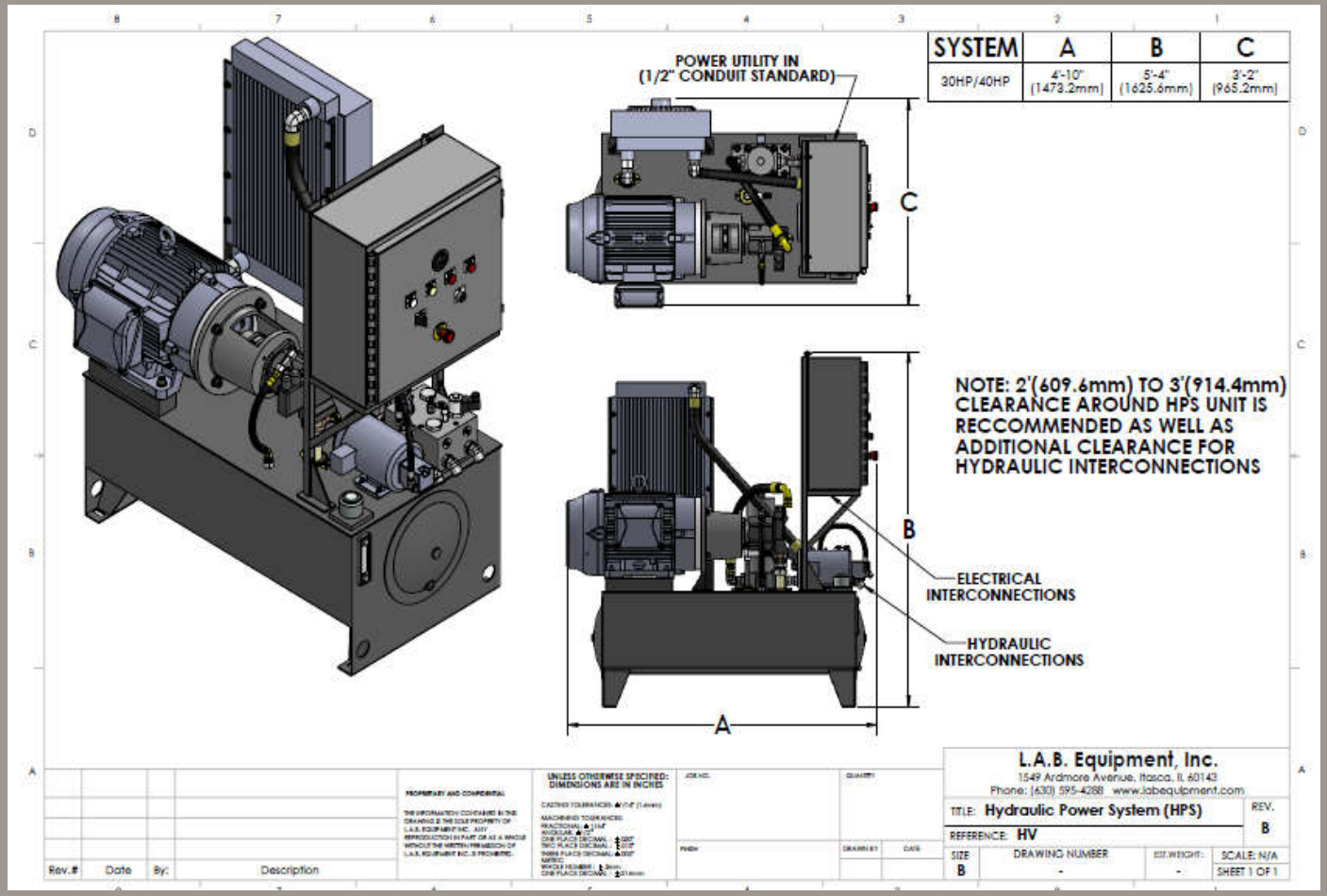
- Oversized reservoir helps dissipate heat
- 3-micron absolute oil filter removes particles from system fluid ensuring trouble-free operation.
- Sensors monitor fluid temperature, level, system pressure and filter condition
- Sight gauge visually indicates fluid level and temperature







HPS Dimensions(30-50 HP)



SYSTEM	A	B	C
30HP/40HP	4'-10" (1473.2mm)	5'-4" (1625.6mm)	3'-2" (965.2mm)

Isolated Reaction Mass

Vibration testing starts from as low as 1Hz. L.A.B.'s HV system provides the highest possible stability and minimum velocity loss at low frequency. L.A.B.'s air suspension and synergistic hydraulic dampening provide first in class isolation. As a result of L.A.B. efficiently designed mass systems, L.A.B.'s reaction mass system provides better overall stability, better system control, and overall system dampening.

Hydraulic Manifold Assembly

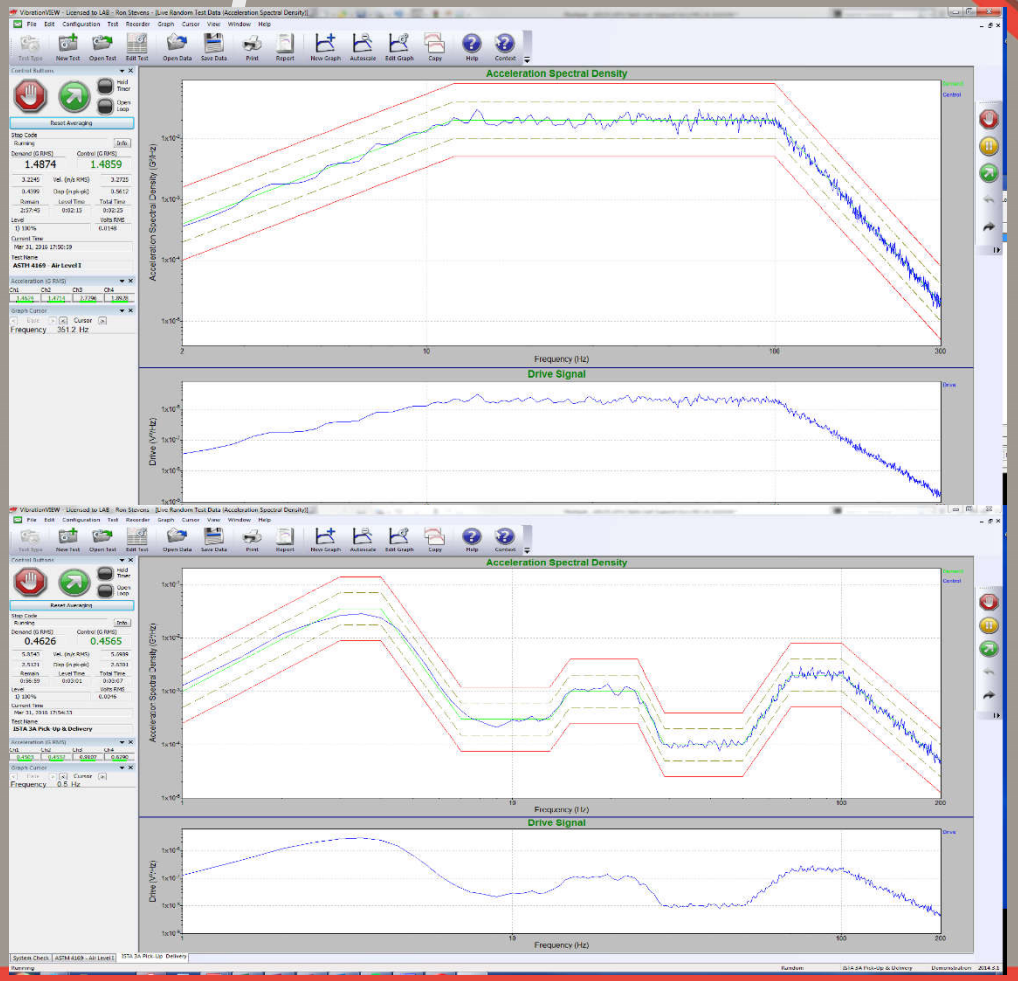
- Provides restricted flow for system start-up
- Controls system high pressure hydraulic fluid
- Controls pressure during start-up & shutdown sequences
- Pressure line accumulator reduces pressure fluctuation & provides peak flow capability
- Return line accumulator smoothens flow of returned fluid & prevents cavitation

Vibration Controller Selection

- Tailored to customer test needs & budget
- Complete Windows 10 based PC system
- Closed-loop control & test specimen monitoring via feedback from accelerometer
- Pre-programmed ISTA & ASTM test profiles
- Sine & random profile modules
- Real-time test display
- Data graphing, analysis & reporting(MS Office)

Vibration Controller Features and Available Options

- ✓ Sine Profiles
- ✓ Random Profiles
- ✓ Shock
- ✓ SRS, Shock, Kurtosion
- ✓ 2-4+ Channels
- ✓ Ethernet







1-G Supports

- Support static weight of the table & test specimen
- Increase payload rating
- Minimize table rotation
- Provides an effective method of increasing capacity efficiently

Key Installation Site

- ✓ Above floor or recessed installation
- ✓ Facility layout
  - ✓ Table system, hydraulic power supply, control station
- ✓ Ceiling height
  - ✓ Table height plus restraining height plus test load height
- ✓ Product restrainer fences from LAB
- ✓ Utilities:
  - ✓ Electrical
  - ✓ Air
- ✓ Location of HPS system
- ✓ Loading and storage of products under test

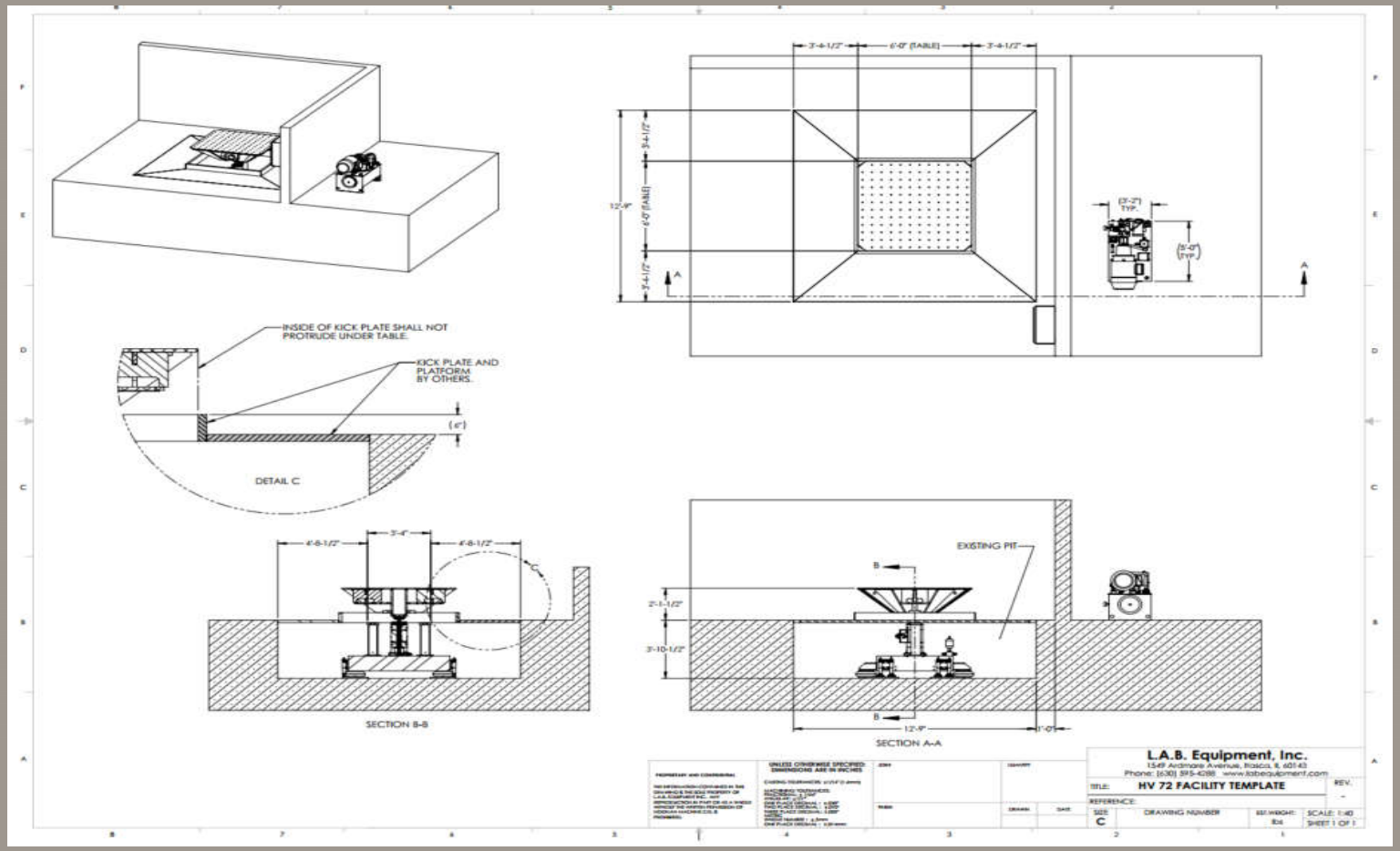




HV Installations

More Installations

Typical HV System Layout



Service Considerations

- ✓ Extended actuator warranties
- ✓ Service contracts for system calibration
  - ✓ Controller
  - ✓ Accelerometers
- ✓ Annual operator and system maintenance training
- ✓ Software upgrades for controller
- ✓ Preventive maintenance scheduling with LAB service team.





Benefits of an L.A.B. Hydraulic System

- ✓ L.A.B exclusive designed hydrostatic bearing assemblies
  - ✓ Almost NO maintenance
  - ✓ Longer actuator and less total system wear
- ✓ Custom controller solutions
  - ✓ flexibility & savings
- ✓ System designs to meet current and future performance standards
- ✓ Open architecture controller
  - ✓ Facilitates data input from field data devices
  - ✓ Facilitates PC system updates without OEM support and cost

L.A.B

OUR EQUIPMENT. YOUR SUCCESS.

L.A.B Equipment Inc., remains dedicated

to consistently

deliver a reliable, accurate, well-engineered, and innovative line of product and package testing systems combined with superior service and support

Visit our website for more information

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