

Navy Standard Bookend Fixtures for Shock Testing

SDMT Presentation

01 May 2024

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Agenda

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MIL-DTL-901E - 3.1 Shock Testing Requirements

From MIL-DTL-901E; Shock tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements For:

3.1.1.3 Approval of detailed requirements: For heavyweight and alternate vehicle/machine shock tests, detailed test procedures and other ordering data, which are independently developed by the contractor, shall require Technical Authority approval prior to installing the item for shock tests. Test fixture drawings shall be as specified and justification shall be provided as to why the test fixture satisfactorily meets the requirements of this document.

3.1.7 Simulation of items during shock tests: Components supported by piping or other flexible connections where simulation of the flexibility is not considered conservative shall be tested by mounting between rigid support structure such as block hangers or bookends.

Lightweight Shock Machine

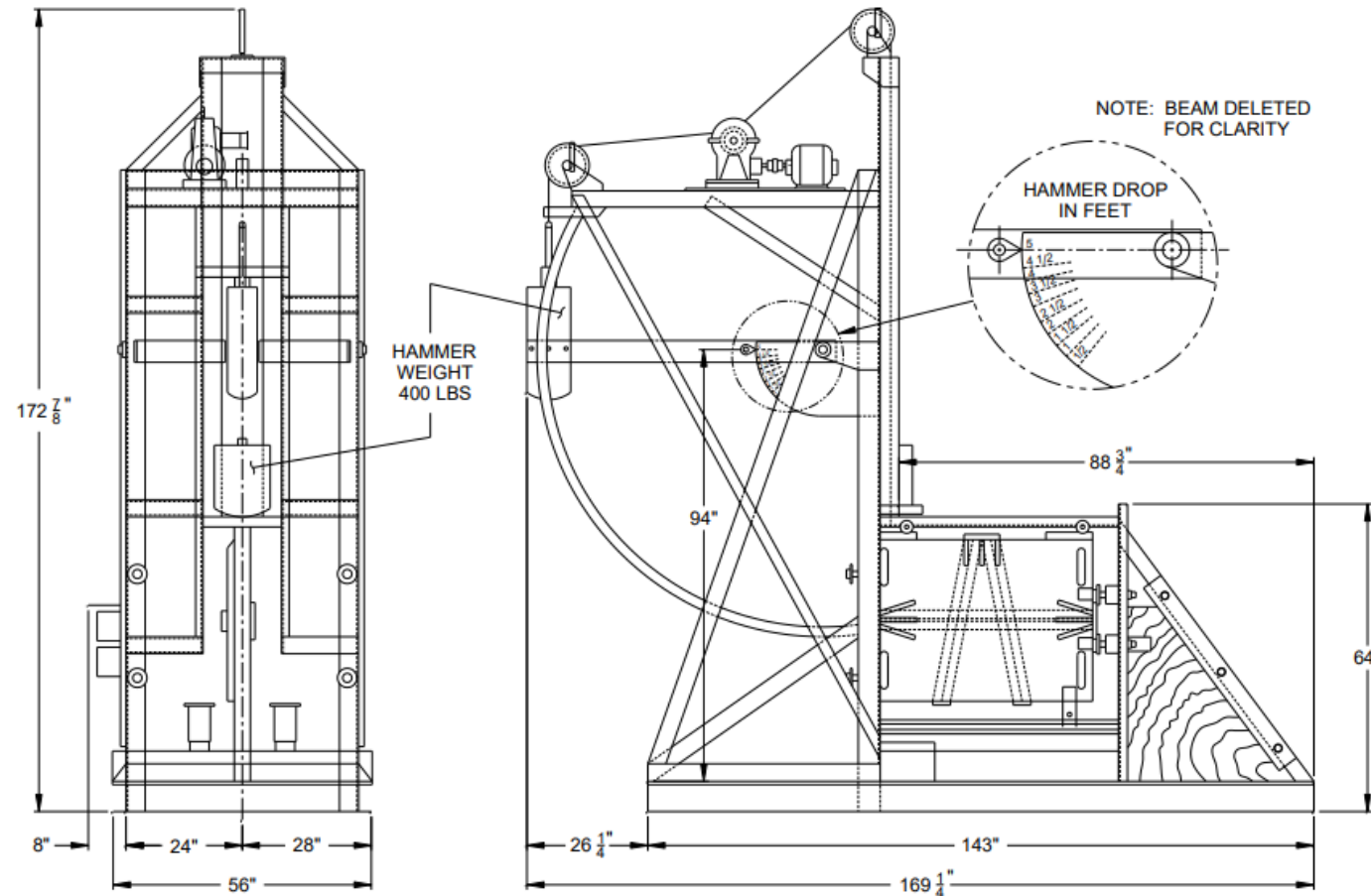


FIGURE 1. Lightweight shock machine (LWSM) for testing lightweight equipment.
(See BUSHIPS drawing 10-T-2145-L for construction details.)

For surface ships, total weight supported by the anvil plate not to exceed 550 pounds

Medium Weight Shock Machine

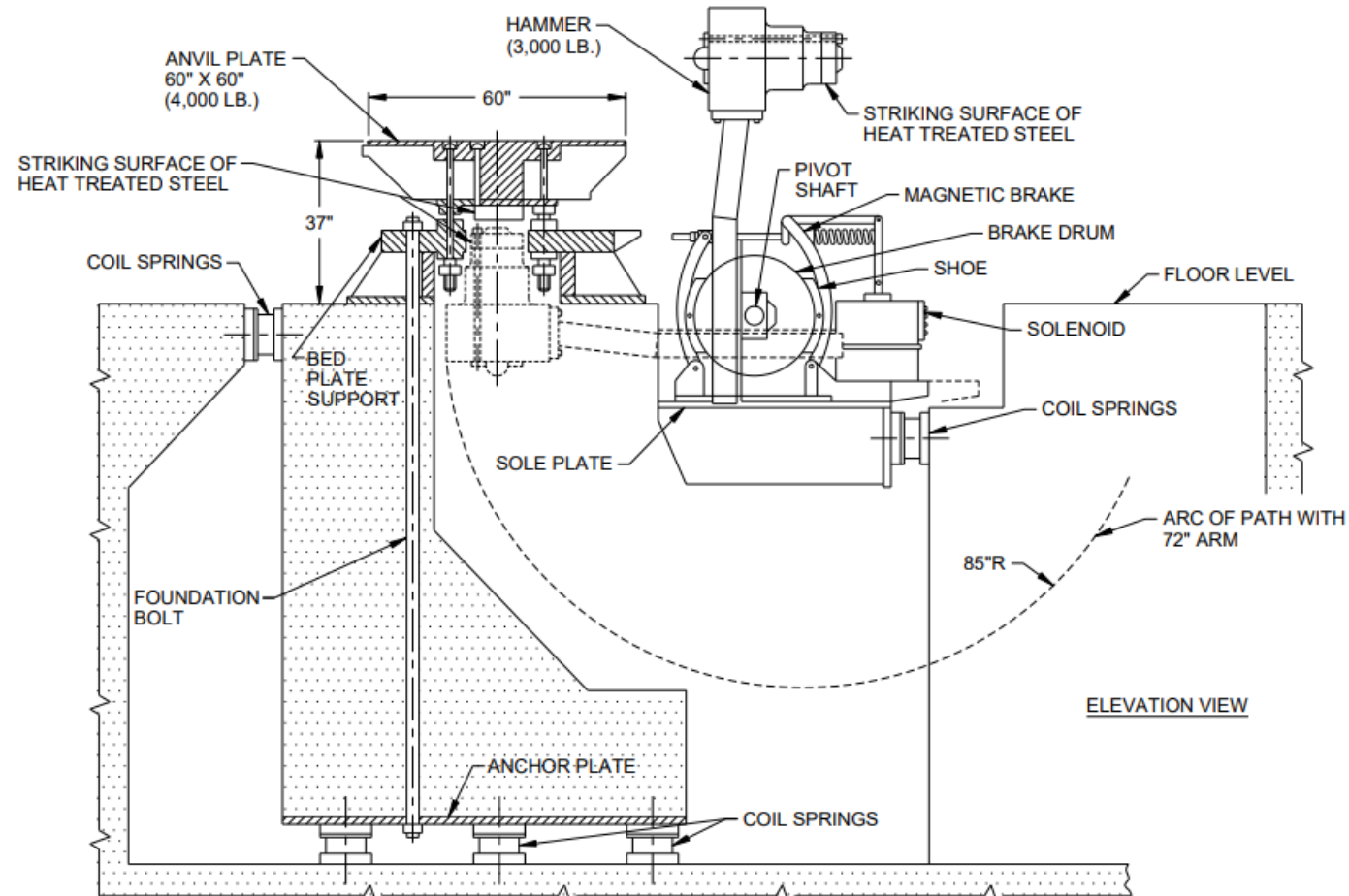
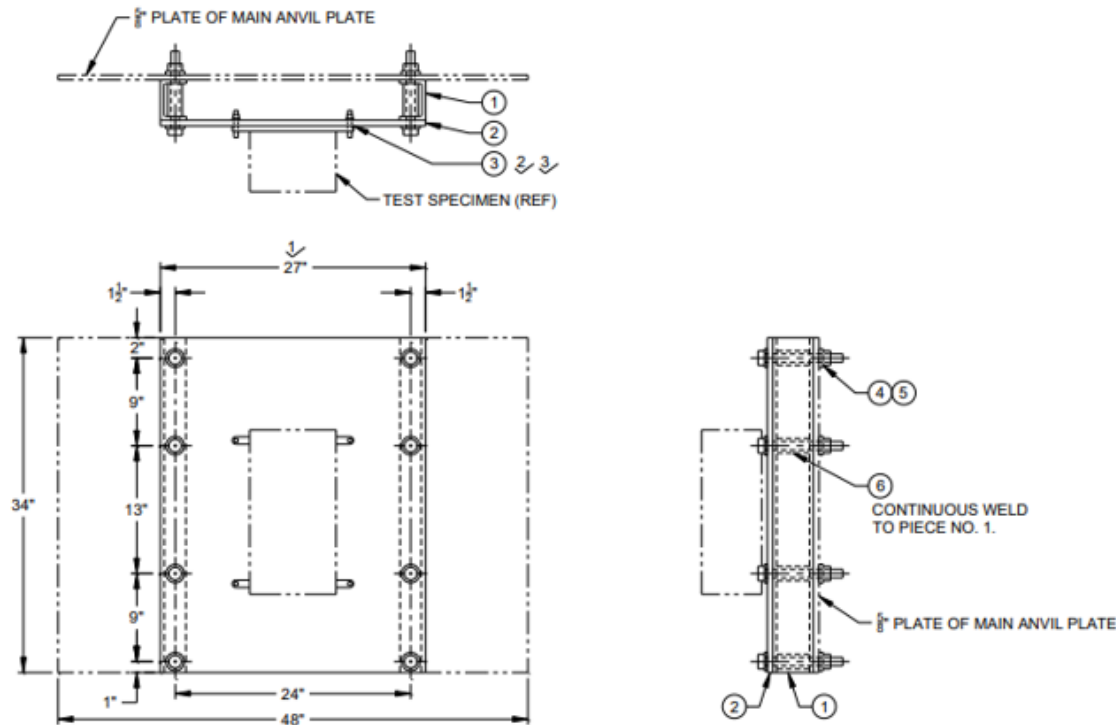


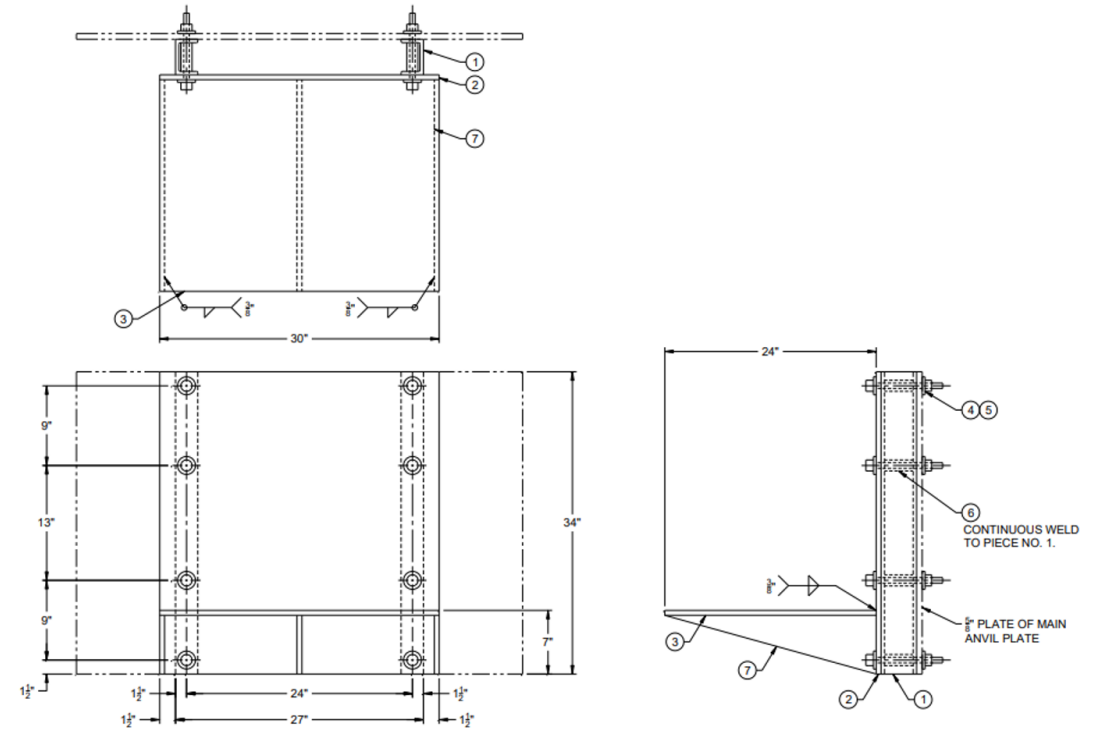
FIGURE 2. Medium weight shock machine (MWSM) for testing medium weight equipment.
(See BUSHIPS drawing N0807-655947 for construction details.)

For surface ships, total weight supported by the anvil plate not to exceed 7,400 pounds

Shock Machine Test Fixtures



Fixture 4A standard mounting for back mounted equipment (type "A" test LWSM).



FOR ADDITIONAL DETAILS, SEE BUSHIPS DWG 10-T-2145-L

FIGURE 12. Fixture 11-C standard mounting for base mounted equipment (LWSM).

- For the Medium Weight Shock Machine, the test component is mounted to a base plate

Lightweight Shock Machine Test Video

<https://www.youtube.com/watch?v=1csT5vohKdg>

Problem Statement

- When shock testing common equipment like valves, eductors, and other in-line pipe components, bookend test fixtures are typically designed and fabricated by a certified shock test facility. The bookend fixture designs are considered, “non-standard” and require submission of associated drawings, models, and analyses to the Delegated Approval Authority for review and approval prior to execution of testing.
- This is a costly process which adds labor and delays which could be avoided if there was an option to utilize a standardized, pre-qualified bookend fixture.

Goals / Objectives

- The goal of this project is to create up to four, qualified Navy Standard Bookend Shock Test Fixtures for “in-line” pipe components to be used on Lightweight and Medium-weight Shock Test Machines.
- The objective is to reduce cost and schedule associated with test fixture development, for all shock hardened, US Navy ships.

Goals / Objectives

- Review Bookend Test Fixture designs used in previously approved Lightweight and Mediumweight Shock Testing.
- Determine maximum and minimum sizes / weights of components to support.
- Determine common interfaces to support (ANSI Standard flanges, hardware, etc.).
- Design and analyze test fixture designs.
- Perform Lightweight Shock Testing on a bookend fixture (at Ingalls).
- Compare shock data to analysis.
- Review results with the Navy Delegated Approval Authority (NAVSEA 05P1).
- Create Navy Standard Drawings of each Bookend Test Fixture for inclusion in the next revision of MIL-DTL-901.

Project Participants - NSRP

Jim House – Senior Program Manager
ATI / NSRP

Victoria Dlugokecki – Program Technical Representative

Project Participants – NAVSEA 05P

Tom Brodrick – Senior EM, Shock - Submarines

Project Participants – Gibbs & Cox (Leidos)

Mike Poslusny - Project Manager

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Michael Parnin – Design

Allison Vella – Engineering

Nikki Washington - Contracts

Dominic Price - Drafting

Terrence Nelson- Drafting



Project Participants – Ingalls Shipbuilding

Michael S. Thompson – Mechanical Engineer

Jamie Breakfield – Project Manager



INGALLS
SHIPBUILDING
A Division of HII

Project Participants – NASSCO

Nour Chihwaro – Electrical Engineer

Dr. John Moatsos – Principal Engineer

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Milestones

		Project Start: 3/7/2024	
Deliverable		Due Date (Days After Award)	Estimated Date
01	Project Plan & Schedule	14	3/21/2024
02	Kick-off Meeting (Minutes/Presentations)	14	3/21/2024
03	Project Status Report 1	60	4/22/2024
04	Project Status Report 2	120	6/21/2024
05	Project Status Report 3	220	9/27/2024
06	Project Status Report 4 and Final Drawings	260	11/8/2024
07	Final Report with Recommendations	320	1/6/2025

Schedule

Task Name	Duration	Start	Finish
Task 1	23 days	Thu 3/21/24	Mon 4/22/24
Review Bookend Test Fixture Designs	4 days	Thu 3/21/24	Tue 3/26/24
Determine Max and Min Sizes / Weights of components to support	4 days	Wed 3/27/24	Mon 4/1/24
Determine Common Interfaces	4 days	Tue 4/2/24	Fri 4/5/24
Investigate standard materials	5 days	Mon 4/8/24	Fri 4/12/24
Brain-storm Bookend Designs, show preliminary designs	6 days	Mon 4/15/24	Mon 4/22/24
Task 2	44 days	Tue 4/23/24	Fri 6/21/24
Design Lightweight and Medium-weight Test Fixtures	18 days	Tue 4/23/24	Thu 5/16/24
Present Designs to the Team and the Navy	26 days	Fri 5/17/24	Fri 6/21/24
Task 3	70 days	Mon 6/24/24	Fri 9/27/24
Analyze Test Fixtures (transient / Static G)	24 days	Mon 6/24/24	Thu 7/25/24
Perform Lightweight Testing	24 days	Fri 7/26/24	Wed 8/28/24
Compare Data	22 days	Thu 8/29/24	Fri 9/27/24
Task 4	30 days	Mon 9/30/24	Fri 11/8/24
Create Navy Standard Drawings of each Bookend Test Fixture	30 days	Mon 9/30/24	Fri 11/8/24
Final Report	41 days	Mon 11/11/24	Mon 1/6/25

Project Status & Questions

