Ship Warfare Systems Integration Panel
July 16, 2024

Perry Haymon, Panel Chair

Huntington Ingalls Industries, Ingalls Shipbuilding

SWSI Panel Agenda

Ship Warfare Systems Integration Panel Meeting

2025 NSRP All Panel Meeting – Charleston, S.C.
Charleston Marriott
February 25-27, 2025

Meeting Agenda
Times listed are Eastern Time Zone

Thursday, 2/27/2025
Room B (Afternoon)

Time	Presentation	Speaker
12:00 pm	Lunch	All
1:00 pm	SWSI Panel Discussion/SWSI FY 25 Panel Project Selection	ATI/Haymon
1:30 pm	Combat Systems Standard Foundations Qualification and Optimization – Final Review	H.G. Howard
2:00 pm	MCI Tough Coat wear surface	H.G. Howard
2:30 pm	Performance Improvement for 25Hz DSSM Spring Tray – Final Review	Mike Talley
3:00 pm	DSSM Latch Adjustment Mechanism	Mike Talley
3:30 pm	FY 26 Panel Project Solicitation Ideas/ Next Panel Meeting	All
4:30 pm	Review Action Items / Closing Remarks	Haymon

Panel Introduction

Ship Warfare Systems Integration Panel

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Anti-Trust Rules

- Regarding your company's and/or your competitor's **product & services**:
  - Do not discuss current or future prices.
  - Do not discuss any increase or decrease in price.
  - Do not discuss pricing procedures.
  - Do not discuss standardizing or stabilizing prices.
  - Do not discuss controlling sales or allocating markets for any product.
  - Do not discuss future design or marketing strategies.

Anti-Trust Rules

- Regarding your company's and/or your competitors' selection of their **supplier companies**:
  - Do not discuss refusing to deal with a company because of its pricing or distribution practices.
  - Do not discuss strategies or plans to award business to remove business from a specific company.

- Regarding your company's and/or competitors' **trade secrets**:
  - Do not discuss trade secrets or confidential information of your company or any other participant.

Organization

Information, Design, & Integration

Ship Design & Material Technologies

Chair: **Monika Skowronska** (NASSCO)
Vice Chair: **Victoria Dlugokecki** (Consultant)

Ship Warfare Systems Integration

Chair: **Perry Haymon** (Ingalls)
Vice Chair: **Harold Howard** (NNS)

Business Technologies

Chair: **Jamie Breakfield** (Ingalls)
Vice Chair: **Patrick Roberts** (ShipConstructor)

Ship Production Technologies

Electrical Technologies

Chair: **Jason Farmer** (Ingalls)
Vice Chair: **Walter Skalniak** (Ashby)

Planning, Production Processes & Facilities

Chair: **Peter Radzicki**
Vice Chair: **Pat Cahill** (Cahill Consulting)

Surface Preparation & Coatings

Chair: **Conlan Hsu** (NNS)
Vice Chair: **Angel Zepeda** (NASSCO)

Welding Technology

Chair: **Kevin Roossinck** (Ingalls)
Vice Chair: **Cody Whiteley** (NASSCO)

Infrastructure, Logistics, & Support

Workforce & Compliance

Chair: **Ean Greene** (NNS)
Vice Chair: **Maurissa D'Angelo** (D'Angelo Technologies)

Sustainment

Chair: **Kirsten Walkup** (BIW)
Vice Chair: **Kaipo Crowell** (Kakou Professional Development)

Ship Warfare Systems Integration Panel's Purpose

- Reduce the costs of integration and test for warfare and **communication** systems in ship construction and maintenance/ modernization.
- Facilitate communications among Navy programs, warfare system integrators, **communication system integrators,** ship designers, shipbuilders and other NSRP panels.

Panel's Purpose

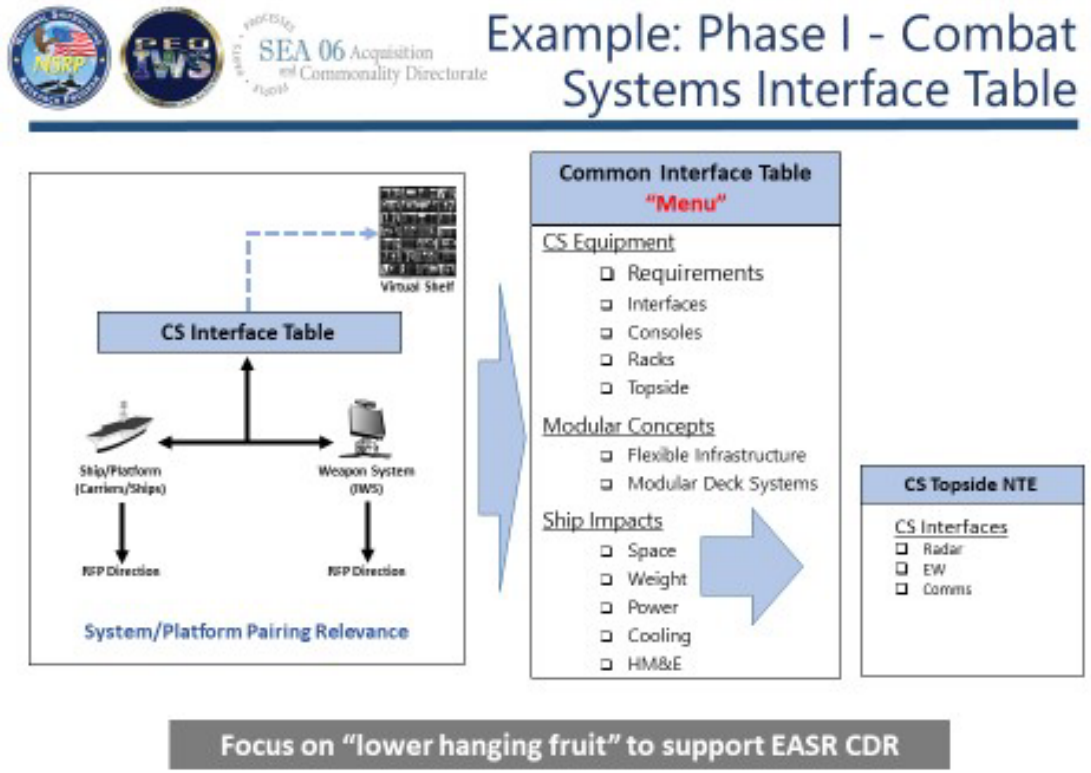
- What does the panel do?
  - Promote standardization of physical interfaces between IWS and C5ISR GFE/CFE and shipboard spaces.
  - Promote ship mission system infrastructure flexibility, modularity and scalability.
- Why?
  - To support the total ship cost reduction and integration of new technology efforts
- How?
  - The panel focuses on commonality
  - Works to identify opportunities to support the "Flexible Warship" concept
  - Works to increase involvement between the shipbuilder, C5ISR and IWS and the OEMs
  - Continually evaluate and share the results of SWSI Panel, RAs and specials projects and their benefits to the Navy, NSRP members and industry partners
  - Work to increase collaboration with other panel

Benefit to the Navy

- NSRP and SWSI provides a unique opportunity to connect the shipbuilder and the OEMs for combat system equipment and C5ISR equipment. Where before this connection did not exist
- SWSI bring the opportunity for shipbuilders and the OEMs to share perspective and potentially identify how small changes early in the design could have large saving in the future
- SWSI has help to identify opportunities that existed on other platforms and transition them to new classes of ships.
- SWSI is focused on the future changing today is hard but if shipbuilders and OEMs start talking now and understand what drives each others cost the future savings for the Navy could be significant

Assistance to the state of the shipbuilding and ship repair industry

- SWSI is preparing for the future of shipbuilding
- As Combat and C5ISR system become more dependent on ship services (high power and demand of pulsed loads) SWSI is building the path for both
- By building these relationships now a foundation is being laid, so as the dependencies continue increase, between shipbuilders and OEMs, the relationship standard that can grow stronger and more beneficial to the industry



Past and Current Projects

- ~19 panels projects have been completed
- 1 project on going
- One Special Pilot Project – Common Interface Pilot Program (CIPP)
- The majority of the Project focused on physical Interfaces been equipment and ship structure
- These efforts helped transition technology found on the Ford Class to LHA 8 and LPD 29 and follow (Flexible Infrastructure)

- DSSM Latch Adjustment Mechanism – 2025 Project

HII - Newport News Shipbuilding
Duration: 12 Months
Objective:
The objectives of this project are to:

- Fabricate, install, and test latch adjustment mechanisms for four DSSM latches
- Develop inspection procedures to obtain evidence for maintenance and replacement actions
- Document results

Questions?

NSRP
NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

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Combat Systems Standard Foundations Qualification and Optimization - Findings

NSRP - Combat Systems Standard Foundation Qualification & Optimization February 27, 2025

NEWPORT NEWS SHIPBUILDING
A DIVISION OF HII

Harold Howard - Newport News Shipbuilding
Ify Amene - Newport News Shipbuilding
Mackenzie Wilson – Newport News Shipbuilding

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NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

Combat Systems Standard Foundations Qualification and Optimization

- Integrated Project Team:
  - Lead – Newport News Shipbuilding:
    - Harold Howard
    - Ify Amene
    - Mackenzie Wilson
    - Daniel Kissinger
  - Participants - Ingalls Shipbuilding:
    - James Breakfield
    - Davida Cunningham
  - NAVSEA O5P1
    - Sloan Burns
    - Robert Heyburn
  - Program Technical Representative
    - Shawn Wilbur – AUSTAL USA

Project Background/ Purpose

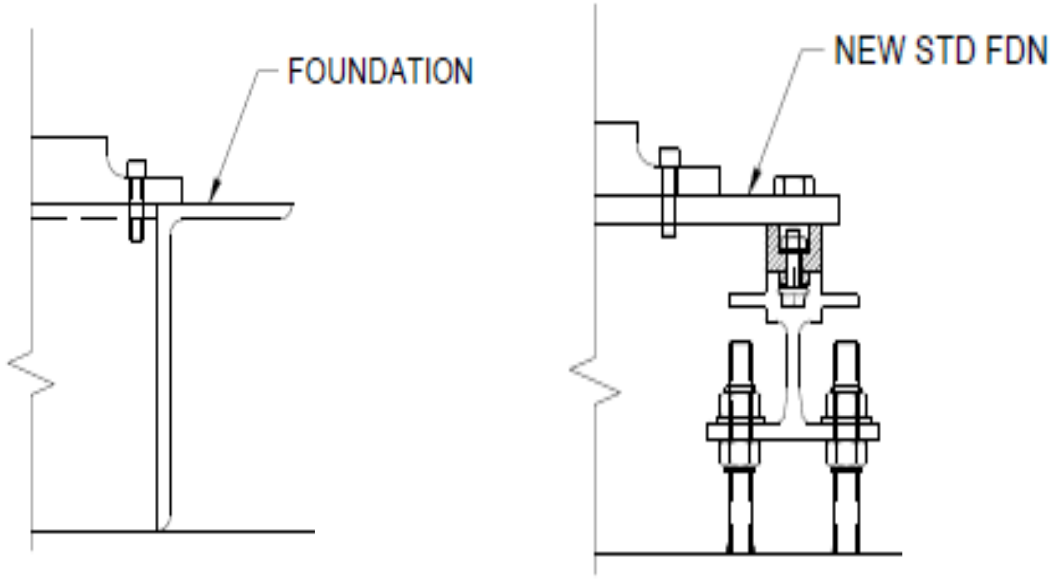
- The standard foundation effort was initiated from the National Shipbuilding Research Program (NSRP) Common Interface Pilot Project (CIPP) with its purpose being to develop common interface standards for the integration of combat systems Enterprise Air Surveillance Radar (EASR) on multiple surface ships

- Multiple shipyards were surveyed to identify the major cost & schedule drivers in the Combat Systems (CS) equipment installation process which included:
  - Impact to schedule caused by late/ changing GFI
  - Impact to adjacent spaces due to performing work out-of-sequence
  - Achieving required installation tolerance of CS equipment

Background/ Purpose (Cont.)

- Therefore, the following objectives were established:
  - Provide flexibility to suit changing equipment/ late technology insertion
  - Develop a foundation that utilizes studs to reduce installation cost & schedule
  - Develop an analysis process that satisfies shock and vibration requirements

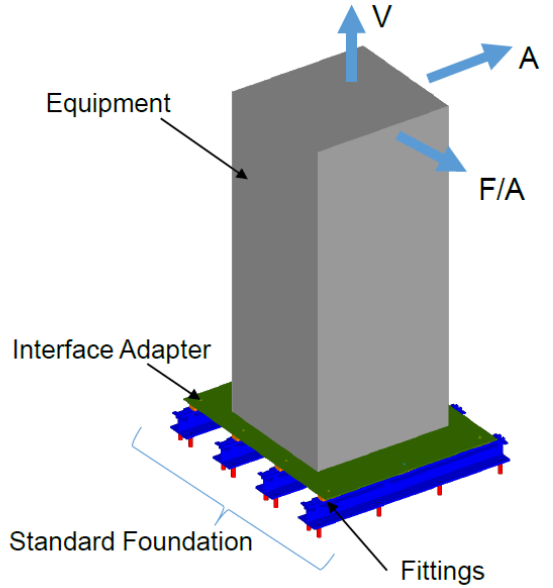
- The project approach for the optimization of a standard foundation design was to utilize the Flexible Infrastructure (FI) Deck Track System



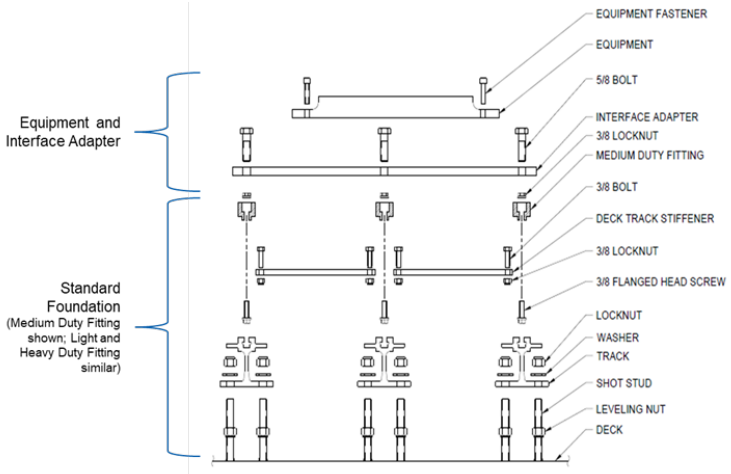
Typical Legacy Foundation vs FI Low Deck Track Concept

Standard Foundation Concept

- FI based standard foundation design will include:
  - Standardized stud and track spacing
  - Method for foundation arrangement
    - Number of tracks, type of fitting, number of fittings, etc.
- Foundation arrangement designed to DDS-072 limit accelerations for surface ship decks
- All FI components are required to stay within elastic material allowables or established allowables from prior shock tests
  - Fitting bolt stresses
  - Deck track stresses
    - Deck track tab shear stresses
  - Track stiffener stresses



Standard Foundation - Stud Mounted & Scalable



Standard Foundation Components

Analysis Tool

- To assess this standard foundation, an Excel spreadsheet tool was developed to automate the process of evaluating the standard foundation for all Class I equipment. The core analysis process of the tool is as follows:
  - Accepts user inputs (equipment size, weight, and center of gravity (CG) information at minimum)
  - Determines a fitting layout configuration based on the inputs (fitting type, number, and locations)
  - Builds the track system under the equipment fitting layout and applies constraints at the stud locations
  - Runs static analysis using fitting loads from vertical, athwartship, and fore/aft shock load cases and outputs both load and stress results for the foundation (tracks, stiffeners, and studs) for each load case

- Utilizing the core analysis process as a base, several functions were created to facilitate the tool's capabilities. These functions are:
  1. Utilize inputs to analyze and evaluate a specific foundation configuration
  2. Utilize necessary/known input parameters to determine an acceptable foundation configuration by iterating track and stud spacing
  3. Creation and evaluation of foundation configuration permutations based on input ranges

Analysis Tool (Cont.)

Combat System Standard Foundation Tool

Permutation, Check, or Iterate?	

Multiple Equipment Check? (I.e. Same Footprint)		

Insert the Following Configuration Values:

Equipment Weight (lbs)	Depth (in)	Width (in)	Vertical CG (in)	Track Spacing (in)	Stud Spacing (in)
Max # of Tracks	**Final # of Fittings**	**Max Possible # of Fittings Along Outer**	**Track Stud Diameter**	**Type of Fitting**	**Fitting Bolt Grade**

After Choosing and Filling Inputs, Click This Button to Run Analysis

To Set/Reset Permutations, Insert the Following Values:

	Equipment Weight (lbs)	Depth (in)	Width (in)	Vertical CG (in)	Track Spacing (in)	Stud Spacing (in)
Range Start						
Range End						
Interval Size						
Exceed # of Range Data Points?						

#1 Calculate Permutations

#2 Run Analysis for Permutations

Check Input Configuration:	
Attachment to Track Acceptable?	
Does Configuration Work?	

Permutation Results:		Number of Configurations:	
Track Stud Diameter Used:		Passing Configurations:	
Passing Configuration Weights:			

Iterate Optimal Config (Less Tracks Prioritized):

Equipment Weight (lbs)	Depth (in)	Width (in)	Vertical CG (in)	Track Spacing (in)	Stud Spacing (in)	# of Tracks	# of Fittings	Max Possible # of Fittings Along Outer Tracks	Type of Fitting	Fitting Bolt Grade

User Input Flow Chart

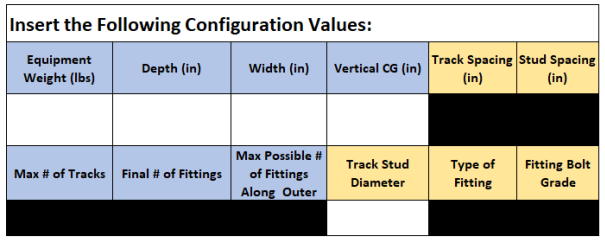
General Configuration

Analysis Tool Steps

Step 1: User Inputs

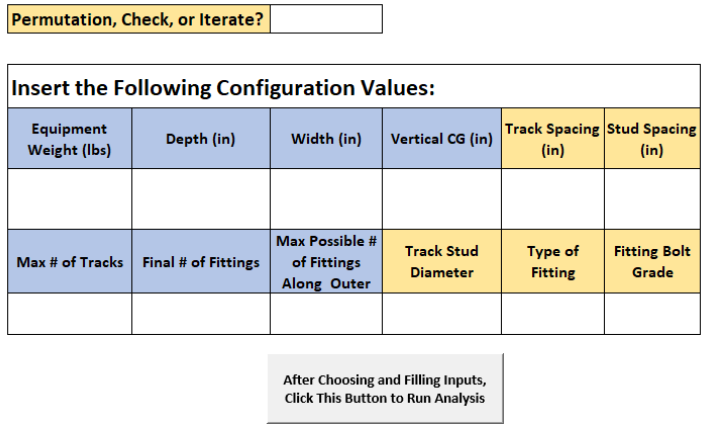
- User chooses Permutation, Check, or Iterate. This will decide what inputs are required:
  - Permutation – Permutation Input Section range start, range end, and interval sizes for equipment weight/size/CG as well as track and stud spacing
  - Check – All Input Section inputs
  - Iterate – Equipment weight/size/CG and track stud diameter inputs (see upper right)

- Once inputs have been entered, pressing the buttons will send the input information to the first calculation to start the analysis



Insert the Following Configuration Values:					
Equipment Weight (lbs)	Depth (in)	Width (in)	Vertical CG (in)	Track Spacing (in)	Stud Spacing (in)
Max # of Tracks	Final # of Fittings	Max Possible # of Fittings Along Outer	Track Stud Diameter	Type of Fitting	Fitting Bolt Grade

Inputs Requested with Iterate Selected

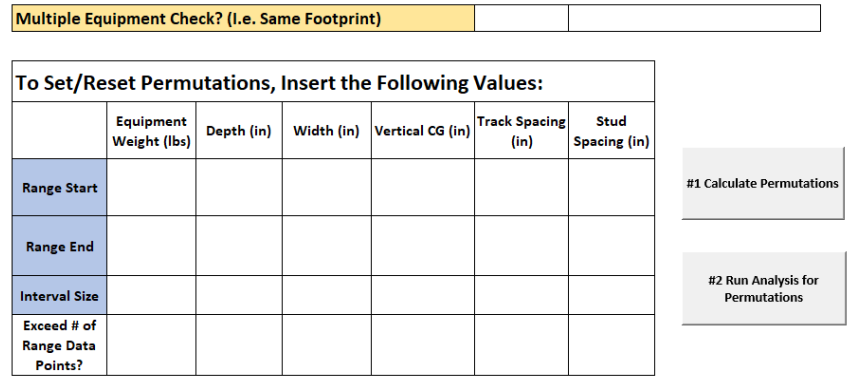


Permutation, Check, or Iterate?	

Insert the Following Configuration Values:					
Equipment Weight (lbs)	Depth (in)	Width (in)	Vertical CG (in)	Track Spacing (in)	Stud Spacing (in)
Max # of Tracks	Final # of Fittings	Max Possible # of Fittings Along Outer	Track Stud Diameter	Type of Fitting	Fitting Bolt Grade

After Choosing and Filling Inputs, Click This Button to Run Analysis

Input Section



Multiple Equipment Check? (I.e. Same Footprint)		

To Set/Reset Permutations, Insert the Following Values:						
	Equipment Weight (lbs)	Depth (in)	Width (in)	Vertical CG (in)	Track Spacing (in)	Stud Spacing (in)
Range Start						
Range End						
Interval Size						
Exceed # of Range Data Points?						

#1 Calculate Permutations

#2 Run Analysis for Permutations

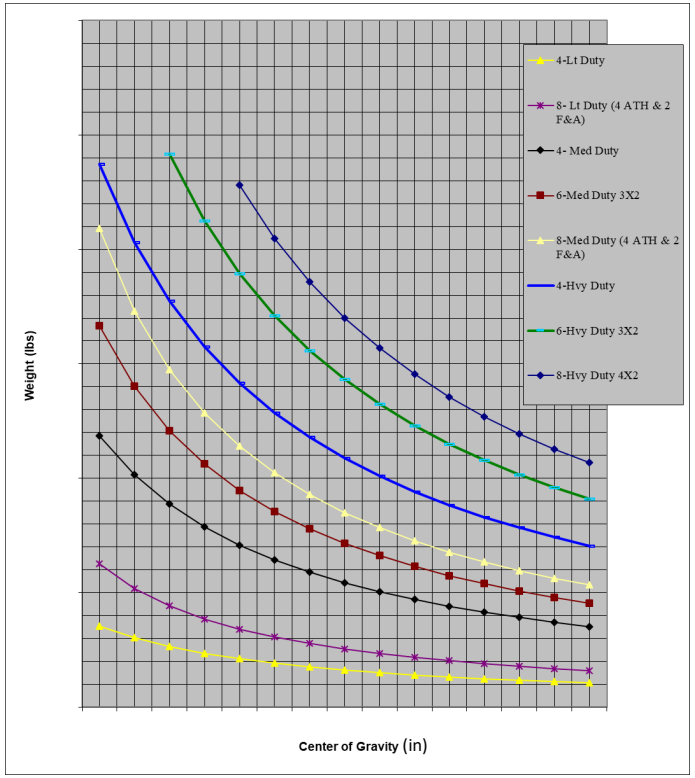
Permutation Input Section

Analysis Tool Steps (Cont.)

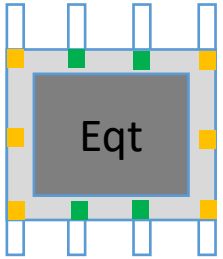
Step 2: Adapter Plate and Fitting Layout

- Determines Adapter Plate details:
  - Size of plate is 8in longer than both equipment width and depth
  - Default material is steel and default thickness of 0.25in

- Determines Fitting Layout details:
  - Fitting spacing span along track is 4in longer than equipment width/depth
  - Fitting spacing between end tracks is 4in longer than equipment width/depth and rounded up to match standard track spacing
  - Number of fittings is determined by nomograph and are placed on outer tracks (yellow) with additional fittings added on the ends of the inner tracks (green) for a more distributed mounting arrangement pattern



Sample Nomograph



Sample Fitting Configuration

Analysis Tool Steps (Cont.)

Step 3: Bolt and Track Tab Check

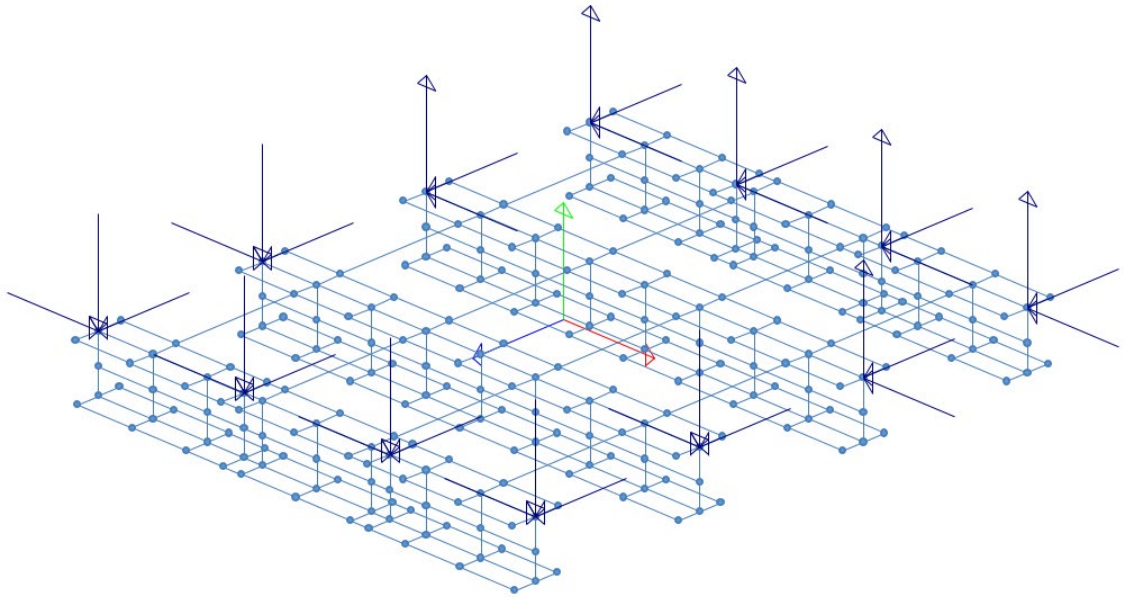
- With fitting locations set, tool performs a bolt pattern analysis to determine the loads and stresses at each fitting location for each shock direction using DDS-072 limit accelerations for surface ship decks

- Equipment bolt, Fitting bolt, and track tab stresses are then evaluated against their corresponding allowable stresses. If any stresses are determined unacceptable, tool stops analysis of track configuration and alerts user to adjust input parameters. If stresses are acceptable, tool moves to step 4

Analysis Tool Steps (Cont.)

Step 4: Build Beam Representation

- To analyze the track configuration, a beam model representation is created
  - The track cross section is divided into individual sections to ensure the loading at the top of the track properly paths to the base of the track
- This is done by utilizing information from steps 1-3 to create:
  - Coordinate points (joints)
  - Connections between joints (members)
- Furthermore, the tool places the previously calculated fitting loads at the fitting locations for each shock direction in preparation for analysis of the track configuration



Example Tool Beam Model Representation

Analysis Tool Steps (Cont.)

Step 5: Analysis & Results Evaluation

- The beam representation that was created is then used to perform a static analysis in each shock direction

- Each shock direction analysis outputs the following results:
  - Joint displacements
  - Member end loads (forces and moments)
  - Stud joint reaction loads (forces and moments)

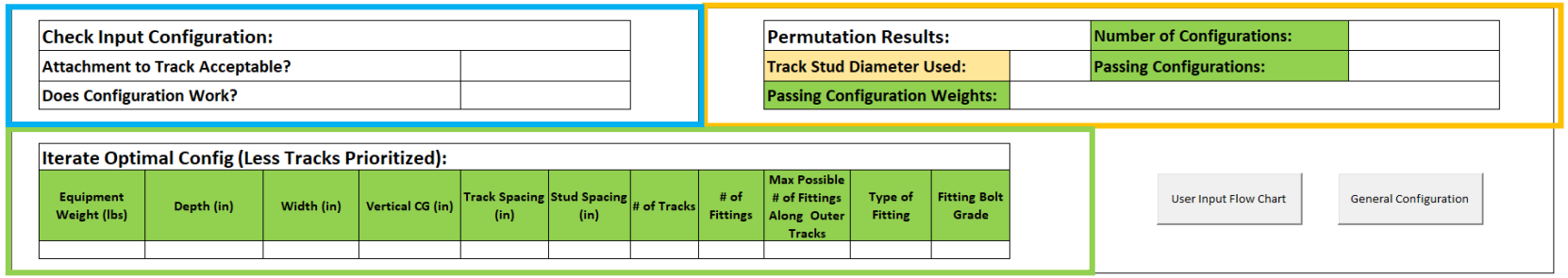
- The analysis results are then utilized to calculate and evaluate the maximum stresses of the studs and stiffeners. In addition to the calculated data, the maximum bolt and track tab stresses as well as other relevant data is recorded for the analyzed configuration

- Then, depending on the user choice in step 1 (Permutation, Check, or Iterate), the corresponding information will be outputted (see next slide)

Analysis Tool Steps (Cont.)

Step 5: Analysis & Results Evaluation (Cont.)

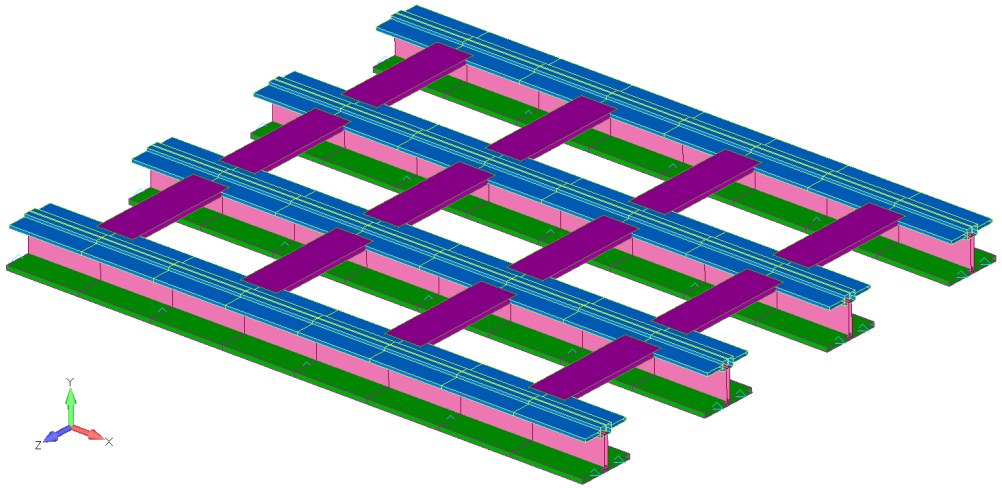
- For Permutation, output consists of: the number of total configurations, the number of passing configurations, as well as the passing configuration equipment weights. Configuration output information is dependent on selected stud diameter (yellow)
- For Check, output consists of does configuration pass the initial bolt/tab evaluations and if so, the check of whether the configuration passes step 6 evaluations. If either output shows unacceptable, the user will be notified and instructed to adjust inputs
- For Iterate, output consists of the passing configuration iteration with least number of tracks prioritized. If none of the iterated configurations pass, the user will be notified and instructed to adjust inputs



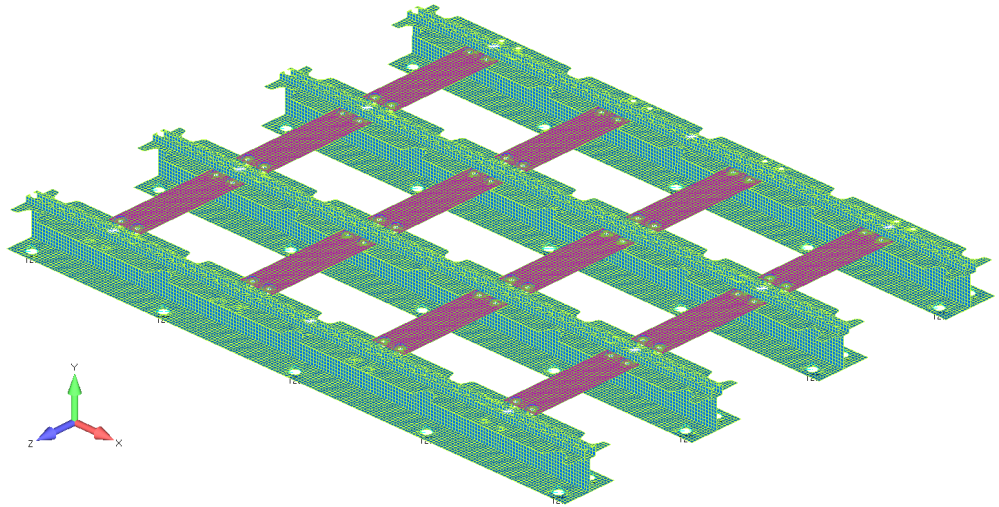
Output Sections

Tool Verification

- Verification Models:
  - Beam model - a mirror of the tool's beam element representation for value agreement verification of the tool results
  - Thin shell model - a more realistic representation for value accuracy verification of the tool results



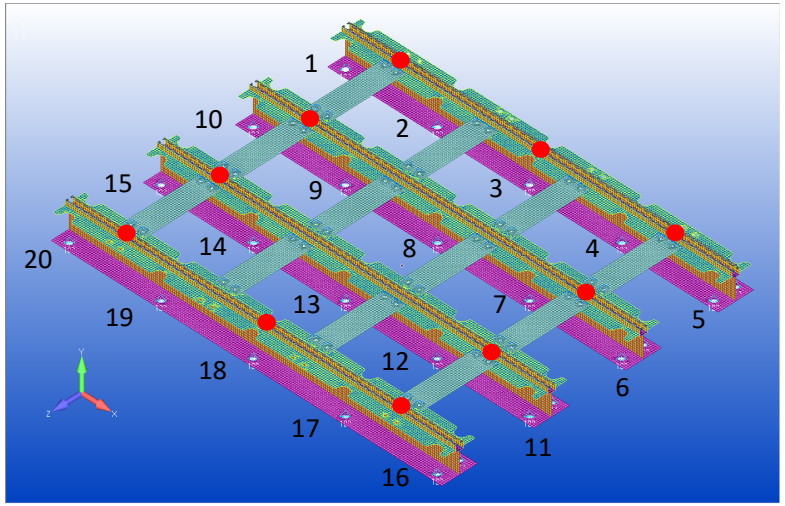
Sample FEA Beam Model



Sample FEA Thin Shell Model

Tool Verification (Cont.)

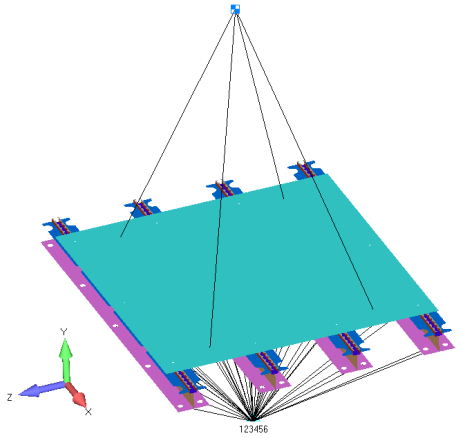
- Constraint pair resultant load results between the beam model and the tool had near perfect agreement
- Constraint pair resultant load results between the thin shell model and the tool had fair agreement with the tool results being more conservative than the thin shell model results for a majority of the constraint pairs

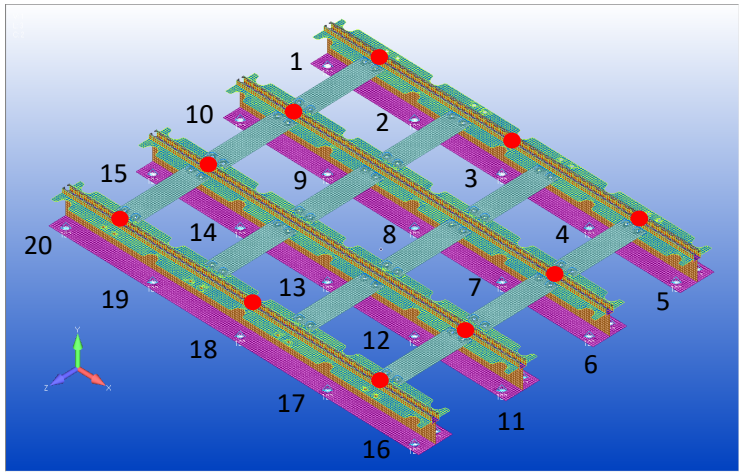


Note: Red Dots are Fitting Locations while Numbers Correspond to Stud Constraint Pairs

DDAM Comparison

- In addition, also checked that it is acceptable to use the tool's static analysis results in lieu of typical FEA DDAM
- The comparison of the constraint pair resultant load DDAM results between the thin shell model and the tool show the tool results being more conservative than the thin shell model results for the constraint pairs





Note: Red Dots are Fitting Locations while Numbers Correspond to Stud Constraint Pairs

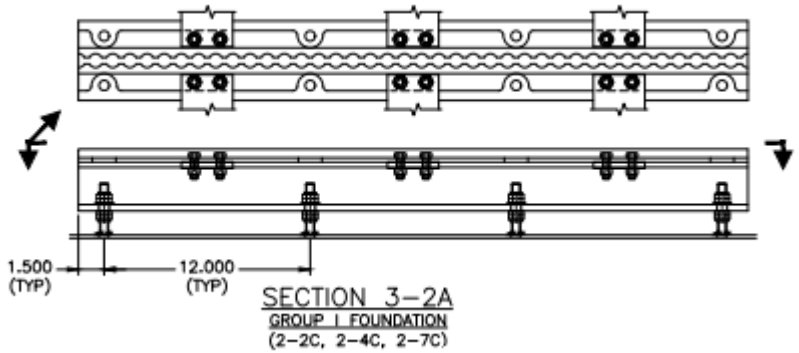
Standard Foundation Guidance Drawing

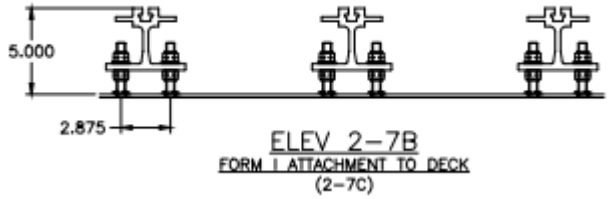
Standard Foundation Guidance Drawing

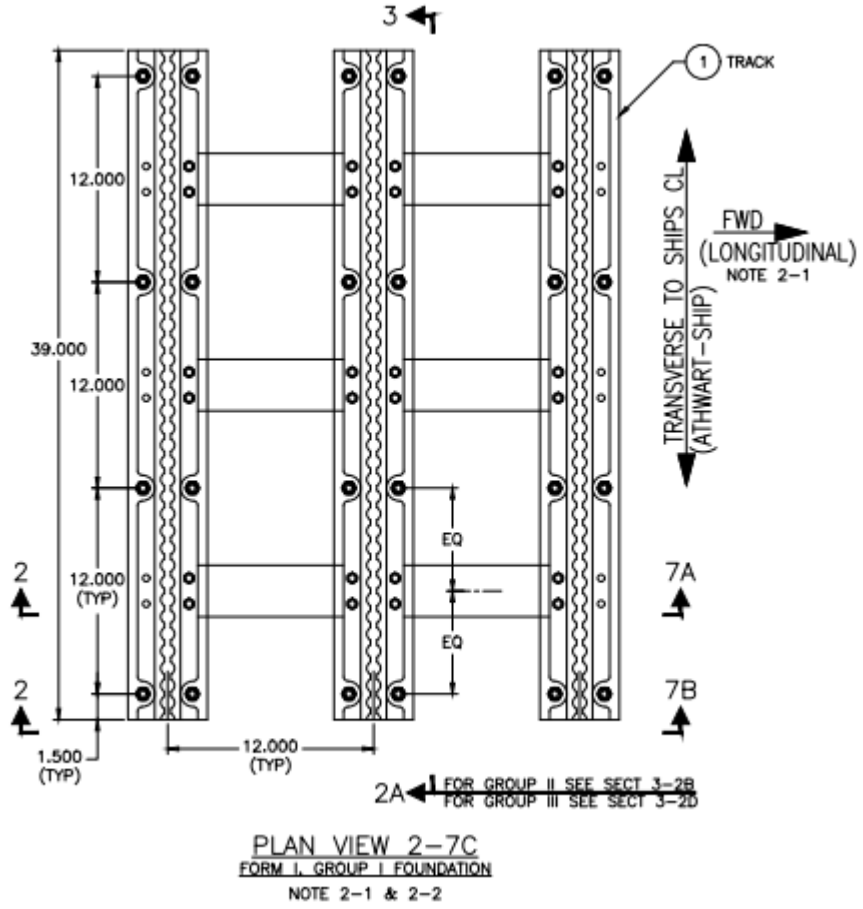
- Purpose:
  - The purpose of the Standard Foundation Guidance Drawing is to provide guidance to Design Agents developing standard foundations in accordance with this NSRP project. This drawing provides manufacturing details for standard foundation components as well as configuration guidance to ensure all previous approvals are maintained in the design process
- Approach:
  - Configure the Standard Foundation Guidance Drawing to reflect the established design criteria of the Analysis Tool for standard foundations:
    - Deck Track profile to profile spacing defined as = 12", 9" or 6" and reflected on drawing as Form I, Form II or Form III foundation respectively
    - Deck Track mounting stud to stud spacing defined as 12", 9" or 6" and reflected on the drawing as Group I, Group II or Group III deck track respectively
    - Deck Track mounting stud diameter defined as ¾" Dia. or 9/16" Dia.
    - Deck Track Stiffener size determined by Track Form and defined in Deck Track Stiffener Table 5-4F

Standard Foundation Guidance Drawing

- Configuration: Form I Group I Standard Foundation
  - Deck Track configured in the athwartship direction
  - Deck Track spaced 12" apart profile to profile
  - Deck Track mounting studs spaced 12" apart
  - Deck Track Stiffeners centered between mounting studs
  - Deck Track manufacturing details included in drawing

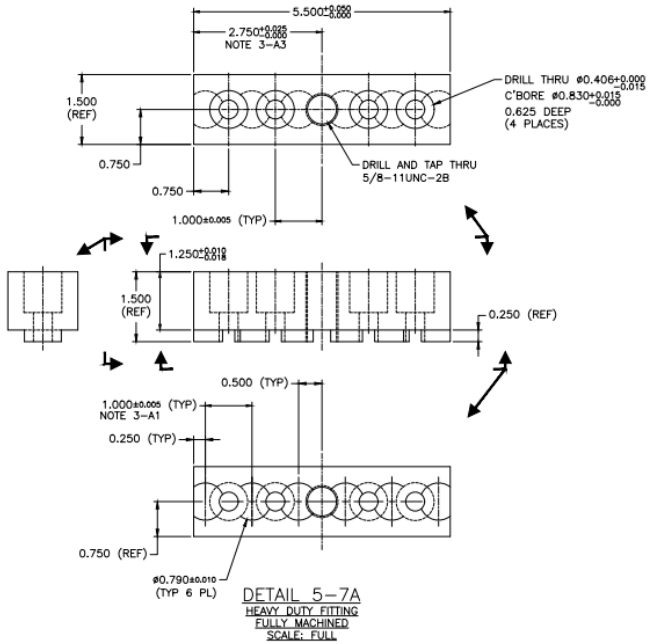




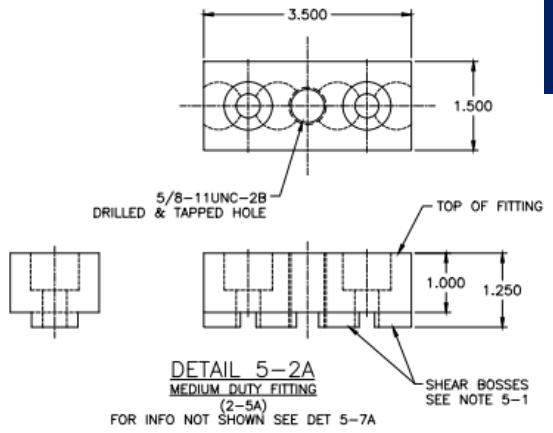


Standard Foundation Guidance Drawing

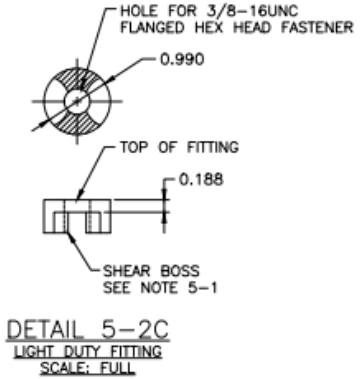
- Standard Foundation Components:



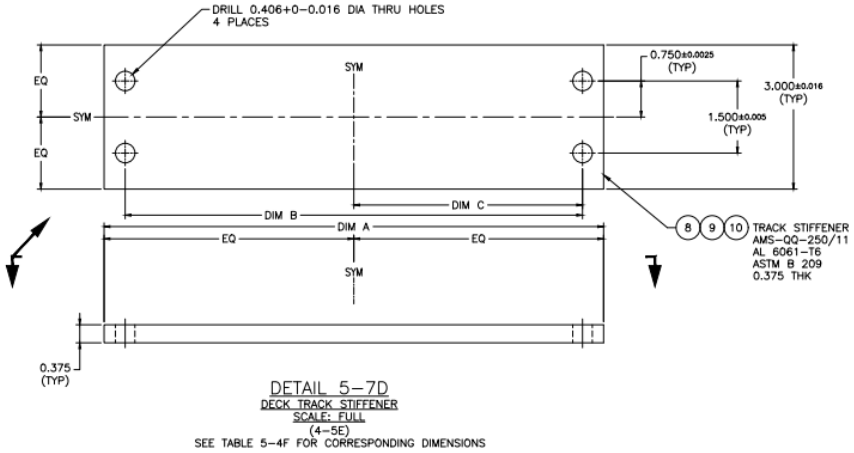
Heavy Duty Fitting



Medium Duty Fitting



Light Duty Fitting



Deck Track Stiffener

Standard Foundation Project Tasks

- Conduct structural and shock analyses on various combat systems standard foundation solutions (Complete)
- Down-select a combat systems standard foundation solution based on the analyses results and define its not-to exceed parameters (Complete)
- Collaborate with the Government Technical Community to determine the Objective Quality Evidence (OQE) required for cross-platform approval of the chosen standard foundation solution, and implement this process as part of the design and analysis tool to be developed (Submitted for Review)

Standard Foundation Project Tasks (cont'd)

- Develop a user-friendly tool for the Design Agents that defines the optimal standard foundation layout for each piece of equipment and associated materials that meet the applicable shipboard foundation requirements (Submitted for Review)
- Develop a standard foundation guidance drawing that optimize the materials and details for the chosen standard foundation solution (Complete)
- Report results to NSRP members (On-Going)

Discussion / Questions

NEWPORT NEWS SHIPBUILDING
A DIVISION OF HII

NSRP
NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

MCI Alternate Deck Wear Surface Evaluation and Qualification

NSRP – MCI Alternate Deck Wear Surface Evaluation & Qualification February 27, 2025

NEWPORT NEWS SHIPBUILDING
A DIVISION OF HII

Harold Howard - Newport News Shipbuilding

James Desing – Milwaukee Composites Inc.

Milwaukee Composites Inc. (MCI) Alternate Wear Surface Evaluation & Qualification

- Integrated Project Team:
  - Lead – HII-Newport News Shipbuilding:
    - Harold Howard
    - Ify Amene
    - Jolene Garner
    - Madelyn Mendenhall
  - Contractor – Milwaukee Composites Inc.
    - James Desing
    - Brian Latz
  - Participants – HII-Ingalls Shipbuilding:
    - James Breakfield
    - Ronald McClellan
  - NAVSEA O5P2
    - David Owen
    - Luis Moreno
  - Program Technical Representative
    - Perry Haymon – HII-Ingalls Shipbuilding

Project Background

- False decks and raised walking platforms are utilized extensively on all classes of Navy ships. The false decking provides:
  - Personnel access to machinery or systems for maintenance and inspection
  - Walking platform over through services routed above the true deck

- Traditionally, Combat Systems spaces utilize false decks with Electric Grade Sheet (EGS) deck coverings to meet dielectric requirements in accordance with ship specifications
  - The EGS most often used is Lonmat

- Lonmat is used on Navy Platform today because it meets the dielectric requirements of MIL-DTL-15562, however, deck panel suppliers have experienced the following issues with Lonmat:
  - Procurement cost increases
  - Color/gloss inconsistencies
  - Growing lead-times
  - Material weight = 1.0 lbs./sq. ft.

Background (Cont.)

- ManTech Project S2723 (False Deck Panel Improvement) successfully implemented two new deck panels:
  - Aluminum Honeycomb core with a Lonmat wear surface
  - Phenolic Infused Balsa Wood core with a Lonmat wear surface

- Note, both new panels utilize a Lonmat wear surface, as no new wear surface material was identified in the above ManTech project
  - Multiple new wear surfaces were tested with none passing the requirements for shipboard use

Project Purpose

- This project is evaluating the new MCI wear surface as an alternative to Lonmat and pursuing the following advantages:
  - Reduce cost
  - Improve material availability
  - Reduce overall weight of raised deck panels
  - Provide the capability to color match existing wear surface
  - Capability to repair vs. replace

- Weight reduction offered by MCI Tough Coat moves the subject panel to areal weight 1 IAW MIL-PRF-32664
  - Areal Weight 1 – for lightest deck panels where weight is most critical
  - Raised decks are often higher in the ship where weight is most critical

Project Tasks

- Project Tasks:
  - Collaborate with NAVSEA stakeholders to address all concerns necessary to gain Navy Shipboard approval
  - Fabricate test articles and perform material testing IAW MIL-PRF-32664, and document test results with NAVSEA
  - Perform a small scale demo to evaluate the material under foot-traffic and panel modification
    - HII Newport News Shipbuilding & HII Ingalls Shipbuilding will evaluate panels in a shipboard/ Laboratory environments
    - MCI will fabricate 10-3/8" X 24" (FI) panels and 27" x 50" panels for shipyard evaluation

Project Status

- Current Status:
  - The IPT has engaged with NAVSEA O5P2 (TWH Materials - Non-Metallic - Ships) to determine the Objective Quality Evidence (OQE) necessary to approve the new MCI wear surface for shipboard use

    - Engage NAVSEA O5P5 (TWH – Fire Protection Systems - Ships) upfront to address Fire/ Smoke/ Toxicity (FST) requirements as these requirements will prove to be the most challenging to meet from a shipboard approval standpoint

  - NAVSEA O5P5 (TWH – Fire Protection Systems - Ships) provided the IPT with the following direction to produce OQE that meet FST requirements for shipboard approval:

    - the novel wear surface provides equivalent or better performance when compared to Material ID 1929 and/or the test standard (e.g., 32664) *(Front-Side)*
    - verify that the increased balsa core thickness does not exacerbate the already high CO and IDLH index values measured in previous testing. *(Back-Side)*

Project Status

Description	Test Method		Fire Parameter	MIL-PRF-32664 Limits and IDLH Limits Criteria	Phenolic Infused Balsa Core With Tough Coat Wear Surface (Front) Passed?	Phenolic Infused Balsa Core With Tough Coat Wear Surface (Back) Passed?
Flame Spread	ASTM E162		Flame Spread Index (I_s)	25 (max)	Yes	Yes
			Melting / Dripping / Flaming Droplets	Not allowed	No	Yes
Smoke Density	ASTM E662		Maximum Smoke Density, Ds (non-flaming/flaming)	200 (max)	Yes	Yes
			Melting / Dripping / Flaming Droplets	Not allowed	Yes	Yes
Toxicity	ASTM E800	CO	*Non-Flaming*	MIL PRF is 600 ppm IDLH limit is 1200	Yes	Yes
			Flaming		Yes	Yes
		CO_2	*Non-Flaming*	IDLH limit is 40,000 ppm	Yes	Yes
			Flaming		Yes	Yes
		HCN	*Non-Flaming*	MIL PRF is 30 ppm, IDLH limit is 50 ppm	Yes	Yes
			Flaming		Yes	Yes
		HCl	*Non-Flaming*	MIL PRF is 30 ppm, IDLH limit is 50 ppm	Yes	Yes
			Flaming		Yes	Yes
		NO_2	*Non-Flaming*	IDLH limit is 13 ppm	Yes	Yes
			Flaming		Yes	Yes
		H_2S	*Non-Flaming*	IDLH limit is 100 ppm	Yes	Yes
			Flaming		Yes	Yes
		HF	*Non-Flaming*	IDLH limit is 30 ppm	Yes	Yes
			Flaming		Yes	Yes
		SO_2	*Non-Flaming*	IDLH limit is 100 ppm	Yes	Yes
			Flaming		Yes	Yes
Immediately Dangerous to Life or Health	IDLH (MIL-PRF-32664	I_{IDLH}	*Non-Flaming*	< = 1.0	Yes	Yes
			Flaming		Yes	Yes

Fire Smoke Toxicity Test Results

Project Status

- MCI continues to optimize the production process in manufacturing test coupons to meet the requirements of MIL-PRF-32664 (False Deck Panels, Composites);
  - Screeding production process
  - Injection molding production process

- HII-Newport News Shipbuilding and HII-Ingalls Shipbuilding will determine if there are any concerns with modifying the new panels utilizing standard shipyard tools and practices.
- Both shipyards will perform a small scale demo to fully evaluate the new material in industrial environments and during shipboard operations

MEET MILWUAKEE COMPOSITES INC.

Milwaukee Composites

Designed For Life

MANUFACTURER OF ADVANCED PHENOLIC COMPOSITE PANELS FOR THE MASS TRANSIT INDUSTRY

WHO ARE WE?

We are an engineering focused company who is committed to providing innovative products

WHERE ARE WE LOCATED?

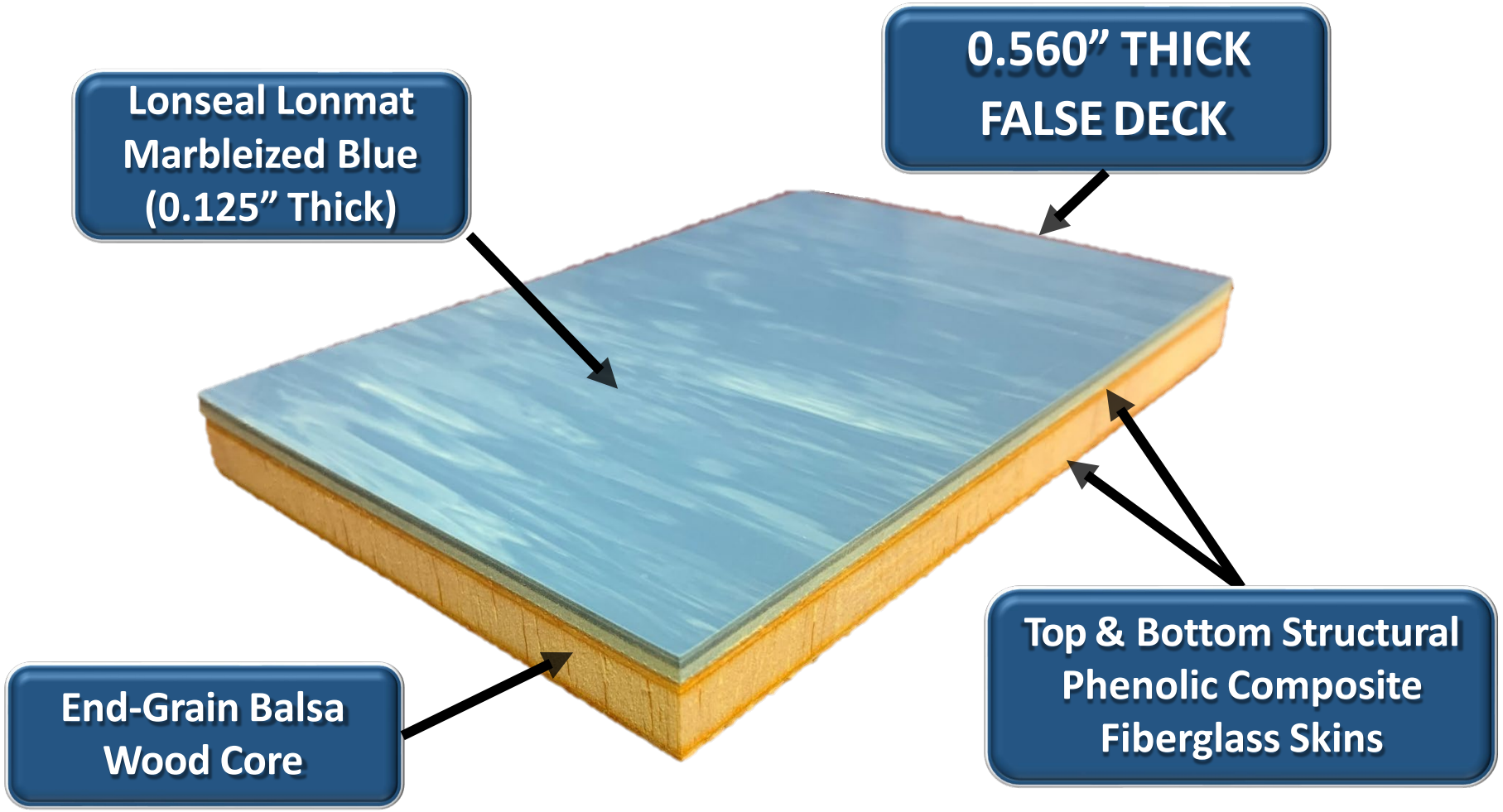
Headquarters:

* Cudahy, WI
* 140,000 ft² (13,000 m²) Facility
* (95) Employees
* ISO 9001: 2015

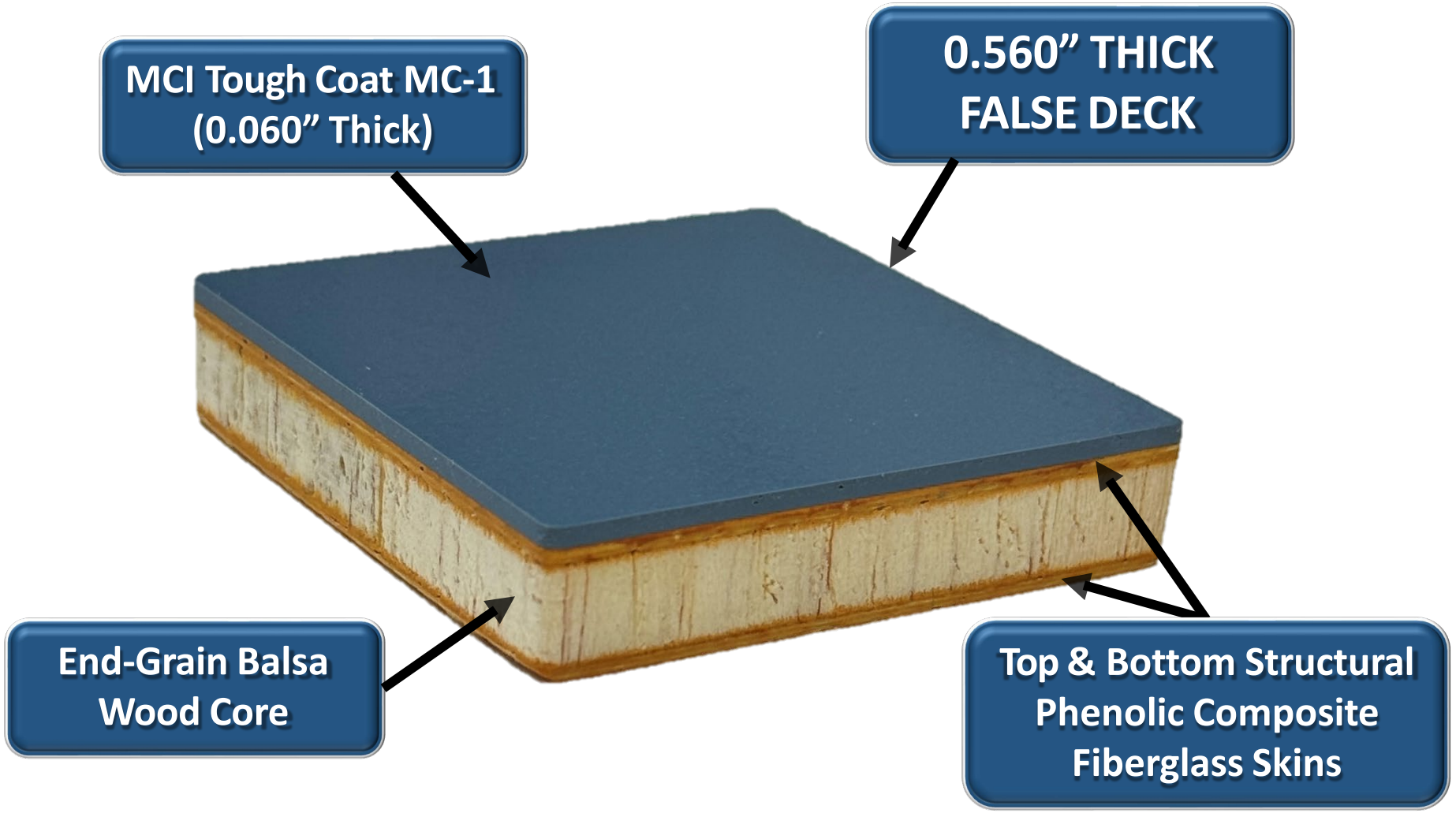
Representation:

- India: Ashok Joshi
- Japan: GSI Creos
- China: James Chen
- Europe: Ian Duffy
- S. Korea: Choi Byung Cheon

CURRENT PHENOLIC COMPOSITE PANEL CONSTRUCTION



PROPOSED PHENOLIC COMPOSITE PANEL CONSTRUCTION



FALSE DECK COMPARISON

Current Lonmat:

* Total Deck Thickness: 0.560”
* Phenolic Panel Thickness: 0.400”
  - Skin Thickness: 0.050”
  - Balsa Thickness: 0.300”
* Lonmat Thickness: 0.130”
* Adhesive Thickness: 0.030”
* Process: Compression Molding
* Areal Weight 2: 2.44 lb/ft^2
* Lonmat Lead-time: 12-14 weeks
  - Produced in Japan

Proposed Tough Coat:

* Total Deck Thickness: 0.560”
* Phenolic Panel Thickness: 0.500”
  - Skin Thickness: 0.050”
  - Balsa Thickness: 0.400”
* MCI Coating Thickness: 0.060”
  - Includes 0.005” Primer
* Process: Compression Molding
* Areal Weight 1: < 1.84 lb/ft^2
* Coating Lead-time: 2-3 weeks
  - US Materials / Processed by MCI

APPLICATION OF NEW COATING

Manufacture of Test Coupons and Serial Production:

* Panel production: The composite panels will be produced using the same compression molding process.

* Mixing of materials: During the trials, MCI found it necessary to invest in a custom variable ratio meter mix system in order to accurately mix and dispense the liquid components (resin/iso).

APPLICATION OF NEW COATING

Manufacture of Test Coupons and Serial Production:

* Application of Materials: MCI originally planned to use a "screeding" process for applying the material. Although it worked well for small coupons, it was determined to not be consistent for larger panels. MCI switched to an injection process that is extremely reliable and repetitive. MCI invested in tooling (18" x 50" and 27" x 50") for production of the test coupons for the NSRP. Upon approval of the coating, MCI will invest in larger tooling (50" x 102") for serial production.

PROJECT GOALS & OBJECTIVES

*Cost Reduction: the cost of the new materials and processing could offer a cost reduction

*Weight Reduction: the reduced thickness of the coating (vs Lonmat) will allow M meet the requirements for Areal Weight 1

* Decreased Lead-Time and US Production

*Repairability: the new coating can be repaired easily by sanding the damaged ar re-applying the coating without removing the panel

OVERVIEW OF TESTING

MCI's phenolic false deck with MCI Tough coat will conform to MIL-PRF-32664 with the following testing:

#	Test	Test Standard	Test Results
1	Dielectric	MIL-DTL-15562G, paragraph 4.6.11	Pass
2	Voltage	MIL-DTL-15562G, paragraph 4.6.10	Need to test (Dielectric test more severe)
3	Flame	ASTM E162	Fail; Modified formula to be tested
4	Smoke (Optical Density)	ASTM E662	Pass
	Toxicity (Flame and Non)	ASTM E800 (flaming and non-flaming)	Pass
5	Moisture Absorption	ASTM D570	Passed In-House Testing
6	Resistance to Cleaning Agents	MIL-PRF-32170	Need to test
7	Heat and Light Resistance	ASTM F1514 and ASTM F1515	Need to test
8	Light Reflectance	ASTM D523	Need to test
9	Wear Resistance	ASTM D4060	Fail; Currently reviewing fillers
10	Impact Resistance	ASTM D7766, Procedure C	Passed In-House Testing
11	Slip Resistance: 1. Leather Shoe, Dry 2. Rubber Shoe, Wet & Dry	ASTM D2047	1. Equivalent to Lonmat 2. Pass
12	Rolling Load Resistance	CISCA - recommended test procedure for access floors	To be tested after FST (flame, smoke, toxicity), Dielectric, Friction and Wear Resistance. Note: a thicker base panel will provide better mechanical performance than existing panel.
13	Short Beam Shear Strength	ASTM C393, Three Point Bend	
14	Long Beam Flexure	ASTM D7249, Four Point , 1/4 span	
15	Sandwich Compression Strength	ASTM C365	
16	Edgewise Compression Strength	ASTM C364	
17	Flatwise Tensile Strength	ASTM C297	
18	Maximum Panel Deflection Form 1	per MIL-PRF	
19	Maximum Panel Deflection Form 2	per MIL-PRF	
20	Shock Testing (current and proposed panel)	per MIL-PRF	Need to test

STRENGTHS / BENEFITS

- 27 years supplying the global transit industry
- Passionate about innovation
- Maintenance-free Products
- Lightweight
- No corrosion or delamination
- Highest level of fire safety

Discussion / Questions

NEWPORT NEWS SHIPBUILDING
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Taking Shipbuilding and Repair to the Next Level

Performance Improvement for 25Hz DSSM Spring Tray - Findings

PERFORMANCE IMPROVEMENT FOR 25HZ DSSM SPRING TRAY

SWSI Panel Meeting

February 27, 2025

Michael Talley, DSc.

Associate Technical Fellow, Shock and Vibration

Newport News Shipbuilding, A Division of HII

NEWPORT NEWS SHIPBUILDING
A DIVISION OF HII

Opportunity for Panel Project

- MIL-DTL-901E permits heavyweight qualification testing of class II deck mounted items having 18Hz < SRF <= 37Hz on a deck simulator fixture (DSF) tuned to target frequency of 25 Hz (±4 Hz) in the vertical direction
- MIL-DTL-901E currently limits DSSM testing of surface ship class II deck mounted items having 4Hz <= SRF <= 10Hz
- Testing of class II deck items with SRFs>18Hz in the deck simulating shock machine (DSSM) instead of heavyweight testing on a DSF can result in a savings of ~$60K per qualification
- 2015 data showed that the DSSM without class II items can be tuned to a target frequency of ~22Hz
- Limited data exists for DSSM testing of class II items with SRFs>18Hz

Panel Project and Participants

- A 2023/24 NSRP panel project was awarded in to investigate how to reach higher DSSM target frequencies for testing class II items having SRFs>18Hz

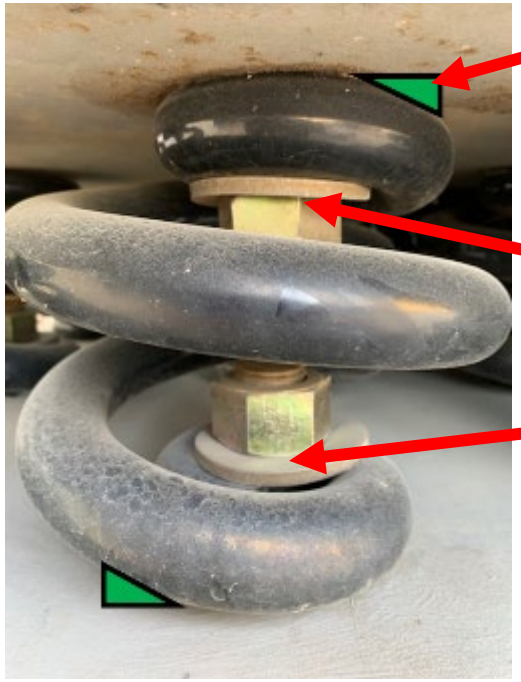
- Participants:
  - Lead: HII-NNS, Michael Talley, D.Sc.
  - NTS (now Element), Calvin Milam and NAVSEA 05P1, Tom Brodrick

- Two approaches considered:
  - Reduce flexibility in the spring connections and evaluate responses of higher frequency class II items in the DSSM
  - Reduce clearances in the tray latching mechanism

- Work performed:
  - Design, fabrication, installation, and testing of custom-machined fitted washers and shims and a simulated class II item with adjustable SRFs>18Hz
  - Evaluate play in latches and develop concepts for a latch adjustment mechanism

Summary of Methods and Procedures

<u>One of the 64 DSSM 25Hz tray springs is shown below</u>



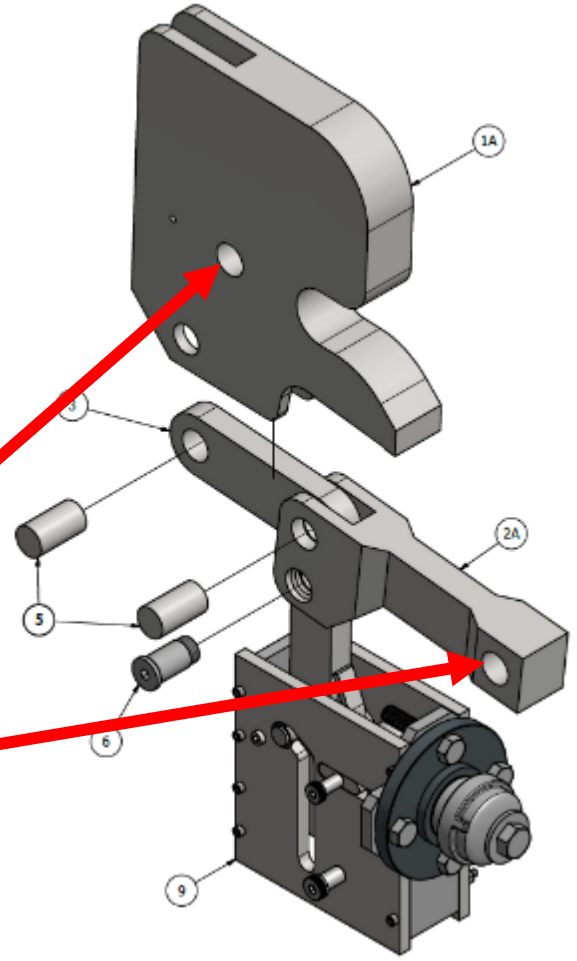
Design, fabricate, and install custom shims (top and bottom) to reduce active spring coils.

Design, fabricate, and install thicker and wider custom machined fitted washers to replace existing washers shown here.

Perform tests with shims and washers and simulated class II item with adjustable SRFs>18Hz.

Develop concepts for an adjustment mechanism for latch links that will achieve optimum latch grip for all spring trays.

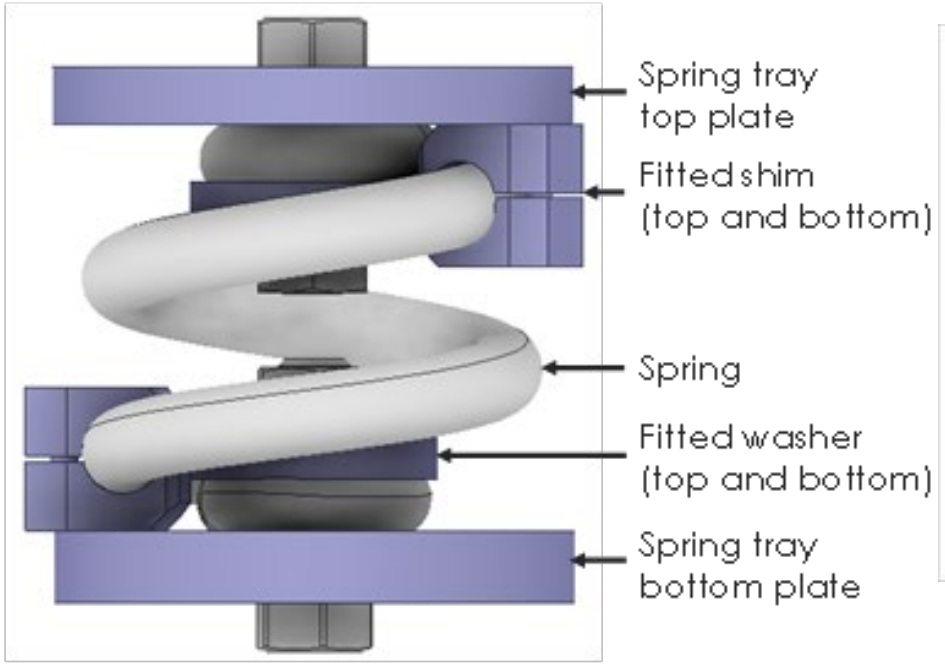
<u>Latch mechanism is shown below</u>



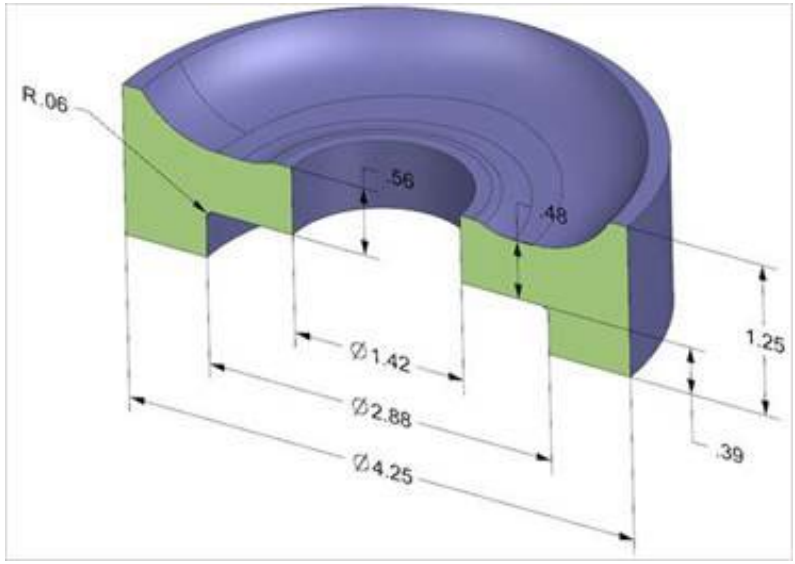
Existing Spring Constraint

Existing washer
(top and bottom)

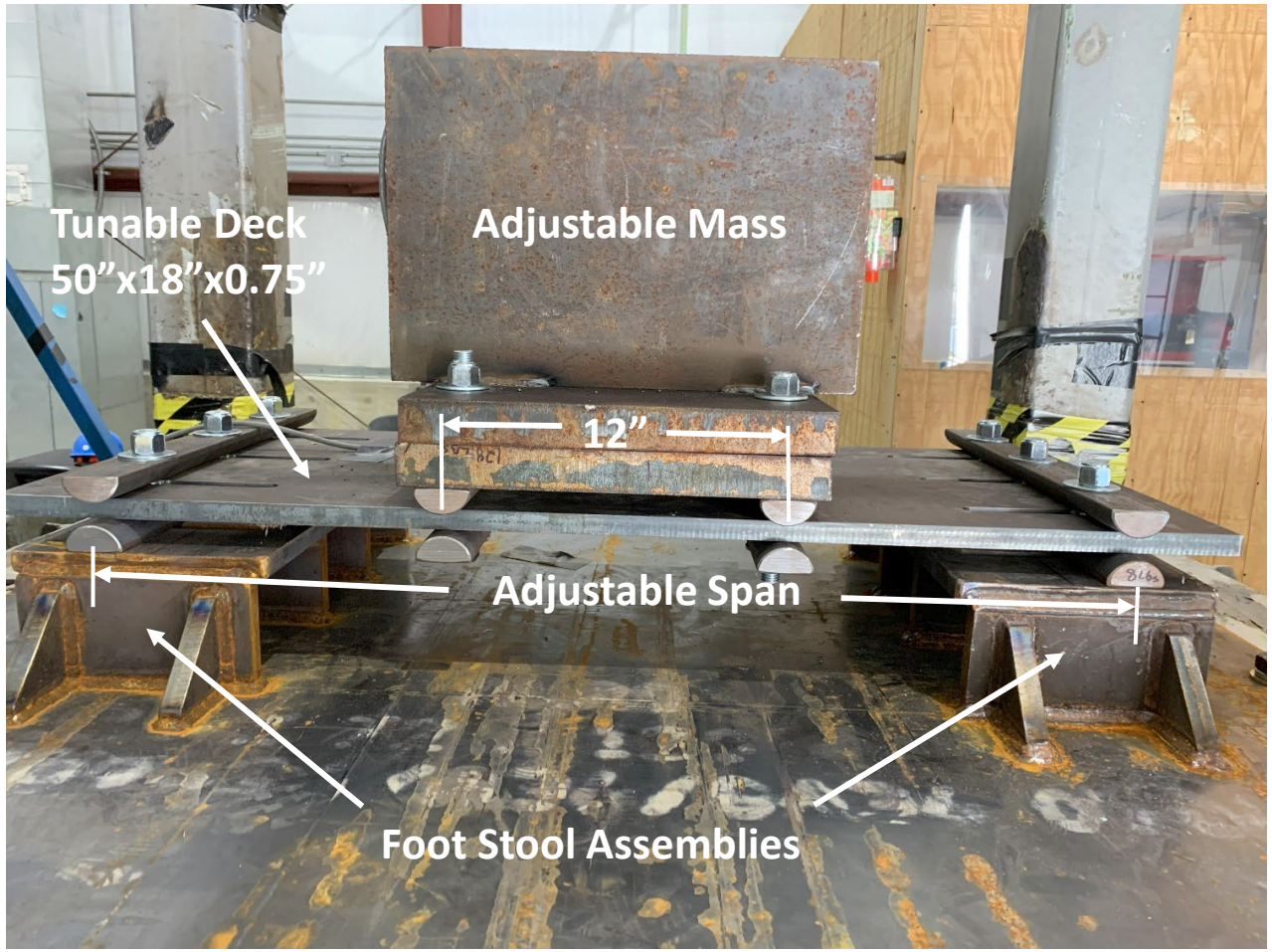
New Spring Constraint



Section view of fitted washer



Class II Item with Adjustable SRFs>18Hz

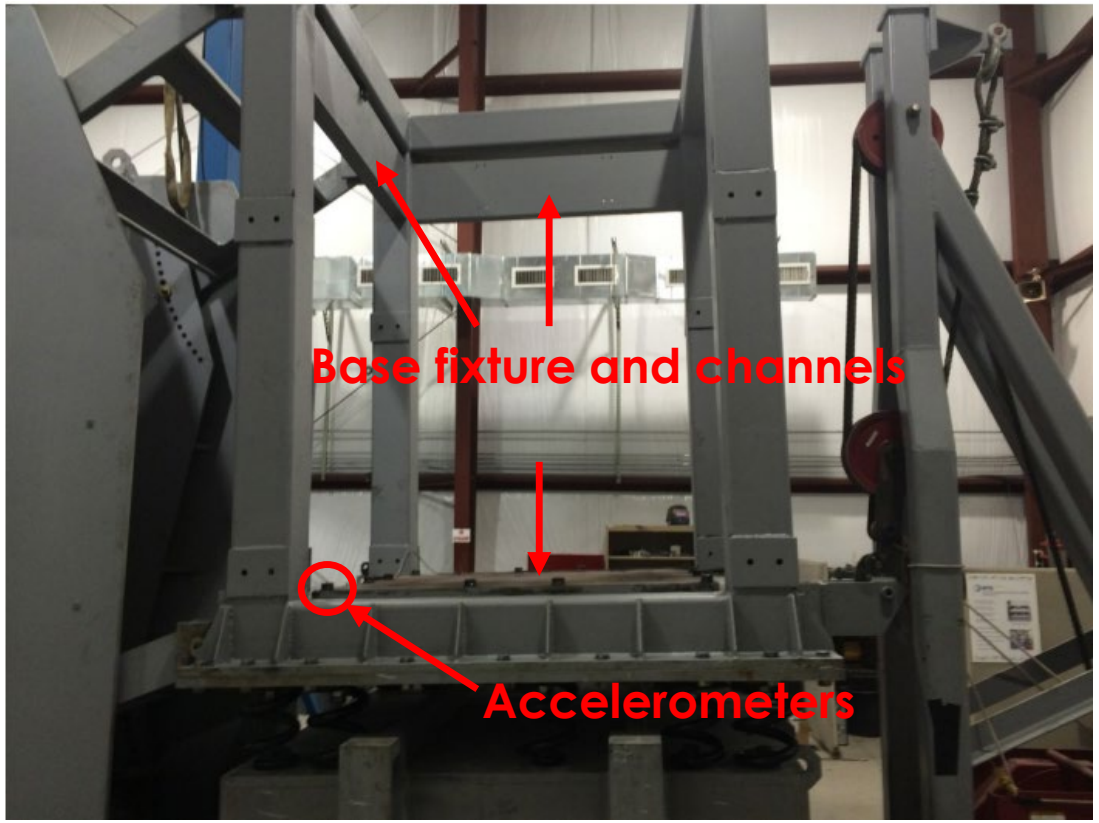


DSSM with 25Hz Spring Tray and Adjustable Class II Item installed

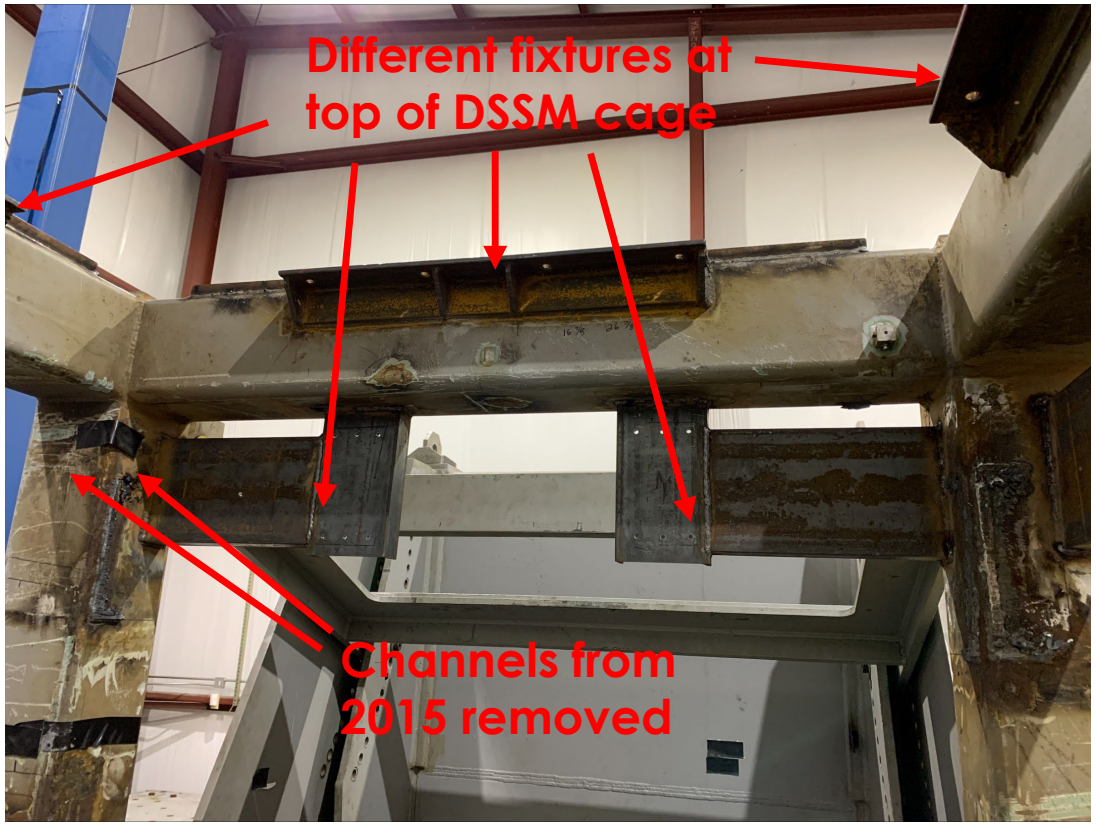
Baseline Tests Fixture Differences: 2015 vs 2024

Case	Fixture Wt. (lbs)
Baseline washers 2015	1,485
Baseline washers 2024	1,561

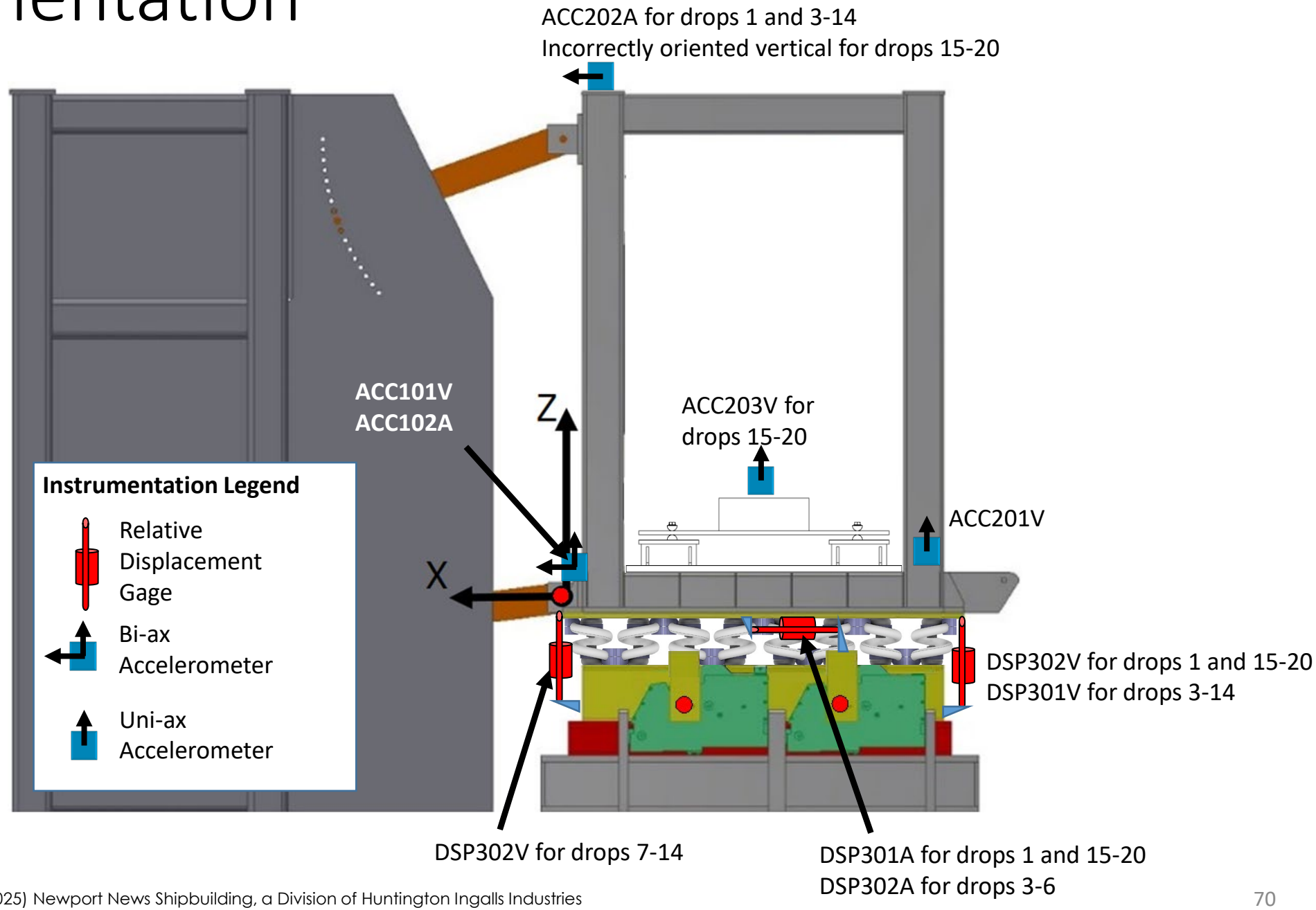
DSSM 2015 validation testing



DSSM 2024 testing



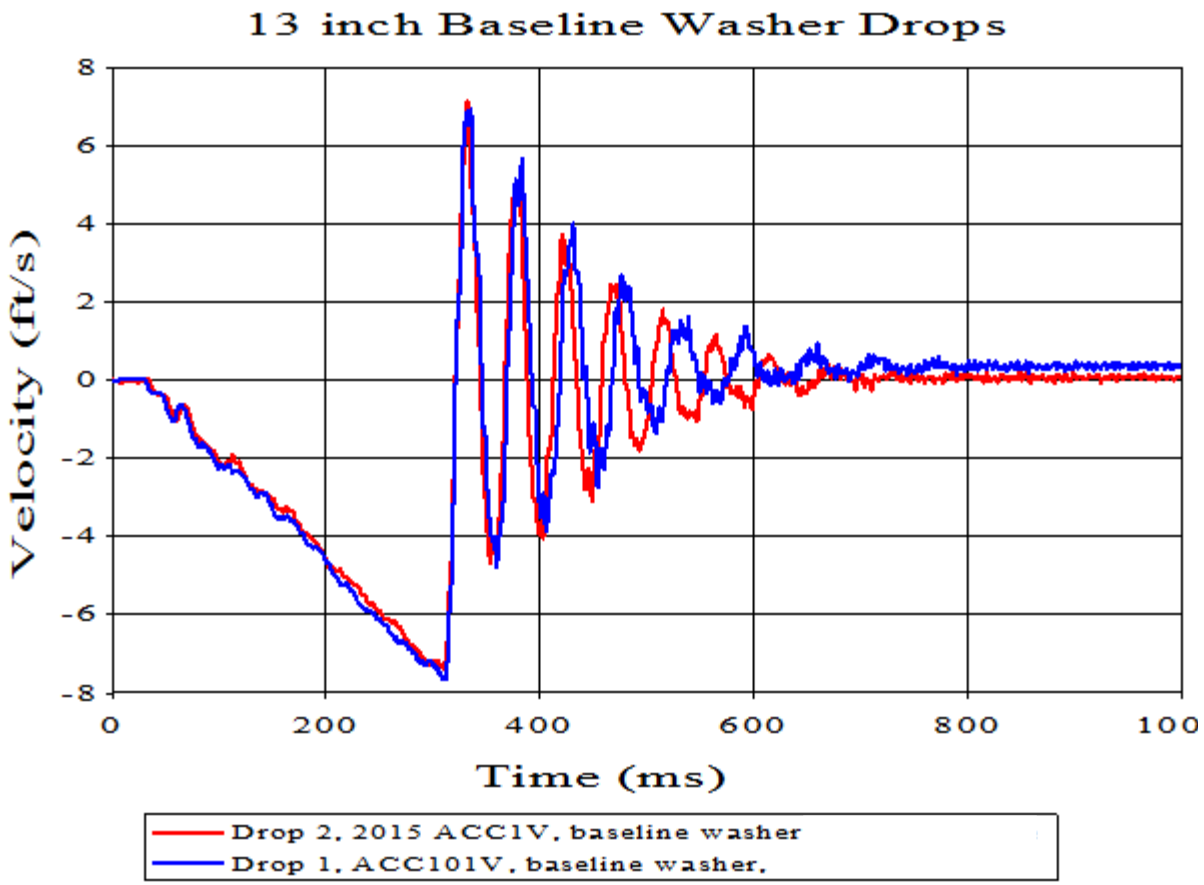
Instrumentation

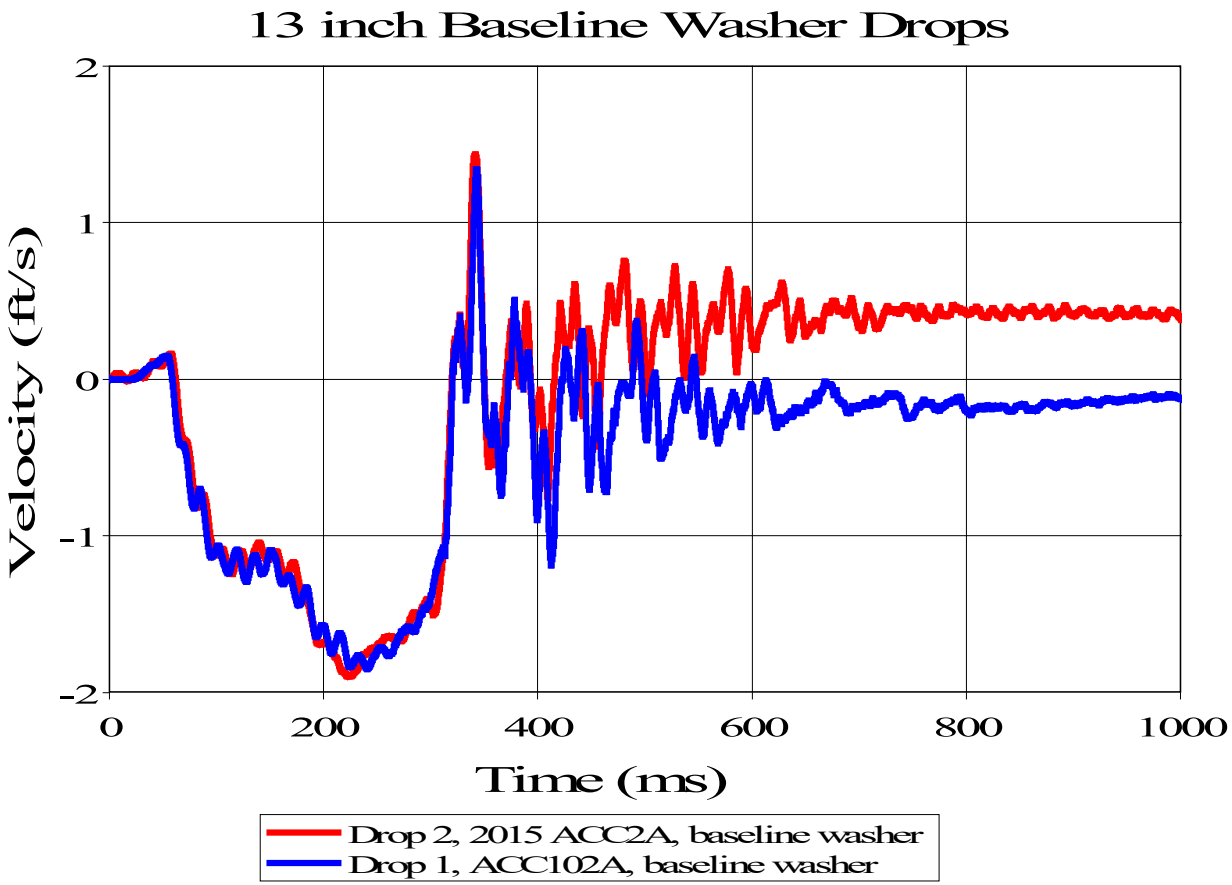


Test Configurations

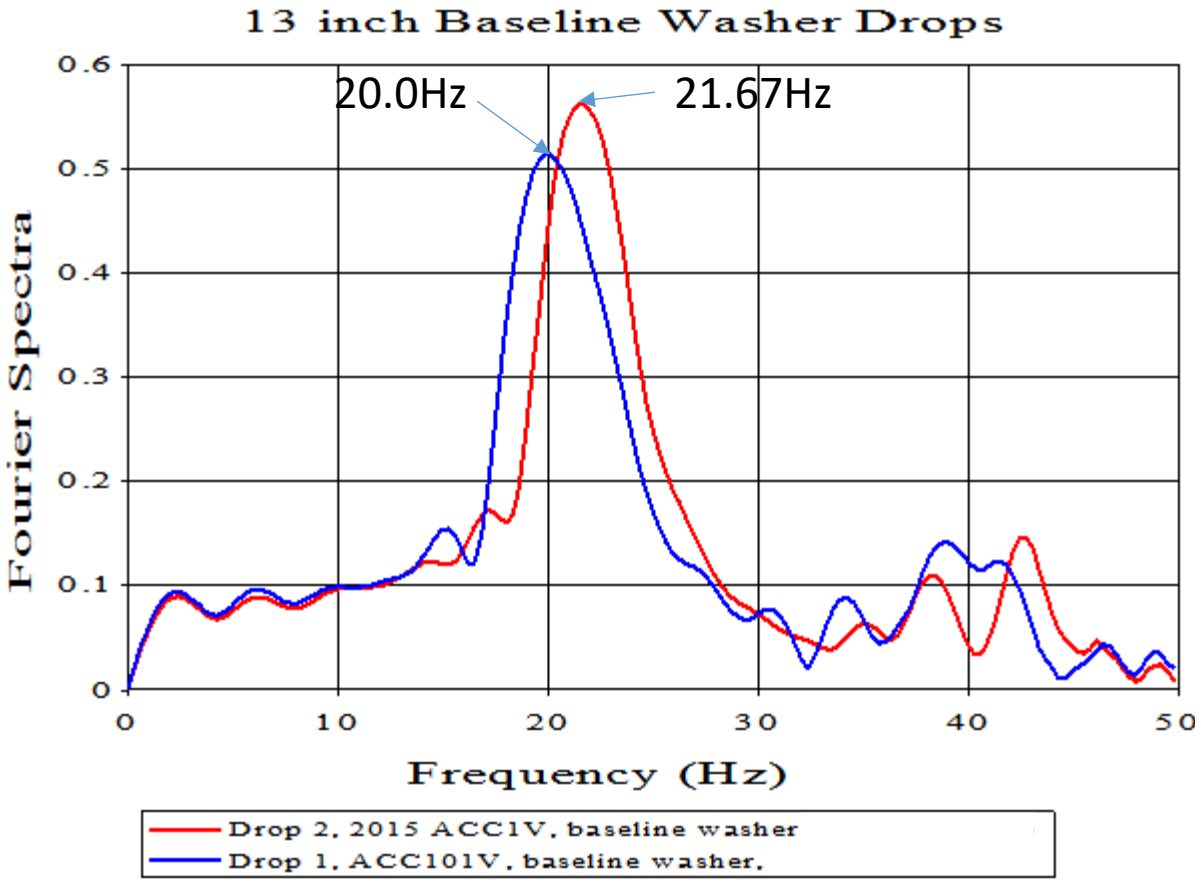
Test Report Drop #	Drop Height, [in]	Configurations
1	13	Baseline washers were installed on springs.
2	13	Baseline washers were installed on springs. Failed to record data
3-14	3-13	Fitted washers with no counter bore and shims were installed on springs.
15	13	Fitted washers only (no shim clamps).
16	13	Fitted washers only (no shim clamps). Tunable deck half round spacing set to ~36 inches.
17	13	Fitted washers only (no shim clamps). Tunable deck half round spacing set to ~30 inches.
18	13	Fitted washers only (no shim clamps). Tunable deck half round spacing set to ~30 inches. Added ballast 1069 lb. weight.
19	13	Repeat of previous drop.
20	13	Fitted washers only (no shim clamps). Tunable deck half round spacing set to ~36 inches. Added ballast 1069 lb. weight.

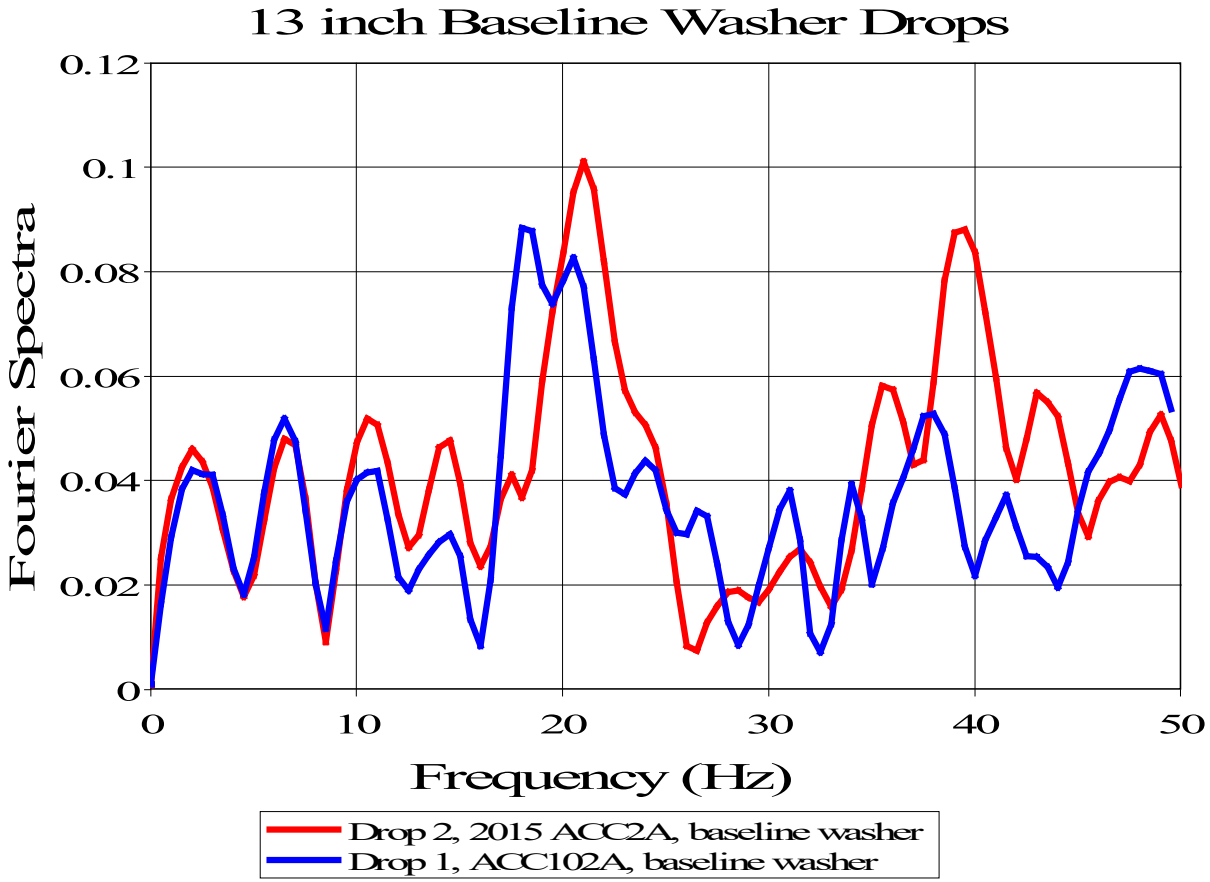
Vertical and Athw velocities compared to DSSM 2015 validation testing



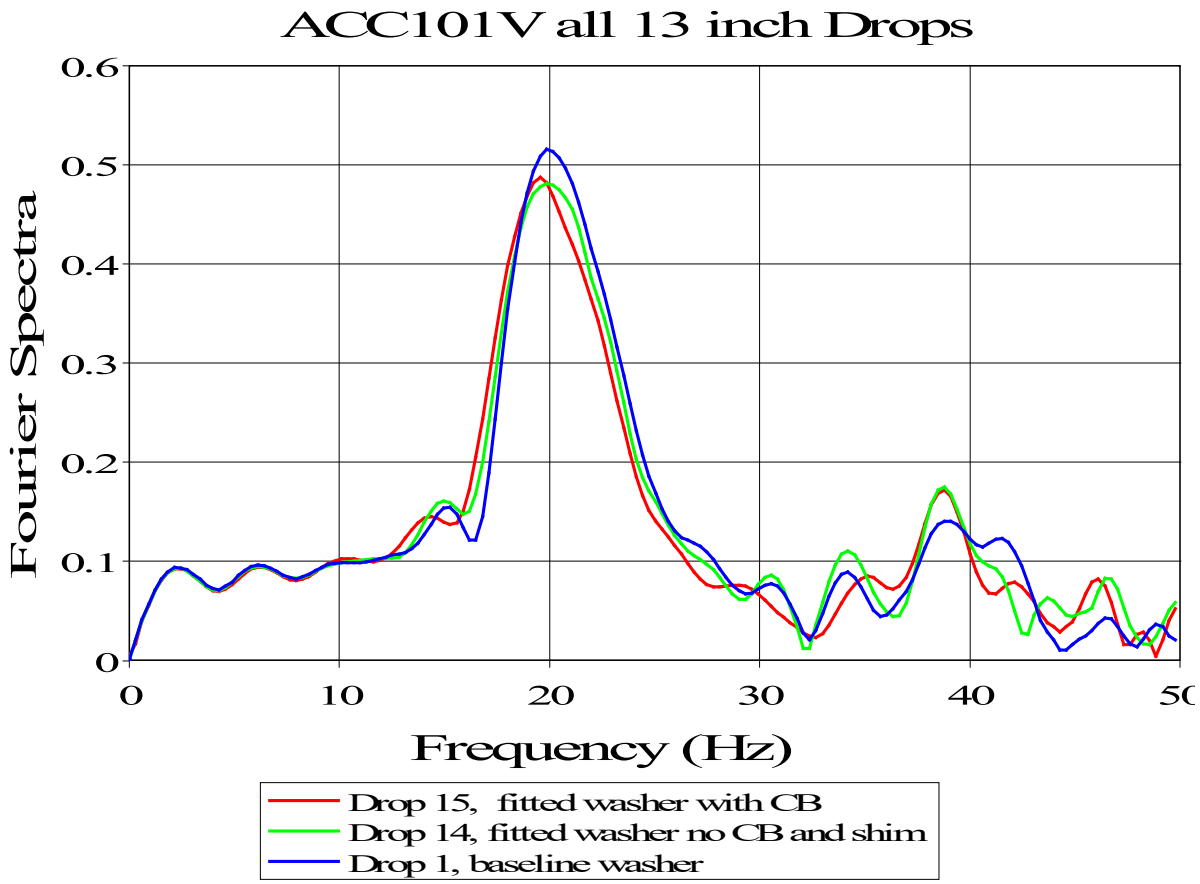


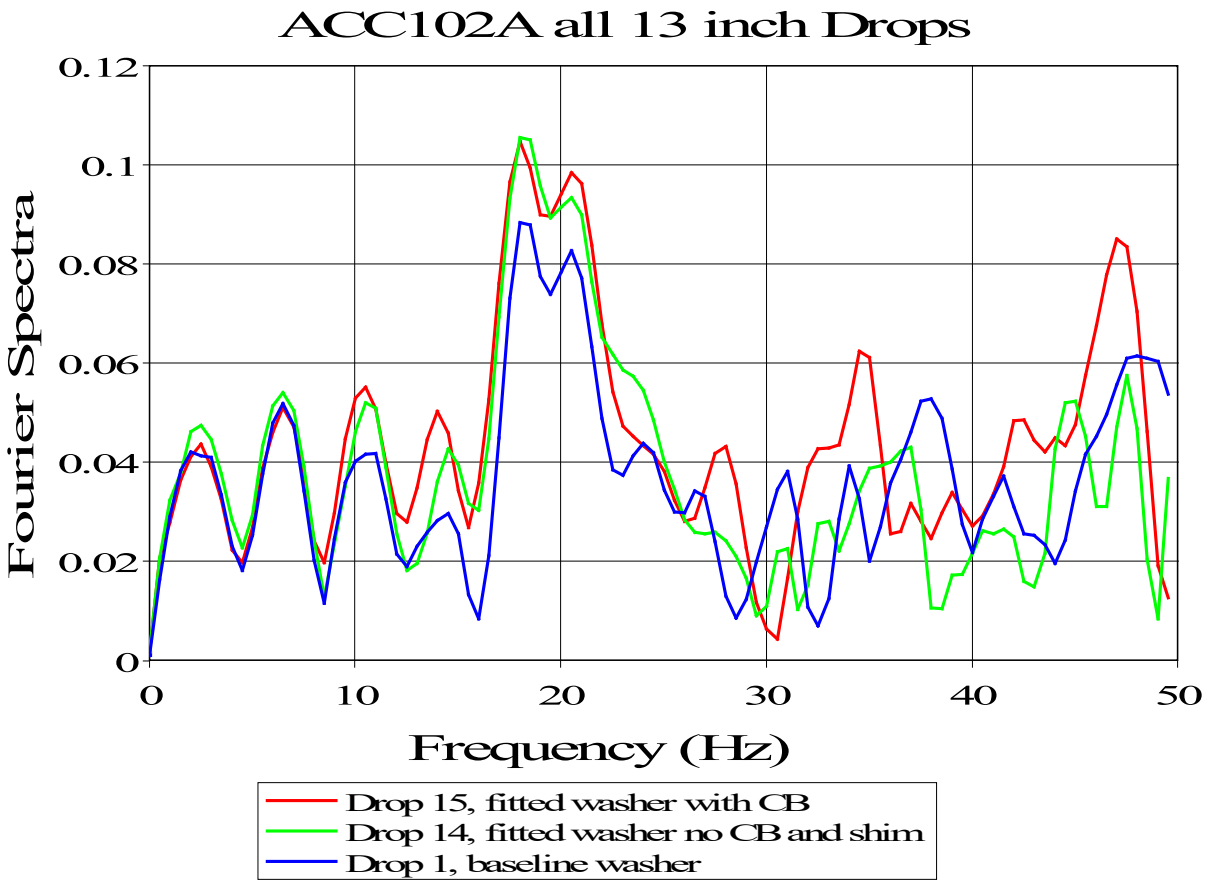
Vertical and Athw FFTs compared to DSSM 2015 validation testing



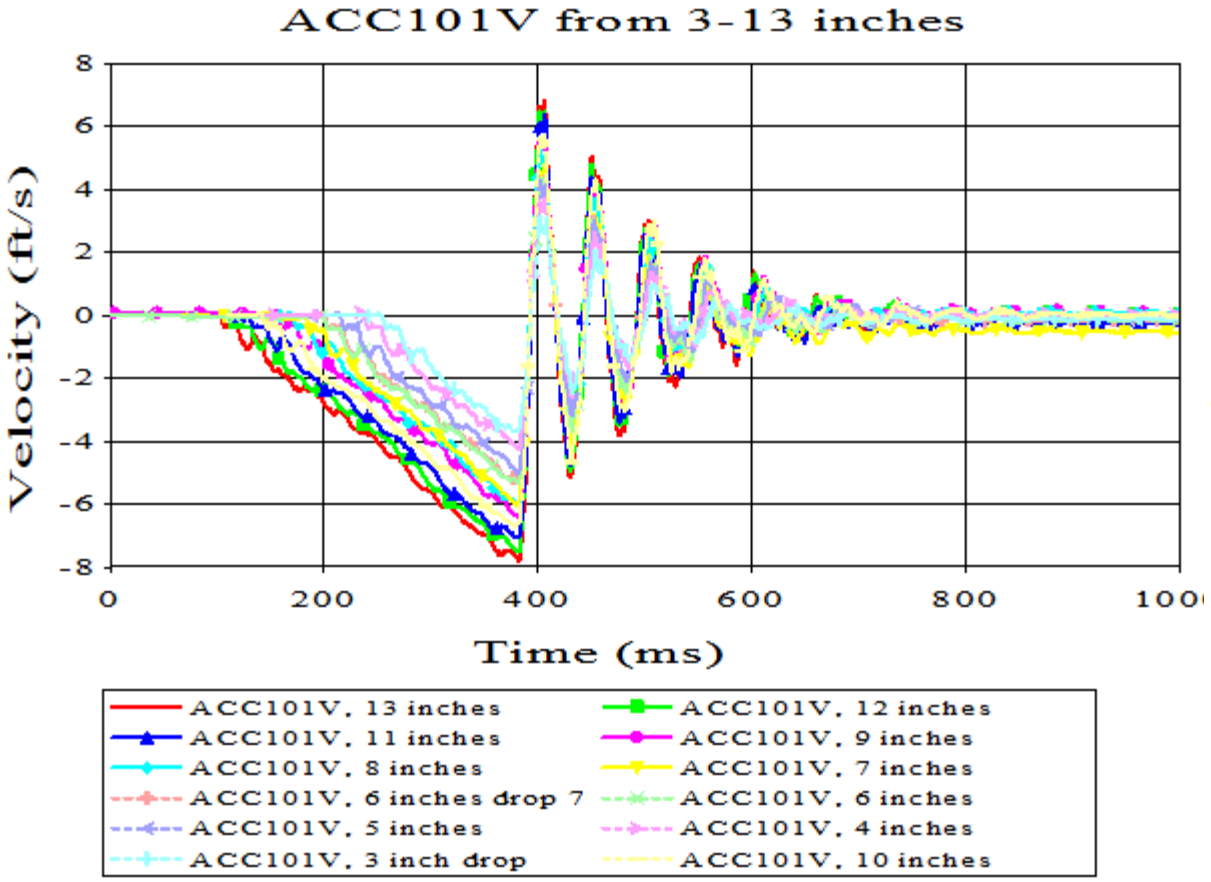


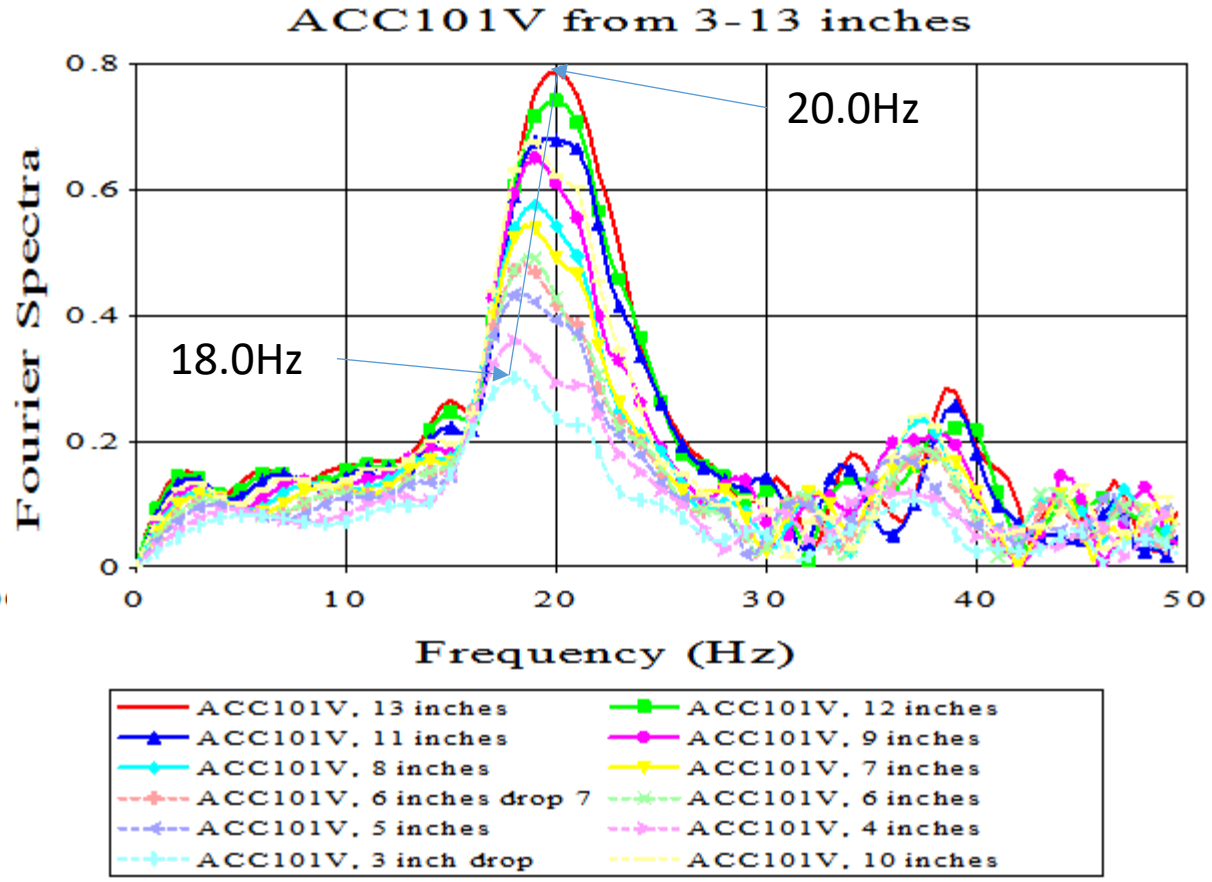
FFT Comparisons of Baseline Washers to Fitted Washers and Shims





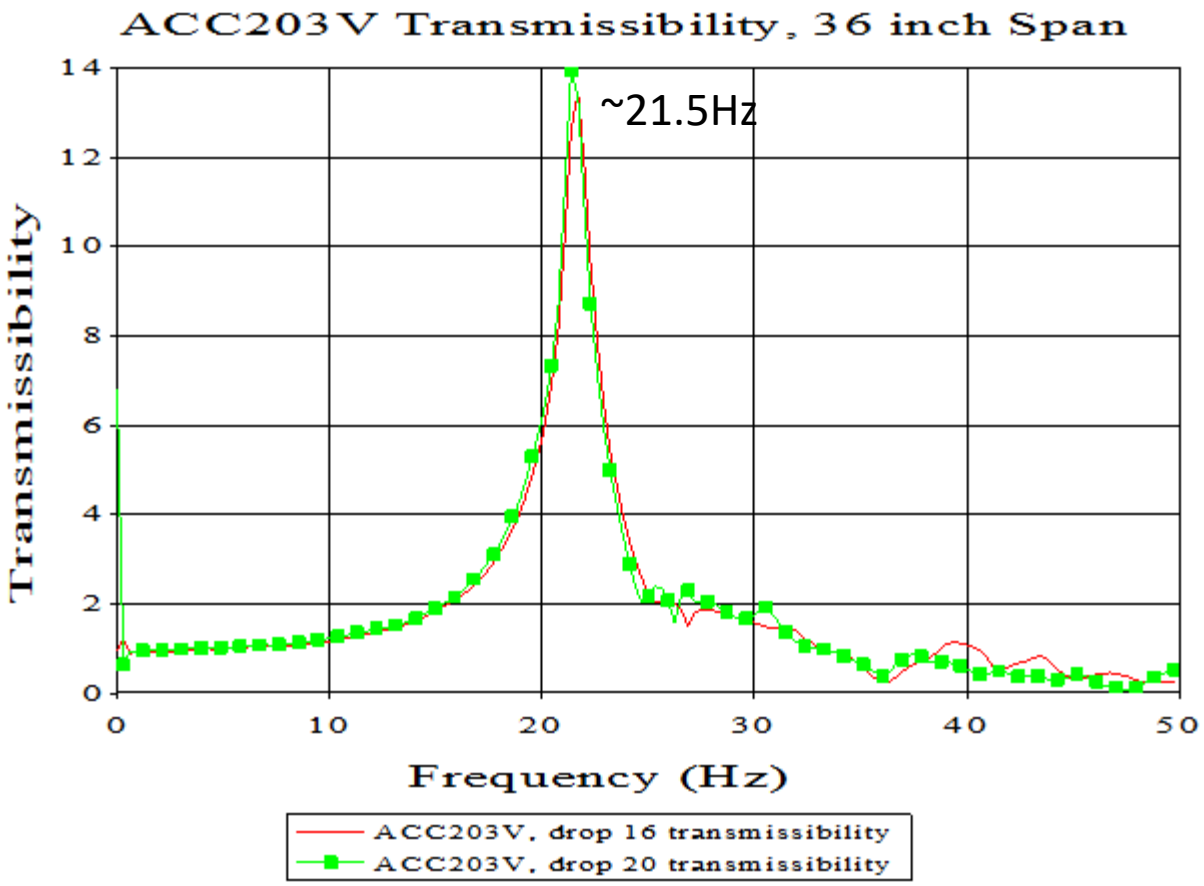
Velocity and FFT Comparisons of Drops Ranging from 3-13 inches

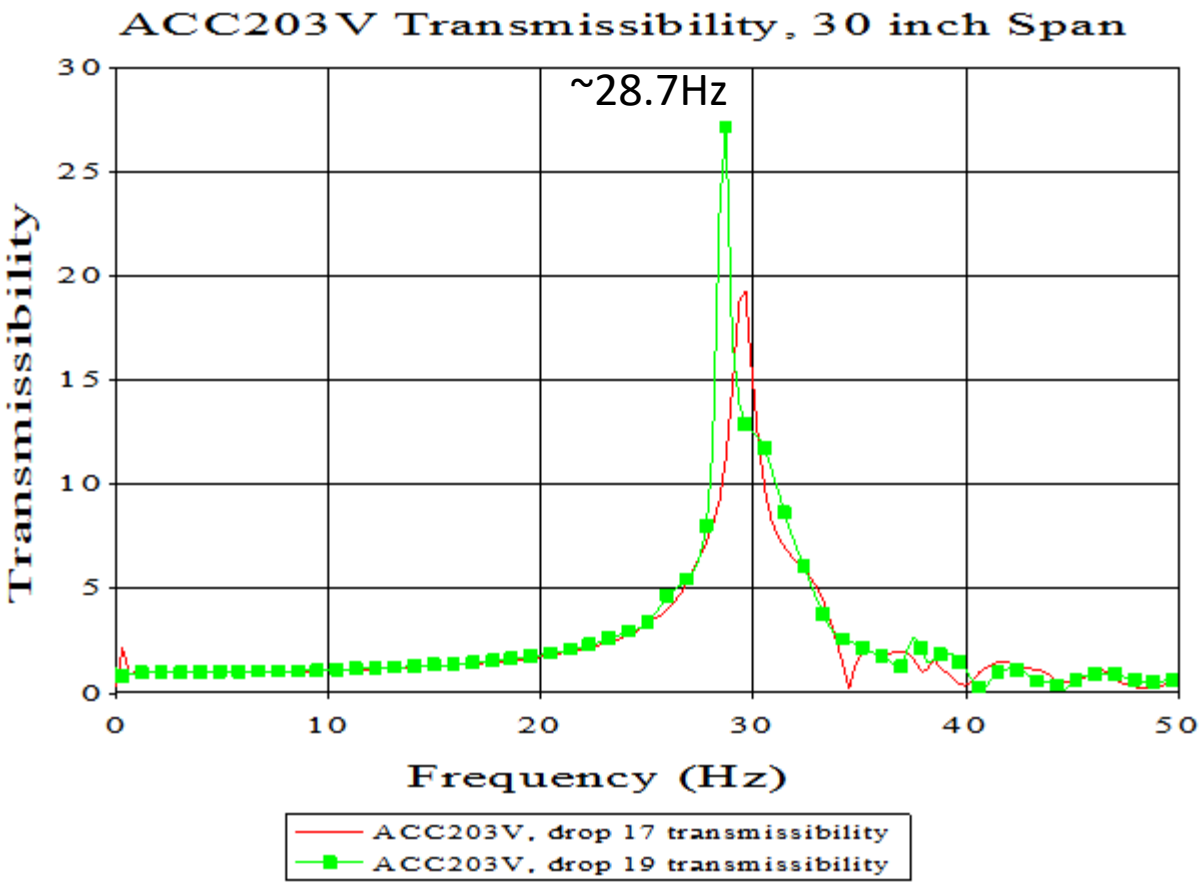




Dominant frequency in the vertical direction drops from 20Hz to 18Hz as drop height is lowered

Transmissibility of Adjustable Class II Item with ~36 and ~30 inch Spans

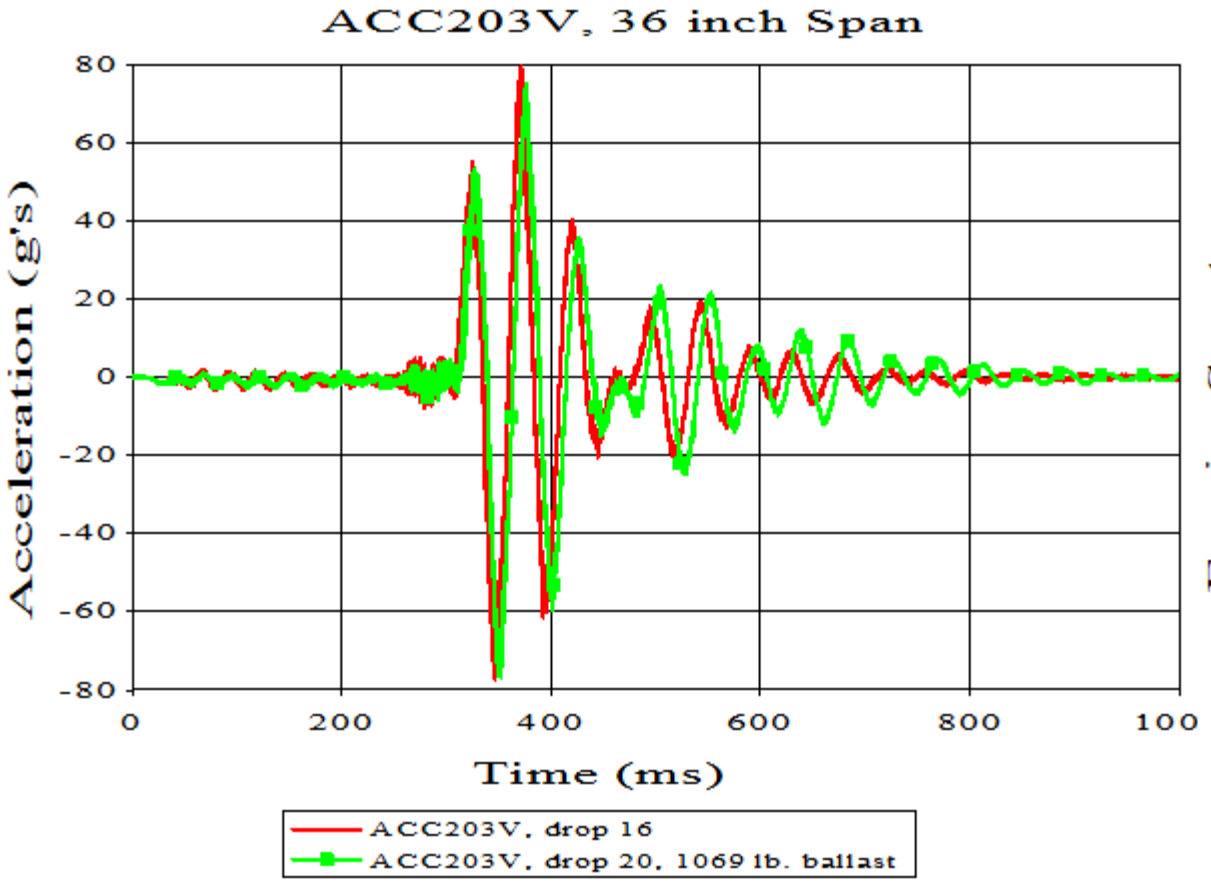


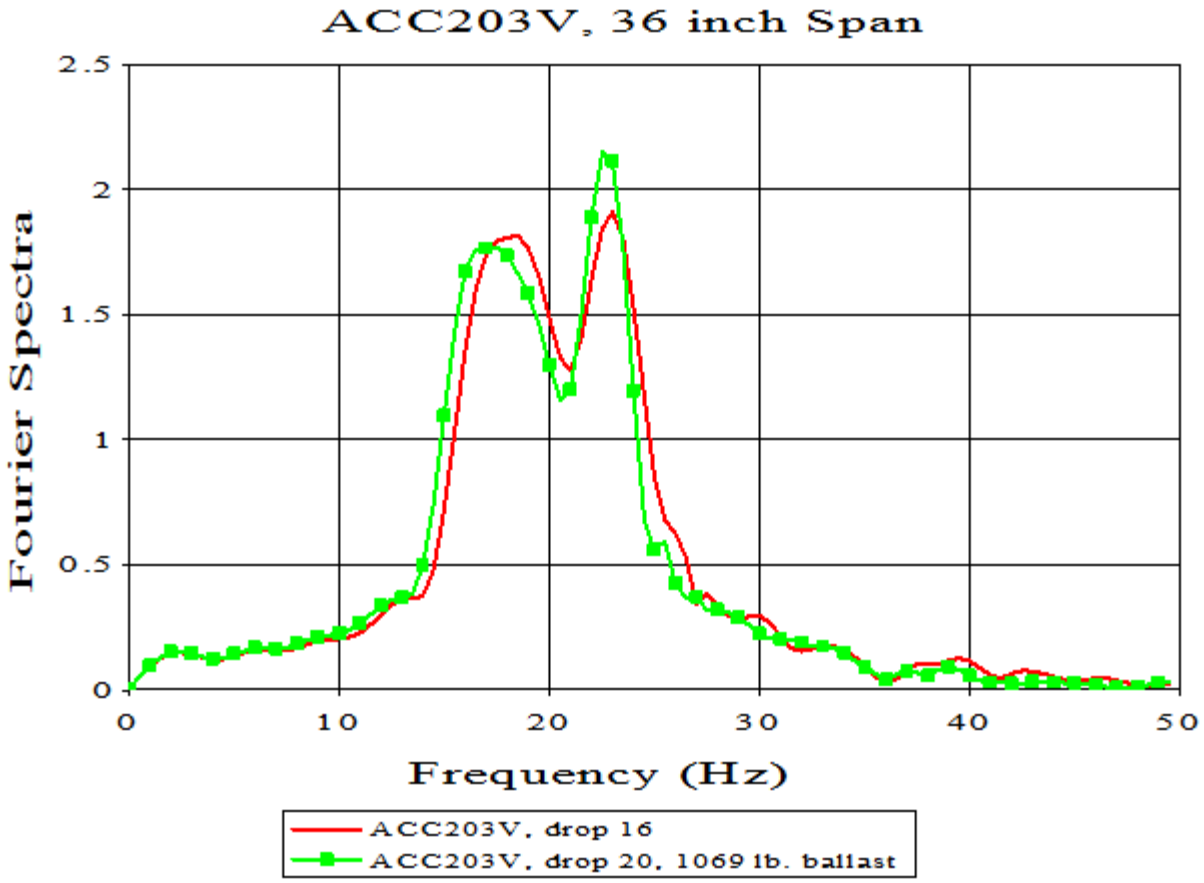


36 inch span has SRF of ~21.5Hz

30 inch span has SRF of ~28.7Hz

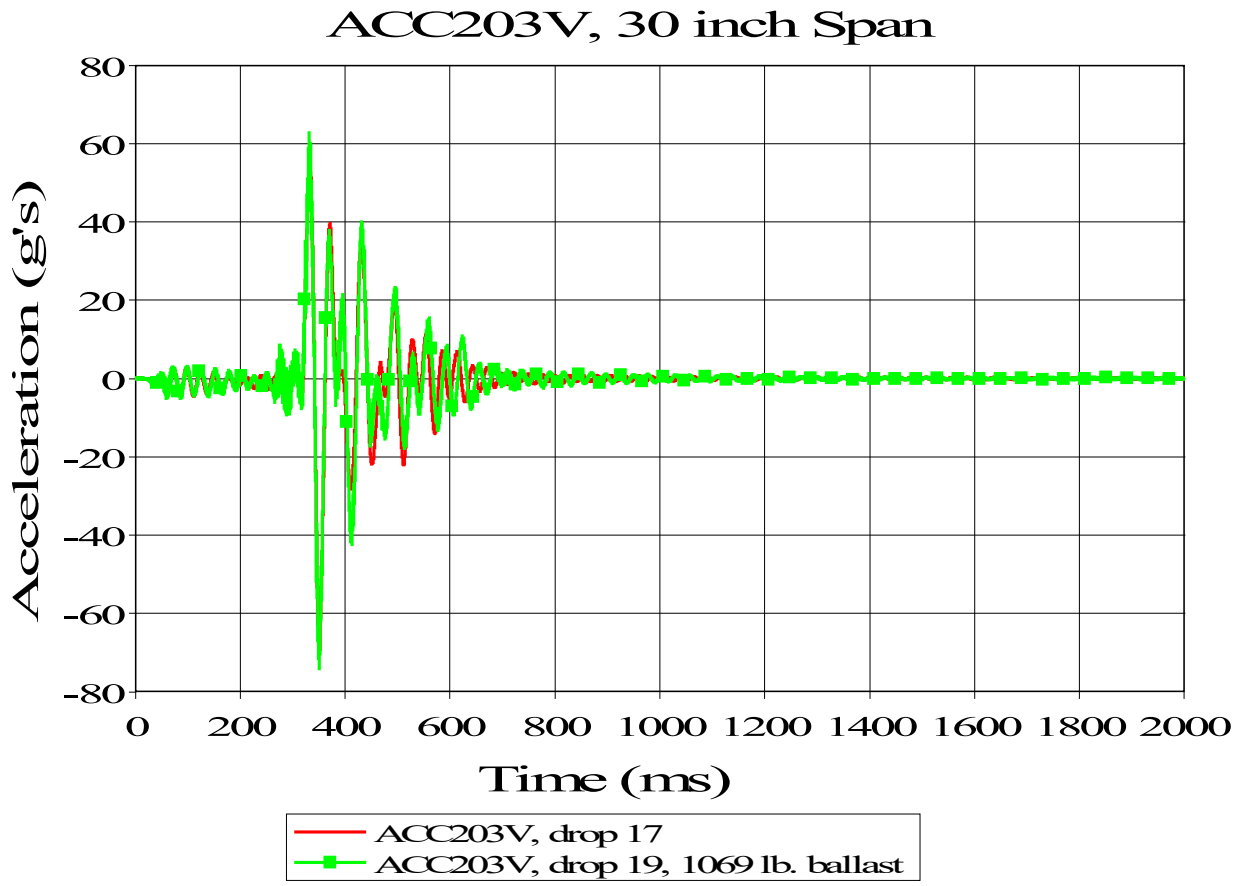
Acceleration and FFT Comparisons of Adjustable Class II Item with ~36 inch Span

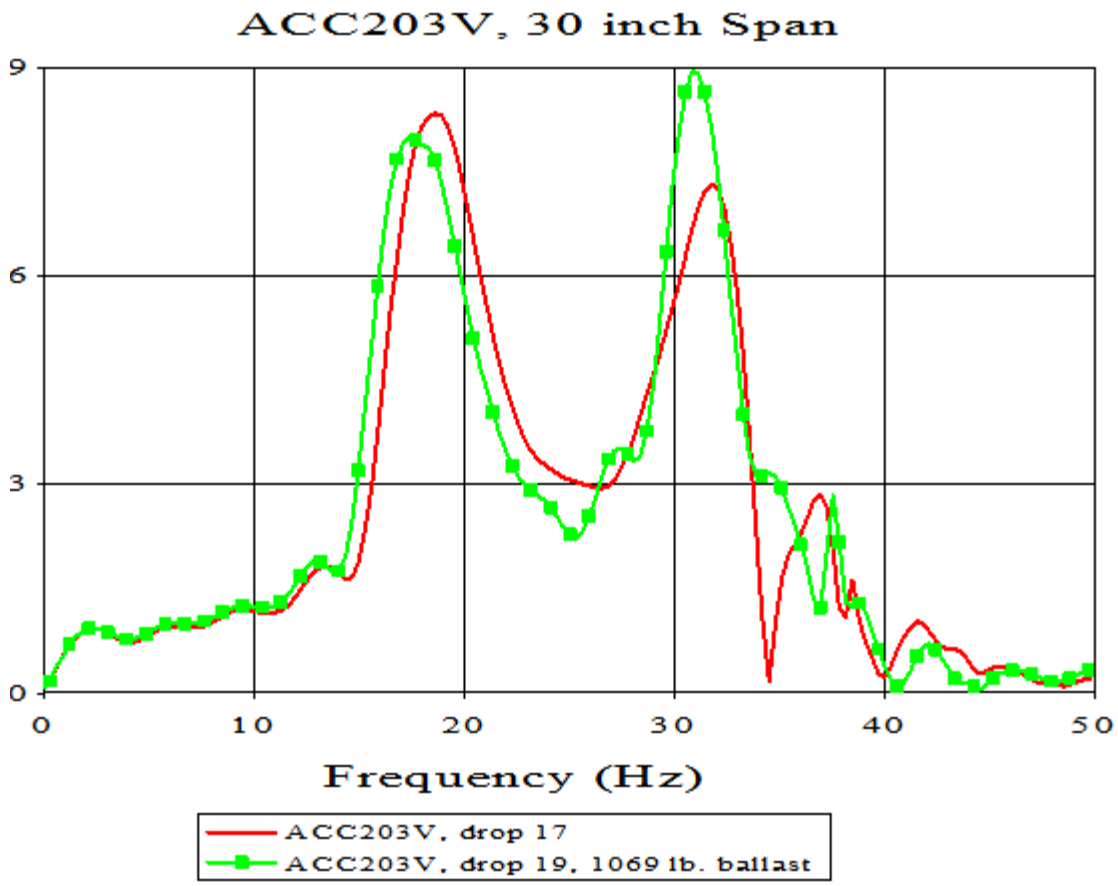




Response of 36 inch span with SRF of ~21.5Hz was amplified since it is close to the 20Hz frequency of the DSSM

Acceleration and FFT Comparisons of Adjustable Class II Item with ~30 inch Span



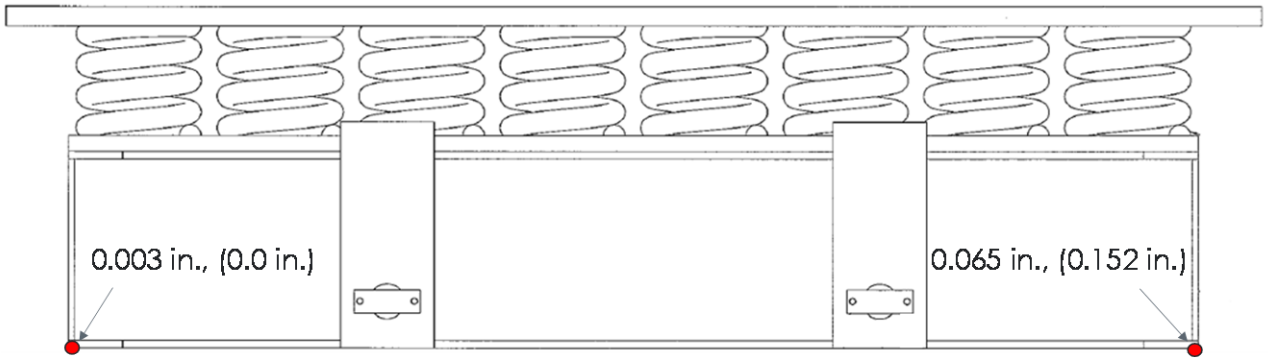


Response of 30 inch span with SRF of ~28.7Hz was not amplified.

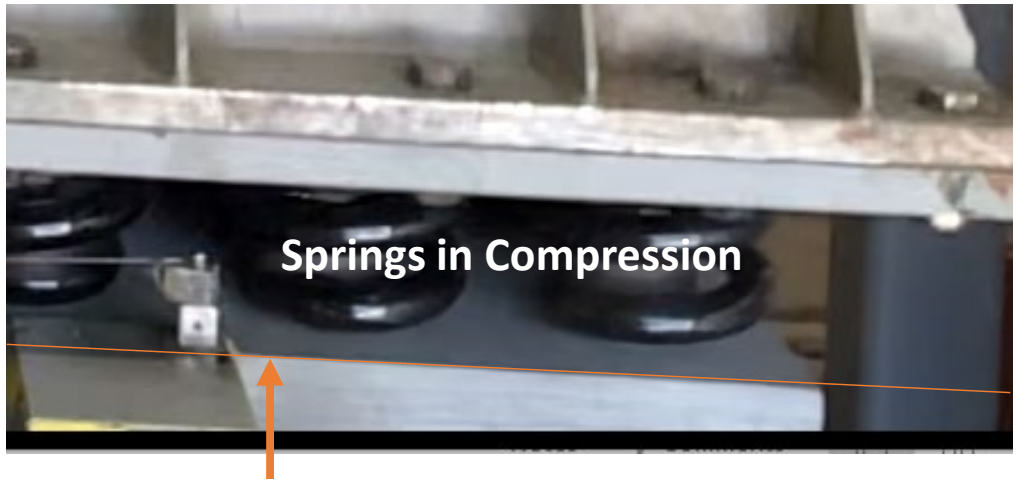
Gap Measurements and Visual Evidence During Drops

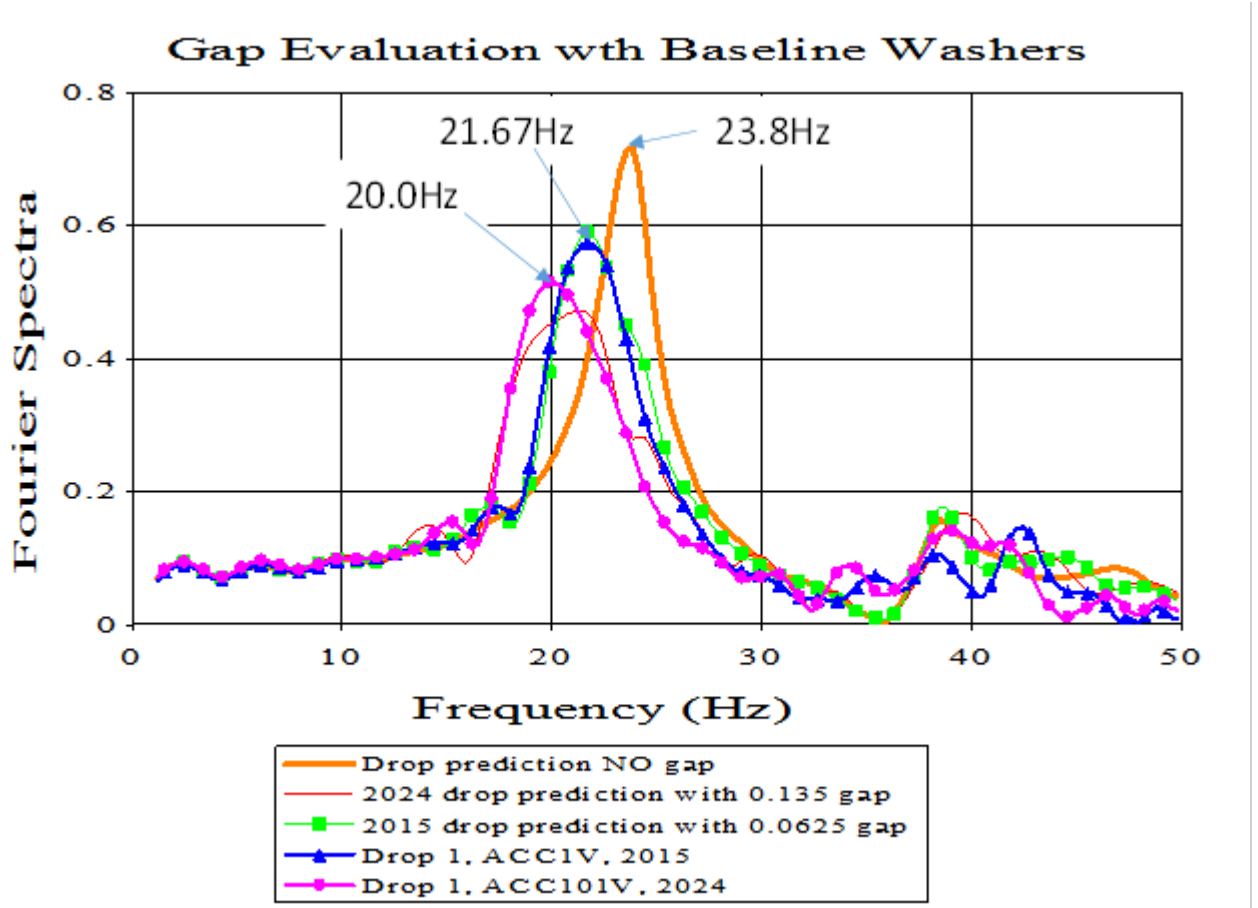
Static Gap Measurement

- DSSM was forced up using the winch cable at the lift point while latches were in locked position.
- Gaps measured with feeler gages at corners marked by red dots



Visual evidence during 13 inch drop



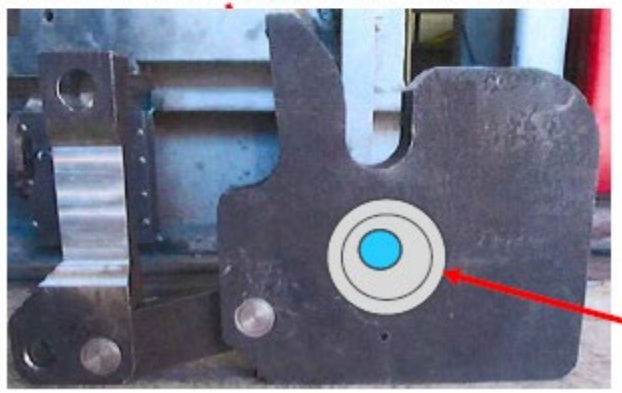


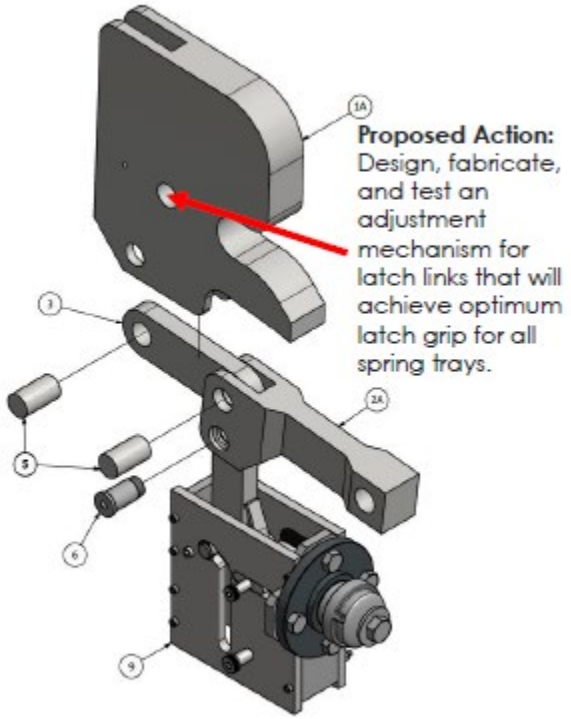
Adjustment mechanism for Latch

Install an eccentric bushing with a locking mechanism into part 1A as shown below

Existing latch fork

Latch fork with eccentric bushing and locking mechanism





Proposed Action: Design, fabricate, and test an adjustment mechanism for latch links that will achieve optimum latch grip for all spring trays.

Eccentric bushing with locking mechanism

Conclusions

- Frequency of the 2015 test was 21.67Hz compared to 20Hz for the 2024
- Vertical frequency difference between baseline and fitted washers negligible
- Tunable deck responses
  - 36 inch span is ~21.5Hz (response amplified as expected)
  - 30 inch span is ~28.7Hz
- Gap measurements and visual evidence during drops indicate latch gap to be between 1/8 to 3/16 of an inch
- Evaluation of the gap effects using simulation implies a gap increase from 0.0625 inches in 2015 to 0.135 inches in 2024
- Summary:
  - Degradation of the latch mechanisms since 2015 have changed the latch tolerance, thereby increasing the effective gap when the springs transition from compression to tension loading.
  - This increased gap undermines the increased tension stiffness associated with using the fitted washers.

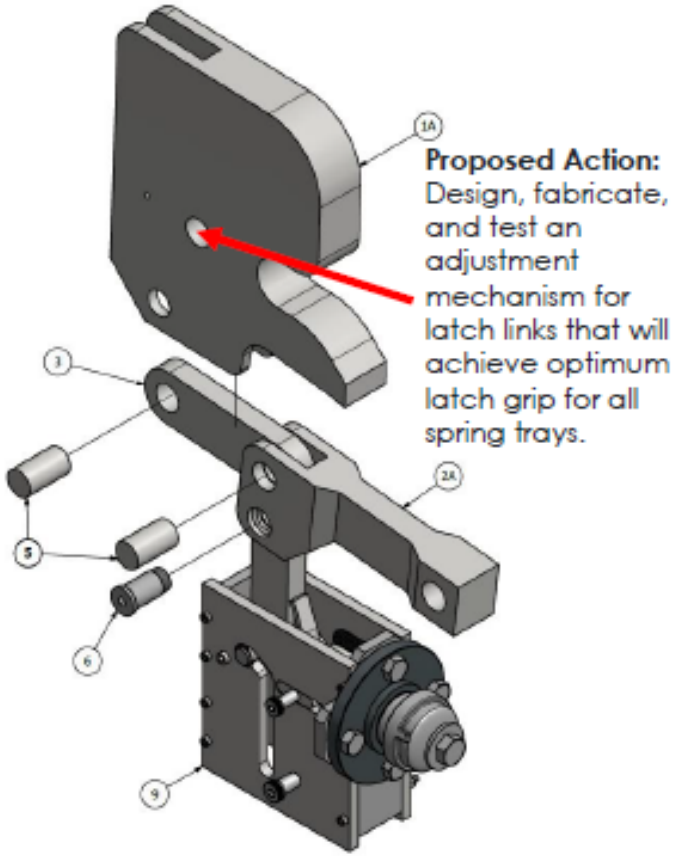
Recommendations

- Finalize design, fabricate, and test an adjustment mechanism for latch links that will achieve optimum latch grip for all spring trays.
- Design a new spring/latch system that can reach higher frequencies. This approach will be constrained by the existing footprint between the DSSM cage and strike pad.

DSSM Latch Adjustment Mechanism - 2025 Panel Project

2025 Panel Project: DSSM Latch Adjustment Mechanism

- Participants:
  - Lead: HII-NNS, Michael Talley, D.Sc.
  - Element, U.S. Space & Defense, Calvin Milam
  - NAVSEA 05P1, Tom Brodrick
- This proposal seeks to design, fabricate, and test a latch adjustment mechanism that will achieve optimum latch grip using existing DSSM spring trays and provide inspection procedures to obtain objective quality evidence for maintenance and replacement actions.
  - The design of the latch adjustment will make use of the concepts and data acquired during the 2023/24 NSRP panel project and additional inspections and measurements to be performed during the 2025 project.
  - Objective quality evidence will indicate maintenance and replacement of latch parts to ensure DSSM target frequencies remain as high as can be achieved with the 25Hz spring tray to support testing of class II deck mounted items with SRFs>18Hz.



SWSI Panel Agenda

Ship Warfare Systems Integration Panel Meeting

2025 NSRP All Panel Meeting – Charleston, S.C.
Charleston Marriott
February 25-27, 2025

Meeting Agenda
Times listed are Eastern Time Zone

Thursday, 2/27/2025
Room B (Afternoon)

Time	Presentation	Speaker
12:00 pm	Lunch	All
1:00 pm	SWSI Panel Discussion/SWSI FY 25 Panel Project Selection	ATI/Haymon
1:30 pm	Combat Systems Standard Foundations Qualification and Optimization – Final Review	H.G. Howard
2:00 pm	MCI Tough Coat wear surface	H.G. Howard
2:30 pm	Performance Improvement for 25Hz DSSM Spring Tray – Final Review	Mike Talley
3:00 pm	DSSM Latch Adjustment Mechanism	Mike Talley
3:30 pm	FY 26 Panel Project Solicitation Ideas/ Next Panel Meeting	All
4:30 pm	Review Action Items / Closing Remarks	Haymon

FY25 Project Solicitation Overview/Ideas

Announcement for Upcoming NSRP R&D Project Solicitations

The mission of NSRP is to employ a unique framework to research, develop, mature, and implement industry-relevant shipbuilding and sustainment technologies and processes, improving efficiency across the U.S. shipyard industrial base and meeting future demand.

The NSRP Executive Control Board (ECB) plans to issue both Research Announcement (RA) and Panel Project Solicitations for proposals that address the Program's mission. NSRP's research objectives and initiatives are documented in the Strategic Investment Plan and topics are identified in the newly-updated 2025 Technology Investment Plan.

Idea Submission Form

All NSRP projects require at least one U.S. Shipyard participant. The online form to facilitate early communication between potential Offerors and ECB member shipyards is available on NSRP.org. The form will be available for submission of R&D ideas to all NSRP shipyards and Panel Officers year-round, and for both project types. To maximize the chances for successful development, ideas should be submitted as early as possible, including prior to solicitation release. Ideas submitted within the final two weeks of the solicitation have a limited chance of success.

Project Types

Research Announcement (RA) Projects

- As with the prior year's RA solicitation, the 50% cost share goal for RA26 will be relaxed for certain participants. The cost share expectation for matching Program-funded participation of the following three organization types is waived for RA26:
  - Small Businesses (per NAICs 541715)
  - Non-Profits
  - Academia
- Cost share contributions from these organizations will still be accepted. These organizations should consider the project's value to their business and consider providing at least some cost share as part of their project to make it more attractive during the ECB final selections. The ECB will take cost share into consideration in determining the project's overall value compared to other projects when selecting projects for award.
- The 50% cost share goal remains unchanged for participation of company types not listed above.

Panel Projects

- Program funding ceiling for panel projects is limited to $200K
- Shipyard participation is required, and can be met by any US shipyard, either privately held or Public shipyards (including the USCG Shipyard). Participation by multiple shipyards, including ECB member shipyards, is preferable.

NSRP Involvement

Panel Meetings

NSRP panel meetings serve an important role within the Program by providing a public forum for potential collaboration, project teaming, and transferring R&D technology across the industry. Participation in one of the nine Panels is highly encouraged and a great way to get involved with the Program. Multiple meetings around the country (and virtually) are already scheduled with more to follow. Meetings are always free and open to the public. The NSRP All Panel Meeting (25-27 February 2025) is an **ideal** event for engagement in the proposal process. Visit the NSRP Event Calendar for the latest information and registration, and subscribe to a panel email list for direct notification of upcoming events and announcements.

Important Dates

RA26 Estimated Timeline
March 2025 – Solicitation Released
Mid-July 2025 - Summary Proposals Due
Late July/Early August 2025 – Technical Evaluation
September 2025 – Virtual Presentations and ECB Selection

FY26 Panel Project Estimated Timeline
April 2025 – Solicitation Released
Late August 2025 – White Papers Due
Late September 2025 – Panel Voting and Down-Select
November 2025 – Panel Officer Presentations and ECB Selection

The RA and Panel Project solicitations will be announced on SAM.gov and posted on NSRP.org upon release.

2025 NSRP TIP Workshop Out brief

NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

2025 TIP Workshop Information Design & Integration (ID&I) Major Initiative Breakout

22-23 January 2025

MI/Panel Descriptions

The Information, Design, & Integration (ID&I) Major Initiative focuses on the research of emerging technology, and the management of information to design and develop advanced solutions that support the full product lifecycle.

The ID&I Major Initiative consist of three Panels as follows:

- Business Technologies (BT)

The Business Technologies Panel focuses on emerging digital capabilities, blending process and information to develop advanced solutions that support product lifecycles of ships and their components from concept to disposal.

- Ship Design and Material Technologies (SDMT)

The SDMT Panel focuses on providing increased capabilities and cost reduction initiatives across the complete spectrum of design processes and the identification of materials and technologies to support rapid and efficient development, construction, sustainment, and disposal of ships and their components.

- Ship Warfare Systems Integration (SWSI)

The SWSI Panel focuses on the cost of integration and test for warfare and communication systems in ship construction and maintenance/modernization. The Panel improves coordination across programs, warfare and communication integrators, ship designers, and shipbuilders.

Sub-Initiatives (7.1.2)

1. Reduce time for qualification and application of systems, materials, components and manufacturing technologies
2. Advance and leverage digital shipbuilding
3. Identify and implement flexibility, modularity, and scalability across platforms
4. Investigate and apply solutions and best practices to support enterprise business processes and information management
5. Develop design guidance to support, maintain, and sustain unmanned platforms
6. Advance design, materials and processes that reduce sustainment/modernization costs and schedule
7. Incorporate autonomy in design processes and decision support tools
8. Define, integrate and implement innovative approaches to cybersecurity compliance, solutions, education & awareness

ID&I Day 1
Technology Investment Plan

NSRP
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Focus Areas

- 7.1.2.1 Reduce time for qualification and application of systems, materials, components and manufacturing technologies:
  1. Additive manufacturing (AM) to include cladding and 3D printing
  2. Non-metallic materials for shipboard application
  3. Materials needing low heat/no heat welding or pre-heat
  4. Advanced structural and non-structural materials
  5. Application and impact of battery chemistries
  6. Sources and application of Alternative Energies
  7. Approval of new/updated specifications and standards
  8. Develop a streamlined approach for reuseable logistics packages as contractor deliverables/CDRLs for Virtual Shelf items

Focus Areas

7.1.2.2 Advance and leverage digital shipbuilding:

1. Integrate Enterprise Processes and Tools to support digital shipbuilding including:
   a. Internal and External Product Lifecycle Management (PLM)
   b. Manufacturing Execution Systems (MES)
   c. Enterprise Resource Planning (ERP)
   d. Application of Artificial Intelligence and Machine Learning (AI/ML)
   e. Modeling and Simulation
   f. Data management, exchange, and reuse
   g. Digital Twin
   h. Augmented Reality/Virtual Reality/Mixed Reality
   i. Knowledge management and retention
2. Enable the Digital Thread by integrating Computer-Aided tools, analysis, manufacturing, and sustainment technologies (CAx) into the enterprise environment
3. Develop a fully integrated and collaborative Model-Based Enterprise (MBE)
4. Evaluate application of secure Cloud, Mobile, Industrial Internet of Things (IIoT) and Data Capture Technologies in the shipbuilding arena

Focus Areas

7.1.2.3 Identify and implement flexibility, modularity, and scalability across platforms:

1. Access and removal routes
2. Align just-in-time equipment with design and production
3. Common space design
4. Standard physical interfaces
5. Standard system interfaces
6. Hull, Mechanical & Electrical (HM&E) equipment packages
7. Advanced shipboard networking technology
8. Common Electronic equipment and racks
9. Power Control and Management Systems

Focus Areas

7.1.2.4 Investigate and apply solutions and best practices to support enterprise business processes and information management for:

1. Data configuration management and governance
2. Data exchange and delivery
3. Data inter-operability and intra-operability between internal/external systems
4. Shipbuilding informatics (data analytics, business intelligence, and reporting)
5. Improvinge knowledge and implementation of Navy standards with vendors
6. Application of artificial intelligence and machine learning (AI/ML)

Focus Areas

7.1.2.5 Develop design guidance to support, maintain, and sustain manned and unmanned platforms:

1. Physical integration
2. Platform interoperability
3. Physical and data security
4. Power architecture
5. Mission Systems
6. Standards and interfaces for UxV (Unmanned Air, Surface, Subsurface Vehicles) such as Unmanned Maritime Autonomy Architecture (UMAA)
7. Evolving battery chemistry and energy storage

Focus Areas

7.1.2.6 Advance design, materials and processes that reduce sustainment/modernization costs and schedule:

1. Impact of environmentally resistant materials and surface treatment techniques
2. In-situ monitoring technologies and methods
3. Customizable techniques for assessing localized material properties
4. Apply digital data acquisition tools
5. Expand re-use of product model data
6. Damage-tolerant design methods
7. Explore cold spray additive technologies

Focus Areas

7.1.2.7 Incorporate autonomy in design processes and decision support tools for:

1. Improving~~ed~~ and expanding the application and design for ~~of~~ robot/cobot~~ic~~ manufacturing
2. Modular construction
3. Design for Production (DfP) rules and optimization
4. Design for Sustainment (DfS) rules and optimization
5. Large scale additive manufacturing
6. Inspections & Repair (e.g., tank, weld quality)
7. Application of Artificial Intelligence and Machine Learning (AI/ML)
8. Leverage sensing technologies (machine/computer vision, scanning, etc.)

Focus Areas

7.1.2.8 Define, integrate and implement innovative approaches to cybersecurity compliance, solutions, education & awareness:

1. Increase awareness of cybersecurity best practices for enterprise processes and tools
2. Introduce compliance solutions for enterprise processes and tools
3. Investigate solutions for protecting data systems

Questions?

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