

Objectives

The objective of the SBD_Test Senior Design project was to design and implement a testing facility for sawhorses and toolboxes in order to deduce areas of improvement and durability. The SBD_Test team was to design and purchase multiple machines, create a floor plan to establish a logical workflow, and improve upon existing Stanley Black and Decker test procedures. This was achieved through allocating work to subgroups within the SBD_Test team, highlighting the skill set of each individual student and their major.

Project Requirements

1. "Facility Design of new lab configuration using available space, existing and new machinery."
2. "Design test procedures which can be used to test the Stanley Black and Decker products and ensure the quality of the product design for the intended use."
3. Implement and test the facility design and procedures for the second semester.

Tests Designed

1. Drop Test
2. Ball Drop Test
3. Label Adhesion Test
4. Conveyor Test
5. Compression Test
6. Water Bath Test
7. Handle Shaker Test

Floor Plan

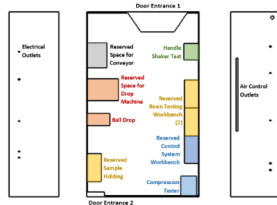


Figure 1

The Floorplan is designed to optimize the 39'x20'8" area by organizing test machinery in a logical order, allowing for sample reuse and synchronous testing.

Ball Drop Test



Figure 2

The Ball Drop Test will be used to test durability of SBD tool boxes. A 4 lb steel ball with a 3" diameter is held above the testing product using a PVC pipe with holes and a pin. The balls will be set to a specified height using the pin. The pin will then be removed, releasing the ball onto the product. This design allows the product's durability to be tested in the same location until failure occurs, before being adjusted to test a different location on the surface of the product.

Design



Saw Horse Test



Figure 3

The Saw Horse Testing procedure utilizes a manual force gauge meter and a 1/4" vinyl coated galvanized steel cable to pull the saw horse in 6 different directions and locations. The legs will be pulled at 75lbs force while the sawhorse is being compressed at a specified weight.

Cage Design

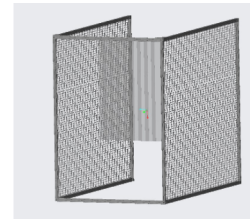


Figure 4

Safety Cages have been designed for all destructive test including drop test, ball drop test, compression test, and conveyor test. These cages prevent any debris from propelling outside of the testing area. The design shown above is the drop test machine safety cage. This is designed using 1 1/2" x 1 1/2" solid t-slotted aluminum railing, 1/4" steel mesh panels, and a welding curtain.

3D Printed Handle



Figure 5

The team designed 3D printed handle fixtures that will be utilized for stabilizing and holding the toolboxes when performing testing using the conveyor and handle shaker machine. There are four different handles that will be implemented. These include a small, medium and large handle used for different sized toolbox when performing conveyor testing and one high infill piece used for handle shaker testing.

Resources and Credits

- Stanley Black and Decker
- McMaster Carr
- Xiamen Co. Industries
- William States Lee College of Engineering
- Duke Centennial Hall

Contacts

Team Lead: Davis Cotton dcotton3@unc.edu

Team: Jesse Chen jchen61@unc.edu
 Anna Moser amoser6@unc.edu
 Talal Alzahrani talzahr3@unc.edu
 Casey Cook ccook933@unc.edu
 Hamad Alkandari halkanda@unc.edu
 Kaitlin Milde kmilde@unc.edu

Mentor: Jerry Dahlberg jdahlbe2@unc.edu

Industry Supporter: Jim Wiley james.wiley@sbdinc.com

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Test Designed

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2. Ball Drop Test
3. Label Adhesion Test
4. Conveyor Test
5. Compression Test
6. Water Bath Test
7. Handle Shaker Test



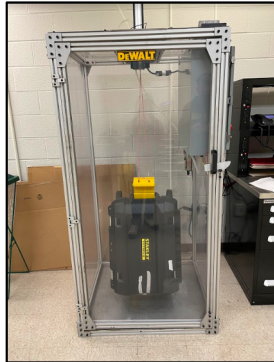
Drop Test Machine



Conveyor Test Machine



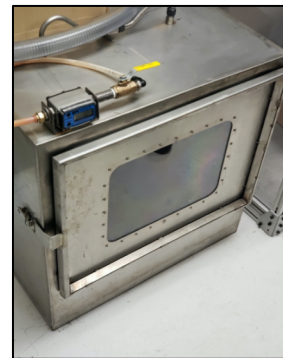
Label Adhesion Test



Handle Shaker Machine



Compression Machine



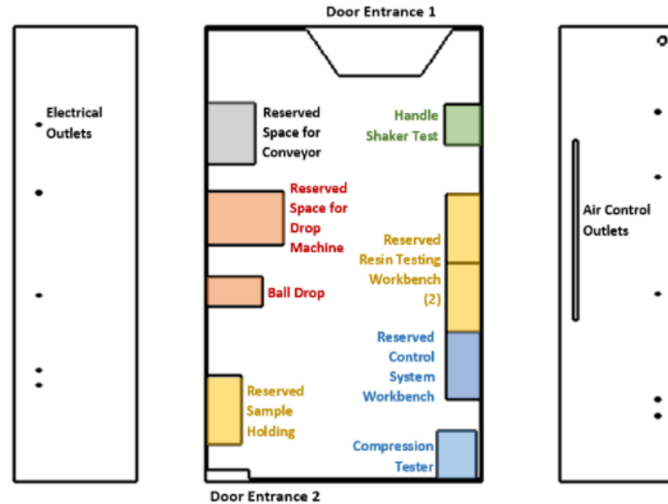
Water Bath Test

Ball Drop



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Floor Plan



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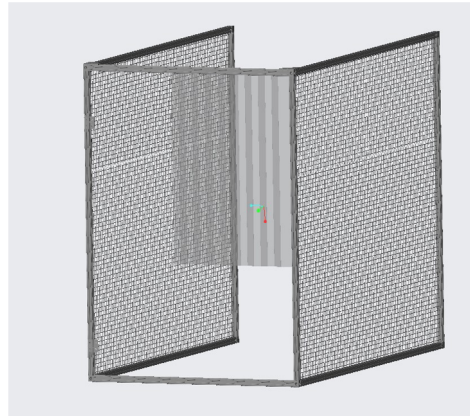
Saw Horse Test



The Saw Horse Testing procedure utilizes a manual force gauge meter and a ¼” vinyl coated galvanized steel cable to pull the saw horse in 6 different directions and locations.

The legs will be pulled at 75lbs force while the sawhorse is being compressed at a specified weight.

Cage Design



Safety Cages have been designed for all destructive test including drop test, ball drop test, compression test, and conveyor test. These cages prevent any debris from propelling outside of the testing area. The design shown above is the drop test machine safety cage. This is designed using 1 ½' x 1 ½" solid t-slotted aluminum railing, ¼" steel mesh panels, and a welding curtain.

3D Printed Handle



The team designed 3D printed handle fixtures that will be utilized for stabilizing and holding the toolboxes when performing test using the conveyor and handle shaker machine. There are four different handles that will be implemented. These include a small, medium and large handle used for different sized toolbox when performing conveyor testing and one high infill piece used for handle shaker testing.

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	Talal Alzahrani	talzahr3@uncc.edu
	Casey Cook	ccook93@uncc.edu
	Hamad Alkandari	halkanda@uncc.edu
	Kaitlin Milde	kmilde@uncc.edu
Mentor:	Jerry Dahlberg	jdahlbe2@uncc.edu
Industry	Jim Wiley	james.wiley@sbdinc.com