Design of a Product Test Lab

Design Team: Davis Cotton, Anna Moser, Jesse Chen, Kaitlin Milde, Casey Cook, Talal Alzahrani, Hamad Alkandari
SB&D Supporters: James (Jim) Wiley
Mentor: Jerry Dahlberg

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

Ball Drop Test
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
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 testing 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-slotted aluminum railing, ⅛” steel mesh panels, and a welding curtain.

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

Contacts
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Industry Supporter: Jim Wiley
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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.

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.

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.

Figure 3
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.

Figure 4
Safety Cages have been designed for all destructive testing 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-slotted aluminum railing, ⅛” steel mesh panels, and a welding curtain.
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- Drop Test Machine
- Conveyor Test Machine
- Handle Shaker Machine
- Compression Machine
- Label Adhesion Test
- Water Bath Test
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