Parker Hannifin Loading Dock

Mechanical and Aerospace Engineering
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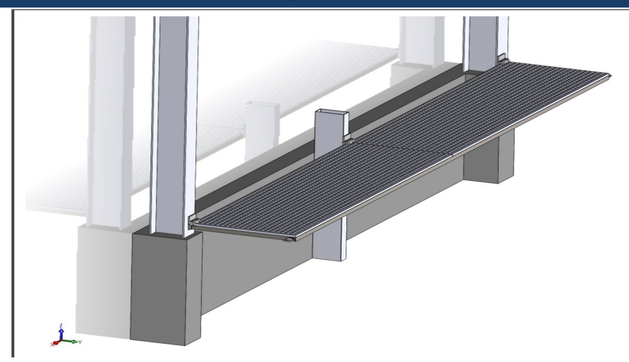
Abstract

Parker Hannifin in the past has had issues with the safety of the workers in the loading dock and proposed a way to solve this issue. The general concept of this design is a twenty-foot actuating walkway that is fixed to the wall adjacent from the trailer that will fold down to give the workers a safe, slip resistant surface to walk. This will be three feet in width allowing the workers to stay off the oiled products that can cause a fall and potential injury. The overall project will operate within a five-thousand-dollar budget.

Customer Needs and Requirements

- 20 FT Walkway.
- 1000 LB Rating with a safety factor of 2.
- Floor grating with coefficient of friction factor of 0.5 or greater.
- Walkway must not interfere with tractor trailer when docked.
- $5,000 budget.

Concept Selection



- Winch Mechanism.
- Frame: 2”x2”x$\frac{1}{4}$” Angle Iron.
- Vertical Frame Design.
- Fiberglass Grating

Design Solution

Winch:

- 2700 lb capacity

Frame Material:

- A36 steel
- 2” x 2” x 0.25”

Frame Pattern:

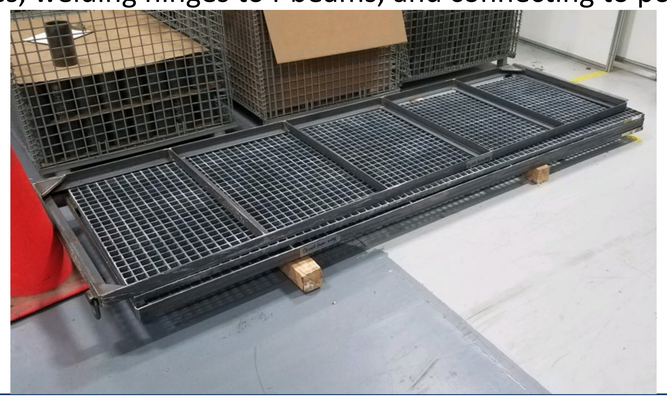
- Vertical Pattern

Grating:

- Fiberglass
- Slip-resistant grit top

Manufacturing

Fabrication of the walkway was the major component of manufacturing and needed to be executed by a licensed welder. The final steps include mounting the fabricated walkway to the winches, welding hinges to I-beams, and connecting to power.



Testing and Validation

Test 1: Winch

- RPM of winches

	Winch #	
Trial	**1**	**2**
1	13.32s	13.92s
2	13.84s	13.53s
3	14.02s	14.08s
Avg	13.727s	13.725s
Diff	0.00167s	

Test 2: Grating

- Testing rubber similar to work boot
- Calculating coefficient of friction

Test 3: Frame

- OHSA standard ASCE 7-10 (Section 4.4)
- The walkway was tested using a 300 lb load and stayed below 1/240th of an inch, so the frame passed OHSA standard.

Test 4: Grating friction

- Slip resistant needs the coefficient of friction to be > 0.5

Angle	**Forces [lbf]**			
10°	26	25	27	25
cos(10)	25.61	24.62	26.59	24.62
Chill Weight	45.7	lbf		
CoF = F/N				**AVG**
0.560393873	0.53873085	0.58183807	0.53873085	**0.55492341**

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