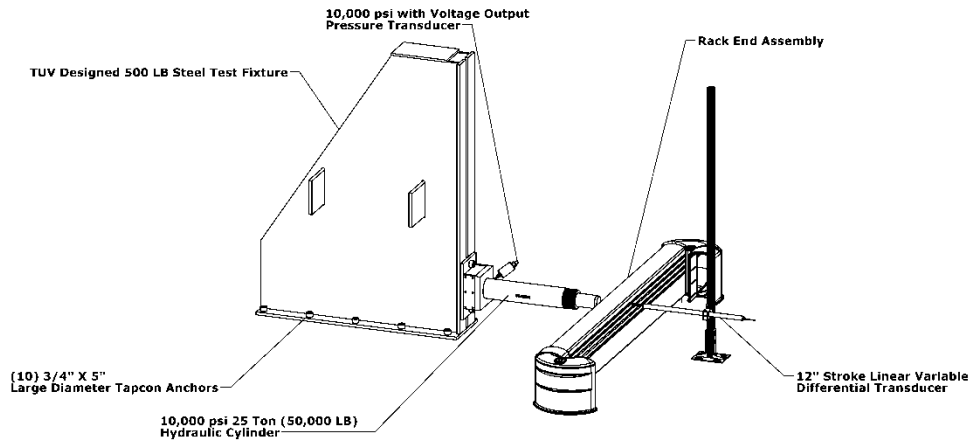
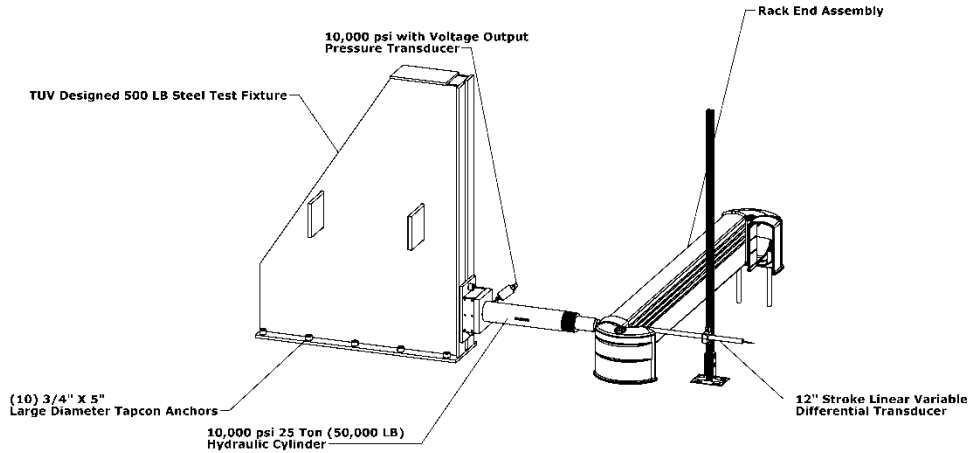




## Objective

McCue products are tested for compliance and product failure analysis to determine safe working conditions.

## Scope

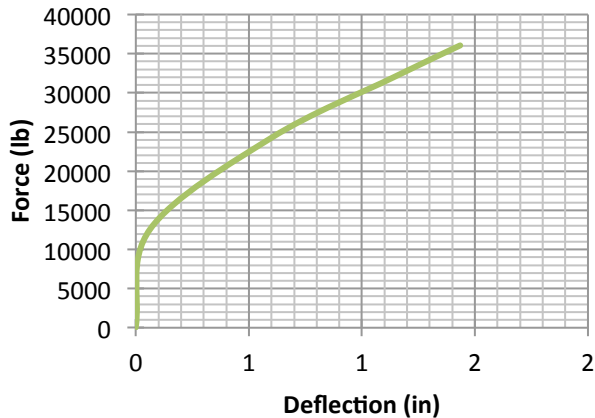


## Explanation

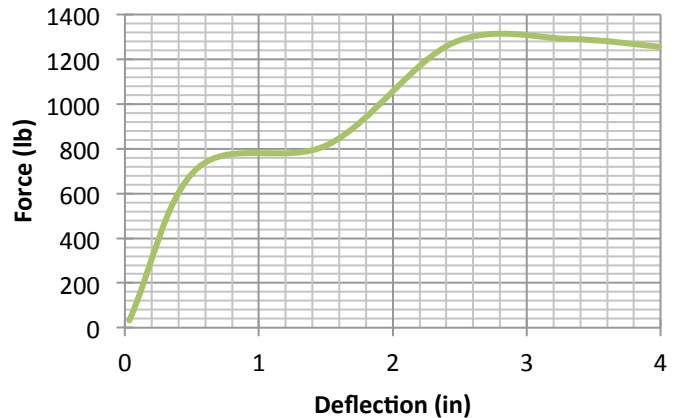
Products are tested for compliance to international standards and codes by taking dynamic measurements in real time of applied force and resulting deflection. These force and deflection measurements are used to determine the magnitude of energy transfer to the product by using the principles of the work energy theorem. The criteria for product failure has been determined at a 4" (10 cm) deflection with the intent of balancing product robustness, valuable footprint space, and application for safe working conditions.

## Results

### Rigid Ends Force v. Deflection



### Extrusion Force v. Deflection



### Maximum Force & Deflection

Rack End  
36,055 lb (160.4 kN) at  $\delta = 1.4''$  (3.6 cm)  
 $v = 4.5$  mph (7.2 km/h)  
 $v_{45} = 31.9$  mph (51.5 km/h)

Extrusion  
1,256 lb (5.6 kN) at  $\delta = 4.0''$  (10 cm)  
 $v = 1.4$  mph (2.2 km/h)  
 $v_{45} = 6.2$  mph (10.1 km/h)

### Summary

The described test demonstrates the worst case scenario of a perpendicular impact. In application, typical impacts will be at an angle and result in lower collision energies.

The Rack End can withstand an impact of 36,055 lb<sub>f</sub>, (160.4 kN) equivalent to a 6,500 lb (2948 kg) forklift at 4.5 mph (7.2 km/h) and recover to the upright position. In testing, the Rack End was subjected to higher loadings and further deflections; however, in an impact of such a degree, failure at the fixing surface and/or injury to the vehicle operator is probable. An equivalent impact at 45° can be achieved at approximately  $V_{45} = 31.9$  mph (51.5 km/h).

The testing data can be translated to indicate the speed at which a predetermined deflection will occur for a specified vehicle at any weight.

*These tests were performed for McCue Corporation only and not subject to acceptance criteria. The test setup, testing, and measurement of data were all witnessed by TRIS and verified to have been performed in accordance with the specifications of BS 6399.*

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