Shock Absorbing Rack Guard
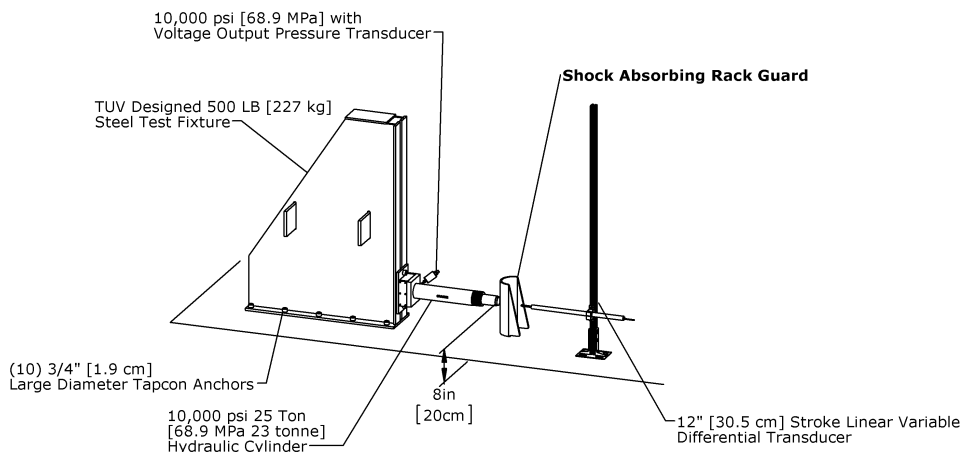
Objective

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

Scope

10,000 psi [68.9 MPa] with
Voltage Output Pressure Transducer

TUV Designed 500 LB [227 kg]
Steel Test Fixture

Shock Absorbing Rack Guard

(10) 3/4" [1.9 cm]
Large Diameter Tapcon Anchors

10,000 psi 25 Ton
[68.9 MPa 23 tonne]
Hydraulic Cylinder

8in
[20cm]

12" [30.5 cm] Stroke Linear Variable
Differential Transducer

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 defined as a 4" [10 cm] deflection with the intent of balancing product robustness, valuable footprint space, and application for safe working conditions.

Maximum Force & Deflection:

Force Vs. Deflection

Force (lb) vs. Deflection (in)

Legend: 10'' , 16''
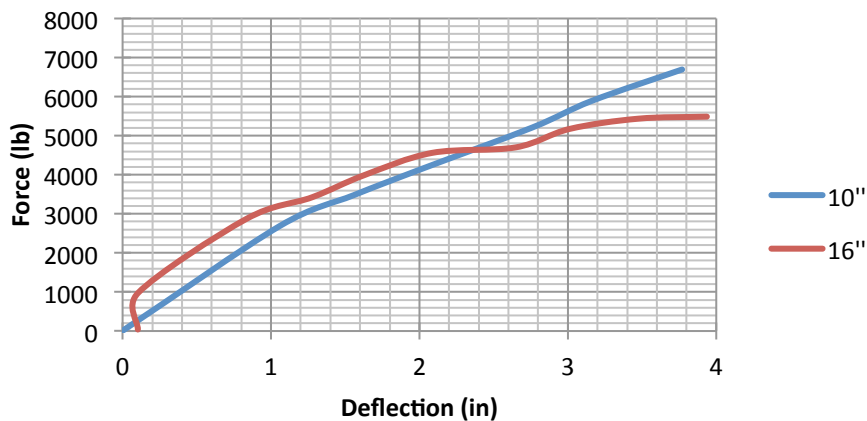
10'' Shock Absorbing Rack Guard
$F_{max} =$ 6,694 lb [29.8 kN]
δ_{max} = 3.9" [10 cm]
$v_\perp$ = 3.1 mph [5.0 km/h]
v_{45} = 14.2 mph [22.7 km/h]

16" Shock Absorbing Rack Guard
F_{max} = 5,487 lb [24.4 kN]
δ_{max} = 3.8" [9.6 cm]
$v_\perp$ = 2.9 mph [4.7 km/h]
v_{45} = 12.9 mph [20.9 km/h]

The Shock Absorbing Rack Guard can withstand an impact of 6,694 lb [29.8 kN], equivalent to a 6,500 lb [2948 kg] vehicle at 3.1 mph [5.0 km/h] and recover to the upright position. In testing, the Shock Absorbing Rack Guard was subjected to higher loadings and further deflections.

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 Shock Absorbing Rack Guard can withstand a 45° angular impact from a 6,500 lb [2948 kg] vehicle traveling at v_{45} = 14.2 mph [22.7 km/h].

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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