THERN STAGE EQUIPMENT
5712 Industrial Park Road
Winona, MN 55987 USA
p: 1.800.553.2204 f: 507.454.5282
www.thernstage.com | info@thernstage.com

Brickhouse FL6 Series Product Test Report

TEST DATE: February 26, 2010

TEST LOCATION: Thern, Inc. manufacturing facility

TEST PRODUCT: FL6-12SP1 Counterweight Arbor

PURPOSE:
1. To determine brick retention of the arbor assembly when subjected to a high-speed downward impact.
2. To determine failure modes for the arbor assembly when subjected to a high-speed downward impact.

PROCEDURE:
1. For testing purposes, the arbor is loaded to a total weight of 750 lb but not rigged to lift a load. Approximate speed of the falling arbor is 23 feet per second resulting in an approximate kinetic energy of 6,300 ft lb at impact. This energy is roughly equivalent to the amount resulting from a typical 40 ft system with a 250 lb weight imbalance between the arbor and the load.
2. Construct an arbor guide wall typical of theatre counterweight systems utilizing aluminum T-bar sections on standard 8 inch centerline spacing.
3. The lower bump stop (first point of arbor contact) should be standard 2x3x3/16” angle with 2x2 hardwood rail. Attach the bump stop angle with 5/16” fasteners to six aluminum T-bar sections.
4. The FL6-12 Series arbor has 3 counterweight compartments. Load the top compartment completely full of Brickhouse style steel counterweight bricks (412 lb). This will put maximum stress on shelf welds and side plates.
5. Load the center shelf with a single brick (22 lb). This will allow maximum potential movement of the brick.
6. Load the bottom shelf about half full (217 lb). This will provide an intermediate compartment-loading scenario.

Arbor setup prior to test.

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TEST IMAGES:

Test #1 – Arbor post drop test.

Test #1 – Top shelf weight movement post test.

Test #1 – Bottom shelf weight movement and deformation post test.

Test #2 – Bottom shelf weight movement post test.

TEST RESULTS:

1. Brick Retention

   Test Purpose: To determine brick retention of the arbor assembly when subjected to a high-speed downward impact.

   Anticipated Result: The bricks would move within shelved compartments and engage the gate, arresting the bricks and preventing escape.

   Test Result: As the arbor continued towards the floor and final impact, the brick weights slid forward making contact with the gate. The weights moved forward only enough to engage with the gate, which prevented further movement. Weights had to be pushed back in place in order to open the gate.

2. Failure Modes

   Test Purpose: To determine failure modes for the arbor assembly when subjected to a high-speed downward impact.

   Anticipated Result: The arbor would severely damage the bump stop rail as a result of the impact. The sides of the arbor would bow as a result of the compression force at impact, but principle weldments would not suffer any structural damage.

   Test Result: The bump stop rail mounting bolts pulled cleanly through the aluminum T-bars. The force of the bricks on the gate was sufficient to shear the pivot screw holding the gate latch. The force was not, however, enough to permanently deform the gate. Permanent deformation to the main arbor weldment occurred at the bottom due to contact with the ground. Deformation occurred at the sides of the arbor enclosure. The energy from the top stack of weights caused the sides to bow outward below that compartment. There was no indication of structural damage at any of the principle welds (top, bottom or shelves).

TEST SUMMARY:

1. The arbor gate performed as designed, arresting brick movement and preventing escape from the shelves with no permanent damage.
2. Principle welded components (top, bottom, shelves) performed as designed, suffering no structural damage as a result of the impact.