Development of Hardware and Control Systems for High Energy Drop Tower (TOP)

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High Energy Drop Tower

•Develop generic high energy drop tower system for testing of armored panels, fastener assemblies and other structures

•Tower accommodates a wide range of test fixtures that include:

1. Large flat panels with adjustable x-y-positioning
2. Three point bend fixtures
3. Direct impact fixtures
4. Mobile fixtures (prior to field testing)
5. Vehicle structures

•Impact node must be generic enough to accommodate large area impactor (blast), FSP type as well as custom nodes

•Base support must be rigid but allow for wide range of fixture assemblies

TOWER OF POWER

Tower Specifications

- Custom Built Tower (12 ft drop Height)
- 32,500J, (24,000ft lbs) Energy
- 8.6m/s (27fps) velocity
- 74in x 100in operating space
- 2000lb maximum drop weight (based on hoist rating, can go higher)
- 20ft total Height (can be extended)
- Dimensions: 227x112x 112in
- Magnetic release mechanism
- Ratchet braking system
- Hydraulic shocks and crane stops mounted on floor

Tower Specs. (cont.)

•"Maltese Cross" fixture developed for novel experimental measurements

•Cable transducer mounted on drop beam used to calculate impactor location, velocity, acceleration and initiate stops after impact

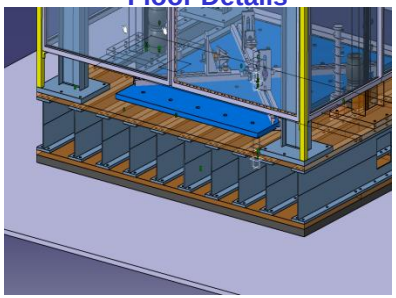
•Keyence Laser system mounted in floor (Optional)

•Load washers mounted on top cross beam

•Lighting system for high speed cameras

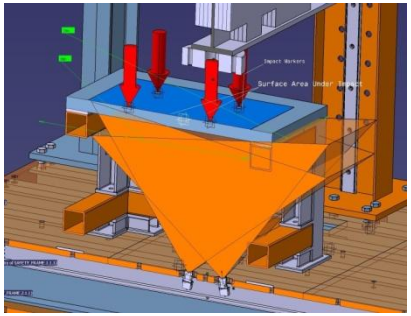
•Safety frame around base with access from front and back

Floor Details



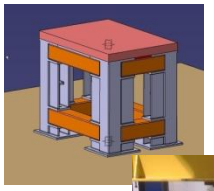
Sandwich construction with 6 120"x30"x1" Floor plates &10 x 10.5"x 5.85" W F beams

Stereographic Cameras



Mounted under floor to capture full 3D strain field during impact

Panel Modularity for ARL Panel Testing



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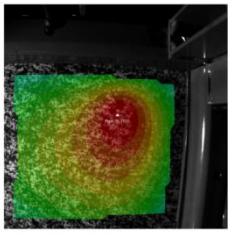
(Continued)

Panel Picture frame

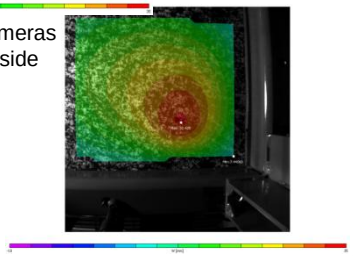
Tasks and Accomplishments

- Fabricate/Install Breaking System (including the ordering and installation of the pneumatic lines required to power the breaks
- Prep vertical/central I-beams for compliance with braking system (grind away paint)
- Fabricate C-channel to mount hi-speed cameras
- Locate and Install 4 “mini” load cells at the crosslink at top of tower
- Prep/Install adapter plate and load cell to underside of central crossbeam
- Fabricate mounting brackets for accelerometers
- Fabricate brackets for/hang safety doors
- Miscellaneous fabrication of parts needed to complete installation of components
- Begin Setup of T.O.P. Computer Control
- Aid in wiring and final preparation of tower

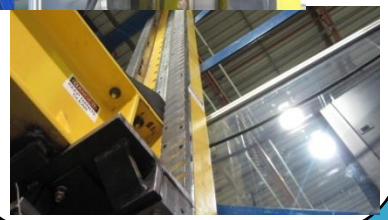
3D Strain Field



Stereographic Cameras Measuring backside deflection



New Breaking System



Load Cell/Adapter Plate

Computer Control

ACKNOWLEDGEMENTS

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