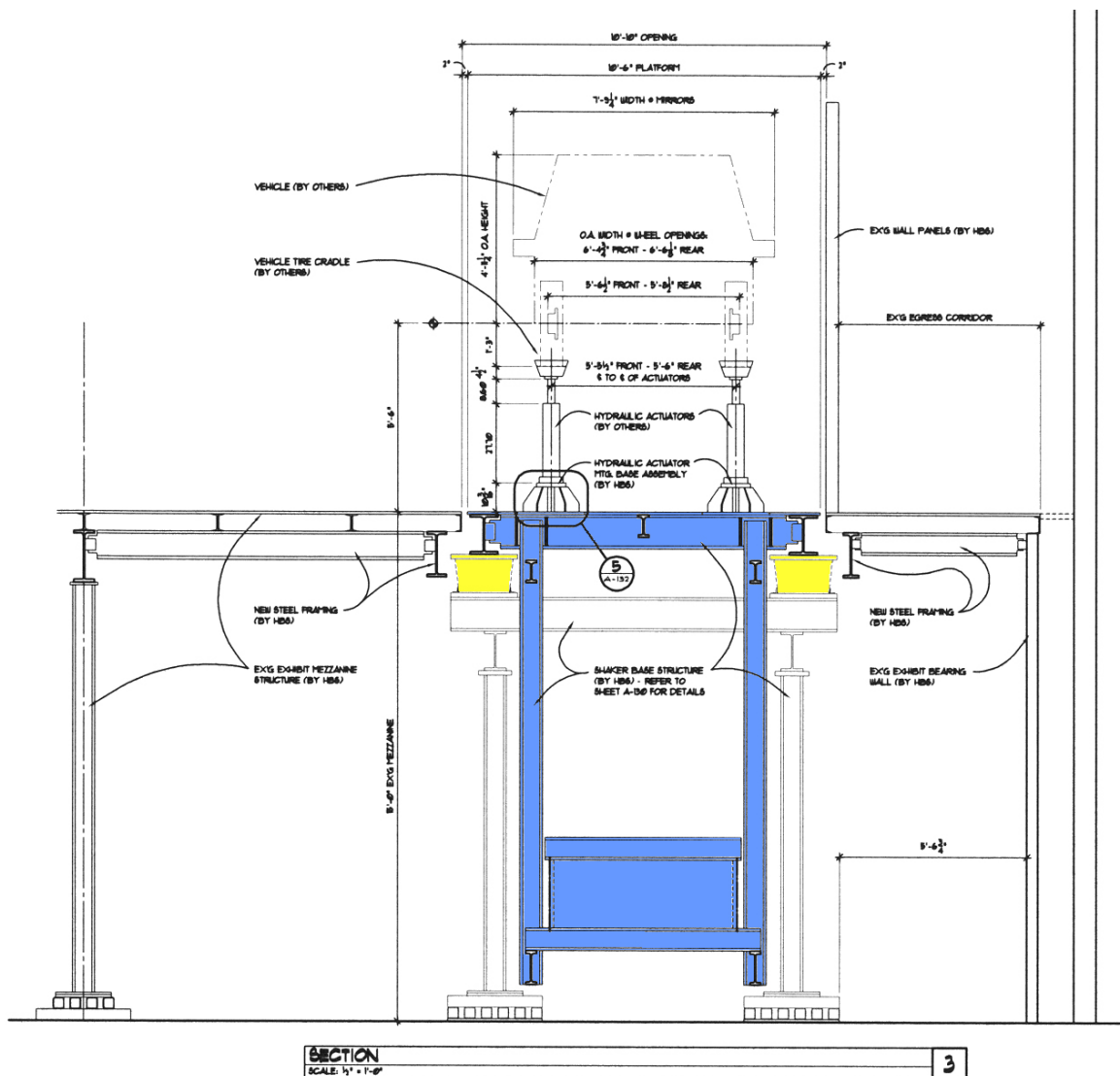


Four Post Shaker at North American Auto Show

H.B. Stubbs Company had a problem. They were asked by General Motors to provide a display for the auto show which included using a four post shaker to demonstrate shake, rattle and roll testing of a full size pickup truck. Previous attempts at this endeavor had failed, due to the large shock and vibration amplitudes created by the actuators and the restrictions of setting up such a display at an exhibition hall. Due to a successful track record isolating this type of equipment, H.B. Stubbs contacted Fabreeka to design and supply an isolation system for this temporary display.

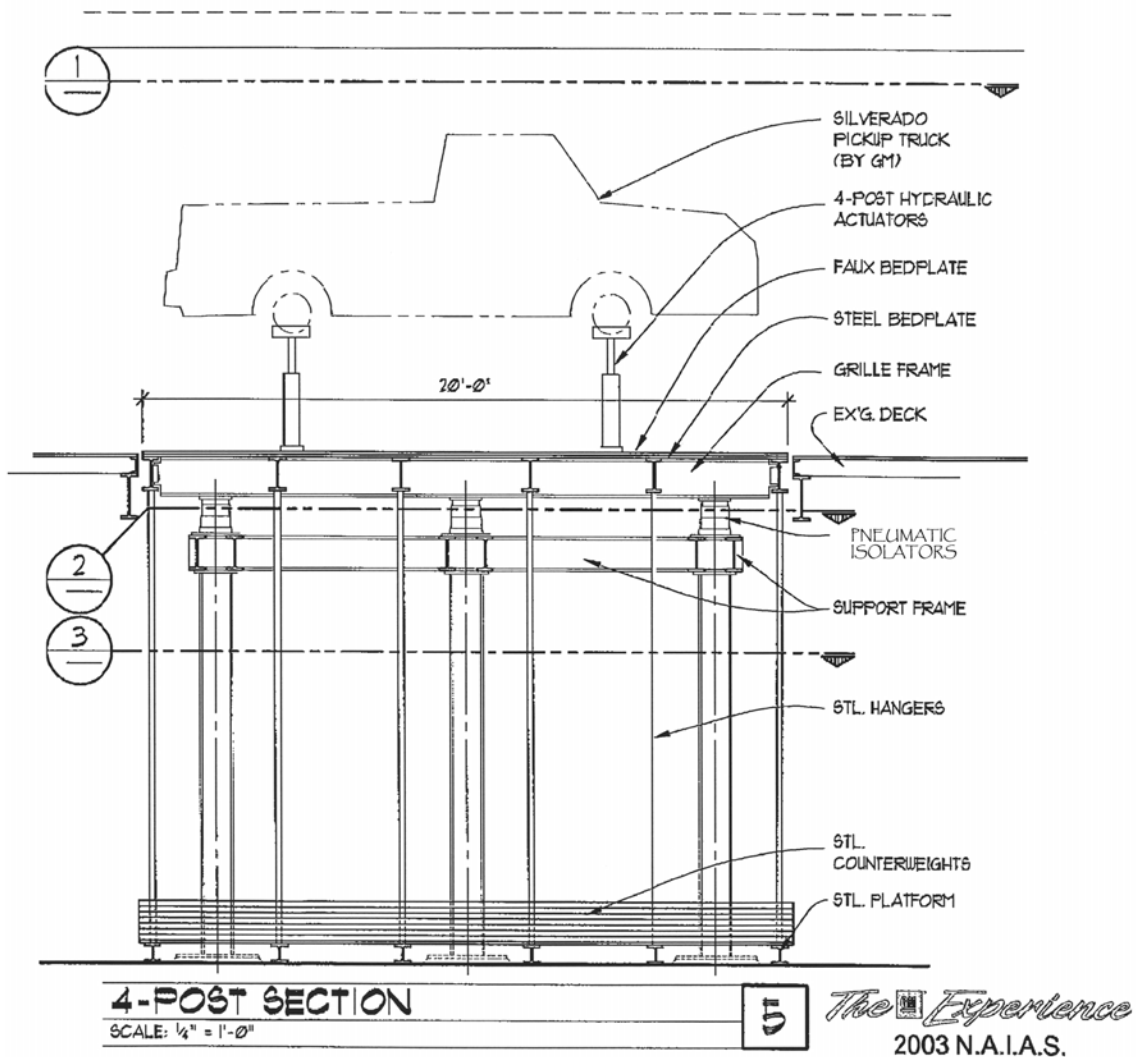
Normally, this type of testing application would involve a large, permanent concrete reaction mass to allow the actuators to be run at low frequencies and be supported on a soft isolation system.

H.B. Stubbs needed the same results, but in the confines of the Cobo Exhibition Hall using a temporary design and limited space.



Design Concept

The design concept included cutting a 20' x 10' area in the upper mezzanine at the exhibition hall and installing a support structure from the first floor up. A massive counterweight was attached to the upper steel bed plate to provide stability for the isolation system. Four pneumatic isolators support the bed plate, counterweight and the 4,000 lb truck being tested – totaling 90,000 lbs!





(Above) View of the truck being lowered onto the actuators on mezzanine level. Each actuator has a ± 3 " stroke and can provide a maximum force of 6.3 kips, depending on the operating frequency. The actuators can operate in and out of phase with each other, which makes the dynamic design of the isolation system challenging, as the base plate must remain stable for testing. The actuators can operate at a frequency as low as 0.5 Hz, depending on the stroke required.

At left, a first floor view showing the support frame and counter mass. Two isolators are visible on the support frame and support the base plate above.



Each isolator (above) supports 25,500 lbs and has a vertical natural frequency of 1.3 Hz. The isolators have adjustable vertical damping to allow the system to be "tuned" in the field for proper dynamic displacement and response to the various shaker inputs.

The required temporary counterweight (shown at left) weighed over 50,000 lbs. The support frame, weight, bedplate and isolation system all needed to be temporary and therefore capable of being removed after this show and rebuilt for a future show.