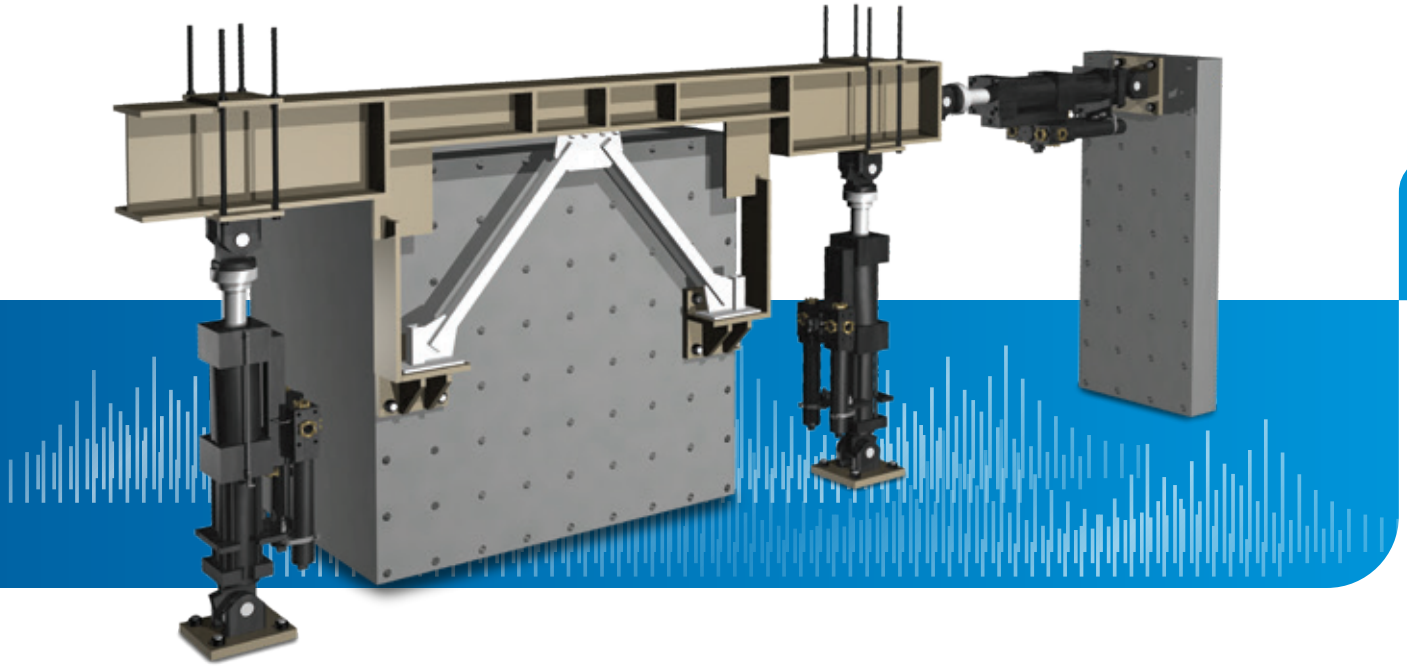


MTS Quasi-Static Civil Hybrid Simulation

Affordable hybrid simulation capabilities for any civil engineering test lab

By simultaneously combining physical testing of substructures with computer models of the remainder of the structure, hybrid simulation technology provides a complete picture of how earthquake events can affect large structures such as buildings and bridges without having to physically test the entire structure. This enables civil engineers to accurately and efficiently capture the effects that a substructure has on the overall structure, while subjecting the substructure to the same forces and motions it would experience within a complete structure.

In collaboration with leading universities — including the University of California Berkeley, the University of Colorado Boulder, State University of New York Buffalo, and others – MTS has developed an array of affordable, high-performance hybrid simulation solutions. Easy-to-deploy and flexible, these solutions enable virtually any civil engineering lab to incorporate world-class hybrid simulation into their seismic research activities.

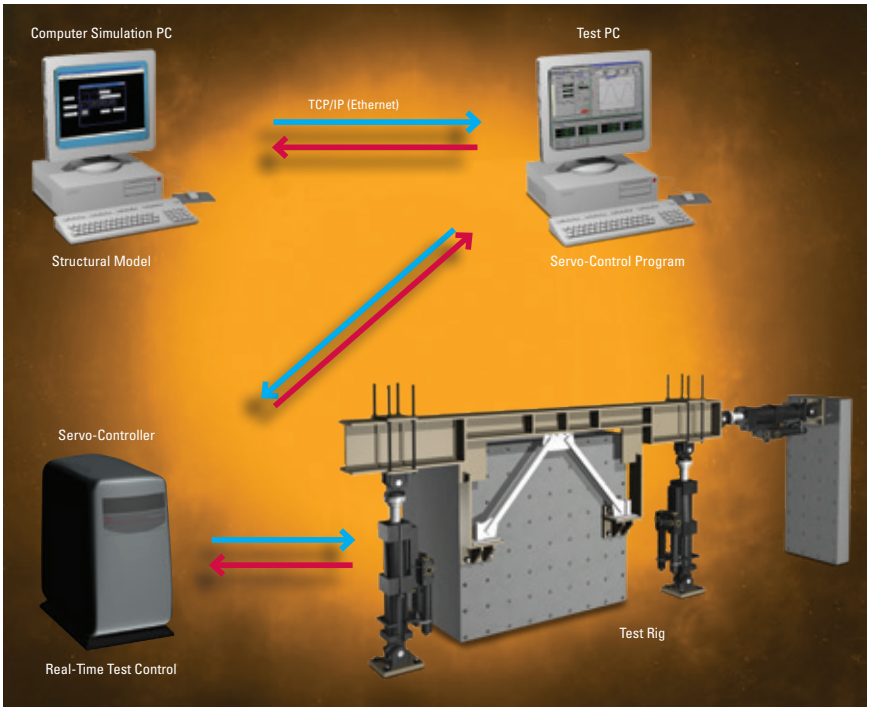
The MTS quasi-static hybrid simulation solution is used to evaluate substructures or components that predominantly contribute stiffness and strength to the complete structure. Elements of this solution include a versatile MTS digital controller, robust MTS physical test equipment and a simplified interface into widely adopted open source modeling and simulation integration tools.

The system also features online access to an array of leading data management and sharing tools, enabling civil engineers to collaborate effectively with peer research organizations anywhere in the world.

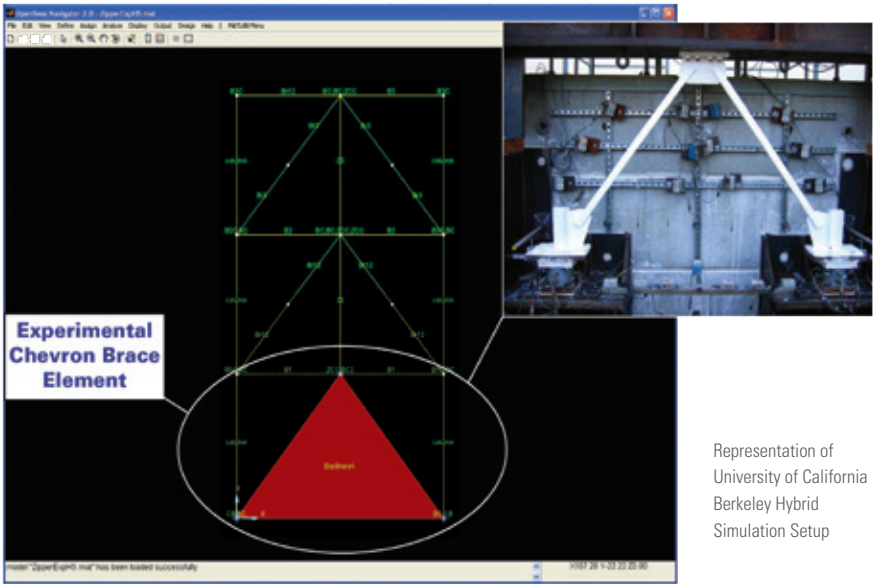
State-of-the-art Control & Integration

A versatile FlexTest® digital controller serves as the system's enabling hub. It accommodates up to eight control channels and features the MTS Computer Simulation Interface, which serves as the bridge between the computer simulation and physical test environments, interpreting command and feedback signals and ensuring the integrity of engineering units. This interface provides an easy way to map the control points and degrees of freedom in the computer model to the system's actuators and physical control channels.

Deployed with the FlexTest controller is the system's Test PC running MPT application software and any one of a variety of open source communication frameworks, such as Berkeley's OpenFresco, to set up and coordinate the integration between the physical and modeled elements of the simulation. OpenFresco is modular and flexible, supporting a wide variety of local and geographically distributed testing configurations.



MTS Quasi-Static Hybrid Simulation



Representation of University of California Berkeley Hybrid Simulation Setup

Robust Physical Testing

The system's physical test rig leverages robust MTS servohydraulic technology and decades of MTS civil structural testing expertise to deliver precise control of seismic forces and motions. Its components include fatigue-rated MTS structural actuators, high-quality TestLine components, and a reliable MTS hydraulic power solution.

Actuation is achieved with heavy-duty Series 201 actuators, which are designed for long stroke and/or low dynamic applications.

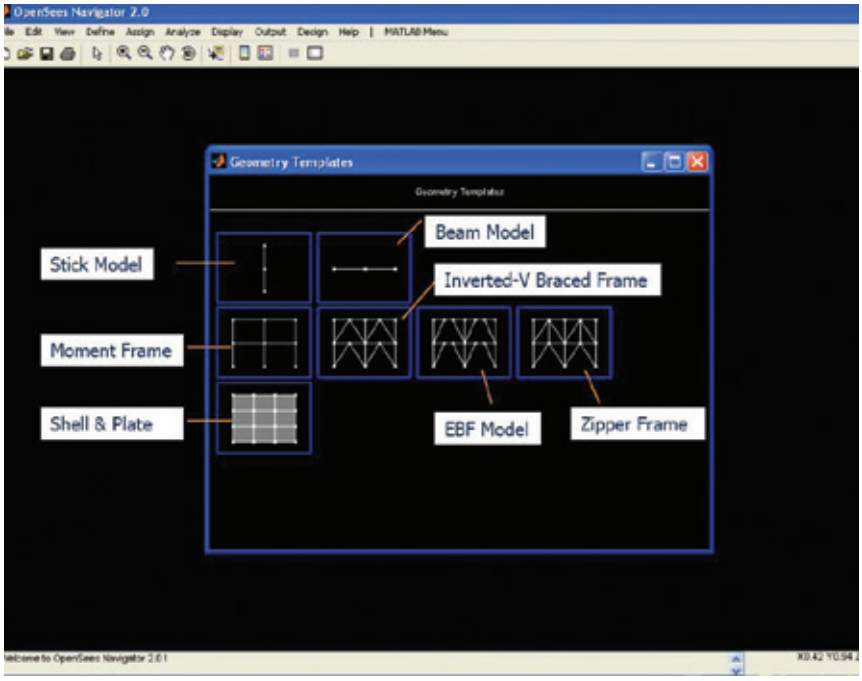
Compatible with MTS' feedback and control components, reliable and highly responsive 201 actuators provide precision performance for low-frequency test and simulation applications.

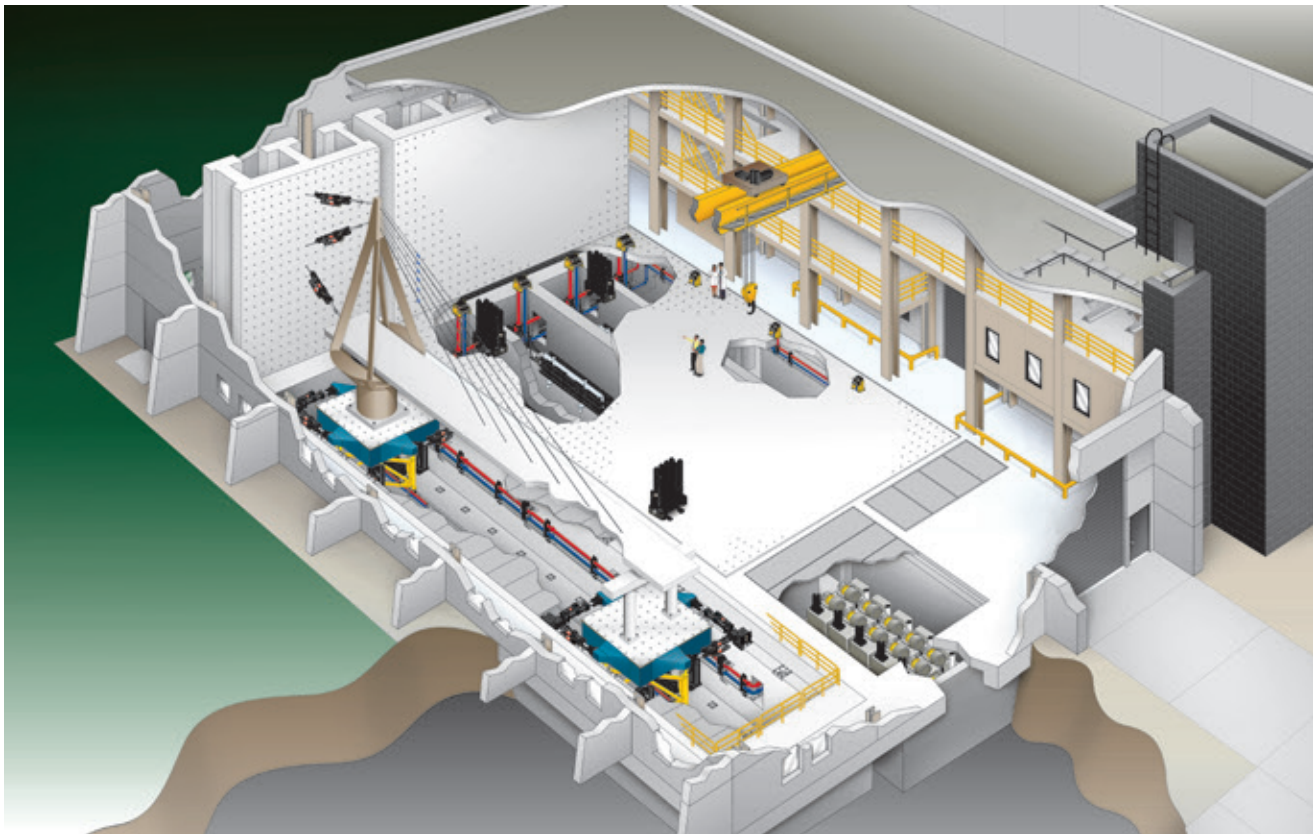
The rig also integrates a wide array of high-quality MTS TestLine™ components, including adjustable reaction brackets, swivels, hydraulic service manifolds and distribution components, portal frames, modular beams and reaction stands.

Hydraulic power is supplied by an MTS SilentFlo™ HPU. Amazingly quiet, SilentFlo HPUs operate at only 58-72 db (A), below normal ambient levels commonly found in laboratory environments. It can be deployed directly in the lab, eliminating the need for special pump housing facilities and reducing supply line length and space requirements.

User-Friendly Computer Simulation

The system's Computer Simulation PC features a user-friendly interface into an array of widely accepted modeling software platforms, such as Berkeley's OpenSees, that replicate the performance of civil structures. OpenSees is a highly modular and transparent open source software that allows researchers in different fields (engineering, computer science, and numerical analysis) to develop specific modules with relatively little dependence on other modules. This allows civil engineers to focus on their respective areas of expertise without having to be familiar with all elements of the simulation's framework.





Unmatched Simulation & Facilities Consulting

MTS' commitment to its customers continues long after system delivery and installation. We provide a broad range of services to ensure optimum seismic simulation system reliability and longevity. Through our training programs, we also help users acquire the technical know-how and skill to get maximum benefits from our equipment.

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290 USA

Telephone: 1-952-937-4000
Toll Free: 1-800-328-2255

E-mail: info@mts.com
www.mts.com

ISO 9001 Certified QMS

100-176-695b QuasiStatic • Printed in U.S.A. • 11/23