High Performance Earthquake Simulation at the University at Buffalo

UB Node of NEES

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Major Components of UB-NEES

- New laboratory
- New hydraulic power supply
- New 6 DOF earthquake simulators (2)
- New dynamic actuators (3)
- New high capacity static actuators (2)
- New testing capabilities
  - One of the most versatile large scale earthquake engineering facilities

Building and Equipment Summary

- Building expansion
  - 1200 m²
- Strong floor
  - 320 m²
- Reaction walls
  - 180 m²
- Reaction mass: 10,000 T
- 6 dof simulators (2)
- 100 T dynamic actuators (3)
- 200 T static actuators (2)
- Hydraulic power supply
  - 6050 lpm
- Controllers
- Video recording network
- Data acquisition network
- LAN for experimentation, data processing and simulation
Ketter Hall Expansion

Hydraulic Power Supply

- Four hydraulic pumps of 700 lpm each
- Surge tank and 14 no. 190 litre accumulators
- Continuous supply of 6050 lpm for 30 seconds of seismic motion
- 6050 lpm of main distribution line
Hydraulic Power Supply

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Simulator Details

- **Platform:** 3.6 m x 3.6 m
- **Platform weight:** 8 T
- **Maximum stroke**
  - X, Y = 150 mm
  - Z = 75 mm
- **Maximum velocity**
  - X, Y = 1250 mm/s
  - Z = 500 mm/s
- **Maximum acceleration**
  - X, Y = 1.15 g
  - Z = 1.15 g
- **Degrees of freedom:** 6
- **Maximum specimen weight:**
  - 20 T nominal
  - 50 T maximum
- **OTM capacity:** 46 T-m
- **Off-center loading moment:** 15 T-m
- **Working frequency range:** 0.1 to 50 Hz

Simulator Details

- **Simulators are re-locatable in a trench**
  - Place together
    - 40 T nominal
    - 100 T maximum
  - Place 30 m apart
    - Test large-span bridge structures
  - Utilize adjacent strong wall for hybrid testing
Simulator Details
Actuators

- **Dynamic actuators (3)**
  - 100 T tons
  - Dual 400 1500 lpm servovalves
  - 500 mm stroke
- **Static actuators (2)**
  - 200 T
  - 57 lpm servovalves
  - 500 mm stroke

Seismic Testing Capabilities

- Earthquake simulator testing
- Effective force method (a)
- Pseudo-dynamic testing (b)
- Real-time dynamic hybrid testing (c)
Real-Time Dynamic Hybrid Testing

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Closing Remarks

- NEES and NSF
  - The next-generation infrastructure for earthquake engineering research
- UB node of NEES
  - Expands national capabilities in earthquake engineering research
  - Complete and on-line in September 2004
  - Faculty are eager to see substantial use of UB-NEES by US and international research teams post September 2004

http://nees.buffalo.edu
http://nees.org