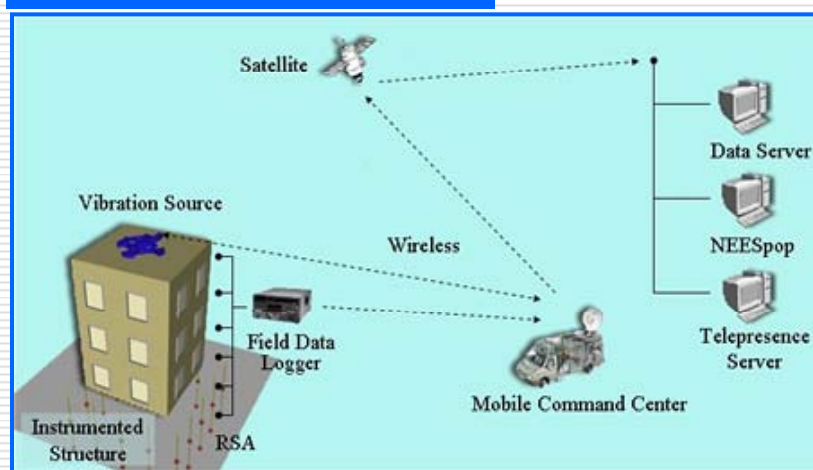


NEES@UCLA: Field Testing for Structural and Geotechnical Research



Concept: Advanced Dynamic Field Testing of Civil Structures



NEES@UCLA Equipment

Equipment

- 4 large mobile shakers
- Extensive field-deployable monitoring instrumentation system
- CPT truck for research use

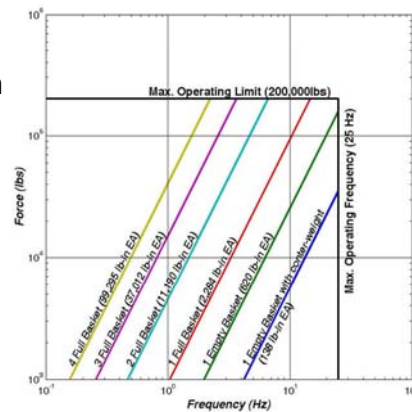
Uses

- Large-amplitude excitation of structures
- Field testing/temporary monitoring of structures
- Site characterization and installation of subsurface sensors using CPT



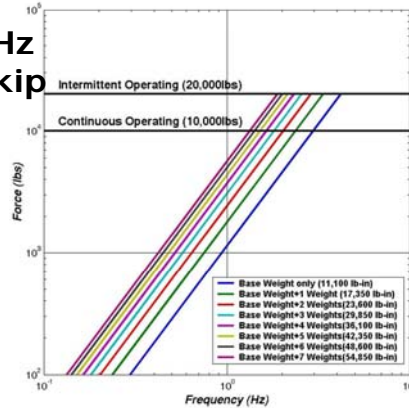
Large Unidirectional Eccentric Mass Shaker

Qty: 2
 Freq: 0-25Hz
 Force: 100kip each



Omnidirectional Eccentric Mass Shaker

Qty: 1
Freq: 0-4Hz
Force: 15kip



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The George F. Brown, Jr. Network for Earthquake Engineering Simulation

15kip Linear Hydraulic Shaker

Qty: 1
Freq: 0-20Hz
Force: 15kip
Waveform: Arbitrary, digitally-controlled force or displacement



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Data Loggers

Kinematics Quanterra Q330 6 Channel (20x)

- Standard in seismology
- True 24-bit A/D
- ~145 dB dynamic range
- GPS time synchronization (< 1 ms accuracy)
- TCP/IP protocol enables wireless telemetry
- Low power (0.5 W) for long-term deployments



Accelerometers

Kinematics Force Balanced Accelerometers

- 55 Uniaxial & 15 Triaxial Episensors
 - $\pm 2g$ & 0-200 Hz
 - > 155 dB dynamic range
 - Low noise ($< 1 \mu g$)
 - $< 1\%$ cross-sensitivity



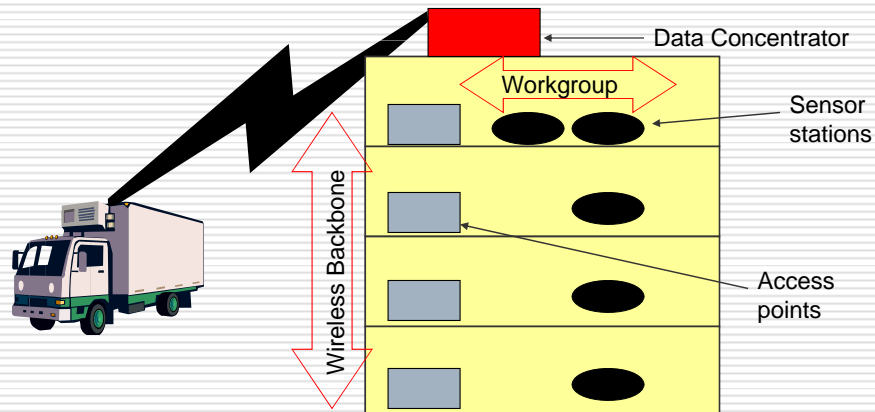
Mobile Command Center

Self-Contained Panel Truck

- Generator power
- Satellite Uplink
 - 1.8m dish
 - T1 speed
- WiFi/LAN Hardware
- NEESpop/Data Turbine
- Data and analysis computers



Wireless Network Topography



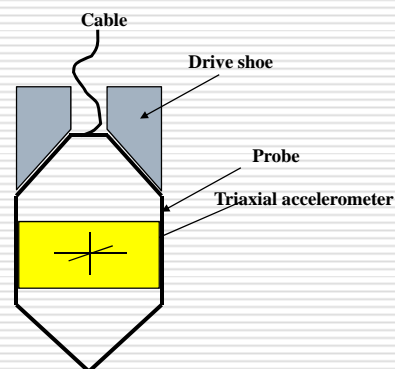
CPT Truck

- Vendor: Hogentogler, Inc.
- Site characterization
 - Tip resistance
 - Sleeve resistance
 - Inclination
 - Pore pressure
 - Geophone for downhole shear wave velocity

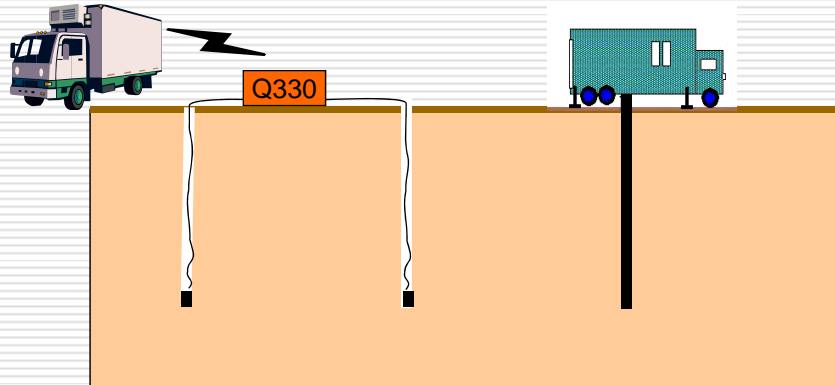


Retrievable Subsurface Accelerometer

- Insert with CPT truck
- Compatible with Q330 data loggers
- Retrievable with winch
- Silicon Designs MEMS triaxial accelerometer
- Downhole signal conditioning to reduce noise contamination
- Micro-controller for built in sensor intelligence



RSA Installation



Past & Current Research Use

- **Some Completed Projects**
 - UCSD Phase I & II (NSF, 2003)
 - UCLA Imperial Valley (PEER, 2003)
 - USC/UCSD Carquinez Bridge (Caltrans, 2003)
 - SUNY Buffalo @ Marina Del Rey (2004)
 - UCLA Forced Vibration 4-story Building (NSF, 2004)
 - BYU/UCSB/USC & UCLA/UT Garner Valley (NSF, 2004)
- **NEESR Projects**
 - BYU Dynamic + Static Foundation Impedance Study (2005-6)
- **Other Projects**
 - ANSS Sensor Testing (ongoing)
 - Caltrans Pile Testing (ongoing)
 - Shear Wall Tests for Private Firm (ongoing)

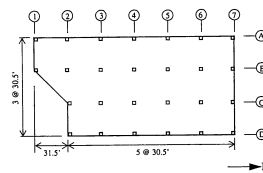
Project Examples: Four Seasons

- **“Four Seasons” building**
 - Four-story with penthouse
 - Reinforced Concrete building
 - Damaged beyond repair in 1994 Northridge Earthquake

- **Structural system**
 - Lateral Load :
 - Perimeter ductile moment resisting frame
 - Gravity Load :
 - Post-tensioned flat slab + interior column



Exterior



Plan

Excitation: NEES@UCLA Shakers

- Eccentric Mass Shakers (two on roof)

- Linear Shaker
 - Arbitrary forces ;
sine-sweep, white noise, earthquake-type loading



Eccentric Mass Shaker



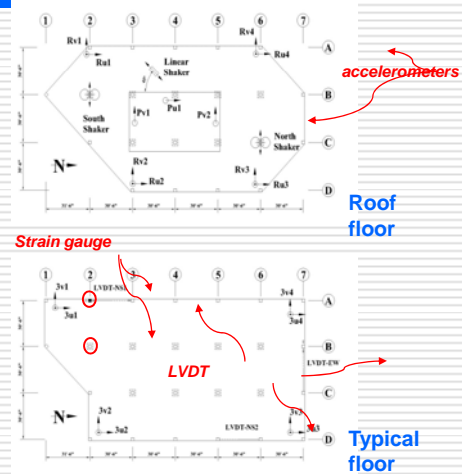
Linear Shaker

Instrumentation

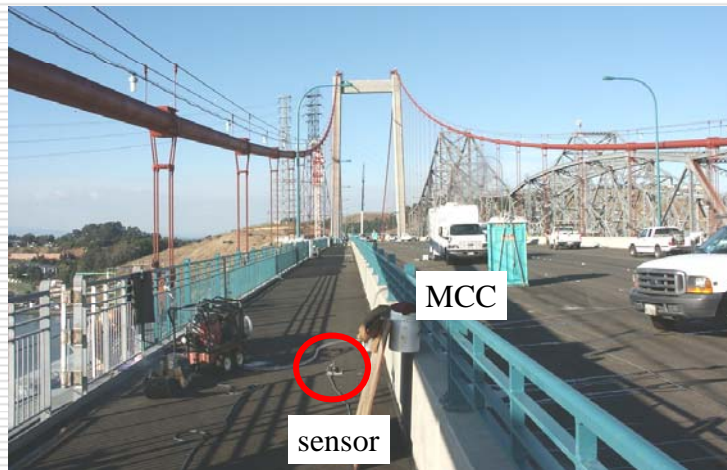
- Accelerometers (100 ch)
- Strain Gauges (96 ch)
- DCDT (drift, 20 ch)

Payload projects

- Nonstructural (UCI)
- Advanced sensors (CENS/UCLA)



Project Examples: Carquinez Bridge



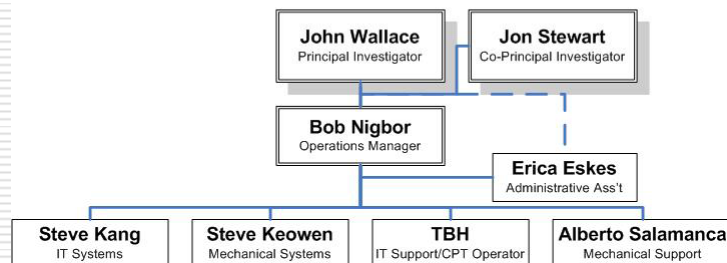
Opportunities

- Building/Bridge/Dam structural response and performance studies
- Health monitoring and sensor network studies
- Response and performance studies for geo-structures and soil deposits
- Soil-Structure Interaction Studies



Personnel

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For Further Information

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