

Status of Dynamic Soil Testing

NuStart – Nuclear Energy Institute
Workshop

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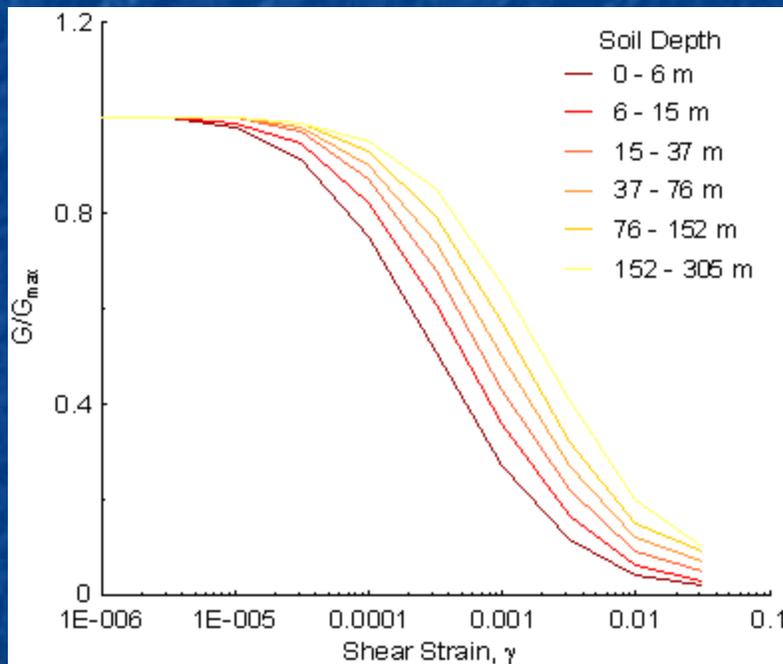
Requirement for Dynamic Soils Testing

Reg Guide 1.138 - § 4.5

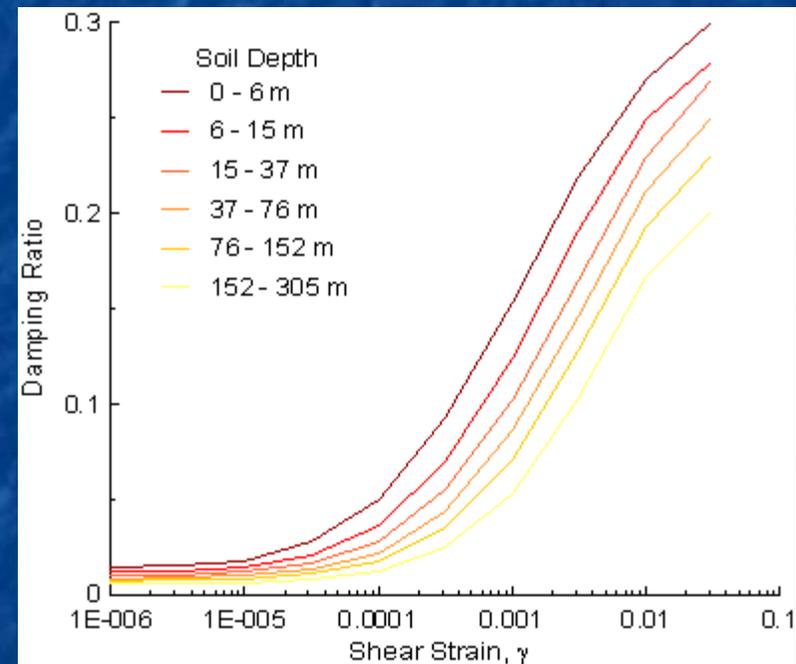
*“The basic parameters required as input for dynamic response analyses of soils include total mass density, relative density, Poisson’s ratio, static soil strength, initial stress conditions, shear and compressional wave velocities, and the **dynamic shear modulus** and **damping ratio**. The variation of strength, moduli, and damping with strain is also needed for such analyses.”*

Key Dynamic Properties

Shear Modulus



Damping Ratio



Test Methodologies

Reg Guide 1.138 - § 6

- Resonant Column
(ASTM D4015-92)
and
- Cyclic Tri-axial
(ASTM D3999-91)

EPRI TR-102293

- Combined Resonant Column/Torsional Shear

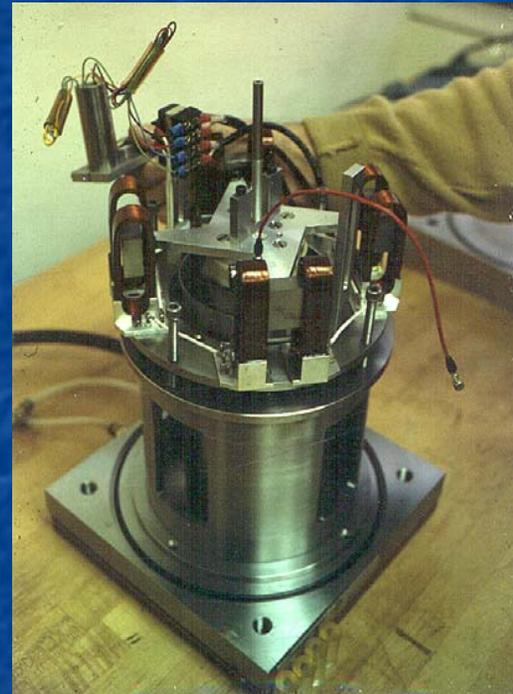
NUREG 0800 – Subsection 2.5.4.2.

“In meeting the requirements of References 1, 2, 3, 6, and 7 and the regulatory positions of References 10 and 11, the description of properties of underlying materials is considered acceptable if **state-of-the-art methods** are used to determine the static and dynamic engineering properties of all foundation soils and rocks in the site area.”

Combined RC/TS Test

Professor Ken Stokoe
University of Texas – Austin

- Developed Testing Protocol
- Developed Test Apparatus
- Proved Protocol in DOE Projects
- Licensed Apparatus Design
- Utilized Protocol in EPRI TR-102293



Testing Capacity

- University of Texas
 - 4 Test Cells, one not in operation
- Other Universities
 - 5-10 Schools, each with one Cell
- Commercial Laboratory – Fugro
 - 7 Resonant Column Cells, capable of conversion
- GeoTac (Trautwein)
 - Licensed to produce new cells

Projected Test Cell Availability

1. Fugro Cell # 1: Start 2/28/07
2. Fugro Cell # 2: Start 3/2/07
3. Fugro Cell # 3: Start 3/5/07
4. Fugro Cell # 4: Start 3/7/07
5. **New Cell # 1: Start 3/09/07**
6. **New Cell # 2: Start 3/12/07**
7. Fugro Cell # 5: Start 3/14/07
8. Fugro Cell # 6: Start 3/16/07
9. Fugro Cell # 7: Start 3/19/07
10. **U of T Cell # 4: Start 3/26/07 (refurbished)**
11. **U of T Cell # 1: Start 4/02/07**

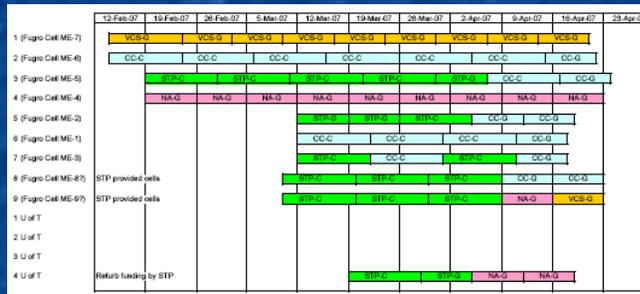
Projected Testing Requirements

For Example Only

- 7 Projects
- 10-20 samples per site (average 15)
- 105 samples
- Test duration: 7 – 14 days per sample
- Total Test Time Required: 1,050 days
- Calendar Time: 150 days – 5 months
- Start at 3/1/07 → End at 8/01/07

Proposed Path Forward

- Review need for tests
- Give priority to Soils Sites over Rock Sites
- Schedule Simultaneous Testing



- Perform Initial "Scoping" Tests
- Perform Follow-up Conformance Testing
- Submit Supplemental Test Data

COL Applications

- Firm And Hard Rock Sites
 - Dynamic Laboratory Testing is Not Required For Structures Founded on Rock
 - Standard EPRI Curves will be used to describe Backfill or Native Soil Around Nuclear Island or Under Adjacent Buildings
- Other Sites
 - Use Standard EPRI Curves, Supplemented By Field Tests And Selected Laboratory Test Results
 - Conduct Confirmatory Testing Following COLA Submittal