MFFFNPEm Resource

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Shaw AREVA
MOX SERVICES, LLC

Draft Slides – Seismic Design
ACRS Presentation, Aug 20, 2010

Shaw AREVA MOX SERVICES, LLC

MFFF Seismic Structural Analysis

- MFFF is an Reinforced Concrete Structure facilities consisting of four major buildings:

  BMF-MOX Fuel Fabrication Building (SCI)

  BEG-Emergency Diesel Generator Building (SCI)

  DOF Tank Vault (SCI)

  BSH-Safe Havens (SCII)

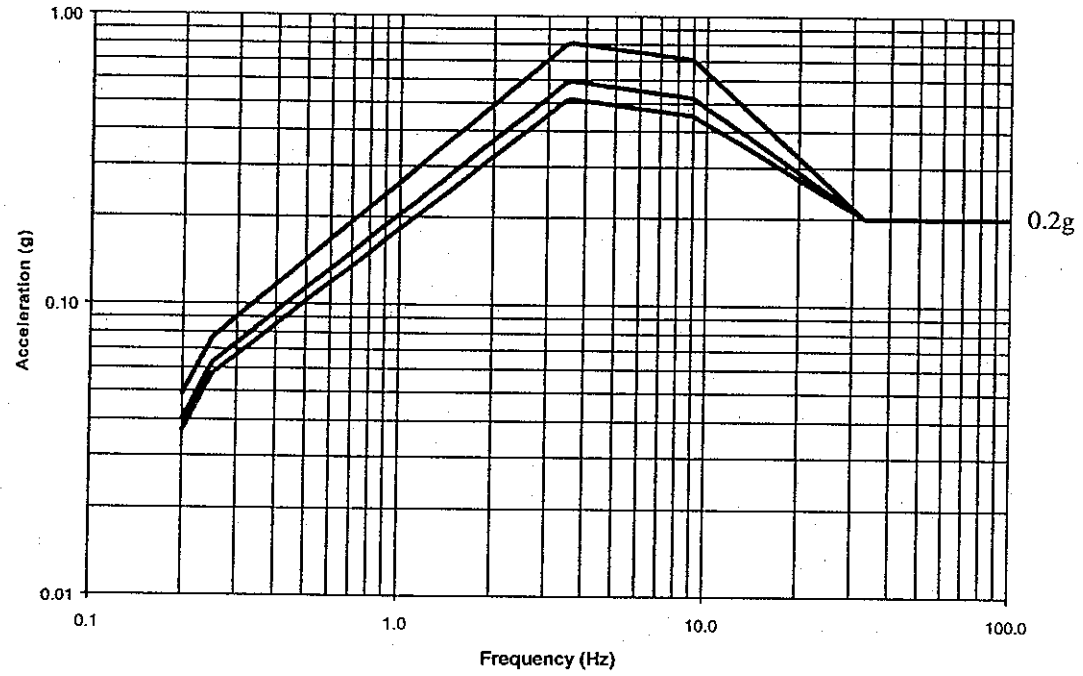
- The seismic design of Structures, Systems and Components (SSCs), which are IROFS.Design Earthquake Loads for SC-I and SC-II Structures has been performed in accordance with the guidance of Regulatory Guide 3.14, Seismic Design Classification for Fuel Fabrication Plants, and DOE-STD-1020, NPH Design and evaluation Criteria for DOE Facilities at the MFFF are designed to accommodate a Design Basis Earthquake (DE). The DE for the MFFF is similar to a Safe Shutdown Earthquake.

MFFF Seismic Structural Analysis

- Seismic SC-I & SC-II (Ground Motion) criteria is Regulatory Guide 1.60, Design response Spectra for Seismic Design of nuclear Power Plants, December 1973 scaled to 0.20g peak ground acceleration.
- Post Earthquake Settlement analysis are calculated based on the method recommended by Ishihara and Yoshimine, "Evaluation of Settlements in Sand Deposits following Liquefaction during earthquakes, Soil and Foundations, Japanese Society of soil Mechanics and foundation Engineering, Vol. 32 No.1.

MFFF Seismic Structural Analysis

- **Vertical = RG 1.60 Vertical Spectrum Scaled to 0.2g PGA**

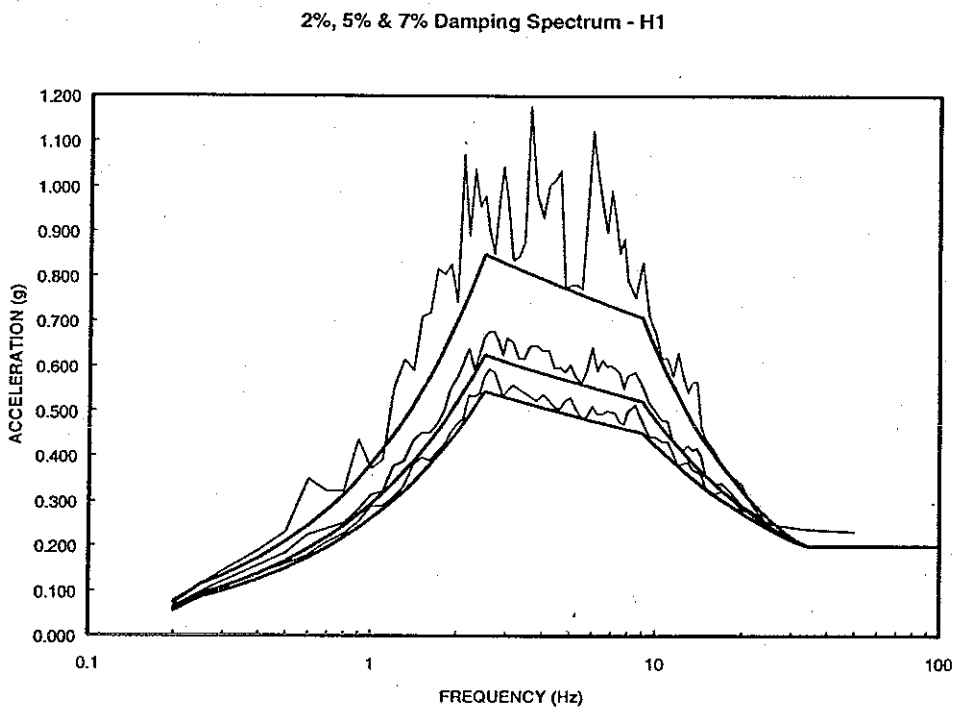


MFFF Seismic Structural Analysis

Matching Synthetic Time Histories

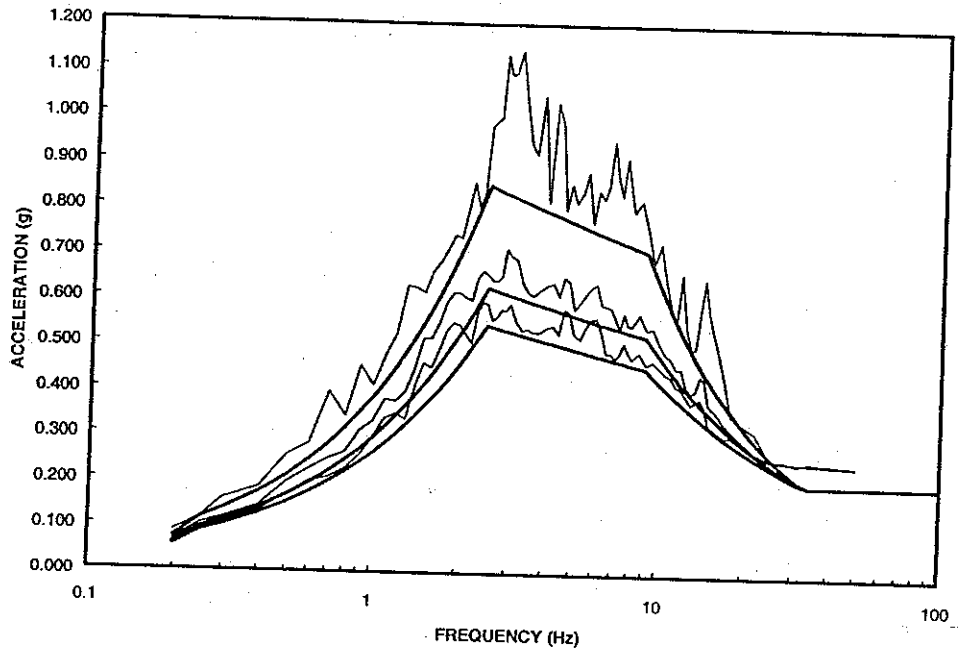
- 24-second duration
- Meet SRP 3.7.1 guidelines for response spectrum enveloping
- Horizontal components meet SRP 3.7.1 guidelines for 80% target PSD enveloping
- Statistically independent of each other

MFFF Seismic Structural Analysis

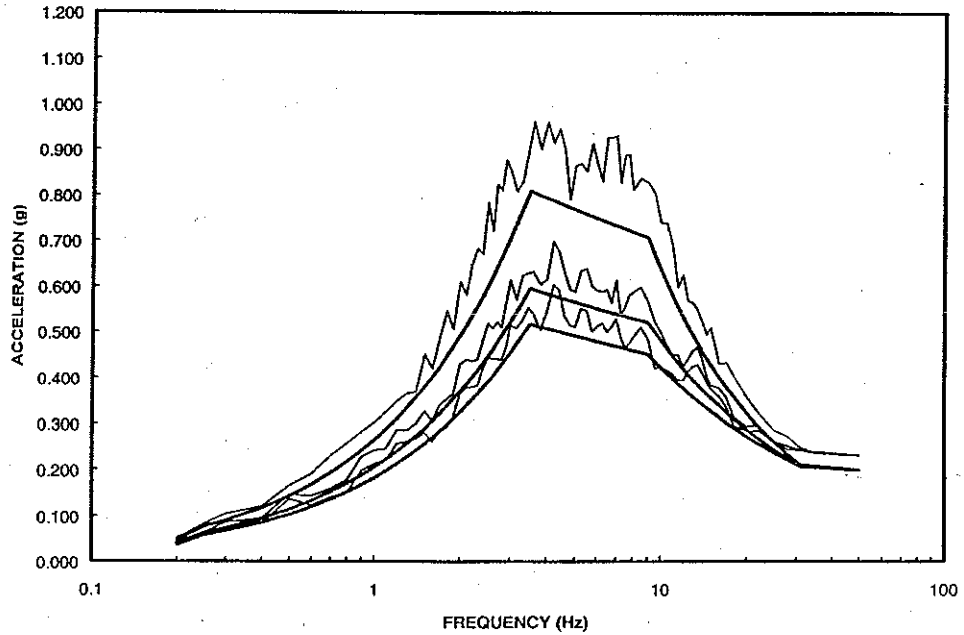


MFFF Seismic Structural Analysis

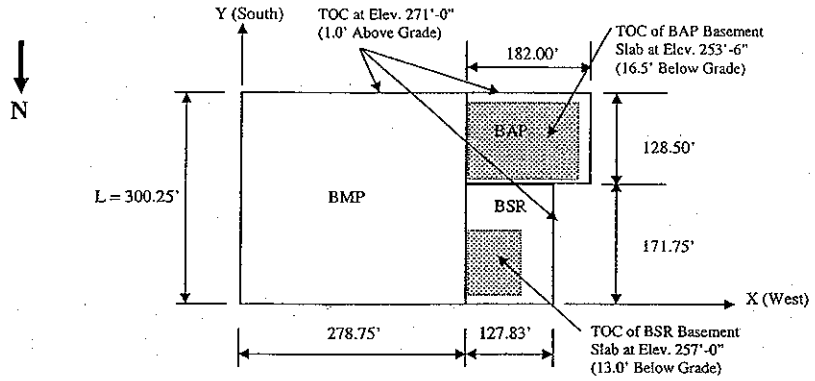
2%, 5% & 7% Damping Spectrum - H2



2%, 5% & 7% Damping Spectrum - V



(2) SSI Analysis of BMF



Plan – Slab at Grade

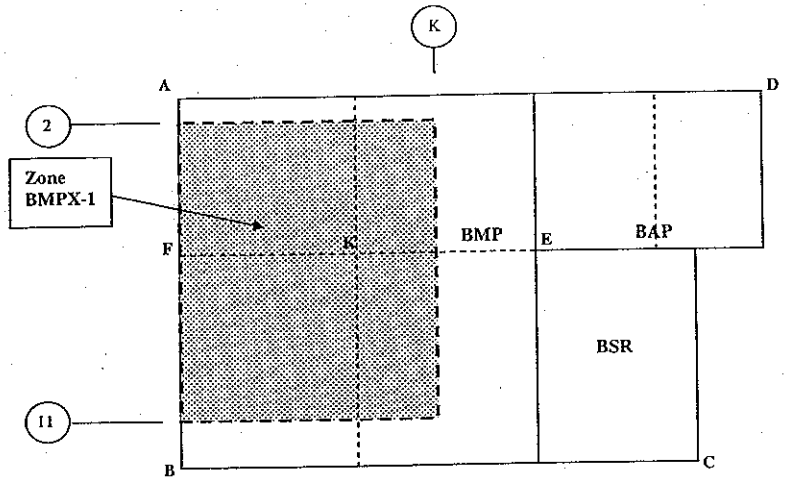
Structural Model (Based on Calc. B-01066-D)

- 3-D finite element model consisting of shell (typical 1x1 mesh per given area) and beam elements
- Shallow embedment ignored (per ASCE 4-98)
  BAP embedment = 17.5' << 0.3Re
  Re = equiv. radius ≈ [300'*433'/π]**$^{1/2}$ = 203'
- Slab at grade assumed rigid, and modeled with a grid of massless rigid beams and a lumped mass, M_1
- Damping = 7%
- Un-cracked concrete (f'c = 4,000 psi, Ec = 3.60E6 psi)

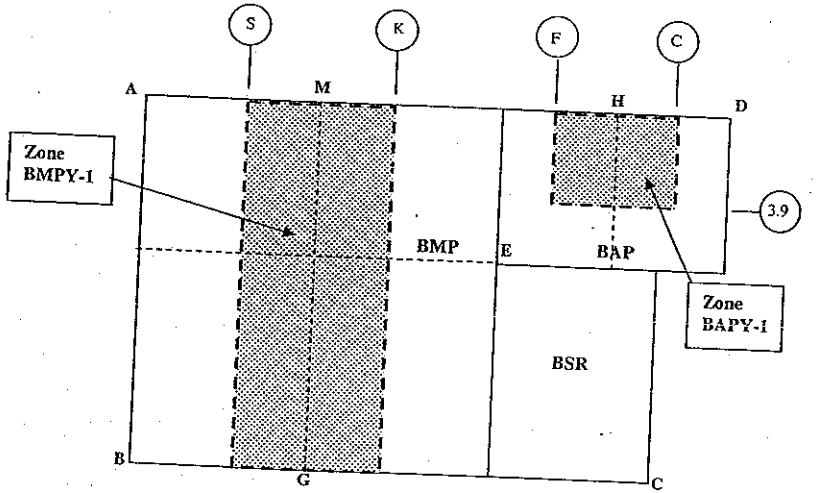
MFFF Seismic Structural Analysis

SSI Responses

- In-plane flexibility of concrete slabs amplifies horizontal response within certain areas of slabs – zone BMPX-1 for X-direction response, and zones BMPY-1 and BAPY-1 for Y-direction response in Y-direction
  (Figs. 1, 2, 3)
- Upper Bound soil governs most SSI responses
  (Figs. 4 to 9)
- Torsional response is negligibly small
  (Figs. 10, 11)
- Rocking response is significant
  (Fig. 12)



Zone BMPX-1 on BMP Slabs for X-Direction Amplified Responses



Zones BMPY-1 and BAPY-1 on BMP and BAP Slabs for Y-Direction Amplified Responses