Session 5: General Treatment of Incoherency

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2:15 to 2:30

CLASSI-SASSI Methodologies

- CLASSIinco
  - Deterministic phasing
- CLASSIinco-SRSS
  - Structure response to each foundation input motion combined by SRSS
- SASSI-Simulation (Randomization)
  - Spatial modes assigned random phasing
  - Mean of structural response to spatial modes computed
- SASSI-SRSS
  - Structural responses to each spatial mode are combined by SRSS
- SASSI-AS
  - Linear combination (algebraic sum) of spatial modes used to compute structural response

Coherency Matrix Gamma [$\gamma(\omega)$]

- CLASSI and SASSI – foundation footprint divided into sub-regions
  - CLASSI – centroids of the sub-regions
  - SASSI – interaction nodes
- Gamma [$\gamma(\omega)$]
  - 3N x 3N where N is the number of sub-regions or interaction nodes (3 is three directions of free-field motion)
  - If centroids of sub-regions (C) coincide with locations of interaction nodes (S) - [$\gamma(\omega)$] is identical

Coherency Matrix Gamma [$\gamma(\omega)$]

- CLASSI
  - Applies the constraint of rigid massless foundation behavior to determine the amplitude of the multipliers to be applied to the sub-region tractions
  - Rigid body motion
  - CPSD matrix - square root of the diagonal terms = incoherency transfer functions (scattering functions)
  - FIM = IFFT[(FFT - free-field ground motion) * Incoherency Transfer Functions (ITFs)]

Coherency Matrix Gamma [$\gamma(\omega)$]

- SASSI
  - Decomposes [$\gamma(\omega)$] into spatial modes

    $([\gamma(\omega)] - \lambda_i^2[I])\ \{\phi(\omega)\}_i) = \{0\},\ i = 1,2,...N$
  - Generalized solution denoted Karhunen-Loeve (KL) based on the spectral factorization of the coherency kernel
  - $\{U_g^I\} = [\phi(\omega)]\ [\lambda(\omega)]\ \{\eta_\theta(\omega)\}\ U_0(\omega)$

    $\{U_g^I\}$ = interaction node motion

    $\{\eta_\theta(\omega)\}$ = random phase vector of form exp $[i\theta(\omega)]$

    where $-\pi \le \theta \le \pi$

    $U_0(\omega)$ is the free-field ground motion component

SASSI – General considerations

- For each SASSI frequency of solution, the spatial modes are derived
  - Total number of spatial modes equals the number of interaction node points (N) for each direction of excitation
  - Complete set of spatial modes may be used (SASSI-Simulation and SASSI-AS) or a subset (SASSI-SRSS)
- Treatment of the spatial modes distinguishes the three methods

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