ENSOFT, INC.
3003 West Howard Lane
Austin, Texas 78728
support@ensoftinc.com

Tel. 512-244-6464
Fax 512-244-6067

DynaPile v2016

DYNAPILE FOR SEISMIC ANALYSES

Kinematic Seismic Response

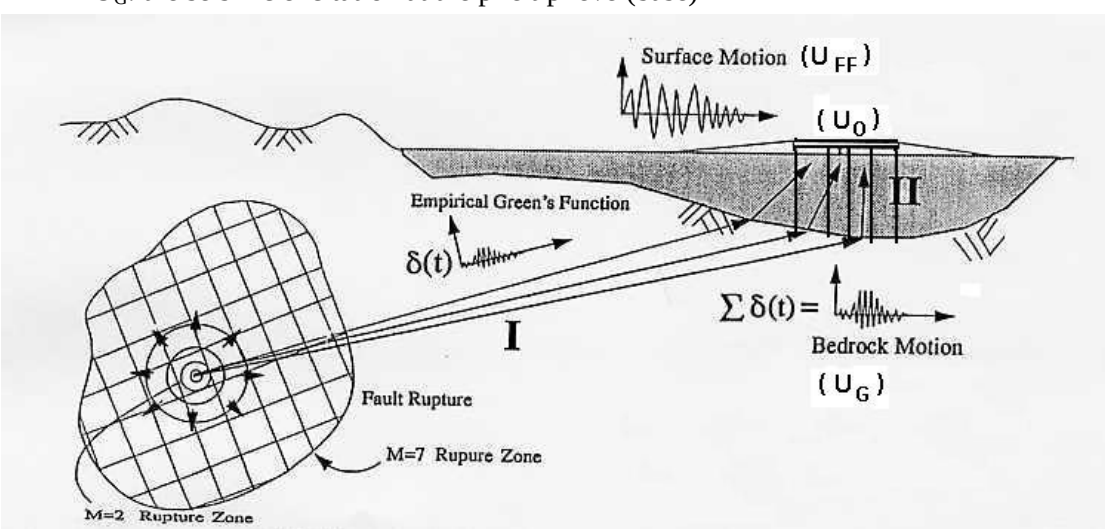
DynaPile can generate the transfer functions for kinematic response of piles and pile groups. The output for the kinematic-displacement factors is listed in the output file as a function of user-specified frequencies.

With regard to the motion of the foundation, the factors are defined as U_o/U_{FF} and U_o/U_G, where U_o is the foundation motion due to seismic excitation, U_{FF} is the free-field displacement of the ground surface, and U_G is the seismic excitation at the pile tip level (base).

With regard to the motion of the super-structure, the factors are defined as U_{ST}/U_{FF} and U_{ST}/U_G, where U_{ST} is the super-structure motion due to the seismic excitation.

If the spectrum of seismic waves at the pile tip or at the free-field surface are measured or are derived, the foundation and the structure responses can be obtained by integrating the program-generated transfer functions (the kinematic-displacement factors) through the response-wave spectrum. The program generates several transfer functions related to the displacement variables as listed below.

- U_{FF}: free-field ground-surface displacement
- U_P: pile-head displacement of pile
- U_{PP}: pile-head displacement of pile group
- U_{ST}: superstructure motion due to a seismic motion
- U_O: foundation motion due to a seismic motion
- U_G: the seismic excitation at the pile tip level(base)



Dynamic Impedances for the Foundation

The foundation impedances are commonly used to represent the sub-structure in structural analyses. The dynamic impedances for the foundation (springs and dashpots) associated with swaying (K_x, or K_y), and rocking ($K_{x\text{-}ry}$ or $K_{y\text{-}rx}$) are computed by the DynaPile software. The dynamic impedance includes real-part (dynamic stiffness) and imaginary part (damping). The foundation may consist of a single pile or a group of piles. The soil can be a homogeneous stratum or inhomogeneous strata with varied shear-wave velocity in each layer.

Super-Structure Inertial Response

The figure below is used as reference, having evaluated the foundation input motion (kinematic response), $U_k(t)$ and $\phi_k(t)$ from Step 1 and the impedance functions, K_x, K_y, $K_{x\text{-}ry}$, $K_{y\text{-}rx}$ from Step 2, the total displacement of the superstructure can be computed by most structural analysis software (Step 3).