Seismic SSI Analysis of Pile-Supported LNG Storage Tank
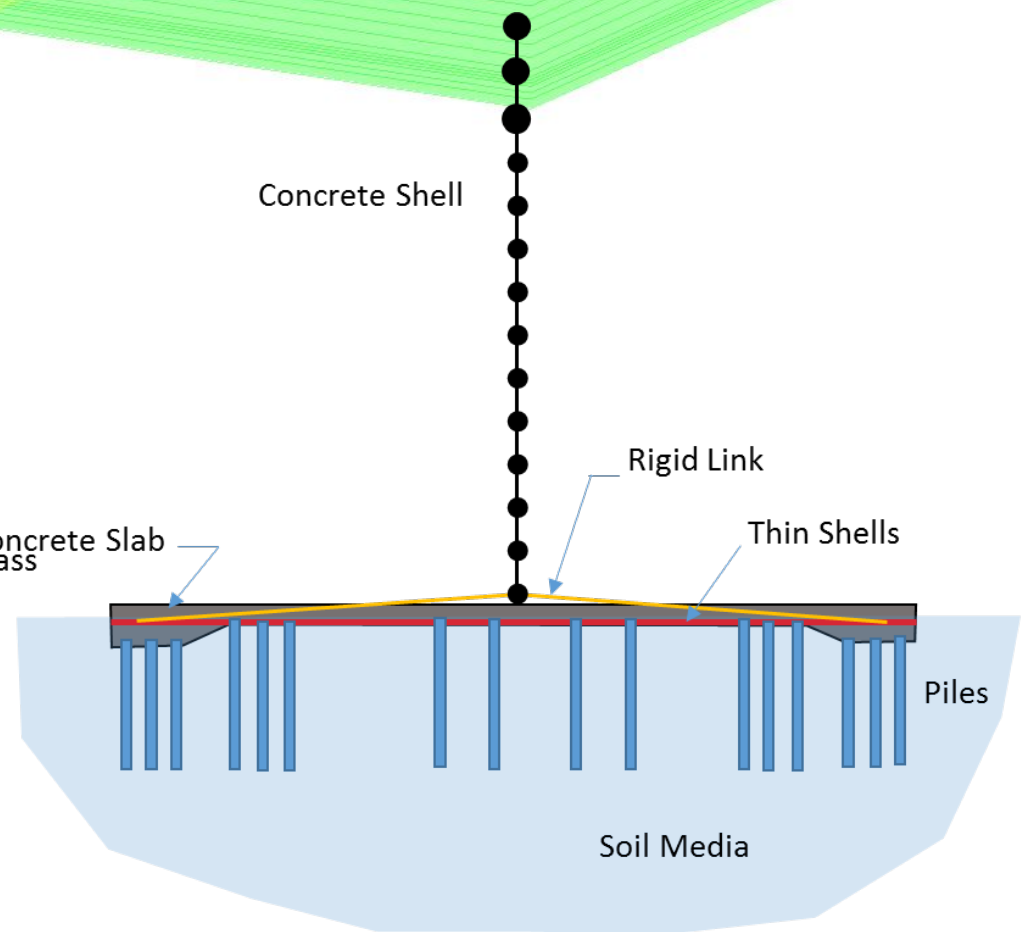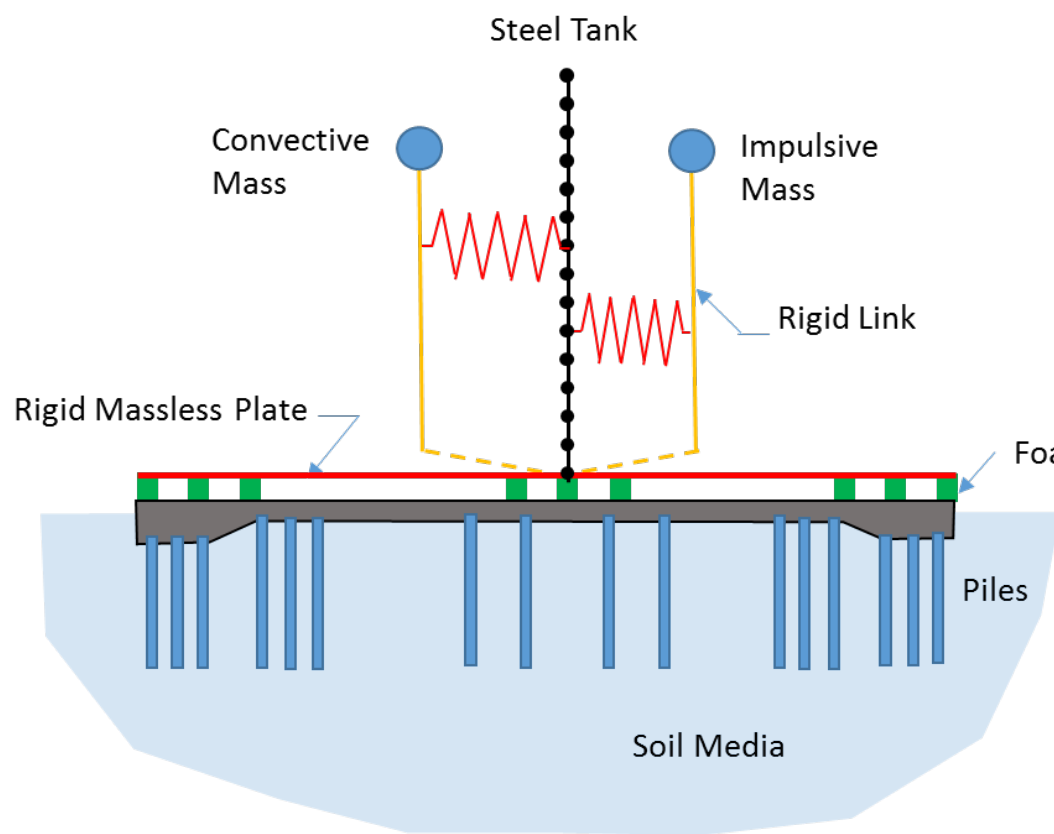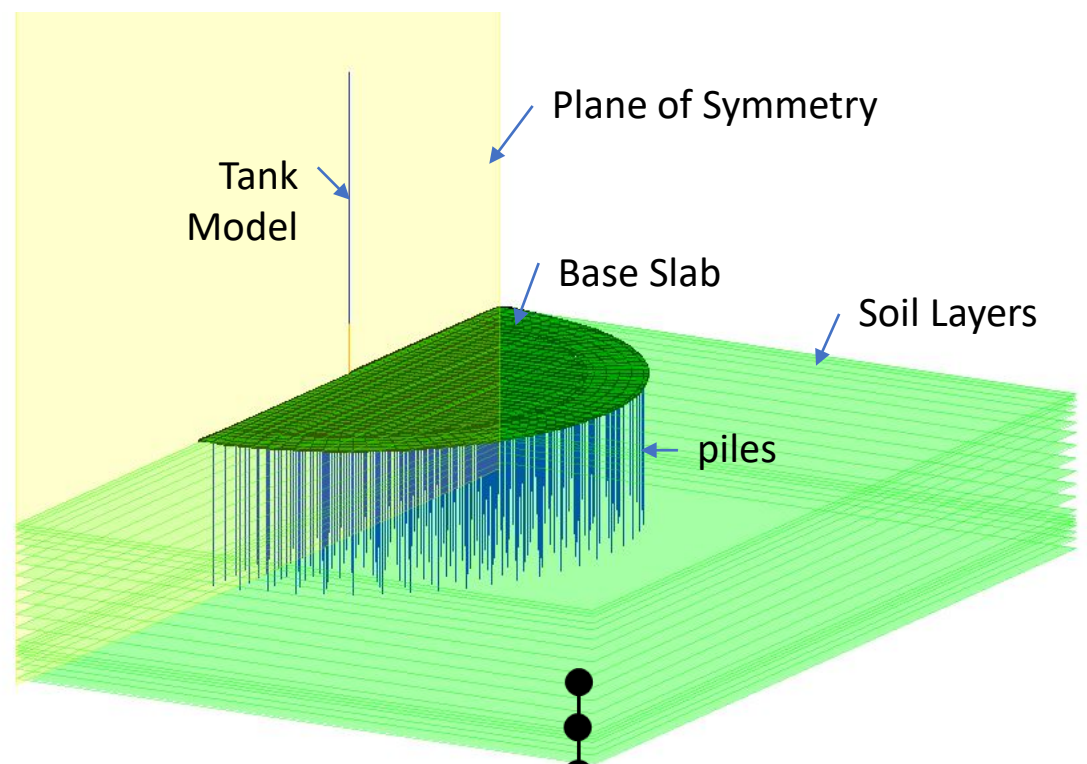

Ground Motion	Free Field	Center of Base Slab (Tank)			Top of Inner Tank			Top of Outer Tank		
		FB	SSI	SSI+InCoh	FB	SSI	SSI+InCoh	FB	SSI	SSI+InCoh
1125A61E	0.62	0.61	0.63	0.52	1.08	0.99	0.80	1.71	1.18	1.12
1125A61N	0.45	0.45	0.48	0.36	0.71	0.75	0.60	1.20	1.06	1.03
ABBAR_L	0.77	0.73	0.64	0.57	1.72	1.87	1.39	1.85	1.77	1.89
ABBAR_T	0.62	0.62	0.61	0.56	1.82	1.92	1.64	1.89	1.72	1.51
ASRIN_L	0.35	0.34	0.34	0.25	0.64	0.68	0.46	0.83	0.85	0.75
ASRIN_T	0.38	0.37	0.38	0.35	0.62	0.57	0.60	0.90	0.87	0.82
CBN090	0.40	0.40	0.40	0.36	1.17	1.18	0.69	0.77	0.81	0.61
CBN360	0.50	0.50	0.49	0.40	1.27	1.33	0.83	0.69	0.52	0.58
DAY_LN	0.69	0.67	0.61	0.56	1.03	1.30	0.98	2.01	1.33	1.37
DAY_TR	0.48	0.47	0.53	0.50	1.00	1.18	1.02	0.97	1.06	1.01
GO1230	0.40	0.40	0.37	0.31	0.72	0.66	0.56	1.04	1.02	0.85
GO1320	0.73	0.73	0.67	0.61	1.21	1.19	1.13	1.74	1.45	1.13
LCN260	0.45	0.45	0.40	0.34	0.73	0.65	0.62	1.43	1.21	1.27
LCN345	0.42	0.42	0.40	0.33	0.76	0.75	0.64	1.08	1.10	0.84
Average	0.52	0.51	0.50	0.43	1.04	1.07	0.85	1.29	1.14	1.06

MTR/SASSI was used to analyze the seismic SSI response of a LNG tank to assess whether the horizontal response of the tank could be optimized by considering the foundation kinematic SSI and incoherent ground motion effects. The SSI model consisted of a lumped-parameter model of inner steel and outer concrete tanks incorporating hydrodynamic effects and a detailed model of the foundation incorporating over 300 cast-in-place concrete piles penetrating a layered soil system. The results of the analysis were used in the preliminary tank and foundation design.