T. Ishihara Lab

Sustainable and resilient buildings / urban areas against multi-hazard

Multidisciplinary Resilience Research Center / Structural Engineering

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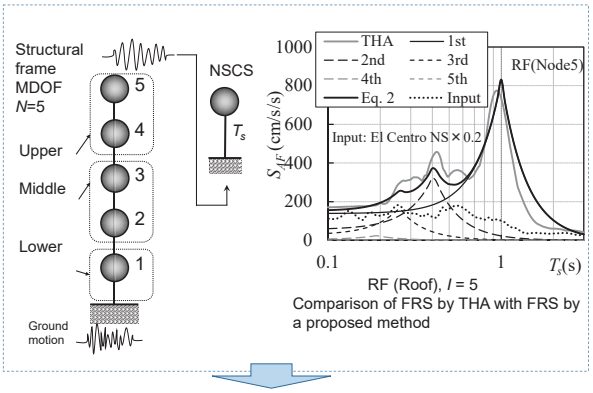
- Seismic capacity and design load for nonstructural components
- Damage reduction effect due to uplift motions during earthquakes
- Rain-on-snow load, flood load, etc. for buildings

Mainly for building structures and seismic engineering, we conduct researches on seismic resistance and design forces for nonstructural components of buildings, researches on uplift motions during earthquakes as one of seismic isolation structures (mechanism of higher-mode vibration, damage reduction effect, etc.). In addition, we also study rain-on-snow load, tsunami and flood load, and so on. We work on research aiming at resilient and sustainable buildings / cities against multi-hazard.

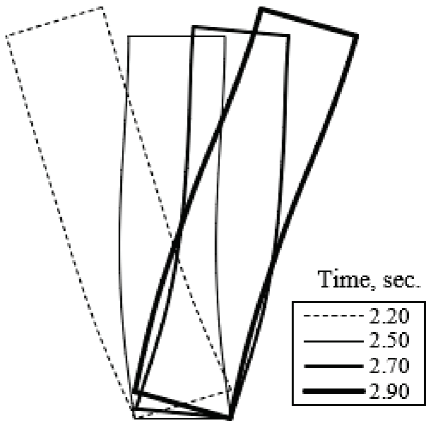


Seismic force (acceleration) for design of nonstructural components

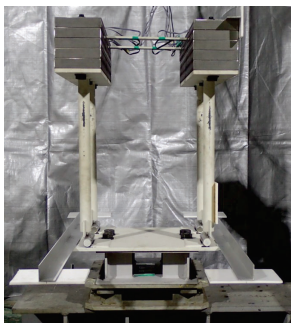
Layer	Classified by the level of resonance		
	$T_1/3 < T_s$ or T_s is unknown	$0.1(s) < T_s \leq T_1/3$	$T_s \leq 0.1(s)$
Upper	2.2 g	1.1 g	0.5 g
Middle	1.3 g	0.66 g	0.5 g
Lower	0.5 g	0.5 g	0.5 g

Design load for nonstructural components

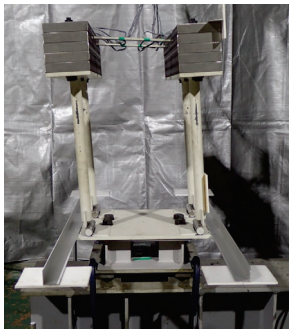
- An method to evaluate floor response spectrum (Top)
- Design load for ceilings based on the method (Bottom)



Uplift behavior



(a) With Uplift



(b) Without Uplift

Residual deformation after tests

Damage reduction effect due to uplift motions of buildings during earthquakes

- Numerical analysis of uplift behavior of a building (Left)
- Shaking table tests with elasto-plastic frame models (Right)

Loading test of suspended ceiling

- Buckling of braces and hanging bolts (Top)
- Deformation of steel furring (Bottom)