Reduced Expression for Timber Structure with Discretized Flexible Diaphragm and Seismic Response Evaluation Method

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This paper discusses various effects of diaphragm flexibility on dynamic properties and seismic responses of timber structure. Equations of motion of a building with multiple discretized diaphragm elements are derived by defining reduced degrees of freedom. A method to predict seismic responses is proposed, and example structures are used to demonstrate its accuracy and advantages. Modification of the method to rationalize and improve the conventional method is also discussed, by indicating good accuracy except when horizontal diaphragm is very flexible and stiffness eccentricity is large. Finally, criteria for “rigid diaphragm” is proposed, and required values of the key parameters are clearly indicated.