

Investigation of Natural Frequency and Dumping Factor of Wooden Eco-House after Three Years since Completion

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As an assigned research subject of 2009 RISH mission research projects, our project team investigated dynamic characteristics of so-called “Wooden Eco House”, which was completed in September 2006 and has been used for about three years, using dynamic measuring methods. At first, very small level vibration of Eco House were measured (called as ambient vibration test). As the next step, in order to search the natural frequency of the house, the sweep harmonic excitation tests were carried out within the ranges of 0.1 to 15.0 Hz by synchronizing three portable shaking force generators which were fixed on the second story floor of Eco house as shown in Fig. 1.

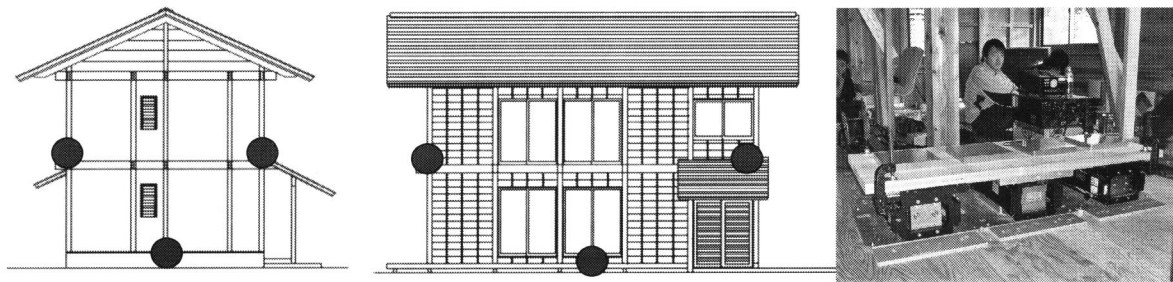


Figure 1. Locations of velocity meters and feature of excitation test on the second floor.

Figure 2 shows a power spectrum of velocity measured along span direction, from which we can see the first natural frequency at east face was 4.0Hz while the value at west wall face was 4.5Hz. The difference between both faces seems to be come from that of specification of shear walls. After the sweep harmonic excitation tests, in order to estimate the dumping factor of the house, free vibration tests were done by applying forced vibration under the natural frequency of 3.9 Hz for span direction then gave sudden cut off of the power from the three shaking force generators. Figure 3 shows a free vibration record of east face from which we could estimate the dumping factor to be about 5% for span direction.

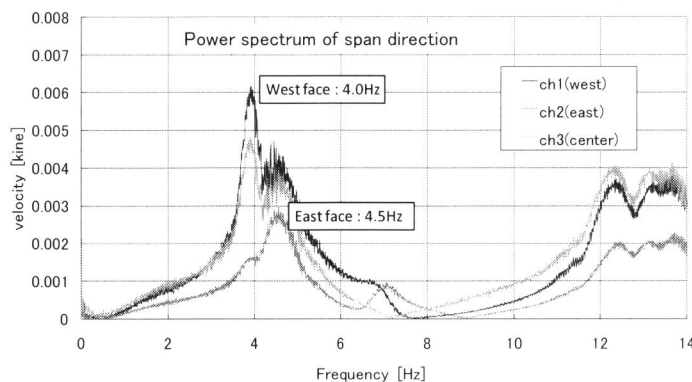


Figure 2. Power spectrum of span direction.

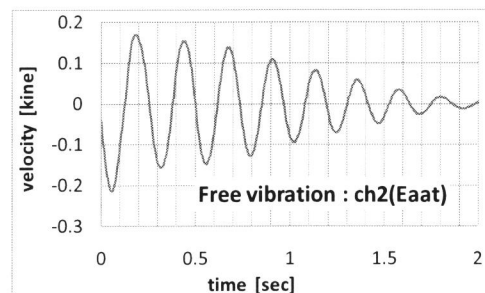


Figure 3. Free vibration wave record.

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