

**Work Theme B: Structural engineering on modern steel construction**  
**B3 International practice on engineering design and management**

**Project Title:**

**b) “Vibration Measurement and Modal Identification of Standing Seam Metal Roofing System and their Applications in Model Updating of the Clip Stiffness”**

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**Project progress:**

An indoor test panel was developed in the structural vibration laboratory in City University of Hong Kong. The test panel is comprised of three complete metal strips together with two half strips (on the two sides), which were supported by twelve clips (marked as red crosses in Figure 1(b)) onto the purlins of steel frame as shown in Figure 1(a). In the study, the vibrations at 18 locations were measured under the action of wind load from an electricity fan to simulate ambient vibration in real situation (see Figure 1(a)).

The first five modes of vibration can be identified. Owing to the space limitation in this proposal, only the first two modes are reported in Figure 2. The finite element model of the system was developed in ANSYS. Additional work is needed to update the finite element model using the measured model parameters.

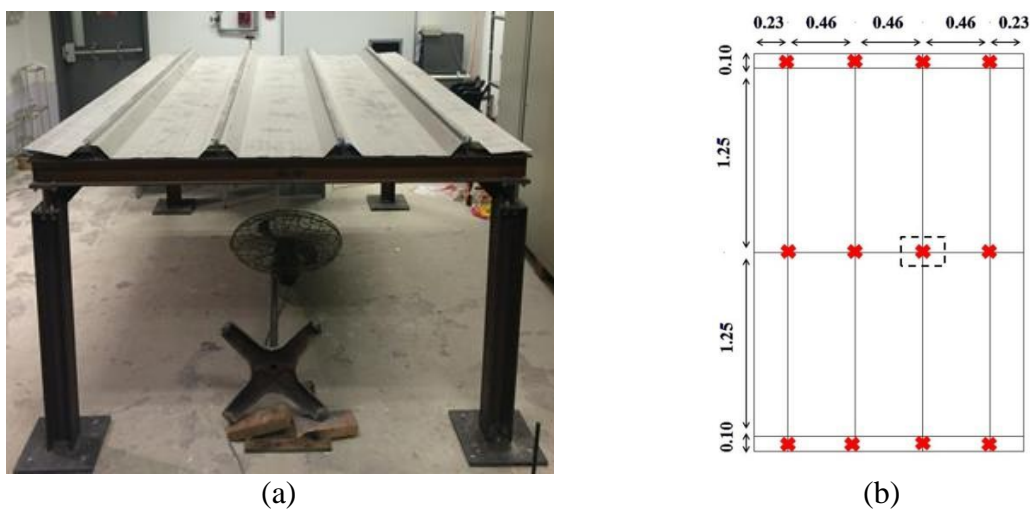
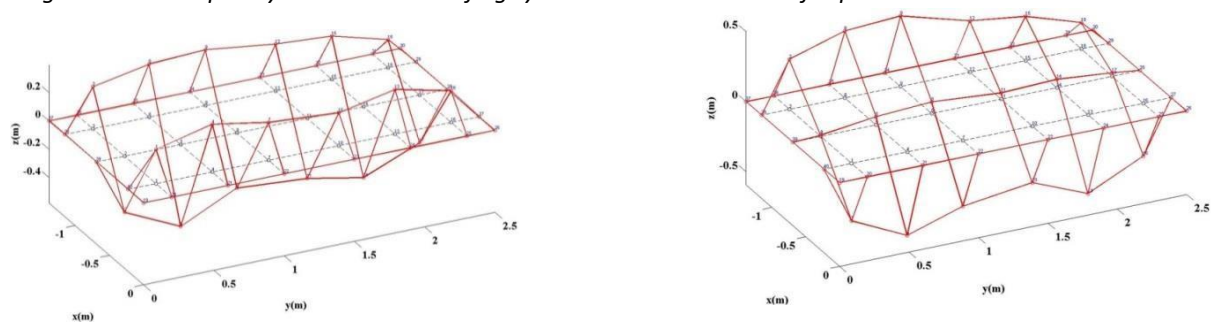


Figure 1: the temporary indoor metal roofing system and the locations of clips.



(a) Mode 1: natural frequency = 19.42Hz, damping = 0.67%

(b) Mode 2: natural frequency = 22.30Hz, damping = 0.52%

Figure 2: Identified modal parameters (selected).

**References:**

1. Tremblay R, Rogers C, Lamarche CP, Nedisan C, Franquet J, Massarelli R, and Shrestha K (2008), Dynamic seismic testing of large size steel deck diaphragm for low-rise building applications, 14<sup>th</sup> World Conf. on Earthquake Engineering, 12-17 Oct 2008, Beijing, China.