Pickup ④

Fire safety of 3-story wooden school

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1. Foreword

According to the Building Standard Law, when building 3-story schools, it was conventionally required from the standpoint of fire prevention that the building was a fire-resistive building whose principal building parts like columns and beams were of fire-resistive construction, as well as the principal building parts of wooden buildings whose total floor area exceeded 3000m^2. However, according to the "Countermeasure policies pertaining to regulation/system reforms" (decided June 18, 2010), a research results-based review was requested regarding these regulations. Furthermore, in the "the Act for promotion of use of wood in public buildings etc." (enforced October 2010), the promotion of wood for the construction of institutional buildings was prescribed based on a review of these regulations.

To enable the construction of 3-story wooden schools, NILIM, with the cooperation of organizations conducting the subsidized project of the Ministry of Land, Infrastructure, Transport and Tourism and the Building Research Institute, had conducted two full-scale fire tests, performed a series of fire experiments using real scale classrooms and had been collecting necessary information to review the Building Standard Law since 2011. Based on these findings, a third full-scale fire test (final experiment) was conducted on a 3-story wooden school.

2. Full-scale fire test on a 3-story wooden school (final experiment)

The principal building parts of the 3-story wooden school were quasi-fire-resistive wooden constructions. The building was a 3-story building 24m long, 12m wide and 15m high. Its building area was 310 m^2 and its total floor area was 850 m^2. The building was separated by a fire wall and its opposite side part was used for evaluating fire spread (see figure). The fire wall was set 50cm apart from the exterior wall and interior fire doors were specified opening protective assemblies made of iron. The unidirectional rigid-frame structures with 8m glued laminated timber spans were in the longitudinal direction, and bearing wall structures with 4m spans were in the span direction. There were no balconies or eaves and the classroom walls were made of wood, although quasi-noncombustible materials were used for the ceilings.

The experiment was conducted on October 20, 2013. First, a fire was ignited inside the 1st floor staff-room. The fire-preventative measures on the classroom ceilings helped control fire expansion in the initial fire. As well, even though the columns and beams in the 1st and 2nd floors withstood intense heat for over 60 minutes, the building did not collapse and there was no noticeable fire expansion beyond the fire wall (see photo). It was confirmed there would also be no negative effects in terms of evacuation, fire fighting operations or thermal effects on the surroundings.

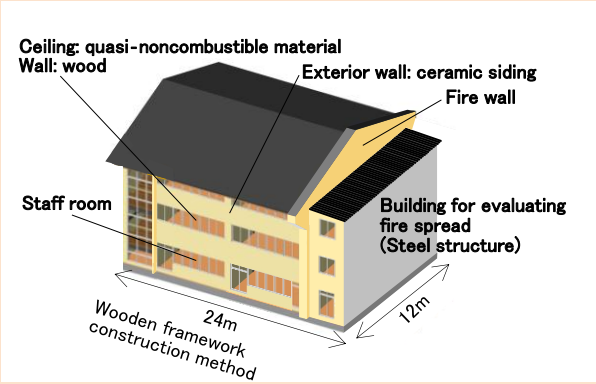

Figure: Test Specimen Overview

Photo: The fire test

3. Revision of the Building Standard Law

The original technical bill based on the experimental results was investigated in a committee for consulting outside experts set up at NILIM, and a partial revision of the Building Standard Law including the revision of Article 21 Clause 2 and Article 27 was promulgated in June 2014. An enforcement order determining the specific technical standards and relevant notification had been developed and promulgated. The revised standards are scheduled to be enforced starting June 2015.