

# Research for Improving the Wind Resistance of Tile Roofs

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## 1. Introduction

The strong winds of Typhoon Faxai (Typhoon no. 15) that hit the Kanto region including the Boso Peninsula in September 2019 caused damage to the roofs of many houses, especially in Chiba Prefecture, and the vulnerability of tile roofs became apparent. Based on the damage, the NILIM analyzed the damage to tile roofs in collaboration with academic experts and tile industry organizations as part of the Review Committee for Measures to Protect Buildings from Strong Winds in Light of the 2019 Boso Peninsula Typhoon (chair: Yasushi Uematsu, dean of the National Institute of Technology, Akita College). In the 2019 project conducted under the supplementary budget, the "Research for Improving the Wind Resistance of Exterior Materials and Roofs of Buildings," the validity of the current Guideline for the Standard Design and Construction of Tile Roofs (hereinafter referred to as "the Guideline"; Fig. 1) was verified, and revisions were made to reflect the latest findings and research results. The section below introduces the outline of the verification.

## 2. Outline of technological development

### (1) Analysis of damage to tile roofs caused by the 2019 Boso Peninsula Typhoon (Faxai)

To examine the necessity of improving measures against strong winds in the future, conditions of damage, and their factors were analyzed based on the results of surveys that examined damage to tile roofs caused by the 2019 Boso Peninsula typhoon (Faxai). A large number of tile roofs installed using methods that did not follow the Guideline were found to fall off or lift up from wind pressure. This damage has been particularly common in flat areas of the roof, excluding the ridge, eaves, and verge sections, which were not subject to fastening according to the notified standards. On the other hand, the analysis found that tile roofs installed according to the Guideline suffered very little damage from falling off and lifting due to wind pressure, although damage from flying objects were observed. However, for some tile roofs in coastal areas, damage due to wind pressure was observed even

when they had been installed according to the Guideline.

Based on the results of this analysis, the notified standard for the structural method of roofing materials, etc., the 1971 Notification of the Ministry of Construction No. 109, was partially revised in December 2020.

### (2) Verification of the current guideline on tile roofs

In order to ensure that the Guideline could complement the revised notified standard, the verification of the Guideline was carried out in cooperation and coordination with tile industry organizations, and the revision of the current version was conducted. In this verification, the standard construction methods for tile roofs were reorganized, and the standard specifications were developed through loading tests etc. as shown in Figure 2. In addition, a loading test method for evaluating the allowable bearing capacity was proposed, and recommended specifications that could be adopted in coastal areas to induce higher wind resistance performance and the concept of wind resistance diagnosis and repair of existing tile roofs were newly presented.



Figure 1: Standard design and installation guideline for roof tiles



Figure 2: Example of load test on a tile roof (F-shaped tile)

## 3. Future plans

In the future, the use of tile roofs that comply with the revised notified standard will be promoted through the publication and dissemination of the revised guideline reflecting the results of this study.

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Website of Structural Standards Division, Building Department (in Japanese)  
[http://www.nilim.go.jp/lab/hcg/taifu\\_hp/taifu.htm](http://www.nilim.go.jp/lab/hcg/taifu_hp/taifu.htm)