Experimental research on rain infiltration of wooden housing

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(Key words) Wooden housing, rain infiltration, spraying test

1. Background to the research

Along with studies of the prevention of rainfall infiltration in order to contribute to the smooth enforcement of the *Law* for the Execution of Warranty Against Housing Defects enacted in October 2009, measures to prevent infiltration of rain must be studied in order to establish future technological standards. Cases where rain infiltrates from exterior finishing material to conspicuously deteriorate body material and connecting material have also been reported, and the external finishing material's bonding force declines so that when an earthquake strikes, peeling off the external finishing material, fire prevention performance and seismic resistance are impacted. Consequently, the NILIM has carried out a variety of fact-finding surveys of design and execution, surveys of rainfall infiltration, outdoor exposure experiments, and accelerated deterioration tests in order to ensure the safety and assets of inhabitants, and this is a report of some strong wind and rain tests.

2. Outline of the tests

2.1 Specimen

The specimen consisted of a structural body made by the conventional frame construction method and exterior finishing made by the ventilation construction method executed using ceramic siding. The major object members were a roof without under-eave ceiling, external wall tie-ins, and balconies, which are locations where rain often infiltrates.

2.2 Testing method

The testing was done by, hypothesizing that the members of the wood house to be tested would be subjected to a typhoon or other strong wind and rain, applying wind and rain at wind speeds at intervals of 5m/s from 5m/s to 20m/s for 15 minutes at each speed accompanied by a water spray of 32 liters per minute. The directions of the spray on the roof and exterior wall tie-ins were one direction each to the eave sides and to the verge (right angles to the eaves), and for the balconies, from the sides of the outside surfaces.

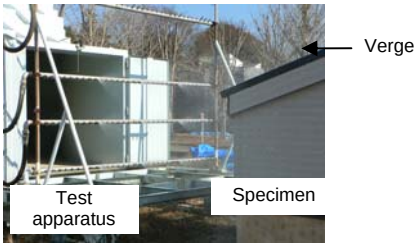

Photo 1. State of Specimens and Testing of Strong Rainfall Testing

3. Major test results

Even when rain infiltrates inside the ventilation layer, because there is usually a permeable waterproof sheet, the rain does not easily infiltrate inside the wall but, because the permeable sheet used for the test easily curled up vertically when it was laterally applied as an effect of the layer configuration etc., or because there was no tape between it and the foundation drain, at a wind speed of 5m/s, rain was observed infiltrating into the room between the permeable waterproof sheet and the foundation drain (see Fig. 1).

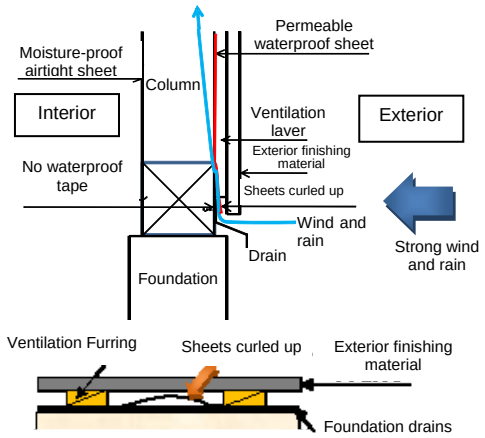

Figure 1. Rain Infiltration Through Curled up Permeable Waterproof Sheets

Recently, as a result of setback line limits and design trends, many roofs have short extended eaves and extended verges, so at the same time as a lot of rain strikes exterior wall surfaces, it is difficult to waterproof the area around the eaves, so rain often infiltrates. The test caused rain to infiltrate at a wind

speed of 5m/s, confirming that it is necessary to fully ensure extended eaves and extended verges. And at the tie-in of exterior walls and roofs, to ensure long-term waterproofing performance, it is important to not only perform sealing, but to appropriately apply metal plates. It is important to prevent deterioration of body material by applying waterproof tape between the permeable waterproof sheets and the foundation drains. During the balcony test, rain did not infiltrate between the FRP and sashes, but it is necessary to separately study long-term impacts, because of vibrations caused by the opening and closing of sashes and by earthquakes, and continuous minute tremors.