

Field Survey of Hygrothermal Behaviour within Wall Assembly Derived from Rain Penetration and Ventilation Performance of Exterior System

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1 Introduction

Rainwater and moisture control are key factors for maintaining the durability of wooden houses. Wall assemblies with sidings are installed on vented cavities to build durable wooden houses. Moisture condensation does not occur generally behind a vapor retarder in walls assembled with a vented cavity; however, it is reported that the condensation mechanism which occurs in the wall assembly due to the high humidity of the vented cavity by rain penetration in Japan, there are only a few studies that investigate hygrothermal behaviour considering effects such as rain penetration in the exterior system. To unravel the mechanism of internal condensation derived from rain penetration, lab-experiments and field measurements were conducted.

2 Quantification of Rain Penetration from the Siding Joints Using a Water Spray Test

In the lab-experiments, rain penetration from siding joints of two installation methods were quantitated using a water spray test. For cases B, there were pinholes at the cross joint on the exterior surface, the rain penetration was observed under the condition without wind pressure. From the result, it is considered that intermittent rain penetration occurs with high frequency in rainy day.

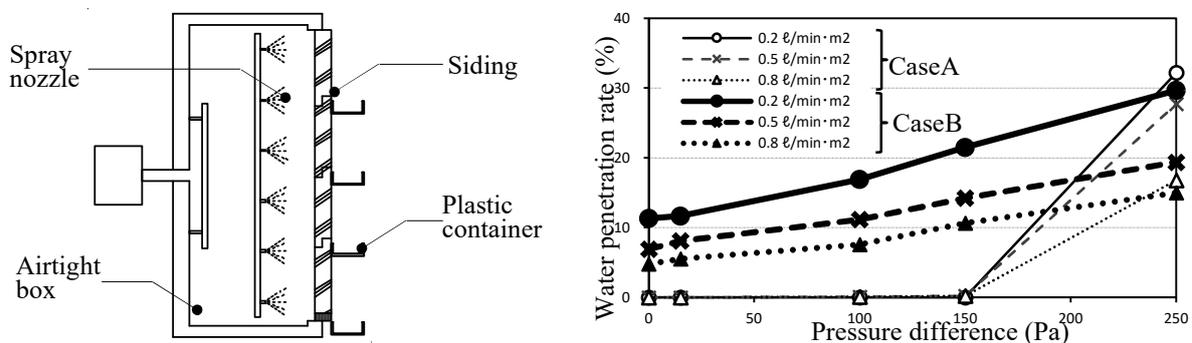


Figure 1. Apparatus for water spray test and the result
(Relation between water penetration rate and pressure difference).

3 Field Survey of Hygrothermal Behavior within Wall Assembly Derived from Rain Penetration

In the field measurements, for the exterior finishes of the experimental house, the sidings were installed on three types of vented cavities. To verify hygrothermal behaviour within the wall assembly, intermittent long-term rain penetration into the vented cavity was reproduced for the experimental house.

According to the field survey of the experimental house on the eastside, moisture gradually accumulates in the wall assembly because of rainfall, and one month after the start of the test, moisture condensation occurred for a long time in some cases. From this result, it can be confirmed that rain penetration has a significant impact on the moisture accumulation in the wall assembly.

The horizontal furring strips and the 6 mm panel clips, due to low ventilation performance, the moisture condensation in the wall assembly occurred for 9–13 h in daytime. This phenomenon is thought to be the result of moisture retained in the sidings and the vented cavity was released by solar radiation, moisture that could not be discharged from the vented cavity moved to the wall assembly of the indoor side at a low temperature; however, the 15 mm panel clips did not occur the moisture condensation. Thus, it is important to ensure a good ventilation performance to maintain durability

4 Conclusion

The rain penetration through exterior finishes has a significant impact on the moisture behaviour of wall assemblies. Aforementioned results verify that moisture condensation at the vapor retarder was caused by co-occurrence of several factors, i.e. rain penetration, insufficient ventilation and solar radiation. To maintain durability, it is important to ensure a good ventilation performance and not retain moisture.

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