XV International Conference on Durability of Building Materials and Components
DBMC 2020, Barcelona
C. Serrat, J.R. Casas and V. Gibert (Eds)

Examination of Optimum Construction Area for Appropriate Thickness in Polyurethane Waterproofing Construction

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Keywords: *Waterproofing Membrane, Polyurethane, Thickness of Membrane, Construction Area, Application Tool.*

1 Introduction

Polyurethane waterproofing membranes are constructed at building sites by applying liquid material to substrate. The membrane thickness is related to the durability of the waterproof material, so quality control during construction is important. However, the membrane thickness is likely to be unstable because it is affected by various factors, such as the environment, substrate conditions, method of waterproofing material application, and construction skills.

Because membranes are made by workmen using tools, such as a trowel or a squeegee, the shape and size of the application area of the roof floor for a worker are thought to affect the membrane thickness. The objective of our research was to examine which construction conditions can ensure a uniform and appropriate thickness, we examined the combination of allocation method of the suitable construction area and application tools as an example of process control during construction.

2 Experimental Methods

This study consists of two experiments. In the first experiment, we confirmed the effect of construction area on the thickness of the waterproof membrane. Using the multiple dwelling house rooftop, this paper converts 1 set of waterproof materials to a target membrane thickness of 1.5mm,and defines its area as 14.0 m^2 (4.0 m × 3.5 m).During the experiment, moving image photographing was carried out from the work start to the end, and work observation and the membrane thickness distribution of the constructor were measured.

In the second experiment, the effect of pouring and spreading waterproof material on the thickness of membrane was

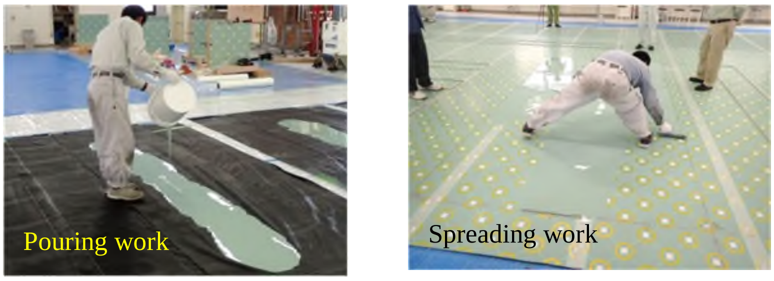

Figure 1. Pouring work (left) and spreading work (right).

confirmed. The pouring work of polyurethane waterproof material seemed to relate to "Area Length", and the spreading work seemed to relate to "Area Width". Therefore, thickness of membrane distribution and working time were measured at 3 levels of section length 9.0 m (0.8 m wide), 5.15 m (1.4 m wide) and 3.6 m (2.0 m wide) using an indoor laboratory. These tasks were performed by technicians with more than 20 years of experience and carried out with trowel and squeegee.

3 Results

The standard deviation of the membrane thickness for the trowel and squeegee area and the pouring and spreading work are shown in Figure 2. To ensure a stable membrane thickness, an area with a wide width and a short length should be used in the pouring work. On the other hand, the spreading work differs depending on the application tools and a narrow partition is desirable for the trowel. In a squeegee, the standard deviation tends to decrease as the area width increases and the area length shortens, and a trade-off relationship exists. The area and cure time of materials at the construction area and the work quantity and productivity must be considered and judged synthetically.

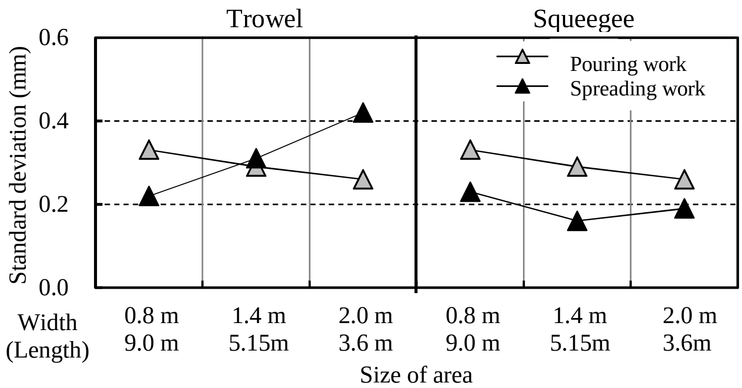

Figure 2. Standard deviation of membrane during pouring and spreading.

4 Conclusion

- To secure the waterproofing membrane thickness, a clarification of the construction area and the area shape are important in addition to the management of the application amount.
- For the pouring work, the length of application of an area influences the membrane thickness.
- The area width of the spreading work and the work time differs according to the construction application tools. For the spreading, the width of an application area influences the working time and membrane thickness.
- Three factors, such as the length and width of an area and the working time should be considered to determine the optimum construction area.

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