Study on a Proper Repair Cycle of Finishing Materials in Condominiums

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1 Main Idea and Aim

In Japan, it is required to make a long-term repair plan for condominiums by law. However, especially the recoating of exterior finishing materials, has a uniform repair cycle in any condominiums regardless of their age, surrounding environment or type of finishing materials. Therefore, in order to efficiently repair work and reduce Life Cycle Cost, it is necessary to set an appropriate repair cycle corresponding to the type of materials, environment and deterioration status.

2 Methodologies

2.1 Carbonation Preventive Effects in Existing Condominiums

We examined the actual status of finishing materials repair cycle and deterioration states before repair in 222 condominiums in Japan. We focused carbonation of concrete in factors affecting deterioration (especially age, repair period and directions).

2.2 Carbonation Preventive Effects of Various Finishing Materials in Exposure Test

Table 1 shows the Factors and levels of the exposed specimens. The finishing material was applied to the side of a concrete specimen having a water cement ratio of 65%. Exposure environment were three types, indoors, outdoors and outdoors under eaves. We measured the carbonation depth and color difference of finishing materials. We report about coating materials in this paper.

| Table 1. Factors and levels of exposure specimens. |
|---|---|
| **Factor** | **Level** |
| Exposure environment | Indoors, Outdoors (rain / no rain) |
| Coating | Gloss paint, Synthetic resin (Multi / single) |
| | Waterproof synthetic resin (multi / single) |
| Mortar | Cement mortar t=10 / 20 mm |
| | Polymer cement mortar t=10 mm |
| Tile | Mortar t=2.0~3.0 / 10mm, Adhesive |
3 Results

3.1 Carbonation Preventive Effects in Existing Condominiums

Figure 1 shows the carbonation coefficient for condominiums with different ages. Most of numbers are less than 1.50 after 20-30 years.

3.2 Carbonation Preventive Effect of Each Coating Materials in Exposure Test

Figure 2 shows the carbonation coefficients for coating materials in each environment. The value of none finishing concrete was 4.56 mm/years$^{0.5}$ indoor, 1.95 mm/years$^{0.5}$ outdoor with rain, and 5.00 mm/years$^{0.5}$ outdoor under eaves. We considered these values as each evaluation standard for the carbonation preventive effect of the finishing materials.

![Figure 1. The carbonation coefficients for different ages.](image1)

![Figure 2. The carbonation coefficients after 10 years (Coating material).](image2)

4 Conclusion

The current repair cycle was about 12 years, but since the carbonation preventive effect was sufficiently maintained at the time of repair, we need to consider proper repair cycle including their age, surrounding environment and type of finishing materials. Furthermore, in the exposed specimens, most finishing materials except single-layer coating still had the carbonation preventive effects at 10 years. In the previous study that conducted an outdoor exposure test in model building, the multi-layer coating had had the carbonation preventive effect even after 20 years. However, we need to also consider aesthetics. We will continue the exposure test for more long term to confirm the performance of each material at various environment.

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