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# Study on Technical Standards of Reinforced Concrete Structures with Long Service Life when Using Blended Cement and Finishing Materials

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## 1 Introduction

It is very important to improve and secure durability of reinforced concrete (RC) building and housing, in order to extend the service life of it. In this study, these were studied experimentally that the contribution ratio of blended cement to the carbonation resistance of concrete when a part of OPC replaced to FA or BFS much more were used for concrete, and the effect of carbonation suppression required for an effective finishing materials when these were applied for concrete surface.

## 2 Carbonation Resistance of Concrete Using Blended Cement

Table 1 shows the results of this chapter. These were obtained that the ratio excluding BFS from the mass of cement for calculating W/C may be 0% for Type A, 20% for Type B and 30% to 60% for Type C. Also, in case of FA, it may be 60% to 100% for Type B and 90% to 100% for Type C. Therefore, it was found that the current standard (Table 1) could be mitigation in some cases.

**Table 1.** Calculation results of Contribution ratio for Carbonation Resistance.

| Binder | Mixture replacement ratio (%) | Blended Cement (JIS) | Contribution ratio of Carbonation Resistance W/B (%) | | | |
|---|---|---|---|---|---|---|
| | | | 30 | 40 | 50 | 60 |
| OPC(N) +FA | 15 | Type B | - | 0.42 | 0.21 | 0.07 |
| | 20 | Type C | - | 0.17 | 0.07 | 0.00 |
| OPC(N) +BFS | 30 | Type A | - | 1.04 | 1.06 | 1.07 |
| | 50 | Type B | - | 0.84 | 0.84 | 0.83 |
| | 70 | Type C | 0.45 | 0.59 | 0.69 | - |

## 3 Suppression Effect of Finishing Materials on Carbonation of Concrete

Figure 1 and 2 show the part of results in this chapter. It was confirmed that the 4 types of

finishing materials, which were tiling, mortar coating, and external insulation method and a finishing coating material, had the same carbonation suppression effect as the concrete cover thickness of 10 mm, i.e. W/C5%. In addition, these were obtained that the effect of carbonation suppression of mortar coating could be improved by initial curing, the amount of polymer increase and the mortar coating (thick coating) of about 30mm.

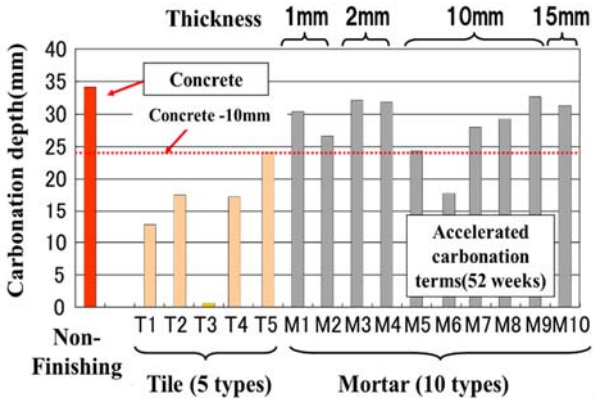


**Figure 1.** Results of carbonation test (finishing materials).

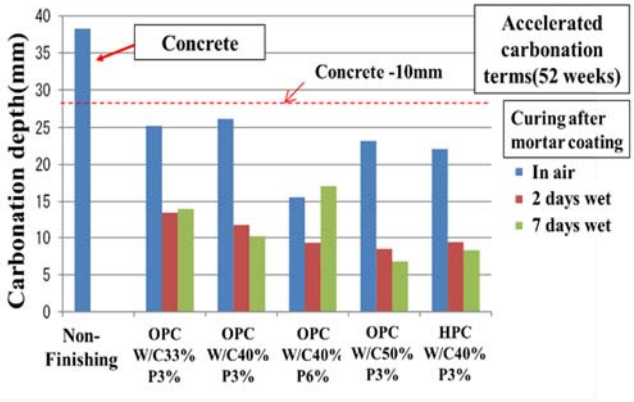


**Figure 2.** Carbonation depth of concrete with mortar changing curing condition.

## 4 Conclusions

We were able to obtain the knowledge that the contribution ratio of blended cement to the carbonation resistance of concrete when a part of OPC replaced to FA or BFS much more were used for concrete, and the effect of carbonation suppression required for an effective finishing materials and its specifications when these were applied for concrete surface, from the viewpoint of securing durability of reinforced building and housing.

As the results, these were considered to be able to sufficiently contribute to the review of the evaluation method or technical standards concerning about the durability of RC buildings and housing prescribed in “Housing Quality Assurance Act” in Japan.

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