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

Tadatsugu Kage¹, Hiroyuki Tanano¹, Naoko Tsuchiya² and Hiroshi Jinnai³

¹ Dept. of Department of Building Materials and Components, Building Research Institute, 1 Tachihara, Tsukuba-c., Ibaraki-pref., Japan, kage@kenken.go.jp
² Building Dept., National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure and Transport, 1 Tachihara, Tsukuba-c., Ibaraki-pref., Japan, tuchiya-n92ta@mlit.go.jp
³ Dept. of Architecture, Faculty of Engineering, Tokyo Polytechnic University, 1583 Iiyama, Atsugi-c., Kanagawa-pref., Japan, jinnai@arch.t-kougei.ac.jp

Keywords: Blended Cement, Finishing Materials, Water-Cement Ratio, Depth (thickness) of Concrete Cover, Resistance or Suppression of Carbonation.

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>
<thead>
<tr>
<th>Binder</th>
<th>Mixture replacement ratio (%)</th>
<th>Blended Cement (JIS)</th>
<th>Contribution ratio of Carbonation Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>OPC(N)</td>
<td>15</td>
<td>Type B</td>
<td>-</td>
</tr>
<tr>
<td>+FA</td>
<td>20</td>
<td>Type C</td>
<td>-</td>
</tr>
<tr>
<td>OPC(N)</td>
<td>30</td>
<td>Type A</td>
<td>-</td>
</tr>
<tr>
<td>+BFS</td>
<td>50</td>
<td>Type B</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>Type C</td>
<td>0.45</td>
</tr>
</tbody>
</table>

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.

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.

Acknowledgements

We would like to thank all those who have contributed to this experimental research.

ORCID

Tadatsugu Kage: http://orcid.org/0000-0002-0767-2622

References


Notification No.1374, Housing Quality Assurance Act, JAPAN

Toshinori, O. et al. (2014-2016). Durability Performance of Blended Cement Concrete (part 1-7), Summaries of Technical Papers of Annual Meeting, Architectural Institute of JAPAN.