

Abstract

In the context of previous research projects, of all the AAC manufacturers producing in Germany at the time, one manufacturer was identified, whose AAC blocks showed extreme compressive strength losses after 18 months of storage under "regular" outdoor conditions. The aim was therefore to verify the results from the previous research projects for current products from Germany and abroad.

In order to identify AAC blocks at risk, a limit value of the total measure of drying shrinkage $\epsilon_{cs,tot}$ of 0.4 mm/m has been introduced into the German application rules DIN 20000-404:2018-04 for the use of AAC according to DIN EN 771-4:2015-11. Another objective was to verify this limit value and the practicability of the verification method within the framework of an interlaboratory comparison test. Further short-term performance parameters were examined and compared with the total measure of drying shrinkage.

The AAC products of the manufacturer identified as critical in the previous projects showed considerable carbonation progress of partly more than 50 % in the surface area during the ageing and shrinkage tests. Already at the beginning of the exposure, some strength values were clearly too low. They decreased further with increasing carbonation through ageing.

The examinations of two German and two English types (with fly ash) showed no significant loss of compressive strength during the initial tests. However, one AAC type of the German manufacturer also showed a strength reduction below the characteristic value in the wall tests after 18 months of outdoor air storage, which was still quite low at 6.6 %. Both types from this manufacturer showed carbonation values in the range of 10 %. During exposure, the types of the English manufacturer partly reached carbonation degrees almost above 20 %. Literature research and our own examinations have shown that significant strength losses usually only occur at carbonation levels significantly above 20 %. Therefore, it cannot be ruled out at present that, despite their inconspicuous behaviour observed here, the AAC containing fly ash could also suffer losses in compressive strength with longer exposure and further increasing carbonation.

The normative limit value for the total measure of shrinkage of 0.4 mm/m was clearly exceeded in the interlaboratory comparison test for the types identified as critical in all test laboratories. The other types all remained below the normative limit value of 0.4 mm/m. Overall, the determination of the total measure of shrinkage $\epsilon_{cs,tot}$ according to DIN EN 680:2006-03 appears to be the most suitable method for identifying AAC blocks with a manageable effort that show an increased carbonation-related risk. The threshold value of 0.4 mm/m specified in DIN 20000-404:2018-04 also appears to be appropriate.