

APPENDIX I

Alumina: Direct Determination Chemical Method

Over many years, many analysts and ASTM members have expressed the opinion that ASTM Methods for Chemical Analysis of Hydraulic Cement (C 114) needs a direct method for determining alumina (Al_2O_3) rather than determining it by difference as in the present scheme of chemical analysis. This “by difference” approach has generated considerable controversy over the years as to just what was to be subtracted from the Ammonium Hydroxide Group (R_2O_3) to determine “ Al_2O_3 ” and what was to be used in calculating the Bogue potential compounds both for research and for specification purposes.

To some degree, the controversy has been somewhat laid to rest in that C 114 now says, “subtract the phosphorus pentoxide (P_2O_5) and titanium dioxide (TiO_2) as well as the ferric oxide (Fe_2O_3) when determining Al_2O_3 ,” while ASTM Specification for Portland Cement (C 150) now says, “add the P_2O_5 and TiO_2 to the Al_2O_3 determined to get ‘ Al_2O_3 ’ for purposes of calculating compounds.” This, plus the widespread and growing use of instrumental methods, has largely obviated the need for a direct method for alumina in the specific methods sections of C 114. In some cases, however, need for such a method may exist.

In some old research files at Lehigh Cement Company Headquarters, a manuscript was located of work dated Nov. 1951, by C. L. Ford, of the Portland Cement Association, that covers exactly the subject of interest. Further, it apparently was intended for submittal to ASTM for consideration and represents some very thorough work.

In any case, here it is for the benefit of anyone who would like to make use of it.

Editor