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TechNote

Type IL Cements and Specifications—TechNote

Keywords: heat of hydration; high early strength; low-carbon concrete; mixture design; portland-limestone cements; specifications; sulfate resistance.

Introduction

Type IL (pronounced "one-el") portland-limestone cements were introduced in ASTM C595/C595M and AASHTO M 240 standard specifications for blended cements in 2012. These cements contain between 5 and 15% limestone, compared to the 5% maximum limestone content of ASTM C150/AASHTO M 85 portland cements. Type IL cements perform comparably to portland cements and do so with up to 10% lower CO_2 emissions per ton of cement. Although portland-limestone cements have been available in other parts of the world, the availability and adoption of these cements in practice have only recently become widespread in the United States (as of 2022) (Schexnayder 2022). Many specifiers may have limited experience in incorporating these cements into project specifications.

Question

How do I incorporate Type IL cements into project specifications?

Answer

In most cases, Type IL portland-limestone cements can be used as a direct replacement for portland cements. For example, where a specification might refer to ASTM C150/C150M Type I cement, a specifier could add ASTM C595/C595M Type IL cement as an additional option. Although Type IL cements contain a higher limestone content than portland cements, they are required to meet the same setting time and strength requirements and are manufactured to provide fresh and hardened properties similar to portland cements. It is not necessary to alter the cement content in specifications that include these requirements for concrete mixture designs; however, as with any change in material supply, it is recommended to verify fresh and hardened properties. Adjustments such as admixture dosages may be required. In fact, requiring a higher cement content if using Type IL cements will negate the sustainability benefits associated with these cements, which have a carbon footprint up to 10% lower than portland cements. Many model and standard specifications (discussed further in the following) already incorporate Type IL cement as an option; specifiers should ensure they are using an up-to-date version of a model specification and include Type IL cement as an acceptable cement in project specifications.

Discussion

Model/standard specifications—Most standard specifications published by state departments of transportation (DOTs) already include Type IL cement as an acceptable option and an alternative to portland cements. Some DOTs use AASHTO standards instead of ASTM International standards, but these are harmonized so there are no technical differences between ASTM C150/C150M and AASHTO M 85 portland cements, or between ASTM C595/C595M and AASHTO M 240 blended cements.

The American Institute of Architects (AIA) MasterSpec, commonly used in commercial construction, includes Type IL cement as an option in Section 03 30 00 (Cast-in-Place Concrete), as shown in the following. Items in brackets are options for the specifier to select for the project specification.

Portland Cement: ASTM C150/C150M, **[Type I] [Type II] [Type I/II] [Type III] [Type V], [gray] [white]**

Blended Hydraulic Cement: ASTM C595/C595M, **[Type IS, portland blast-furnace slag] [Type IP, portland-pozzolan] [Type IL, portland-limestone] [Type IT, ternary blended]** cement.

For airfield paving, the Federal Aviation Administration (FAA) standard specification includes the option to use Type IL cements. This is found in Item P-501, Cement Concrete Pavement, in FAA Advisory Circular AC 150/5370-10H, as modified by FAA Engineering Brief No. 106. The bold text between the starred lines provides instructions to the specifier to retain all acceptable cement types for inclusion in Section 501-2.2 of the project specifications.