IN-LB	Inch-Pound Units
SI	International System of Units

Guide to the Selection and Use of Hydraulic Cements

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This guide covers the influence of cement on the properties of concrete, summarizing the composition and availability of commercial hydraulic cements and the factors affecting their performance in concrete. Cement is the most active component of concrete and usually has the greatest unit cost; therefore, its selection and proper use is imperative to attaining the desired balance of properties and cost for a particular concrete mixture. Selection should include consideration of the cement properties in relation to the required performance of the concrete. It includes a discussion of cement types, a brief review of cement chemistry, the influences of chemical admixtures and supplementary cementitious materials as well as the effects of the environment on cement performance and reviews of the sustainability aspects for the use and manufacture of portland cement. Cement storage, delivery, sampling, and testing of hydraulic cements for conformance to specifications are addressed. Users will learn to recognize when a readily available, general-purpose cement will perform satisfactorily or when conditions require selection of a cement that meets additional requirements.

Keywords: admixture; blended cement; calcium aluminate cement; cement storage; cement types; chemical analysis; hydraulic cement; physical properties; portland cement; pozzolan; slag cement; supplementary cementitious materials; sustainability.

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CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction

This guide assists specifiers and designers in choosing appropriate cement for specified concrete applications. Although hydraulic cements are only one ingredient of a concrete mixture, they are the active ingredient and, therefore, play a key role in the long-term viability of the structure, floor, or pavement. Cement choice depends on many variables, such as the service conditions for which the concrete is designed, properties of other materials used in the mixture, or the performance characteristics of the concrete required during or shortly after placement.

Cement paste is the binder in concrete or mortar that holds the fine aggregate, coarse aggregate, or other constituents together in a hardened mass. The term "hydraulic" in this guide refers to the basic mechanism by which the hardening of the cement takes place—a chemical reaction between the cement and water. The term also differentiates hydraulic cement from binder systems that are based on other hardening mechanisms, as hydraulic cements can harden underwater.

Concrete properties depend on the quantities and qualities of its constituents. Because cement is the most active component of concrete and usually has the greatest unit cost, its selection and proper use are fundamental in obtaining the most economical balance of properties desired for a particular concrete mixture. Most cements will provide adequate levels of strength and durability for general use. Some provide higher levels of certain properties than are needed in specific applications.

1.2—Scope

This guide summarizes information about the composition, availability, and factors affecting the performance of commercial hydraulic cements. It also provides information regarding:

a) Cement selection, whether a cement is readily available, and if conditions require a general-purpose cement or a special cement

b) How the chemical and physical characteristics of a cement can affect certain properties of concrete

c) How interaction of cements with various additives, admixtures, and mixture designs can affect concrete

This guide deals with hydraulic cements manufactured in conformance with ASTM International, American Association