
Additions for concrete

Ajout pour béton

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 3, *Concrete production and execution of concrete structures*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Silica fume consists of mainly spherical particles of amorphous silicon dioxide smaller than 10^{-6} m and is highly pozzolanic. It is collected by filters as a by-product of the smelting process to produce silicon metal and ferro-silicon alloys. It can be supplied as collected from the filters (undensified), after treatment to increase its bulk density (densified), or as a slurry. Silica fume from more than one furnace, filter or intermediate storage silo will normally be blended in the production plant.

Many years of research and practical experience have demonstrated that silica fume which satisfies the requirements in this document has highly pozzolanic properties and can be used to produce concrete with improved properties in both the fresh and hardened states. Silica fume is normally used in combination with a plasticizer and/or superplasticizer.

The use of coal for electricity production results in the generation of large quantities of fly ash. Different types of coal and the type of boiler used in this process produce different fly ashes, such as siliceous, silico-calcareous, or calcareous fly ashes with pozzolanic and/or latent hydraulic properties. All these types of fly ash are used in concrete production in some countries, based on national experience and tradition.

Before use, fly ash can be subject to processing, for example by classification, selection, sieving, drying, blending, grinding or carbon reduction, to optimize its fineness, reduce its water demand or to improve other properties. Such processed fly ashes can conform to this document to which reference is made in such a case. If they are out of the scope of this document, their suitability for use as Type II additions in concrete according to ISO 22965-2 can also be established from national standards or provisions valid in the place of use of the concrete and which refer specifically to the use of the addition in concrete conforming to ISO 22965-2.

When using fly ashes conforming to this document, it should be noted that, apart from the effect from the pozzolanicity of the fly ash, certain properties of fresh and hardened concrete can be affected. Where relevant, such effects need to be considered in concrete mix design (see ISO 22965-2).

Blast-furnace slag is classified into two types, air-cooled blast-furnace slag and granulated blast-furnace slag, according to the cooling process after the molten slag of approximately 1 500 °C is removed from the furnace. Granulated slag is made by rapidly chilling molten slag, such as by water jet, into a granulated glassy material, which is used for ground granulated blast-furnace slag, a material for slag cement. The amorphous glassy granulated slag has hydraulicity. When finely ground into ground granulated blast-furnace slag, it also demonstrates hardening and strength-developing properties (latent hydraulicity), as the slag itself undergoes hydration, similarly to cement, in the co-presence of cement (an alkaline stimulant) and water.