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High Performance Concrete in the Argentinean West Central Area

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Keywords: HPC, additives, natural pozzolan, pozzolanic activity, mechanical properties.

Abstract

Active mineral additions, as components of concrete, make possible the enhancement of the mechanical resistance of the concrete. Besides, it allows preparing concrete with better durability properties, i.e. resistance against aggressive agents and lower development of hydration heat. Anyway, it is possible to get significant energy savings and design purpose made mixtures for specific structures located in special areas. This preparation of mixtures is what we call in this work HPC.

A lot of research works exist in relation to the use of active mineral additives (micro-silex, fly ashes, metha-kaolin, etc.) in the elaboration of HPC. Physic-chemistry properties of these additions are variable and the action mechanism is controlled by the pozzolan reaction. The mechanical properties of the HPC, also depend on the characteristic of the granular materials used. There are considerable differences on the mechanical behaviour of HPC, inclusive with the same resistance, depending on these variables and on where they are been manufactured ^[1]. The characterisation of natural pozzolan of volcanic origin and diatomaceous ground extracted from local quarries, of the area of the Andes mountain range (San Juan and Mendoza provinces) in the region of "Cuyo", (the region of Cuyo is located in the Argentinian West Central area) with the purpose of being employed, as active mineral additives, is shown in this work. Preliminary geologic surveys, specimen collection and tests for physical chemical characterisation were also carried out.

The most interesting samples were selected to investigate the effect of fineness and granulometry on the pozzolanic activity. In addition, some concrete samples were made to evaluate traction and compression mechanical properties and their evolution in time. All the results of these samples are also presented. The work presented in this paper is part of a greater research project which aim is the evaluation of the technical and economical possibilities for using this HPC, made with local materials, in building structures of the Argentinian West Central area. This area is, on the other hand, the zone of maximum seismic risk in this country.

Nevertheless, it is necessary to investigate further in the optimisation and study of structural elements under different load patterns, in order to use this HPC in the Cuyo region. As we mention before this is a high seismic region. The following conclusions of the first results can be pointed out:

- The pozzolanic activity of the samples studied has been tested and proved.
- The addition of active raw materials from the geographic area can be considered to be apt to elaborate concrete of especial properties. For instance, durability, i.e. sulphate attack resistance, and to control the hydration heat dissipation.
- Despite of having a lower efficiency than concrete prepared with microsilica, still it is possible to use the Pozzolan to make HPC.
- The cost of the quarry is around \$2 per ton. From the economic point of view is very interesting and can be considered to be apt.
- The fresh concrete has a slightly higher viscosity compared with the ones without pozzolan, but nevertheless is apt to be placed through difficult access places.
- Hardened shows increasing resistance up to one year, with a higher increase in the beginning due to the type of cement used.

Aknowlegments

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