ABSTRACT

Concrete is currently the main material used for construction. Mix design is a crucial step in the final quality result of the material, and thus in the performance of concrete-based structures.

Despite the existence of a huge number of literature concerning mix procedures for concrete, the growth of industrial production plants has led to the development of new experience-based methods in order to lower cement costs and be more competitive.

The prevalence of such empirical methods is especially relevant in non conventional concretes, due to the inefficiency of the usual procedures and to the lack of universally accepted ones. This panorama makes it hard for un-experienced people to successfully design the mix for this type of concretes.

Consequently, this study aims to underline the information necessary for a beginner to undertake the mix design of any type of concrete.

The general framework and main objectives of the study, as well as the methods used, are laid out in chapter 1. Chapter 2 gives a general overview of the main procedures used for the mix design of both conventional and non conventional concretes. The requirements and recommendations of the current Spanish regulation are also included.

Chapter 3 brings a thorough theoretical study that aims to obtain norms of mix designing to help the reader on the development of any type of concrete. First of all, the structure of concrete is analysed, as well as the influence that each of its development steps have on the properties of the latest. Secondly, the main mix design objectives are defined depending on the performance required for concrete in its different ages, and a procedure of mix design is established in each case. Finally, the study takes into consideration the influence that field implementation may have in those mix design procedures.

The objective of Chapter 4 is to take the reader from theory to practice by implementing in real cases the mix design norms mentioned in the former chapter in order to check its validity. To do so, several experience-based procedures are collected for different concrete applications, such as dam concrete, shotcrete and sliding concrete. Following the analysis of this data several conclusions are obtained concerning the materials used and their mix.

Finally, the conclusions and recommendations derived from this study are presented in chapter 5.