

FACULTAD DE INGENIERÍA

Escuela Académico Profesional de Arquitectura

Tesis

**Mix Design for Cellular Concrete Applied in Masonry
Units Using Decyl Glucoside as a Foaming Agent for
Construction in High Andean Cities in 2022**

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Mix design for cellular concrete applied in masonry units using Decyl Glucoside as a foaming agent for construction in high Andean cities in 2022

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Abstract.

The research aimed was to find a suitable mix design of cellular concrete applied in masonry units using decyl glucoside as a foaming agent for construction in high Andean cities, because of the advantages this offers, being the main one, thermal comfort since high Andean cities suffer from low temperatures, meeting the compressive resistance standard for masonry units and reducing the dead load, due to cellular concrete is not currently very commercial. Therefore, this study experiments with seven different proportions of water, cement, fine/coarse sand and a foaming agent to achieve better resistance. The study is of descriptive level in that the experimental method is employed in which we use an observation card; for the mixing process, an industrial cement mixer was used, which allows us to integrate the foaming water with the aggregates. The compressive resistance results were favorable obtaining results of up to 260.7 kg/cm² and lightening the weight up to about 30% of standard concrete, in the other trials lower compressive resistance were achieved, but with a weight even lighter and also a lower volume. The conclusions determine that it is possible to realize a cellular concrete using decyl glucoside meeting the strength standard for masonry units by achieving reduced volume and weight.

Keywords: cellular concrete, decyl glucoide, foaming agent, high Andean cities, lightweight concrete, masonry units, compressive resistance, dead load.

1 Introduction

Within the field of construction, concrete has a major commercial incidence to other type of materials, so this material was taken as a reference for the research, in this case, the low density of the concrete was taken as the focal point for partitioning since it has many advantages such as decreased dead load, having the greatest welcoming in Europe and the United States, however in Peru very little is known about low density concrete or also called cellular concrete and its development, therefore, it is almost unknown in the Peruvian market.

Cellular concrete is a special building material that is very light due to a large number of pores. According to ACI 523-3R-14 [1] Defines that cellular concrete is "A lightweight product consisting of portland cement and/or lime with fine siliceous material, such as sand, slag or fly ash, mixed with water to form a paste that has homogeneous voids or a cellular structure". This guide addresses the materials, properties, design, production, and placement of cellular concretes with casting densities above 50 lb/ft³ (800kg/m³). The usual density range of cellular concrete is 20 to 120 lb/ft³ (320 to 1920 kg/m³). This material has many advantages, as in addition to decreasing dead load it is also thermal insulator; which is advantageous for high Andean cities because these areas are plagued by periods of low temperature during which phenomena such as frosts, snow, and hail occur, as in ACI523.3R-14[1] refers that cellular concrete is more thermal than a conventional concrete due to the porosity which presents acoustic properties and is non-combustible. It is because of these advantages that a suitable mix design of the cellular concrete was sought to be achieved; for this, one of the most important factors is the foaming