

## Extrudable Foamed Concrete: General Benefits in Prefabrication and Comparison in Terms of Fresh Properties and Compressive Strength with Classic Foamed Concrete

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**Abstract :** Foamed concrete belongs to the category of lightweight concrete. It is characterized by a density which is generally ranging from 200 to 2000 kg/m<sup>3</sup> and typically comprises cement, water, preformed foam, fine sand and eventually fine particles such as fly ash or silica fume. The foam component mixed with the cement paste give rise to the development of a system of air-voids in the cementitious matrix. The peculiar characteristics of foamed concrete elements are summarized in the following aspects: 1) lightness which allows reducing the dimensions of the resisting frame structure and is advantageous in the scope of refurbishment or seismic retrofitting in seismically vulnerable areas; 2) thermal insulating properties, especially in the case of low densities; 3) the good resistance against fire as compared to ordinary concrete; 4) the improved workability; 5) cost-effectiveness due to the usage of rather simple constituting elements that are easily available locally. Classic foamed concrete cannot be extruded, as the dimensional stability is not permitted in the green state and this severely limits the possibility of industrializing them through a simple and cost-effective process, characterized by flexibility and high production capacity. In fact, viscosity enhancing agents (VEA) used to extrude traditional concrete, in the case of foamed concrete cause the collapsing of air bubbles, so that it is impossible to extrude a lightweight product. These requirements have suggested the study of a particular additive that modifies the rheology of foamed concrete fresh paste by increasing cohesion and viscosity and, at the same time, stabilizes the bubbles into the cementitious matrix, in order to allow the dimensional stability in the green state and, consequently, the extrusion of a lightweight product. There are plans to submit the additive's formulation to patent. In addition to the general benefits of using the extrusion process, extrudable foamed concrete allow other limits to be exceeded: elimination of formworks, expanded application spectrum, due to the possibility of extrusion in a range varying between 200 and 2000 kg/m<sup>3</sup>, which allows the prefabrication of both structural and non-structural constructive elements. Besides, this contribution aims to present the significant differences regarding extrudable and classic foamed concrete fresh properties in terms of slump. Plastic air content, plastic density, hardened density and compressive strength have been also evaluated. The outcomes show that there are no substantial differences between extrudable and classic foamed concrete compression resistances.

**Keywords :** compressive strength, extrusion, foamed concrete, fresh properties, plastic air content, slump.

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