



## Structural Lightweight Aggregate Concrete and Its Applications

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### Abstract

Construction industry demands for high amount of raw material to produce concrete. The continuous depletion of natural resources results in negative impact to the environment and shortage of raw material. To reduce environmental impacts of concrete production one way is to utilize by-product and waste materials as cement and/or aggregate replacement in the concrete mixture. However, the next solution is the use of new structural systems and lightweight structural materials to reduce overall weight of a structure. Structural lightweight aggregate concrete (SLWAC) is a promising material to be used in high-rise buildings and long-span bridges to reduce the size of piers, footings, walls and other load bearing elements in such structures. Therefore, application of SLWAC not only reduces the cost of construction but it will have significant contribution in sustainable construction.

**Keywords:** Structural lightweight aggregate concrete; lightweight concrete; lightweight aggregate; density; compressive strength.

### 1 Summary of workshop

In construction industry, there is always special attention to the use of lightweight structures due to their significant advantages. For example, cable-stayed bridges are considered as lightweight structures with longer span length and small structural members [1]. Also, the weight of a concrete structure can be reduced significantly if structural lightweight concrete is used instead of normal weight concrete in high-rise buildings and long-span bridges.

Lightweight concrete (LWC) has been widely used in buildings as masonry blocks, wall panels, roof decks and precast concrete units [2]. LWCs could be produced with a dry density ranging from 300 to 2000 kg/m<sup>3</sup>, with corresponding compressive strengths from approximately 1 to over 60 MPa [3].

Low density concrete with a compressive strength less than 7 MPa and a density less than 1000 kg/m<sup>3</sup> are aerated, cellular, foamed or gas concrete while another non-structural lightweight concrete is no-fines concrete with a density in the range of 1600 to 1900 kg/m<sup>3</sup> and low compressive strength between 1 to 7 MPa. However, for structural applications, the common method to produce structural lightweight concrete is the use of lightweight aggregates instead of normal aggregates in concrete mixture. Lightweight aggregate concrete (LWAC) to be used in structural elements must have a density less than 2000 kg/m<sup>3</sup> and a cylinder compressive strength more than 17.5 MPa.

In the most cases, the SLWAC has been made using a lightweight aggregate as coarse and normal sand for the fine aggregate [4]. Lightweight aggregate