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# Ecological Significance of Light Weight Aggregate Concrete

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## Abstract

As the construction industry is booming due to rapid pace of industrialization the need for building ingredients are also causing tremendous pressure on mining sector, which in turn creates lots of environmental problems. Apart from ecological consequences there is variety of other reasons that this sector is thinking to substitute traditional building ingredients with eco-friendly alternatives. The use of light weight aggregate in concrete will not only economical but also possess variety of positive ecological benefits in construction sector. In this paper an effort has been made to analyze the properties of light weight aggregate.

## Introduction

One of the disadvantages of conventional concrete is the high self weight of concrete. Density of the normal concrete is in the order of 2200 to 2600 kg/m3.This heavy self weight will make it to some extent an uneconomical structural material. Attempts have been made in the past to reduce the self weight of concrete to increase the efficiency of concrete as a structural material. The light-weight concrete as we call is a concrete whose density varies from 300 to 1850 kg/m3.There are many advantages of having low density .It helps in reduction of dead load, increase the progress of building, and lowers haulage and handling costs.

## VARIOUS TYPES OF LIGHT-WEIGHT AGGREGATE AND THEIR PHYSICAL PROPERTIES

### NATURAL AGGREGATES

Pumice, Diatomite, Scoria, Volcanic Cinders, Saw Dust, Rice Husk etc.

### ARTIFICIAL AGGREGATES

Foundry slag, Brick Bats, Cinder, Clinker and Breeze, Foam Slag, Bloated Clay, Sintered Fly Ash (Pulverized Fuel Ash), Exfoliated Vermiculite, Expanded Perlite , Blast furnace slag.

## POTENTIAL COST BENEFITS

### What are the potential advantages in using lightweight aggregates in bridges?

The advantages in using in using lightweight aggregates in bridges:

(i) Owing to reduced dead load by using lightweight aggregates, there are savings in structural material such as the cost of foundation and false work.

(ii) It brings about environmental benefits when industrial waste products are used to manufacture lightweight aggregates.

(iii) It enhances higher durability by having lower coefficient of thermal expansion which reduces the thermal movement. Moreover, it has lower permeability and higher resistance to freeze-thaw cycles when compared with normal aggregates.

As expanded shale, clays, slates and slag, one can expect to reduce the weight of a yard of concrete to approximately 95 lb/ft$^3$ to 115 lb/ft$^3$ (1,520 kg/m$^3$ to 1,840 kg/m$^3$) or a maximum potential reduction of approximately 35% by dry weight.

## STRUCTURAL CONSIDERATIONS

Advances in today's concrete technology provide producers with many options for concrete mix designs that can overcome almost any perceived challenge relating to strength and durability. Precast producers should not be overly concerned that using lightweight aggregates will have significant structural issues – they can depend on suppliers of these products for assistance. However, there is no substitute for a complete engineering and structural analysis when facing these considerations; validation by an engineering professional is not optional for the decision process. Suppliers of these products can also provide assistance regarding any producer concerns.

## COST CONSIDERATIONS

One of the biggest advantages of using lightweight aggregates is the weight savings realized in the products themselves. Product weight reductions can save on shipping costs to the producer as fewer; more cost-efficient loads of product are shipped to the job site. Products receive a structural benefit as well by reducing the dead loads that the precast structure must support. Weight savings in the cast products can lead to reduced handling costs at the job site and in the plant by reducing crane capacity for lifting and setting the products.

The comparison shows that the savings in transportation costs well outweigh the additional expense of the lightweight aggregate. These savings were realized because additional product could be loaded on each truckload and, consequently, fewer shipments were needed. These examples show that saving money is possible. However, each precast concrete producer must analyze variables that would ultimately affect the overall production and shipping costs at his or her own plant.

## CONCLUSIONS

The successful application of structural lightweight aggregate demonstrated that lightweight used for precast structural elements can be used in building construction to increase the speed of construction, enhance green construction environment such as reducing the wet trade on site and keep dust level at construction site to the minimum.

Also in road constructions these aggregates are in extreme demand.

The following advantages are concluded for using lightweight concrete in prefabrication in building:
• Reduce the dead weight of a façade from 5 tons to about 3.5 tons
• Reduce craneage load, allow handling, lifting flexibility with lighter weight
• Good thermal and fire resistance, sound insulation than the traditional granite rock
• Allow design and construction flexibility for larger prefabrication modules
• Allow maintenance flexibility with replaceable modules
• Factory production of module enhances quality of product
• Enhance speed of construction, shorten overall construction period
• Enhance green building construction, minimize wet trade on site
• Improve damping resistance of building
• Utilization of PFA in aggregate production resolves the waste disposal problems of ash and reduce the production cost of concrete

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