

Hey, Check Out Those Aggregates

I can't overemphasize the importance of selecting the right type and quality of aggregates for each mix recipe. These aggregates, which greatly influence concrete properties and economy, occupy about 60% to 75% of the concrete's volume, or approximately 70% to 85% of the concrete weight.

I like to compare the operating of a good precast plant with the human body. In a concrete production facility, there are machines, or forms, that rely on a quality concrete mix in order to make a good product. I liken these production stations to the arms and legs of a human body, and compare the mixing plant with the human heart.

For the arms and legs to function efficiently and correctly, they need good quality blood (consisting of red corpuscles, white corpuscles and serum). Similarly, for the concrete production stations to make a top quality product, they need good quality concrete (consisting of aggregates, cement and water). It doesn't matter how good the machines (arms/legs) are, if the concrete (blood) is of poor quality, you can be assured that the final product will be of poor quality.

Because they make up such a large percentage of the final concrete mix, aggregates are obviously a major component of the mix design. It is imperative for you to ensure that your suppliers are providing aggregates that meet ASTM C33, which is the standard specification for normal-weight aggregates. You will want to specify grading limits and maximum size, which affect cement and water requirements, as well as economy, workability and durability.

For most applications, you will want well graded aggregates. By this we mean an aggregate that includes a collection of sizes (particle size is determined from a sieve analysis) that will enable all of the particles to fit together nicely, reducing the air voids. The result is a more compact, dense mix that will be durable and watertight. A gap graded (all one size, for example) is not considered acceptable for normal mix designs, but might be used to obtain a uniform texture with an exposed-aggregate mix.

One of the most common reasons for poor strength results from dirty aggregates. Aggregates must be clean, if they are to be effective. You want to be sure that your supplier is properly cleaning your aggregates with a suitable cleaning system, not simply spraying them with a hose. The fine materials found in dirty aggregates seriously affect the hydration process and don't allow the cement paste to properly bond with the aggregates. A simple way to check your aggregates, is to pick some up in your hands and rub your hands together - if there is dust on your hands, the aggregates are too dirty.

Your aggregates need to be hard, strong and durable. Stay away from aggregates like shale, shaly rock, soft rock, porous materials and any materials that are easy to split. Particle shape and surface texture also influence concrete properties. Since rough-textured, angular particles need more water to produce a workable concrete than do smooth, round particles, they will require more cement to maintain the same water/cement ratio.

Another consideration that bears attention, is the assurance that your aggregates are not alkali reactive. In other words, you need to ensure that you won't have a problem with Alkali-Silica Reaction (ASR). Although most aggregates are chemically stable in hydraulic cement concrete, some are not. The use of reactive aggregates in a concrete product that will be exposed to moisture, can result in ASR, which can cause distress and crack the product.

Aggregates are important, and they need to be checked out, once in a while.