Glass Concrete Precast Facade Elements

Building facade elements are among the primary tools available to architects. Numerous materials are at their disposal for this purpose: natural stone, brick, masonry, synthetics, metals, wood and architectural concrete.

We are in the process of adding a new material to this array of options: glass concrete. By varying the color combinations of glass aggregate and cement matrix, glass aggregate grading and surface texture we can create a virtually unlimited number of possibilities. For example, the coarseness of surface texture is controlled by the strength of the retarding agent, which determines the amount of cement matrix and fines that will be washed out after demolding. By varying the strength of the retarder and aggregate grading, a range of options can be presented to an architect like a catalogue to chose from.

Facade elements are not only subject to esthetic requirements. They have to offer thermal insulation, serve as moisture or vapor barriers, and resist loads. For the same reason why we are reinforcing precast concrete basement wall panels with recycled carpet fibers, we are contemplating to add such fibers also to facade elements. Such reinforcement not only improves the mechanical properties of the material, but also its thermal resistivity. Finally, we intend to combine the glass concrete with our lightweight concrete technology. Reducing the weight of precast panels not only eases their handling, transportation and lifting. It also leads to savings in structure and foundation costs.
In sum, it is possible to engineer the mechanical properties of the glass concrete (strength, fracture toughness, durability), its resistance against chemical attack, thermal resistivity, permeability, and weight density. Even its appearance can be "engineered" to achieve the desired effects, by varying surface texture, aggregate grading and color coordination between cement matrix and glass aggregate. The potential of this building material for facade elements is only beginning to be explored. Yet, initial reactions from design professionals have been unanimously encouraging.

In fact, we are cooperating with the architectural firm Fox and Fowle, New York City, noted for its pioneering work with "green buildings", i.e., buildings that incorporate innovative energy-saving technologies and large-scale use of recycled materials. The office is considering to use precast glass concrete facade elements for a new building in midtown Manhattan and is assisting us in the development of this novel panel element.

**Research Sponsors**

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