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Research Article

USAGE OF SELF-COMPACTING CONCTRETE IN MODETN ARCHITECTURAL CONSTRUCTION

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ABSTRACT

In the given article we are going to firstly, overview the common usages of self-compacting concrete, as well as discuss its' differences and advantages in comparison with traditional concrete, which is used in construction in combination with metals. Secondly, and most importantly, the new idea of exploitation of self-compacting concrete will be introduced.

KEYWORDS

Architecture, patterns, forms, construction.

INTRODUCTION

The main difference, which is immediately noticeable at first grance, is consistency. Concrete, that we are accustomed to seeing in buildings construction, has a paste consistency; a lot of common methods are used in order to obtain the required form, reach its' mechanical properties, such as: solid consistency, frost

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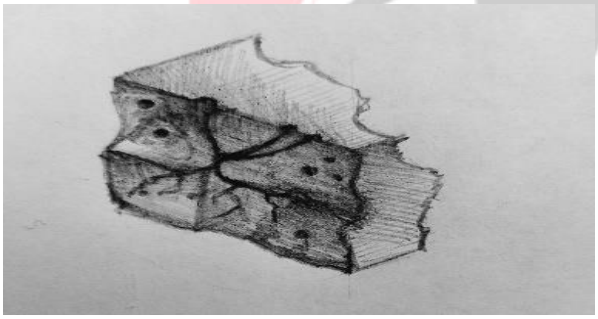
resistance, strength to mechanical loads and chemical resistance. All these properties are reachable by compacting (pressing, influence of vibrations, chemical additives) the concrete and making the bulk density (density, including all the liquids and air pores inside the material) of concrete as close as possible to its' dry density (density of solid component only). The reason of such procedures is to avoid the appearance and collecting of liquid and gas components in the volume of explanted concrete, because such components are usually the reason of corrosion of metallic constructions, chloride attack, sodium attack and other stuff that is learned in the middle of bachelor's degree.

In the given illustration, the air pores and holes in the concrete's cross section are shown. Understandably, water or other dangerous liquids can collect in these spaces and cause the problems, previously mentioned.



Pic.1 Unfortunately, it is impossible to avoid all of them by mechanical influences.

In the case of self-compacting concrete, all the air pores and cracks are squeezed by the weight of the concrete itself, which is an advantage that makes it preferable over regular concrete. For a recognizable example, imagine

Pic.2 that you are trying to fill a glass with a paste substance (such as peanut better), without appearing any air bubbles in its' volume, no matter how hardly you try to press it, hit the glass on the tables' surface or mix, you will not reach the condition of fully integral and homogeneous paste. While when you pour some liquid substance into the glass (such as water or milk), all the air accumulations come on the surface themselves, and here we can fully and logically observe the benefits of self-compacting concrete:

Its' bulk density is equal to dry one from the very start of exploitation, without any time and energy spent on mechanical procedures. As a result, such widespread problems of frost cracking, chemical reactions from soil and non-sterilized water, decreasing of load resistance can be ignored.

Nowadays, self-compacting concrete is used in the manufacturing and construction of roads, to support the huge amount of non-homogeneous loads that they bear by them every day and accommodate for the fact that roads usually have atypical shapes.

In this article, more attention will be concentrated on the ability of self-compacted concrete to obtain any shape and harden in a stable position.

Idea of exploitation of self-compacted concrete in the building's constructions:

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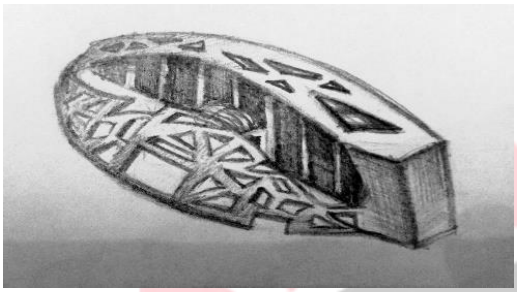
We are all accustomed to the idea that breaks are used in the constructions, the reason of such decision is easily recognizable; it is simpler to use kind of universal unit of construction in order to incarnate more complex and interesting architectural ideas. We all know about the walls, basements, columns, made from bricks or other types of blocks. Indeed, such blocks are very convenient in exploitation, however, as visible from their shape, they are suitable mostly for basic and traditional constructions, with straight walls and sharp corners. Of course, it's hard



Pic.3

to call such a condition - disadvantage, such constructions are used by people for a lot of centuries with a great success.

Nevertheless, even from the middle of last century architectures and civil engineers gave rise to the idea of curvilinear constructions that represent the natural tendentious by the graceful shapes, and even contemporary architectural companies try to follow this still demand tendency.

Pic.4

Pic.5

As it is visible from the given examples (pic.4 and pic.5), in order to construct the curvilinear shapes, the metallic layers are commonly used. The reasons of such decision are quite understandable; metal is a durable material and it's easy to manipulate by its' shape, when we are dealing with a thin layer. However, almost all the metals, especially the ones that are used in the construction, have very high thermal conductivity. They are also costly, and even if we ignore the financial component, such widespread problems as corrosion and oxidation appear in the metallic construction. So, therefore, if we return to the topic about self-compacting concrete, the authors of this article offer an idea of exploitation this kind of concrete in order to create the appearance of the building, here are the supporting reasons:

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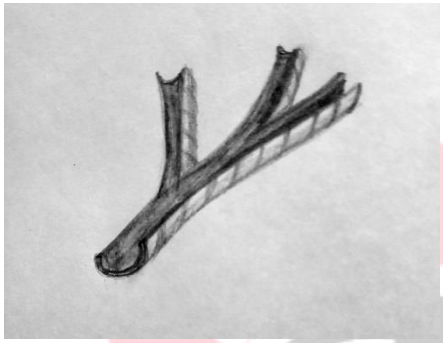
- Because of liquid consistency self-compacting concrete is able to adjust its' shape to that, which is required to implement the idea of the buildings.

- Forms that will mold the self-compacting concrete can be made from cheap materials that can be used more than once. The requirements for these materials are very low, because even in the liquid form self-compacting concrete does not heat that much.

That is a sketch of the form that can be used to give the self-compacting the desired shape.



Pic.6

- As mentioned before, this concrete is fully homogeneous, so its' frost resistance as well as chemical resistance, are quite high.

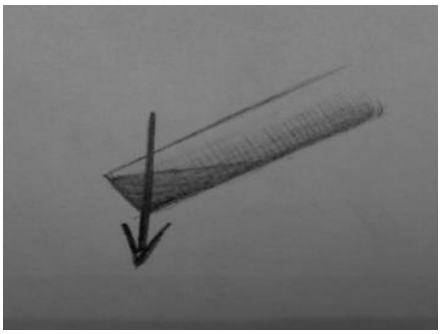
- After drying and hardening self-compacting concrete has the same hardness, load strength and bending strength as the traditional concrete.

- Concrete has very low thermal conductivity, so it would not heat as much in exposure to the sun as aluminum, for example.

- It is easy to integrate electrical viruses and systems inside the concrete while it is in liquid form.

Some words about the physics of the liquid:

If the form, where the liquid is placed, does not lay horizontally, but under some angle; the liquid itself goes to the deepest point in the bottom of the form. Therefore, when self-compacting concrete is poured into the form for hardening, the form itself must stay in most horizontal position as possible. Otherwise, the liquid concrete would collect in the lowest point of the form, so the required shape will not be obtained.



Pic.7

Furthermore, there is no way to bring the hardened concrete back to the liquid form, so, all the concrete that is hardened in the wrong position will end up being wasted material.

CONCLUSION

The purpose of this idea is the same purpose that our ancestors had when they created a brick:

To construct the buildings with an already ready construction units that have all the mechanically required properties, but with an help of a liquid substance that hardens in the given form, and furthermore has all the mechanical properties to allow the construction of the buildings to become much faster and easier. It is going to look like the process of creating the Lego house, applying already manufactured necessary parts of building, moreover, when there will not be any limits in the shapes of this part, revolutionary architectural ideas can be implemented.

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