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Review on Transparent Concrete as an Innovative Material Used in Civil Engineering

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Abstract-Since the dawn of history concrete has been, right behind stone and brick, one of the oldest building materials. The ancient Romans took advantage of its opportunities. They constructed amazing architectural objects, which survived centuries as whole buildings or parts of them. Concrete is so ubiquitous, that when we are walking in a newer districts of cities we are virtually surrounded by concrete from everywhere. Sometimes we do not realize in how many cases and various ways concrete is used in towns and cities. As we know, human curiosity and quest for newer and newer solutions and capabilities does not leave such amazing material as concrete alone. There are many varieties of concrete, depending on what people want to achieve. By changing its chemical composition, technological process and adding various other materials, we receive various types of concrete. We use them to create durable supporting structures, a variety of concrete which is resistant to constant moisture or different chemical types. Additionally, some aspects of aesthetics in architecture are made with the help of concrete.

Key Words- Transparent concrete, Workability, Compressive strength, Tensile strength, Flexural strength.

I. INTRODUCTION

The aim of this paper is to carefully study and describe one of the particular types of related to designing and constructing beautiful buildings, structures, etc. Concrete-partially clear like lightly frosted glass concrete. This material is becoming more popular due to its unusual properties. Its high strength and clear/open and honest character are related with beauty-related value of concrete. more than two, but not a lot of examples of applications of this material are shown in the paper.

The origin, properties and problems of using.about creating spaces through theproper shaping of the forms and the relationships between them. Designs/builds express both feelings andfeelings of love, hate, fear, etc. through their projects. related to the beautiful design and construction of buildings is certainly one of the oldest types of art departments. Since people left caves, they have started building shelters. Later on they began to take care ofappearance of their places of living, changing ordinary buildings into works of art. Construction technologies and building materials have been developing for a very long time and very quickly. A construction material which is constantly being changed in order to improve its properties is concrete. Habits/desires shaping its quality and development are described in many scientific papers [1-3]. The strength of concrete, its ability to last and usability are in an organized way changed so that the buildings made in this technology can be higher, with larger span, and lengthy period of their use. Although itseems that probably (but not definitely) everything that a man could build has already been invented, yet new possibilities are still newly appearing.

One of the ideas is to create a material with a bearing ability to hold or do something ofconcrete and partial clearness of glass. The composition and technology of such a material andpossibilities of its usage were

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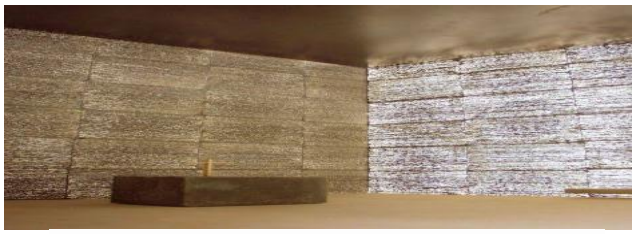
created by a Hungarian designer Aron Losonczi. His purpose was toget a construction material with clear properties of glass. The combination of ordinaryconcrete with a very expensive and smart fibre-optic material resulted in anamazing effect. The only one, but unfortunately very big disadvantage of this material is the price,which has limited its spread and narrowed the field of applications which are available only for the
richest



Translucent Concrete

Figure 1: Translucent Concrete

II. ORIGIN AND DEVELOPMENT OF LITRACON

Figure 2: hydroTechnical concrete.

Concrete is a made up of different things made from group, water and binding agent which is cement. By using certain things added to food, or something else concrete limits/guidelines can be changed in order to get a clearly stated/particular texture, desiredweight, bearing ability to hold or do something or colour. Now concrete is the most popular building material. Every yearabout 5 thousand Articles [4] on concrete are published every year. This is mostly due to thepossibility of developing different forms. Also, concrete as a building material has very goodload-bearing limits/guidelines which affect the variety of computer programs in different structures. The first use ofconcrete dates back to Roman times. One of the largest very old structures made from concrete is the(place where famous people are)'s dome which is over 43 meters in distance or line from one edge of something, through its center, to the other edge, weighing more than 5,000 tons. The history of concrete development as a building material and types of structures which can be created from concrete

In order to cover buildings with significant spans and to increase the pressure resistance, concrete some thing that strengthens or adds support bars were added to concrete structures. These bars are meant to move from one place to another, related to stretching wire, etc.forces.The combination of both materials allows to create related to what holds something together and makes it strong parts/pieces that are resistant topress or force into a smaller spaceion, stretching and bending . Waterproof concrete is a type of concrete which isresistant to only lasting for a short time or constant influence of water.

There are more than two, but not a lot of classes of these concretes depending on their waterproofness. It is important that the mixture of these concretes is as dense as possible and that the group is fine and uniform.Water proof ness itself depends on the porosity ofthe concrete. Scrape/injury resistant concrete as the name suggests is the concrete resistant to scrape/injury.There are two types of this concrete: resistant to scrape/injury with flat surfaces andresistant to any small particles of hard materials, sand. Another type of concrete ishydro technical concrete. It can be said that hydroTechnical concrete is a combination of two typestalked about/said above.

Figure 3: Fireproof concrete

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It must be resistant to both water and scrape/injury. Mixes of these concrete are preparedindividually depending on the health of the Earth/the surrounding conditions in which they are supposed to be used. Fireproof concreteis mainly used for the construction of flue chimneys, central heating boilers, escape staircases inobjects especially exposed to fires. Standard concrete loses its bearing properties at temperaturesover 200-300 degrees, which is a compared to other things low temperature during fires. Fireproof concretes cansurvive temperatures up to 700 degrees, but they must be made of high-quality materials, whichsignificantly raises their costs. Shielding concrete is used to separate the areas with radioactiveradiation. It is used at nuclear power plants and in laboratories, where radiation experiments arecarried out. These material is created for particular situations and the type of radiation for properly selectthe parts/pieces and methods of production this type of concrete should be know.

Figure 3: lightly frosted glass concrete

One of the more modern types of concrete is partially clear (like lightly frosted glass) concrete. This concrete is made from acombination of clear/open and honest materials and concrete. Light transmitting elements must be located overthe full thickness of the finished concrete element. Special layouts can create different light areas, depending on your needs. Translucent concrete has been invented (not very long ago).

New versions of this material are constantly being developed. Different types of partially clear (like lightly frosted glass) materials such as plastic, glass or even fibre optics are used.The creator and originator of clear/open and honest concrete is Aron Losoncz, a Hungarian designer/builder,graduated from Royal College of Fine Arts in Stockholm. While studying, he experimented with twobasically different materials: concrete and glass. He tried to get a material that would combinethe (features/ qualities/ traits) of the two parts/pieces: glass clearness/openhonesty and the load bearing ability (to hold or do something) and(related to what holds something together and makes it strong) properties of concrete. In this way, clear/open and honest concrete was created. The main inspirationwere artistic works Aron found during his studies. There were drawings which showed objects with(features/ qualities/ traits) almost the same as that of today's clear/open and honest concrete. In 2001 the young designer/builder patented hiswork as a new building material called "Litracon"

III.CHARACTERISTICS OF LITRACON

It would seem that creating material with properties like Litracon could totally change and improve modernrelated to the beautiful design and construction of buildings Of the same opinion was the young creator who was fully convinced that his inventionwould really affect the world of related to the beautiful design and construction of buildings. But he was wrong.The high cost ofmaterials made its usage very limited. Now/recently, few objects have been made in this technology and it is old enough to be known in the whole world.In 2006 the designer/builder got one of the most importantawards in the field of design - the RedDot Design Award. After this event it was almost obvious thatthe material would be related but had met (more than two, but not a lot of) (blocking or stopping things) in its path.

Figure 4: LITRACON

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Table 1. The pros and cons of Litracon

Advantages	DisAdvantages
• Resistant Of Compression - 50 N/Mm2 And Bending - 7 N/Mm2 • Blocks May Have Different Dimensions Even 30 X 60 Cm • May Be Construction Material Which Allows To Build Several Meter High Walls With Light Transmitting • Changes In The Intensity Of Light, Referred As "Light Information", Are Transferred From The Brighter Side Of The Wall To Darker Side Without Major Changes , Due To The Parallel Arrangement Of The Fibres • Reduction Of Energy Due To The Penetration Of Daily Light Into The Object	• Compressive Strength Is Classification As Standard • Square Meter Thickness Of 2.5 Cm Costs About 750 Euro • • Available Only In The Form Of Ready, It Can't Be Made On The Building Site

The biggest disadvantage of the new material was its cost. Producing a square meter which is only2.5 cm thick costs about 800 euros. Apart from the price, the problem was a serious problem that could bewatched/followed in the process of people making, selling, and buying things in the years when material was invented and developed. But that was onlythe beginning; some time later Aron created a concrete called Litraconp XL whose composition andmanufacturing process allowed for significant cost reduction.

There is a chance that partially clear like lightly frosted glassconcrete will replace luxfer tiles used in related to the beautiful design and construction building today. Clear/open and honest concrete can be used as arelated to what holds something together and makes it strong element and it contains between 2.5% and 4% of fibre optics in its volume [5].In this case,using standard concrete mix was getconcrete with a density of 2100-2400kg/m3, press or force into a smaller spaceive strength and related to stretching wire, strength of 50-80MPa and bending strength of 7MPa [6].4. Optical fibres used in blocks of Litracon:-Optical fibre is a closed fibre glass structure that is capable of transmitting light information within its structure at a speed of light for huge distances. Fibre optics are used in many areas of life, in medicine ,communication, serving to make something look prettier ways of doing things, lasers, etc. The fibre, in which information is transmitted, little goes beyond the distance or line from one edge of something, through its center, to the other edge of a human hair. The extremely important feature of the fibre is that no matter howit is arranged, how many bends and changes of direction there are, it does not lose any amount ofenergy that has been applied to one of its ends. In short, the amount of energy coming into one endgoes out from the other one. When creating partially clear concrete, no partially clear like lightly frosted glass plastics or glass are areal match to the fibre since they lose light energy

every curvature and bend. Fibre optics provedas far as quality is concerned. However, the price has this material. It can bewonder why in there is no problem using so expensive material but in case ofcreating Litracon it is. When it comes to building whole communication installations, the cost of usingfibre optics is not important because the installations themselves are so expensive that the use of opticalfibre does not make up/be equal to a high price increase and greatly improves the (wasting very little while working or producing something) of the installation.

However, in building materials, the combination of cheap concrete with expensive fibre makes theprice increase more than two, but not a lot of times.The fibre optic construction is shown in Figure 5-6. Single fibre consists of core - this is the internal and most important part of the fibre, it transfers all the information from the transmitter to the receiver. The diameter of this element is very small (5 to 100 microns). Cladding is the material that surrounds the core. Its light reflecting capacity is lower which allows the light to stay in the core and flow freely over the length of the connection. Buffer coating is a plastic rubber sheath which protects the fibre from mechanical damage[7-8]. The totalthickness of the fibre is between 250 and 300 microns.

V. EXAMPLES OF USING LITRACON

Clear/open and honest concrete is used in elements on which the light has clearly stated/particular influence.It is used in eg.partition walls, shower cabins, stairs, floors between levels (with good lighting up/education of the building) andin smaller objects such as lamps, garden benches, garden walls or small (related to designing and constructing beautiful buildings, structures, etc.) elements.Theeffect of clear/open and honest concrete can be compared to the partition walls using rice paper in Japanese.You do not see exactly what or who is on the other side, but you can see the black outlineof an object or a character .The thickness of the concrete does not play any role here apartfrom its bearing ability (to hold or do something). Optical fibres will pass the light through the concrete with the same strength no matter whether the thickness is 500mm or 25mm.

Additionally, because it is concrete, ornaments or building elements in different shapes on their choice as to when and how could be modelled.One of the most interesting Architectural Exhibitions with Litracon is the Italian Pavilion at the Shanghai Expo in 2010. The facility covers an area of about 3,600 square meters and is 18 meters high.

The interior is divided into irregular sections of different dimensions.Only in certain places transparent concrete was used. The rest of the structure is made of ordinary concrete blocks of the same color as transparent concrete. By day the building is not outstanding in any way ,however, after dark shows its second face.Much smaller implementation is the Europe Gate of 2004, which symbolizes the accession of Hungary to theEuropean Union .A manufacturer of Litracon has in its offer lamps made with this material.

VI. CONCLUSIONS

Concrete could give huge numbers of (showing the ability to create interesting new things) possibilities. (more than two, but not a lot of) millennia ago people knew this and areconstantly developing their knowledge in this scientific field. Concrete is a great material not only forconstruction purposes, but also has great artistic (possible greatness or power). The simpleness of its construction, (compared to other things)low price (unless we talk about the concrete with expensive (things added to food, or something else)), the possibility of giving themold any desired shape, gives concrete a great advantage over other building materials. So why not research/dig deeper into the subject and look for new solutions and possibilities. As far as Litracon itself is concerned, the impression is that the world is not yet ready for the Hungarian product. This materialcan be used in many ways, in many versions, (even though there is the existence of) its high price. It gives the possibility to light up/educatethe interior while preserving privacy which cannot be received/be gotten with ordinary glass. Also,

It can be used as a constructional element. So far the only solution for Litracon is to try to change itsproperties, mainly by replacing fibre optics with glass (plastic did not give such a great effect). Sodesigns/builds and constructors need to focus mainly on creating a quality other choice to a fibre optic with alower price or to try to find a solution for cheaper fibre optic production. Otherwise, such a greatproduct can go away into nothingness.

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