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Autor: Isler, Heinz

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Effective use of concrete

Utilisation effective du béton

Zweckmässige Verwendung von Beton

HEINZ ISLER
Dipl. Ing.
Ingenieur- und Studienbüro
Burgdorf, Switzerland

SUMMARY
The fundamental characteristic of concrete is that it can be formed into virtually any shape thereby bestowing great freedom on the designer. The author stresses the other good qualities of concrete and urges that it should be used more imaginatively.

RESUME
Le béton a pour caractéristique essentielle de pouvoir prendre n'importe quelle forme, conférant ainsi une grande liberté au projeteur. Les autres qualités principales du béton sont soulignées. L'auteur recommande plus d'imagination dans l'utilisation du béton.

ZUSAMMENFASSUNG
Die wesentliche Eigenschaft des Betons liegt darin, dass er jegliche Formen annehmen kann, was dem Entwerfer grosse Freiheiten zugesteht. Andere wichtige Qualitäten des Betons werden unterstrichen. Der Autor empfiehlt, bei der Anwendung von Beton mehr Phantasie walten zu lassen.

If cement, gravel, sand and water are put together, the result is a mixture which in fact is liquid stone. Within a few days rock is obtained from this liquid form - rock which is similar to that which forms the high mountain walls of our planet. The artificial rock is called concrete.

This property - being initially liquid - is the most fundamental characteristic of the building material, concrete. On one hand it poses problems and limits; on the other hand it provides enormous freedom for the designer.

The first problem lies in the fact that a liquid must have a container in which to be poured: the formwork. Generally it is constructed in timber, sometimes in steel, when the need arises for multiple usage. The formwork must be watertight and strong enough to take high pressure. Concrete having a specific weight two and a half times that of water, produces pressure on the formwork two and a half times higher than the pressure of water. On the other hand the container can be realised in an absolutely unlimited range of shapes or forms. Concrete fills any cavity and runs into the finest details of the cavity.

There are no limits to the shape of concrete. Enormous freedom lies before the designer, an astonishingly vast field. It is astonishing that in fact very little use is made of this freedom. It is astonishing that the great majority of concrete buildings follow the typical shapes of wood and steel, namely the straight beam, the flat slab and the plane wall.

What is the reason for this fact? Are the adopted criteria valid ? Surely a slab should be flat. Unevenly shaped floors in a home or in an office would not be very practical. Yet walls and roofs need not be flat and straight. Round rooms are more intimate and it is well known that domeshaped roofs induce much more comfortable feelings.

Is it lack of imagination? Or, have we not learned to handle the non-linear?

Design and calculation of curved shapes is not easy. The problem of building technique is another impediment. Curved formwork is complicated and expensive, at least in the traditional sense.

When physical requirements suggest curved lines, then they are built. For instance in highway structures curved shapes today are quite common. The moving vehicle demands curves. Therefore they are constructed.

New techniques have been invented and developed to construct non-linear formwork. Therefore other buildings - houses, stores, hangars - could make use of them. This is a very interesting field for creative minds.

Concrete is a wonderful material. It is not only cheap but is still available without limit. It has very good strength properties - high compression strength by its very nature, tension strength obtained by combination with reinforcement, by use of prestressing cables or by reinforcing with special glass or wires or fibres.

By itself concrete has a very high weathering resistance. If cracks are avoided by good, correct design it can endure for centuries without maintenance. It resists the worst weather conditions, prevalent from mountain peaks to heavy seas. It can resist high temperatures as well as extreme cold by the use of modern additives in the concrete mix. It needs no protection, no painting, no cladding.

Concrete allows monolithic structures. Being cast in place, columns and beams, walls and slabs can be joined without hinges or joints. By this means the structures gain additional safety without additional cost. The advantage is really seen in cases of emergency or accidents; monolithic structures then demonstrate their high capacity to carry extraordinary loads.

Concrete has the highest fire resistance of all building materials. It also gives protection from weapons and radiation.

Today in most countries it is very easy to obtain concrete. It is purchaseable, it is delivered by concrete mixer lorries, it can be pumped to any place required. There is no longer a need for expensive installations, heaps of gravel, sand and cement; there is no more dirt and dust. Concrete is poured and a few days later one has the solid, unburnable slab one seeks. It is so easy.

Why then, one might ask, has concrete a rather bad reputation in the modern world? It may be because it is so widespread. It has become the symbol of man's intensive building activity, imposing more and more on the natural environment and nature. Concrete has become a symbol for destroying nature, and has become its apparent enemy. Because of the fact that it is durable, that in itself it disintegrates so slowly and invisibly man feels defeated or at least frustrated. It is left for future generations be it for their good or be it as an obstacle.

It is not concrete which should be criticised. It is human overactivity, the lack of respect for natural resources, landscapes and nature itself which are aspects for criticism.

It is not the high dam inundating a whole valley which is bad, but the fact that soon every valley will be drowned.

It is not the useful concrete highway which is bad, but the fact that motorisation constantly increases and that man believes he can only find his fortune in other places, never where he actually is.

When this background is understood and tackled, concrete need no longer be the scapegoat.

It is a medium in the hands of architects and engineers. It is neutral. The politician decides what has to be done and the technician decides how it is to be done. Be it exaggerated or sound. Be it ugly or beautiful.

Let us hope that concrete will be applied more and more for the well-being, prosperity and joy of man.

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