

Notes on the construction procedures

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The Construction Procedures constitute the different processes, systems and methods available to make a work come true following an orderly set of rules or constructive practices based on the experience and on the technical and scientific knowledge available at that moment, all to achieve constructions useful, safe, economical, aesthetic, environmentally acceptable and, if possible, lasting over time. The works and constructions that are made to satisfy basic needs such as security, housing or transport, must be executed following a certain order or pre-established plan according to a set of norms or rules capable of ensuring their success.

Factors that influence the properties of concrete:

Concrete properties

Component materials

Dosing and preparation

Transport and placement

Drained and vibrated

Curing and protection

Control Materials that make up the concrete
Cement: It should be stored indoors and not directly on the floor.

There is a lot of types:

Type I : General use, without special properties.

Type II: Moderate resistance to sulphates, structures with aggressive environments or massive drainage.

Type III: Rapid development of resistance, used in cold climates.

Type IV: Uncommon, massive concrete.

Type V: High resistance to sulphates, very aggressive environments.

Materials that make up the concrete

Type IP: Cement with a percentage between 15 and 40% of pozzolan.

Type IPM: Cement with a percentage of up to 15% pozzolan. Pozzolans change some properties of concrete, increase or delay the time to acquire resistance, decrease the heat of hydration and improve the behavior against chemical aggressiveness.

Water : Drinking water should not be stored for very long periods to avoid the appearance of microorganisms

Aggregates: They can be natural or artificial. Among the natives: crushed stone and coarse sand.

Additives: They are added in proportions less than 2% by weight. They modify some physical or mechanical property, in a fresh or hardened state. Some types: accelerators, set retarders, plasticizers, superplasticizers, waterproofing, air incorporators. Additions: Materials that are added to fresh concrete in important proportions to modify some physical properties once hardened. For example:

Expanded polystyrene: obtain lower densities.

Metallic slag : obtain higher densities.

Fibers : improve flexotraction behavior.

Colorants and others. Dosing and preparation

The dosage is preferably carried out by weight.

It must be adjusted for the volume of mixing equipment used.

In works with daily drainage volumes greater than 40m³, a metering plant is usually installed on site. Large mixers or ready-mix concrete are also commonly used.

The preparation must be done in equipment specially designed for this function.

The order to add the materials is usually the following: 80-90% water + 50% coarse aggregate + 100% sand + 100% cement + 50% coarse aggregate remaining + water difference. Transport and placement

It can be handled and transported by various methods, such as chutes, forklifts, buckets, trucks, conveyor belts and pumping pipes.

The transport and emptying must be carefully monitored to maintain uniformity within the mixture. Avoid segregation. Concrete pouring

The emptying must be carried out in a fluid way so that there are no interruptions that can cause cold joints.

Before proceeding with the emptying, the following must be taken into account:

Check the arrangement of the reinforcement and the formwork.

Have enough materials.

The elements and installations that are recessed must be correctly located and fixed.

Equipment and access roads must be properly enabled. Vibrating concrete

Its correct application is an essential factor in any work.

The vibration procedure varies with the type of work, the type of vibrator used and the concrete mix.

The vibration allows the air voids to be expelled from the concrete, but in turn allows the water to rise to the surface, modifying the homogeneity and consistency of the concrete. The vibrators should be inserted and removed slowly, deep enough to vibrate effectively the bottom of each layer (45 to 60 cm.)

A suitable vibration together with an adequate selection of material will prevent the formation of crabeater.

It is not correct to use the energy of the vibrator to push the concrete horizontally. Segregation may occur.

Segregation is the phenomenon by which the larger particles tend to precipitate to the bottom of the concrete mass due to the lower resistance to displacement they have, especially in very fluid concrete.

Segregation can be avoided by reducing the free fall of concrete, with the use of emptying windows in elements of great depth (columns, plates).

Curing and protection

The resistance and impermeability of the concrete improve with a good curing.

The conditions that are favorable for the hydration of the cement should be generated.

The precautions that must be taken for an adequate curing process are:

Moisture: It can be maintained by spraying or flooding the formwork (continuously), putting covers that retain moisture or coating with liquid sealant that upon hardening forms a thin impermeable film (membrane heater). **Smooth flat horizontal areas:** In this type of surfaces (such as pavements, slabs) the perimeter of the surface can be surrounded with mounds of sand or other material that holds the water, and the enclosed area is aniega. For vertical elements are also used moisture retaining covers such as jute fabrics or blankets. **Temperature:** It affects the development of the chemical reactions between the cement and the water and consequently the speed of hardening of the concrete. In hot and cold climates special considerations must be taken for the preparation and curing of the concrete.

Concrete controlThe aim is to evaluate the characteristic resistance f'_c of

concrete at the site. This characteristic resistance will always be lower than the average resistance, and the range of variation depends on the quality control of the concrete manufacturing process.