

CONTROLLING THE QUALITY OF CONCRETE CONSTITUENT MATERIALS

1- Reinforcing Steel

Storage: Reinforcing steel is stored on layers rested on wooden base raised above land level by reasonable spacing to make far from the effect of humidity, water, and oils that have harmful effect on the bond between reinforcing steel and concrete. In regions having severe humidity conditions, reinforcing steel must be covered with plastic sheets.

Test Specimens: In case the difference between the larger and the smaller bar diameter lies in the range of 10mm, one specimen is selected from the smaller of the average diameter. In case the difference in diameters is larger than 10mm, one specimen is selected from the larger diameter and another one is selected from the smaller diameter.

Inspection unit: For one batch the inspection unit is 10 tons,
For cast element the inspection unit is 20 tons.

Tests that must be carried out on reinforcing steel

a- Tensile strength test	Tensile strength
	Yield strength
	Percentage of elongation

b- Cold Bent test

Reinforcing Steel Limits

	Yield / proof strength	tensile strength	% Elongation
	24/35 not less than 24 kg/mm^2	35	20
Mild steel	28/45 28	45	18
	36/52 36	52	12
High strength steel	40/60 40	60	10

2- CEMENT

Storage: Cement is stored on site in a way efficiently protecting it from rain water and humidity in air and land.

Cement containing hardened particles or masses, impurities, or have been stored for more than 6 months, must not be used in concrete.

Storage of buckets is made in a regular way. Buckets are stacked in maximum of 10 buckets high in a way so as a reasonable spacing is left between each column of buckets to ease handling of buckets.

Test Specimen:

$\sqrt[3]{\text{number of specimens}}$, then a reasonable amount is taken from each bucket so the whole weight of the specimens is nearly 5 kg.

Inspection unit:

For buckets	20 ton
For unpacked cement	a specimen is taken from each batch

Tests of Cement:

- 1- Determination of setting time.
- 2- Fineness of cement
- 3- Soundness of cement
- 4- Compressive strength of cement mortar
- 5- Muffle of cement

Cement limits:

Cement	Initial setting	Final setting	Fineness cm^2 / gm	Soundness (mm)	Muffle of cement (%)	Compressive strength (kg / cm^2)
Ordinary Portland Cement (O.P.C)	Not less than 45 minutes	Not ore than 10 hours	2500	10	4	183 - 3 day 275 – 7 day 366 –28day
Rapid Hardening Cement (R.H.P.C)	Not less than 30 minutes	Not ore than 10 hours	3500	10	4	244 - 3 day 315 – 7 day 407 –28day
Sulfur Resisting Cement (S.R.P.C)	Not less than 45 minutes	Not ore than 10 hours	2800	10	4	183 - 3 day 275 – 7 day 366 –28day

3- AGGREGATE**Storage:**

- Fine and coarse aggregate must be stored in separate places.
- Aggregate is stored on clean and damp floor far from organic materials, impurities, and dusts.
- Storage is made as a pyramid shape less than 3m high. Storage is made on layers of height not exceeding 0.5 meter in a way preventing segregation.

Test specimen:

Test specimen is taken using the quadrilateral division method. In this method aggregate quantity is formed as a frustum of a cone. Then the upper surface of the aggregate cone is

divided into four equal divisions. Specimen is taken from each two opposite quarters successively until the required specimen is taken. The specimens required are as follows:

25 kg for coarse aggregate,
15 kg for fine aggregate.

Inspection unit: For each batch delivered

Tests of Aggregate:

- 1- Grading of aggregate,
- 2- Percentage of clays and fine impurities,
- 3- Percentage of absorption,
- 4- Chemical analysis.

Aggregate limits:

	Absorption (%)	Clays and impurities (Not more than %)	Chloride content (% by weight)
Sand	2	3	0.6
Coarse aggregate	1	1	0.4

The Egyptian Code of Practice ECC 203 limits the maximum aggregate size for gravel so as to comply with the following conditions:

- 1- Not exceeding $\frac{1}{5}$ the smaller dimension of the cross-section.
- 2- Not exceeding $\frac{3}{4}$ bar spacing.
- 3- Less than $\frac{1}{3}$ the slab thickness.

4- Mixing water

In case the water used in mixing or curing is not tap water, a specimen of 5 liters volume is taken for the following testing:

- a- Inorganic impurities,
- b- Chloride content,
- c- Sulfur content,
- d- Alkali carbon,
- e- PH value.

Salts content in mixing water must not exceed the following values:

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|-------------------------|------------------------|
| 1- Total salts | 2 gm/liter |
| 2- Chloride | $\frac{1}{4}$ gm/liter |
| 3- Sulfur | 0.3 gm/liter |
| 4- Carbon | 1 gm/liter |
| 5- Inorganic impurities | 3 gm/liter |
| 6- Organic materials | 0.2 gm/liter |