

Experiment No.

13

ACI

211

TITLE

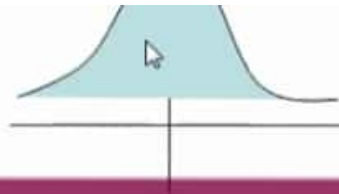
Concrete Mix Design



Design Data

Minimum Compr. Strength	200 Kg/cm ² at 28 days	Assumed for required work
Standard Deviation	20 Kg/cm ²	Assumed
S.G. of CA	2.68	Previous Experiment
Dry rodded density	1600 Kg/cm ²	Previous Experiment
G _{max}	25 mm	Previous Experiment
S.G. of FA	2.64	Previous Experiment
FM of FA	2.80	Previous Experiment
Slump	50 mm	Previous Experiment
Cement used	OPC	Assumed

CALCULATION



$$S_{av} = S_{min} + K\sigma$$

T-11.3

If **1%** result is allowed to fall below minimum $K = 2.33$

w/c ratio [regards to strength]

F-11.3

w/c ratio [regards to durability]

T-11.5

Minimum of above two

Based on **slump & G_{max}**

T-11.8

Water =

Entrapped air =

Cement = Water/w/c ratio

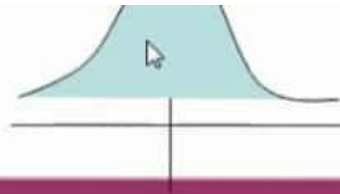
Based on **G_{max} & FM of FA**

T-11.4

Bulk volume of CA per unit volume =

Weight of CA = Dry rodded density x Bulk volume

CALCULATION



$$S_{av} = S_{min} + K\sigma$$

T-11.3

If **1%** result is allowed to fall below minimum $K =$

w/c ratio [regards to strength]

F-11.3

w/c ratio [regards to durability]

T-11.5

Minimum of above two slab

Based on **slump & G_{max}**

T-11.8

Water =

Entrapped air =

Cement = Water/w/c ratio

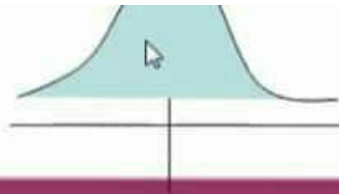
Based on **G_{max} & FM of FA**

T-11.4

Bulk volume of CA per unit volume =

Weight of CA = Dry rodded density x Bulk volume

CALCULATION



$$S_{av} = S_{min} + K\sigma$$

T-11.3

If **1%** result is allowed to fall below minimum $K = 1.65$

w/c ratio [regards to strength]

F-11.3

w/c ratio [regards to durability]

T-11.5

Minimum of above two slab

Based on **slump & G_{max}**

T-11.8

Water =

Entrapped air =

Cement = Water/w/c ratio

Based on **G_{max} & FM of FA**

T-11.4

Bulk volume of CA per unit volume =

Weight of CA = Dry rodded density x Bulk volume

CALCULATION

Volume except FA			
C	----kg	----x10 ³ /3.15	----cm ³
W	----kg	----x10 ³ /1	----cm ³
CA	----kg	----x10 ³ /s.g.	----cm ³
Air	----%	----x10 ⁶ /100	----cm ³
Total			----cm³
Volume of FA	100x100x100 - Total		----cm³
Weight of FA	---- x s.g./10³		----kg



CALCULATION

Let surface moisture of FA = 3%

<i>Free water contribution from FA</i>	$(3/100) \times \text{wt. of FA}$	----kg
<i>Actual Water</i>	<i>Weight of W – free water</i>	----kg
<i>Actual FA</i>	<i>Weight of FA + free water</i>	----kg

Final Batch

<i>Cement</i>	----kg
<i>Fine Aggregate</i>	----kg
<i>Coarse Aggregate</i>	----kg
<i>Water</i>	----kg
<i>Density</i>	----kg/m ³

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Making & Curing of test specimen

APPARATUS

- ❖ Cylindrical mold [C-31- 6" by 12"]
- ❖ Tamping rod
- ❖ Vibrator
- ❖ Small tools [shovel, trowel, straight edge, scoop, ruler, rubber glove, metal mixing bowl, mallet]
- ❖ Slump Apparatus
- ❖ Sampling & mixing pan
- ❖ Air content Apparatus
- ❖ Temperature measuring device
- ❖ Concrete mixer

APPARATUS



Cylindrical Mould



Tamping Rod



Vibrator



Shovel



Trowel



Scoop



Mallet



Air Content Apparatus



Concrete Mixer

PREPARATION OF MATERIALS

Temperature

Bring the concrete materials to room temperature 20°C to 30°C

Cement

Store in dry place, in moisture proof container. It shall be pass through a 850 μm (# 20) or finer sieve to remove all lumps, remixed on a plastic sheet and returned to sample container

Aggregate

Separate into individual size fractions and for each batch recombine in proper proportions to produce desired grading. Determine S.G. and Absorption of aggregates.

Aggregates may be brought to and maintained in a SSD condition.

Surface moisture must be determined

PROCEDURE

1. Mixing

Mix concrete of such size as to leave about 10% excess after molding the test specimens

- a) Add CA, disperse the admixture in mixing water, add some of the solution
- b) Start mixer
- c) Add cement, FA and water with mixer running
- d) Mix for 3 mins., after all the ingredients are in the mixer
- e) 3 mins. rest
- f) Again 2 mins. mixing
- g) Cover the top or open end to prevent evaporation
- h) Deposit mixed concrete in the clean, damp mixing pan and remix by shovel until it appears uniform



PROCEDURE

2. Checking

- a) Slump [C143]
- b) Air content [C173 or C231]
- c) Temperature [C1064]

PROCEDURE

3. Making specimens

- a) Mold the specimens as near as possible to the place where they are to be stored
- b) Place molds on rigid surface, free from vibration and disturbances
- c) Avoid striking, tilting
- d) Place the concrete in molds using scoop or shovel with symmetrical distribution ● ● ● ●

PROCEDURE

4. Consolidation

- a) It is done by rodding or external/internal vibration based on slump
- b) Place concrete in **3** layers
- c) Rod each layer **25** times
- d) Distribute the strokes uniformly over the cross section
- e) For each upper layer allow the rod to penetrate the layer being rodded approximately **1"**
- f) Tap the outsides of the molds lightly **10** to **15** times with mallet [to close the holes left and to release large air bubbles that may have been trapped]



PROCEDURE

5. Finishing

- a) Strike off the surface of concrete and trowel it
- b) No depressions or projections larger than **3** mm are allowed

