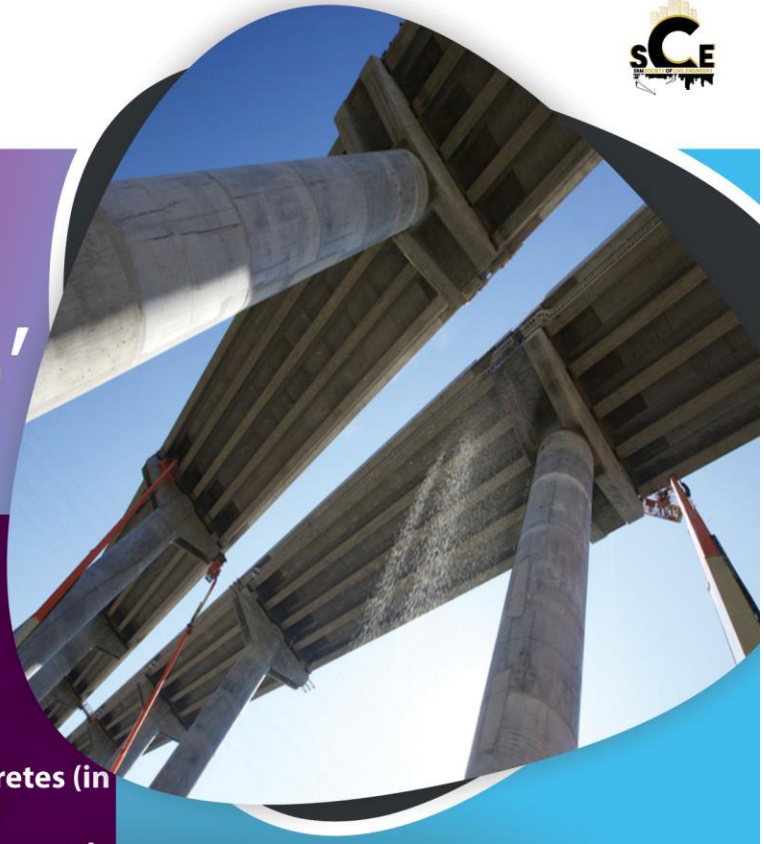
SRM SOCIETY OF CIVIL ENGINEERS
IN ASSOCIATION WITH
INDIAN CONCRETE INSTITUTE PRESENTS

CONCRETUS 20'

NATIONAL LEVEL TECHNICAL FEST



AITCIN

Competition Domain: **Concrete Technology**

HIGH PERFORMANCE CONCRETE

Abstract: **The definition of high strength concretes (in other words high performance concrete) is continually developing. In the 1950s a cube strength of 35MPa was considered high strength, and in the 1960s compressive strengths of up to 50MPa were being used commercially. More recently, compressive strengths approaching 140MPa have been used in cast-in-place buildings. This special concrete when used in the lower storeys of multistoreyed buildings the columns can be made slimmer than regular strength concrete columns, which allows for more usable space. The handling and placing properties of this type of concrete mixes can be improved considerably by the use of cement replacement materials such as fly ash, silicafumes, GGBS etc. Furthermore, the use of admixtures such as water reducers and superplasticisers has beneficial effects on workability without compromising other concrete properties. The workability of fresh concrete should be suitable for each specific application to ensure that the operations of handling, placing and compaction can be undertaken efficiently.**

THE OUTPUT

- Enable students to put their techinical skills and creativity in producing a good quality high performance concrete.
- Create awareness on the versatility of possiblity of producing a workable concrete.

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AITCIN - HIGH PERFORMANCE CONCRETE

INTRODUCTION

The definition of high strength concretes (in other words high performance concrete) is continually developing. In the 1950s a cube strength of 35MPa was considered high strength, and in the 1960s compressive strengths of up to 50MPa were being used commercially. More recently, compressive strengths approaching 140MPa have been used in cast-in-place buildings. This special concrete when used in the lower storeys of multistoreyed buildings the columns can be made slimmer than regular strength concrete columns, which allows for more usable space. The handling and placing properties of this type of concrete mixes can be improved considerably by the use of cement replacement materials such as fly ash, silicafume, GGBS etc. Furthermore, the use of admixtures such as water reducers and superplasticisers has beneficial effects on workability without compromising other concrete properties. The workability of fresh concrete should be suitable for each specific application to ensure that the operations of handling, placing and compaction can be undertaken efficiently.

The aims and objectives behind this competition are to:

- Encourage students to put their creativity and technical skills in producing a good quality high performance concrete to achieve a target compressive strength of 50 -60 MPa.
- Create awareness on the versatility of possibility of producing a workable concrete with a slump of 150 – 175 mm;

As budding civil engineers, now it is the right time and SRM IST "CONCRETUS'20" is the best platform to innovate this aspect of civil engineering.

CHALLENGE

Prepare three cubes of Geopolymer Concrete of dimension 150x150x150 mm having compressive strength between 50 to 60 MPa (N/mm^2). The density (Surface dry) of the cubes should not exceed 2500 kg/m^3. The materials to be used in the concrete are

- Binder Content (Cement partially replaced by any one or two materials such fly ash, GGBS, Silica fume, Rice husk or metakaoline)
- M sand or river sand
- Coarse Aggregate (10 – 12.5mm)
- Suitable Chemical Admixtures

  Any other materials such as steel fibres, metallic aggregate, reinforcement is strictly prohibited to be used in concrete. If any these materials found then the team will be disqualified.

Before testing, the average compressive strength of the three cubes have to be predicted by the participating team one week prior to the competition date and send it through the google forms which will be mailed to you on a later date.

TESTING CRITERIA

- The cubes will first be tested for density. The mass will be measured using a sensitive weighing balance. The volume will be calculated by measuring the sides of the cube manually using Vernier calipers. From the obtained data, density will be calculated.
- Compressive strength will be measured using compression testing machine (CTM),
- The rate of loading will be 140 kg/cm^2 per minute

MARKING SCHEME

Predicted average compressive strength by the participating team =W Compressive strength of three blocks/cubes after testing = A1, A2, A3 Average compressive strength after testing = f_{ck}

f_{ck} = (A1 + A2 + A3)/3

Score 1 = 100 – {[W-f_{ck}] x 200/W}

There will be deduction of score for deviation of compressive strength of each block from predicted value, which will be as follows:

1. If Value of compressive strength of cube, A > Predicted average compressive strength, W then {2 x [W-A]} will be deducted

2. If Value of compressive strength of cube, A < Predicted average compressive strength, P then {3 x [W-A]} will be deducted

3. All values will be rounded off to two decimal places

In case of a tie of final score, the participant having larger score 1 will be considered.

Example :

Suppose your predicted score, W = 55.00 N/mm^2

Compressive strength of cubes after testing : A1=54.00 N/mm^2; A2=53.50 N/mm^2;

A3 =57.00 N/mm^2

Average compressive strength, X = (54.00 + 53.50 + 57.00)/3 = 54.83 Score 1 = 100 – {[55.00-54.83] x 200/55.00} = 99.38

Deducted scores : A1 < W, So 3 x [54.00-55.00]=3.0; A2 < W So 3 x [53.50-55.00]=4.50;

A3 > W So 2[57.00-55.00] = 4.00

Deducted score = 3.00 + 4.50 +4.00 = 11.50

Final score = Score 1 - deducted score = 99.38 - 11.50 = 87.88

RULES

- Student should form teams comprising of maximum 3 to 4 members.
- The measurement of workability should be performed using a slump cone test. The video of the slump cone measurement should be submitted to the judges at the time of the competition.
- 3 cubes of size 150 x 150 x 150 mm with a tolerance of 5mm have to be submitted. Anything more than 5 mm will lead to direct disqualification. Then density should not exceed for 2500 kg/m^3.
- You can use of M. Sand, 10 – 12.5 mm aggregates only; use other than leads to direct disqualification.
- No restriction on use type of Chemical admixtures.
- Reinforcement of any type is strictly prohibited. If found, will lead to direct disqualification.
- No metallic aggregate should be used. If found, will lead to direct disqualification.
- Water Curing should be performed under ambient room temperature.
- There is no bar on how many days prior to competition the cubes are cast.
- No paint should be added or used; it will lead to direct disqualification.
- No certificate will be provided to disqualified teams.

REPORT (5 POINTS)

A report, which carries 5 points, has to be submitted along with the cubes which should

Include the following:

- Technical mix design report which includes material specifications, casting and curing procedure. Students can modify the table 1 appropriately as per the materials used in the mix.
- Photograph of the materials before mixing
- The date of casting the cubes
- The following table on a separate A4 Sheet

Table No 1 Mix Proportions:

S.No	Description	Requirement
Cement (kg/m^3)		
GGBS (kg/m^3)		
Fly ash (kg/m^3)		
Silica fume (kg/m^3)		
M Sand (kg/m^3)		
Coarse aggregate (kg/m^3)		
Superplasticisers (kg/m^3)		

Table No:2 Compressive Strength Details (f_{ck})

Specimen Number	Age of Concrete (No of Days)	Size of Specimens (mm)	Weight of Specimen (kg)	Density of specimen (kg/m^3)	Load (kN)	Compressive Strength (N/mm^2)
1						
2						
3						

- Report should be duly signed by a Professor, who is a registered faculty member of your institution/Engineering college.
- Report should not exceed 5 sides of an A4 sheet
- Report will be judged by SRM IST Team
- The decision of SRM IST team will be final
- Teams which don't submit the report will be disqualified.