

## RULES AND REGULATIONS

### 1.0 GENERAL RULES AND ELIGIBILITY REQUIREMENTS

- i. A team of participant may register up to maximum of **FOUR** members. Only maximum of **4 groups** from an institution/industry are allowed to register. Similar formulation is prohibited within the groups of the same institution/ industry.
- ii. Participants are required to come with their own moulds size **100mm x 100mm x 100mm** and other sizes are not allowed.
- iii. Cement and water will be provided. The participants are required to bring their own aggregates. The participants are also allowed to include additive/(s) in concrete mix but its content need to be revealed. However, polymer modified cementitious binder and chloride based accelerators are prohibited.
- iv. The maximum cementitious content plus any supplementary cementitious materials allowed to be used is only up to **450 kg/m<sup>3</sup>**. Participants are **not allowed** to bring their own of Portlands cement (all types).
- v. Participants are required to mix the concrete **MANUALLY** in the Concrete Laboratory at the Faculty of Civil Engineering, UiTM and test the cubes at the day/time specified by the organiser. The flowability must achieve **minimum 500 mm diameter** of flow. Those not achieving the minimum flow will be disqualified for the cube testing. The flowability of the fresh state of the concrete mix will be tested using inverted “**slump cone**” which the method will be specified by the organiser and not necessarily subject to any of the relevant standard of the flowability test for fresh concrete. The cubes will be tested after **24 hours** of casting.
- vi. Participants are required to prepare **A1 SIZE POSTER** and **POWERPOINT PRESENTATION** displaying materials used and mix formulation designed. Judging for Presentation Category will be based on design and content of poster, presentation and communication skill, Q & A discussion and sustainability in materials selection. Participants are required to bring their own tools to mix and demould the specimens.
- vii. Participants are required to **prepare three (3) cubes** but only the best **TWO (2)** cubes will be tested. Air curing method is only allowed. Other means of curing such as autoclaving, high temperature and boiling are not allowed.
- viii. The participants are given **30 minutes** to weigh, mix and cast the specimens. The participants are also required to clean the place, floor and tools within the time given.
- ix. Entries not complying with the rules and regulations of the competition will be disqualified.
- x. **DECISIONS BY THE JUDGES ARE FINAL.**

**RULES AND REGULATIONS****2.0 HIGHEST FLOW AND HIGHEST EARLY STRENGTH CONCRETE CUBE**

Highest Flow concrete is referred to concrete which has highest flowability without segregation. Highest early strength concrete cube referred in this competition is a concrete cubes that have the highest compressive strength after 24 hours or less of casting. Concrete is reported to have a compressive strength values at least after 12 hours of casting. International Highest Early Strength of Self-Consolidating Concrete Cube Competition (i- HESSCCC 2018) is a competition organised by ACI-Malaysia Chapter in collaboration with Institute for Infrastructure Engineering and Sustainable Management (IIESM), Concrete Society of Malaysia (CSM) and Universiti Teknologi MARA (UiTM) with focus to create an opportunity of concrete community to acquire and perform their concrete mixing skill to produce the most optimum concrete mix design and technique in achieving the highest early strength concrete cube.

**2.1 Materials**

- All team may come with their own concrete mix design and formulation.
- The main materials used must be based on the principle of concrete.
- Cement and water will be provided by the organiser. Aggregates (fine and coarse) are not provided by the organiser. The participants have to bring their own aggregates.
- All groups are only allowed to take maximum 3 kg of Portland cement to produce six (6) Liter of concrete for 3 cubes inclusive wastage and flowability test.
- No limit of weight on aggregates and water required.
- There is no restriction on the type of aggregates used.
- All reinforcement type and system are not allowed. This includes all types of fibres.
- The participants are also allowed to include additive/(s) in concrete mix but its content need to be revealed. However, polymer modified cementitious binder and chloride based accelerators are prohibited.
- The maximum cementitious content allowed to be used is only up to **450 kg/m<sup>3</sup>**.
- Additive is allowed in this competition. However, polymer modified cementitious materials are not allowed.
- All participants may bring their own additive/(s) and use in their concrete mix.
- Additive/(s) allowed use in the concrete mix can be one or combination of materials stated below:
  - a) Innovative cementitious materials
  - b) Commercialised cementitious materials
  - c) Supplementary cementitious materials
  - d) Industrial waste as cementitious materials
  - e) Innovative aggregate
  - f) Industrial waste as aggregates
  - g) Plasticiser or superplasticiser
  - h) Innovative materials

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- Any type of fibres, chloride based accelerators and geo-polymer based materials are prohibited in this competition. The utilisation of any type or component of the materials mentioned above by any team may make the team being disqualified.
- Examples of cementitious materials:
  - a) Rice husk ash
  - b) Silica fume/micronized silica fume
  - c) Slag d) Metakaolin
  - e) Quartz powder

and other pozzalana materials that the total content of chemical composition of  $\text{CaO} + \text{SiO} + \text{Al}_2\text{O}_3$  are or more than ( $\geq$ ) 65%.

**It is reiterated that the content of the above cementitious materials inclusive of Portland Cement (provided by the organiser) must not more than  $450 \text{ kg/m}^3$ .**

### 2.2 Concrete mixing and curing

- All groups will be provided with the following :
  - a) Cement (3 kg maximum) and water
  - b) One set of weighing container
  - c) One set of washing tools
- All groups will be given **30 minutes** to conduct their **concrete mixes process**.
- No extra time will be given.
- At each session or batch seven (7) groups will conduct the mixing process **MANUALLY** at the same time. Only man-powered mixing tools are only allowed.
- All groups will be monitored by the Head of Batch. Each batch consists of seven (7) groups.
- **All teams/participants are required to bring their own tools for mixing and only MAN-POWERED mixing tools are allowed.**
- **Concrete mixing process** include :
  - a) Weighing materials
  - b) Preparing moulds
  - c) Slump cone
  - d) Concrete mixing
  - e) Casting
  - f) Compacting (manual)
  - g) Finishing (manual)
  - h) Curing (normal/air)
  - i) Cleaning

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The Head of Batch will record the time for each group complete the mixing.

- Any group that is found fail to comply the time allocated will be disqualified from the competition.
- Each group is only allowed to mix the concrete once. No trial mixes and repeating of concrete mixes is allowed.
- Only manual compaction using tamping rod is allowed.
- A time of 24 hours will be counted from the concrete mixing process start.
- Only air curing will be conducted for all the concrete after casting. Other means of curing such as water-spraying, immersing in water, auto-claving, pressurising, boiling etc are not allowed. Curing shall be done by covering the top of the moulded specimens with plastic sheet provided by the organiser.

### 2.3 Highest Flow and Highest Strength Cube

- Highest flow will be determined through measurement of flow using “inverted slump cone” method as specified by the organiser. The diameters of slump flow will be measured.
- The highest flow obtained will get 40% marks and set as reference in a calculation out of total 40% marks. The formula is :

$$\frac{\text{Slump flow of the participant}}{\text{The highest flow obtained}} \times 40\%$$

- Highest concrete cube strength will be determined through compressive cube test using compression machine at Concrete Laboratory Faculty of Civil Engineering, Universiti Teknologi MARA (UiTM).
- The concrete cubes for the group that finished the mixing first will be tested first.
- Mean value of strength from the two (2) identical concrete cubes prepared by the participants will determine the highest compressive cube strength.
- The highest compressive strength obtained will get 60% marks and set as reference in a calculation out of total 60% marks. The formula is :

$$\frac{\text{Cube strength of the participant}}{\text{The highest cube strength obtained}} \times 60\%$$

- The total marks = slump flow results + cube strength results
- If in case, there are more than one group, their slump flow and compressive strength are in equal value, the standard deviation of the results and the density of the specimens will become criteria to determine the winner. The density of the cube specimens cannot exceed 2,500 kg/m<sup>3</sup>. The participants with the cube density more than 2,500 kg/m<sup>3</sup> will be disqualified.

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### **3.0 PRESENTATION**

- Each group is required to prepare **A1 SIZE POSTER** and **POWERPOINT PRESENTATION** displaying materials used and mix formulation designed.
- Oral presentation by the members of the group is required.
- Minimum five (5) judges were appointed by the organiser to judge the presentation for each group.
- 100% marks will be given based on creativity of design and content of poster, presentation and communication skill, Q& A discussion and sustainability in materials selection.
- Marks given by judges are final. Any objection on marks given will not be entertained.

### **4.0 DETERMINATION OF WINNER**

- The winner of **highest early strength of self-consolidating concrete cube** competition will be determined based on the highest marks obtained from a sum of average strength cube results and decisions by the judges are final.
- The i-HESSCCC 2018 committee reserves the right to add, delete or amend any of the rules and regulations that it deems necessary such as rectification of ambiguity and also for clarity purposes.