Great Lakes Conference 2014

American Society of Civil Engineers
University of Illinois at Urbana-Champaign

Dear Great Lakes Student Chapter:

This is Mailer III of the Great Lakes Conference 2014. Please read the following information carefully as it contains pertinent information and rules about the competitions. This information may not be repeated in subsequent mailers, so do not delete this mailer.

Enclosed in this mailer:

- Environmental Rules
- Materials Competition Rules

For the surveying competition, teams are allowed to use textbooks for the calculations for the construction layout event. The names of the textbooks that teams plan on using must be emailed to and approved by the event coordinator.

If you have any questions about the conference, please direct them to asceglc2014@gmail.com. Frequently asked questions will also be posted to http://publish.illinois.edu/asceglc2014 along with other information such as mailers and schedules. In the last mailer, a detailed schedule with order of teams for most competitions will be provided.

We look forward to seeing you in the soon,

Mark Keller
ASCE Student Chapter President
GLC 2014 Chair

Great Lakes Conference 2014

American Society of Civil Engineers

University of Illinois at Urbana-Champaign

Environmental Engineering Competition Rules

Overview:

The 2010 Deepwater Horizon Oil Spill showed the catastrophic effects that a marine oil spill can have on its surroundings. It takes quick thinking and extensive knowledge by environmental engineers to mitigate the damages that these accidents have on marine ecosystems. This year's environmental engineering competition will simulate an oil spill and ask teams to develop their own system to remove and recover oil after these disasters.

Participants:

- Each school may enter only one team.
- Each crew may have as many members as they wish on their team.
- Each team member must be a registered participant of the 2014 ASCE Great Lakes Student Conference.

Event Description:

- Oil Spill Cleanup: Teams will test their system on a given volume of water and attempt to maximize the recovery and purity of spilled oil in the given amount of time.
- Presentation: Teams will present their oil cleanup systems and the results of their cleanup attempt to the judges.

Rules:

Oil Spill Cleanup

1. Teams may bring their own supplies with them, but all supplies (excluding a recovery container) must fit within a shoebox (7.5 in x 5.1 in x 14.4 in).
2. Teams will be given a tank of 4 L of freshwater mixed with 400 mL of canola oil.
3. Teams will be given 20 minutes to perform oil spill cleanup.
4. The tank must stay in contact with the table.
5. Electricity will be provided, but all electricity consumption will be monitored using a Kill-A-Watt electricity usage monitor.
6. Teams shall recover the oil from the tank into a recovery container (teams must supply their own recovery container to collect recovered oil). The recovery container is excluded from the shoebox size requirement.
7. At the end of the time, the recovery container will be emptied by judges to determine the final amount of oil recovered and relative purity of the oil (i.e., both the volume of oil recovered and the percentage of oil vs. water in the recovery container will be quantified).

Presentation

1. The presentation should be 5-7 minutes in length.
2. Teams should discuss the relevance of their system in relation to a large-scale marine oil spill, and the feasibility of scale-up.
3. Teams may present in any format they wish. Computers and projectors will be accessible for teams to use for the presentation.
4. Receipts of all materials purchased must be kept while discussing cost efficiency of the system. If you will be using materials that are already owned, estimate their current cost and include that in your presentation.
5. Results of oil spill cleanup and electricity consumption will be provided to teams before their presentation. Teams should discuss their result as a part of the presentation.

Scoring

70% Oil Spill Cleanup

- Points will be awarded for volume of oil recovered and purity of oil recovered. A small fraction of awarded points may be deducted based on electricity consumption.

30% Presentation

An exact breakdown of scoring will be sent with the next mailer.

Concrete Materials Competition
ASCE GLC Regional Competition 2014

This competition is presented in two parts. The first part is the development of a high strength concrete mix with few restrictions on the mix design elements. The second part is the development of a lightweight concrete cylinder through either the use of lightweight aggregates, foaming or cellularizing agents, or unique structural design.

1 High Strength Cylinder Competition

The high strength cylinder portion of the competition will be run using the following rules. Any entry that does not conform to the rules will be disqualified at the judge's discretion.

1.1 Design Specifications

The following design specifications will be examined either before or after testing, as appropriate:

- Cylinder must be nominally 6 inches by 12 inches. Any cylinder not meeting ASTM C39-12a will be rejected. This includes diameter deviations listed in §6.1 and perpendicularity listed in §6.2.
- Any cylinder not within 5.9 and 6.1 inches in diameter and 11.8 and 12.2 inches in height, inclusive of any capping compound used, will be disqualified.

- If cylinders are capped with sulfur or neat paste, they will be checked for compliance using ASTM C617-12. Any cylinder not meeting the specification will be disqualified.
- Weight of the cylinder must not exceed 34 pounds (15.4 kg). This weight includes any capping compound that may be present.
- Cylinder must follow the material specifications outlined in Section 1.2.
- A mixture design report must accompany cylinder following the formatting guidelines listed in Section 1.4.
- Cylinder will be tested in accordance with Section 1.3. If there is an equipment problem that prevents Section 1.3 from being followed, the test plan will be modified to allow for the test to be run and each entry will be tested with the new regime. If the equipment problem occurs during the competition, the judge will make a determination on how to continue while being fair to each entry.
- In all cases, the judge's ruling is final.

1.2 Material Specifications

1.2.1 Cement and Cementitious Materials

A minimum of 20%, by total cementitious weight, Portland cement, any type, must be used in the concrete mixture design. There is no maximum.

Any type of cement or cementitious material may be used in the competition. This includes common supplementary cemen-

titious materials such as fly ash, ground granulated blast furnace slag (GGBFS), and silica fume. Other, less commonly used, cementitious materials may be used such as metakaolin, vitrified calcium aluminosilicate, and rice husk ash. Special cements such as Type K cements are also allowed.

1.2.2 Aggregates

Most aggregates are acceptable for use in this competition. In general, aggregate apparent specific gravity, as determined by ASTM C127-12 or ASTM C128-12, cannot exceed 4.00. Metal and metal alloy aggregates are explicitly banned. Use of such aggregates will result in an immediate disqualification. Metal oxide aggregates, such as alumina and blast furnace slag, and mineral based aggregates, such as silicon carbide, are allowed provided they meet the aforementioned specific gravity requirement.

Any coating or chemical treatment applied to the aggregates must be accounted for in the mixture design report (see Table 3.1).

1.2.3 Admixtures

Any admixture(s) may be used in the concrete mixture. All admixtures shall be included in the mixture design report. Water from admixtures must be accounted for in the mix calculations (see Table 3.1). The manufacturer recommended dosage range of each admixture should also be reported in the report (see Table 3.1).

1.2.4 Epoxy and Other Confining Reinforcements

The cylinder surface must be concrete only. No epoxy, fiberglass resin, or other coating material may be applied to the surface with exception of sulfur or neat paste compound at the ends to provide a planar surface. Discrete wires, threads, or meshes are also forbidden on the surface of the cylinder.

1.2.5 Fibers and Other Reinforcing Materials

Fibers and other reinforcing materials are allowed in the concrete mixture. Per Subsection 1.2.2, metal fibers, metal rebar, and metal meshes are not allowed. The polymer or ceramic equivalents are allowed.

1.2.6 Specimen Preparation

The specimen must be made in accordance with ASTM C192-13 §7.3, ASTM C1176-08, or ASTM C1435-08. Any attempts to create a "structure" will result in the immediate disqualification of the entry.

The specimen may be cured in any manner but must be indicated on the design report (see Table 3.1). In addition, the specimen must be at room temperature when tested. Excessively cold or hot specimens will be disqualified. Specimens may be wet, with water, during testing.

1.3 Testing Regime

The testing regime will follow ASTM C39-12a. Team's will place their entry into the test machine and position it as they wish.

An initial seating load that consists of the platen weight will first be applied to the specimen. Once the hydraulic system activates, loading will be smoothly applied until failure. The failure will be defined as the point when the load drops more than 20%. Improper capping or grinding can lead to premature failure. It is each team's responsibility to ensure the capping or grinding is done properly.

Each cylinder must be at room temperature at the start of testing.

1.4 Design Report

The design report consists of a single mixture design table (Table 3.1). This table is heavily influenced by the concrete canoe mixture design table released by ASCE. It is advised that someone from the concrete canoe team look over the calculations to ensure accuracy. A 20% deduction will be applied if the design report is not completed properly. This will be at the discretion of the judge.

1.4.1 Density Measurement

There are several ways to measure density of fresh and hardened concrete. Depending on the amount of concrete mixed, one method may be easier than another. The density must be

measured with one of the standards below and indicated in the design report (see Table 3.1):

- ASTM C138-13
- ASTM C567-11
- ASTM C642-13
- ASTM C1040-08
- ASTM C1170-08

1.5 Scoring

The specimen score will be derived purely from the applied load, in lb_f, on the specimen. There will not be any normalization of the score due to specimen weight. The design paper is required but does not contribute positively to the team's score. However, failure to submit a design report, or submitting a design report with errors, will cause the specimen's score to decrease by 20%.

2 Lightweight Concrete Cylinder Competition

The lightweight concrete cylinder competition is more flexible in terms of rules. In general, a 6 inch by 12 inch cylinder, weighing no more than 23 pounds (10.4 kg), will be tested for compressive strength.

2.1 Material Specifications

The lightweight concrete cylinder competition will follow all of the rules contained within §1.2. The notable exception is that §1.2.6 is superseded by §2.1.1 below.

2.1.1 Specimen Preparation

The specimen may be prepared in any fashion including integration of a "structure". The specimen must still meet the dimensional specifications of §1.1.

The specimen may be cured in any manner but must be indicated on the design report (see Table 3.1). In addition, the specimen must be at room temperature when tested. Excessively cold or hot specimens will be disqualified. Specimens may be wet, with water, during testing.

2.2 Testing Procedure

The testing regime will follow ASTM C39-12a. Team's will place their entry into the test machine and position it as they wish.

An initial seating load that consists of the platen weight will first be applied to the specimen. Once the hydraulic system activates, loading will be smoothly applied until failure. The failure will be defined as the point when the load drops more than 20%. Improper capping or grinding can lead to premature failure. It is each team's responsibility to ensure the capping or grinding is done properly.

Each cylinder must be at room temperature at the start of testing.

2.3 Design Report

The design report consists of a single mixture design table (Table 3.1). This table is heavily influenced by the concrete canoe mixture design table released by ASCE. It is advised that someone from the concrete canoe team look over the calculations to ensure accuracy. A 20% deduction will be applied if the design report is not completed properly. This will be at the discretion of the judge.

2.3.1 Density Measurement

There are several ways to measure density of fresh and hardened concrete. Depending on the amount of concrete mixed, one method may be easier than another. The density must be measured with one of the standards below and indicated in the design report (see Table 3.1):

- ASTM C138-13
- ASTM C567-11
- ASTM C642-13
- ASTM C1040-08
- ASTM C1170-08

2.4 Scoring

The specimen score will be based on a normalized score that will be calculated using Eqn. 1 where P is the applied load, in lb_f, and W is the weight of the specimen, in lb. The design paper is required but does not positively contribute to your score. However, failure to submit a design report, or submitting a design report with errors, will cause the specimen's score to decrease by 20%.

$$\text{Score} = \frac{P}{W} \tag{1}$$