

# 2024 American Society of Civil Engineers® Concrete Canoe Competition™

## REQUEST FOR PROPOSALS



**Date:** September 5, 2023  
**To:** ASCE Student Chapters and Concrete Canoe Teams  
**Subject:** Request for Proposal – 2023-2024 Concrete Canoe

1801 Alexander Bell Drive Reston, VA 20191-4382  
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(866) 902.6249 fax ■ www.ASCE.org

Dear ASCE Student Chapters and Concrete Canoe Teams:

The Concrete Canoe Competition Committee (C4) is excited to release the Request for Proposals (RFP) for the 2023-2024 competition and welcome all ASCE chapters to submit a proposal for selection as the best Concrete Canoe at the ASCE Civil Engineering Student Championships.

Each year, the committee gathers to determine ways to improve and refresh rules for the upcoming competition season. Changes are based on qualities, ideas, or lessons we want the competition to envelop. We call these pillars. This year, the committee chose three pillars -- clarity, simplicity, and fun -- and made the following modifications:

#### **General**

- Introduced contextual comments throughout the rules.

**Contextual Comment:** *If you have ever read the rules and wondered, “What on earth are they thinking,” or “Why would that possibly apply,” or “Who in the real world does any of this,” we hope these comments provide answers. We want to communicate why we do what we do so that you and your teams can produce the best of what you do.*

#### **Proposal**

- Removed the executive summary and introduced the infographic in its place
- Modified the format to include elements of marketing, research, and development, and technical report
- Requested production costs to focus teams on what is most valuable by maximizing how your time is spent (Think: time is money. Can some of the thousands of hours hand sanding be used in a more valuable way?)
- Reduced the total page count from 23 to 18 to aid students in explaining simply and effectively.

#### **Mixture Design**

- Removed the appendix for mix design tables and introduced an excel file deliverable in its place
- Removed mix gradation requirements
- Increased hydraulic cement to 50% and included hydrated lime in the hydraulic cement calculations.

#### **Prototype**

- Removed all dimensional requirements for the prototype’s length, width, and depth.

The above does not capture all of the modifications, and all teams should read **this year’s** RFP in its **entirety**. We hope these rules lead to a safe, educational, and fun experience participating in the competition!

Lastly, to everyone participating, good luck! We look forward to the creative, innovative ideas your teams develop and implement and wish you all the best as you begin this competition season. See you in Provo, UT!

Sincerely,

### **COMMITTEE ON CONCRETE CANOE COMPETITIONS**



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Co-Chair, Committee on Concrete Canoe Competitions



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## INTRODUCTION

Since the early 1970s, ASCE student chapters have been constructing and racing concrete canoes. During that time, canoe designs and mixes have varied, but the long-established tradition of teamwork, camaraderie, and spirited competition has been constant. Teams, their associates, judges, and all other participants are expected to maintain and build upon this tradition.

The objectives of the Concrete Canoe Competition are as follows:

- Providing civil engineering students an opportunity to gain hands-on, practical experience and leadership skills by working with concrete mix designs and project management.
- Building awareness of the versatility and durability of concrete as a construction material among civil engineering students, educators, practitioners, and the general public.
- Creating awareness of concrete technology and application among civil engineering students, educators, practitioners, and the general concrete industry.
- Generating and increasing awareness of ASCE's and national sponsors' commitment to civil engineering education among civil engineering students, educators, practitioners, and the general public.
- Increasing awareness of civil engineering as a dynamic and innovative profession essential to society among industry leaders, opinion makers, and the general public.
- Increasing awareness of the value and benefits of ASCE membership among civil engineering students, professionals, and faculty to foster lifelong membership and participation in the Society.

While the intent of the competition is to learn and build technical and social experience, students are a short step from being practicing engineers involved in projects critical to society's welfare.

Ethics, professionalism, civility, and respect are the cornerstone of every successful competition, and ASCE expects professional conduct from all participants. ASCE enforces high standards to preserve the quality of this competition and improve the quality of future competitions.

The Concrete Canoe Competition rules are © 2024 ASCE. Permission is granted to copy, distribute, or otherwise use the rules for any noncommercial purpose as long as proper credit is given to ASCE as the source of these rules.

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)



The American Society of Civil Engineers (ASCE) is the oldest national engineering society in the United States. Founded in 1852 with 12 members, the Society was created to disseminate information among engineers building a young nation's roads, canals, bridges, and railroads.

Today, ASCE is a global organization with more than 150,000 members, including international members residing in 177 countries outside the United States. Individual professional engineers rather than companies or organizations hold membership. The members are organized geographically into ten regions, 94 sections, 160 branches, 122 Younger Member Groups, and 422 student chapters. Student Chapters sponsor meetings, educational outreach, symposia, student competitions, social events, and other activities to help future engineers better prepare for their careers. Numerous scholarships and awards are made available for deserving students of civil engineering, and a variety of Society-wide finals competition opportunities are held so students have a platform to compete with other students from around the world.

A Board of Direction governs the Society. The Board, which includes ASCE officers and representatives elected by the membership, establishes all policies for the organization. A staff of 250 implements the policies; most staff work at ASCE International Headquarters in Reston, Virginia.

For more information, visit <http://www.asce.org>.

## R. JOHN CRAIG MEMORIAL AWARD

The concept of a society-wide competition has existed for many years. In the mid-1980s, Dr. R. John Craig, a professor at the New Jersey Institute of Technology and member of the ASCE Committee on Student Services (CSS), and other members of CSS began to formulate plans for more uniform regional competitions. They formalized a plan to study the feasibility of a national competition with finalists from each region.

In the spring of 1985, Dr. Craig first brought his grand vision of the National Concrete Canoe Competition™ to ASCE. He was instrumental in bringing delegates from all over the country to meet one auspicious day in New York City at the ASCE National Headquarters executive conference. During this meeting, the feasibility of conducting a national competition was discussed, preliminary rules were prepared, and a formal recommendation to proceed was drafted.

In the fall of 1985, the preliminary rules were presented to the Committee on Student Services (CSS). During the next year, discussions regarding sponsorship were conducted with Master Builders, Inc. and ASCE Headquarters. After almost two years of committee debate, while meeting at the fall 1987 ASCE National Convention, the Educational Activities Committee (EdAC) adopted the preliminary rules. It established a standing task committee to implement the rules and requirements.

In the winter of 1987, just as the first National Competition was in sight, Dr. Craig was diagnosed with a rare inoperable brain tumor. He passed away just two months before his dream came to fruition. In June of 1988, the first National Concrete Canoe Competition™ was held in East Lansing, Michigan, hosted by Michigan State University.

In the spring of 1989, CSS approved the formation of a permanent subcommittee to ensure the continuation of the National Concrete Canoe Competition™. Through the efforts and dedication of individuals like Dr. R. John Craig, the National Concrete Canoe Competition™ has become a perennial favorite event for tens of thousands of students.

In that spirit, ASCE has dedicated the Coed Sprint Race as a memorial to the teamwork and dedication of Dr. R. John Craig. It is our distinct honor to present the *R. John Craig Memorial Award* to the school that best exemplifies the spirit and cooperative ideals of the Competition by placing first in the Coed Sprint Race each year.

## 1.0 REQUEST FOR PROPOSAL

### 1.1 Problem Statement

The Committee on Concrete Canoe Competitions (C4), a subcommittee of the American Society of Civil Engineers (ASCE), is considering manufacturing 100 concrete canoes to support regional lake and river transportation across the US. As such, C4 is soliciting pre-qualified ASCE student chapters, hereinafter referred to as “Teams,” to respond to this Request for Proposals (RFP) with their complete submission, which will require each team to:

- Construct a prototype canoe and product display that educates the committee, judges, and the public user about the canoe’s design, materials chosen, fabrication process, and durability to withstand use in America’s waterways.
- Deliver a technical presentation to address questions about their team, design, process, and materials chosen.
- Prepare a project proposal detailing the technical aspect of their submission and the value it brings the client, C4, and ultimately the consumer.
- Participate in a series of race demonstrations consisting of 200- and 400-meter sprints with 180-degree hairpin turns and a 200-meter slalom course to prove performance.

For the purposes of each teams’ submission, C4 values the canoe's innovative design and fabrication approaches, high-quality aesthetics, and paddling performance (maneuverability and speed) more than the proposed production costs. However, teams should make efforts to reduce costs where feasible and appropriate. The teams should also strive to present realistic estimates of proposed production costs to ensure C4 can request appropriate financial resources to produce the canoes.

Teams are expected to conduct research, perform design analysis, and procure & test construction and canoe materials.

To ensure objectivity, C4 has hired judges to evaluate which team’s design and construction process should be awarded the production contract.

Teams will be expected to attend a regional student symposium to complete an initial evaluation. ASCE will invite the most qualified regional team to the ASCE Civil Engineering Student Championships held at Brigham Young University in June 2024, where a second panel of judges will evaluate and award the winning team.

C4 encourages engaging with local ASCE professional chapters to promote impactful contributions to developing project deliverables. ASCE and the C4 are committed to assisting teams in facilitating these engagements and developing the necessary contacts.

**Contextual Comment:** *Including proposed costs for 100 canoes is not meant to drive teams toward the lowest-cost solution. Innovation and creativity within the design space are valued significantly more than achieving the lowest cost, which is subject to several variables outside each team's control and likely different for each team as well. C4 highly values **realistic** cost estimates as part of their proposals regardless of the total. Local ASCE professional chapters are a great source of information on how cost realism is included in proposals in the industry.*

## 1.2 Request for Qualifications (RFQ) Pre-Qualification Form & Letter of Intent

Interested teams shall complete the Pre-Qualification Form (see *Exhibit 4*), including signatures from at least one (1) team captain and the ASCE Student Chapter Faculty Advisor. A brief Letter of Intent shall be the cover letter for the Pre-Qualification form. See **Section 4.2.1** for submittal requirements.

**Contextual Comment:** *In many instances, for real-world projects, before working on and submitting a proposal, the project owner will solicit interested companies to respond to a Request for Qualifications (RFQ). This helps the Owner determine which companies are interested in the project, their experience/qualifications, and whether they meet the other requirements outlined.*

## 1.3 Request for Proposal (RFP) Documents

The following documents, as part of this RFP will be provided to teams:

Request for Proposal – Release September 5, 2023  
Mix Design Template (MS Excel) - Release September 5, 2023  
Fee Schedule Template (MS Excel) - Release September 5, 2023  
Request for Information Summary – Release Early February 2024

If there are any major clarifications needed, RFP addendums may be released. Release announcements would take place on the C4 Facebook page at <https://www.facebook.com/ASCENCCC>, as well as the ASCE Concrete Canoe website at <https://www.asce.org/communities/student-members/conferences/rules>

## 1.4 Request for Information (RFI)

*Requests for Information* (RFI) are to be directed via e-mail to [concretecanoe@asce.org](mailto:concretecanoe@asce.org). Official responses will be posted to the C4 Facebook page . RFI responses from previous years do not carry over. **The cut-off date for submitting an RFI is Monday, January 29, 2024.**

– End of Section –



## 2.0 WEBINARS

The C4 will host live webinars during the academic year to engage and communicate with the teams and prepare them for success. Participation in these webinars is not mandatory but highly encouraged. Registration information will be posted on the ASCE Concrete Canoe Competition Facebook Page. The table below summarizes the planned events. Interested teams should check the C4 Facebook page (<https://www.facebook.com/ASCENCCC>) for upcoming details.

Live Webinar	Planned Date
Competition Kick-off	September 25, 2023
Concrete Mix Design Calculations	October 12, 2023
Structural Calculations	November 14, 2023
Infographic Development and Design	mid-December
Materials Notebook	mid-January

### 2.1 Previously Recorded Webinars

The C4 has hosted additional webinars in previous years and the content is still valid. The list of previously hosted webinars is below, with associated links for viewing.

Previously Recorded Webinar	Link
Proposal Format How-To	<a href="https://players.brightcove.net/75114961001/SFtvStcMPG_default/index.html?videoId=6315676301112">Concrete Canoe Proposal Writing Webinar</a> ( <a href="https://players.brightcove.net/75114961001/SFtvStcMPG_default/index.html?videoId=6315676301112">https://players.brightcove.net/75114961001/SFtvStcMPG_default/index.html?videoId=6315676301112</a> )
How to Give a Presentation	<a href="https://players.brightcove.net/75114961001/SFtvStcMPG_default/index.html?videoId=6321489682112">Presentations 101 The Art of Persuasion</a> ( <a href="https://players.brightcove.net/75114961001/SFtvStcMPG_default/index.html?videoId=6321489682112">https://players.brightcove.net/75114961001/SFtvStcMPG_default/index.html?videoId=6321489682112</a> )

– End of Section –

## 3.0 ELIGIBILITY

It is expected that teams will foster an inclusive culture and treat everyone with dignity and respect.

### 3.1 Registered Participants

A team may register up to a maximum of ten (10) participants. The requirements set herein strive for gender diversity by making the team composed of no more than five (5) participants that identify with pronouns she/her/hers and no more than five (5) participants that identify with pronouns he/him/his. Participants that identify as they/them/their or do not distinctly identify with she/her/hers or he/him/his are eligible to compete in all aspects of the competition but need to choose to participate either in the men's or women's races and must maintain that choice throughout the Symposium or Society-wide Competition.

No other team, judge, host, etc., shall dispute or appeal a participant's gender identity or their selection to compete in either men's or women's races.

Only registered participants are eligible to present on behalf of their team at the Technical Presentation, participate in races and/or any other activities. Substitutions are allowed up to the time of on-site registration. No substitutions shall be permitted afterward, except in the case of extenuating circumstances. Each team shall designate two (2) registered participants as team captains.

Registered participants shall meet the requirements outlined in Exhibit 3

**Contextual Comment:** *Substitutions after on-site registration are possible for extenuating circumstances outside of a team's control for example, illness, injury, etc. at the judges' discretion. Note: C4 strongly encourages students not to paddle if they have an injury and strongly encourages judges to find fair solutions for all participating teams in these scenarios.*

### 3.2 Levels of Competition and Student Chapter Eligibility

There are two levels of competition: ASCE Student Symposia and the Society-wide Final Competition. The Society-wide Final Competition will be conducted at the 2024 ASCE Civil Engineering Student Championships in conjunction with other Society-wide competition finals in June 2024 at Brigham Young University.

Teams may be invited to the Society-wide Final Competition by placing as the top qualified team at one of the twenty-one (21) ASCE Student Symposia Concrete Canoe Competitions, or as the host school of the Society-wide Final Competition.

All qualifying teams must represent an ASCE Student Chapter and shall meet the requirements outlined in Exhibit 3 – Student Chapter and Participant Eligibility. Teams should feel free to email the C4 with any additional questions or clarifications on eligibility.

At the end of each student symposium, ASCE will verify competition scores and the eligibility of each participating student chapter. Teams will not be invited to the Society-wide Final Competition until eligibility is confirmed.

– End of Section –

## 4.0 SUBMISSION REQUIREMENTS AND DEADLINES

### 4.1 Conference/Team Folders

ASCE uses a submission platform called *Cerberus Web Client*. All digital competition deliverables must be submitted on this platform. Submissions outside of this platform will be considered non-responsive and will not be considered.

The main folder (link provided below) contains a sub-folder for each Student Symposium, and within each Symposium Folder is a folder for each school. Please note that these folders will only allow files to be uploaded and viewed, no file deletions will be permitted.). Refer to *Exhibit 2 – How to Navigate Folders and Upload Submissions for directions*.

[https://upload.asce.org/public/folder/7ppbx1\\_RXkarZVFZcl9TYw/2024%20Concrete%20Canoe%20Submissions](https://upload.asce.org/public/folder/7ppbx1_RXkarZVFZcl9TYw/2024%20Concrete%20Canoe%20Submissions)

### 4.2 Required Submissions and Schedule

Teams shall meet all submission deadlines listed below. Submissions not received by the deadlines or partial/incomplete submissions will be considered non-responsive and subject to deduction. Symposia host schools shall not change or amend any of the submission requirements. If a host school does, teams are directed to only follow the requirements listed below. Refer to *Exhibit 1 – Summary of Important Dates/Deadlines*.

#### 4.2.1 Letter of Intent & Pre-Qualification Forms

Teams shall submit a *Letter of Intent* along with their *Pre-Qualification Forms* which acknowledges receipt of the Request for Proposal solicitation and shall provide a synopsis of their understanding of the project. The letter must be **signed** by at least one (1) team captain in addition to the ASCE Student Chapter Faculty Advisor. The phone number and email address for both the team captain and faculty advisor shall be provided.

The *Pre-Qualification Forms* (see *Exhibit 4*) are required to be completed and signed off by each team including initialing off on each line item and providing signatures from one team captain and the ASCE Student Chapter Faculty Advisor.

Adobe PDF versions of the *Letter of Intent* and *Pre-Qualification Forms* are to be uploaded to the team's respective folder **no later than 5:00 pm EDT [Eastern] Friday, November 3, 2023. Late submissions and documents missing any of the required signatures, initials, and email addresses will be considered non-responsive and subject to deduction.**

#### 4.2.2 Preliminary Project Delivery Schedule

All teams are to upload their schedule to their respective folder, no later than **5:00 pm EDT [Eastern] Friday, November 3, 2023**. This Preliminary Project Delivery Schedule shall cover the period from the issuance of this RFP up to the Society-wide Competition at Brigham Young University, and shall include items such as, but not limited to, design and construction-related activities, important milestones, and submission deadlines.

### 4.2.3 Project Proposal, Mix Design Sheets, and Materials Notebook

#### Digital Format (PDF Version)

- For the Student Symposia Competitions, digital versions of the *Project Proposal*, *Mix Design Sheets*, and *Materials Notebook* documents are to be uploaded to their respective folder **no later than 5:00 pm EST [Eastern] Friday, February 16, 2024.**
- For the Society-wide Final Competition, digital versions of the *Project Proposal*, *Mix Design Sheets*, and *Materials Notebook* documents are to be uploaded to their respective folder according to the instructions in their *Letter of Invitation* **no later than 5:00 pm EDT [Eastern], Wednesday, May 15, 2024.**
- File names shall be in the form of “School Name – Canoe Name – Document – Year” (examples: *South Central Louisiana State University – Mud Dawg – Project Proposal – 2024*)

#### Hard Copies

- For the regional ASCE Student Symposiums, no hard copies are required for submission.
- For the Society-wide finals competition, six (6) bound hard copies of the *Project Proposal* shall be **received no later than Wednesday, May 15, 2024** and be mailed to the following address:

ASCE Student Programs  
1801 Alexander Bell Drive  
Reston, VA 20191  
Attn: Concrete Canoe

– End of Section –

## 5.0 PROJECT PROPOSAL, MIX DESIGN SHEETS, and MATERIALS NOTEBOOK

One of the greatest challenges in the engineering profession today is the art of stating a complex idea, solution, or decision simply. From city council meetings to public hearings, engineers are increasingly asked to address the society they work for in terms they can understand.

The setup of this RFP aims to aid each team in learning the importance of simple visuals and concise writing to help others understand complex technical material. The sections below are separated so that each portion of the report serves a different subset of people engineers can expect to interact with.

Each team shall provide their *Project Proposal*, *Mix Design Sheets*, and *Materials Notebook*, which details their approach to meeting the requirements of the Request for Proposal solicitation as it pertains to the various areas related to the design and construction of the concrete canoe. The response to this RFP has an Infographic, Research and Development section, Proposal Section, and supporting data in appendices.

Full URL for “[Reference Materials](#)” shown in this section:

<https://upload.asce.org/public/folder/xyLDxYR2R0GTJpmNZc6vRA/AAA%20Reference%20Documents%20and%20Webinars>

### 5.1 General Requirements

- All body pages - 8 ½ in. by 11 in. pages (unless otherwise stated below)
- All pages – ½ in. margins on all sides (MTDS are not subject to this requirement)
- Body text shall be Times New Roman, Arial, or Calibri font, 12 pt. normal width character spacing, and single spaced
- Section headings and subheadings may be of any legible font type or size
- Headers and footers are permitted within the margins and may utilize any legible font type or size that is the same relative size to the body text or larger
- Section and Appendix dividers are permitted but are not required
- All dimensions throughout the Proposal are to be reported in English units

### 5.2 Pictures, Figures, Graphics, and Infographics

Pictures, renderings, illustrations, graphs, figures, etc. are permitted and encouraged.

- No use of copyrighted or trademarked materials is permitted without written approval from the copyright or trademark owner.
- Items from publications must be properly referenced.
- Items developed and owned by the 2023-2024 team do not need to be referenced. Items developed and owned by a previous year's team, for example, photographs depicting a construction method, can be used as long as they represent what is being proposed for this submission and are properly cited in the proposal as previous teams' work.

### 5.3 Plagiarism

Plagiarism of any kind, intentional or unintentional, will not be tolerated and is grounds for disqualification. Submitted proposals may be screened for plagiarism at the discretion of the judging panel and/or the C4. Please note the following:

- “Text Recycling”, while permissible in some deliverables in industry, will be considered plagiarism for this competition.

- All language included in the proposal, presentation, display, and any other incidental deliverable shall reflect work completed within the current academic year, unless otherwise referenced and properly cited as work completed in a prior year. This includes but is not limited to text, pictures, renderings, illustrations, graphs, figures, etc. Failure to properly cite work completed in a prior year will be considered plagiarism for this competition
- The use of generative artificial intelligence (AI) and natural language processing models (NLP) such as OpenAI's ChatGPT are neither encouraged nor discouraged by C4. However, if such models are used, all instances shall be cited as work completed by the respective generative AI/NLP. Failure to cite all instances of generative AI/NLP use will be considered plagiarism for this competition.

**Contextual Comment:** *Framing the rules and regulations of this competition as a Request for Proposals is intended to provide teams with familiarity and experience with how the competitive bid process works in industry and for teams to articulate in plain language how the deliverables were created within the current academic year. It should be noted that while the framework is that of a competitive bid process, this is still an academic competition. As such, teams are expected to adhere to the principles of academic integrity.*

*By participating in the 2024 ASCE Concrete Canoe Competition, teams agree to adhere to the ethical publishing standards in ASCE Journals. As ASCE is a Committee on Publication Ethics (COPE) member, all project proposals submitted to the C4 must follow the guidelines recommended by COPE and the requirements outlined above. ASCE reserves the right to publish any project proposal submitted during the competition exclusively and will not review or publish any proposal that violates the ASCE or COPE ethical guidelines.*

## 5.4 Project Proposal

The sections outlined below are expected to be in the order presented and contain all requested information at a minimum.

### 5.4.1 Front Matter (3 pages)

#### 5.4.1.1 Front Cover (1 page)

The front cover of hard copies shall be single-sided. The back side of the front cover shall be left blank. Digital copies do not need to include a blank page.

#### 5.4.1.2 Cover Letter (1 page)

The Cover Letter is an official response to the C4 Request for Proposal solicitation. The following statements shall be included on the Cover Letter, and by signing the Cover Letter, the team agrees that

- The proposed hull design, concrete mixture design, reinforcement scheme, and construction of the prototype canoe have been performed in full compliance with the specifications outlined in the *Request for Proposal*.
- Material Technical Data Sheets (MTDS) and Safety Data Sheets (SDS) have been reviewed by the team for completeness and compliance.
- The team acknowledges receipt of the *Request for Information* (RFI) Summary and that their submissions comply with the responses provided.

- The anticipated registered participants are qualified student members and Society Student Members of ASCE and meet all eligibility requirements (including names and ASCE Society Member ID Numbers).
- All text generation AI/NLP algorithm uses are properly cited within the respective document.

The letter shall be signed by at least one (1) team captain and the ASCE Student Chapter Faculty Advisor, certifying that the information presented in the *Project Proposal*, *Mix Design Sheets*, and *Materials Notebook* is valid. The team captain and faculty advisor's phone number and e-mail address shall be provided.

#### 5.4.1.3 Table of Contents (1 page)

List the various sections and appendices of the *Project Proposal*, including appropriate page numbers. A list of tables and figures may be provided but is not required.

### 5.4.2 Infographic (1 page, 11 in. x 17 in.)

#### 5.4.2.1 Intent and Purpose

To aid in each team's infographic, the committee offers the following definition: Infographics are graphic visual representations of information, data, or knowledge intended to present information quickly and clearly.

Rather than block text, this one-page maximum is expected to rely heavily on illustrations, lists, icons, and other graphical content.

**Contextual Comment:** *This infographic replaces previous years' Executive Summary section, which the committee found repetitive from year to year while providing minimal additional value. Introducing the Infographic aims to allow students to express and show more creativity in the project while minimizing the block text judges need to evaluate.*

#### 5.4.2.2 Infographic Required Content

C4 requests an infographic that will serve as a marketing flier for this project and will be included on the project display (Section 7.3.4). The committee will use this infographic to inform the public and potential manufacturers of the project scope, prototype dimensions and specifications, and the team's unique theme. The Infographic shall highlight why the team is best suited to be awarded the opportunity to provide the standardized design for manufacturing/building canoes for the consumer.

Along with additional information the team deems appropriate, the infographic must include the following:

- A profile of the school's student chapter, brief history highlighting its activities, awards, and other information the team deems relevant.
- Innovative features or methods the team uses that provide external value
- Team's unique approach to the problem statement includes
  - Expected cost of production
  - Ways the team addressed the client's ultimate needs
- Prototype Specifications
  - Length; Width; Depth; Thickness; Weight
  - Composite flexural strength (indicate the age of testing)
  - All reinforcement utilized - primary and secondary (type and name)
  - Any flotation utilized (type/name and density, if applicable)

- Concrete Mixture Specifications
  - Density - wet (plastic) and oven-dried unit weights (for each mix)
  - Concrete slump/spread and air content (for each mix)
  - Compressive and tensile strength - indicate age of testing (for each mix)

All properties shall be reported in English units to the accuracies outlined in the industry standards (e.g., ASTM C39, C138, C109, and C496, as examples) and as outlined in the table below. **These shall be used as the official properties used for any compliance checks.**

PROPERTY	REPORTED ACCURACY (to the nearest..)
Strength	10 psi
Density (hardened concrete)	1 lb/ft <sup>3</sup>
Density (fresh concrete)	0.1 lb/ft <sup>3</sup>
Slump, Spread	¼ inch
Weight	1 lb
Air Content	0.1 %

### 5.4.3 Preliminary Design Report (10 pages maximum)

#### 5.4.3.1 Project Management (5 pages maximum)

The overall Project Management section is limited to 5 pages maximum. Unless otherwise stated in the subheaders below, subsections have no length restriction.

#### I. Key Team Roles & Organizational Chart (1 page) (8 ½ in. by 11 in. or 11 in. x 17 in.)

Provide team member names, including descriptions of the roles, tasks, or areas in which they contributed at any time during the project. Include the year (Fr., So., Jr., Sr., Grad) for all members. Indicate team captains. As appropriate, list advisors, sub-consultants, and other pertinent individuals.

#### II. Project Scope

Demonstrate a thorough understanding of the proposal requirements and sequence of tasks to develop a concrete canoe regarding its hull design, structural capacity, material selection and testing protocol, and constructability.

#### III. Health and Safety

Discuss the team's safety program and implementation, including, at a minimum, material testing and construction.

#### IV. Project Management Plan (PMP)

Present the team's project management scheme and planning process related to budget, schedule, scope, and risk management. Discuss the financial and resource allocation associated with material procurement and construction. List anticipated major milestone activities and how these were determined and will be achieved. Present critical path activities and describe how this critical path was determined. Identify hurdles that pose the most risk to critical path activities and how these hurdles affect the planning process.

If additional tasks, re-arrangement of tasks, or other changes occurred from the Preliminary Project Delivery Schedule, provide a discussion on why.



#### V. Quality Assurance and Quality Control

Define quality assurance and quality control. Discuss how the team uses assurance and control independently and in conjunction as part of an overall QA/QC program related to all parts of the project scope as defined in this RFP.

#### VI. Research and Development Cost

Discuss the costs associated with materials, people-power, and tools or machinery used in the research and development phase.

#### VII. Research and Development Cost - Fee Schedule (1 page)

Based on the written explanation above, provide a one-page itemized fee summary sheet for the Research and Development Cost using the template located at [Reference Materials](#):

- Projected total hours (including a breakdown of person-hours) dedicated to responding to this RFP. See Exhibit 8 for further details.
- Costs of labor, mixture materials, and all construction materials associated with the fabrication of the canoe including a lump sum for the mold.

**Contextual Comment:** *The lump sum cost for the mold should match the detailed cost breakout in the Manufacturing Fee Sheet.*

- Costs associated with testing material
- Costs associated with person-hours for each item.
- Time and material associated with competition travel and participation can be excluded.

Hourly rates, material costs, and appropriate multipliers are provided in *Exhibit 8 – Fee Schedule*.

For any portion of the project that a team expects to be completed by others (i.e. if the team's mold is fabricated by an outside vendor), the team is still expected to determine labor hours worked and cost of materials, just as if they were completing the task. Teams are highly encouraged to ask vendors about their labor hours and costs to aid in their fee schedule.

**Contextual Comment:** *Recall from the Problem Statement, the C4 is not necessarily looking for the lowest cost solution, but inclusive and realistic costs assessments.*

#### VIII. Project Schedule (1 page - 11 in. x 17 in. pages)

Provide a complete project schedule, including milestone dates and critical path from the Request for Proposal solicitation issuance to the Society-wide Competition at Brigham Young University.

The project schedule should include baseline dates (from the Preliminary Project Delivery Schedule submitted in November) and actualized dates (when the task was completed).

#### 5.4.3.2 Technical Design and Construction Support (5 pages maximum)

The overall Technical Design and Construction Support section is limited to 5 pages maximum. Unless otherwise stated in the subheaders below, subsections have no length restriction.

## I. Hull Design

Present the selected hull design and related performance objectives. Include any reasonings supported by data for these performance objectives related to stability, turning, straight-line speed, maneuverability, and other constraints, criteria, or structural elements as determined appropriate by the team.

## II. Structural Analysis

Present the team's structural analysis and determination of both the required material properties (concrete, reinforcement, and composite) and critical section properties. At a minimum, teams shall report findings on the following modes of analysis:

### Longitudinal Analysis

- Provide the shear diagram for the critical load case with the location and magnitude of the maximum shear force defined ( $V_{max}$ )
- Provide the bending moment diagram for the critical load case with location and magnitude of the maximum bending moment defined ( $M_{max}$ )
- Define the critical section properties: moment of inertia ( $I_x$ ) and extreme fiber distances ( $c_c$  and  $c_t$ ) at the location of the maximum bending moment ( $M_{max}$ )
- Define and provide justification for any applied Factors of Safety (FS) or Load Factors

### Punching Shear Analysis

- Determine the critical area for punching shear for the critical load case defined in the longitudinal analysis
- Determine the punching shear stress for the critical load case defined in the longitudinal analysis
- Provide commentary on the relationship between the results of the longitudinal analysis and the results of the punching shear analysis. Consider the following: How are these values connected? How are they different? What do both results mean for how the team should design against failure?

### Failure Envelope Analysis

For this analysis mode, teams shall use the results of the longitudinal analysis and strength testing results (see Section 5.4.3.2.III) in combination with simplified Mohr's Criterion to develop a failure envelope plot that contains at a minimum, the following information:

- Mohr's Stress Circle using the maximum compressive ( $\sigma_c$ ) and tensile ( $\sigma_t$ ) stresses determined above, with  $\sigma_c$  and  $\sigma_t$  defined
- Mohr's Circle for compressive strength ( $f'_c$ , as determined via strength testing) with  $f'_c$  defined
- Mohr's Circle for tensile strength ( $f_t$ , as determined via strength testing) with  $f_t$  defined
- The tangent line between the Mohr's Circle for compressive and tensile strengths, with both the y-intercept (maximum predicted shear stress,  $\tau_{max}$ ) and slope of the line defined

**Contextual Comment:** Mohr's Criterion/Mohr's Failure Theory essentially boils down to this: use the stress and strength data you have on hand in a meaningful way to make a prediction about how and when a brittle material will fail. This mode of analysis has been added as a requirement to emphasize the importance of combined

*load effects. By taking this more holistic approach, teams will be able to visually depict 1) how efficiently they have designed their concrete mix(es), 2) if their mix design is sufficient to protect against failure in all predicted states, and 3) whether or not adjustments need to be made to the hull design to alter the critical stress state. The committee will host a webinar on this topic to help students with any questions.*

All modes of analysis shall be completed using 2-dimensional concepts of mechanics of materials, strength of materials, and reinforced concrete design. This section will not discuss more advanced analytical analysis methods, such as finite element analysis (FEA). However, if appropriate, teams are permitted to discuss the use of advanced analytical analysis as part of the Value section of the Production Proposal.

**Contextual Comment:** *Please note that many of the analysis and design programs used in industry, including, but not limited to RISA-3D, SAP2000, ETABS, etc. all utilize solvers that are based on the finite element method. The use of software in the development of your structural analysis is not prohibited. Still, teams should verify whether their intended software's underlying solver is FEA-based prior to using it.*

### III. Mix Design

Present the team's approach to planning, developing, researching, and testing the mix design to meet the requirements of this RFP.

At a minimum, describe

- Quantitative test results of mixtures tested and selected.
- Concrete and reinforcement materials considered and selected.
- Physical properties and composition of the proposed aggregate sources, including specific gravity, absorption, and particle size.
- Admixtures tested and their effects on concrete properties/behavior.
- Primary reinforcement considered, tested, and used, and layering scheme chosen.
- New or innovative ideas, materials, and methods implemented in developing the concrete composite and the impacts on budget, schedule, and safety.

Refer to standard test methods where appropriate.

### IV. Construction Process

Describe the construction process and include new or innovative ideas implemented in the construction of the mold and canoe and their impacts on budget, schedule, and safety.

Include, at a minimum, material selection, form construction, methodology of mixing and placement of concrete and reinforcement, layering scheme, curing, form removal, concrete finishing, and aesthetics.

#### 5.4.4 Production Proposal (6 pages maximum)

The overall Production Proposal section is limited to 6 pages maximum. Unless otherwise stated in the subheaders below, there is no restriction on the length of any subsection.

##### 5.4.4.1 Value

Merriam-Webster defines value as *“the monetary worth of something.”* By the same source, it can also be described as *“relative worth, utility, or importance.”*

For this section, one or both of these definitions may be used to aid the team in presenting the value their prototype design brings to the client, C4.

The team shall highlight processes or design features where value can be provided and discuss how their innovations relate to C4's stated needs. The team is expected to understand and demonstrate that while innovation and value are often perceived as synonymous, they are not identical. Thus, innovation does not always provide value.

The team should frame this section toward the external value (i.e., the Client (C4)) rather than internal (i.e., the team).

#### 5.4.4.2 Sustainability

Using at least one of the three pillars of sustainability – social, economic, and environmental impacts – outline, in detail, sustainability processes the team used and their direct or indirect impact. State which pillar(s) these processes were tied to.

#### 5.4.4.3 Improvements

Throughout any project process, a team learns best practices to improve the prototype, process, or procedure. The committee requests that the teams provide descriptions of their best practices related to the team's approach, design, and/or materials.

#### 5.4.4.4 Manufacturing Cost Estimate

C4 intends to mass-produce the winning prototype for general use. To aid the committee in projecting manufacturing costs, the team shall discuss the cost of mass-producing 100 canoes. Assumptions can be made on the unit rate for the bulk buying power of materials. No preference will be given to a school's location or potential fabrication facility. Shipping and delivery costs, taxes, and necessities (water, electricity, etc) on each fabricated canoe do not need to be included. These will be the responsibility of the individual buyer or C4.

The actual cost of the canoe is less important for this competition than proper accounting and explanation of prices.

**Contextual Comment:** *The cost estimate presented by the team should be substantiated by the actual material costs and hours it took to fabricate their prototype canoe. This section aims to have teams consider the materials they use and how they might affect mass production and to think more broadly about construction processes. For example, would using a mold that costs more to sustain over multiple iterations be considered sustainable? Would that still be a selling point or a cause of concern for the client?*

#### 5.4.4.5 Manufacturing Cost Estimate - Fee Schedule (1 page)

Based on the written explanation above, provide a one-page itemized fee summary sheet for the Manufacturing of 100 canoes using the template located at [Reference Materials](#):

- Costs of labor, mixture materials, and all construction materials associated with the fabrication of each canoe.
- Costs of mold fabrication and re-use. Identify the number of canoes expected to be built with a single mold before replacing it with a new one. The mold fabrication cost should be pro-rated to the number of re-use opportunities. This pro-rated mold fabrication cost will be applied to the per canoe fabrication cost.

Hourly rates, material costs, and appropriate multipliers are provided in *Exhibit 8 – Fee Schedule*.

**Contextual Comment:** *This new format for the fee schedule is meant to stimulate new competition analysis by framing the costs as preparation for mass assembly instead of just focusing on the prototype.*

*Sustainability benefits from material use or mold reuse are substantial and encouraged by the committee. However, sustainability has been a vague concept discussed in previous years that until now didn't have a metric to compare against. This section gives all schools a new opportunity to explain how their mix design, construction process, and mold system may perform in a production setting.*

#### 5.4.4.6 Construction Drawings (2 pages, 11 in. x 17 in.)

Present isometric, elevation, plan, and typical composite cross-section views of the canoe and mold with applicable dimensions and other details as needed to construct. Additional sections and details may be added to present construction techniques. Provide any relevant specifications as deemed essential by the team.

**Contextual Comment:** *Construction drawings are a key component of the evaluation as C4 solicits teams to provide a design we can then hand over to a manufacturer to build. These drawings should strive to provide the key features and pertinent information to enable that fabrication to occur with the drawings as the primary source of information. Meaning, can the team's canoe be built by someone else only using these drawings?*

### 5.4.5 Appendices

#### 5.4.5.1 Appendix A – Bibliography (Page Limit – none)

ASTM and other industry standards, technical software, and any previously published material, including previous design papers for prior RFP submittals and sources referenced when performing calculations, must be properly cited, as applicable. Any professionally acceptable reference style can be used if the reader can use the citation to find original information sources.

#### 5.4.5.2 Appendix B – Hull Thickness/Reinforcement and Percent Open Area Calculations (Page Limit – 2 max.)

Present the measurements and calculations of the reinforcement and hull thickness for the various canoe elements (i.e., walls, ribs, gunwales, thwarts, and bulkheads) and percent open area (POA) as applicable.

#### 5.4.5.3 Appendix C – Supporting Documentation Page Limit – none)

Provide the completed Pre-Qualification Forms, documents outlined in *Exhibit 10 – Durability and Repairs (if applicable)*, and any additional documents required by the C4.

#### 5.4.6 Back Cover

The back cover of hard copies shall be single-sided. The front side of the back cover shall be left blank. Digital copies do not need to include a blank page.

### 5.5 Mix Design Sheets

Each team shall provide **one** Microsoft Excel file with a tab for **each** mix design utilizing the template located at [Reference Materials](#). Mixtures that differ in only color shall be considered as one mixture, and

one tab shall be provided. In this case, it should be clearly noted on the table or tab name that the color of the mix varies.

No rows, columns, or text in cells with no background color shall be deleted or altered from this provided format. Failure to adhere to this could result in penalties. The team is only to input values in the blue cells and only equations in the orange cells as noted in the legend.

**Contextual Comment:** *Using Excel (and other Microsoft products) to create, revise, fill out, and update forms and tables is vital for the engineering industry. City, county, state, and federal governments, as well as developers, all have their own versions of various Excel created data inputs (cost estimates, schedules, memoranda, meeting notes etc) that civil engineers must use expertly every day.*

*To incorporate this vital skill, streamline the judging process, and reduce minor errors resulting in appeals, the committee provides an Excel file void of any calculated equations. Teams are responsible for educating themselves on Excel equations and cell formatting for their given mix needs and providing correct equations, calculations, and formatting in the submitted Excel file, which will simulate the real-world experience of submitting project calculations.*

## 5.6 Materials Notebook

Project owners typically provide specifications for materials that may be incorporated into the work. Usually, the Contractor must submit mix designs, product data sheets, etc. to the Owner and/or Engineer of Record for specification compliance review. The Materials Notebook intends to simulate the contractor submittal process wherein teams provide information about all the materials incorporated into the canoe prototype itself.

The notebook shall consist of:

- Front Cover
- MTDS Summary Table
- A Technical Data sheet for each material

The *Materials Notebook* shall be a separate document from the Project Proposal.

The judges and C4 will use the *Materials Notebook* to verify all materials are included in a team's Project Proposal and verify compliance of materials.

### 5.6.1 MTDS Summary Table

Provide a Summary Table that lists each material used in the canoe prototype. At a minimum, include the complete brand name (include company name), type of material (e.g.: Water Reducer, Reinforcing Mesh), and applicable industry standard.

### 5.6.2 Material Technical Data Sheets

Provide a Technical Datasheet for each of the materials used in the canoe. Wherever possible, order the data sheets in the same order as the MTDS Summary Table. Datasheets should provide technical information and not be a product brochure. Safety Data Sheets (SDS) are not equivalent documentation for MTDS and should not be provided in lieu of Material Technical Data Sheets.

### 5.6.2.1 Materials with Prescribed Specifications

The MTDS must provide **current** information clearly verifying that the materials used in the canoe **comply with the specifications** (e.g.: a cementitious material MTDS - typically a 'mill certification' - should show compliance with the applicable ASTM outlined herein and typically would also show the chemical composition and how the cement meets that ASTM).

Highlight or circle, on the datasheet, the ASTM standard or material requirement that is being met. If there are multiple products or sizes of materials on a MTDS, circle, highlight, or identify which product is being used by the team.

If the manufacturer does not provide a Technical Data Sheet (such as for proprietary reasons), a letter from the company (on letterhead) certifying that the materials used follow the specifications shall suffice. The certification letter shall be submitted to C4 for its review and approval prior to its inclusion in the *Materials Notebook*. Contact information of the individual providing the letter shall be included.

### 5.6.2.2 Materials without Prescribed Specifications

Canoe materials that do not have specific specifications or material requirements in the RFP should still be included in the *Materials Notebook* and still provide basic technical information on the material. Some materials, such as reinforcement materials from local stores, may not have an official MTDS available; however, a printout (from the store website or the packaging) showing the basic strength properties of the material may be included instead. Other examples, such as foam used for flotation bulkheads, may not have an official MTDS available; however, a printout (from the store website or the packaging) showing what the foam is made of (polystyrene Styrofoam, polyurethane foam, charcoal foam, etc.), the density, open/closed cell, and any other basic properties of the material may be included instead.

Datasheet or product questions may be submitted via RFI to the C4 for review. See *Exhibit 7: MTDS Summary Table Example* for an example of the table.

– End of Section –

## 6.0 CANOE HULL DESIGN PROTOTYPE

Teams shall propose a canoe hull and conduct a structural analysis on their proposed designs to establish the concrete properties needed. After research and testing, the team will construct a full-scale canoe prototype of their proposed design ahead of their Student Symposium.

### 6.1 Dimensional Constraints

#### 6.1.1 Length, Width, and Depth

There are no length, width, or depth constraints for the canoe.

**Contextual Comment:** Previous RFPs have had constraints of 22 feet long, 36 inches wide, etc. However, the dimensions have rarely been breached, with canoes longer than 22 feet or 36 inches wide providing little to no value in the evaluation. Eliminating the constraint simplifies the RFP and reduces judges' workload.

### 6.2 Canoe Material Components

The Final Product Prototype shall be constructed with components that are categorized under and comply with **Concrete**, **Reinforcement**, or **Flotation** requirements presented herein. All flotation and reinforcement must be encased in concrete.

**Exclusions:** lettering, sealers, damage repairs (tape), and added flotation needed to pass the flotation test.

#### 6.2.1 Gunwale

The gunwale shall be finished to prevent injury to the paddlers (i.e., no exposed reinforcement or sharp edges.) Foam pipe insulation foam may be used as gunwale protection and may be taped to secure it.

### 6.3 Concrete Materials, Mixtures, and Reinforcement

Concrete mixtures shall be developed using concrete materials and reinforcement that comply with the specification in *Exhibit 5 – Technical Specifications for Concrete and Reinforcement*. Teams should consider setting up a research and testing regime that allows for testing individual materials, concrete mixtures, and composite elements.

### 6.4 Flotation

In the event a canoe becomes submerged, canoes should be designed and constructed to pass the flotation test by the buoyant design of the canoe. Flotation material shall be limited to within 3 feet of the bow and stern sections and encased in concrete.

#### 6.4.1 Flotation Test

The canoe shall pass a flotation test whereby the canoe floats generally horizontally, with the canoe floating near the water's surface, within two (2) minutes after being filled with water. The canoe's buoyancy, rather than the exact depth at which it floats, will be the subject of the test. The canoe does not necessarily need to break the water surface – this test intends to ensure the canoe



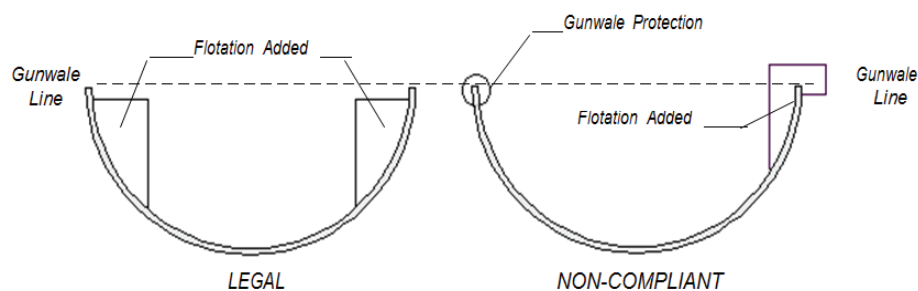
does not sink and is easily retrievable should the canoe be submerged during the competition and ensure the safety of team members prior to the race. Teams shall submerge their canoe by whatever means necessary (such as filling the canoe with buckets of water, tilting the canoe so that water fills in, pushing it downward, etc.) and are solely responsible for handling the canoe to meet the requirements of the test. Gunwale caps are not permitted on the canoe during the flotation test. Once the canoe has been certified as passing, gunwale caps may be added.

Canoes that do not pass the flotation test on the first attempt will automatically be assessed a deduction on the Final Product Prototype.

#### 6.4.2 Additional Flotation

If a canoe does not pass the flotation test, teams shall be required to add additional flotation materials until the canoe does pass the test to the satisfaction of the judges and/or C4. Any added flotation shall be below the gunwale line. Gunwale caps shall not be permitted to serve as flotation material. If flotation is added at the Student Symposium Competition, it shall be removed for the Society-wide Competition. At the Society-wide Competition, the canoe will be evaluated in the flotation test as if it was the first time undergoing the flotation test.

**Contextual Comment:** *If a team fails the flotation test at a Student Symposium Competition, they will be re-assessed at the Society-wide competition if they qualify. This is a re-testing of the canoe as it was designed and intended to be delivered at the Student Symposium Competition and does not allow teams to “repair” their canoe to pass the flotation test before the Society-wide Competition.*



Any gunwale caps and coverings shall be removed at the time of judging. Aesthetics judging may occur before or after the canoe has been certified to pass the flotation test. If judging takes place after the flotation test, teams that require additional flotation to pass the test may temporarily remove the added flotation to be judged. After judging, the teams shall place the flotation back in its original position.

### 6.5 Finishing & Aesthetics

#### 6.5.1 Canoe & School Name

The name of the school and canoe shall be prominently displayed on the exterior of the canoe, above the waterline, on both sides, with individual letters. The school and canoe name shall be letters between 4 and 6 inches high. Recognized abbreviations for the official school name, based on the school’s official website, are permitted. The minimum name length is 5 characters.

The method used to create the school and canoe name shall meet the graphics requirements outlined in Section 6.5.2 with the exception of adhesive lettering. Adhesive lettering is permitted, but is limited to the lettering used for the school and canoe names.

### 6.5.2 Graphics

Graphics created using concrete coloring agents and pigments within the concrete mix design (i.e., integrally colored concrete) are not limited in dimension or frequency. Any coloring agents or pigments used shall be in accordance with ASTM C979.

Any commercially available stain(s) specifically formulated for concrete may be applied to the canoe. The stain(s) must generally be transparent in nature, and the volatile organic content (VOC) of any given stain used shall be less than or equal to 350 g/L (as shown on the material data sheet(s) provided in the *Materials Notebook*).

Commercially available thickeners specifically formulated for acid stains may be used with the stains if the combination does not exceed the maximum VOC specified above. Post-manufacturer additives such as glitter or other particulate material are not permitted. The dilution of stains with any other medium (e.g., water, acetone, etc.) is not permitted.

Stains that come in powdered dyes to be reconstituted with water or other liquid mediums are permitted, and teams must follow the manufacturer's directions for their proportioning and mixing. The application of any given stain to any portion of the canoe shall be limited to a maximum of two (2) coats, following the manufacturer's recommended procedure for application and thickness.

Concrete stains can be used on the canoe's inside or outside faces, but not on both. If a concrete stain is used, it must not form a coating/membrane on the surface of the concrete. If used, the Project Proposal must discuss in the section on Health & Safety (5.4.3.1.III) the details about the stain hazards, application procedures used, health & safety procedures taken to ensure safety, and approval of the faculty advisor and relevant university health & safety personnel responsible for auditing the laboratory safety. Questions, clarifications, and equivalent products may be submitted via RFI to the C4 for consideration as an approved equal.

### 6.5.3 Concrete Sealers

Only clear, non-pigmented concrete sealers may be applied to the canoe. The sealer may be either:

- A. silane- or siloxane-based penetrating sealer with a VOC of less than or equal to 350 g/L,
- or
- B. liquid membrane-forming compound for curing and sealing compliant with ASTM C1315 requirements (there are no VOC requirements with this option)

Post-manufacturer additives such as glitter or other particulate material are not permitted. The application of sealer to any portion of the canoe shall be limited to a maximum of two (2) coats, following the manufacturer's recommended procedure for application and thickness.

**Contextual Comment:** For the purpose of this competition, There are two main types of sealers, which C4 presents above. It's imperative that the team understand what they are using to ensure compliance. While there are many resources, the link below provides a neatly organized table to aid in selecting appropriate sealers.

<https://www.concretenetwork.com/products-sealer/comparison.html>

## 6.6 Durability and Repairs

Canoes should be durable enough to survive the rigors of the Symposium Competition, the Society-wide Competition, and transportation to and from the various events. Following the completion of the slalom races and the preliminary sprint races, all canoes shall be removed from the water, assembled in a commonplace or a location specified by the head judge, and inspected by the judges and/or C4 members for durability (judges score) and use of tape as a repair (deduction). *Exhibit 10 – Durability and Repairs*, discusses in detail the criteria for assessing durability.

## 6.7 Official Weigh-In

At the Society-wide event, canoes are subject to an official weigh-in with the measured weight compared to the weight reported in their *Project Proposal* infographic.

– End of Section –

## 7.0 PROTOTYPE DISPLAY REQUIREMENTS

### 7.1 General

Teams will have the opportunity to showcase their canoe on display, along with having a Project Display to highlight the processes and materials from the project and have a cross-section of the canoe representing its construction (canoe and mold). The prototype display will allow all teams to share their results with the judges and their knowledge with other teams to create a collaborative environment consistent with ASCE values. Failure to adhere to the requirements below may result in penalties.

### 7.2 Restrictions

*Project Display* – The display, as a whole, shall fall within a 4 ft (W) by 8 ft (L) by 7 ft (H) space.

- a. Displays must be designed to be judged from the front (not a walk-around).
- b. Displays must be designed to be self-supporting. Nothing shall be taped, mounted, or attached in any form or manner to any surrounding trees, walls, doors, floors, etc.
- c. Displays shall not include electronic devices (such as, but not limited to, laptops, lighting, sound or video equipment, radios, loudspeakers, or any other noise-creating devices).
- d. No sponsor-related items (such as sponsor lists, logos, etc.) shall be part of the display.
- e. Using scents, both from humidifiers or open-flamed candles, is prohibited.

**Contextual Comment:** *The entire project display is intended to fit inside the dimensions listed above. Consider those dimensions an invisible box that the team cannot exceed. It will be within the judge's purview to either not judge anything outside the box or dock overall product display points as they deem fit should the team not contain the product display within limits.*

### 7.3 Requirements

Alongside the canoe prototype, the Project Display is where a team will showcase their approach to the design, research, testing, and construction. At a minimum, teams must include what is outlined in this section.

#### 7.3.1 Design Process

Teams should include what they deem appropriate to convey their Proposal's strengths fully. The team shall include design, research, testing, and construction elements. Photos, graphics, physical samples, etc. are all encouraged.

#### 7.3.2 Canoe Cross-Section

A full-scale model cross-section *representative* of the raw and finished canoe shall be presented alongside the canoe. The cross-section shall demonstrate the concrete casting, finishing, and reinforcement techniques used, including showing the mold. The cross-section, including any stand, shall fall within a 4 ft (W) by 4 ft (L) by 7 ft (H) space, separate from the Product Display.

**Contextual Comment:** *The entire cross-section display is intended to fit inside the dimensions listed above. Consider those dimensions to be an invisible box that the team cannot exceed. It will be within the judge's purview to either not judge anything outside of the box or dock overall*

product display points as they deem fit should the team not contain the product display within limits.

### 7.3.3 Canoe Stands

The canoe is to be displayed on stands that hold the canoe approximately 4 feet off the ground. The underside of the displayed canoe shall be available and visible for judging and inspection.

Both ends of the canoe do not necessarily need to be displayed horizontally at the same height – the 4 feet is approximate, with the intent here to allow the judges to have access to inspect all areas of the canoe (e.g. one end of the canoe is not 7 feet off the ground or resting on the ground).

**Contextual Comment:** *The height requirement intends to allow judging to occur from a generally upright standing position. The judges shouldn't be required to climb a step stool or kneel to get a full view of the entire canoe. The 4' list height is an approximate value to aid the students in planning their display to accomplish this intent. It will be up to the judges if this intent is achieved.*

### 7.3.4 Required Information and Samples

The following shall be provided as part of the display. Samples of aggregates, cementitious materials, and fibers shall be provided in transparent containers and labeled accordingly. Samples shall be of sufficient sizes/volume to represent their product to showcase the material clearly.

- Individual sample(s) of each aggregate
- Composite sample(s) of aggregate.
  - Composite blends should be of the same proportion as each concrete mixture.
  - Composite blends shall consist of only aggregate.
- Concrete cylinder(s) of each mixture, 3 in. or 4 in. diameter, split into two halves
  - If several colors of a given concrete mixture are used, provide only one (1) sample of that mixture (i.e., samples of each color are not required).
- Raw reinforcement samples
  - *Mesh, Grids, Strips, Tendons, and Bars* – A representative sample of each reinforcement material used in the canoe
- For any fibers used in the concrete mixtures, individual sample(s)
- Individual sample(s) of each cementitious material
- One (1) hard-copy of *Project Proposal*
- One (1) hard-copy of *Mix Design Sheets*
- One (1) hard-copy of *Material Notebook*
- Infographic from team's Project Proposal shall be visible/displayed for viewers

In addition, the following items are to be readily available for compliance checking:

- Seats/Mats for measurement check
- Life Jackets & Paddles
- **[Society-wide Only]** Concrete cylinders (unbroken) 3 in. or 4 in. diameter cylinder, oven-dried, of each concrete mixture used for unit weight verification.
  - These should be prepared per ASTM C39. The sample(s) shall be a quality control (QC) test cylinder taken at the time of canoe construction and be representative of the in-place density, color, consistency, and make-up of the concrete(s) used.

– End of Section –

## 8.0 TECHNICAL PRESENTATION

### 8.1 Time Limit

Each team will be afforded the opportunity to present a 5-minute-long presentation, followed by an additional 7-minute period for questions by a panel of judges. The panel will evaluate the presentation based on what has been presented within that time frame.

### 8.2 Presentation Focus

The presentation should focus on the primary aspects of the design, construction, and technical capabilities. Briefly summarize the major aspects of the project, with the intent of demonstrating why the panel of judges should select your team, design, and prototype for the canoe manufacturing/building design.

**Contextual comment:** Recall this is a hypothetical scenario to provide an end goal for the RFP and the competition. The presentation intends to go beyond simply informing the audience of what you did and how you did it. Ultimately, the presentation should persuade the judging panel why they should select your prototype. The presentation is not intended to be a word-for-word regurgitation of either the research and development section or the proposal section of the report.

### 8.3 Language

All presentations are to be presented in English.

### 8.4 Presentation Order

Shall be randomly selected and provided to the teams by the host school no later than the time of on-site registration. The presentations, including the question-and-answer period, shall be open to the public.

### 8.5 Equipment

The host school shall provide electrical outlet access, a projection screen, and a projector unit for use during the presentations. A room diagram shall be provided by the host school a minimum of two weeks prior to the event. Teams giving a presentation shall furnish any additional equipment necessary.

### 8.6 Presenters

Presenters may be any registered team members who officially sign-in at registration. Presenters are those with speaking parts and individuals operating the computer or projectors. A minimum of two (2) presenters must have speaking parts.

Teams shall make a live presentation. The use of video shall be permitted. Teams shall not pre-record any speaking parts. No handouts or other materials shall be given to the panel as part of the presentation. Any registered participant on a team may be on stage to participate in the question-and-answer period.

### 8.7 Question and Answer Session

Following the presentation, teams will need to set themselves apart by displaying their knowledge to the panel by answering questions related to their *Presentation* and *Project Proposal*.

– End of Section –

## 9.0 CANOE PROTOTYPE PERFORMANCE DEMONSTRATION

Each team will be afforded the opportunity to demonstrate the racing capabilities, handling performance, seaworthiness, and durability of their full-scale prototype. A series of races will accomplish this focused on assessing straight-line speed and turning capabilities under various loading conditions. A total of five (5) types of races are to be held (weather conditions permitting): women's slalom (2 women), men's slalom (2 men), women's sprint (2 women), men's sprint (2 men), and co-ed sprint (2 men and 2 women).

### 9.1 Demonstration Course

#### 9.1.1 General Requirements

The canoe's bow shall remain the bow throughout each race in consideration of the successful negotiation of a turn or finish buoy.

Different colored buoys shall mark the racecourse lanes. The Slalom and Sprint courses must meet the alignment, distance, spacing, and turns as noted in *Exhibit 9 – Race Regulations and Safety*; however, these are subject to site-specific conditions and limitations.

#### 9.1.2 Symposia and Society-wide Competition

For all Symposia competitions, all sprint races shall be 200 meters. For the Society-wide competition, the co-ed sprint race will be increased to 400 meters.

### 9.2 Slalom Course (200-meter)

The slalom course shall consist of the following, subject to site conditions:

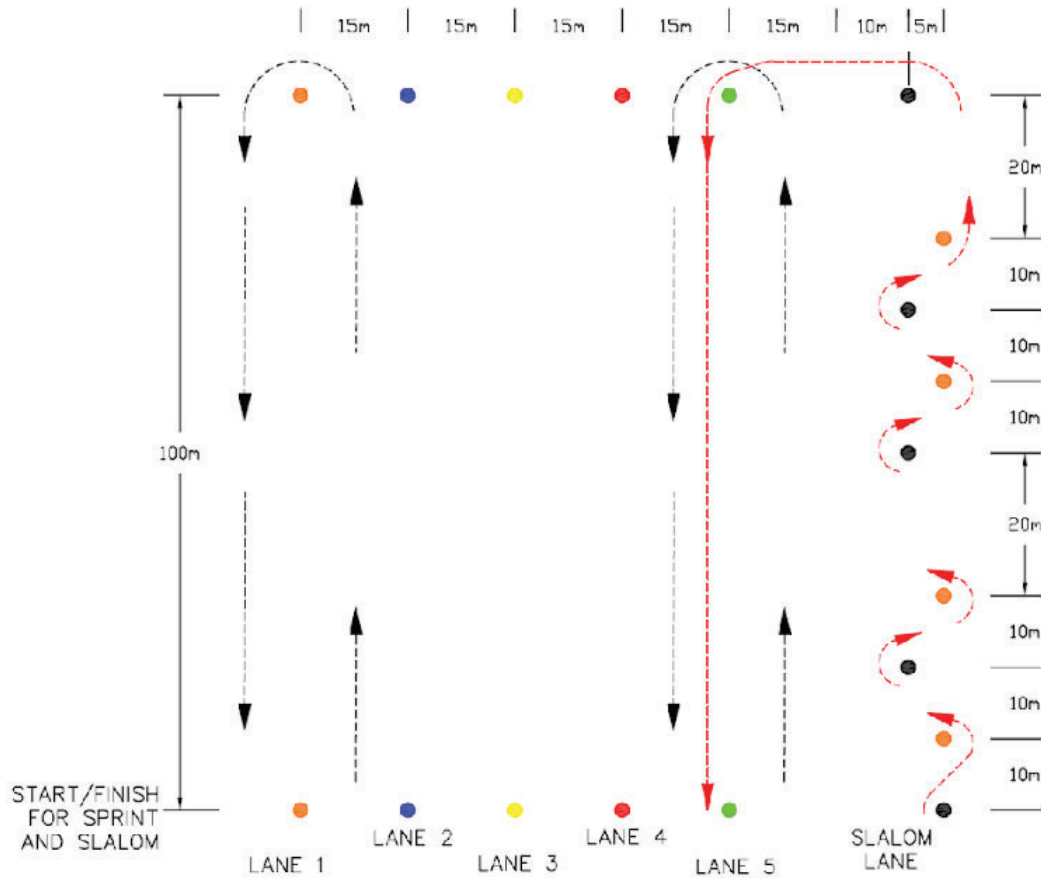
- a. The men's and women's slalom course will be nominally a 200-meter race consisting of a slalom course through the first 100 meters out (*actually a little longer with the slalom turns*), a 180° turn, and 100 meters straight back.
- b. At Symposia Competitions, the course shall begin with a slalom course consisting of seven (7) buoys. Each slalom buoy shall be staggered 5 meters transversely from each other. Buoys shall be longitudinally spaced at 10 meters with 20 meters between the third and fourth buoy.

### 9.3 Sprint Course (200- and 400-meter)

A sprint course shall consist of the following subject to site conditions:

- a. The men's and women's sprint course will be a 200-meter race consisting of a straight course 100 meters out, a 180° turn, and 100 meters back.
- b. For Symposia competitions, the co-ed race will also be a 200-meter race.
- c. For the Society-wide competition, the co-ed race will be a 400-meter race and shall consist of two (2) laps of the sprint course.
- d. Lanes shall be no narrower than 15 meters.

## Example Race Course Layout



**Note:** that the slalom race return path is around the buoy for lane 5. This provides adequate space to prevent interference between a team heading away from the starting line and a team returning to the finish line. This reduces the time it takes to run the slalom race at both regionals and ASCE Student Civil Engineering Championships by allowing the next team to start before the previous team finishes the race. The host school can also choose other layouts for the return path that allow the next team to start before the previous team finishes so long as there is adequate space to prevent interference between a team heading away from the starting line and a team returning to the finish line.

– End of Section –



## 10.0 EVALUATION

### 10.1 General

The evaluation of the teams will be divided into four (4) categories:

Categories	Maximum Points
Project Proposal	30
Technical Presentation	25
Final Product Prototype	25
Race Demonstrations (5 events)	20
Total Possible	100

In a situation where none of the race events can take place, the overall competition score shall be based solely on the results of the technical portion of the competition (Project Proposal, Technical Presentation, and Final Product Prototype) with the maximum possible score being 80 points.

### 10.2 Evaluation Panel

Each event shall be evaluated by a panel of judges. The minimum number for any event is three (3), and the maximum is five (5). C4 intends that the same judges will evaluate each portion of the competition.

If the same judges do not judge each portion of the competition, the C4 will not consider the competition a valid competition and will not extend an offer to compete at the Society-wide Final Competition. In extenuating circumstances, the C4 will request a description of the evaluation panel to determine the validity of the competition and may invite the team to the Society-wide Final Competition.

### 10.3 Evaluation Scoring

Evaluation points will be allotted per placement according to the following table:

Place	Maximum Points					
	Technical Categories			Race Categories		
	Project Proposal	Technical Presentation	Final Prod. Prototype	Slalom	Tandem Sprints	4-person Sprints
First	30.0	25.0	25.0	4.0	3.0	6.0
Second	27.0	22.5	22.5	3.6	2.7	5.4
Third	24.0	20.0	20.0	3.2	2.4	4.8
Fourth	21.0	18.5	17.5	2.8	2.1	4.2
Fifth	18.0	15.0	15.0	2.4	1.8	3.6
Sixth	15.0	12.5	12.5	2.0	1.5	3.0
Seventh	12.0	10.0	10.0	1.6	1.2	2.4
Eighth	9.0	7.5	7.5	1.2	0.9	1.8
Ninth	6.0	5.0	5.0	0.8	0.6	1.2
Tenth	3.0	2.5	2.5	0.4	0.3	0.6

Competition Points for Project Proposal, Technical Presentation, and Prototype are awarded per *Exhibit 11 – Evaluation Forms*.

The ranking of the overall scores determines placement in each category and in the case of races, the overall time. In the event of a tie, the average of the raw scores will determine the actual placing. If the tie remains after averaging the raw scores, then the tie will remain.

The *Project Proposal*, *Technical Presentation*, and *Prototype* will be ranked for each judge independently from 1st to *n*th place (with *n* being equal to the number of teams competing) for each category. The aggregate of the independent rankings of each judge will be averaged to determine the overall rank for the entry, and scores will be assigned based on the scoring table for places 1 through 10. Raw scores will be used during a tiebreaker for the categories.

## 10.4 Summary of Deductions / Disqualification

### 10.4.1 General

These deductions may also be referenced in other sections of this document and/or the scoring sheets. **It is highly suggested that the judges contact C4 regarding situations that may not be covered to determine the appropriate course of action.**

### 10.4.2 Deductions

The Deduction Scorecards determine a deduction unit that is input into the electronic scoresheet and is used to adjust the final scores for each judge for each school. Each deduction unit is one (1) percent of the difference between the pre-deduction highest and lowest score by a judge for that particular portion of the competition and is calculated for each judge.

### 10.4.3 Disqualification

Teams may be disqualified (DQ) from the competition for the following:

- a. Failure to meet student eligibility requirements
- b. Violations under the *Spirit of the Competition* [at the discretion of C4 and/or Judges] or under the *Ethics and the Competition*
- c. Sportsmanship and interference requirements
- d. Failure to follow safety rules
- e. Plagiarism

## 10.5 Appeal of Deductions

During the competitions, the judges and/or C4 shall inform the team captains about the deductions that have been assessed. The team captains will then be afforded the opportunity to appeal the deductions through a **written response to the judges** that will then be reviewed. **Designated team captains are the only individuals that may appeal the deductions.** The judges' decisions following their review are final, and they will accept no further appeals beyond those decisions. The judges may contact C4 to ensure that the proper deductions are made and for any additional guidance.

**C4 will not consider any appeals beyond the Symposium Competition nor overturn any Symposia judges' decisions regarding the deductions assessed against a given team.**

The following sections detail the process of teams being informed of the deductions, the team captain's appeal (if they choose to do so), and the rendering of the judges' final decision following their review of the appeal.

If the team chooses to appeal deductions, the team captains will have until the date/time specified to submit to the Head Judge or C4 member a completed *Deduction Scorecard* (with signature), *Appeals Form*, and any supporting documentation. The judges shall review the appeal, render their final decision, and inform the team captains of the decision. Upon being informed of the judge's decision, no further appeal may be filed

## 10.6 Tiebreaker (Final Overall Standings)

Ties in the final standings for the competition overall shall be broken. In such cases, a tie-breaking score, *TBS*, shall be calculated according to the following formula:

$$TBS = \frac{30}{100} \left( \frac{\Sigma DPP}{NOJ} \right) + \frac{25}{100} \left( \frac{\Sigma OPP}{NOJ} \right) + \frac{25}{100} \left( \frac{\Sigma FPP}{NOJ} \right) + RP$$

Where: *DPP* = Project Proposal event points for a given judge  
*OPP* = Technical Presentation event points for a given judge  
*FPP* = Final Product Prototype event points for a given judge  
*NOJ* = number of judges  
*RP* = unmodified race points

The calculation of the *TBS* shall not change the standings for team placement in any given technical scoring part. Of the teams tied for the overall winner or second place, the team with the highest *TBS* shall be awarded the place in contention.

If a tie still exists for first and/or second place after the tie-breaking scores have been determined, then the judges shall determine the overall winner for the competition position. The judges may base their decision on whatever criteria they deem appropriate.

The judges' criteria and decision shall be final and may not be appealed.

– End of Section –

# EXHIBIT 1

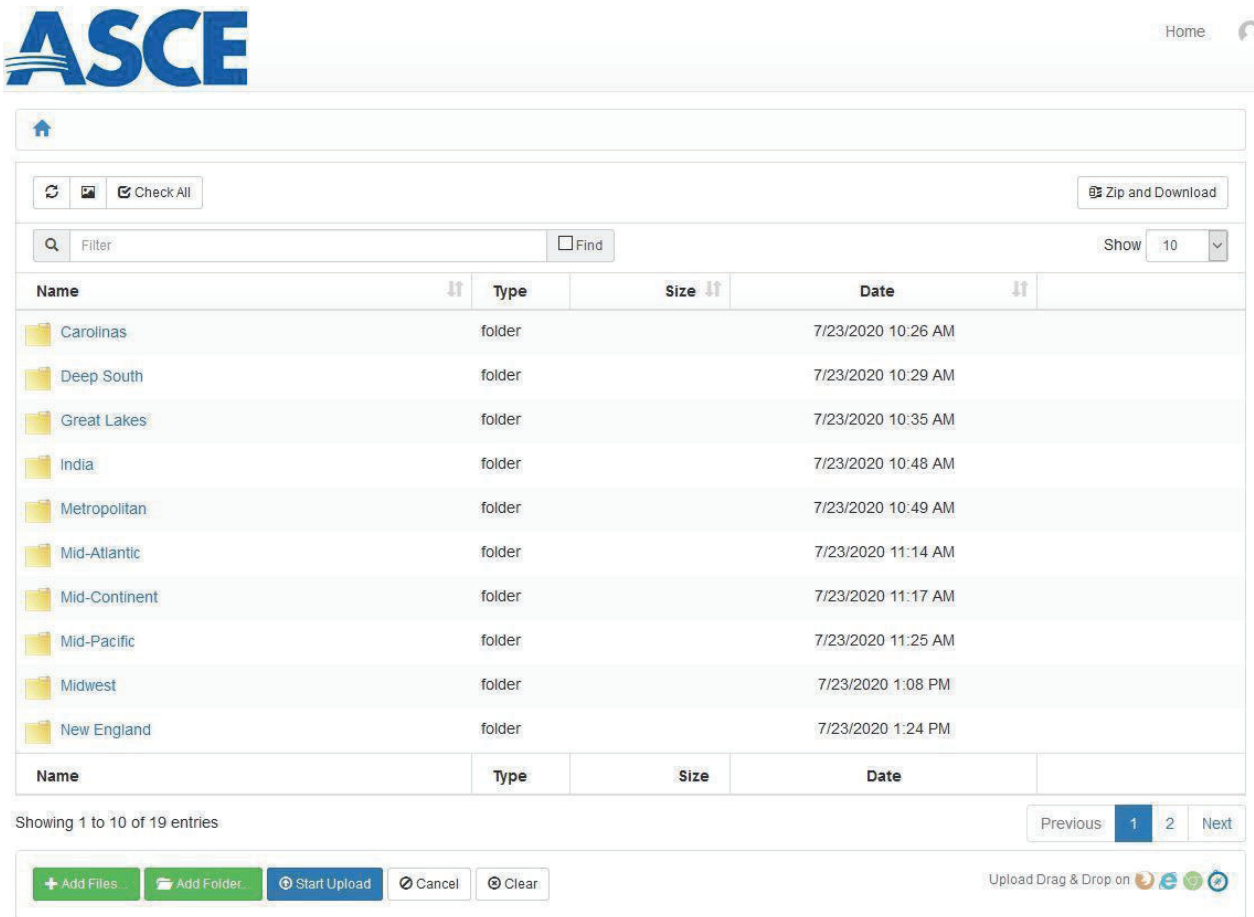
## Summary of Important Dates/Deadlines

ITEM	DATE
Issuance of 2024 Request for Proposal Solicitation	September 5, 2023
Webinar: Welcome Kick-Off and Canoe Project Overview	September 25, 2023
Deadline for Submission of Preliminary Project Delivery Schedule, Letter of Intent, and RFQ Pre-Qualification Form	November 3, 2023
Webinar: Concrete Mix Design Calculations	October 12, 2023
Webinar: Structural Calculations	November 14, 2023
Webinar: Infographic Development and Design	mid-December
Webinar: Materials Notebook	mid-January
Last Day to Submit RFIs to the C4	January 29, 2024
ASCE Student Chapter Annual Reports/Dues Deadline	February 1, 2024
Issuance of RFI Summary	On or about February 2, 2024
Project Proposal, Mix Design Sheets, and Materials Notebook Deadline (Symposia Competitions)	February 16, 2024
ASCE Student Symposia Competitions	March to Late April 2024
Project Proposal, Mix Design Sheets, and Materials Notebook Deadline (Society-wide Finals)	May 15, 2024
2024 ASCE Concrete Canoe Competition, hosted by Brigham Young University	June 20-22, 2024

# EXHIBIT 2

## How to Navigate Folders and Upload Submissions

When you first arrive at the upload site, you will see folders labeled for each Student Conference:



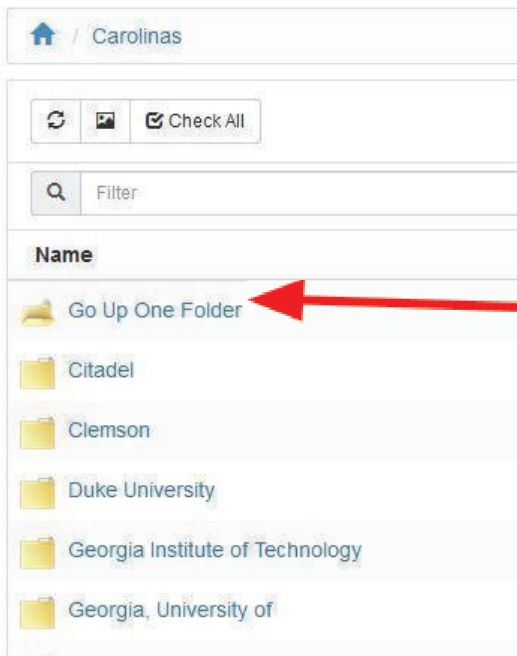
The screenshot shows the ASCE upload site interface. At the top left is the ASCE logo. On the top right, there is a 'Home' link and a user profile icon. Below the header is a navigation bar with a home icon, a refresh icon, a 'Check All' button, and a 'Zip and Download' button. A search bar with the text 'Filter' and a 'Find' button is present. A 'Show' dropdown menu is set to '10'. The main content area is a table with columns for Name, Type, Size, and Date. The table lists 19 folders, each representing a student conference. The folders are: Carolinas, Deep South, Great Lakes, India, Metropolitan, Mid-Atlantic, Mid-Continent, Mid-Pacific, Midwest, and New England. The dates for these folders range from 7/23/2020 10:26 AM to 7/23/2020 1:24 PM. Below the table, there is a 'Showing 1 to 10 of 19 entries' message and a page navigation bar with 'Previous', '1', '2', and 'Next' buttons. At the bottom, there are buttons for '+ Add Files...', '+ Add Folder', 'Start Upload', 'Cancel', and 'Clear'. On the right side of the bottom bar, there is an 'Upload Drag & Drop on' section with icons for file upload.

Name	Type	Size	Date
Carolinas	folder		7/23/2020 10:26 AM
Deep South	folder		7/23/2020 10:29 AM
Great Lakes	folder		7/23/2020 10:35 AM
India	folder		7/23/2020 10:48 AM
Metropolitan	folder		7/23/2020 10:49 AM
Mid-Atlantic	folder		7/23/2020 11:14 AM
Mid-Continent	folder		7/23/2020 11:17 AM
Mid-Pacific	folder		7/23/2020 11:25 AM
Midwest	folder		7/23/2020 1:08 PM
New England	folder		7/23/2020 1:24 PM

Locate your Student Conference and click the folder to open it. If you don't see the name of your Student Conference, click the page navigation to move to the second page:



When you click the folder for your Student Conference, you will see a list of the Student Chapters assigned to that Conference:

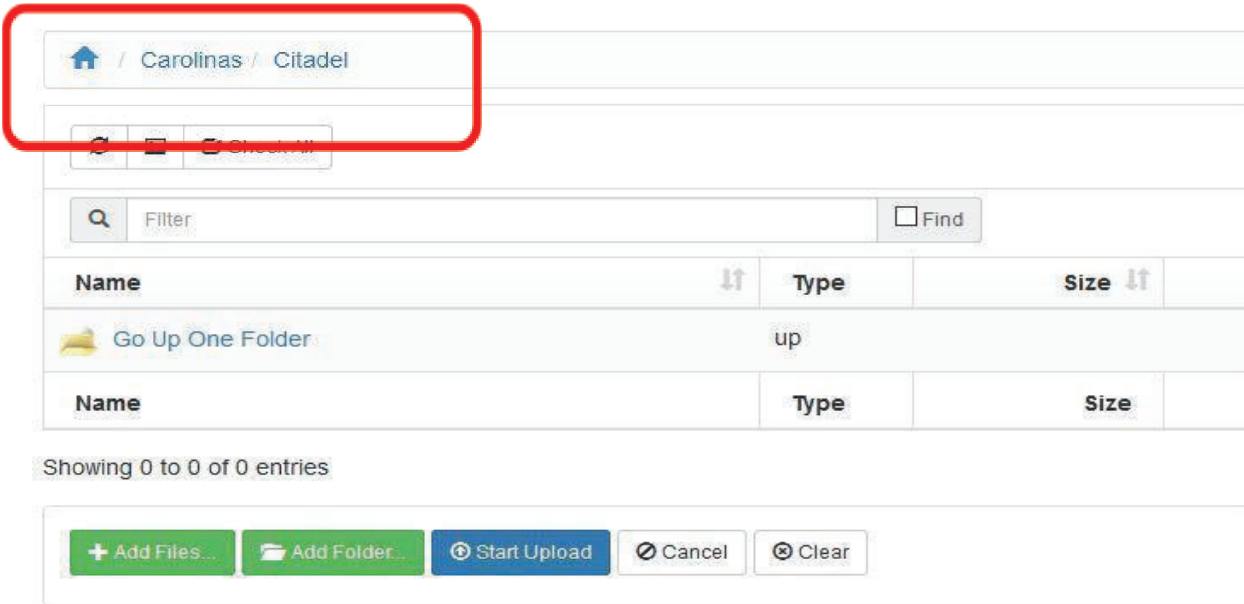


If you accidentally open the wrong folder, you can “back up” by clicking the **Go Up One Folder** folder and navigate correctly.

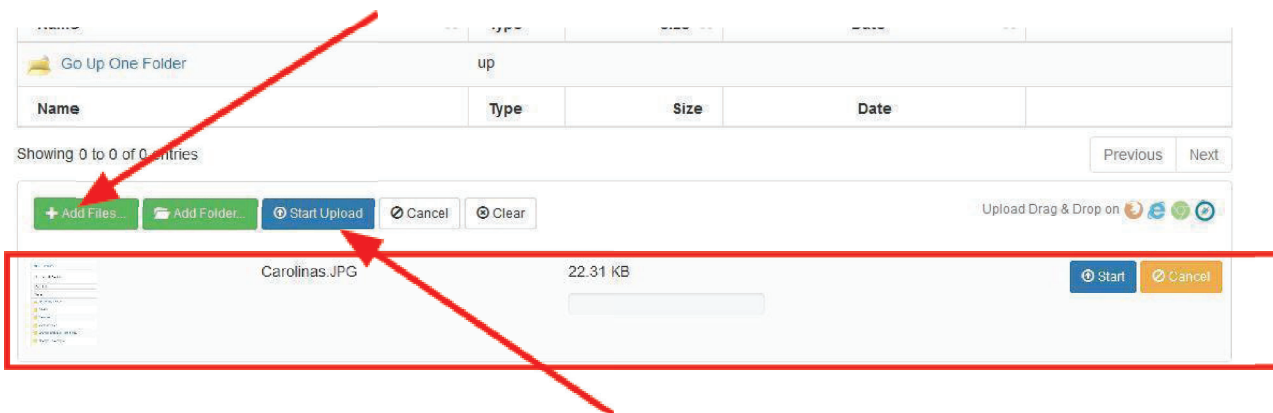
Locate the folder for your Student Chapter and click to open it. If you don’t see the name of your Student Chapter, click the page navigation to move to the second or third page:



When you have opened the folder for your Student Conference and Student Chapter, double-check that you are in the correct location before you begin uploading your files (In this case, **The Citadel** – within the **Carolinas** Student Conference):

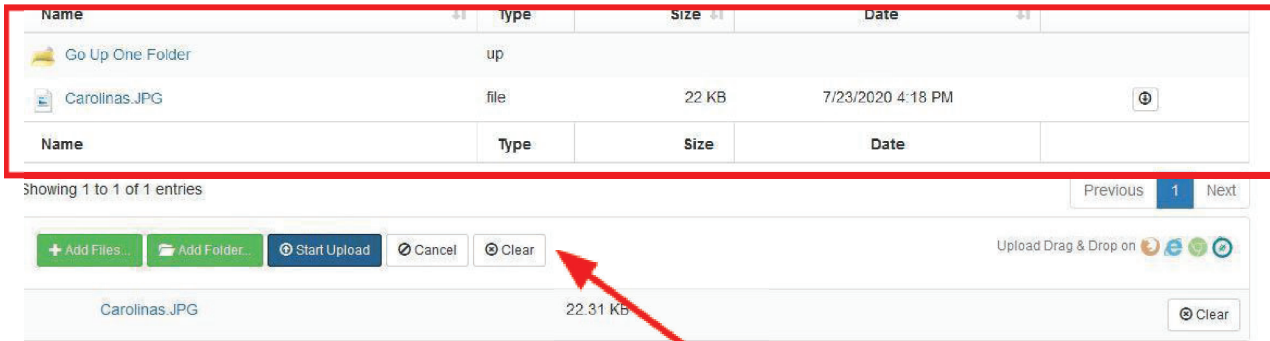


When you have confirmed that you have navigated correctly to the proper folder, you can either click the **+Add Files** button and then browse to find the files to upload or drag and drop files to the area directly below the **+Add Files** button.



The selected (or dragged and dropped) files will appear in the upload area. To upload the file into the folder, click **Start Upload**.

When the file has been successfully uploaded, the name of the file will appear under the **Go Up One Folder** folder



The screenshot shows a file management interface. At the top, a table lists files with columns for Name, Type, Size, and Date. The table contains one entry: 'Carolinas.JPG' with a size of 22 KB and a date of 7/23/2020 4:18 PM. Below the table, there is a control bar with buttons for '+ Add Files...', '+ Add Folder...', 'Start Upload', 'Cancel', and 'Clear'. A red arrow points to the 'Clear' button. Below the control bar, the file 'Carolinas.JPG' is shown with its size '22.31 KB' and a 'Clear' button next to it.

Name	Type	Size	Date
Go Up One Folder	up		
Carolinas.JPG	file	22 KB	7/23/2020 4:18 PM

Showing 1 to 1 of 1 entries

Previous 1 Next

+ Add Files... + Add Folder... Start Upload Cancel Clear

Upload Drag & Drop on

Carolinas.JPG 22.31 KB Clear

To clear the uploaded file from the upload area, click **Clear**.

### Need help?

If you uploaded a file to the wrong folder, or want to replace an uploaded file with a corrected version, send an email to [concretecanoe@asce.org](mailto:concretecanoe@asce.org) and ask that the incorrect file be deleted. Include both the location (folder path) and **exact name** of the file you want deleted. (Files cannot be moved – you will have to upload the file again to the correct folder after it has been deleted).



# EXHIBIT 3

## Student Chapter and Participant Eligibility

---

The American Society of Civil Engineers (ASCE) and the Committee on Concrete Canoe Competitions support and encourage a fully inclusive culture that celebrates individual uniqueness, engenders a sense of belonging, and promotes equitable opportunity for all people to participate in the Concrete Canoe Competition. (See ASCE Policy statement 417 - Justice, equity, diversity, and inclusion.) Participation should be inclusive, open, and fair to all interested and eligible students. Please note that the requirements for eligibility for Society-wide competitions are more stringent than the requirements for participation at student symposia competitions.

### REGISTERED PARTICIPANTS

Registered participants (for both Symposia and Society-wide Competitions) shall meet all the following requirements:

- a. Be an undergraduate student majoring in engineering or related to engineering during the 2023/24 academic year (August 2023 to June 2024). Students do not need to be enrolled during the entire year (e.g., students graduating in December, or students not in school during the fall term but in school for the spring term.) Students that graduate during the academic year and have begun graduate studies during the same academic year are eligible to compete;
- b. Be members of an ASCE Student Organization in good standing;
- c. Be Society Student Members of ASCE. ASCE student membership numbers shall be required upon registration; and
- d. Have contributed to the design and construction of the concrete canoe during the current academic year.

### STUDENT CHAPTER ELIGIBILITY FOR STUDENT SYMPOSIUM COMPETITIONS

The following qualifications are required of all ASCE Student Chapters to compete at the Student Symposia Competitions:

#### **An ASCE Student Chapter must:**

1. Be in good standing with ASCE:
  - a. Have paid their annual dues, as received by ASCE, **no later than the start of their Student Symposium.**
  - b. Have submitted their student chapter full Annual Report or EZ Annual Reporting Form **no later than February 1, 11:59 p.m. EST.**

### STUDENT CHAPTER ELIGIBILITY FOR SOCIETY-WIDE COMPETITIONS

The following qualifications are required of all ASCE Student Chapters in order to advance to the ASCE Society-wide Competition Finals:

#### **An ASCE Student Chapter must:**

1. Be in good standing with ASCE:
  - a. Have paid their annual dues, as received by ASCE, **no later than February 1, 11:59 p.m. EST**
  - b. Have submitted their student chapter's **full Annual Report, no later than February 1, 11:59 p.m. EST and have received a minimum score of 25 points out of a possible 100. Student Chapters that submit an EZ annual reporting form do not qualify** to advance on to competition finals; and

2. Attend and participate in their assigned Student Symposium as shown through their school's:
  - a. On-time attendance and active participation by a member of the ASCE Student Chapter at the Student Symposium Business Meeting.
  - b. Participation in the Student Symposium Paper Competition, including submission and presentation by a member of the ASCE Student Chapter. Note that any papers/presentations created for any other competition do not count as an entry into the Student Symposium Paper Competition.

*Note: Invitations to Student Symposia and ASCE Student Civil Engineering Championships/Society-wide Competition Finals are a privilege, not a right. Failure to act professionally can result in letters of reprimand, mandatory behavior management plans, and loss of invitations to further competition for individual institutions and/or entire conferences.*

Questions regarding eligibility should be directed to [student@asce.org](mailto:student@asce.org).

### **QUALIFIERS**

The Society-wide competition host school has the choice of competing in the current year or deferring their entry until the following year. The Society-wide host school must compete at their respective Student Symposium competition the same year they intend to compete in the Society-wide finals.

Student Symposia competitions are required to meet certain standards. To earn an invitation to the Society-wide ASCE Concrete Canoe Competition, a student team shall qualify through participation in its assigned Student Symposium competition. There must be at least three (3) eligible ASCE Student Chapters that are official members of the Conference participating in the concrete canoe competition to constitute a qualified Student Symposium competition. In addition, the Student Symposium competition must be hosted by a school that is an official member of the Conference. Only one (1) team from any given school can compete in a Student Symposium competition.

ASCE student chapters hosting Symposia may invite Official Guest teams, which are teams from colleges or universities that have an official ASCE student chapter that is not assigned to any Student Conference. Official Guest teams are eligible (if they meet the other requirements) to be invited to the Society-wide competition. Official Guest teams may compete in only one Student Symposium per year. ASCE Student Services shall be notified by the Student Symposium Host School of an Official Guest team prior to the start of the Student Symposium. Notification can be by e-mail to [student@asce.org](mailto:student@asce.org). Conference assignments are listed in the ASCE Official Registrar at <https://www.asce.org/about-asce/official-register>, and symposium host chapters are listed at <https://www.asce.org/communities/student-members/conferences>.

### **ETHICS AND THE COMPETITION**

According to the ASCE Code of Ethics, Canon 5, “Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.”

In the context of this contest, “unfair competition” may include conduct such as the following:

- 1) Failure to provide proper credit for past teams, plagiarism, or any other false statements concerning the source of material used in the contest;
- 2) Taking other people’s designs, artwork, or other creative content without permission (for an overview of Intellectual Property Laws, including Trademark and Copyright, visit <http://fairuse.stanford.edu/overview/introduction/intellectual-property-laws/>); and
- 3) Any false or malicious statements about other teams, members, or others involved in the contest.

## **SPIRIT OF THE COMPETITION**

The judges and/or C4 may take disciplinary action, including warnings, point deductions, or disqualification of a team or entry for inappropriate use of materials, language, alcohol, uncooperativeness, or general unprofessional behavior or unethical behavior of team members or persons associated with a team. The judges and/or C4 have the final authority to determine what constitutes a violation of the “Spirit of the Competition” and may take appropriate action towards point deduction or disqualification.

# EXHIBIT 4

## Pre-Qualification Forms

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Teams shall submit their **Letter of Intent** along with their **Pre-Qualification Forms** which acknowledge receipt of the Request for Proposal solicitation and shall provide a synopsis of their understanding of the project.

The letter must be signed by at least one (1) team captain and ASCE Student Chapter Faculty Advisor. The phone number and email address for both the team captain and faculty advisor shall be provided.

The **Pre-Qualification Forms** are required to be completed and signed off by each team including initialing off on each line item and providing signatures from the team's captain and the ASCE Student Chapter Faculty Advisor.

Adobe PDF versions of **Letter of Intent** and **Pre-Qualification Forms** are to be uploaded to the team's respective folder **no later than 5:00 pm [Eastern] Friday, November 3, 2023.**

**Late submissions and documents missing any of the required signatures, initials, and email addresses will be considered non-responsive and subject to deduction.**

Click the following hyperlink to access: Project Proposal Submissions

[https://upload.asce.org/public/folder/7ppbx1\\_RXkarZVFZcl9TYw/2024%20Concrete%20Canoe%20Submissions](https://upload.asce.org/public/folder/7ppbx1_RXkarZVFZcl9TYw/2024%20Concrete%20Canoe%20Submissions)

## Pre-Qualification Form (Page 1 of X)

\_\_\_\_\_  
(school name)

We acknowledge that we have read the 2024 ASCE Society-wide Concrete Canoe Competition Request for Proposal and understand the following (initialed by one (1) team captain and ASCE Faculty Advisor):

Statement	Captain Initials	Advisor Initials
The requirements of all teams to qualify as a participant in the ASCE Student Symposium and Society-wide Competitions as outlined in Section 3.0 and Exhibit 3.		
The eligibility requirements of registered participants (Section 3.0 and Exhibit 3).		
The deadline for the submission of <i>Letter of Intent, Preliminary Project Delivery Schedule</i> and <i>Pre-Qualification Form</i> (uploaded to ASCE server) is November 3, 2023; 5:00 p.m. Eastern.		
The last day to submit <i>ASCE Student Chapter Annual Reports</i> to be eligible for qualifying (so that they may be graded) is February 1, 2024.		
The last day to submit a <i>Request for Information (RFI)</i> to the C4 is January 29, 2024.		
Teams are responsible for all information provided in this <i>Request for Proposal</i> , any subsequent RFP addendums, and general questions and answers posted to the ASCE Concrete Canoe Facebook Page, from the date of the release of the information.		
The submission date of the <i>Project Proposal, Mix Design Sheets, and Materials Notebook</i> for the Student Symposium Competition (uploading of electronic copies to ASCE server) is Friday, February 16, 2024.		
The submission date of the <i>Project Proposal, Mix Design Sheets, and Materials Notebook</i> for Society-wide Final Competition (hard copies received by ASCE and uploading of electronic copies to ASCE server) is May 15, 2024; 5:00 p.m. Eastern.		

\_\_\_\_\_  
*Team Captain*

\_\_\_\_\_  
*(date)*

\_\_\_\_\_  
*ASCE Student Chapter Faculty Advisor*

\_\_\_\_\_  
*(date)*

\_\_\_\_\_  
*(signature)*

\_\_\_\_\_  
*(signature)*

## Pre-Qualification Form (Page 2 of X)

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(school name)

*In 250 words or less, provide a high-level overview of the team's Health & Safety (H&S) Program. If there is currently not one in place, what does the team envision their H&S program will entail?*

*In 150 words or less, provide a high-level overview of the team's current QA/QC Program. If there is currently not one in place, what does the team envision their QA/QC program will entail?*

*Has the team reviewed the Department and/or University safety policies regarding material research, material lab testing, construction, or other applicable areas for the project?*

*In 150 words or less, provide your team's perspective on the use of ChatGPT and other AI/NLP algorithms in the competition. Do you intend to use it? If so, in what areas? (Note: C4 neither encourages or discourages the use of AI/NLP algorithms, but is interested in collecting data on student usage in the competition.)*

*The core project team is made up of \_\_\_\_ number of people.*

# EXHIBIT 5

## Technical Specifications for Concrete and Reinforcement

### GENERAL

Each concrete mixture developed shall comply with this section's requirements. The use of pre-packaged or pre-mixed concrete, mortar, or grout is not permitted. Bondo®, epoxy or similar materials are not permitted during any stages of the construction of the canoe (i.e., as the component of the mixture itself, as an aid during the placement of concrete, as a modifier of the reinforcement, or as a means of attaching the flotation material).

Teams shall develop a reinforcement scheme using materials that meet percent open area (POA) requirements with the total thickness of the reinforcing layers is equal to or less than 50% of the total thickness of the reinforced composite, and the reinforcing materials do not have post-manufacturer applied coatings that enhance the properties of the reinforcement.

### REQUIREMENTS

**Composite Thickness** – the ratio of the total measured thicknesses of the primary reinforcement to the total thickness of the canoe wall or structural element at any point in the canoe shall not exceed 50%. All canoe elements, including but not limited to, the hull, ribs, gunwales, thwarts, bulkheads, etc., and the connections of structural elements to the canoe wall are subject to this rule.

**Number of Concrete Mixtures** – limited to a total of three (3) concrete mixture designs, while any given mixture(s) can be produced in a multitude of colors.

**Primary Reinforcement** – All primary reinforcement shall be covered in concrete. All materials not part of a concrete mixture or a flotation material shall be classified as reinforcing material and shall comply with the specifications outlined below.

### MATERIALS

#### **Cementitious Materials, Alternative Supplementary Cementitious Materials (ASCM), and Pozzolans**

Any type of commercially available, inorganic cementitious binder, either hydraulic, non-hydraulic or a combination of these is permitted. These materials shall meet the following ASTM standards and are stated as such in the submitted MTDS documentation.

The maximum amount of hydraulic cement (c) is 50% (by mass) of the total cementitious materials (cm) content in any given concrete mixture (e.g., c/cm ratios shall be less than 0.50 for any given concrete mixture). Hydrated lime shall be considered part of the hydraulic cement (c) for calculations. Hydrated lime is permitted, while quicklime is not permitted for use in the canoe. Any one type (or mixture of various types) of hydraulic cement(s) may be used, but each type must comply with the requirements below.

<b>Cementitious Materials</b>	<b>ASTM</b>
<i>Hydraulic Cement (c)</i>	C150, C595, C1157, or C845
<i>Fly Ash</i>	C618 (Class C or F)
<i>Metakaolin or Calcined Clay</i>	C618 (Class N)

<i>Slag Cement</i>	C989 (Grade 80 minimum)
<i>Silica Fume</i>	C1240
<i>Hydrated Lime</i>	C207 (Type S or N) or C821
<i>Ground-Glass Pozzolan</i>	C1866
<i>Ground Pumice, Pumicite, or Volcanic Ash Natural Pozzolan</i>	C618 (Class N)

Alternative cementitious materials and pozzolans evaluated using provisions of ASTM C1709 are also permitted. If non-commercial or other products are being considered, approval by C4 shall be obtained prior to their use.

### Aggregates

Any natural, manufactured, or recycled aggregate is permitted, and its proportioning shall meet the following requirements:

- o Regardless of source, the total aggregate volume shall be 30% (min.) of the total volume of any concrete mixture.
- o Gradation requirements: No limits are given, but gradation shall be reported. Teams shall conduct a sieve analysis and provide a particle size distribution table of each individual aggregate as received and composite aggregate for each mix by following ASTM C136. If the team decides to sieve the aggregates and recombine aggregates into a particular distribution, this must be stated clearly in the report, with the original gradation as received and the final composite aggregate from all sources given. The particle size distribution and table shall be tested and created by the team (not one provided by the aggregate supplier) and be provided as part of the team's aggregate product information in their *Materials Notebook*.

### Fibers

Fibers shall meet the requirements of ASTM C1116 and be considered as secondary reinforcement and dispersed within the concrete matrix. Other fibers may be considered if approved by the C4 prior to use.

### Admixtures

These materials shall meet the following ASTM standards and are stated as such in the submitted MTDS documentation.

<b>Admixtures</b>	<b>ASTM</b>
<i>Water-Reducing &amp; Set-Control</i>	C494
<i>Air-Entraining</i>	C260
<i>Coloring Admixture/Agents &amp; Concrete Pigments</i>	C979
<i>Specialty Admixtures</i>	C494 (Type S)

The use of bonding adhesives (ASTM C1059), waste latex paints, and latex emulsions (ASTM C1438) is prohibited.

Epoxy resins, their curing agents, asphalt emulsions, or similar materials shall not be considered specialty admixtures and are strictly prohibited. Teams wishing to incorporate a material as a specialty admixture that does not fall under ASTM C494 Type S, is not commercially available, or specifically made for use in concrete and have questions or concerns of whether it is an acceptable material shall contact C4 for a determination of its applicability.



The solids content of dyes and admixtures in powder form are to be accounted for in the determination of solids content. Disregard the contribution of solids from other admixtures.

**Curing Compounds** – concrete may be cured using a liquid membrane-forming compound (ASTM C309 and/or ASTM C1315) or a C4-approved equivalent. Any curing compound applied is limited to a maximum of two coats following the manufacturer’s procedure for application and thickness.

**Concrete Sealers** – See section 6.5.3 for Concrete Sealers

**Integrally Colored Concrete and Stains** – See section 6.5.2 for concrete coloring agents, pigments, and use of concrete stains

**Mesh and Grids** – All materials serving as primary reinforcement shall have sufficient open space to allow for the mechanical bonding of the concrete composite as measured by its *percent open area* (POA). Solid mats or plates for reinforcing are not permitted. Pre-impregnated (pre-preg) materials that contain resins and require heat to complete polymerization are not permitted. Solid mats and plates are described as materials that require additional bonding agents or post-manufacturer perforations to keep the reinforcement from delaminating (i.e., there is a lack of open space between the reinforcement sufficient for mechanical bonding).

The minimum percent open area (POA) of any layer of reinforcing material is 40%. The determination of the POA is obtained by the following equation:

$$POA = \frac{\sum Area_{open}}{Area_{total}} \times 100\%$$

where:  $Area_{open}$  is the total open area (i.e., the area of the apertures)  
 $Area_{total}$  is the total area of the reinforcement specimen

Teams are permitted to modify a given mesh by removing strands as needed to achieve the required POA. Teams may fabricate meshes or grids by placing (weaving, tying) material in the “as-received” condition. Once fabricated, teams are not permitted to treat the material (e.g., apply coatings or heat). The “as-received” condition is defined as a commercially available “off the shelf” product directly available to a consumer which has not been modified by a third party (for example, fiberglass can be used as is, but to have a third-party make a grid out of it, then “delivering” it to the team and then considering it “as-received” is not allowed).

**Strands, Tendons, and Bars** – are materials less than ½ inch wide used to make a reinforcement grid or used in pre- or post-tensioning. When used individually, they must meet thickness requirements but are not subject to percent open area. Grids consisting of strands, tendons, and bars are subject to thickness and percent open area requirements.

**Bearing Plates and Fasteners** – used for pre- or post-tensioning of tendons are permitted and are not subject to the thickness or percent open area requirements. The location of the bearing plates is limited to within 2 feet from the bow and stern sections. The thickness of any bearing plate itself is limited to ¼ inch.

# EXHIBIT 6

## General Guidelines for Concrete Mix Design

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### General Comments:

- This exhibit provides general guidelines and helpful hints so that teams understand what is required in the concrete mix design table and how it should be properly filled out.
- Under the categories of “Cementitious Materials,” “Aggregates,” “Fibers,” and “Admixtures”, provide the name of the constituents that are being used. **Commercial (trade) names should be used if it is clear what the product is.**
- Absorption and moisture content values (in percent) for the aggregates shall be provided (to the nearest 0.1%)
- Under the “Specific Gravity” column, provide the specific gravity (dimensionless) of the cementitious materials, aggregates, fibers, and water used in the concrete mix. **For aggregates, you will provide the Oven Dried (OD) and Saturated, Surface Dry (SSD) values.** Two or three decimal places are sufficient.
- The weight of the liquid admixtures shall be provided in lb/gal.

### Notes:

1. The values provided in these tables are shown for MATHEMATICAL EXAMPLE purposes only.
2. Teams should not consider the mixture proportions shown to result in concrete with the needed fresh (slump, air content) and hardened (strength) characteristics required for the competition.
3. Values such as specific gravity are based on generalized numbers and should not be used for your design calculations (i.e., do not reference this document as the one you based your values on).

The following is a step-by-step example for reporting FINAL yielded concrete mixture proportions and checks to make sure that it is theoretically and mathematically correct. **This means that the reported unit weight is measured, and the values provided consider relative yield,  $R_y$ .**

### Proposed Mixture Proportions

Type I/II Cement	400 lb, SG = 3.15
Fly Ash (Class C)	250 lb, SG = 2.93
Blast Furnace Slag	250 lb, SG = 2.85
Fibers, Nylon	5 lb, SG = 0.92
Fibers, PVA	3 lb, SG = 1.40
w/cm ratio	0.50
Expanded Shale, aggregate	600 lbs (dry), Abs = 13%, $SG_{dry} = 1.55$ (ASTM C330 compliant)
Pumice, aggregate	600 lbs (dry), Abs = 17%, $SG_{dry} = 1.59$ (ASTM C330 compliant)
Admixtures:	6 fl oz/cwt HRWR Admixture (47% solids by weight, 8.5 lb/gal) 20 fl oz/cwt Liquid Dye (50% solids by weight, 10.0 lb/gal)
Design Unit Weight (wet)	99.55 lb/ft <sup>3</sup>
Design Air Content	11.3%

## ABSOLUTE VOLUME METHOD

The absolute volume of a given material is computed by dividing the mass of the material by its absolute density, which is the specific gravity (SG) times the density of water (62.4 lb/ft<sup>3</sup>), as shown by:

$$\text{Absolute Volume} = \text{mass} / (\text{SG} \times 62.4)$$

Example : How much volume does 400 lbs of portland cement occupy given that SG = 3.15?

$$\begin{aligned} \text{Volume}_{\text{cement}} &= \text{Mass}_{\text{cement}} / (\text{SG}_{\text{cement}} \times 62.4) \\ &= 400 / (3.15 \times 62.4) = 2.04 \text{ ft}^3 \end{aligned}$$

In a batch of concrete, the sum of the absolute volumes of cementitious materials, aggregate, fibers, water, solids from admixtures and air, gives the volume of concrete produced per batch. The above equation can be used to determine the volumes of the various constituents and populate the table.

Please note that there are several specific gravities reported for aggregate, depending on the condition that they are in, such as dry (SG<sub>OD</sub>) and saturated, surface dry (SG<sub>SSD</sub>). **The values are different** as one is obviously in the dry state and the other considers the water that is required to bring the aggregate to the SSD condition, and it can be shown that it is a function of absorption. For example, it can be shown that for the shale (SG<sub>SSD</sub> = 1.55; A = 13%), the SG<sub>OD</sub> is 1.75.

The volume that the aggregate occupies between the conditions, however, can be shown to be the same. That is, the volume of aggregate in the OD condition determined by taking the amount of aggregate in the OD condition divided by SG<sub>OD</sub> is equal to the volume of aggregate in the SSD condition as determined by taking the amount of aggregate in the SSD condition divided by SG<sub>SSD</sub>.

## WATER

Based on the final w/cm ratio, the amount of water is simply computed using the total amount of cementitious material in the mixture

$$\text{Water} = w/cm \times cm$$

Example: How much water is needed for 900 lbs of cm using a w/cm of 0.50?

$$\begin{aligned} \text{Water} &= w/cm \times cm \\ \text{Water} &= 0.50 \times 900 \text{ lb} = 450 \text{ lb} \end{aligned}$$

The water that is computed from the w/cm ratio is the water that is needed to hydrate the cementitious materials (cm). It is not used to condition the aggregate to the SSD condition.

The water (w) comes from three sources – water from the aggregate (if there is “free” water then the value of this is positive; if the aggregate is drier than the SSD condition, then the value is negative), water from the admixtures, and additional batch water, and is expressed as (or a rearrangement of this equation):

$$w_{\text{batch}} = w - (w_{\text{free}} + \sum w_{\text{adm}})$$

### Compute Free Water from Aggregates

With the values previously obtained for the aggregates, the total moisture content, free moisture content and the amount of moisture available, can be computed for each aggregate using the following three equations:

$$MC_{total} = \frac{W_{stk} - W_{od}}{W_{od}} \times 100\%$$

$$MC_{free} = MC_{total} - A$$

$$w_{free} = W_{OD} \times \left( \frac{MC_{free}}{100\%} \right)$$

Aggregate	W <sub>OD</sub> (lb)	Abs (%)	W <sub>SSD</sub> (lb)	MC <sub>total</sub> (%)	MC <sub>free</sub> (%)	w <sub>free</sub> (lb)
Aggregate #1	600	13	678	8	-5	-30
Aggregate #2	550	17	643.50	12	-5	-27.5

Combined, the aggregates have -57.50 lb of free water

What does this mean? In this case it means that the aggregates are drier than the SSD condition. So, if you added the amount of water computed above (450 lbs to get your 0.5 w/cm ratio), the aggregate would want to soak up 57.5 lbs of it to get to the SSD condition. So, in the end, your w/cm ratio is no longer 0.5. However, we must deal with water from other sources as well. See below.

### Compute Water from Admixtures

The water in the various admixtures can be found from the following equation:

$$\text{Water in admixture} = \text{dosage} \times \text{cwt of cm} \times \text{water content} \times (1 \text{ gal}/128 \text{ fl oz}) \times (\text{lbs}/\text{gal of admixture})$$

From liquid dye

$$[20 \text{ fl oz}/\text{cwt} \times 8.30 \text{ cwt}] \times [(100\% - 50\% \text{ solids})/100] \times (1 \text{ gal}/128 \text{ fl oz}) \times (10 \text{ lb}/\text{gal}) = \underline{6.48 \text{ lb}}$$

From HRWR

$$[6 \text{ fl oz}/\text{cwt} \times 8.30 \text{ cwt}] \times [(100\% - 47\% \text{ solids})/100] \times (1 \text{ gal}/128 \text{ fl oz}) \times (8.5 \text{ lb}/\text{gal}) = \underline{1.75 \text{ lb}}$$

Total water from all the admixtures is then 8.93 lb.

## Compute Batch Water

We have computed water from two of the three sources – the aggregate and the admixtures. Based on this example, we ended up having no “free” water from the aggregate (if fact, you were in a deficit).

Since we know the amount of water needed to hydrate the cm (450 lb) based on the w/cm ratio chosen, the batch water can be computed by:

$$\begin{aligned} w_{batch} &= w - (w_{free} + \sum w_{admx}) \\ &= 450 \text{ lbs} - (-57.5 + 10.34) = 497.16 \text{ lb} \end{aligned}$$

The volume of water, to hydrate cm only, ( $SG_{water} = 1$ ) is then

$$\begin{aligned} Volume_{water} &= Mass_{water} / (62.4) \\ &= 450 / 62.4 = 7.21 \text{ ft}^3 \end{aligned}$$

## SOLIDS (from liquid admixtures)

Typically, the proportional volume of the solids included in the liquid admixture is so small in relation to the size of the batch that it can be neglected. The exclusion to this includes latex admixtures (which are prohibited) and dyes (both liquid and in powder form) which can have substantial volumes.

- **For the competition, only dye solids (in the liquid medium) are to be accounted for.**
- **Disregard the contribution of solids from other admixtures.**
- If you have a powdered admixture (i.e., it is not in a liquid medium), then use the absolute volume method as previously shown.

The solids content can be computed in a fashion like the water content from admixtures

$$\text{Solids in admixture} = \text{dosage} \times \text{cwt of cm} \times \text{solid content} \times (1 \text{ gal}/128 \text{ fl oz}) \times (\text{lb}/\text{gal of admixture})$$

Based on the weight of the admixture (in lb/gal) and the percentages of water and solids within it, one can determine the SG of the solid particles (SG of water is taken as 1.0) as follows:

- If the liquid dye is 50% water by weight, the weight of water is 6 lb (0.50 x 12 lb)
- The weight of the solids is 6 lb (in a gal of admixture).
- The volume of water is then (6 / 62.4) to obtain 0.0962 ft<sup>3</sup>.
- Solids volume is 0.0375 ft<sup>3</sup>. Note: 1 gal = 0.13368 ft<sup>3</sup>.
- The unit weight of solids is then 6 lb / 0.0375 ft<sup>3</sup> = 160 lb/ft<sup>3</sup> and therefore its SG is determined to be 2.56.

### From liquid dye

$$[20 \text{ fl oz}/\text{cwt} \times 9 \text{ cwt}] \times [(50\% \text{ solids})/100] \times (1 \text{ gal}/128 \text{ fl oz}) \times (12 \text{ lb}/\text{gal}) = 8.44 \text{ lb}$$

### From HRWR

$$[6 \text{ fl oz}/\text{cwt} \times 9 \text{ cwt}] \times [(47\% \text{ solids})/100] \times (1 \text{ gal}/128 \text{ fl oz}) \times (8.5 \text{ lb}/\text{gal}) = 1.90 \text{ lb}$$

## DENSITIES, AIR CONTENT, SLUMP and RATIOS

Now that all the amounts have been determined, the respective volumes can be computed so that theoretical densities and air content can be found.

**Mass of Concrete (M)** – The mass of concrete is the sum of all masses of the constituents in the mixture – cm, fiber, aggregate, water and admixture solids:

$$M = \text{Amount}_{cm} + \text{Amount}_{fibers} + \text{Amount}_{aggregate} + \text{Amount}_{water} + \text{Amount}_{solids}$$

$$M = 900.00 + 8.0 + 1321.50 + 450 + 8.44 = \underline{2687.84 \text{ lb}}$$

**Absolute Volume of Concrete (V)** – The absolute volume of concrete is the sum of all the constituents in the mixture. This is based on zero air content. **This value has to be less than 27 ft<sup>3</sup> (1 yd<sup>3</sup>):**

$$V = \text{Volume}_{cm} + \text{Volume}_{fibers} + \text{Volume}_{aggregate} + \text{Volume}_{water} + \text{Volume}_{solids}$$

$$V = 4.81 + 0.12 + 11.75 + 7.21 + 0.05 = \underline{23.941 \text{ ft}^3}$$

**Theoretical Density (T)** – is the density of concrete with no air in it and is the mass of concrete (M) divided by the absolute volume of concrete (V):

$$T = M / V$$

$$T = 2687.84 \text{ lb} / 23.91 \text{ ft}^3 = 112.27 \text{ lb/ft}^3$$

**Measured, or Anticipated, Density (D)** – the density of concrete obtained from cylinders, cubes, etc. in the plastic (wet) state (i.e., immediately after casting). 99.55 lb/ft<sup>3</sup>

**Air Content** – The air content is computed by comparing the theoretical density (no air) to the measured density (D) or using the absolute volume methods:

Air content from theoretical density:

$$\text{Air content} = (T - D) / T \times 100$$

$$\text{Air content} = (112.27 - 99.55) / 112.27 \times 100 = 11.3\%$$

Air content from a absolute volume method:

$$\text{Air content} = (27 - V) / 27 \times 100$$

$$\text{Air content} = (27 - 23.941) / 27 \times 100 = 11.3\% \text{ (check)}$$

**The value of the air content should be checked using the absolute volume method (you should come up with the same answer. If you do not, then there is an error someplace).**

**Note: If the measured density is higher than the theoretical density, the result would be a negative air content. This is not possible.**

### Cement-Cementitious Materials Ratio

The c/cm ratio is a calculated value: 400 lb c / 900 lb cm = 0.444

### Water-Cementitious Materials Ratio

The w/cm ratio is a calculated value: 450 lb / 900 lb cm = 0.50

**Slump** – measured value (in inches).

### **AGGREGATE PROPORTIONING**

**Aggregate - Concrete Ratio (Volumetric)** – Per EXHIBIT 5 – Technical Specifications for Concrete and Reinforcement, “Regardless of source, the total aggregate volume shall be 30% (min.) of the total volume of any concrete mixture.”

$$\text{Aggregate Ratio (\%)} = V_{\text{aggregate}} / 27 \times 100\%$$

$$(11.75 / 27) \times 100\% = \underline{43.5\% > 30\% \text{ (OK!)}}$$

# Exhibit 7

## MTDS Summary Table Example

Note, the format can differ from the below example, as long as the minimum required information is included. See Section 5.6 for further details on the required information for the *Materials Notebook*.

Product Name	Type	Applicable Standard	URL/Link to Datasheet
<b>CEMENTITIOUS MATERIALS and POZZOLANS</b>			
Cemex Type I Cement	Type I	ASTM C150	No link available. See attached mill test report
<b>AGGREGATES</b>			
Utelite Structural Fines	Expanded Shale	C330	<a href="https://www.utelite.com/resources/material-reports-documents/">https://www.utelite.com/resources/material-reports-documents/</a> Also see attached gradation table
<b>FIBERS</b>			
NYCON-PVA RECS100	PVA Fiber	C1116	<a href="https://cdn.shopify.com/s/files/1/0088/0764/5299/files/NyconPVARECS100Sheet042015.pdf?7980">https://cdn.shopify.com/s/files/1/0088/0764/5299/files/NyconPVARECS100Sheet042015.pdf?7980</a>
<b>ADMIXTURES</b>			
Euclid – Pastol 5000	Water Reducer	C494 Type A & F	<a href="https://www.euclidchemical.com/filesshare/ProductFiles/tds/plastol_5000.pdf">https://www.euclidchemical.com/filesshare/ProductFiles/tds/plastol_5000.pdf</a>
<b>REINFORCING MATERIALS</b>			
1/16" 7x7 Galvanized Aircraft Cable	Steel Tendon	n/a	<a href="https://www.fastenal.com/content/product_specifications/WR.7X7.G.EQR.00.pdf">https://www.fastenal.com/content/product_specifications/WR.7X7.G.EQR.00.pdf</a>
<b>CURING &amp; SEALING COMPOUNDS</b>			
BASF MasterKure CC 1315WB	Curing and Sealing Compound	ASTM C1315	<a href="https://assets.master-builders-solutions.com/en-us/masterkure-cc-1315-wb-tds.pdf">https://assets.master-builders-solutions.com/en-us/masterkure-cc-1315-wb-tds.pdf</a>
<b>OTHER/MISCELLANEOUS</b>			
Closed-cell extruded polystyrene foam	Bulkhead flotation	n/a	No link available. See attached printout and picture of product information from packaging



# EXHIBIT 8

## Detailed Cost Estimate

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### GENERAL

In addition to the breakdown below, teams will have access to an example Excel file to serve as a template, located here [Reference Materials](https://upload.asce.org/public/folder/xyLDxYR2R0GTJpmNZc6vRA/AAA%20Reference%20Documents%20and%20Webinars) (<https://upload.asce.org/public/folder/xyLDxYR2R0GTJpmNZc6vRA/AAA%20Reference%20Documents%20and%20Webinars>). It is expected that teams only use this template as a reference. Teams should update the template to match current market costs, their specific labor hours, and materials. For the sections below, teams shall include hours, as applicable, for each of the project sections listed below:

- Project Management
- Hull Design
- Structural Analysis
- Mix Design & Testing
- Mold Construction
- Canoe Construction
- Project Proposal Preparation
- Presentation Preparation
- Display Preparation

### LABOR COSTS

Total billable Direct Labor (DL) shall be calculated using the Raw Labor Rates (RLR). Labor Hours spent on the project (HRS), and the multipliers for Direct Employee Costs (DEC), and Profit (P).

The formula for Direct Labor (DL) is as follows:

$$DL = [\sum(RLR * HRS)] * (DEC) * (1 + P)$$

Each team shall develop a Table of Billable Direct Labor Rates for the classifications of personnel used in the project.

- **Direct Employee Costs (DEC)** are those costs associated with employee taxes, benefits, insurance, and vacation. A multiplier of 1.50 shall be used to calculate the Direct Employee Costs.
- A **Profit Multiplier (P)** of eighteen percent (18%) shall be applied to labor.

### EXPENSES

Expenses (E) shall include both materials costs and other project direct expenses not specifically covered. Total expenses shall be calculated using the Materials Costs (MC), Direct Expenses (DE) and Markup (M).

The formula for Expenses (E) is as follows:

$$E = (\sum MC + \sum DE) * (1 + M)$$

- **Materials Costs (MC)** shall be determined using current materials rates.
- **Direct Expenses (DE)** shall include, but are not limited to, costs of outside consultants and other direct expenses related to the fabrication of 100 canoes
- A **Markup (M)** of ten percent (10%) shall be applied to both material costs and direct expenses.



# EXHIBIT 9

## Race Regulations and Safety

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### GENERAL

The race demonstration of the canoe prototypes will consist of five (5) types of races: women's slalom (2 women), men's slalom (2 men), women's sprint (2 women), men's sprint (2 men), and co-ed sprint (2 men and 2 women).

### RACE RULES

The following general rules apply to the paddlers:

- a. Good faith efforts are made to start and finish all races. Should issues arise that may compromise the canoe's structural integrity or the paddlers' safety, teams must exercise good judgment in determining the safest course of action.
- b. Teams shall use the same registered individuals in any race's preliminary and final heats.
- c. In the event of an injury that prevents a paddler from further competition after the preliminary race has been completed, the injured person or a substitute shall be in the canoe in subsequent races. The substitute passenger shall be one of the original five (5) of the same gender registered on the team and shall not be allowed to paddle.
- d. If a team cannot field the proper number of paddlers of the required gender, registered substitute passengers of another gender shall be used, but substitutes shall not be allowed to paddle.

Teams competing in the slalom races shall compete against the clock in a timed single event. All other races shall include timed preliminaries and finals. The top five canoes advance to the grand final and the next five canoes advance to the petite final based on qualifying times in the preliminaries. Points shall be awarded based on the finish times in the finals. If finals cannot be conducted or the host school determines before the race competition starts that separate finals heats will not be run; the preliminary times shall be used as the final times.

For all sprint races, if a team qualifies for a final event but cannot start the event, that team does not receive points and the team's slot is conceded to the team with the next best preliminary sprint time. For final sprint races, if a team starts a race in a canoe deemed race-worthy by the judges, but is unable to complete the race, they are awarded the points corresponding to completing the race in last place in that final event.

In a situation where all the race events cannot be conducted (for example, the slalom races were completed but the sprint races could not be completed), the race scores for all of the completed races shall be accounted for in the overall competition score. By no means should the race scores be adjusted to account for races not held/completed.

### SYMPOSIUM EVENTS

Depending on the number of entrants at the Symposia competitions, host schools shall decide on having grand and/or petite finals for the various sprint races. The host school shall inform all teams prior to the competition of the race setup.

**Lane Position and Heat Assignments** - Lane position and heat assignments shall be randomly selected before the competition begins and shall be provided by on-site registration. The Symposia and Society-wide host schools shall

provide a diagram or map to the participants outlining the layout of the course prior to the races. Sprint course turn direction (left/right) shall be determined prior to races.

**Interference** - In situations where lane interference and/or canoes collide, paddlers must immediately STOP, hold paddles above their heads and discontinue racing. If interference occurs, the team captain shall appeal directly to the head judge. Once presented with the appeal, the judges shall:

- a. Allow any team(s) directly affected by interference the option to rerun the heat in a timed event. Times from the rerunning of the heat shall be used as the official time for the heat. Heats shall be rerun after a minimum of ten (10) minutes to allow paddlers to prepare themselves.
- b. Disqualify a team that has willfully interfered with another team. (If the interference is not deliberate, then the team should not be disqualified).
- c. Disqualify a team that willfully fails to adhere to course boundaries resulting in interference with another canoe. (If the interference is not deliberate, then the team should not be disqualified).

**If paddlers fail to stop, raise paddles, and continue to race immediately, they cannot claim interference and will not be granted an opportunity to rerun their race.**

## **EQUIPMENT**

**Paddles** - shall be single-bladed and may be straight-bladed or bent. Spare paddles are permitted in the canoe during the race demonstration.

**Seats and Mats** - dimensions of seats and mats are regulated to prevent them from serving as a structural component. Seats cannot exceed a 20" x 20" x 20" maximum. Mats cannot exceed a 20" x 30" x ½" thick maximum. Seats and mats can be used together, at the same time, by one paddler. Alternatively, knee pads are permitted.

**Fixed Paddler Restraints** - Straps, seatbelts, Velcro®, suction cups or any other item that attaches the paddler to the canoe or that interferes with the paddler safely exiting the canoe in the event of capsizing are not permitted. The judges and/or C4 will prohibit the use of any paddler restraints if safety is deemed an issue.

**Slip Resistant Materials** - Non-skid tape or other slip-resistant material is not permitted.

**Spray Skirts** - Post-construction applied devices that prevent water from entering the canoe, such as spray skirts, are not permitted.

## **RACE POINTS & PENALTIES**

A buoy is successfully negotiated when the entire canoe passes on the proper side of the buoy. A canoe may touch a buoy, but the top of the buoy must stay above the waterline on the proper side of the canoe until the canoe has entirely passed. A canoe's time shall not be considered final until all buoys have been properly negotiated. All slalom buoys must be attempted. The following corresponding penalties shall be assessed as defined below:

Description of Infraction	Penalty
Canoe crosses the finish line in wrong lane	30 seconds
Sprint: Turn buoy(s) not properly negotiated	DQ
Slalom: Missed buoy	30 seconds per buoy
Slalom: Bypass buoys to save time	DNF

For a team to successfully finish a given race, the bow of the canoe must cross the finish line with the same number of paddlers (in the canoe or touching the canoe) with which the race began.

## **DID NOT FINISH (DNF)**

If a canoe cannot complete a given race but is found to be seaworthy enough to continue to compete (a typical example is when a canoe becomes submerged during a race), then the team will be given a "Did Not Finish" (DNF) for that race (zero points for a given race). If other circumstances arise where a DNF may be applicable, judges shall contact C4 to determine whether a DNF should be applied.

## **APPEALS**

Requests for rule interpretations and/or appeals during Competition shall be presented to the Symposium Head Judge by the designated team captain(s). Such requests or appeals must be lodged before the start of the next heat or in the case of the slalom races, before the next three (3) canoes finish the race. A team captain shall make appeals. The decisions made by the judges and/or C4 concerning all aspects of the race and judging shall be final. Symposium head judges may contact C4 to clarify rule interpretations and to discuss appeals.

## **SAFETY**

Below are safety protocols that shall be followed for the canoe prototype race demonstration, followed by safety guidelines to consider for both the participants and host schools.

**Powered Rescue Boat** - At least one and preferably two powered rescue boats shall be on the water during all the races. If a powered rescue boat is unavailable, the races shall not occur. The powered rescue boat shall traverse the entire perimeter of paddling areas to ensure accessibility before races occur.

If sustained winds at the race site are greater than 25 miles per hour or wave heights are greater than 1 foot, the races shall not occur.

If the water temperature is less than or equal to 35°F and/or the combined air and water temperatures are less than or equal to 85°F, the races shall not occur. If the combined air and water temperatures are between 85°F and 120°F, the races may take place at the discretion of the safety director. However, there must be a warming area within 200 feet of the canoe/boat loading zone which holds a constant temperature of greater than 75°F, and two powered rescue boats shall be on the water during all the races.

If lightning is encountered within 15 miles of the race site, the races **shall not** occur until at least 30 minutes of elapsed time since the last recorded strike within the 15-mile distance.

Any entry deemed unsafe or hazardous by the judges shall not be permitted in the water unless corrective measures are taken. If corrective measures are not or cannot be made, the entry shall be disqualified from further competition. If repairs must be made to an entry prior to any race, the judges may allow the entry to reschedule for a later heat, but prior to the next event.

### **Safety Director**

A safety director shall be strategically positioned to observe the activities, especially those near the starting and docking area. The safety director is responsible for stopping all activities involving violations of any safety rules.

In addition, the safety director is responsible for briefing paddlers on all known hazards prior to any paddling or racing, and as conditions warrant throughout the race competition.

### **Paddler Safety**

All paddlers shall be competent swimmers. All Paddlers shall wear a US Coast Guard-approved inherently buoyant (no inflatables) Type I, II or III Personal Flotation Device (life jacket) always while in a canoe during competition and/or practice. Wetsuit buoyancy pads shall not be used as a substitute for the Coast Guard approved Personal Flotation Device.

### **Safety Guidelines**

**Participant safety is always the first priority.** When scheduling and planning the races, consider all safety hazards, depending on location and circumstances, plan accordingly to mitigate them and decide what conditions would cause races to be canceled. Each competition host has the authority to require safety equipment or procedures beyond the general requirements established for the Society-wide Competition. The recommendations below identify many common hazards, but not all eventualities are covered. It is strongly recommended that each hosting site comprehensively evaluate specific hazards and develop their own safety plan.

**Cold water** can cause impaired judgment, loss of coordination and hypothermia within minutes. Paddlers, already excited about the races, may make unreasonably poor decisions when cold and becoming hypothermic. Being immersed in water as warm as 60°F can initiate Cold Water Shock. The American Canoe Association (reference below) recommends wetsuits for water temperatures less than 60°F and/or if the combined air and water temperatures are less than 120°F. Consider using wetsuits for those with experience (full-body, sleeveless, or shortie depending on severity) and more safety boats to get paddlers out of the water quickly.

**Wind and waves, currents, obstruction, and other rough water** can more easily swamp and break canoes. Carefully evaluate the proposed race site during a variety of weather conditions to have a good sense for how the water behaves. Depending on seasonal weather conditions, water may be higher or lower. For the canoes, consider requiring integrated grab handles, provisions for tied-in air bags (common flotation for whitewater canoes), and more stringent flotation requirements. Just like cold water, more safety boats may be required.

**Hazardous wildlife** in and out of the water can cause anything from skin irritations and allergic reactions to more serious lacerations. Be sure to alert participants and monitor activities carefully.

**Lightning and storms** are also very dangerous. Monitor the weather and remove everyone from the water when lightning and/or strong storms threaten.

### **Additional Safety References**

Following are a couple references to documents from the American Canoe Association ([www.americancanoe.org](http://www.americancanoe.org)) for further reading and planning race day safety.

American Canoe Association. Best Practices for Paddlers and Paddlesport Programs [PDF document] URL: [www.americancanoe.org/resource/resmgr/sei-educational\\_resources/best\\_practices.pdf](http://www.americancanoe.org/resource/resmgr/sei-educational_resources/best_practices.pdf)

American Canoe Association. Cold Water Survival [PDF document]: [https://www.usps.org/eddept/files/cold\\_water\\_survival\\_aca.pdf](https://www.usps.org/eddept/files/cold_water_survival_aca.pdf)

# EXHIBIT 10

## Durability & Repairs

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### General

The durability of the Canoe Prototype with regards to how the Canoe holds up to the competition events, transportation, and general handling will be evaluated following the completion of the slalom races and the preliminary sprint races. All canoes shall be removed from the water to be evaluated by the judges for durability. Team captains shall be present with their canoes at the time of inspection and shall have with them any *Damage/Accident Report* (included in this Addendum) including written permission from the Judges/C4 for any tape already applied to the canoe. Any tape applied to the canoe, without written permission, is subject to a 25-point deduction. Tape used to secure gunwale protective caps/coverings and tape used to secure additional flotation material in order to pass the flotation test does not apply in this instance. The team captain shall be informed verbally if a point deduction is being assessed. The decision of the judges and/or C4 members is final and is not subject to appeal.

### Judging Criteria

Each judge will evaluate and score the canoe from 0 to 10 for Durability in this category on the Final Product Prototype Score Card provided with this Addendum. Things to consider regarding durability include, but not limited to – the frequency and severity of any microcracks, the frequency and severity of any structural cracks, areas where repairs with tape were needed, seaworthiness, damage/cracking to aesthetic elements, etc.

Damage sustained from race collisions shall not be considered when evaluating a canoe's durability.

### REPAIRS

#### Repairs Made During Competition

After on-site registration at the competitions, repairs shall only be made with tape. Any type of tape is allowed. Canoes shall be assessed an automatic deduction if the tape is used for repairs.

If the damage to the canoe occurs due to a collision, deductions for the use of tape shall not be assessed against a team. In the event of damage resulting from a collision, the team must first file a *Damage/Accident Report* (included in this Addendum) with the judges or C4 and must receive written approval before any tape can be applied. This applies to all instances where tape will be added (permission to use tape to repair damage in one location does not give the team the freedom to put tape elsewhere; permission is needed for each instance).

#### Repairs Made Between Competitions

If the qualifying Canoe Prototype is damaged during the Student Symposium or between the Symposium and Society-wide Finals, the team may patch, repair, and refinish it following the submission and subsequent approval of a *Repair Procedures Report*. The team shall submit a Reconstruction Request to rebuild the canoe if the damage is deemed beyond repair.

The *Repair Procedures Report* or *Reconstruction Request* must be formally requested from the C4 via e-mail at [concretecanoe@asce.org](mailto:concretecanoe@asce.org), completed and signed by the team captain(s) and ASCE Student Chapter Faculty Advisor, and received by the C4 within seven (7) business days of the date that an incident damaging the canoe occurred.

The *Repair Procedure Report* or *Reconstruction Request* must contain sufficient information regarding the cause and extent of damage and the proposed repairs (including the methodology, repair materials, and area of damage) to enable the C4 to decide whether to approve repairs or grant permission to rebuild a canoe. The C4 will review the



documentation and, if necessary, provide comments regarding compliance of the proposed repairs/reconstruction, suitability of the repairs, requests for additional information/details, etc. Any proposed repairs shall be made using materials originally used during the construction of the Canoe Prototype. Proposed reconstruction of the canoe shall be of the same hull design, materials, and concrete mixture proportions of the original canoe. Schools are not to repair or reconstruct their canoe until the C4 grants written approval.

Refinishing (such as, but not limited to, additional sanding, repairing minor dents and cracks, and the reapplication of sealers) constitutes a repair and is subject to this section. The reapplication of letters is not considered to be a repair.

If the C4 determines poor design or construction resulted in damage to the canoe, the *Reconstruction Request* will be denied. If the C4 does not permit the team to repair/reconstruct the canoe, the team shall be given an opportunity to decide whether it can safely, and in “good faith”, compete at the ASCE Student Civil Engineering Championships with a non-repaired canoe. If this is not possible, the team shall forfeit to the designated alternate concrete canoe team within their Student Symposium.

The Repair/Reconstruction request, C4 disposition, and any supporting documentation shall be included as an additional Appendix in the *Project Proposal*.

**Schools granted permission to repair their canoes shall be assessed a 25-point deduction at the ASCE Student Civil Engineering Championships. Schools granted permission to reconstruct shall be assessed a 50-point deduction at the ASCE Student Civil Engineering Championships.** The C4 reserves the right to waive the automatic deductions that may be assessed on a case-by-case basis.

# DAMAGE / ACCIDENT REPORT

**School Name:**

**Canoe Name:**

**Date of Accident:**

**Location of Accident:**

**Type of Accident:**

Collision with other canoe  Paddler fell out of canoe

Collision with inanimate object  Other: \_\_\_\_\_

**Briefly Describe Circumstances of Accident:**

**Describe in Detail the Extent of Damage:**

**Team Captain's Signature:** \_\_\_\_\_

**Team Captain's Signature:** \_\_\_\_\_

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**FOR COMPETITION OFFICIAL USE ONLY**

**Damage is due to accident outside the control of the paddlers? (Circle one) YES NO**

**Comments:**

Deduct 25 units from Final Product \_\_\_\_\_

Do Not Deduct 25 units from Final Product \_\_\_\_\_

**Head Judge** \_\_\_\_\_

# REPAIR PROCEDURE REPORT

**School Name:**

**Prototype Name:**

**Team Captain(s):**

**Date of Request:**

**Description of Cause:**

**Description of Repair:**

**Materials used in Repair:**

**Description of Supporting Documentation:**

*Provide a list of Supporting Documentation attached to this report*

<b>C4 Disposition</b>		
<b>Date:</b>		
<b>Request to Repair Canoe:</b>	<input type="checkbox"/> <b>Granted</b>	<input type="checkbox"/> <b>Declined</b>
<b>Reason for Disposition:</b>		

*Filing this report does not guarantee the school will be granted permission to conduct repairs to their canoe. The ability to do so is a function of the reason for the request and the supporting documentation. Under no circumstances should a school consider a verbal disposition permission to repair their canoe.*

*If the school is permitted to conduct repairs, that school will receive a 25-unit penalty for doing so. The maximum final product points will be reduced to 75 out of 100 units. This penalty may be waived at the discretion of the C4 on a case by case basis.*

# RECONSTRUCTION REQUEST

**School Name:**

**Prototype Name:**

**Team Captain(s):**

**Date of Request:**

**Reason for Request:**

**Description of Supporting Documentation:**

*Provide a list of Supporting Documentation attached to this report*

<b>C4 Disposition</b>		
<b>Date:</b>		
<b>Request to Reconstruct Canoe:</b>	<input type="checkbox"/> <b>Granted</b>	<input type="checkbox"/> <b>Declined</b>
<b>Reason for Disposition:</b>		

*Filing this report does not guarantee the school listed above will be granted a Reconstruction Request. The ability to do so is a function of the reason for the request and the supporting documentation. Under no circumstances should a school consider a verbal disposition permission to rebuild their canoe.*

*If the school is permitted to reconstruct, that school will receive a 50-unit penalty for doing so. The maximum final product points will be reduced to 50 out of 100 units. This penalty may be waived at the discretion of the C4 on a case by case basis.*

# EXHIBIT 11

## Evaluation Forms

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### GENERAL

The scoresheets will be filled out by the judges individually. The individual judges' scoresheets shall not be requested or given out during the competition. The judges will come to a consensus on the deductions applicable to each team and complete (1) one deduction scoresheet to be given to each team. See Exhibit 10 for Damage/Accident, Repair, and Reconstruction Request Forms

The following in this attachment include the evaluation forms to be used by the judges.

### **INSTRUCTIONS - DEDUCTION SCORE CARDS**

1. The Symposium/Society-wide Final Judges shall come to a consensus on the determination of any infractions made by the team regarding the competition event.
2. Judges shall circle the unit value of the deduction in the "Deduction" column. The units of the deductions for the infractions are standardized (i.e., cannot be higher or lower than what is prescribed).
3. The Head Judge shall tally the deductions and initial his/her name next to it. At the Final Competition, a C4 member may tally the deductions in lieu of the Head Judge; however, the judges will make the determination of the infractions.
4. The total amount of deductions can exceed 200 units.
5. The Head Judge (or C4 member) shall provide all team captains with these forms to inform them of the deductions being assessed against them. Teams with no deductions will also be provided with these forms to assure anonymity.
6. The team captains shall indicate if they agree with the infractions and deductions or if they wish to appeal any of the infractions by signing the form. Teams that wish to appeal the infractions shall be given a reasonable amount of time to review the rules, obtain their supportive documentation, and provide the judges with their response. Teams are cautioned to be able to substantiate their appeals.
7. The Head Judge (or C4 member) shall indicate the day and time (deadline) that the team captains must submit the completed and signed form to the judges or C4 member.
8. Following the receipt of the form, the judges shall re-evaluate any infractions that the teams may appeal given the supportive documentation and render their final decision on the form. The Head Judge shall input the official total deduction, sign off on the form, and inform the team captains of the judges' decision. Once this is done, no further appeals regarding this matter will be entertained.
9. All appeals shall be handled prior to the Awards Ceremony. The final tally shall be inputted on the paper copy of the score sheet and in the electronic score sheet which is then officially ratified by the Head Judge. At the Final Competition, the Head Judge and the C4 will ratify the scores.

Members of the C4 will be on-call and are available to provide guidance, clarification, and interpretation of the rules and regulations for the judges. During the competitions, teams are given the option to request that the judges contact the C4 for rule interpretation (see Request for Clarifications and Appeals).

<b>Project Proposal</b>		<b>30% of Overall Score</b>	
School Name: _____ Canoe Name: _____		Possible Points	Score (whole numbers)
<b>Infographic</b> All required information presented (5 Points) Clarity of graphics, illustrations, pictures, etc (5 Points) Clear navigation of data (5 Points) Presented sections enhance view understanding and experience (10 Points)		25	
<b>Preliminary Design Report</b> Key Team Roles & Organization Chart (5 points) Project Management <i>Project Scope, Health and Safety, PMP, QA/QC, R&amp;D Costs, R&amp;D Fee Schedule (10 points)</i> Hull Design (10 Points) Structural Analysis (10 Points) Mix Design (10 Points) Construction (10 Points)		55	
<b>Project Schedule (11x17)</b> - Completeness & Ease of Understanding		15	
<b>Production Proposal</b> Value (20 points) Sustainability (10 points) Cost Estimate (5 Points) Cost Estimate - Fee Schedule (10 Points) Improvements with Substantiating Data (10 Points)		55	
<b>Construction Drawings &amp; Specifications (11x17)</b> - Clarity & Ease of Understanding		15	
<b>Concrete Mixture Materials and Proportions</b> General Compliance of Mixture to Proposal Specifications (Appendix B) and completeness of Mixture Design Excel File (10 points) Correct Equation Inputs (all mixtures) (5 points)		15	
<b>Overall</b> Conciseness and Clarity (5 points) Presentation of Information (5 points) Overall Layout and Format (5 points) Quality of Writing (5 points)		20	
<b>Subtotal</b>		<b>200</b>	
<b>Academic Judging – Project Proposal Total</b>			

Technical Presentation		25% of Overall Score	
School Name: _____ Canoe Name: _____		Possible Points	Score (whole numbers)
<b>Presenters</b> Preparation Level (10 points) Confidence/Voice Projection (6 points) Overall Demeanor (4 points)		20	
<b>Presentation</b> Quality of Audio/Visuals (10 points) Content (20 points) Professionalism (10 points)		40	
<b>Judges' Questions</b> Preparation/Expertise in Answers (20 points) Confidence Level (10 points) Conciseness of Answers (10 points)		40	
<b>Comments:</b>           			
<b>Subtotal</b>		100	
<b>Deductions:</b> A. Failure to observe time limit: A penalty shall be assessed when the official time exceeds 5 minutes 5 seconds (5:05). 15 units B. Sponsorship or commercialism violation: 15 units C. Less than two (2) speakers: 15 units D. Failure to adhere to live presentation format: No Presentation Points			
<b>Academic Judging - Technical Presentation Total</b>			

# FINAL PRODUCT PROTOTYPE SCORE CARD

Evaluation Sheet from Judge: \_\_\_\_\_

Enter a numeric value (whole numbers) in category and tally the total score.

	Name of School	Canoe Workmanship (0 to 25 Points)	Exterior and Interior Finish (0 to 25 Points)	Cross-Section Workmanship (0 to 15 Points)	Product Display (0 to 25 Points) <i>Required Items &amp; Overall</i>	Durability (0 to 10 Points) <i>*To be completed after Prelim Races*</i>	Total (100 pts. max)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							



## FINAL PRODUCT PROTOTYPE

Below are a list of descriptions, guidelines, and things to consider while judging the Final Product Prototype. Note that these are not to be thought of as an “all-inclusive list.” Ultimately, it is up to each individual judge to provide a score for each category and provide consistent scoring from school to school.

**Canoe Workmanship** – The intent of Canoe Workmanship is to evaluate the build quality of a canoe. Most items in this category are related to construction of the canoe itself. Some things to consider include, but are not limited to:

- \* are there noticeable cold joints in the concrete;
- \* the “lumpiness” of the concrete;
- \* the consistency of the wall thickness;
- \* the consistency of concrete color(s);
- \* the consistency of concrete materials (i.e. are there clumps of fibers visible, are there other areas the concrete was clearly not mixed well, etc.);
- \* is there is any cracking or micro-cracking;
- \* is any reinforcement mesh visible;
- \* if there is any concrete chipped off (either due to poor construction or mishandling of the finished canoe);
- \* are there any other general quality control issues

**Exterior and Interior Finish** – The intent of the Exterior and Interior Finish is to mostly evaluate the post-construction processes and general aesthetics. Some things to consider include, but are not limited to:

- \* the smoothness of the finish;
- \* if there are noticeable voids/ “bug holes” in the concrete;
- \* the intricacy of graphics;
- \* how ‘clean’ the edges of the graphics are;
- \* the execution of various techniques used for creating the aesthetics (i.e. colored concrete, sand blasting, 3-D elements, etc.);
- \* evaluation of the overall theme and how it fits with the aesthetics/graphics

**Cross-Section Workmanship** – The intent of the Cross-Section Workmanship is to evaluate how well the cross-section represents all the processes and materials used to fabricate the canoe. Some things to consider include, but are not limited to:

- \* is the cross-section full scale and is the mold shown
- \* is the cross-section representative of the construction process actually used;
- \* are all the layers of concrete shown and demonstrate the concrete casting process;
- \* are all the materials used shown (i.e. reinforcement, mold, graphics application, sealer, etc);
- \* are all the processes clearly labeled;
- \* if applicable, are there any components highlighting new or innovative processes;
- \* is the entire process from start to finish easy to follow

**Product Display** – The intent of the Product Display is to evaluate how creatively and effectively the display showcases the overall “big picture” of the entire canoe/cross-section/table display setup while incorporating all the required display items. Some things to consider include, but are not limited to:

- \* how the product display is organized and is it easy to find various components;
- \* are all the required sample items present and of representative size;
- \* are the items labeled and easy to read;
- \* if applicable, are there any components highlighting new or innovative processes;
- \* if there are more than the required items on the product display, do they help to provide insight to various tests or research performed during the project;
- \* are the product display, cross-section, and canoe stands effectively integrating the canoe theme
- \* is sustainability highlighted as relevant

**Durability** – ‘Surviving the rigors of the competition and races’ – See section 6.6 Durability and Repairs and Exhibit 10.

# PROJECT PROPOSAL DEDUCTION SCORE CARD

School: \_\_\_\_\_

Infraction	Deduction
	<i>(Circle those that apply)</i>
A. Use of plagiarized material	Disqualification
B. Project Proposal over specified number of pages ( _____ page(s)) x 10 units/page	_____ Units
C. <i>Project Proposal, Mix Design Sheets, or Materials Notebook</i> received after deadline	30 Units
D. Failure to submit a <i>Preliminary Project Schedule, Pre-Qualification Form, and/or Letter of Intent</i> by deadline	10 Units
<b>Total Deductions (Project Proposal)</b>	_____ Units

Please provide information on the infraction(s) being applied:

\_\_\_\_\_

Teams shall have until (day/time) \_\_\_\_\_ to either agree with the infractions listed above or to appeal the decision and provide supporting documentation.

## FOR TEAM CAPTAINS ONLY

- We agree with the infractions and deductions applied to the Project Proposal
- We wish to appeal the following infractions (*circle those that apply*):

A B C D

\_\_\_\_\_

Team Captain

\_\_\_\_\_

Team Captain

## FOR COMPETITION OFFICIAL USE ONLY

Upon review of the Appeal Form (and any supporting documentation) provided by the team captain:

- The deductions originally determined by the judges shall stand.
- The deductions for the following infractions shall be rescinded (*circle those that apply*):

A B C D

The total deduction for the Project Proposal is \_\_\_\_\_ Points.

\_\_\_\_\_ Head Judge

# FINAL PRODUCT PROTOTYPE DEDUCTION SCORE CARD

School: \_\_\_\_\_

Infraction	Deduction
	<i>(Circle those that apply)</i>
A. Canoe not built within current academic year; cannot race due to design or safety issues, or cannot complete preliminary sprint and endurance events	No Final Product Points
B. Reinforcement thickness exceeds 50% of canoe thickness	No Final Product Points
C. Use of Bondo®, epoxy, or similar materials for construction or repairs	No Final Product Points
D. Use of more than 3 concrete mixtures	No Final Product Points
E. Use of prohibited materials	No Final Product Points
F. Flotation not within 3 ft of bow and/or stern or flotation not encased in concrete	10 Units
G. Non-compliant or non-approved concrete mix, materials, admixtures, or finishing materials	15 Units
H. Reinforcement does not meet Percent Open Area requirements	15 Units
I. Product display does not adequately show design process (7.3.1)	5 Units
J. Product display does not include all required display components (7.3.4)	5 Units
 <u>Society-wide Only</u>	
K. Reported concrete oven dry unit weight compared to measured unit weight >5 lb/ft <sup>3</sup>	5 Units
L. Measured weight of canoe not within the max of ±10 lbs or ±5% of the reported weight	15 Units
M. School granted permission to repair / reconstruct canoe	25 / 50 Units
<b>Flotation Test:</b> PASS / FAIL	50 Units
<b>Nuisance Deduction:</b> If Deduction G is rescinded by MTDS resubmittal, this deduction line will apply	5 Units

**Total Deductions (Final Product Prototype)** \_\_\_\_\_ Units

Please provide information on the infraction(s) being applied:

\_\_\_\_\_

Teams shall have until (day/time) \_\_\_\_\_ to either agree with the infractions listed above or to appeal the decision and provide supportive documentation.

- We agree with the infractions and deductions applied to the Project Proposal
- We wish to appeal the following infractions (*circle those that apply*):  
A B C D E F G H I J K L M

\_\_\_\_\_  
**Team Captain**

\_\_\_\_\_  
**Team Captain**

Upon review of the Appeal Form (and any supporting documentation) provided by the team captain:

- The deductions originally determined by the judges shall stand.
- The deductions for the following infractions shall be rescinded (*circle those that apply*):

A B C D E F G H I J K L M The total deduction for the Final Product Prototype is \_\_\_\_\_ Points.

\_\_\_\_\_  
**Head Judge**

# REQUEST FOR CLARIFICATIONS AND APPEALS

**Instructions:** Completed forms must be submitted by a Team Captain to the Head Judge. Requests will not be considered once the competition has concluded. All decisions of the judges are final.

**School Name:** \_\_\_\_\_

**Team Captain(s):** \_\_\_\_\_

**Nature of Inquiry:**

- ( ) Project Proposal
- ( ) Technical Presentation
- ( ) Final Product Prototype
- ( ) Race Demonstration
- ( ) Other: \_\_\_\_\_

**Briefly Describe Nature of Inquiry or Appeal: (Continue on reverse side if more space is needed).**

**[Conference Only]** We formally request that the C4 member on-call be contacted in order to obtain an official interpretation or clarification regarding this matter.

**Rules & Regulations Section(s) Referenced:** \_\_\_\_\_

**Team Captain's Signature:** \_\_\_\_\_

**Team Captain's Signature:** \_\_\_\_\_