

**American Society of Civil Engineers/Master Builders, Inc.
National Concrete Canoe Competition**



2003 Rules and Regulations

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Introduction

ASCE Student Chapters and Clubs have been involved in constructing and racing concrete canoes on the local and regional level since the early 1970's. The first National Competition came to fruition in the summer of 1988 after almost two years of discussion between representatives from the American Society of Civil Engineers (ASCE) and Master Builders, Inc. (MBI).

The objectives of the National Competition are as follows:

- To provide civil engineering students an opportunity to gain hands-on, practical experience and leadership skills by working with concrete mix designs and project management.
- To increase awareness of the value and benefits of ASCE membership among civil engineering students and faculty in order to foster lifelong membership and participation in the Society.
- To build awareness of the versatility and durability of concrete as a construction material among civil engineering students, educators and practitioners, as well as the general public.
- To build awareness of concrete technology and application among civil engineering students, educators and practitioners, as well as the general concrete industry.
- To increase awareness among industry leaders, opinion makers and the general public of civil engineering as a dynamic and innovative profession essential to society.
- To generate and increase awareness of ASCE and MBI's commitment to civil engineering education among civil engineering students, educators and practitioners, as well as the general public.

While the intent of the competition is to learn and to create a forum for interaction both technically and socially, the students are a short step from being practicing engineers involved in projects that are critical to society's welfare. Hence, we shall expect professional conduct from all participants. In order to preserve the quality of this competition and to improve the quality of future competitions, we shall demand high standards, which shall be enforced under the Spirit of the Competition in Section I.O.

Each year the competition is held in a new location and hosted by an ASCE Student Chapter. The rules are modified from year to year to address concerns that have developed from the Regional and National Competitions. This year's rules have undergone significant changes, which are designed to challenge not only the students' engineering prowess but also their creativity. Please read the rules carefully.

The rules are divided into eleven sections; please review each section thoroughly.

Good luck, have fun and be safe! May the best team win!

I. General Rules and Eligibility Requirements

- A. A student team shall have qualified as a first place winner or designated alternate in conjunction with one of the twenty (20) nationwide ASCE Student Regional Conferences, as an international entry upon approval of the Committee on National Concrete Canoe Competitions (CNCCC), upon approval or protest acceptance by the CNCCC from a regional contestant, or as the host school of the National Competition. The host school for the National Competition has the choice of competing in the current year or delaying their entry until the next year.
- B. In order to earn an invitation to the National Concrete Canoe Competition (NCCC), a student team shall qualify through participation in a Regional Concrete Canoe Competition. There must be at least three eligible Student Chapters/Clubs participating in the concrete canoe races in order to constitute a qualified Regional Concrete Canoe Competition. If a school's Region does not have a Regional Concrete Canoe Competition, that school shall qualify in a competition in another Region as designated by the school's Regional Conference Host School. There must be at least three eligible Student Chapters participating in order to constitute a qualified Regional Concrete Canoe Competition. School(s) participating as visiting teams in another Region must earn the equivalent of second or better in the overall competition to be invited to attend the National Competition. The points for the visiting team shall be tallied separately and the visiting team shall not displace the winner, or second place team if eligible, of the Host Regional Competition. A school cannot qualify for the National Competition in more than one Region. Only one team from any given university can qualify for the National Competition.
- C. If any of the top five placed teams from the previous year's National Competition qualify for the current year's National Competition, the second place team from the respective Region will be invited to attend.
- D. Teams interested in participating in the ASCE/MBT National Concrete Canoe Competition as international entries must contact CNCCC via the Student Services Department of ASCE (703-295-6000) by March 1st of the competition year. International teams shall submit a brief proposal discussing the skills, abilities, and accomplishments of the team and documenting that the team has already or is capable of competing in all facets of the competition (paper, display, oral presentation, final product, races). Final approval or denial will be issued upon review of the proposal.
- E. ASCE Student Chapters or Clubs cannot qualify for the National Competition if on probation or suspension (i.e. Annual Report and/or Annual Dues not received at Headquarters by May 15th of the competition year).
- F. A team shall register up to five (5) male and five (5) female participants. These registered participants are the only persons eligible to present or answer questions for the oral presentation or compete in the races. Substitutions of registered participants will be allowed up to the time of on-site registration. No substitutions shall be permitted after on-site registration. There shall be no limit to the number of support personnel permitted

to prepare the design report, oral presentation, and assist at the races. Each team shall designate two (2) of the ten (10) registered participants to act as team captains. Only team captains are eligible to file protests on behalf of the school.

- G. All students are encouraged to participate in their school's canoe project (concrete and materials design and testing, canoe design and construction, design paper, fundraising, presentation, etc.), including canoe competitions.

Registered participants at regional and national competitions shall be undergraduate engineering students during the academic year in which the canoe was constructed, be members of an ASCE Student Chapter or Club in good standing and have contributed to the design and construction of the canoe. Registered participants are required to be National Student Members of ASCE in order to participate at the National Competition. ASCE student membership numbers shall be required upon registration. Registered participation shall not exceed 3 years (consecutive or non-consecutive). There are no term limits for participation in other roles.

- H. For publicity purposes, ASCE and/or Master Builders may use any or all canoes, papers, and displays entered in the National Competition for a period of one year from the date of the competition. All associated transportation costs, etc. shall be paid for by ASCE and/or Master Builders.

- I. As sole corporate sponsor of the National Concrete Canoe Competition, Master Builders, Inc. is committed to providing concrete mix design and material assistance to all competitors. Student Chapters/Clubs are encouraged to contact the Master Builder, Inc. Technical Information Group at 1-800-MBT- 9990 to request admixture samples and/or mix design assistance from a local Master Builders, Inc. sales or engineering services representative. Students are also encouraged to visit the Master Builders' home page (<http://www.masterbuilders.com>) for product information.

- J. Use of trade and company names for services, products, and intellectual property shall be permitted for informational purposes. Sponsorship recognition shall be limited to T-shirts or other apparel.

- K. Questions regarding national race qualifying procedures, etc. should be directed to the Student Services Department of ASCE via email (student@asce.org) or phone 1-800-548-ASCE or 703-295-6000.

- L. Questions regarding rule interpretations prior to the National Competition should be directed via email to the CNCCC (cnccc@ermail.asce.org). Responses may take up to two weeks. Questions along with their official responses will be broadcast to the NCCC list server unless a specific request is made for privacy. Private questions will be published in a generic format so as to keep private any specific innovative use of materials or ideas. Teams are strongly encouraged to contact the CNCCC to avoid misinterpretation of rules at the Regional Competitions. Please note that only questions directed to cnccc@ermail.asce.org will receive an official response from the CNCCC. The cut-off for submitting a question to the CNCCC is February 15. All questions (except private) and official responses will be accumulated and published to the Canoe

list server in an FAQ document by the CNCCC on November 1 and March 1 during the academic year.

The NCCC list server is available as a forum for general questions and answers for anyone to use. Students are required to subscribe to the list server as teams are responsible for all information provided in the rules, the general questions and answers [from the list server], and information given at competitions from the date of the release of the information. Students may join the canoe@ftl.com <mail to:canoe@ftl.com> list server by sending an email to majordomo@ftl.com with a body of “subscribe canoe” or “subscribe canoe <your email address>”. For more information, send an email to majordomo@ftl.com with a body of “HELP”.

- M. General information on the concrete canoe competition as well as registration information for the National Concrete Canoe Competition each spring is located on the ASCE website (http://www.asce.org/inside/stud_chapacts.cfm). Students shall be responsible for registration materials and technical paper submittal deadlines published on these websites.
- N. It is the responsibility of the participating schools to remove their entire canoe and any associated debris from the host school site after the competition. The host school has the option to remove any remaining canoe debris from the site and bill the responsible school.
- O. Under the Spirit of the Competition, the Judges and/or CNCCC 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 of team members or persons associated with a team. The judges 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.
- P. Every effort shall be made to resolve protests at the Regional level with direct assistance from the CSA Representative or through contact with the CNCCC. In the event a legitimate appeal situation does occur, an Appeal Application shall be requested from ASCE, shall be signed by the Faculty Advisor prior to submittal, and shall be submitted and received by ASCE within **one week** of the Regional Competition. The form shall be submitted to ASCE for consideration by the CNCCC. Sponsorship is not provided for any team(s) that may be attending based on an appeal.

II. Design and Construction Requirements

A. The Canoe

1. From herein the term “canoe” shall be defined as a watercraft designed for paddlers using single-blade paddles.
2. The canoe shall be built within the current academic year of the National Competition. The same canoe shall be used at both the Regional and National Competitions. In the event that the qualifying canoe is damaged between the Regional and National Competitions, the Chapter/Club may patch, repair, and refinish the canoe. For repairs that violate any rule, an Accident Report must be signed by the Faculty Advisor and be received by the CNCCC within one week of the Regional Competition. Requests for Accident Reports shall be made via email to the CNCCC. In the event the qualifying canoe is destroyed, the Chapter/Club may rebuild the canoe upon submission of an Accident Report (signed by the Faculty Advisor and received by the CNCCC within one week of the Regional Competition) for verification of catastrophic damage. In either case, the resulting canoe shall be of the same design, material, proportions, and performance characteristics, or the Chapter/Club shall forfeit to the designated alternate Chapter or Club within their Regional Conference. No new flotation shall be allowed between the Regional and National Competitions without point deduction.
3. A full-scale cutaway section not less than three feet in length, representative of both the raw and finished canoe shall be judged as part of the final product. This typical cutaway section shall demonstrate the forming, casting, finishing, and reinforcement techniques used to construct the canoe.
4. Fixed paddler restraints, such as straps, seatbelts, Velcro, 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 shall prohibit the use of any paddler restraints if, in their judgment, safety is an issue.
5. Use of structural elements (ribs, gunwales, thwarts, and bulkheads) shall be permitted as long as they do not impede paddlers from exiting the canoe.
6. All concrete, regardless of density, shall comply with Sections II.C.1 through II.C.4. All material not part of a concrete mixture shall be classified as reinforcing material and shall comply with Sections II.C.5.
7. Structural elements shall be constructed of a reinforced concrete as defined in Section II.C. The reinforcement used in structural elements must comply with the thickness (Section II.C.5.c) and Ottawa test (Section II.C.5.b) rules.

8. The gunwale shall be finished in such a way as to prevent injury to the paddlers (i.e. no exposed reinforcing or sharp edges). Gunwale caps or coverings that are not cast as an integral part of the original canoe shall not introduce a structural element to the canoe. Exterior gunwale caps that could provide any element of rigidity (e.g., wood strips, plastic channels, or other rigid materials) shall be cut into sections no longer than 2 feet each. Typical pipe insulation foam used as gunwale protection shall be permitted and is not considered as providing rigidity.
9. All canoe components and external protrusion(s) shall be made of the same materials as the hull.
10. The canoe shall float horizontally when filled with water and shall be certified as such before entering any race.
11. Externally applied flotation materials shall be permitted, shall not be permanent, and if required for to pass the flotation test, shall be present in their respective locations in the canoe during final product aesthetics judging.
12. For the purpose of identifying canoes during racing events, students shall supply a removable flag between 10 and 12" wide and 18 to 20" long. The flag need not be rectangular and may feature any colors or designs. The flag shall be mounted to a 23 to 24" long 1/2" diameter, hardwood dowel rod that fits into a vertical hole 5" to 6" deep located between 5" and 6" from the most rearward point on the canoe. The flag shall be located in this position during racing events.

B. Materials

1. Binders:
 - a. Binders are defined as cementing materials, either hydrated cements or products of cement or lime and reactive siliceous materials; also, materials such as asphalt, resins, and other high molecular-weight polymers and materials which bind the matrix of concretes, mortars, and sanded grouts. Binders include, but are not limited to, hydraulic cements, pozzolans (such as fly ash, silica fume, blast furnace slag, and metakaolin), resins (such as acrylic, phenolic, and polystyrene resins), and polymers in latex form. Curing agents (i.e., hardeners/catalysts) that are required for use by resins shall be considered as binders
 - b. The weight of a binding material is defined as the weight of the non-water portion of the binder(s) and therefore does not include mix water, slurry water, or water serving as the dispersing medium of an emulsion.
 - c. A minimum of 70% (by weight) of the binding material of all concrete mixtures used in the canoe shall be Portland cement of Type I, Type II, Type III, or a combination of these types as defined by the latest version of ASTM

C 150 'Standard Specification for Portland Cement'. Cement shall be reacted with water to form a binding material.

- d. A minimum of 20% (by weight) of the binding material of all concrete mixtures used in the canoe shall be a Class F fly ash, a Class C fly ash, or a combination of the two classes of fly ash as defined by the latest version of ASTM C618 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.'
- e. If the only binding materials are a combination of Portland cement, fly ash, microsilica, and slag, there is no minimum ratio of water to binding materials. If other binding materials are used, the minimum ratio of water to Portland cement shall be 0.24.

2. Aggregates:

A minimum of 15% by volume of the aggregate particles is to consist of "Graded Sand" as defined in the latest version of ASTM C778 'Standard Specification for Standard Sand.'" The volume of the aggregate particles herein referred to includes the volume of the particles and their permeable and impermeable voids but does not include the volume of the voids between particles. (See ASTM C127)

3. Concrete:

- a. Pre-packaged or pre-mixed concrete, mortar, or grout is not permitted.
- b. The proportions of each mixture of concrete used in building and repairing the canoe shall be summarized in a copy of Table II.C.1, and shall be included in the final pages of the report.

4. Filler and Patching Materials:

Filler and patching material shall be a Portland cement based concrete, meeting the requirements of Section II.C.1-3. Bondo or similar materials are not permitted. Tape or an epoxy-based repair shall only be used, if required, during the competition.

5. Reinforcing:

- a. Solid mats or plates for reinforcing are not permitted. Solid mats and plates are described as reinforcing materials that require additional bonding agents or post-manufacturer perforations to keep the reinforcement from delaminating from the concrete composite (i.e., there is a lack of open space between the reinforcement sufficient for mechanical bonding to the concrete composite).
- b. Students shall be prepared and able to demonstrate reinforcement acceptance to the judges. A 102 by 203 mm (4" by 8") cylinder mold shall be filled with one cup of "Graded Standard Sand" as described in ASTM C 778 (Ottawa

sand). The reinforcement shall be placed over the cylinder in the same configuration (layers, layer orientation, and spacing) that will be used in the canoe. When the cylinder is inverted, the sand shall take less than five (5) seconds to pass through the reinforcement scheme. Any used combination and single layer of reinforcement must comply.

- c. The thickness of a layer of reinforcing is defined as follows: a single layer of the reinforcing is to be placed on a flat surface, a piece of plate glass, 6 mm (~1/4") or thinner, is to be placed on the reinforcing, the distance from the bottom of the plate to the top of the supporting flat surface is the thickness of a single layer. When subjected to the weight of the glass alone, the sum of all such measured thickness divided by the total thickness of the canoe wall (prior to painting) at any point in the canoe shall not exceed 50%. These measurements and calculations shall be presented to the judges upon request. All canoe elements, including but not limited to walls, ribs, gunwales, thwarts, bulkheads, are subject to this rule. If individual rods or reinforcing bars are used in such a way that they cross each other, this use constitutes at least two layers of reinforcing.
- d. All reinforcement shall be covered in concrete.

TABLE II.C.1—SUMMARY OF MIXTURE PROPORTIONS

MIXTURE DESIGNATION: _____

AIR AND CEMENTITIOUS MATERIALS				
Component	Quantity (whether base or batch)			Units
air content by volume of concrete			<i>AIR</i>	%
cement (plain),	ASTM Type:			<i>c</i> : kg/m ³
other cementitious material 1*	Description:			<i>m</i> ₁ : kg/m ³
other cementitious material 2*	Description:			<i>m</i> ₂ : kg/m ³
other cementitious material 3*	Description:			<i>m</i> ₃ : kg/m ³
other cementitious material 4*	Description:			<i>m</i> ₄ : kg/m ³
mass of all cementitious materials	<i>cm</i> :			kg/m ³
cement to cementitious materials ratio	<i>c/cm</i> :			
AGGREGATES				
Aggregates	Base Quantity (SSD aggregates) (kg/m ³)	ASTM C127 <i>BSG (SSD)</i> (unitless)	Agg. Volume (m ³)	Batch Quantity (At stock moisture content) kg/m ³
1.	<i>W</i> _{SSD,1} :			<i>W</i> _{stk,1} :
2.	<i>W</i> _{SSD,2} :			<i>W</i> _{stk,2} :
3.	<i>W</i> _{SSD,3} :			<i>W</i> _{stk,3} :
4.	<i>W</i> _{SSD,4} :			<i>W</i> _{stk,4} :
Combined	<i>W</i> _{SSD,agg} :			<i>W</i> _{stk,agg} :
WATER				
water †	<i>W</i> :		<i>w</i> _{batch} :	kg/m ³
vol. of admixture #1	<i>x</i> ₁ :			ml/m ³
vol. of admixture #2	<i>x</i> ₂ :			ml/m ³
vol. of admixture #3	<i>x</i> ₃ :			ml/m ³
vol. of admixture #4	<i>x</i> ₄ :			ml/m ³
water from admixture #1			<i>w</i> _{adm,1} :	kg/m ³
water from admixture #2			<i>w</i> _{adm,2} :	kg/m ³
water from admixture #3			<i>w</i> _{adm,3} :	kg/m ³
water from admixture #4			<i>w</i> _{adm,4} :	kg/m ³
total of free (surplus) water from all aggregates			$\sum w_{free}$:	kg/m ³
total water	<i>w</i> :		<i>w</i> : ‡	kg/m ³
concrete density §				kg/m ³
water to cement ratio	<i>w/c</i> :			
water to cementitious material	<i>w/cm</i> :			

* If the binder comes from the manufacturer mixed with water, include only the weight of the binder here.

† 1st column is used for the desired total water, the 2nd column is for water added directly to batch

‡ *w* in this column = *w*_{batch} + *w*_{adm,1} + *w*_{adm,2} + *w*_{adm,3} + *w*_{adm,4}. This value should match the value for *w* in the previous column.

§ The sum of items in rows (1), (2), and (3)

TERMS AND FORMULAS FOR TABLE II.C.1

A = absorption of an aggregate, whether taken as a whole, the coarse, or the fine aggregate, %.

MC_{total} = total moisture content referenced to the oven-dried condition of the aggregate, %.

MC_{free} = free moisture content, referenced to the saturated, surface-dry condition, of the aggregate, %.

W_{SSD} = mass, in the saturated, surface-dry condition, of aggregate per unit volume of concrete, kg/m^3 .

W_{stk} = mass, in the stock moisture condition, of the aggregate per unit volume of concrete, kg/m^3 .

w_{batch} = the mass of water to be batched per unit volume of concrete when the aggregates are in a stock moisture condition, kg/m^3 .

w_{free} = free water carried into the batch by a wet per unit volume of concrete, kg/m^3 .

Each one of these formulas should be applied to each aggregate source:

$$A = \frac{W_{ssd} - W_{od}}{W_{od}} \times 100\%$$

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

$$MC_{free} = \frac{MC_{total} - A}{\left(1 + \frac{A}{100\%}\right)}$$

$$W_{SSD} = \left(1 + \frac{A}{100\%}\right) * W_{OD}$$

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

Note that w_{free} can be a negative number indicating a dry and absorptive aggregate.

$$W_{stk} = W_{SSD} + w_{free}$$

Then, for the mixture as a whole: $w_{batch} = w - \left(w_{free,agg} + \sum w_{adm}x\right)$

D. Finishing

1. The school name (no initials) shall be prominently displayed on the exterior of the canoe, above the waterline, on both sides, with letters 4" +/- 1/4" high. If the complete name of the college or university is 31 characters or more (including all letters and spaces between words), the name may be abbreviated. The abbreviated name must still clearly indicate the specific college or university competing, and as applicable include state or city.
2. Graphics such as logos, symbols, etc. created using concrete coloring agents and pigments within the concrete mix design shall not be limited in dimension or frequency.
3. The use of paint and adhesive appliqué (except as stated in II.E.4) shall be limited to the following:
 - a. letters used for school name
 - b. a maximum of three graphics
 - no more than two shall fit within a circle of 12" diameter
 - no more than one shall fit within a circle of 24" diameter
4. A clear penetrating sealer may be applied to the exterior of the canoe only. Any sealer applied to the canoe must not add strength to the canoe and must meet the following requirements: less than 10% solids, less than 10% VOC's, clear in color, non-epoxy based. Under no circumstances will it be acceptable to apply any finish coating to the interior portion of the hull except as permitted by rule II.D.3.

E. Equipment

1. Coast Guard approved life jackets shall be required for all paddlers at all times during the competition. Wet suit buoyancy pads shall not be used as a substitute for the Coast Guard approved life jacket.
2. Canoes shall be paddled and not rowed. Paddles shall be single-bladed and may be straight bladed or bent.
3. Seats shall not be permanent and dimensions shall not exceed 12" (h) x 12" (w) x 40" (l).
4. The use of non-skid tape or other slip resistant material shall be permitted.
5. Spray skirts are not permitted.

F. Safety

1. It is the responsibility of all participants to be knowledgeable of Occupational Safety and Health Administration (OSHA) policies. See www.osha.gov for more information.
2. It is the responsibility of all participants to know about the materials with which they are working. (See the “laboratories” and “Hazard Communication” Safety and Health Topics at www.osha.gov.) Participants should obtain and read material safety data sheets (MSDS) for each material with which they will be working.
3. MSDS for each material used in the construction of the canoe shall be available to judges upon request during aesthetics judging.
4. It is the responsibility of all participants to work in a safe manner in a safe workplace environment. (See the “Construction: Concrete and Masonry,” “Personal Protective Equipment,” and “Ventilation” Safety and Health Topics at www.osha.gov. Also see the “Silicosis Fact Sheet for Construction Workers” at www.osha.gov.)

III. Academic Requirements

A. Design Paper

1. Except for the design drawing pages, the design paper shall be presented on 8 ½” by 11” pages in portrait orientation. Pages shall maintain a minimum of 1” margins on all sides. Body text shall be in English and use 10- or 12-point, normal width, Times New Roman or Arial font. Section headings and subheadings shall be considered part of the body text, shall adhere to the margin requirements and may be of any font type or size.
2. The report shall consist of a report cover, a certification statement, single-sided pages for the body, and a back cover page. Body pages shall be numbered and begin with the number one (1). The design drawing pages shall be presented on 11” by 17” pages in landscape orientation and be folded to fit within the report.
3. Photographs, tables, line drawings, graphs, headers, and footers shall be permitted and shall be counted as part of the page limit defined herein. These items shall be restricted to the margin and body text described herein. Material on the covers and certification page may not be referred to in the body pages.
4. Only the body pages will be used for scoring. There is no requirement to fill a page. The optimum balance between being thorough and being concise is desired.
5. The reports must adhere to the following format, and the following must be included at a minimum:
 - a. **Cover Page**
 - b. **Compliance Certification:** Each report shall contain a certification statement, signed by each of the ten (10) registered participants, stating at a minimum that 1) the construction of the canoe has been performed in complete compliance with the rules and regulations of the National Competition; 2) the ten (10) registered participants to be registered at the National Competition are qualified student members and National Student Members of ASCE as specified in the rules and regulations of the National Competition; and 3) the canoe has been completely built within the current academic year of the competition.
 - c. **Analysis (page 1):** Present the method(s) of analysis used to determine the structural and material design requirements. Include quantitative results from your analysis of forces, stresses, etc. Describe loading cases, support conditions, assumptions, and analysis tools used. Include the material property values for the concrete, reinforcement and composite that must be achieved according to your structural analysis. If applicable,

discuss how requirements for bulkheads, thwarts or other structural elements are determined. The description of, and reasons for the selected hull geometry (rocker, chine, shape, etc.) shall not be provided unless it is necessary to understand the loading, support, and modeling analysis.

- d. **Development & Testing (page 2):** Present concrete and reinforcement materials considered, tested, and actually used in the construction of the canoe. Describe the method(s) used for testing. Use and refer to standard test methods where possible. Describe the initial (e.g. the baseline) concrete and reinforcement materials considered and why. Include quantitative test results from this baseline. If this is not the final mix and reinforcement used in the construction of the canoe, discuss the adjustments in material types and proportions considered and why. Describe the iterative process of going from your baseline to achieving the desired material and composite properties. Include the final concrete, reinforcement and composite test results. Compare the final material properties and proportions to the design specifications determined from your analysis presented on page one of this report.
- e. **Project Management & Construction (page 3):** Present the method(s) of project management and of construction used. List major milestone activities and how these were achieved. Compare the planned dates with the actual dates for these major milestone activities and discuss the variances (if any). Present critical path activities and describe how this critical path was determined. Describe the organizational structure of project team and why this structure was chosen. Describe the process used for form material selection, form construction, placement of concrete and reinforcement, form removal and concrete finishing. Include drawings and bill of materials for the construction of the form and the canoe.
 - 1) **Schedule (page 4):** Include a project schedule with all major activities and milestones and clearly denote all activities on the Critical Path.
 - 2) **Organization Chart (page 5):** Include a project team organization chart with team member names, role(s), tasks, or areas in which they made contributions at any time during the project.
 - 3) **Design Drawings with Bill of Materials (pages 6 and 7):** Include one design drawing and bill of materials for the form and another for the hull, each on an 11"x17" sheet of paper folded to fit within the report. (Examples are given in Figures III.A.5.a and III.A.5.b. The title block and bill of materials can differ in appearance as long as they are in a standard engineering format.

- Page six (6) – The drawing shall show elevation, plan, and typical cross-section views of the form or formwork with dimensions and other detail as desired. A bill of materials listing all material quantities used to construct the form shall also be displayed on this page.
 - Page seven (7) - The drawing shall show elevation, plan, and typical cross-section views of the hull with dimensions and other detail as desired. If a bulkhead, thwart, rib or similar structural element is used the cross-section shall be at a location with the structural element present. Show hull thickness, reinforcement, concrete, spacing, and connections. A bill of materials listing all material quantities used to construct the hull shall also be displayed on this page.
- f. **Mixture Proportions (page 8+):** Include one page (Table II.C.1 - Summary of Mixture Proportions) for each final concrete mixture(s) used.
- g. **Back Cover:** This page shall be left blank.
6. For the National Competition, each school shall provide twelve (12) bound copies, and one (1) unbound copy of the report such that it must be received by the date specified in the registration materials as published on the Master Builders, Inc. home page. The schools receiving the five highest scores in the design paper at the National Competition shall provide an electronic copy of their papers in PDF format after the competition has taken place.
7. Scoring for each of the four major sections (III.A.5.c – III.A.5.f) comprising the body of the report shall be based on the criteria in Section VII.A.
8. All papers shall become the property of ASCE and Master Builders and may be used for publication and/or distribution.

B. Oral Presentation

1. An oral presentation (maximum of 5 minutes) shall be required for each participating school. Oral presentations shall be presented in English. An additional seven (7) minute period shall be permitted for judges' questions immediately following the oral presentation. The time required to set up and break down equipment shall not exceed four (4) additional minutes for each school.
2. A fifteen (15) point penalty shall be assessed when the official time exceeds 5 minutes 5 seconds (5:05) per the official timer's clock during the oral presentation. Additional fifteen (15) point deductions shall be assessed for each minute or fraction thereof the presentation extends beyond the five-minute allocation, i.e., at 6:00 minutes, 7:00 minutes, etc.
3. Presenters may be any of the ten (10) registered participants who officially sign-in at registration. 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 judges as part of the oral presentation. All team members participating in the presentation shall be on stage and available for judge's questions.
4. The host school shall provide two (2) grounded power plugs, two (2) projector screens, and a computer projection unit for general use during the oral presentation. The host school shall provide a stage diagram two weeks prior to the competition. Access to the staging area may be limited. The ability to use props may be limited by this restricted access. The individual school making a presentation shall furnish any additional equipment necessary.

C. Final Product

1. The final product and cross section shall be consistent with the design report and oral presentation.
2. Final product assessment consists of assigning a score to the canoe based on its aesthetic appeal and its durability.
3. Aesthetics
 - a. For aesthetics judging, all canoes will be assembled in a common area. Each team shall bring its canoe cross-section and display it with the canoe at this time. Teams will also be required to bring their seats to the final product judging for measurement check.
 - b. Canoes shall be displayed on display stands designed to support the canoe at a clear height of 2.5 to 4 feet below the canoe. No lighting, sound, or canopies shall be permitted.

- c. Addition of non-skid tape or other permissible slip resistant, block, pad, or cushion attachment material shall be permitted at any time during the competition and may be applied before or after aesthetics judging.
- d. Prior to aesthetics judging, each team captain will receive a rating sheet that lists each canoe in the competition with the numbers 1 through 10 to the right of each canoe name. Each team will use this sheet to record their assessment (e.g. a value between 1 and 10) of each canoe's aesthetic appeal. A team shall not rate its own canoe.
- e. Subject to Rules III.C.3.f and III.C.3.g, each team will decide for itself what the criteria is for aesthetic appeal and how the team will arrive at a rating for any particular canoe. Each team will then assess a value from 1 (least appealing) to 10 (most appealing) by circling the appropriate number. Intermediate values, such as 6.5, are not allowed on student score sheets. Completed sheets are then to be turned in to the appropriate competition official at the end of aesthetics judging.
- f. Any attempt to influence the votes of other teams is not allowed and is cause for disqualification and immediate dismissal from the event. Judges decisions regarding this are final and may not be appealed.
- g. Teams are to assess canoes for aesthetics based on aesthetic appeal of the canoe only. Criteria may include but are not limited to surface finish, hull design, quality of materials, quality of workmanship, aesthetics, innovation, and name selection. Canoe cross-sections, stands, seats, or flags are not to be included in the team assessment
- h. Each judge will also receive a rating sheet and will also decide for her/himself what constitutes an appealing canoe and assess accordingly. Intermediate values, such as 6.5, are allowed on the judges' score sheets.
- i. For each canoe in the competition, there will be one aesthetics score from each judge and one combined averaged score from the students. The score from the students shall be calculated as the average of all team assessments submitted by the team captains for each entry. See Section VI for more on scoring of aesthetics.

4. Durability

- a. Durability will be assessed after all canoes have been subjected to the same number and type of races. Normally, this will occur after the slalom/endurance races and all preliminary heats of the sprint events are complete, and before the final heats of the sprint events.

- b. Canoes should be tough enough to survive the rigors of the regional competition, the national competition, and transport. Use of tape or other repair materials during competition shall be permitted.
- c. At the time of durability assessment, each judge will assign a durability value to each canoe according to the following criteria. Intermediate values, such as 2.3, are allowed. See Section VI for more on scoring of durability.

Durability Value	Rationale
1	The canoe is badly damaged and without repair materials could not be raced in a future event.
2	Significant, widespread cracking has occurred and there may also be holes in the canoe. Without tape or other repair materials, leaking would be substantial enough to require bailing in order to finish the event. Tape and other repair materials are also providing structural strength to the canoe. Cracking and other damage is significant enough that structural integrity has been compromised: the canoe or some canoe elements are significantly more flexible than before.
3	The canoe exhibits significant cracking but the canoe is still sound structurally and any leaking that occurs in future races is unlikely to be significant enough to require bailing during a race.
4	There is light cracking in the canoe, but the canoe is structurally sound and unlikely to leak significantly.
5	The canoe exhibits no evidence of cracking or distress due to racing and transport.

- d. Damage occurring to canoes due to collision with other canoes or due to other circumstances beyond the students' control may or may not be considered by the judges during durability assessment. In the event of such damage, the school shall file an accident report prior to the durability judging.

IV. Race Rules & Regulations

A. General Rules

1. Five (5) races shall be held: women's slalom/endurance (2 women), men's slalom/endurance (2 men), women's sprint (2 women), men's sprint (2 men), co-ed sprint (2 men and 2 women).
 - a. Schools shall use the same team members in both the preliminary and final heats of any particular race.
 - b. In the event that a paddler is injured prior to a preliminary race, a substitution may be made. Such a substitute paddler shall be one of the original five (5) of the same gender registered on the team.
 - 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. However, this person or these persons shall not be allowed to paddle. Substitute paddlers shall be one of the original five (5) of the same gender registered on the team.
 - d. In the event that a team cannot field the proper number of paddlers of the required gender, substitute passengers of opposite gender shall be allowed, but these substitutes shall not be allowed to paddle. Substitute passengers shall be of the team's registered participants.
2. Presentation order, lane position and heat assignments shall be randomly selected before the competition begins and shall be provided at registration. Course and turn directions shall be announced as soon as they can be determined by the course layout and site conditions.
3. Canoes competing in the distance races shall compete against the clock in a timed single event. All other races shall include timed preliminaries, a grand final and a petite final based on the top ten qualifying times from the preliminaries. Points shall be awarded based on the finish times in the finals. In the event that 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. If a grand or petite final entry becomes disqualified, scratched, or cannot finish the final, all positions below that finisher shall move up one place in the ranking. This includes the next highest qualifier from the preliminaries.
4. Commonly accepted rules of sportsmanship shall prevail. Any canoe willfully interfering with the performance of any other canoe or participant in a race shall be automatically disqualified from that event.

5. If interference occurs, a team captain may protest to the CNCCC. The CNCCC will then present the information to the judges who:
 - a) Shall disqualify a team that has willfully interfered with another.
 - b) Shall disqualify any canoe that willfully fails to adhere to course boundaries resulting in interference with another canoe.
 - c) Shall 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 10 minutes.
6. Requests for rule interpretations and/or protests during the National Competition shall be presented to the CNCCC by the designated team captain(s). Such request or protest must be lodged before the start of the next heat or in the case of the distance races, before the next three canoes finish the race. Protests shall be made by a team captain as defined in Section I.F. The CNCCC's and the judges' decisions concerning all aspects of the race and judging shall be final.
7. Spectators interfering with the performance of contestants shall be asked to leave and may cause the disqualification of affiliated contestants.
8. Contestants or spectators interfering with the performance of the competition, judges ruling, or protests, may cause the disqualification of the affiliated school.

B. Safety

1. **A powered rescue boat shall be on the water during all the races. If a powered rescue boat is not available, the races shall not take place.**
2. 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.
3. All canoes shall be able to pass a flotation test before entry in any race. The canoe shall float when filled with water; otherwise, it shall not be permitted to compete. If flotation materials are necessary to pass the flotation test, the canoe shall contain these same flotation materials during the race.
4. Paddlers shall wear US Coast Guard-approved life jackets at all times while in a canoe during competition and/or practice.

5. There shall be strict enforcement of racing etiquette by the CNCCC and the judges. Any use of paddles to strike at an opponent's canoe, or at any person, shall cause the disqualification of the offending team from the event. Good sportsmanship, cooperation, fellowship, and the spirit of competition shall be strictly adhered to.
6. Containers or objects not required for canoe operations shall not be permitted in canoes. Spare paddles are permitted.
7. All paddlers shall be competent swimmers.
8. A safety director shall be located in a strategic position 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 of the safety rules.
9. All materials used to coat the exterior of the canoe prior to racing shall be environmentally safe. The materials data sheet for any exterior coatings shall be made available to competition officials upon request.

C. Race Course

1. The slalom/endurance course shall consist of the following subject to site conditions:
 - a. A total of 600 meters in distance with a minimum of two (2) turns.
 - b. At regional 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.
 - c. At the National Competition the CNCCC reserves the right to modify the location and layout of the slalom portion of the course.
2. A sprint course shall consist of the following subject to site conditions:
 - a. Straight course 100 meters out, a 180 degree turn, and 100 meters back.
 - b. Lanes shall be no narrower than 15 meters.
3. The bow of the canoe shall remain the bow of the canoe throughout each race in consideration of a successful negotiation of a turn or finish buoy.
4. The race course lanes shall be marked by different colored buoys. See Figure IV.C.1 and Figure IV.C.2 for recommended course layouts subject to site specific conditions and limitations.

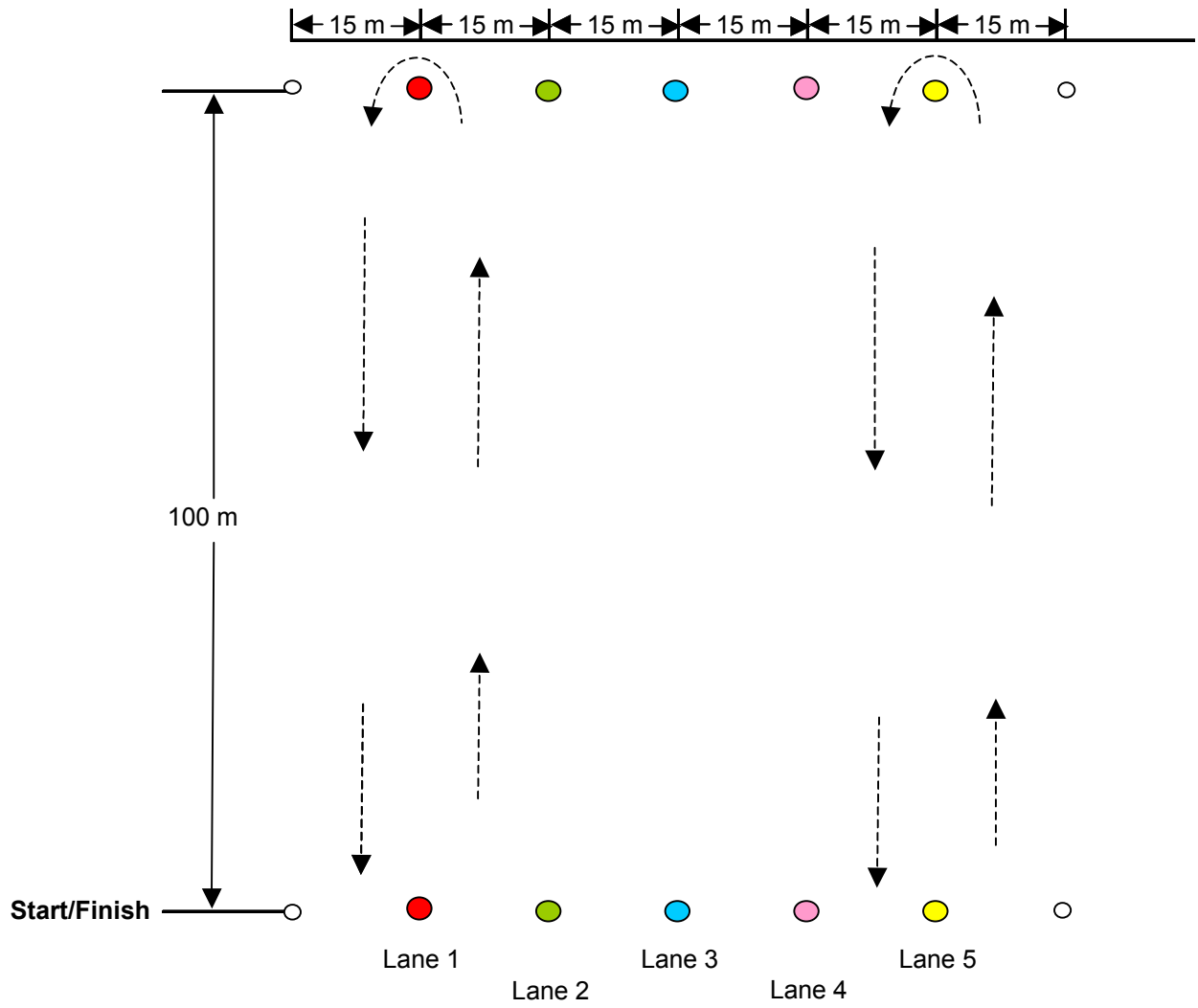


Figure IV.C.1
Sprint Race Course Layout

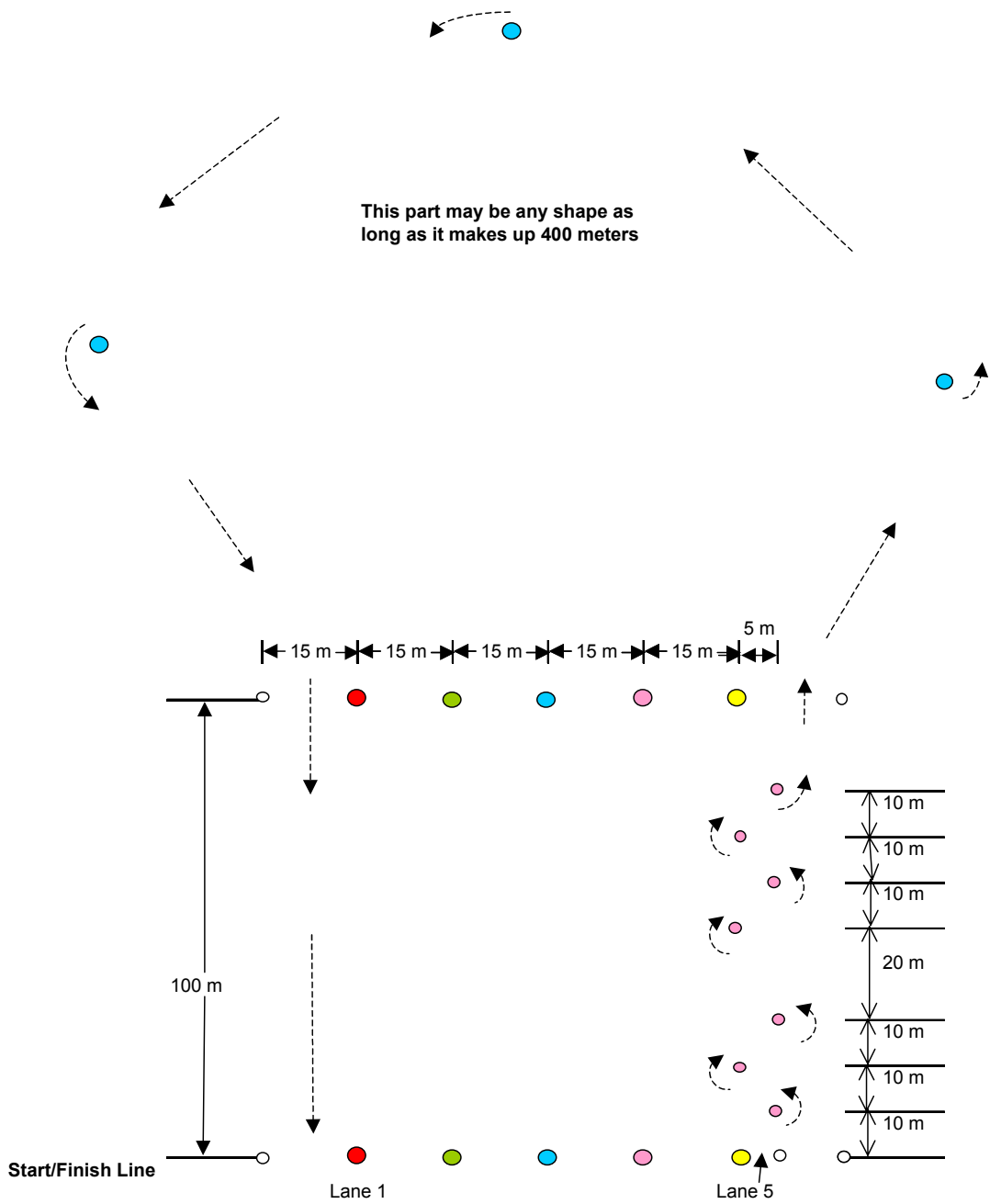


Figure IV.C.2
Slalom/Endurance Race Course Layout

D. Race Penalties

1. A canoe's time shall not be considered final until all buoys have been properly negotiated or the corresponding penalty has been assessed as defined below:
 - a. A canoe that crosses the finish line in the wrong lane shall be assessed a 30 second time penalty for that particular event.
 - b. A canoe that misses one or more slalom buoys may renegotiate the buoy or be assessed a 1 minute time penalty per buoy missed.
 - c. 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.
 - d. With the exception of the allowance to renegotiate the slalom buoy or accept a time penalty, all other turn buoys must be properly negotiated or the school shall be disqualified for that particular event. Teams must properly negotiate all turn buoys in the endurance race. A sprint turn must be negotiated within the assigned lane.
 - e. For a canoe to successfully finish a given race, the bow of the canoe must cross the finish line with the same number of paddlers (in or touching the canoe) with which the race began.
 - f. Paddlers shall remain in the boat or touching the boat throughout the race. Safety officials reserve the right to use their best judgment to remove a swamped canoe and paddlers from the race course if the situation warrants.

V. National Qualifying Rules

To maintain the competition of the event in addition to creating a more uniform system for national qualification, it shall be mandatory that the Regional Competitions adopt and comply with the following sections of the 2002 National Rules.

- A. Section I: General Rules and Eligibility Requirements; All except A - E, H.
- B. Section II: Design and Construction Requirements; All.
- C. Section III: Academic Requirements; All except A.10.
- D. Section IV: Race Rules and Regulations; All
- E. Section VI: Scoring; All. However only one canoe from a school may accumulate points for selection for the National Competition. Participation is encouraged at the Regional Competitions; however, additional canoes from one school cannot take points away from other competitors. If a school participates with more than one canoe, the canoe that will accumulate points must be so designated before any judging of any aspect of the competition and before any racing occurs.
- F. Appeal Process - The Regional Host shall settle all protests from their competition, decide the Regional Competition winner, and distribute awards. Any regional competitor may appeal the regional decision in writing to the CNCCC through the Student Services Department of ASCE within one week of the Regional Competition. Appeal forms will be available through ASCE and must be signed by the Faculty Advisor. Other committees of ASCE or Master Builders will not accept appeals. This is the only formal appeal process available for the Regional Competition. There is no appeal process for the National Competition.
- G. Concrete Canoe Competition team members at the Regional Conferences shall be members of an ASCE Student Chapter or Club affiliated with their university. Registered participants for the National Concrete Canoe Competition shall be National Student Members of ASCE and shall provide valid ASCE ID numbers with the submittal of the registration materials. Team members that do not provide valid ASCE ID numbers will not be allowed to participate as registered participants.

VI. Overall Scoring

A. Scoring is divided into four events:

Event	Maximum Competition Points
1. Academic Judging - Design Paper	30
2. Academic Judging - Oral Presentations	25
3. Academic Judging - Final Product	15
4. Races (5 races)	30
	100

B. Competition Points for Events 1-3 above are awarded per Section VII, Scoring sheets.

1. For the Design Paper and the Oral Presentation events - if five (5) judges are present, then the high and low score for each entry shall be discarded and the middle three (3) scores averaged to determine the overall score for the entry. If fewer than five judges are present then all scores shall be averaged for the entry.
2. For the Final Product judging, team captains shall submit to the scorekeeper an aesthetics score for each entry in the competition. The scores for each entry shall be averaged and this average for each entry shall be equal in weight to a judge's score. This shall be referred to herein as the "peer average." To determine the aesthetics score the high and low score of each judge's score and the peer average for each entry shall be discarded and the middle scores averaged. For example, if there were four regional judges, there would be five scores to consider: one from each of the four judges, plus one "peer average." The five scores for each entry would be treated as equals, and the high and the low scores would be dropped before averaging the remaining three to determine the aesthetic score.

The durability score for each entry is to be the simple average of the judges' Durability Scores for that entry.

Final Product Points (*FPP*) are derived from (a) the aesthetic score (*AS*, from 1 to 10) and (b) the durability score (*DS*, from 1 to 5) using the following formula:

$$FPP = 2.5 \times AS \times (DS-1)$$

C. Placing for each event shall be determined by the ranking of the overall scores.

1. For the Design Paper and the Oral Presentation, if five judges are present and a tie occurs in any of the academic events (Events 1 through 3), then the average of all scores for those tied schools will be used in an attempt to break the tie for that event.

2. For the Final Product Judging, if a tie occurs, the average of all aesthetic scores for an entry will be used to calculate new final product points, in an attempt to break the tie for that event.
3. If the tie cannot be broken by these methods in any of these events, competition points shall be determined by dividing points for the positions involved in the tie. For example, if a second place tie occurs in the design paper event, points for second and third places will be averaged and awarded to the tied teams. The team with the next highest score will receive points for fourth place.

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

$$TBS = \frac{\frac{30}{100}(\sum DPP) + \frac{25}{100}(\sum OPP) + \frac{15}{100}(\sum FPP)}{NOJ} + RP$$

where: *DPP* = display product event points for a given judge (Table VII.A.), *OPP* = oral presentation event points for a given judge (Table VII.B.), and *FPP* = final product event points for a given judge (Table VII.C.), *NOJ* = number of judges, and *RP* = unmodified race points. No judge's score shall be dropped when calculating these points even if five judges are present. The calculation of the *TBS* shall not change the standings for team placement in any given academic scoring part. Of the teams tied for overall winner or overall 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 choose to base their decision on whatever criteria they deem appropriate including but not limited to their subjective evaluation of determination, dedication, sportsmanship, enthusiasm, and overall comportment. The judges' criteria and decision shall be final and may not be appealed.

Competition points will be allotted per place according to the following table:

Place	Academic Events			Race Events		
	Design Paper	Oral Pres.	Final Product	Slalom/ Endur.	Men's & Women's Sprints	Coed Sprints
First	30.0	25.0	15.0	6.0	5.5	7.0
Second	27.0	22.5	13.5	5.4	5.0	6.3
Third	24.0	20.0	12.0	4.8	4.4	5.6
Fourth	21.0	17.5	10.5	4.2	3.9	4.9
Fifth	18.0	15.0	9.0	3.6	3.3	4.2
Sixth	15.0	12.5	7.5	3.0	2.8	3.5
Seventh	12.0	10.0	6.0	2.4	2.2	2.8

Eighth	9.0	7.5	4.5	1.8	1.7	2.1
Ninth	6.0	5.0	3.0	1.2	1.2	1.4
Tenth	3.0	2.5	1.5	0.6	0.6	0.7

- E. No points shall be given for the preliminary or qualifying heats unless unforeseen circumstances prevent the running of the final heats or the host school determines before the race competition starts that separate finals heats will not be run. For the slalom/endurance race, no points are awarded a team that does not finish or does not race. For all sprint races, if a team qualifies for a final event but cannot start an event, that team does not receive points and the team's slot is ceded 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 last in their final.
- F. Summary of Deductions/Disqualification: These deductions may also be referenced in other sections of the rules and/or the scoring sheets. Moreover, in accordance with Section II.A.1, judges may make additional deductions if a situation not covered specifically by the rules arises.
1. Teams may be disqualified for the following:
 - a. Failure to follow student eligibility requirements (Sections I.E & I.G).
 - b. Violations under the Spirit of the Competition (at the discretion of the CNCCC and/or Judges (Section I.K).
 - c. Failure to follow academic year, rebuilding, and reinforcing material requirements (Sections II.B.1 & II.C.5-6).
 - d. Sportsmanship and interference requirements (Section IV.A.4-8).
 - e. Failure to follow safety rules (Sections II.F. and IV.B).
 2. Deductions from Section III.A, Design Paper (Section VII.A, Scoring Sheet): as prescribed on the scoring sheets.
 3. Deductions from Section III.B, Oral Presentation (Section VII.B, Scoring Sheet): as prescribed on the scoring sheets.
 4. Deductions from Section III.C, Final Product (Section VII.C, Scoring Sheet): as prescribed on the scoring sheets.

VII. Scoring Overview

- A. Design Paper
- B. Oral Presentation
- C. Final Product
- D. Summary Score

VII.A. Design Paper		30% of Overall Score	
School Name: _____ Canoe Name: _____		Possible Points	Score
Analysis Modeling (appropriateness of loading cases, applied loads, support conditions, model geometry) (5 points) Analysis (how the modeling was done) (5 points) Conclusions (appropriateness, validity, and importance of goal properties selected) (10 points)		20	
Testing and Development Testing program (tests used for individual materials and composite action and execution and validity of those tests) (5 points) Development (understands relationship between mix component properties and proportions and achieving design goal based on analysis) (5 points) Conclusions (appropriateness, validity, and importance of test results achieved) (10 points)		20	
Project Management & Construction PM Application (effectively understands and communicates CPM) (5 points) Construction Application (construction process and techniques) (10 points) Innovations in the PM and Construction methods (5 points) Project Schedule Completeness (per section III.5.e.1) (5 points) Organization Chart Completeness (per section III.5.e.2) (5 points) Design Drawings Clarity (ease of understanding the drawings) (5 points) Completeness (per section III.5.e.3) (5 points)		40	
Mixture Proportions Compliance (materials and proportions match rules) (10 points)		10	
Overall Presentation Effective Use of Graphics, Tables and Charts and Quality of Writing (5 points) Conciseness and Clarity (5 points)		10	
Subtotal		100	
Deductions:			
Failure to follow format, margin, page, and/or body text requirements: 5 to 50 points at the discretion of the judges			
Design paper over specified number of pages: 10 points/page			
Received after deadline: 5 points/day			
Other failure to comply with these rules: Up to 100 points at the discretion of the judges			
Academic Judging - Part 1 Design Paper Total			

School Name _____

VII.B. Oral Presentation		25% of Overall Score	
School Name: _____ Canoe Name: _____		Possible Points	Score
Presenters Preparation Level (8 points) Confidence (4 points) Voice Projection (4 points) Overall Demeanor (4 points)		20	
Presentation Quality Quality of Audio/Visuals (5 points) Content (20 points) Overall Performance (5 points)		30	
Judges Questions Expertise in Answers (35 points) Preparation Level (5 points) Confidence Level (5 points) Conciseness of Answers (5 points)		50	
Comments:			
Subtotal		100	
Deductions: Failure to observe time limit: A 15 point penalty shall be assessed when the official time exceeds 5 minutes 5 seconds (5:05). An additional 15 point deduction shall be assessed for exceeding each additional minute or fraction thereof on the official timer's clock, i.e., 6:00, 7:00, etc. (Section III.B.2).			
Sponsorship or commercialism violation: 15 points			
Failure to adhere to live presentation format: Up to 100 points at the discretion of the judges			
Academic Judging - Part 2 Oral Presentation Total			

School Name _____

VII.C. Final Product		15% of Overall Score	
School Name: _____			
Canoe Name: _____			
Aesthetics (1 to 10 points)	Initial	After dropping high and low	Avg. after drop (AS)
Average student score:			
Judge 1			
Judge 2			
Judge 3			
Judge 4			
Judge 5			
Durability (1 to 5 points)		Score	Average (DS)
Judge 1			
Judge 2			
Judge 3			
Judge 4			
Judge 5			
Final Product Points (0 to 100) $FPP = 2.5 \times AS \times (DS-1)$			
Deductions: No Final Product points shall be given for any of the following: Not built within current academic year A canoe that does not race. A canoe that cannot finish all races prior to durability judging (durability score = 1) A canoe that cannot be raced safely or exited safely if swamped or overturned Improper finishing of canoe - Paint, appliqué, coating, or other materials violation MSDS not available upon judge's request			
Cross-section missing: 75 points Cross-section smaller than required: 25 points Cross-section does not properly represent the canoe: 50 points Failure to provide canoe cross-section at time of aesthetics judging: 25 points. Failure to include flotation material in the canoe if it is required to pass swamp test: 10 points each infraction. Canoe fails the flotation test at the normal time of flotation testing: 50 points Improper display stands: 10 points			
Improper canoe identification Name present but not full name or proper abbreviation: 5 points Letters of improper height: 10 points Name not present on one or both sides: 15 points per side Flags of wrong size or in wrong location: 20 points Flag not present: 50 points			
Academic Judging - Part 3 Final Product Total			

School Name _____

VII.D. Summary Score		100% of Overall Score	
School Name: _____ Canoe Name: _____		Possible Points	Score
Academic Judging - Part 1 Design Paper		30	
Academic Judging - Part 2 Oral Presentation		25	
Academic Judging - Part 3 Final Product		15	
Total Race Competition		30	
TOTAL SCORE		100	

School Name _____

VIII. Awards and Recognition

The winners of the American Society of Civil Engineers/Master Builders, Inc. National Concrete Canoe Competition shall be determined by compiling a team's total number of points from the academic and race portions of the competition. Master Builders, Inc. shall award a total of \$9,000 in academic scholarships to the winning teams' undergraduate civil engineering program. To be eligible to receive a scholarship, the entrant school must be a recognized ASCE Student Chapter/Club.

Selection of the academic scholarship winner(s) shall be determined by the local ASCE Student Chapter/Club. The academic scholarships shall be awarded to student member(s) within twelve (12) months of completion of the current years' national finals. The academic scholarship money shall be used toward satisfying tuition reimbursements only and shall not be used to fund current or future concrete canoe competitions. ASCE and Master Builders shall be notified in writing of academic scholarship winner(s) prior to distribution to recipients.

Total scholarship awards shall be distributed as follows:

1st place overall winner	\$5,000 scholarship and trophy
2nd place overall winner	\$2,500 scholarship and trophy
3rd place overall winner	\$1,500 scholarship and trophy

Special plaques shall be awarded to the top team in the following individual categories:

4th place overall winner	Commemorative Plaque
5th place overall winner	Commemorative Plaque
Best design paper	Women's slalom/endurance race
Best oral presentation	Men's slalom/endurance race
Best final product	Women's sprint race
Spirit of Competition	Men's sprint race

A special plaque in honor of R. John Craig, a former ASCE Committee on Student Services member who was a driving force behind the National Concrete Canoe Competition, shall be awarded to the team that has the best time in the coed race.

A special plaque in honor of Anthony P. (Tony) Chrest, a champion of the concrete canoe competitions on both the regional and national level, shall be awarded to the team that demonstrates superior and creative use of technology and materials in the construction of their concrete canoe. The winner of this award shall be selected at the sole discretion of Master Builders, Inc.

Ribbons shall be awarded to teams finishing second through fifth in each event. Each team shall receive a commemorative plaque for their participation in the National Concrete Canoe Competition. All ten registered team members in the National Concrete Canoe Competition shall receive a certificate of participation for the National Competition.

IX. Past Winners and Host Schools

- A. 2002 hosted by University of Wisconsin – Madison, WI
 - 1. Clemson University
 - 2. Universite Laval
 - 3. Oklahoma State University
 - 4. Western Kentucky University
 - 5. University of Wisconsin-Madison

- B. 2001 hosted by San Diego State University - San Diego, CA
 - 1. University of Alabama in Huntsville
 - 2. Clemson University
 - 3. Oklahoma State University
 - 4. Universite Laval
 - 5. South Dakota School of Mines and Technology

- C. 2000 hosted by the Colorado School of Mines – Golden, CO
 - 1. Clemson University
 - 2. Oklahoma State University
 - 3. Florida Institute of Technology
 - 4. Michigan State University
 - 5. University of Washington

- D. 1999 hosted by Florida Institute of Technology – Melbourne, FL
 - 1. Clemson University
 - 2. University of Alabama in Huntsville
 - 3. Oklahoma State University
 - 4. University of Washington
 - 5. South Dakota School of Mines and Technology

- E. 1998 hosted by South Dakota School of Mines and Technology - Rapid City, SD
 - 1. University of Alabama in Huntsville
 - 2. California State University at Sacramento
 - 3. Clemson University
 - 4. Florida Institute of Technology
 - 5. University of Washington

- F. 1997 hosted by Cleveland State University - Cleveland, OH
 - 1. Florida Institute of Technology
 - 2. University of Alabama in Huntsville
 - 3. University of California - Berkeley
 - 4. Michigan State University
 - 5. University of California - Los Angeles

- G. 1996 hosted by University of Wisconsin - Madison - Madison, WI
 - 1. University of Alabama in Huntsville
 - 2. Michigan State University
 - 3. University of California - Berkeley
 - 4. South Dakota School of Mines and Technology
 - 5. Clemson University

- H. 1995 hosted by George Washington University - Washington, DC
 - 1. South Dakota School of Mines
 - 2. California State University at Sacramento
 - 3. Michigan State University
 - 4. Clemson University
 - 5. University of New Orleans

- I. 1994 hosted by the University of New Orleans - New Orleans, LA
 - 1. University of Alabama in Huntsville
 - 2. University of California - Berkeley
 - 3. University of New Orleans
 - 4. South Dakota School of Mines and Technology
 - 5. Clemson University

- J. 1993 hosted by California State University - Sacramento, Sacramento, California
 - 1. University of Alabama in Huntsville
 - 2. Michigan State University
 - 3. University of California - Berkeley
 - 4. University of New Orleans
 - 5. Colorado State University

- K. 1992 hosted by Colorado State University, Fort Collins, Colorado
 - 1. University of California - Berkeley
 - 2. University of Alabama in Huntsville
 - 3. University of New Orleans
 - 4. University of Maryland
 - 5. Michigan State University

- L. 1991 hosted by University of Central Florida, Orlando, Florida
 - 1. University of California - Berkeley
 - 2. University of Maryland
 - 3. State University of New York - Buffalo
 - 4. University of Illinois - Urbana/Champaign
 - 5. University of Texas - Austin

- M. 1990 hosted by State University of New York - Buffalo, Buffalo, New York
 - 1. Michigan State University
 - 2. University of Maryland
 - 3. University of California - Berkeley
 - 4. University of Texas - Austin
 - 5. University of Wisconsin - Milwaukee

- N. 1989 hosted by Texas Tech University, Lubbock, Texas
 - 1. University of California - Berkeley
 - 2. Michigan State University
 - 3. University of New Hampshire
 - 4. Washington State University
 - 5. University of Houston

- O. 1988 hosted by Michigan State University, East Lansing, Michigan
 - 1. University of California - Berkeley
 - 2. University of New Hampshire
 - 3. University of Akron
 - 4. Portland State University
 - 5. University of Alabama in Huntsville

X. Preliminary Schedule of Events (Subject to Host School Requirements)

Friday, June 20, 2003

9:30 AM - 12:00 PM	Registration
12:00 PM - 1:00 PM	Welcome Comments and Lunch
1:00 PM - 2:00 PM	Team Meeting
2:00 PM - 2:30 PM	Team Captains' Meeting
2:00 PM - 3:30 PM	Final Product Set-Up
3:30 PM - 6:30 PM	Final Product Judging/Swamp Tests/ Team & Group Photos
6:00 PM - ???	Icebreaker/Dinner

Saturday, June 21, 2003

7:00 AM - 8:15 AM	Breakfast
8:00 AM - 12:00 PM	Academic Presentations
12:00 PM - 1:30 PM	Lunch
1:30 PM - 5:30 PM	Academic Presentations
6:30 PM - 9:00 PM	Dinner

Sunday, June 22, 2003

6:00 AM - 8:00 AM	Breakfast
7:00 AM - 12:00 PM	Distance Races/Preliminary Sprint Races
12:00 PM - 1:00 PM	Lunch/Special Awards/Distance Race Awards
1:00 PM - 4:00 PM	Final Sprint Races
7:00 PM - 10:00 PM	Awards Banquet

Monday, June 23, 2003

9:00 AM - 12:00 PM	Checkout
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XI. Corporate Profiles

The American Society of Civil Engineers – Profile

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 who were building the roads, canals, bridges and railroads of a young nation.

Today, ASCE has more than 130,000 members, including some 7,000 of whom are international members residing outside the United States in 150 countries. Individual professional engineers rather than companies or organizations hold membership. The members are organized geographically into 21 Regional councils, 87 sections, 148 branches and 259 student chapters and clubs.

The objective of ASCE is to enhance the welfare of mankind through the advancement of the science and profession of engineering. In response to these goals, more than 6,000 members voluntarily serve nearly 580 different technical, administrative and coordinating committees. Another 300 participate on 36 other professional committees. Including the activities of sections, student chapters and clubs, as well as the national and local committees, ASCE groups average 100 meetings throughout the country every day.

Educational activities extend to college campuses through 259 student chapters and clubs. These groups sponsor meetings, Regional conferences, student competitions, social events and other activities to help future engineers become better prepared for their careers. Numerous scholarships and awards are made available for deserving students of civil engineering. Additionally, career guidance is conducted to encourage primary and secondary students to study civil engineering through the following: summer institutes held on college campuses, films and videotapes, literature and lectures.

A 28-member Board of Direction governs the Society. The Board, which includes ASCE officers and representatives elected by the membership, establishes all policy for the organization. A staff of 250 implements the policies; the vast majority of staff work at ASCE International Headquarters located Reston, Virginia.

Master Builders, Inc. – Profile

Founded in 1909, Master Builders, Inc. is a leading provider of innovative chemical and mineral admixtures for specialty concrete used in the ready-mix, precast, paving, manufactured concrete products and underground construction markets.

The company offers the widest range of concrete admixtures, materials and accessories available from a single source used to improve the placing, pumping, finishing and appearance characteristics of concrete. Master Builders admixtures ensure high strength and durability, inhibit corrosion of steel embedded in concrete, reduce permeability, and improve resistance to chemical attack. New liquid color conditioning admixtures developed specifically for ready mix and precast production ensure enduring, structurally sound colored architectural concrete. Special chemistries allow effective placement of concrete in extreme weather conditions and in difficult applications, enhance surface appearance and ensure consistent quality an improved productivity.

The full line of Master Builders products is backed by the support and service of a network of experienced local technical representatives, and a world-class research and development center dedicated exclusively to the advancement of the art and science of concrete. For more than 90 years, Master Builders has been providing solutions to construction challenges around the world.

Located in Cleveland, Ohio Master Builders, Inc. operates as part of Degussa Construction Chemicals, the largest manufacturer of construction chemicals worldwide. The parent company, Degussa AG, is a global leader within the specialty chemicals industry. Headquartered in Dusseldorf, Germany, Degussa is the world's largest specialty chemical company with sales of \$15 billion and a workforce of 64,000 employees.

R. John Craig Memorial Award

The concept of a National Concrete Canoe Competition had been around for a number of 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 and formalized a plan to study the feasibility of a National Competition.

In the spring of 1985 Dr. Craig first brought his grand vision of a 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 executive conference of the ASCE National Headquarters. During this meeting the feasibility of conducting a National Concrete Canoe Competition was discussed, preliminary rules 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 and the Manager of Student Services for ASCE.

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 and 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 of a National Concrete Canoe Competition came to fruition. In June of 1988 the first National 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 execution of the National Concrete Canoe Competition. Through the efforts and dedication of individuals like Dr. R. John Craig their efforts have established this National Concrete Canoe Competition.

In that spirit ASCE and Master Builders have 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 this award to the school who best exemplifies the spirit and cooperative ideals of the Competition by placing first in the Coed Sprint Race each year.

Tony P. Chrest Award for Innovation

The Tony P. Chrest Award for Innovation was established by Master Builders, Inc. in 2002 to honor Anthony P. (Tony) Chrest, a champion of the concrete canoe competitions on both the regional and national level. He served as a national concrete canoe judge in 1996, and as the first returning judge in 1997, and is remembered for challenging participants and organizers to increase the level of innovation applied to the concrete canoe project.

Senior Vice President and Corporate Chief Engineer of Walker Parking Consultants, Mr. Chrest was a fellow of both ACI and the Prestressed Concrete Institute. He acted as a senior project manager, as well as a senior structural advisor and designer on Walker's largest projects. With more than 30 years of industry experience, Mr. Chrest was responsible for project management, structural system concepts, master specification preparation, in-house education, and quality assurance.

Mr. Chrest held a BA from St. Benedicts College (1963), a BS in Civil Engineering from Colorado State University (1964), and a Master's degree in Structural Engineering from Purdue University (1966). Mr. Chrest co-authored the book, *Parking Structures*, now in its third edition, which defines the planning, design, construction, maintenance and repair of parking facilities. He also taught at North Carolina State University for two years (1972-1974).

As a tribute to Mr. Chrest, who died suddenly in the summer of 2002, Master Builders, Inc. has established the Tony P. Chrest Award for Innovation to "recognize superior and creative use of technology and materials in the construction of a concrete canoe. "