



Frequently Asked Questions March 2009

General

- A. The 2009 Rules and Regulations allow for a higher degree of flexibility in design, material, and reinforcement choices.

If you are unsure whether something is permissible, assume that it is permissible ONLY if:

1. it does not compromise safety
2. the rules and regulations do not specifically state that what you would like to do is not allowed

- B. A question to the CNCCC will not receive a response if the rules and regulations related to the question are specific in what is required and obvious in what is not said.

The following are examples:

"The rules don't mention a thing about Displays. Are there displays this year?"

"I can't find anything restricting the use of end-caps. Are end-caps allowed?"

Apply the general guideline (1 and 2 above) and you will have the answers to these questions and others like them.

Section 1. General Rules and Eligibility Requirements

Section 1.1 - Qualifiers

QUESTION 1: With regard to the Mid-Pacific Conference region. For the 2008 season, UNR and Second Place respectively. The last paragraph of section 1.1 states that if any of the top five teams qualify for Nationals the following year then the second place team will then also advance. In our case we have two teams both placing in the top five, Would we then be able to send a third team to Nationals, if both teams qualify again for nationals?

RESPONSE 1: As the rule states, if any of the top five teams qualify for the national competition, then the SECOND place team will also advance. In this case, Nevada-Reno placed first and Cal-Berkeley placed second at their conference competition and ultimately both placed in the top five at the national competition. If UNR places first again in their conference, or if Cal-Berkeley places first, then the second place team, whomever it is, will also advance to the national competition (assuming that all eligibility rules are met). There is no language for inviting a third team from any conference if two teams from that conference placed in the top five of the previous national competition (the only noted exception could be a host school from a conference using its one year of eligibility the year of or year after hosting).

Section 1.2 - Registered Participants

1.2.1_Eligibility Requirements

QUESTION 1: In Section 1.2.1.a, it is stated that all registered team members must be undergraduate students in engineering. My question is about students concurrently enrolled in a graduate program. At our university, seniors with high academic achievement can enroll concurrently in graduate school while finishing their undergraduate degrees. Are these students still eligible based on the fact that they are still active in an undergraduate program in engineering?

RESPONSE 1: Yes.

Section 1.5 - Sponsorships

QUESTION 1: We received funding from a company to purchase a trailer, are we allowed to say the company name in the Design paper?

RESPONSE 1: Section 1.5 states that "The use of trade and company names for services, products, and intellectual property shall be permitted in the design report for informational purposes only. Sponsorship recognition shall be limited to T-shirts, other apparel, or other non-competition related material. Sponsors are not to be recognized on the Product Display (Section 10)." The purchase of a trailer has nothing to do with the design and construction of the canoe and would have no place in the Design Paper.

Section 1.6 - NCCC List Server

QUESTION 1: How can one ask a private question?

RESPONSE 1: All questions posed to the CNCCC are private (i.e., only CNCCC members actually see the question) until the question and its response are posted to the list server. Teams that request privacy (for example, to keep the wraps on innovative materials) have responses directly sent to them. On occasion and depending on the subject, we may send a generic response to the list server based on the private response given to them. However, we only do that after first contacting the team and asking for permission to do so. Also, there have been questions posed by teams that requested privacy, however, the subject matter was not in regards to any proprietary products, innovative materials or practices, rather they have been on "common"

issues. Therefore, we have sent them a response in private and stated to them that we intended to send out a public response. Conversely, there have been occasions where even though privacy was not originally requested, a private response was sent to the team after review of the subject matter.

Section 2. Canoe

Section 2.1 - Dimensional Constraints

Concrete Canoeists,

One of the significant changes to the NCCC is the requirement for all teams to construct a canoe using a hull design that has been developed by the CNCCC. In general, the 2009 canoe is a 20-foot long asymmetrical hull with a maximum beam width of 31.1875 inches located at approximately 10.2 ft from the bow. The canoe features an elliptical cross-sectional shape with 4-inch radial chines and flared sidewalls and 4 inches of rocker at the extreme ends of the bow and stern sections. The depth of the canoe varies from 16 inches at the bow tapering down to 14 inches near the center and stern.

Please find attached to this e-mail the following documents in Microsoft Excel format:

- 2009 Concrete Canoe Hull Design in AutoCAD 2004 format.
- 2009 Canoe Design Coordinates in Microsoft Excel format

The hull design in AutoCAD 2004 provided is similar to Figure 2.1 in the Rules and Regulations. The design coordinate file contains the offset and height for 19 stations (18 of which are spaced at 1-ft intervals and 1 for the widest point of the canoe located at approximately 10.2 ft from the bow) and the bow and stern sections. Please note that the coordinates provided gives half of the cross-section (i.e., need to mirror the section). Dimensions such as, but not limited to, depths, radii of chines, and beam widths, are regulated and their values shall be replicated according to the design specifications and drawings.

Teams shall not make any modifications to the hull design (i.e., increase/decrease in length, width, height and/or rocker; change in cross-section shape; etc.). Other elements of the canoe to include, but not limited to thwarts, ribs, and hull thickness needed to ensure that adequate structural capacity is attained shall not be measured and their dimensions and locations are at the discretion of the team.

Teams shall be in general compliance with the dimensional constraints provided in the 2009 edition of the Rules and Regulations. The tolerances for the length of the canoe shall be limited to +/- 1.0 inch, the width of the canoe at the widest point shall be limited to +/- 0.5 inch, and the rocker at bow and stern shall be limited to +/- 0.5 inch. If each of the dimensions are within the tolerances provided, then the canoe shall be deemed to be in general compliance and not subject to the 25 point deduction for dimensional constraints (Final Product Deduction Scorecard).

Sincerely,
CNCCC

[QUESTION 1:](#) There appears to be an error in the hull data provided to teams in excel format; the (y) value for Station 6 data point #4 is 77.7490, the numbers before and after are 5.9296 and 9.0429 respectively. Could you please clarify what the correct value for that data point is?

[RESPONSE 1:](#) There is indeed an error in the data point for Station 6 and should be 7.7749. There was also an error in Section 12. Please find attached the revised coordinates. The errors are regretted.

ERRATA - Hull Rocker

It was brought to the attention of the CNCCC that there was an inconsistency with the design drawings and coordinates in Section 2.1, Dimensional Constraints. Section 2.1 states that "The canoe features an elliptical

cross-sectional shape with 4 inch radial chines and flared sidewalls and 4 inches of rocker at the extreme ends of the bow and stern sections."

It should read:

"The canoe features an elliptical cross-sectional shape with 4 inch radial chines and flared sidewalls with 4 inches of bow rocker and 2.5 inches of stern rocker."

With that being said, the hull design drawings (AutoCAD) and the hull design coordinates (Excel) that have been sent via the listserv and uploaded at the ASCE website are correct.

NOTE: REVISED hull design coordinates were posted to the list server on 09.16.08 to correct some typographical errors and provide plots of the cross sections. This version supersedes any version that had been previously sent via the list server.

QUESTION 2: I wanted to confirm my understanding of the hull design rules this year. Is it true that you are giving the exact template that you want ALL of the canoes to be built to? If this is true it is really a shame, you are taking all of the ingenuity out of one of the main parts of this competition. I wonder why you would do this, also this makes the races more based on the skills of the paddlers than on you canoe design. If you could explain why this is being done that might help me not be so disappointed. Part of the reason I got into this competition was the challenge of DESIGNING the best canoe possible NOT just constructing to a given template.

RESPONSE 2: Although the CNCCC is committed to responding to questions for clarification purposes, and not justification for the decisions that we have made, we feel that it would be best that we provide the rationale for the significant change to the hull design. Yes, it is true that we are giving each team the exact templates for the hull design (per Section 2.1) and that each and every team that competes is, to the best of their abilities, replicate the design as provided to them. We would like to call it the "Noah's Ark Principle." Each year, the CNCCC looks to improve the overall competition and implements rule changes to challenge the teams. This year, a major decision was made to require teams to focus more on what is truly the biggest aspect of the competition - CONCRETE. In particular, looking at the current trends in industry to go "green" with a focus on sustainability in design and construction. By designing a hull for all the teams to replicate, we have attempted to eliminate the time the teams have typically used in hull design so that they could spend more time on concrete design and testing, material selection, reinforcement design, construction techniques, innovative use of materials, sustainability practices, etc. Over the years we have reviewed many design papers, both at the conference level and national level, where teams still have trouble with the mix design tables (and we are not talking minor items, but blatant errors, which tend to lead us to believe that teams do not have a thorough understanding of even some of the basic principles). We also have found a wide variation in the results of structural analysis, even though the design of the canoes were generally the same in length and weight (stresses as low as 100 psi to 2500 psi+). We understand that values are a function of loading conditions, factors of safety, etc., but it will be very interesting to see what teams come up with given that everyone has the same design. The reasoning provided may not quell your disappointment, but for this year's competition we do not intend to debate this aspect.

QUESTION 3: I am extremely bewildered and disappointed with the rule change that essentially removes hull design from the competition. The justification is ill-thought out because it forces teams that already do extensive mix design and testing to eliminate a huge part of their design process for the concrete canoe. Hull design is one of the most important aspects of the design process of the canoe. Without it, the competition hardly seems like an engineering competition anymore. My team typically spends the year casting and testing different mixes with a large variety of aggregates, admixtures and binders. We also have a group of students work on hull design while we cast these mixes. In the past, a large amount of work has been put into this aspect of the competition, and it has been developed so new people can learn and apply it. The rule changes essentially eliminates a whole part of what our team does and does not affect the part that researches

concrete mixes. Although I respect the idea of trying to make teams focus on concrete, I do not respect how it has been forced on teams. I believe teams should have the option of designing their own hull. I will be speaking with the other Canadian teams in the near future, and attempting to see if we can ignore this rule in our competition. Although I do not agree with them, some team members of our team are so upset by this change in rules they want to boycott the competition. Although I don't suppose these rules will change, I would still like to express my extreme disappointment.

RESPONSE 3: The CNCCC appreciates the time and effort that teams put towards the competition and applaud your efforts in regards to development and testing of concrete mixes. When we develop the rules and regulations we look at the overall competition and the level of competitors (please understand that perhaps 10 schools or so compete at the Canadian National Competition, while we look at 18 conference competitions, an average of 170-190 schools vying for the ASCE National Competition, with teams varying from beginners to seasoned veterans).

We have made the decision to guide the teams to focus on what we consider the most important aspect of the competition - CONCRETE TECHNOLOGY. In order to do that, this year we felt that by giving each team the hull design, more time would be focused towards concrete proportioning and testing. At the same time, we would like to have teams think about sustainability (i.e., going "green") which is an ever increasing trend in design and construction. As stated in a previous e-mail, we provided some of the rationale to have teams focus on concrete and the other aspects of the project. Some issues that we have seen include:

- Filling out the mix proportion table correctly - examples: calculations done incorrectly and numbers not adding up; an understanding that if you designed a 60 pcf mix and it weights 65 pcf, the air content has to change and the amount of mix proportions need to change (i.e., continuity of mass and volume)
- Questions regarding Mix Proportioning - one example that we have seen and it really has not been explained all too well is the use of high doses of HRWR. Say, according to a manufacturer, 3-5 fl oz /cwt typically gives a slump of 3-4 inches and 12-16 allows a self-consolidating concrete to be made; how does 50+ at the max. w/cm give a near zero slump concrete?
- Lack of Quality Control - examples: not having someone review the mix proportion table (like a professor or design professional) just to see if the calculations are done correctly; teams stating that concrete strengths in the canoe did not meet what they designed for leading to failure; simple lettering of the school and canoe names falling within the specified limit (and we give a + 0.5 in. tolerance on that!)
- Structural Analysis - what is the worse-case loading condition? (if you see a variety of papers, you find a different answer - 2-person, 3-person, 4-person, on-land) and the values of stress vary from under 100 psi to greater than 2500 psi. We are not saying that there are "right/wrong" answers, as assumptions are made (loads, loading factors, factors of safety) and there are variations in design (length and weight).

Do all teams have these problems? No. But we are trying to facilitate a way to have teams concentrate on some of these aspects. Yes, we are "forcing" a hull design on the teams. Actually, we are giving specifications (just like a limit on hydraulic cement, type of stains, amount of flotation, pages in the design paper - not to sound sarcastic, but we are "forcing" you to limit certain sections to a total of 6 pages, etc.). However, the challenges facing the teams are how to best construct the canoe and what are the best materials and practices to accomplish it. What quality control measures are you going to apply to ensure that the dimensions are achieved? What construction techniques will you use to fabricate the canoe (and no, this does not mean that we are forcing teams to use a female mold)? When comparing "apples to apples" who is going to have the lightest canoe (does it matter that it is the lightest canoe)? Do I need to stiffen the canoe with thwarts or ribs, or can I develop a very thin hull skin strong enough to withstand the loads? Do I need additional flotation? What are the design stresses and the critical loading condition?

In regards to the Canadian National Competition, we must point out that the committee DOES NOT create the rules and regulations for that competition; generally, they have been adopted and have been modified on occasion (for example, they allow metric units to be used and presentations/papers also could be done in French) and then allowing up to seven (7) male paddlers when the standard is five (5) (<http://wwwcivil.usherbrooke.ca/cnccb2006/ADDENDA.pdf>).

Since the CNCCC does not govern the Canadian competition, the rules and regulations that we have developed do not have to be adhered to. However, please note that several Canadian teams (such as Laval and ETS) do participate as ASCE Student Chapters at ASCE Student Conferences (including Steel Bridge and Concrete

Canoe) and will more than likely want to abide by our rules and regulations in order to compete. At this point in time, the CNCCC considers this matter closed.

We have developed and published the rules and regulations for the ASCE National Concrete Canoe Competition and challenge the teams to replicate the design that we have provided while integrating innovation in CONCRETE design and construction.

[QUESTION 4:](#) Is it safe to assume that the errors were only in the excel spreadsheet, and that the AutoCAD drawing initially sent out is correct?

[RESPONSE 4:](#) Yes. The AutoCAD drawings were used to generate the values to be put into the Excel spreadsheet, and that is where the typographical errors occurred. The edition of the hull design coordinates sent out on 09.16.08 included plots of the stations to ensure that they were correct.

[QUESTION 5:](#) Can the gunwales be on the outside of the hull or must they remain inside of it to maintain the exterior shape that we must replicate?

[RESPONSE 5:](#) According to Section 2.1, Dimensional Constraints, "Teams shall not make any modifications to the hull design (i.e., increase/decrease in length, width, height and/or rocker; change in cross-section shape; etc.). Other elements of the canoe to include, but not limited to thwarts, ribs (Section 2.3), and hull thickness needed to ensure that adequate structural capacity is attained shall not be measured and their dimensions and locations are at the discretion of the team." This section would be applicable to the gunwales as well (i.e., no thickened gunwales which go beyond the exterior shape provided).

[QUESTION 6:](#) For the hull design, how are students supposed to measure off 0.1838 inches and 0.1538 inches. Those are too precise for conventional measuring devices (tape rules are in 1/16" and we don't have anything that can measure that precisely. Or do I not have the latest coordinates?

[RESPONSE 6:](#) We have provided the AutoCAD drawings (to scale) for the cross sections needed for construction. We have also provided the coordinates (taken from the AutoCAD file) in the Excel file for those that may consider 3-D modeling.

[QUESTION 7:](#) We are having problems understanding some of the significant changes for the concrete canoe competition concerning depth limitations. The rules state: "The depth of the canoe varies from 16 inches at the bow tapering down to 14 inches near the center and stern." We are taking this rule as the maximum depth is 16 inches at the bow and a minimum of 14 inches at the stern. Therefore no boat height will be shorter than 14 inches at any point along the canoe. We were also wondering about the canoe features. The rules state: "The canoe features an elliptical cross-sectional shape with 4 inch radial chines and flared sidewalls and 4 inches of rocker at the extreme ends of the bow and stern sections." We were wondering if these are the exact specifications for every boat or just limitations.

[RESPONSE 7:](#) Please note that there is an Errata that was posted regarding the rocker which stated that the bow rocker was 4 inches and the stern rocker was 2.5 inches (the information posted in the design files are correct). Each and every team has been provided the exact specifications for their canoe (i.e., each and every team is building the same canoe).

[QUESTION 8:](#) Please provide clarification on how the length of the canoe will be measured during the competition, will it be measured from tip to tip including the thickness or excluding the thickness of the canoe? Our confusion comes from two parts of the rules in Section 2.1. In the second paragraph of Section 2.1 it states "The length is defined as the end-to-end measurement of the canoe taking into account the outermost dimensions of the hull as measured at the gunwale." But later, in the fifth paragraph, it states "Other elements of the canoe to include... hull thickness... shall not be measured and their dimensions and locations are at the discretion of the team."

[RESPONSE 8:](#) The length of the canoe is measured end-to-end. The design that was provided to each team is the exterior surface of the canoe. If measured, the thickness of the canoe would be measured from the exterior surface in. We are not going to take measurements of the thickness of the canoe. In the end, a canoe that is 0.25 inches thick and a canoe that is 1.0 inches thick should still look the same when comparing the exterior surface, length, beam width and rocker.

QUESTION 9: In the Significant Changes (Section 2) it states that the max width is located 10.2 feet from the bow and is 31.1875 inches wide. I am wondering if that means that the canoe has to have that exact width at that location or if that is the maximum that it can be and the minimum of 28 inches from last year still applies.

RESPONSE 9: The Rules and Regulations state that the maximum beam width of 31.1875 inches is located at a distance of 10.2 feet from the bow. This dimension, along with all of those provided, are what the teams are to build their canoe to (i.e., each and every team is building the same exact canoe). There is no language in the rules that allow a minimum of 28 inches. The Rules and Regulations for this year's competition are not tied to any other previous rules.

QUESTION 10: The rules state and the design drawing shows that the canoe is 20 feet long. What tolerance is allowed for the length of the canoe (i.e. +/- 1 inch)?

RESPONSE 10: There is no tolerance. The goal is to replicate the canoe with respect to the length, width, height, rocker and cross-sectional shape as provided.

QUESTION 11: Are we to assume that all of these cross sections are created for a female mold, and if not, then is it okay to adjust them for a male mold?

RESPONSE 11: The cross sections provided by the CNCCC are for the canoe itself (the exterior surface). Typically, if the team was designing their own canoe for construction, they would use some program to do the design based on the performance characteristics they deemed necessary, then import the design to say a program like AutoCAD so that they could construct it. From that point, depending on what mold technique the team decided to use, a team could offset for a male mold or do something to create a female mold. All we did was take the first step for you (i.e., give the teams the design). You can manipulate the drawings or files as you see fit in order to do the construction as long as it does not change the final design.

Section 2.10 - Flotation

2.10.1_Requirements

QUESTION 1: Section 2.10.1 explains the requirements for the flotation of the canoe. The rule states that wood blocks are allowed as flotation, however sawdust is not permitted. The mix design of our canoe is using wood shavings as an aggregate in compliance with the recycled aggregate rule under section 3.3.2. We wanted to confirm that this is rule compliant since our flotation comes from K-1 glass bubbles aggregate and blocks of Styrofoam encased in each of the tips.

RESPONSE 1: The use of wood shavings as aggregate would meet the definition of recycled aggregate per the rules and regulations of the competition (i.e., the wood would end up in a landfill but instead is being used in concrete). However, there is an issue with the second part of the question that you posed. You are stating that your flotation comes from the use of K-1 glass bubbles. The K-1 aggregate, if being used as flotation material (i.e., is encased in concrete and not actually part of a concrete mixture) is a particulate material similar to sawdust, Styrofoam beads, etc. and cannot be used as a flotation material in particulate form. The reason for this rule is that if the flotation cavities are breached, the particulate material could flow out and compromise the ability of the canoe to float if fully submerged. Large blocks of foam/wood, etc. would be easier to repair if they became dislodged.

QUESTION 2: Is flotation in the bottom of the canoe legal, as long as it is incased in concrete?

RESPONSE 2: There is no limit to the amount or location of flotation within the canoe as long as it is encased in concrete (Section 2.10.1).

Section 3. Concrete

Section 3.0 - General

QUESTION 1: Please provide clarification on all the different rules regarding the mix design. Are we allowed to do a cement (just cement and water) wash on our canoe? Or does every mix need to be in compliance with all the proportioning rules?

RESPONSE 1: We refer you to Section 3 - Concrete. The CNCCC Intent states that "In general, teams are permitted to use one (1) or more mixtures that (a) meet a meets gradation requirements and recycled content, (c) meet a minimum specified gravimetrically-measured air content of 6.0%, and (d) has a water-to-cementitious material (w/cm) ratio not greater than 0.40." Furthermore, 3.0 GENERAL states that "Concrete mixtures, regardless of their use in the canoe, are defined as unique and independent mixes and shall comply with all of the requirements of this section." In short, the answer is no, you may not just use a cement/water wash. Your second question is answered by the last sentence of the above paragraph.

QUESTION 2: The CNCCC responded to the following question, " I was wondering if it was allowed to use glass in one of our inlays as if to produce a mosaic. The pieces of glass would be applied to the fresh concrete and have the edges covered with a troweled layer of concrete" with "This is not allowed." Why are glass mosaics not allowed on the canoes? They would not be interfering with any aspects of the reinforcement cover.

RESPONSE 2: Although glass mosaics embedded in concrete would be fairly artistic, there are no provisions within the rules and regulations to allow them. This response will be a little rhetorical, for example, what will constitute a size of glass (area and thickness) allowed? Does the glass count as part of the hull thickness and if so (or better yet, if not), how does one handle the reinforcement to hull thickness calculation? If you allow a glass mosaic to be used, can one use ultra-lightweight plastics (or materials other than glass) to make a mosaic? The CNCCC is not asking for answers to this question, but are pointing our reasons why they are not allowed. We have no language for them and we cannot create rules to allow it at this point in time.

Section 3.2 - Materials

3.2.1_Cementitious Materials

QUESTION 1: For a cementitious material that is not stated outright in the rules (for instance, a pozzolan that is not metakaolin, not silica fume, not fly ash, etc.), is there any special procedure to confirm its eligibility in a mix design? The certain pozzolan that I am referring to is stated to "exhibit pozzolanic activity comparable to silica fume and metakaolin when tested in accordance with ASTM C 618 and ASTM C 1240."

RESPONSE 1: The only procedure that we have is for teams to submit the manufacturer's literature for review. Depending on the material, we may leave it as a private response to the team or if it is something that is commonly used, we would most likely publicly post a response.

3.2.1.1_Hydraulic Cement

QUESTION 1: For clarification are metakaolin, fly ash and slag cement considered hydraulic cements?

RESPONSE 1: Metakaolin and fly ash are not hydraulic cements. They are pozzolans which require a reaction with the free lime resulting from portland cement hydration to become cementitious. Slag cement can be considered a hydraulic cement, because it can react with water and set up with or without portland cement and it meets the requirements of ASTM C 595, "Standard Specification for Blended Hydraulic Cements." There are blended hydraulic cements which contain fly ash and slag (ASTM C 595).

3.2.1.2_Fly Ash

QUESTION 1: In the rules it states that Fly Ash shall meet the requirements of ASTM C 618, Class C or Class F, except loss-on-ignition not to exceed 3%. We were unsure about what the loss-on-ignition not to exceed 3% because the ASTM C 618 says that the loss-on-ignition is 6% max. Could you please clarify this for us?

RESPONSE 1: The specification should be pretty clear as it is currently written. The fly ash that is used is to meet all of the requirements of ASTM C 618 with the exception of the loss of ignition. The standard states that LOI is 6% max; the CNCCC has limited it to 3%. A fly ash a LOI with 4% or greater would be compliant with the ASTM standard, but not in compliance with the rules and regulations.

3.2.1.4_Slag Cement

QUESTION 1: The CNCCC has stated that since slag cement meets the requirements of ASTM C 595, it is a hydraulic cement. In my experience, I have seen quite a variation in the terminology referring to slag. In the past, we have used a product that meets ASTM C 595 because it is not a blended cement (despite the name), it is just Ground Granulated Blast Furnace Slag, meeting ASTM C 989. Would this slag be considered a hydraulic cement for the purposes of this year's canoe competition?

RESPONSE 1: In our response we stated that slag cement can be considered a hydraulic cement (will set and harden when mixed with water by reacting chemically). Slag cement is typically used with portland cement to make concrete or with lime to make mortar (for masonry applications, etc.), but it is not used alone to make structural concrete. However, there are hydraulic slag cements that set and harden by chemically reacting with water. These slag cements would be Types IS and S (Portland blast-furnace slag cement, designation is a function of slag content) conforming to ASTM C 595, "Standard Specification for Blended Hydraulic Cements," as well as ASTM C 989 or ASTM C 1157. It is possible that certain slag cement products can be considered a hydraulic cement even though the data sheet does not state that it meets C 595 or C 1157. We recommend that students contact the appropriate technical service group to get this information.

QUESTION 2: Based on the previous question that asked about what constituted hydraulic cement, it would appear that using Type I/II cement in combination with slag cement (if that combination constituted more than 50% of the cementitious materials) would be in violation of the rules. Is that correct?

RESPONSE 2: The technical answer to this question is, "it depends." Please refer to the earlier response regarding this matter.

3.2.2_Aggregates

QUESTION 1: Would a pelletized blast furnace slag be considered a recycled aggregate that could be used?

RESPONSE 1: Slag in this form can be considered a recycled aggregate - it is a by-product of a manufacturing process and its incorporation in construction (as aggregate in concrete, lightweight fill in road construction, etc.) prevents its disposal in landfills

QUESTION 2: Would expanded fly ash be considered an aggregate within the mix design, since the expanded fly ash would not contribute to the cement?

RESPONSE 2: If the expanded fly ash is inert, it may be considered an aggregate.

QUESTION 3: (a) Is coal fly ash considered a recyclable material? (b) Is a MTDS required for the recyclable aggregate?

RESPONSE 3: (a) Yes. (b) Yes. All recyclable aggregates must have a MTDS submitted unless the material is manufactured by the students and in that case the original materials MTDS should be submitted.

QUESTION 4: If a commercially available product claims to be made from "100% recycled material", would it be a legal product to use to satisfy the requirement in this year's rules?

RESPONSE 4: Yes.

QUESTION 5: Are cenospheres, a by-product of coal burning power plants, are considered a recycled material? The primary use of the initial product, coal, was to burn to make energy and therefore since cenospheres are a byproduct of this process we would be using them as an aggregate instead of letting them go to waste.

RESPONSE 5: According to Section 3.2.2, "Recycling aggregate shall be defined as processing used materials into new products in order to prevent the waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air and water pollution by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions as compared to virgin production." Cenospheres are a prime example of a recycled aggregate as they are used in order to reduce the need for conventional waste disposal (i.e., placed in a landfill) and is a "used material" (i.e., by-product).

QUESTION 6: Is pumice acceptable to be used as a recycled aggregate? Although it is not strictly recycled it does reduce air and water pollution and lower greenhouse gases since it is not a manufactured product.

RESPONSE 6: Pumice is a textural term for a volcanic rock commonly resulting from explosive eruptions (plinian and ignimbrite-forming) where gases from viscous magma nucleate bubbles cannot readily decouple from the viscous magma prior to cooling to glass (i.e., not having a crystalline structure). The result is a solidified frothy lava composed of highly microvesicular glass pyroclastic with very thin, translucent bubble walls of extrusive igneous rock. Yes, it is not a manufactured product, but it is a naturally occurring material. In its natural form it cannot be construed in any way as a "recycled aggregate." If it was part of a pumice concrete that was recycled, then the pumice would be part of the recycled content.

QUESTION 7: With regard to the 25% recycled aggregate content in the mix, first, do we need some sort of documentation showing that we have at least 25% recycled aggregate? Second, and most important, our school received pumice from a company that makes concrete and they sieve out the pumice that is too small for what they need. If we use this pumice which is not going to be used by the company is it considered recycled because it would go to waste if we did not use it?

RESPONSE 7: The documentation will come in the form of technical data sheets or description of the material (such as its original). For example, if you are using a recycled concrete aggregate, you can explain where it came from (demolition of a stadium, crushing of concrete cylinders from a testing laboratory, etc.). We have addressed the issue of the use of pumice in concrete in a response "Section 3.2.2. Aggregate" where we stated that pumice is a naturally occurring material and that in its natural form it cannot be construed in any way as a "recycled aggregate." If it was part of a pumice concrete that was recycled, then the pumice would be part of the recycled content. In the case that you described, it is just left over pumice (it can be used for the other 75% of the aggregate that you need)

QUESTION 8: Concerning the aggregates, the rules state that the aggregates must have a recycled material content of at least 25%, does that mean that we have to recycle the material ourselves or it can be aggregates manufactured with recycled materials?

RESPONSE 8: The aggregate is manufactured with recycled materials. We have defined what is considered recycled in Section 3.2.2., "Recycling aggregate shall be defined as processing used materials into new products in order to prevent the waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air and water pollution by reducing the need for "conventional" waste

disposal, and lower greenhouse gas emissions as compared to virgin production." A recycled material can be supplied by others (manufacturer, distributor, etc.) or it could be something recycled by the team. A portion of the aggregate used in the concrete mixtures has to meet the definition of recycled aggregate. There is no requirement that you recycle your own material, however, recycling materials that you intend to use as aggregate would meet the requirement.

QUESTION 9: I have a question regarding recycled aggregate. Would we be able to use crushed walnut shells?

RESPONSE 9: Yes.

QUESTION 10: If we overdose the mixture with fly ash, only a certain percent of it will actually aggregate for the canoe?

RESPONSE 10: For this competition, the cementitious materials cannot be considered aggregate (it will just be un-hydrated cm). Technically, there are some advanced in concrete technology such as reactive powder concrete or ultra-high performance concrete which have very low w/cm ratios resulting in not all of the cm hydrating and therefore "acting" as aggregate (which leads to the possibility of re-hydrating the concrete to help seal cracks and all). Here, we will still refer to it as cm.

QUESTION 11: We have a class creating different types of lightweight concrete using different types of foam. One type consists of small Styrofoam balls and another type consists of an actual foam that is sprayed into the concrete as it is mixing to make it extremely lightweight. Down to approximately 40 pcf. My question to you is can we then take this concrete that is going to be tested and crush it up to use it as our recycled aggregate?

RESPONSE 11: If the intent of the research being conducted in the development of the lightweight concrete was not related to the development of the concrete canoe this competition year, then the recycling of the concrete is allowed. That is, one cannot say that they developed the concrete for the sole purpose of crushing it to then incorporate it into the final selected mixture design.

3.2.3_Fibers

QUESTION 1: What is the minimum length required that separates a fiber from an aggregate? We have some milled fibers of very small length and are wondering whether they should be documented as fibers or aggregates.

RESPONSE 1: There is no minimum length that separates a fiber from an aggregate, as fibers are fibers and aggregate is aggregate. Fibers are dispersed within the concrete matrix to improve the tensile and flexural characteristics of the concrete. According to Section 4.2, Materials, "Fibers shall not be considered an aggregate in any concrete mixture."

3.2.4_Admixtures

3.2.4.3_Coloring Admixtures/Agents and Coloring Pigments

QUESTION 1: Can we use two different color pigments (not mixed together)? Would this be considered an inlay? Can you define and explain an inlay?

RESPONSE 1: You may use multiple color pigments, separately or mixed together, in your concrete. An inlay is graphic or design that is incorporated into the canoe typically by placing a layer of concrete that is thinner than the rest of hull and then going back and filling in the space (i.e., the inlay itself) with concrete, usually of a different color).

Section 3.3 - Requirements

3.3.1_Mass of Cementitious Materials

QUESTION 1: In Section 3.3.1, it states that "the total amount of hydraulic cement meeting the requirements of Section 3.2.1.1 cannot exceed 400 lb/yd³." Does this mean total for each mix, or total for the entire canoe? For example, if our structural mix has is at 400 lb/yd³, are we not going to be able to add a finishing mix?

RESPONSE 1: The rule is for each individual mixture design. In the example provided above, you can max out at 400 lb/yd³ of hydraulic cement for your structural mix and max out at 400 lb/yd³ of hydraulic cement on a finishing mix.

QUESTION 2: According to the Significant Changes document, Section 3 - Concrete states: "A maximum of 50% (by mass) of the cementitious materials used in any concrete mixture must consist of hydraulic cement and the total amount of hydraulic cement shall not exceed 400 lb/cubic yard." According to the Rules and Regulations, Section 3.3.1 - Mass of Cementitious Materials states: "A maximum of 50% (by mass) of the cementitious materials used in any concrete mixture can consist of hydraulic cement meeting the requirements of Section 3.2.1.1. In addition, the total amount of hydraulic cement meeting the requirements of section 3.2.1.1 can not exceed 400 lb/cubic yard." It is our understanding that if we CAN use hydraulic cement, then we do not have to because there is no set minimum, but if we MUST, then we shall put no less than 1% (by mass) so that it is not 0%.

1.) Please clarify if we MUST use or CAN use hydraulic cement as a cementitious material.
2.) We may leave out portland cement, as there is nothing in the rules regulating it. Is this correct?

RESPONSE 2: 1.) The word "must" was inadvertently left in the Significant Changes document. The Rules and Regulations are the governing document for the competition. 2.) Yes, you can technically design a non-hydraulic cement concrete.

QUESTION 3: Rule 3.3.1 stipulates that "A maximum of 50% (by mass) of the cementitious in any concrete mixture can consist of hydraulic cement..." It is correct to interpret this as only half (or less) of your cementitious material can be cement, the rest must be pozzolans? Is there a minimum cement content?

RESPONSE 3: Your interpretation is correct; the maximum amount of cement is 50%. There is no minimum cement content.

3.3.2_Aggregate Proportioning

QUESTION 1: According to Section 3.3.2, Aggregate Proportioning, "In addition, the aggregate(s) must have a recycled materials content of at least 25%, based on the total amount of aggregate(s) in the concrete mixture."... Does this mean the recycled materials content must be 25% of the weight of the total amount of aggregates or 25% of the total volume of the aggregates?

RESPONSE 1: By weight.

QUESTION 2: Since this year's rules states 25% total weight of aggregates has to be recycled, would crushed concrete from previous projects serve as a recycled material?

RESPONSE 2: Yes, the recycling of concrete from previous projects (by crushing it into aggregate and incorporating into a new concrete mixture) meets the requirements. In industry, this is probably one of the most common practices. With that being said, here are a couple of notes; 1. The concrete that is being crushed and used as aggregate does not need to meet the mixture design requirements set forth in the rules and regulations. The crushed concrete is treated solely as aggregate. 2. The attributes of the concrete (i.e., air content, w/cm, etc.) that is proportioning of the concrete that the crushed aggregate is being

incorporated into. 3. Teams should not try to make a concrete solely for the purpose of crushing so that it can be incorporated into another concrete. Technically, you are not recycling a used product.

QUESTION 3: The 2009 NCCC rules state that a minimum of 25% of the aggregate used in our mixtures must be recycled. We would like to know if crushed and recycled concrete counts as aggregate according to the 2009 rules of NCCC, if it is necessary to know the chemical and physical composition of this crushed concrete, and if this recycled concrete mixture would have to follow the regulations of the 2009 NCCC as well.

RESPONSE 3: This question has been posed by many teams over the past several years. Recycled (crushed) concrete may be used as an aggregate source. Recycled concrete can be used in the concrete as long as the following criteria are met:

1. Teams shall ensure that any concrete used as aggregate is INERT; that is, all cementitious materials are completely hydrated prior to crushing, processing, and eventual incorporation into the concrete mix design(s) used in the canoe.
2. The process used to ensure inertness shall be fully documented in the design paper.
3. The relevant properties of the aggregate (absorption, specific gravity, etc.) must be determined for the aggregate according to applicable ASTM standards. Other properties of the concrete (including its origin) would be helpful as well.

The concrete that is being used for the aggregate does not need to meet the specifications outlined in Section 3 of the 2008 Rules and Regulations. The concrete mix design that incorporates the recycled concrete aggregate must meet the specifications of Section 3.0. With that being said, the ingredients used in the creation of the recycled concrete aggregate shall not be included in the summary of mixture proportions.

Teams cannot count the ingredients used to make the recycled concrete aggregate as ingredients to make the concrete mix design (for example, one cannot use the cement content in the recycled aggregate as part of the cement content in the final mix design proportioning).

QUESTION 4: The aggregate proportioning section, mandates 25% of the aggregates used for the canoe be recycled. We want to use Poraver as our main aggregate. Poraver's website states that the product comes from post consumer recycled glass. Poraver makes use of a raw material not utilized by the glass industry. Is Poraver considered a recycled material?

RESPONSE 4: Yes, Poraver (aka Siscorspheres) is a recycled glass aggregate that meets the requirements of the rules and regulations of the competition. This particular product has been used by many schools over the years.

QUESTION 5: Should the recycled content of the concrete be 25% based on weight or is it only the aggregate that must consist of 25% recycled material?

RESPONSE 5: 25% of the aggregates used in the concrete mixture must be a recycled material (by weight). For example, 75% natural sand, 25% crushed glass.

QUESTION 6: With regard to the distribution of recycled aggregates in the mix, does the requirement that at least 25% of the aggregates have to be recycled permit the use of a 100% recycled material content?

RESPONSE 6: The 25% value is a minimum requirement for the recycled content of your aggregate source in each and every concrete mixture that you intend to you.

QUESTION 7: Reading Sections 3.3.2 and 3.4.2 it does not appear that each of the individual aggregates have to meet the gradation requirements. Are we allowed to use a single aggregate size for one aggregate and use a second aggregate to create the necessary composite gradation? For example, can we use 3 mm plastic pellets and sizes 0.25 to 2 mm glass beads to create a good composite gradation? Also, is there a maximum aggregate size that we can use?

[RESPONSE 7:](#) Individual aggregate sources do not need to meet the gradation requirements, it is the final composite that needs to meet the gradation requirements (since gradation is based on weight/mass passing, one has to take into account the variation in specific gravities of the various aggregates used). You can use various aggregate sources of various particle sizes to meet the competition requirements. There is no limit imposed on the maximum particle size, only the percentage passing the No. 100 sieve.

3.3.4_Minimum Air Content

[QUESTION 1:](#) Can we measure the geometric air content of a hardened concrete cube due to the absorbent nature of some of our aggregates?

[RESPONSE 1:](#) We assume that you are actually referring to the gravimetric air content. Please note that the gravimetric air content is simply a calculations based on theoretical maximum density (i.e., a concrete on an air-free basis) and an actual measured density (See ASTM C 138). By testing the absorbency of a hardened concrete sample, you are not determining the gravimetric air content.

Section 3.4 - Documentation

3.4.1_Mixture Proportioning Table

Concrete Canoeists,

Concrete Mixture Data Table

Table 3.1 is the same one that can be found in the 2009 ASCE National Concrete Canoe Competition™ Rules and Regulations and will also be uploaded to the ASCE website in the next few days. The table has been formatted so that it meets the margin requirements of the design paper (however, teams are strongly cautioned to check to ensure that it does). In general, volumes shall be presented to three (3) decimal places. For most other values, two (2) decimal places are appropriate. Yields only require one (1) decimal place.

Modifications to the table are permitted but there are limitations:

- Teams are permitted to add or subtract rows under *Cementitious Materials, Fibers, Aggregates, Solids Content of Latex Modifiers* and *Admixtures* as appropriate (For example, a team uses only two aggregates while the standard form has up to 5 aggregates. The team can delete the three extra rows).
- Teams are permitted to change fonts, colors, etc. for presentation purposes.
- Teams MUST provide all the information required in the columns, such as but not limited to, absorption for the aggregates, densities for admixtures (wt/gal), and relevant concrete parameters (c/cm, w/cm, slump, air contents, densities and yield).
- All units must be in English.

For information on how to correctly fill out the table, please refer to Section 3 - CONCRETE and Appendix C of the Rules and Regulations. ASTM C 138 is also a pertinent document. As always, the CNCCC will provide clarifications as appropriate.

Sincerely,
CNCCC

[QUESTION 1:](#) With regard to the Concrete Mixture Data Table, what is meant by Non-SSD Proportions as Designed, Actual Batch Proportions, and Yielded Proportions?

[RESPONSE 1:](#) Please make reference to Appendix C - General Guidelines for Concrete Mixture Data Table of the Rules and Regulations which explains what is meant by Non-SSD, Actual Batch and Yielded Proportions. In

general, the "as designed" proportions are those that you intend to make, "actual batch" are those that you actually batched in the laboratory with actual results for density, slump, air content, etc., and the "yielded" are the proportions that have been corrected to account for the yield that you made (see ASTM C 138). One can think of it this way - "as designed" is what you think you are going to get, "actual batch" is what you ended up with after mixing and testing, and "yielded" are the adjustments made to the "as designed" based on the "actual batch."

QUESTION 2: In Table 3.1 there is a section to incorporate solids from latex modifiers. Are we to assume the solids content of the other admixtures is negligible?

RESPONSE 2: For the most part yes; unless the admixture has a fairly high solids content and it is being used at a high dosage that can influence the density and gravimetric air content calculations.

QUESTION 3: Section 3.3.3 states: "The water content of all admixtures shall be taken into account in the determination of the w/cm ratio, except as noted in Table 3.1." Table 3.1 states: Total Batched Water[^], where ^ leads to: "INCLUDING water added for aggregate absorption." C-1 General Guidelines for Concrete Mixture Data Table states: "Batched Water" is the total amount of water needed to hydrate the cementitious materials and for workability. As noted on table 3.1, EXCLUDE the amount of water needed to account for aggregate absorption." These two statements are contradictory. Please confirm Table 3.1 is incorrect and Appendix C-1 is correct. _____ In Appendix C you state that "Batched Water" excludes the amount of water used for aggregate absorption while at the bottom of Table 3.1 you say that "Batched Water" includes water added for aggregate absorption. Which is correct? If the latter is correct then wouldn't Total Water be Batched - Absorption + Admixtures, otherwise water added for absorption would be counted twice.

RESPONSE 3: Table 3.1 was modified for the 2009 competition. It appears that Appendix C-1 was not changed to reflect the changes to Table 3.1. Table 3.1 is correct

QUESTION 4: After reviewing the concrete mixture data in Table 3.1 for the top 5 finishing schools of the 2008 competition, I have noticed that cells indicating the "Water in Admixture" for Air Entraining Admixtures (AEA) has been filled solid for those schools that chose to use an AEA. This implies either the water content in the admixture is ignored and not included in calculating of water-cementitious materials ratio, or, the cells were incorrectly disregarded - and instead the water in the AEA must be taken into account when calculating the water-cementitious materials ratio. Section 3.3.3 states: "The water content of all admixtures shall be taken into account in the determination of the w/cm, except as noted in Table 3.1" I have also noted the cell for AEA was blocked solid in the 2008 template of Table 3.1, while instead this year's Table 3.1 has the top row cells colored solid with no reference to an AEA. Please advise.

RESPONSE 4: The first line under "Admixtures" for Table 3.1 should be designated with "Air Entraining Admixture" and would correspond with the blocked out cell for "Water in Admixture." The assumption being made is that the amount of water in the AEA is very small and will not have a major contribution of water to concrete. If your team does not use AEA in its concrete, then you can eliminate the row from your mixture design table.

QUESTION 5: In the General Guidelines for Concrete Mixture Data Table section of the Rules and Regulations the amount of water needed for the mixture is broken down into three sections. These sections are "Batched Water", "Total Water Added for Aggregate Absorption", and "Total Water from All Admixtures" The Guidelines also state that these three categories should be added together to show the total water in the mixture; however, we primarily use latex for our water and use it to account for aggregate absorption. Therefore by adding the "Total Water Added for Aggregate Absorption" and the "Total Water from All Admixtures", we are adding part of the water twice. Can we change the "Total Water Added for Aggregate Absorption" to "Total Water Needed for Aggregate Absorption", but not include it in the sum?

RESPONSE 5: Table 3.1 has a note for "Total Batched Water"(Row 1 under "Water") which says "including water added for aggregate absorption." The second row (Row 2) is "Water Added for Aggregate Absorption"

and the third row (Row 3) is "Total Water from All Admixtures." In general, the Total Water = Row 1 - Row 2 + Row 3. In this particular case, where the water in the latex admixture is being used as the water for cement hydration and aggregate absorption, the "Total Batched Water" will be just the water added to the mixture since the "Total Water needed for Aggregate Absorption" is included in the "Total Water from All Admixtures". You should not take water from the latex and add it to Row 1, because you will have to reduce the "Total Water from All Admixtures" by this amount, which though mathematically correct will trigger an error in the calculations (for total water from all admixtures). If you are using just the water in the latex (i.e., not adding any additional water), then Row 1 is zero, Row 2 will have some sort of value, and Row 3 will be the water in the latex admixture. If you incorporate some additional amount of water, then Row 1 would be that additional amount. The end result is still the same.... Total Water = Row 1 - Row 2 + Row 3.

QUESTION 6: At the bottom of Table 3.1 it says to use ASTM C 127 to determine oven-dry bulk specific gravity, which is for coarse aggregate. Why are we not using ASTM C 128 which is for fine aggregate. Both say they are not for use with lightweight aggregates, which all concrete canoes use, but as far as I could tell there is no ASTM standard for lightweight aggregate testing. It is possible to modify C 128 for our purposes but unlikely that C 127 would yield accurate results.

RESPONSE 6: The CNCCC provides a listing of the relevant ASTM standards as part of the rules and regulations, however, it may not include all of the standards that are needed or used by the teams. C 128 may be applicable to some of the teams, but as you noted, many lightweight aggregates would not be covered (in general, aggregates have a specific gravity greater than 1, usually on the order of 2.65, and quite a bit of the lightweight aggregates are less than 1.0, and therefore float in the water that used in the test method. There may be other standards that could be used to determine specific gravity and depending on the aggregate, the manufacturers or suppliers can provide the value that can be used.

QUESTION 7: I have a question regarding the number of significant digits to be used when conforming to the NCCC rules. I am specifically referring to specific values that are outlined in Section 3 - Concrete (specifications 3.2.2, 3.3.1, 3.3.3, and 3.3.4) other values may apply in other specifications. For example specification 3.3.3 states, "The maximum allowable water-cementitious materials ratio (w/cm) for any concrete mixture is 0.40. The water content of all admixtures shall be taken into account in the determination of the w/cm, except as noted in Table 3.1." Are we to assume that this value may be rounded down to the nearest hundredth? In other words, is a water-cementitious materials ratio of 0.40 (two significant figures, rounded down from 0.40499) acceptable? In addition, specification 3.2.2 states, "The composite gradation of the aggregates selected shall have no more than 5% (by weight) passing the No. 100 sieve (0.15 mm)." Likewise, are we to assume that this value may be rounded down to the nearest tenth? I assume a percentage passing value of 5% (one significant figure, rounded down from 5.499%) is correct? Due to the differentiation of significant figures, I presume when the specifications were first formulated, significant figures were considered (hence the specific dictation in the specification of one significant figure 5% vs two 40). Most importantly, for teams who choose to use Microsoft Excel to formulate mix designs, and depending upon the number of decimal places or significant digits that are displayed when a value is calculated, the use or assumption of significant figures is unclear in the specifications when the numerical values computed are compared to the written values in the specifications. This question has been purely for verification/clarification of the rules.

RESPONSE 7: The main issue is to ensure that minimum or maximum values (depending on what governs) in order to be in compliance with the rules and regulations are achieved. The issue of significant figures would complicate the issue and in general, two decimal places (three at the most) are enough for the calculations to be made. Certain calculations are easy. For example, if you intend on maximizing the amount of water you want in the mixture then take 0.40 (the max. allowable w/cm ratio) and multiply it by the amount of cm that you have. In the examples given it would be perfectly fine to round up to 5.5% (since it exceeds the 5% that you need); rounding the 0.40499 could be questionable. Our suggestion - simplify the math.

QUESTION 8: In the concrete mixture table, do we put latex in the admixture category to take count of the water content, report that water amount in the water line 3 AND the solids in the Solid content category or do we just put the solid part in its category and the water in the water line 3? in other words, do we take the latex as an admixture?

[RESPONSE 8:](#) Latex is considered an admixture that is an emulsion (solids emulsified in water), so the total amount of latex (water and solid) added is to be provided in the admixture column and the water that is part of it will be accounted for as well in the Water section of the table. This applies to all of the admixtures.

3.4.4_Material Safety Data Sheets

[QUESTION 1:](#) With regard to the presentation of MTDS for the recycled aggregate, we are currently recycling our own materials that are attainable from local stores and crushing them to a certain diameter for use in our concrete mix. Since the recycled aggregate is not made by an industrial business...how do we go about "producing" a MSDS or technical data sheets?

[RESPONSE 1:](#) Section 3.2.2 "Aggregate" states that "Recycling aggregate shall be defined as processing used materials into new products in order to prevent the waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air and water pollution by reducing the need for 'conventional' waste disposal, and lower greenhouse gas emissions as compared to virgin production." Depending on the particular products that you are using, you may be able to find typical properties of material and/ or conduct testing. For example, if you are using crushed glass, you can easily determine specific gravity, absorption, etc. for the material. If you have a particular product(s) in mind, we may be able to offer some recommendations. We should also ask if you are actually meeting the definition of recycling material. For example, are you processing a "used material" (for example, buying cases of bottled beer, drinking said beer (used), then crushing the glass instead of throwing it away - this would meet the definition)? There may be instances that you are attaining materials that in the end would not meet the recycling definition. So if you have a particular product in mind, please inform the committee and we can render a decision.

[QUESTION 2:](#) It is stated in Chapter 5 that for the finishing products, the MSDS must include a statement that the product meets the requirement and different standards, and if it is not on the MSDS, then a letter from the product manufacturer that certifies the compliance of the product. In Chapter 3 for admixtures and cementitious materials, it is neither explicitly said that the compliance must be on the MSDS nor the need for the compliance letter from manufacturer. Shall we provide such letter for, as an example, a latex that is compliant but is not written on the MSDS?

[RESPONSE 2:](#) Actually, it is the Material Technical Data Sheets (MTDS) that must state that products are in compliance with the various standards set in the rules and regulations. MTDS can be product literature or data sheets provided by the manufacturer. MSDS are Material SAFETY Data Sheets and discuss issues as chemical makeup, flammability, toxicity, exposure limits, material handling and storage, etc. of the products used. Typically, you will not see material compliance with ASTM standards on a MSDS. In addition, Section 3.4.4, Material Technical Data Sheets, stipulates that "Material Technical Data Sheets (MTDS) for each material used in the construction of the canoe shall be presented under Tab D of the Engineer's Notebook (Section 7.1.2.d). This includes, but is not limited to, cementitious materials (including cement), aggregate (other than natural or manufactured sands), chemical admixtures, and pigments. **Material Data Safety Sheets (MSDS) are not equivalent documentation for MTDS.**" We do have a provision to allow letters to cover compliance issues depending on the materials (proprietary).

3.4.6_Concrete Sample(s) Cylinders

[QUESTION 1:](#) In Section 3.4.6, it states that "a 3 in. x 6 in. cylindrical sample of each concrete mixture used in the canoe shall be made available for compliance checking as part of the product display," but we do not have any molds to cast a 3x6 cylinder. We only have 6in x 12in or 4in x 8in molds. Will the 4x8 cut in half suffice for our sample?

[RESPONSE 1:](#) A 4" diameter cylinder will suffice.

Section 4. Reinforcement

Section 4.2 - Materials

[QUESTION 1:](#) Can we use #2 rebar to reinforce our ribs?

[RESPONSE 1:](#) Yes, as long as the other requirements for reinforcing are met, in particular the reinforcement to thickness ratio. The reinforcement scheme must be in compliance with Section 4.3.1 which requires the total reinforcement thickness to not exceed 50%. In addition, the reinforcement scheme must also maintain a minimum percent open area (POA) of any layer of reinforcing material of 20%. The percent open area would not generally apply to rebar unless you are somehow making a grid pattern.

[QUESTION 2:](#) May reinforcing bars have additional pieces of metal attached or tied to them for the purpose of increasing the bar--concrete bond? If separate pieces cannot be attached, then can the bar itself be tied or notched such that a "bulge" is created to increase bonding?

[RESPONSE 2:](#) As long as the requirements of percent open area (POA) and thickness ratio (reinforcement thickness to overall hull thickness), the tying of reinforcing bars to increase bonding is allowed.

[QUESTION 3:](#) Is it possible to make our own reinforcement out of fiberglass or carbon fiber and coat it with epoxy resins to be used inside of the canoe? No epoxy resin shall touch concrete only the fiberglass. This is in an effort to provide more rigidity to an otherwise weak material.

[RESPONSE 3:](#) According to the CNCCC Intent of Section 4 - Reinforcement, "the reinforcing materials do not have post-manufacturer applied coatings that enhance the properties of the reinforcement." Therefore applying epoxies and similar materials to fiberglass, carbon fiber or any other reinforcing material is not allowed.

Section 5. Finishing

Section 5.5 - Concrete Stains

Concrete Canoeists,

For the past couple of years, many teams have been using stains by Triple-S, which come in a variety of colors, one of the more popular being "Sea Blue." There had been some questions raised to the CNCCC a couple of years ago regarding the legality of using the "Sea Blue" as an acid stain for the competition. At the time, we reviewed the technical data sheets provided by Triple-S which gave the impression that they were indeed an acid stain with some additional solids (in the form of a dye); they were listed as an acid stain. While we noted that these acid stains tended to "run" like other types of stain or even paint (note that acid stains contain organic salts and minerals, i.e., the solids, and are HCl based, and chemically react with the concrete to stain it), the fact they were classified by the manufacturer as an acid stain led the CNCCC to rule that these stains (in particular, the colors of Sea Blue, Yellow, Brick, Gray and Burgundy) as legal stains.

Recently, a review of Triple-S website now states that these particular colors are not acid stains, rather they are dye-based stains. Given the change in their classification, these particular colors do not meet the requirements of Section 5.5, Concrete Stains, of the 2009 Rules and Regulations. We will note that Triple-S does carry acid stain products as well.

Although we are only noting one particular product (given its use by many teams), we caution all teams to ensure that the products that they are using are indeed acid stains. If you have a particular product in mind

for the committee to consider, please e-mail the CNCCC and provide a PDF of the technical data sheet or a link to the website so that we can conduct a review and render a decision on the legality of the product as it relates to the competition.

Sincerely,
CNCCC

QUESTION 1: With regards to the rule for acid stains and volatile content, we were wondering about the legality of using organic stains that are made from 100% recycled materials as opposed to acid stains which are potentially dangerous chemicals. Would we be able to use a stain of this kind on the canoe?

RESPONSE 1: Section 5.5 "Concrete Stains" state that equivalent products may be submitted to the CNCCC for consideration as an approved equal. It is possible that organic stains may be approved by the CNCCC, but the technical data must be supplied in order for the committee to render a decision on a given product.

QUESTION 2: In regards to the 5% paint limit on the canoe, does this same rule apply to the inside of the canoe or just the exterior? Do the rules refer to "paint" and "stain" as the same type of material or are they different within the context of the rules? If so...does the 5% paint limit apply to stains as well?

RESPONSE 2: We believe that you are confusing two sections of the Rules and Regulations as there is no 5% paint limit for the canoe. Section 5.4 "Paint and Adhesive Appliqués" limits the use of paint solely to the lettering for the school and canoe names. We do not specify the paint type so it can range from finger paint to automotive paint. The 5 percent that you mention is a limit that we have placed on the maximum solids content for the concrete acid stains (Section 5.5) and the addition of commercially available thickeners specifically formulated for the acid stains. Acid stains, or their CNCCC-approved equals, are not paints. The percent solid content is a value that the manufacturers of a given product can supply and should be shown on the product labels and/or technical data sheets.

QUESTION 3: Is there a limit to how much stain we can use on the exterior and interior of the canoe?

RESPONSE 3: Section 5.5, Concrete Stains, states that "The application of any acid-based 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." The same goes for sealers (Section 5.6).

QUESTION 4: Are we allowed to dilute a commercial acid stain with water and apply it to the canoe? If so, will providing the original MTDS sheets (stating all the original technical data/composition regarding the acid stain as manufactured) be sufficient for the Engineer's Notebook?

RESPONSE 4: We see no issue with the dilution of an acid stain with water as long as the acid stain meets all of the requirements set forth in the rules and regulations (i.e., one cannot dilute the acid stain to meet the requirements, for example, a VOC of 1000 g/l and diluting it to get it down to 700 g/l or less). The stain's MTDS shall still be provided in the Engineer's Notebook.

QUESTION 5: Is Soycrete Architectural Concrete Stain, an organic stain, permitted for use in the canoe competition? Here are the MSDS and TDS for the product.

RESPONSE 5: Several teams have submitted a question regarding the use of SoyCrete Architectural Concrete Stain as an approved equal to the acid stains, many of which were requesting privacy. However, one school had posted the question to the list serve and we have made a decision to post the response to everyone. The CNCCC has ruled that this particular product is not an approved material given its use of pigments. While eco-friendly, its approval would have conflicted with other rulings regarding dyes, pigments and other solids in stains.

Section 5.6 - Concrete Sealers

QUESTION 1: Per Section 5.6, sealers must contain a minimum solids content of 20%. Would it be acceptable to mix "glitter" or some other sparkly substance like aluminum flake into the sealer and roll onto the canoe to give it a shimmer effect, like paint on a car? We feel that this would be within the confines of the rules, as it simply increases the solids content of the sealer.

RESPONSE 1: The CNCCC's response to other teams which have asked the same question is that glitter or other similar solids are not allowed to be added to either the stains or sealers used on the canoe. The above question was posed with the request for privacy, however, since our ruling will be against the use of such materials, we felt we should inform all teams of this ruling.

QUESTION 2: None of the film forming sealers I have researched state on their MTDS sheets that they meet ASTM C 1315 requirements. They do state the VOC and the type or class it is. With the VOC and type/class stated is that enough information to be a legal sealer? I have attached a MTDS sheet as the one I was looking at using on the canoe. Does it pass guidelines?

RESPONSE 2: If we are correct, the product MTDS submitted to the CNCCC was for fiber reinforcing and not a concrete sealer. The team should resubmit the appropriate MTDS for our review. In response to the question, the MTDS for the product should state ASTM C 1315 (it should also be listed on the container that it comes in). There is a mention that "type and class" is provided. ASTM C 1315 does list type and class as part of its specifications, but it could be also listed for a variety of other standards. Until we see the actual MTDS, we cannot make a determination.

Section 6. Design Paper

Section 6.2 - Design Paper

6.2.2_Format

QUESTION 1: Section 6.2.2 states that the following is required in the executive summary of the paper: "List at a minimum, the canoe name, weight, length, width, depth, thickness, and color, as well as the engineering properties of the concrete (unit weight and strength) and type(s) of reinforcement used." We have a large number of different concrete mixtures (including 6-7 finishing mixtures). We were wondering if we were required to list all of these concrete mixtures and their properties in the executive summary, or if there was a way to condense this information (can we just list the structural mix and the main finishing mixture or something like that?)

RESPONSE 1: Although privacy was requested on this question, many teams have a variety of concretes that they use so the response is applicable to them as well. In addition, the response does not give out any proprietary information and is more of a general clarification. The answer is that they should all be listed. Depending on what you have, it may be able to be condensed (for example, say you have the same mix design with 5 different colors. You could give the parameters and list that they come in different colors and state them). Looks like you need to make a table. Before it is asked, yes, every time will have the same length, width, and depth for their canoe in the Executive Summary.

Section 6.3 - Submissions

6.3.1_Conference Competition

QUESTION 1: Due to complications, we recently redesigned our mix. Our paper is due to be post-marked March 10th. At that time, we will not have 28th strengths, unit weights or a total weight of the canoe. How are we supposed to report these numbers if they are not known? We can report estimates, but not the exact measured numbers. Will we face deductions if we report estimates to the best of our abilities at the time but they turn out to be off?

RESPONSE 1: When it comes to the conference competitions the CNCCC inform the judges to provide some leeway in regards to the values provided in the report to those that perhaps are presented in the oral presentation. There is a general understanding that the reports for the conference competitions are due before the canoe is finally constructed (and at the national level, the final report is prepared after the canoe is constructed). Providing estimates of weight is perfectly fine (just be realistic by explaining how that value was determined) and say it is an estimate. Report breaks that you have and state what you think the 28-day strength would be. Your presentation can cover final numbers and you can point out if there was a significant difference in a given value(s). Or the judges can ask why the difference, and you will be able to reasonably and rationally explain why (function of schedule, submission of paper, actual construction of canoe). Do not issue a revised report or some sort of addendum.

Section 7. Engineer's Notebook

Section 7.1 - References

7.1.2_Format

QUESTION 1: In Section 7.1.2.d the rules say "Present MTDS for each of the materials used in the construction of the canoe, including but not limited to binders (other than cement),...." While in section 3.4.4 the rules say "Material Technical Data Sheets (MTDS) for each material used in the construction of the canoe shall be presented under Tab D of the Engineer's Notebook (Section 7.1.2.d). This includes, but is not limited to, cementitious materials (including cement)..." The rules appear to contradict themselves, could you clarify whether you would like MTDS sheets for the cement or not?

RESPONSE 1: We apologize for the contradiction. Provide MTDS for cement (i.e., abide by section 3.4.4.)

Section 9. Final Product (Canoe and Cutaway Section)

Section 9.1 - Aesthetics

9.1.2_Judging Criteria

QUESTION 1: Section 9.1.2 states that: "Deductions shall be assessed against canoes that do not have the correct length, width, height and/or rocker. The assessment of the team's ability to meet the desired cross-sectional shape is subjective, using the templates as a method to assist in judging, and will be taken into account on the judge's rating sheet (Section 9.1.3)." Is there an allowable tolerance for being outside of the specified dimensions. (For instance, you will not be penalized if your canoe's dimensions are within 1" of the specified dimensions... deductions will begin to be assessed after this tolerance has been exceeded.) Also, the rules state that a maximum point deduction of 25 points may be assessed for failure to comply with these specifications. Is there a set relationship between point deduction and the amount of deviation from the standard drawings? In other words, is there a standard judging system that states that (for instance) if your canoe's section is 1" wider than the specified width n points will be deducted, 2" will result in a deduction of 2n points, etc.?

RESPONSE 1: The CNCCC issued a rather lengthy response/clarification regarding hull design and conformance to the specifications (see response to next question). Please note that the response was not to change the

rules and regulations regarding this matter, but to put minds at ease. In addition we covered the deductions for the hull design (note: don't get worried, it is actually good news). In general, the deductions in place for the competition are "all or nothing." There is no scale for the deductions. We implemented this process a couple of years ago so that the deductions applied across the board (and across the country) were objective rather than subjective. For instance, we saw in previous regional (now conference) competitions that an infraction was given a penalty in one region but that a similar infraction was penalized much more harshly in another region. So now whether you are in the Southeast or Mid-Atlantic or Pacific Northwest, if the same infraction occurs, the same deduction should be implemented.

QUESTION 2: Based on previous responses, if there is no tolerance and deductions will be imposed for not meeting dimensional requirements does that mean any team with a canoe that is not exactly the dimensions given (for example 20.0000 ft long) will receive a 25 point deduction? How will this be measured in competition?

I have a question as to the allowable deviation from given dimensions for the canoe. Obviously we are striving to match the dimensions exactly, but due to construction techniques and accuracy of measurement, we may either be slightly off or may not be able to measure the error. How much error must be present before points are deducted on the Final Product Deduction Score Card (25 points)? Is there a tolerance for length, width, depth of the canoe? Is it a fixed value or percentage based?

Regarding the hull dimensions and Final Product point deductions, the deduction score card states that 25 points will be deducted if the canoe does not meet dimensional restrictions. Given that the coordinates are precise to 0.0001 (which is 1/10,000 of one inch), will the 25 point deduction be applied if dimensional requirements are violated by 1/10,000 of one inch? If not, what will the tolerances be? For example, could the dimensions be off by 0.001 inch? If they are, how will the judges measure this? Or could the dimensions be off by 0.01 inch? Still, how would this be measured? I would suggest that + or - 1/4" or perhaps as small as 1/8" would be more realistic. After all, this is concrete, not a high-precision machine.

RESPONSE 1: *We have received a number of questions about the standardized hull design as it related to dimensional tolerances for construction, measurement of the dimensions, and the implementation of deductions for not meeting certain criteria. Some of the questions are provided above. This detailed response will address these issues and hopefully will put all of your minds at ease!*

According to Section 2.1 "Dimensional Constraints" (errata changes included), the canoe is a 20-foot long asymmetrical hull with a maximum beam width of 31.1875 inches (note that this is 31 and 3/16 inches, a dimension that can be easily measured with a tape measure even though the value can be taken out to 4 decimal places). The length is defined as the end-to-end measurement of the canoe taking into account the outermost dimensions of the hull as measured at the gunwale. The measurement of the maximum beam width is defined as the outermost dimension of the hull skin as measured at a distance of 10.2 from the bow. The canoe features an elliptical cross-sectional shape with 4 inch radial chines and flared sidewalls and 4 inches of rocker at the bow section and 2.5 inches of rocker in the stern section. The depth of the canoe varies from 16 inches at the bow tapering down to 14 inches near the center and stern.

In Section 2.1 we have provided the basic dimensions typically used in canoe hull designs, and which are fairly in line with dimensions used by many teams over the years. The CNCCC is requiring each and every team to construct the canoe to the best of their ability (i.e., every team will have the same hull design; there is to be no deviation from the design such as modifying the length, width, rocker, etc.). Furthermore, each of these basic dimensions can be measured fairly accurately with a standard tape measure (which is to generally to 1/16 inch, but we will get to tolerances shortly).

The CNCCC has provided every team with two (2) files for them to construct the canoe in the manner that they best see fit. The first is an AutoCAD file that contains plan, elevation and cross section views of the canoe with cross sections every foot and one for the widest beam. The second file is an Excel spreadsheet and contains the coordinates based on the AutoCAD file for the various cross sections. The coordinates are given to four (4) decimal places in order to provide smooth lines. We would contend that if we asked teams to take any of their cross sections from one of their previous design (assuming it was entered into AutoCAD), that they could easily obtain coordinates in a grid pattern and have them to 4 or more decimal places. With

that being said, the rule and regulations do not state that the canoes need to be made to the nearest 1/10,000 or even 1/10 of an inch, leading us to the following on dimensional tolerances.

According to Section 9.1.2 the "Judging Criteria" has been set to assess the team's ability to replicate the hull design provided by the CNCCC, where the judges will make appropriate measurements of the canoe's length, width, heights, bow/stern rocker, and cross sectional shape. The concern for most teams is the potential 25 point deduction (Final Product Deduction Score Card, D). Hopefully, everyone will agree that the measurements of 20 ft (length), 31 3/16 in (width), 16 in and 14 in (height), 2.5 in and 4 in (max rocker) can be easily and accurately measured with a standard tape measure. Furthermore, teams should be capable of building a canoe to these dimensions.

Will there be any tolerances on the measurements? Yes, there will be some tolerance, which we have not defined yet, so that the judges have something to go by. While we are not saying to totally disregard Deduction D, it really is not as big as an issue that many are making it out to be. We would ask teams not to get too worried about this particular deduction unless they blatantly intend to deviate from the hull design.

This will sound sarcastic, but if teams have trouble using a +/- 0.5 inch tolerance on the lettering (which is something that can be easily controlled), and there are numerous deductions that have been applied to teams in competition for that, giving a tolerance for the canoe of 1/4 or 1/8 inch does not seem practical. We just want each and every team to have the same canoe design so that you can focus more of your efforts on concrete mix design, construction methodologies, and sustainable practices.

The quality of the cross sectional shapes will be gauged using three (3) templates, one from each third of the canoe's overall length, at stations to be determined by the CNCCC prior to the start of the conference competitions. The assessment of the team's ability to meet the desired cross-sectional shape is subjective, using the templates as a method to assist in judging. Basically, if the template is placed on the cross section and it is a nice snug fit showing little to no divots or high spots, teams will get a high score. Conversely, if there are major gaps and high spots, or if the section is too small or large, you will get a lower score. So this will be more of a subjective evaluation.

We hope that this puts this issue to rest.

Section 9.4 - Final Product Deductions

9.4.5 Non-Compliance with the Specifications

QUESTION 1: Can the 25 point deduction for violation of Item D on the Final Product Deduction Scorecard, "Canoe does not meet dimensional restrictions (length, beam width, height and rocker)" be applied multiple times or just once? For example, if a canoe does not meet the tolerances for length and beam width, will the deduction be 50 points, or only 25 points?

RESPONSE 1: The deduction is only applied once. The intent is that if the length, beam width, height and/or rocker do not meet the dimensional requirements, the 25 point deduction shall be assessed.