The annual tradition of building an ice arch dates back to the late 1960’s. Engineering students, mainly Civil Engineers, have built the arch through a selective bidding process meant to mimic the situations of the practicing professional. Construction methods have historically been block-by-block, like stone arches, sprayed on ice, packed snow, or by freezing layers of water poured into form work. The construction of the ice arch is intended to be a team-building exercise for students to learn the basics of a construction project from start to finish. All majors and student backgrounds are encouraged to participate in the joint effort to keep the UAF Ice Arch tradition strong for years to come.
Introduction

The UAF Ice Arch is a joint project between several participants. These include the sponsor (owner) AGC, owner’s representative (assigned UAF Faculty), design advisor, build advisor, design team, and build team. Working together, they will design and build this year’s Ice Arch. The Ice Arch shall be completed before the Engineering Open House (E-week), which is usually scheduled during the third week of February each year. In the event that E-week is moved to a different week, the completion date of the Ice Arch will still be set for the day before the open house. Anyone interested in designing, being the build captain, or helping with construction of the Ice Arch need to contact tbtharp@alaska.edu and is encouraged to join the ASCE/AGC meetings to receive the latest updates.

Basic Functions of Each Party:

- The **owner’s representative** is responsible for selecting the judging committees that choose the design and build proposal. The owner’s representative also acts as a link between the owner and the design/build teams and serves as an intermediary for all entities. Dr. J. Leroy Hulsey, a distinguished professor at UAF, is the default choice of owner’s representative unless otherwise selected before the design balloting.

- The **design advisor** serves as a student resource for questions and basic engineering principles governing the necessary stability and safety related calculations for the Ice Arch. The design advisor will also review the designs and build proposals to be present at voting. Typically Wilhelm Muench email: wemuench@alaska.edu

- The **build advisor** serves as a student resource for questions and basic engineering and construction principles governing the constructability and safe practices for constructing the Ice Arch. The build advisor will also review the designs and build proposals and be present at voting. Typically Wilhelm Muench email: wemuench@alaska.edu

- The **design team** shall be responsible for the initial project design. The design team shall maintain all documents relating to the design, which will be presented in hardcopy to the judges, and in a professional quality hard copy three-ring binder to the owner’s representative.

- The **build team** is responsible for the construction of the project. The build team shall submit all documents relating to the build proposal in an organized manner presented in hardcopy to the judges and in hard copy in a three-ring binder to the owner’s representative.

Design Specifications

The Ice Arch shall be a freestanding ice structure or group of ice structures (located at a visible location on the UAF campus) and must incorporate at least one span over a minimum distance of ten (10) feet. The arch must consist primarily of ice but may include other building materials, such as rebar. Other materials included must be easy to clean up after the arch has melted. The location of the arch may not unduly interfere with pedestrian or vehicular traffic on or around the campus. In an effort to foster diversity and ingenuity of this years Ice Arch, a tip up style Ice Arch will be highly discouraged and will result in a significant reduction in the design teams Creativity/Innovation score. Provision shall be made for securing the site during and after project completion, in accordance with the safety regulations of UAF. The design advisor shall review the design prior to judging to ensure that the design merits presentation based on constructability and safety.

The Ice Arch Design Package Shall Include Sections Covering the Following Elements:

- Proposed Site Plan
  - Location for the construction of the arch, staging area for any equipment, tools or materials to be used, area to be fenced off, and final lighting plan.
- Arch Diagrams
  - At least 1 diagram in a plan, a profile, and an elevation view with all dimensions and specifications including weight figures (CAD Drawings are required).
- Load Calculations
  - Must demonstrate static stability using conventional engineering principles and must at minimum show that the arch will be stable under its own self-weight, both during construction and after construction.
  - Note: if the designer(s) are unfamiliar with the basic engineering principles necessary to meet this requirement, upperclassmen and/or the design advisor will be available to supply information.
- General Material List
- Estimated construction cost
- Tentative Construction Plan
  - Includes Methodology and details to satisfy constructability concerns.
- List of Design Team Member(s) and Roles.

The design package shall be prepared in both written form and as an oral presentation:

- An oral and visual presentation before judges will be conducted at a joint ASCE/AGC meeting.
- A written presentation, containing all design documents in an organized manner presented as a hardcopy to the judges and a hard copy in a three-ring binder to the owner’s representative.

Design Selection:
The design shall be selected by a judging committee. The judging shall take place during an ASCE/AGC meeting scheduled for November 21st, 2019. Design proposals must be submitted to the design advisor by November 14, 2019 5pm for approval for presentation. It is highly encouraged that designers coordinate with the design advisor prior to the submission deadline in order to ensure their proposal is adequate.
Designs shall be judged on the following criteria:

- Thoroughness of Design 25%
- Constructability/Safety 25%
- Creativity/Innovation 25%
- Aesthetics 10%
- Design and Presentation Quality 10%
- Budget 5%

(The elected design team must remain available to collaborate with the owner’s representative and design advisor as needed during construction.)

**Designer payment:**
The selected designer shall receive $200 in payment, for a complete design package. If the selected design package is missing elements, the payment shall be reduced by $50. Payment shall be dispersed to the designer after successful construction or the end of E-week. The owner’s representative may withhold up to half the payment due if the designer failed to effectively collaborate with the owner’s representative, design and build advisor during construction.
Build Specifications

The initial team members on the build team shall be selected by the team captain. Others may subsequently join the build team on a volunteer basis once construction has commenced with the approval of the captain and build advisor. **Deadline for project completion shall be the day before the Engineering Open House (E-week),** which is usually scheduled during the third week of February each year. In the event that E-week is moved to a different week, the completion date of the Ice Arch will still be set for the day before the open house. The ice arch shall remain standing, barring vandalism or acts of God, until it is deemed by the owner’s representative or the build advisor to be unsafe and ready for demolition. The project is considered complete when all structures are freestanding; all false-work, staging, trash and equipment are removed from the site; and permanent lighting and security measures are in place on the site.

The owner’s representative or build advisor shall have the authority to cancel the contract with no payment and assign further construction as he/she sees fit; in the event of gross and repeated safety violations, construction significantly behind schedule, and/or failure to substantially respond to owner representative or build advisors communication. In the event that the build captains performance is grossly inadequate, causing the project to have repeated safety violations, or becoming significantly behind schedule, or failure to substantially respond to the owner’s representative or build advisors communications, the owner representative and build advisor reserve the right to appoint a new build captain in an effort to keep the project moving forward.

**The Ice Arch Build Proposal Shall Include Sections Covering the Following Elements:**

- **Build Method**
  
  *Detailed construction plan to construct the Ice Arch safely, timely, and according to design.*

- **Construction Schedule**
  
  *Detailed outline and completion date of each project phase.*

- **Materials List**
  
  *Detailed breakdown of all materials and supplies that the team expects to need to complete the project*

- **Total Budget**
  
  *Include materials list and other expenses that the team expects to incur over the course of the project.*

- **Safety Plan**
  
  *In accordance with UAF Policy (https://www.uaf.edu/safety/)*

- **Initial build team members** (4 minimum including captain and co-captain).

**The Build Proposal Shall Be Prepared in Two Forms as Follows:**

- A written presentation, containing all documents relating to the build proposal in an organized manner presented as a hardcopy to the owner’s representative and build advisor. The proposal must be submitted no later than **December 3rd, 2019.**

- If there are multiple build proposals ASCE/AGC and the owner representative will schedule a meeting for the proposals to be presented and judged.
A preliminary Build proposal must be submitted to the design and build advisor by November 26th, 2019 by 5pm for review and approval for presentation. It is highly encouraged that potential build teams coordinate with the design and build advisor prior to the submission deadline in order to ensure their proposal is adequate.

**Build Proposal Selection:**
The build proposal shall be selected by a committee of judges. The judging shall take place during an ASCE/AGC meeting. Build proposals shall be judged on the following criteria:

- **Budget** 10%
- **Constructability** 30%
- **Safety** 20%
- **Design and Presentation Quality** 10%
- **Thoroughness of construction plan** 30%

If a build team is selected despite not covering all of the above criteria in its build proposal, the team will incur a penalty deduction of $75 from the prize money. The owner’s representative and build advisor reserves the right to request more details in the selected build proposal in writing, to ensure that the proposal will address the design adequately. Such a request shall not be considered a penalty against the build team.

**Build Fund**
A copy of the internal agreement detailing the financial split between team members shall be submitted prior to payment. The build team prize award will be paid to the build team from the AGC student chapter president or treasurer, who shall disburse it among the build team members according to written internal agreement. Early completion of the arch will increase the build team prize award amount by $25 for each 24-hour period that the project is completed before the stated deadline. Late completion of the arch will result in a penalty against the build team prize award amount of $100 for each 24-hour period that the project is completed after the stated deadline. The Ice Arch will be considered as incomplete and late for the completion deadline if it for any reason fails to be standing on the completion deadline (due to any circumstance, including failure after early completion). The baseline for competition of the arch on time is $700, the maximum build team prize award amount is $1000 and the minimum is $300 (including all penalties and bonuses). Penalties that would reduce the net prize amount to less than the minimum figure shall be duly noted by the owner’s representative but shall not be levied. No award payments will be made until all the project documents are submitted to the owner’s representative, facilities used during construction are cleaned to the satisfaction of the build advisor and owner’s representative, and a successful quality inspection by the designer and design advisor.

**Build Team – Purchases**
The build team will work with the AGC student chapter treasurer and president to purchase items. Purchase receipts shall be provided to the AGC student chapter treasurer or president for reimbursement, if they are not made directly from the student chapter account. Expenditures exceeding the project budget, shall be deducted from the prize Award.
Build Team – Change Orders
The build team captain may request changes to the design in order to improve constructability and safety of personnel. Any proposed changes must be presented in writing to the owner’s representative and or design advisor in a timely manner.

The change order shall address the following:
- Rationale for design change
- Impact on original design
- Impact on construction and schedule
- Impact on costs

The owner’s representative and/or design advisor will at their discretion consult between themselves and the designer on the proposed changes, and approve or disapprove all or part of the proposed change. Only approved changes may be incorporated into the construction of the arch. Change orders SHALL NOT be included in the original build proposal. A design change made without submitting and receiving an approved change order shall result in a deduction (penalty) of $100 from the prize award amount. These penalties may be assessed more than once for multiple violations. The build captain is responsible for acquiring permission for any facilities and/or tools used during construction. The build captain is responsible for ensuring that facilities and the construction site are kept clean to the owner’s representative’s satisfaction. The owner’s representative or build advisor may place a stop to all construction activities if safety and construction site conditions are unacceptable.

Safety
The build captain is responsible for all personnel in connection with the project. Personnel actions that the build captain deems questionable or offensive shall be addressed within the build team. The build captain retains the ultimate authority to “hire” and “fire” team members, without deference to the designer, owner’s representative, or build advisor. The build captain is responsible for coordinating the demolition of the arch upon notice from the owner’s representative or build advisor requiring it. The co-captain serves as safety officer. The safety officer is responsible for drafting the Project Safety Plan and maintaining records of the Safety plan on site and with the UAF Environmental Health, Safety, and Risk Management Office (EHSR). He or she shall also be the liaison with EHSR for the duration of the project (https://www.uaf.edu/safety/). The safety officer shall ensure that all team members undergo the required formal safety training for their job duties and that documentation of this training is maintained. The safety officer is responsible for reporting violations of the safety plan to the build captain, who may then choose to address them internally or confer with the owner’s representative or build advisor. Violations reported to the owner’s representative or build advisor by the team captain will not incur penalties if the build captain is able to demonstrate a competent plan to avoid them in the future. However, if similar infractions continue, the owner’s representative or build advisor may choose to apply a monetary penalty of $100 per occurrence. Should safety violations come to the owner’s representative or build advisor attention by any means other than through the captain, the owner’s representative or build advisor will require the captain to provide a competent plan for fixing the problem and may administer a monetary penalty.