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, design-build team. Working together, they will design and build the Ice Arch. The date of completion shall be no less than two days prior to the E-week open house. Students interested in submitting a design, or helping with construction of the Ice Arch need to send their contact information to rcburnham@alaska.edu or 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 team 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 selection.
- 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. Designs and construction proposals must be submitted to, and approved by, the design advisor prior to their presentation for selection. Wilhelm Muench, whom also serves as the advisor to the steel bridge team, shall be the default design advisor.
- The design-build team shall be responsible for the design and construction of the ice arch. This is intended to mimic that of a real-world relationship for a design-build project, there should still be separate individuals leading both phases. This is intended only to allow the builder to be involved in the design portion and to ensure the designer remains involved through construction. The design team shall maintain all documents relating to the design, while the build team shall submit all documents relating to the build proposal. These documents shall be presented in one concise hard copy document to both the judges and the owner’s representative bound in three ring binders.

Specifications

Design Specifications
The Ice Arch need not be an arch but 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 of no less than ten (10) feet. The arch must consist primarily of ice but may include other building materials, such as rebar. While arches that contain other materials will not be penalized, arches will score higher in the innovation category for minimizing the use of other building materials. The location of the arch may not unduly interfere with pedestrian or vehicular traffic on or around the campus. 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. Designers are encouraged to present their designs to the design advisor early so that deficiencies can be corrected.
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 designer(s) are unfamiliar with the basic engineering principles necessary to meet this requirement, upperclassmen and/or the design advisor will be available to assist with this 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, including a named head designer.

Ice Arch Design Poster
The design team shall be responsible for making two (2) posters to be displayed with the ice arch, each poster should be approximately 24”x36”. The first poster should explain the design, such as any meaning the design may have and why you chose that design; explain the design and construction processes that were used; and provide a set of sample calculations for the forces experienced by the arch in the finished position. Additionally, drawing(s) showing the dimensions of the bridge shall also be on the poster, a chart near the drawing should specify weight and amount of water the arch contains.

The second poster should list the design and build team members, including roles; faculty and staff that assisted; and contain logos for all companies that donated to ice arch in any way; be it financial, goods, or services. If an individual donated their name shall be listed as well. Logos for companies shall be sized and located in a manner consistent with the amount that was donated.

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. Deadline for project completion shall be 5pm February 14th, 2018, and shall remain standing, barring vandalism or acts of God, until it is deemed by the owner’s representative 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, as demonstrated to the design advisor. The owner’s representative shall have the authority 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’s representative communication.
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 a captain and co-captain).

The design-build package shall be prepared in both written form and as an oral and visual 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-Build Package Selection:**

The design-build package shall be selected by a judging committee. The judging shall take place during an ASCE/AGC meeting scheduled for November 29th, 2017. Design-build packages must be submitted to the design advisor prior to November 15th, 2017 5pm for approval for presentation. It is highly encouraged that design-build teams 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 Package** 20%
- **Innovation** 20%
- **Aesthetics** 20%
- **Constructability** 20%
- **Safety** 10%
- **Budget** 5%
- **Design and Presentation Quality** 5%

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

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

If the selected package is missing elements related to construction, the build team will incur a penalty deduction of $75 from their payment. The owner’s representative 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 payment**

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 captain, 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 design advisor and owner’s representative, and a successful quality inspection by the designer and design advisor.

**Build Team – Purchases**

Purchase receipts shall be provided to the AGC student chapter treasurer for reimbursement. Expenditures exceeding the project budget, shall be deducted from the prize Award.

**Change Orders**

The design-build process should minimize the need for change orders. In the event that a situation incompatible with the safety of personnel or constructability arises the designer and build team captain shall request a deviation to the original design. Any proposed changes must be presented in writing to the owner’s representative and or design advisor in 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. 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 team captain is responsible for acquiring permission for any facilities and/or tools used during construction. The team captain is responsible for ensuring that facilities and the construction site are kept clean to the owner’s representative satisfaction. The owner’s representative may place a stop to all construction activities if safety or construction site conditions are unacceptable.

**Safety**

The team captain is responsible for all personnel in connection with construction of the project. Personnel actions that the team captain deems questionable or offensive shall be addressed within the build team. The team captain retains the ultimate authority to "hire" and "fire" team members, without deference to the designer or owner’s representative. The team captain is responsible for coordinating the demolition of the arch upon notice from the owner’s representative 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/](https://www.uaf.edu/safety/)). The safety officer shall coordinate with EHSR to develop a plan to secure the project site during construction and until the arch is demolished. 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 team captain, who may then choose to address them internally or confer with the owner’s representative. Violations reported to the owner’s representative by the team captain will not incur penalties if the team captain is able to demonstrate a competent plan to avoid them in the future. However, if similar infractions continue, the owner’s representative may choose to apply a monetary penalty of $100 per occurrence. Should safety violations come to the owner’s representative attention by any means other than through the captain, the owner’s representative will require the captain to provide a competent plan for fixing the problem and may administer a monetary penalty.