

2019 G. B. Gunlogson Fountain Wars Design Competition



Figure 1 : The Bacchante and Infant Faun fountain in the courtyard of the Boston Public Library.
Artist: Frederick MacMonnies, Sculpture cast in 1894.

Contest Format

Fountain Wars is a hands-on, real-time design competition where students design and model their entry before the Annual International Meeting (AIM), and build and test their actual entry under time pressure during the competition at the AIM. *Fountain Wars* requires a modest design document and limited expenditures. As such, it is primarily targeted at student clubs or participants in sophomore/junior-level class design projects. Teams will arrive at the competition with a design for their fountain, along with the necessary PVC pipe, couplers, fittings, valves, nozzles, and pumps to assemble their design. They will construct their system during a 120-minute “build” period. After final construction and testing period, the contest will begin with an aesthetic display. The technical tasks for 2019 will be 1) the Boston Beach Ball Marathon and 2) the Beach Ball Balancing Act.

Awards are based on the combined scores of the written report, oral presentation, construction, technical tasks, and aesthetic display.

Contest Procedures and Rules

COMPETITION DATES HAVE BEEN REVISED TO COINCIDE WITH OTHER ASABE COMPETITIONS:

Entry Deadlines: **April 15, 2019** is the deadline to email your team's intent to enter the competition to gayleb88@hotmail.com. Late entries will be penalized at a rate of 0.5 points per day after the entry deadline. The email should include:

- A contact name, phone number, and email for the student team member representative.
- A contact name, phone number and email for the team's primary faculty advisor.

May 15, 2019 is the deadline to email the following team information to gayleb88@hotmail.com. The email should include:

- The name, phone number and email of the team member designated to represent the team at the ASABE awards banquet.
- The name(s), phone number and email of the team's faculty advisor(s).
- The names of all team members (**please review member eligibility in the next section**).
- A file with a team or university logo.
- Late team information will be accepted up to May 31, 2019 but will be penalized 2 points per day for each day it is late and may result in the team information not being published in the ASABE programs or shown in the power point awards presentations.
- Written report. Late reports will be accepted until May 31, 2019 but will be penalized 2 points per day for each day it is late. Requirements for the written report follow.

Team Membership and Member Eligibility

- All team members must hold National ASABE student membership and have been enrolled at the team school during the previous academic year. **Please make certain all team members are ASABE members. There will be a 10 point penalty for each team member that is listed on the roster that is not an ASABE member, even if the team member is later dropped. The penalty will be reduced to 5 points if the team member becomes an ASABE member before the June 1, 2018.**
- The fountain must be designed entirely by the student team members without direct involvement from outside professionals or faculty. However, faculty, vendor technical support, or other professionals may be consulted for design mentoring.
- Advisors are prohibited from any form of supervision during the construction period.
- There is no limit on the number of team members, but only six persons may participate on the "construction crew."
- All on-site fabrication and construction must be completed by the "construction crew."
- The demographics of the "construction crew" must reflect the overall team membership.
- Teams unable to bring six members for the construction will be allowed to use up to three construction "ringers." Ringers may be any person registered for the meeting with the exception of the team advisor(s).
- Each participating institution may field up to two teams. However, schools fielding two teams must have two significantly different designs. Each team must be completely independent.

- Teams planning to participate need to email the contest coordinator as soon as possible for planning and information distribution purposes.
- Each team must have at least one member who can answer questions and address the crowd at the request of the emcee during the competition.

Written Report

Each team must compile and electronically submit a design report. Reports must adhere to the requirements listed below.

- The following limitations will be placed on the reports:
 - Reports are to use 12 pt or larger font size.
 - Reports must have 1” margins.
 - Reports must be 15 pages or less (excluding pump specifications and title page). Additional pages (in excess of 15) may not be reviewed.
 - Reports must be submitted in a single PDF file to ensure figures are viewed properly.
- Reports will contain the following information:
 - A title page the university name and the name and role of the team members.
 - A page with any acknowledgements the team wishes to make (optional).
 - A complete narrative of design objectives, processes and results
 - A complete parts list with the price of each purchased component (including donated and recycled parts and their value).
 - A piping design including piping layout, dimensions and construction details.
 - Design drawings and fabrication technique of any custom parts used.
 - Calculations of flow rates, pipe friction and expected technical test performance.
 - A statement of the aesthetic philosophy and objectives.
- Reports will be scored based on a scale of 100 points using the following criteria:
 - Completeness of the design narrative (20 points)
 - Completeness of the parts list (5 points)
 - Quality and feasibility of the design communicated by the report and figures (30 points)
 - Inclusion and accuracy of the flow calculations (25 points)
 - Description of aesthetics philosophy and objectives (10 points)
 - Style (including organization of writing, grammar, spelling, labeling of figures, etc.), adherence to report requirements, and conciseness of writing (10 points)
 - Timeliness of submission (minus 2 points per day late)

Oral Presentation

- An oral presentation will be made at the annual meeting prior to the building and performance competition.
- Presentations will be geared toward promotion of the design and should contain enough information to enable the audience to be familiar with the entry.
- With the exception of students participating in a conflicting ASABE sponsored event, all team members attending the meeting must be present, and at least two of the team members must speak.
- Presentations should be between 9 and 11 minutes long. Teams will be penalized 5 points per minute outside of this range.

- Questions will be allowed at the end of the presentation from judges only.
- **Pools for use in the competition should be brought to the oral competition to be given to a contest official.**

Building Materials Supplied

- Contest officials will provide PVC primer and cement.
- Access to fused 110 V AC, 20-amp service. Extension cords may be needed to bring the service to pool pump location. Each team should bring an appropriately rated extension cord(s).
- Teams **will not** be provided pipe at the contest. Each team must bring all building supplies except for PVC primer and cement.
- The pools shall be an approximate 999L reservoir, which will have an approximate diameter of 6 feet and be approximately 15 inch high. Each team will provide a new pool (pool in an unopened box) to the Fountain Wars officials at the oral presentation. This will allow contest officials to begin set up of the contest site prior to team check in. The pool brought by a team will be assigned to a building site at the contest location. The pools and building site are assigned to teams by random draw, therefore the pool brought by a team may not be assigned to that team.

Water to fill the reservoir will be provided prior to or during construction to the degree possible but filling may continue throughout the construction period. .

Materials Limitations

- Teams will supply their own pumps, pipe, nozzles, fittings, valves, controllers, aesthetic components, etc.
- The contest officials do not supply extension cords. Each team should bring an appropriately rated extension cord. If the team is also using computers or other water sensitive electronic equipment, they would be advised to bring plastic sheeting or other materials to protect their equipment from inadvertent overspray. The contest officials cannot guarantee sufficient spacing separation to prevent overspray from all fountains.
- Teams must also supply as many UL listed ground fault interrupters (GFIs) as needed for their design. They must be wired so the power supply feeds directly into them. Teams must demonstrate to the safety judges that their GFI(s) works and are advised to bring an extra GFI unit(s) because of GFI failures in the past. A team will not be allowed to compete without a working unit.
- Only 2-feet of flexible hose may be used in a design as part of the fountain's conveyance system. Small diameter flexible hose of less than 0.5 inches O.D. is not subject to the 2 foot limitation and is intended to allow use of various controllers and/or valves.
- All materials provided by the team including, parts, equipment and tools must fit within five (5) cases.
- Each case must have the sum of its linear dimensions (length + height + width) less than 62 inches and weigh less than 20 kg (44 lb), including the case and all packing.
 - Cases exceeding the specified size limit will not be allowed
 - Items will be removed from overweight cases until they are under the limit
- Materials not allowed in airline checked bags are prohibited.

- Restricted articles include, but are not limited to, acids, explosives, flammables, oxidizers, corrosives, compressed gases, and poisons.
- PVC primer and glue will be provided. Primer and glue should not be brought to the contest.
- Teams traveling by auto must also adhere to these requirements with their materials packed into five cases.

Pump Limitations

- Teams will supply their own pumps.
- Teams will supply complete manufacturer specification sheets for all pumps used as an appendix to their written report.
- The sum of the manufacturers specified maximum amperage of all pumps utilized during any portion of the competition must not exceed 14 amps and must use 110 VAC.
 - The written report should state the maximum designed electrical supply current (at 110 VAC).
 - Judges may test the line current of a team's pump system at their discretion.
- Modifications of a pump from the original design will result in team disqualification.
 - Modifications may include, but are not limited to; modifying or replacing the impeller, increasing the motor speed and replacing the motor.
 - Cosmetic changes of paint finish and normal pump repair and maintenance will not be considered modifications
- Pumps will be included in the weight and size limits as outlined in "Material Limitations"

Biological Materials

- Each design is encouraged to use biological materials in their design, and bonus points will be awarded for doing so.
- Bio-matter includes: plants and plant leaves, flowers and seeds; processed plant fibers; paper and wood; animal feathers, hair, bones, horn, shells and hides; and edible foodstuffs.
- Live animals are prohibited.
- Bio-matter may be used as decoration and/or as an integral part of the apparatus, with the latter given the higher credit in judging.

Safety

- Power tools and equipment are prohibited with the exception of:
 - Battery powered drills and drivers,
 - Sensors, lighting, solenoids, limited motion actuators, and
 - Computers and controllers.
- Electric saws, drills, and any tool or device using an AC motor are specifically prohibited. Use of prohibited tools will result in a penalty and continued use after a penalty will result in disqualification.
 - Pumps being used in the design are the only exception.
- **All 110 Volt equipment must be furnished with a UL listed ground fault interrupter (GFI), and be in good condition so it does not pose a shock hazard.**

- If a team uses compressed air for any reason, any portion of the fountain that contains compressed air must be rated and safe for that application. **Note: PVC pipe is not rated for compressed gasses.**
- All electronic controls (valves, actuators, etc) in or near the pool may not exceed 24V. All wires must be neatly bundled and routed to minimize the potential for tripping.
- The 110 volt service line that is supplied on site may not be connected or positioned near the pool until after the signed approval of the safety judge.
- All 110 volt devices including computer supply transformers must be positioned at least 10 feet from the pool and kept dry by a suitable weather tight enclosure. The enclosures must be positioned such that they may not accidentally be dragged or dropped in the pool. 110 Volt devices may not be powered at any time when their enclosures are open.
- **All members of the construction crew must wear closed toe shoes and should wear appropriate safety gear when necessary.**
- **Eye protection MUST be worn when using battery powered tools, such as drills and during any gluing process, and is recommended for most other assembly activities.**
- **Water outside the pool can be aslip hazard and extreme caution must be taken by all team members during all phases of the competition.**
- **During competition any unsafe or hazardous behavior by team members will result in a warning from the judges. A second similar offense will result in penalty points.**
- No person shall be in the pool after the electrical service (pump) is activated.
- Manual operation of any electrical valve must occur through an approved switch.

Pool and Building Site Check in and Contest Order

Thirty minutes before the announced start of the construction, each team will be assigned a pool and building site by a random draw. Each team will then position their five cases of materials and tools at their designated site for inspection. Once the size and weight of the cases are checked, all materials and tools must be displayed, for inspection of material limitations and safety requirements.. The site assignment will also determine the order of the aesthetic display, with the lowest number assignment being first.

Construction

- All teams must fabricate their fountain during a common 120-minute construction period.
- The name of the University will be displayed on the fountain in a manner to be easily viewed by the audience.
- Custom nozzles and nozzle assemblies may be prefabricated.
- The fountain structure, piping, electronic controls and etc. can be brought to the degree of assembly possible but must adhere to the shipping requirements outlined in the Materials Limitations section of these contest rules. The use of threaded fittings to allow parts re-use will be awarded bonus points during construction judging. The teams will indicate to the construction judges the number of fittings in use and their location of use at the judges' request. Judges will award 1 point per fitting, if the use is deemed appropriate to the design, but limited to 20 total points.
- Each team must keep all materials, parts and equipment within their building area. However space is often limited, so teams will need to be considerate and cooperative with regards to building area space.
- **Each team will use a catchment system to hold the open pipe cleaner and glue containers and a protective cover of cardboard or plastic to prevent spillage to the floor while gluing pipe.**
- Team members must provide any assistance requested by the judges, referees, or other contest officials.
- The fountain or any structural portion or component of the fountain may not contact the ground outside the pool. (exception: an electrical control system that do not bear any structural support load)
- **Building area cleanup is included in the 120 minute construction period.**
- The end of construction will be determined when all team members have moved outside of their building area.
- Teams going over time will be allowed to complete their design, but will be penalized points as specified on the score sheet.
- Construction will be scored based on scale of 65 points using the following criteria:
 - Conduct and safety (15 points)
 - Fabrication skill (15 points)
 - Demonstrated teamwork (15 points)
 - Fittings and sustainability (20 points)
 - Bonus for use of bio-materials (up to 15 points)
 - Penalty for unsafe or hazardous behavior (up to 20 points)
 - Penalty for expanding build area (up to 10 points)
 - Penalty for exceeding building time (5 points per minute)

Performance Trials

- Performance trials will consist of a testing period, the aesthetic display and two technical tasks.
- Each team must be present during the entire performance period and team members must provide any assistance requested by the judges, referees, or other contest official.
- The only tools allowed in the building area during trials must be carried at all times by team members.
- Teams will be given a common 45 minute calibration period before testing begins to refine nozzle direction and component placement.
 - This time will be in addition to the 120 minute building period.
 - Construction or addition of components will not be allowed during this period.
 - Judges may make construction measurements during this period.
- Reservoirs will be re-filled as needed at the end of the testing period.
- Adding water to the pool after the performance trials begin will be penalized as specified on the score sheet.
- No physical changes to the fountain will be allowed between technical tasks, except for manually setting valves. Any other changes made will result in penalty points as specified on the score sheet.
- Team members must stand outside the building area until instructed by the judges to begin a technical task.
- A team composed of local celebrities and/or professional ASABE members may be selected to design, build and test their own fountain during the contest, however this team will be for exhibition; they will not be in direct competition with the participating teams.

Aesthetic Display

- Before the start of the aesthetic display, one team member will be required to give a brief introduction to the audience, including an introduction to the team members and a description of the team's aesthetic philosophy.
- The aesthetic display must start within 60 seconds of the judge's order and last a maximum of 90 seconds.
- The display must be *either a continuous display or other pattern that requires no human intervention, once initiated for the 90 second judged time period.*
- Pumped water must be used in the aesthetics display.
- Aesthetics display will scored based on scale of 80 points using the following criteria:
 - Introductory presentation (10 points)
 - Adherence to reported design (10 points)
 - Creativity and originality (10 points)
 - Water display (20 points)
 - Use of lighting and sound (20 points)
 - Penalty for display exceeding allotted time (1 point per second)
 - Bonus for use of control system (up to 10 points)

Scoring

- Overall scores will be computed by summing the scores from the *Written Report, Oral Presentation, Construction, Performance Trials, and Aesthetics* portions of the competition.
- Judges may apply additional penalties at their discretion *up to disqualification* for unforeseen design and competition issues or poor behavior or unsportsmanlike conduct. Penalties can be assessed for inadequate clean up following the contest. Each team is responsible to clean up their assigned areas and place all unwanted materials into the designated disposal container. Please ask a contest official for a site inspection before leaving the contest area.
- Penalties, however, may *not* be applied to fine a team that through creative design circumvents the intent, but not the letter of a rule, with the exception of safety.
- Judges may also award additional points at their discretion to reward teams for especially creative or good sportsman-like efforts.
- Sustainability (parts re-usability) and economy of design concepts are included in the scoring segments. Threaded fittings can be used in the fountain construction. Threaded fittings can be glued to pipe prior to the competition.

Competition component	Points possible
Written reports	100
Oral presentation	50
Construction	65 (+ possible bonus)
Aesthetics display	80 (+ possible bonus)
Technical tasks	90 each (+ possible bonus)
Total points possible	525 (+ possible bonus)

2019 Technical Tasks

Technical Task 1: The Boston Beach Ball Marathon:

The Boston Beach Ball Marathon will consist of propelling a beach ball around the outer edge of the pool for a half circle (180 degrees) where the ball will be picked up out of the pool and elevated to a height of at least 5 feet above the edge of the pool before returning to the starting position and propelled again for a half circle but in the other direction where it will once again be picked up to a height of at least 5 feet above the pool and returned to the starting position, which is the completion of one cycle. The team whose ball completes the most cycles in the 3 minute contest will receive the highest score. At the start of the technical task, the judge will ask the team if they are ready. If the team is not ready, the judge will grant a 90 second preparation time period. At the end of this time, the judge will signal the beginning of the contest period,

although the team can indicate to the judge that they are ready to begin prior to the end of the ninety second period. The team will accumulate points based on the number of times ball completes a full cycle. This technical task is subject to the following conditions:

- Energy used to move the ball must originate from the pump system.
- Teams will be provided with an approximately 8 inch diameter vinyl beach ball for the contest.
- The ball while in the pool must be untethered or free floating and stay within 10 inches of the pool edge.
- A ball that does not complete a cycle can be reset to the start position but there is not credit for a partial cycle completion.
- One point will be awarded for each completed beach ball cycle. No credit for a partial revolution at the end of the contest time period.

Scoring Criteria: The Team(s) with the highest course point total will be awarded 75 points.

The score for the remaining teams will be calculated as follows:

$$\text{Score} = 75 \times (\text{Team Course Points}) / (\text{Highest Team Course Points})$$

Technical Task 2: Beach Ball Balancing Act:

The Beach Ball Balancing Act will consist of balancing up to six beach balls on streams of water within the pool area. The team who balances the most balls for the longest time for the 3 minute contest will receive the highest score. At the start of the technical task, the judge will ask the team if they are ready. If the team is not ready, the judge will grant a 90 second preparation time period. At the end of this time, the judge will signal the beginning of the contest period, although the team can indicate to the judge that they are ready to begin prior to the end of the ninety second period. The team will accumulate points based on the number of times balls balanced and the accumulated balancing time. This technical task is subject to the following conditions:

- Energy used to balance the ball must originate from the pump system.
- Teams will be provided with six approximately 8 inch diameter vinyl beach balls for the contest.
- The balls can only be constrained with water.
- Balls can either be added manually to an existing water stream or start in a rest position that touches a physical constraint but cannot touch the physical constraint after the introduction of water to score points.
- The ball must be balanced for at least 10 seconds before points are awarded.
- The ball must be at least one foot above the pool edge when balanced.
- The balls must be balanced using at least three different balanced heights.
- The ball, when balanced must be at least one inch above any nozzle, orifice or other water application device.
- Ten points for the first successfully balanced ball. 20 points will be awarded for the second successfully balanced ball with the first ball still in balance. 30 points for the

third, 40 for the 4th and so forth until all 6 balls are balanced. Any previously balanced ball that falls from balanced must be replaced and balanced (ten seconds) or later placed balls scores will be forfeited and before any additional balls if available are placed.

- If all six balls are successfully placed and stay in balance for the remainder of the contest, bonus points in the amount of a point per second will be awarded from the time of the 6th ball balance to the end of the contest.
- The team can choose to end the scoring period at any time and received the contest points awarded at that moment.

Scoring Criteria: The Team(s) with the highest course point total will be awarded 75 points.

The score for the remaining teams will be calculated as follows:

$$\text{Score} = 75 \times (\text{Team Course Points}) / (\text{Highest Team Course Points})$$

Proposed Timeline

The following timeline is **NOT** finalized.

Elapsed Time	Event Description	Event Duration
½ hour	Inspection	30 min
2 ½ hours	Construction	120 min
3 ¼ hours	Testing	45 min
	Aesthetics Display	
	Break	
	Technical Task 1 Technical Task 2	

** During the highlighted times team members are not allowed into the building area except when told by judges to complete that portion of the competition. The technical tasks may be judged concurrently.

Awards

Award values listed are minimum amounts for the competition. Actual award amounts will be determined by sponsorship.

Competition Overall Awards

1st: \$500
2nd: \$350
3rd: \$200

Special Awards

Special Awards of \$100 each are given in recognition of excellence in specific aspects of the competition, and may be granted in addition to the 1st, 2nd and 3rd place awards.

Economy of Design
Most Attractive
Innovative Design

Best use of Bio-Materials
Judges' Recognition
Best use of Electronics

Best Technical Task Proposal \$100*

***Teams can submit one idea for a future Fountain Wars technical task. The proposal can be added as an appendix to the written report and is limited to one page. The proposal should use the format of the technical tasks of these Fountain Wars rules. Proposals do not have any effect on the current year contest scoring nor is there any penalty for not submitting a task. The proposal page does not count against the page limitation of the written report.**

Fun Awards

To keep the competition fun for participants and interesting for spectators, non-monetary awards may be given out throughout the competition. Categories will be announced two months prior to the competition and may include best dressed, best theme, best sportsmanship, etc.

Contact Person

Fountain Wars is competition administered by the P121 GB Gunlogson Environmental Design Competitions Committee. The committee consists of ASABE members in both private industry and academic professions. The committee member who will serve as the contact person for the teams is:

Gayle Baker
gayleb88@hotmail.com