**2018 G. B. Gunlogson
Fountain Wars Design Competition**



Figure 1, Plate 19, *Les Fontaines Publiques de la Ville de Dijon*, by Henry Darcy. Dalmont, Paris, 1856.

##

## 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 2018 will be (1) Putting from the Drink and (2) The Balancing Act.

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

##

## Contest Procedures and Rules

###

Entry Deadlines: **January 26, 2018** is the deadline to email your team’s intent to enter the competition to Dr. Danny Rogers at drogers@ksu.edu. 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 4, 2018** is the deadline to email the following team information to Dr. Danny Rogers at drogers@ksu.edu. 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 June 1, 2018 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.

**May 18, 2018** is the deadline to email the written report, link to the video abstract, and other requested team information to Dr. Danny Rogers at drogers@ksu.edu. Late reports and video abstracts will be accepted until June 1, 2018 but will be penalized 2 points per day for each day it is late. Requirements for the written report and video abstract 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)

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### 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.**

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### Video Abstract

* Each team is to prepare a video abstract of 2 to 4 minutes in length. Many resources and guides can be found online to assist you in this process.
* Abstracts should briefly introduce the technical tasks, highlight the aesthetic philosophy of the fountain, describe the approaches used to address the technical tasks, and demonstrate your fountain in action.

Video abstracts may be on displayed in the Exhibit Hall, posted on the ASABE website, and on ASABE social media pages.

* Video abstracts will scored based on scale of 50 points using the following criteria:
	+ Content (25 points)
	+ Production quality (25 points)

### 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. Theymust 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”

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### 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)

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### 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 will include an introductory presentation by a team representative.
* 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*, *Video Abstract*, *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.

**2018 Technical Tasks:**

**Technical Task 1: Putting from the Drink**

**2013 Submission by ISU**

Putting will consist of using water to lift a golf disc from the pool and launching it at a target. The team will be provided a disc by the contest official. The placement of the disc in the pool by a team member in the pool will signal the beginning of the contest. The contest is subject to the following conditions:

Energy to move the disc must originate from the pump system.

An Innova™ Pulsar Ultimate Disc with a weight of 175 g and a diameter of 27.5 cm will be provided.

The disc will start in an area designated by the team.

The disc must be “free” floating, not be pinched or held in place to start.

The disc must be removed from the water before being launched.

The structure must fit inside the dimensions of the pool.

Atarget will be placed 25 feet from the perimeter of the pool in the direction indicated by the team.

The target will be a standard with a height of approximately 6 feet and 2.5 feet width. The lower portion will be solid to a height of 2.5 feet with an opening space of 2.5 feet and solid at the top (1 foot) (see figure 2).

Teams can have as many throws as possible within the time allocation.

The total time of the contest event, beginning with the signal of the judge to begin the

event, will be 6 minutes. After 6 minutes the contest period ends.,

In the event of a team tie, the tied teams will be awarded the maximum course points.

The launching system may be adjusted between launches, but may not be manually

manipulated during a launch sequence, which is from when the disc is placed in the

pool to when the disc is launched.

SCORING

 o A disc flies through the target opening awarded 50 points for that “throw”.

o A disc that hits any part of the target

but does not pass through the opening or first hit the ground , will be awarded 40 points.

O A disc that flies in the air past the target distance but not hitting the target will be awarded 20 points

O A disc that flies in the air past for a distance of at least 10 feet will be awarded 5 points.

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:

Score= 75 x (Team Course Points) / (Highest Team Course Points)



**Figure 2: Target for Putting from the Drink Technical Task.**

**Technical Task 2**: The Balancing Act Revisited

### The Balancing Act Technical Task will consist of keeping a balance beam leveled for the longest time during the duration of the contest as determined by the location of a handball placed on a trackway located on top of the balance beam. The contest will begin within 60 seconds after the team receives the contest ball from the judges. At the end of sixty seconds, the judges signal the beginning of the contest period, unless the team indicates ready before this time has elapsed. The team will accumulate points based on the time the balance beam stays leved during the contest period. The contest period will be 3 minutes. The contest is subject to the following conditions:

* Energy used to move the balance beam must originate from the pump system.
* The ball will be a standard sized rubber handball.
* The fulcrum of the balance beam must be within the pool footprint and the top of the balance beam will be at least three feet above the pool edge at the fulcrum point. When in a tipped position in either direction the beam should not contact the pool edge.
* The total length of the beam is at the discretion of the team but the top of the beam will be equipped with a section of pvc pipe split in half of six foot length with the midpoint of the pipe centered at the fulcrum. This pipe will serve as the ball track and attached to the beam so that when the beam is level the track is parallel to the beam.
* The track will have a pipe section of 18 inches of length and centered on the beam fulcrum that is painted in a different color than the rest of the pipe. This area is the designed area for the beam being in the level position. On the outside of the track at the end of the painted level section on both sides and both ends of the track, perpendicular to the beam ½ inch dowel rods will be attached that extend at least three inches above the track. The outside edge of the rod will align with the edge of the level section of the pipe.
* The balance beam can be fixed into a set position if needed for the aesthetics display or other technical task but should be able to freely tip from one side to the other during the balancing act contest period. Either end of the beam must be able to touch the ground surface outside the pool footprint but without touching the pool walls.
* One end of the beam, when in the rest position should be able to move to a down position on either side with the addition of a 5 pound weight, although the rest position can include one side touching the ground.
* Prior to the start of the contest, the judges may place a weight of up to 6 pounds within the catch container at either end of the beam.
* Water used to balance the beam must be returned to the pool and not spilled outside the pool area.
* For scoring purposes, the beam will be considered balanced if the ball is fully within designated level area of the track. When the ball is within this area, the team will receive one balance point for every second the beam is in a continuously balanced position. If the beam goes out of balance, the time re-starts. The team can choose to re-start the time or keep their existing time and end the technical task contest.

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:

Score= 75 x (Team contest task points total) / (Highest team contest task points total)



Figure 3: Outline of the balance beam for technical task 2.

## 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 1Technical 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 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: $100 Innovative Design: $100 Best use of Bio-Materials: $100

Most Attractive: $100 Judges' Recognition: $100 Best use of Electronics: $100

**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

The Fountain Wars 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:

Danny H. Rogers

Professor and Extension Agricultural Engineer, Irrigation

Kansas State University

129 Seaton Hall

Manhattan, KS 66506

Phone: 785-532-2933 Fax: 785-532-5825

Email: drogers@ksu.edu