Student Information Packet

When:
Saturday November 4, 2017

Event Address:
Abbotts Creek Elementary School
9900 Durant Rd, Raleigh, NC 27614
9th Annual
Model Water Tower Competition

General
Challenge: The challenge is to build a structurally efficient model water tower that holds water that can be filled and drained quickly, while also being aesthetically pleasing.

- The 9th Annual Model Water Tower Competition will be held as follows:
  - When: Saturday, November 4th from 9:00 a.m. to 12:00 p.m. In each division (elementary and middle school), the first place team will be awarded a cash prize of $300, Second Place team: $200, and Third Place team: $100.
  - Time: Check-in between 9:00 am and 9:30 am
  - Where: Abbotts Creek Elementary School, 9900 Durant Rd, Raleigh, NC 27614
  - Who: Elementary (3rd, 4th and 5th grades) and Middle School Students (individuals or teams of up to 4)
  - Registration deadline: Friday, October 20th. To register, please fill out the Google form located here: goo.gl/r2KqrH. If you have trouble with the Google form or have questions about the competition, please email or call Laura Styles (contact information below). No paperwork is required before competition day to register.

- There is no cost to enter. To participate, register by October 20th and arrive at the check-in on November 4th with the following materials (one set of forms for each team):
  - Bring your completed model water tower.
  - Bring your completed Registration, a blank form is attached.
  - Bring your completed Participant Release Forms (one for each student), a blank form is attached.
  - Bring your completed Materials List, a blank form is attached.

- Model water towers may be of any design and constructed from any materials. In fact, you will be awarded for using creative designs and innovative materials. Creative designs mean the water tower will function even though it does not look like any other
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tower. Innovative materials may have been used for something else at one time – an old broom handle used for support, for instance. Due to facility constraints, we cannot supply electricity to towers.

Objective

The objective of the competition is to make participants aware of the importance of reliable drinking water and the rewarding opportunities available in the water profession. The competition does this by having students develop an idea into a functioning water tower, just like water professionals do in the real world!

Prizes will be awarded to the top three finishers, with a top prize of $300 for 1st place. The lowest scores win. Judges’ decision is final.

Judging will be based on four criteria – structural efficiency, hydraulic efficiency, cost efficiency and design ingenuity. Understand and achieve these criteria to do well! They are explained below.

Structural Efficiency

Structural efficiency is calculated by dividing the weight of the model when it is empty by the average height of the tank times the volume of water it holds. The lower this number the better. This is shown with the following formula:

\[
\text{Structural Efficiency} = \frac{\text{Weight of the tower when empty (pounds)}}{\text{Average tank height (ft)} \times \text{Volume of water (gal)}}
\]

This criterion is similar to what engineer’s use in the real world!

The average tank height is calculated by measuring the height from the base of the tank to the bottom of the storage tank (must be at least 18 inches) and the height from the base of the tank to the point at which water starts to overflow the tank (maximum hydraulic height; less than 30 inches). These two heights are then averaged. See model testing image at the end of this packet.
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Hydraulic Efficiency

Hydraulic efficiency is the amount of time it takes for the tank to fill and drain. The judges will fill the tank with 1 gallon of water, and will time how quickly the tank drains through the connector. The less time it takes, the better. The average time of three runs is used to score. Please be sure to check your tank for leaks before coming to the competition! Significant leaks can lead to penalty points.

Cost Efficiency

Cost efficiency measures your ability to save money while building your model. Bring receipts for all items purchased for your model. Points will be assigned as follows (the lower the score the better):

- $ 0.00 - $ 5.00: 1 pt
- $ 5.01 - $ 10.00: 2 pt
- $ 10.01 - $ 15.00: 3 pt
- $ 15.01 - $ 20.00: 4 pt
- More than $ 20.00: 5 pt

List all items used in your model and their costs on the Materials List Form. Where recycled items are used, put the letter “R” in the cost column. You may use as many recycled materials as you wish. A penalty of 1 pt will be given for each missing receipt for items purchased new. No receipt is necessary for recycled items.

Design Ingenuity

Ingenuity (in·ge·nu·i·ty) is how much imagination and skill were used in your model. Water professional must often use ingenuity; they use skill and imagination to solve difficult problems. The judges will look at several items:

- Craftsmanship - Is the model sturdy? Do the parts fit together nicely?
- Imagination - Is the design unique?
- Artistic merit - Does the model have creative ideas, colors or themes?
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Penalties
Keep to the following standards when designing and constructing your model:

- The base of the model must fit in a square **1 foot on each side**.

- The tank must be **at least 18 inches tall** (measured from the tank platform to the bottom of the storage tank). The tank must be **no more than 30 inches tall** (measure from the tank platform to the point at which water overflows the tank when it is completely filled with water).

- The tank must have a **2-inch diameter vent or removable lid** so the judges can tell when it is full and can fill the tank with water during the judging.

- When full, the tank must **hold between 1 and 2.5 gallons** of water (including the volume in the riser pipe) and it **should not leak**. Hint: test your model to make sure.

- The model must use the **3/8 inch connector** specified. See attached connector detail.

- **Bring receipts** for all materials purchased for your model. A one point penalty will be given for each item not having a receipt. (Reminder: recycled items have no cost associated with them and do not require a receipt.)

- **Electricity will not be supplied to your tower.**

Penalties will be assessed for not following the above standards. These standards are demonstrated in the diagram attached at the end of this hand-out.

Additional Information

For more information please contact the event organizer:

Laura Styles (919-481-4342 or lstyles@hiepc.com)
c/o Highfill Infrastructure Engineering, P.C.
2703 Jones Franklin Road, Suite 201,
Cary, NC 27518
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Registration Form

Team Name: _______________________________________________________

Elementary or Middle School? _______________________________________

School: ___________________________________________________________

Teacher or Advisor: ________________________________________________

Complete this form and bring with it you to the check-in.

List the name of your team members below. Teams may have from 1 to 4 members.

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*Each team member must bring a signed Participant Release Form.
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Participant Release Form

INSTRUCTIONS: Each team member must bring a copy of this form signed by their parent or guardian.

I AM THE PARENT/GUARDIAN OF _____________________________________________

I HEREBY AUTHORIZE THE MEMBERS OF THE WATER TOWER COMPETITION COMMITTEE, A SPECIAL PROJECT OF THE AMERICAN WATERWORKS ASSOCIATION-WATER FOR PEOPLE COMMITTEE TO:

1. PREPARE ANY PROMOTIONAL MATERIAL SUCH AS PRESENTATIONS, SLIDE SHOWS, VIDEO TAPES, PHOTOGRAPHS AND MOVIE FILMS IN WHICH MY CHILD WILL SPEAK AND/OR APPEAR.

2. USE, REUSE, PUBLISH AND REPUBLISH THE SAME IN THE WHOLE OR IN PART INDIVIDUALLY OR IN CONJUNCTION WITH OTHER PHOTOGRAPHS, VIDEO OR FILM IN ANY MEDIUM FOR ANY PURPOSES WHOSOEVER, INCLUDING (BUT NOT BY WAY OF LIMITATION) ILLUSTRATION, PROMOTION AND ADVERTISING BY THE COMMITTEE.

I HEREBY WAIVE ANY MONETARY RIGHTS OR OTHER RIGHTS THAT I MAY HAVE TO INSPECT AND/OR TO APPROVE THE FINISHED PRODUCT OR THE ADVERTISING COPY THAT MAY BE USED IN CONNECTION THEREWITH OR THE USE TO WHICH IT MAY BE APPLIED. I UNDERSTAND AND AGREE THAT ALL RIGHTS, ROYALTIES AND MATERIALS WILL BELONG TO THE COMMITTEE.

Parent/Guardian_(Print Full Name)______________________________________________

Parent/Guardian_(Signature)___________________________________________________

Date_________________________ Phone #________________________________________
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**Materials List Form**

Team Name: 

Participants: 

Complete and bring this form and all receipts on the day of the contest. List the materials and costs used to construct your model water tower. Put an ‘R’ in the cost column where recycled materials are used.

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**NC AWWA-WEA**

[American Water Works Association North Carolina Section] [Water Environment Federation]
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TOTAL:

* Use additional sheets if necessary to list all materials. A penalty will be given for not bringing this form and required receipts.
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**Model Water Tower Connector**

- Connector must be installed at the base of the model. Use the 3/8” diameter connector.
- Connectors are available at Home Depot or Lowes.
  - Ask for the WATTS Model No. PL-3022 Quick Connect 3/8” OD
- Vertical tube may be any diameter - use a reducer or increaser as necessary to change tube size

The proper 3/8” diameter push-on connector must be used by all registered contestants. Connectors must be 3/8” O.D. on the pump connection side. Watts 3/8” OD by 3/8” OD quick connect union elbows (Model No. PL-3022) are available at both Lowes and Home Depot for approximately $3.50. The cost of the connector will be deducted from the total cost to construct so it will not affect your “Cost Efficiency” score. You must use the connector specified to avoid a penalty. We use this connector to pump water into the tank during the hydraulic efficiency judging.

Contact Laura Styles (information provided below) if you need additional information about the connector:

Laura Styles  
C/o Highfill Infrastructure Engineering, P.C.  
2703 Jones Franklin Rd, Suite 201,  
Cary, NC 27518  
(919) 481-4342  
lstyles@hiepc.com
MODEL TESTING

SUPPLY BUCKET & PUMP

WATER TOWER MODEL

1.5' MIN.
2.5' MAX.

2.5'

JUDGING TABLE