



## 2026 Piedmont Model Water Tower Competition Student Information Packet

**Competition Date:**

Saturday, May 2<sup>nd</sup>, 2026, at 9:00 AM

**Registration Deadline:**

Saturday, April 11<sup>th</sup>, 2026

**Event Address:**

Craft Community Recreation Center  
3911 Yanceyville Street, Greensboro, NC

# Model Water Tower Competition

## 1. General

Challenge: The challenge is to build a structurally efficient model water tower that holds water, can be filled and drained quickly, is aesthetically pleasing, and minimizes cost. Be prepared to tell the judges about your design at the interview station.

The Model Water Tower Competition will be held as follows:

- When: **Saturday, May 2<sup>nd</sup>, 2026, from 9:00 AM to 12:00 PM**
- Prizes will be awarded as follows:

Place	Cash Prize
1 <sup>st</sup> Place Team	\$250
2 <sup>nd</sup> Place Team	\$150
3 <sup>rd</sup> Place Team	\$100
4 <sup>th</sup> Place Team	\$50
5 <sup>th</sup> Place Team	\$50

- Time: Check-in between **9:00 am and 9:30 am**
- Where: **Craft Community Recreation Center, 3911 Yanceyville Street, Greensboro, NC**
- Who: Individuals or teams of up to 4 students. There are separate Elementary and Middle divisions so students from different divisions should not participate on the same team.
  - Elementary School Division: 3<sup>rd</sup> – 5<sup>th</sup> grade
  - Middle School Division: 6<sup>th</sup> – 8<sup>th</sup> grade
- Registration Deadline: **Saturday, April 11<sup>th</sup>, 2026**. To register, please fill out the Registration Form located here: [www.greensboro-nc.gov/WaterTowerComp](http://www.greensboro-nc.gov/WaterTowerComp) or use the QR code at the end of this document. Complete one form **per team** with all students included. If you have trouble with the Registration Form, please contact the event organizers (contact information in Section 9).



# Model Water Tower Competition

There is no fee to enter. To participate, register by Saturday, April 11<sup>th</sup>, 2026, and arrive at the check-in on Saturday, May 2<sup>nd</sup>, 2026, with the following materials:

- **Model Water Tower:** Bring your completed **Model Water Tower**.
- Bring your completed **Registration Form**.
- Bring your completed **Participant Release Form(s) (one for each student) and City of Greensboro Liability Waiver Form(s)**
- **Materials List and Receipts:** Bring your completed **Materials List and Receipts**; a blank form is included as Attachment B.

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 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.

## 2. 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! Students will have the opportunity to tell the judges about their water tower and design process at the interview station.

**Prizes** will be awarded to the top five water towers. The highest scores win. Judges' decision is final.

## 3. Connector

The proper 3/8-inch O.D. push-on connector must be used on all model water towers. The judges will use this connector to pump water into the tank during the hydraulic efficiency judging. The connectors are available at both Home Depot and Lowes for approximately \$6.25. See Attachment C for additional details.



# Model Water Tower Competition

## 4. Scoring Criteria Overview

### 4.1 Elementary and Middle School Divisions

Judging will be based on **five criteria**: cost efficiency, interview, structural efficiency, hydraulic efficiency, and design ingenuity. Understand and achieve these criteria to do well! They are explained in Section 5. The maximum possible score is 100 points.

Criteria	Maximum Score
Cost Efficiency	15 points
Interview	10 points
Structural Efficiency	30 points
Hydraulic Efficiency	30 points
Design Ingenuity	15 points
<b>Total</b>	<b>100 points</b>

## 5. Scoring

Scoring for the different criteria is described below. Detailed examples for calculating point totals are included in Section 10.

### 5.1 Cost Efficiency Score (15 points)

Cost efficiency measures your ability to save money while building your model. **Bring receipts** for all items purchased for your model water tower (excluding the connector). The less money you spend (excluding the connector), the higher your cost efficiency score will be. The maximum cost efficiency score is 15 points, which you can achieve by using all recycled materials (not spending any money except for the connector).

List all items used in your model water tower and their costs on the **Materials List Form** (included as Attachment B). 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 will be given if receipts are not provided for all items purchased new. No receipt is necessary for recycled items. Do not list the connector on the Materials List Form.



# Model Water Tower Competition

## 5.2 Interview Score (10 points)

Communication is an important part of engineering, and just like water professionals, you will have a chance to present your hard work. Prepare for a short (**2-minute**) interview with the judges. The judges will ask you the following questions:

- What is your name?
- What grade are you in?
- Describe your design. What inspired your design?
- Why did you decide to build a model water tower?
- What was a challenge you encountered? How did you resolve it?
- What was your favorite part?

You do not need to memorize what you are going to say. Feel free to bring notes if that makes you feel more comfortable.

The judges will evaluate several items:

- Communication: Did you clearly answer the questions?
- Public Speaking: Did you look at the judges while talking?
- Excitement: Are you excited about the work you did?

## 5.3 Structural Efficiency Score (30 points)

A structurally efficient tower will be tall, hold lots of water, and be lightweight. Specifically, the structural efficiency is calculated based on the following:

- Average tank height
- Volume of water
- Weight

The average tank height is calculated by measuring the height from the base of the platform to the bottom of the storage tank (must be at least 18 inches) and the height from the base of the platform to the point at which water starts to overflow the tank (maximum hydraulic height; must be less than 30 inches). These two heights are then averaged. See Model Testing diagram included as Attachment D.

*\*Pro tip: Achieve a higher structural efficiency score by making your tower lighter, taller (within height limits), and able to hold more water (within volume limits).*



# Model Water Tower Competition

## 5.4 Hydraulic Efficiency Score (30 points)

Hydraulic efficiency is the amount of **time it takes** for the tank to fill and drain. The judges will fill the tank with  $\frac{1}{2}$  gallon of water and will time how quickly the tank fills and drains through the connector. The less time it takes, the better. The judges will test your tank twice. The average time of two trials will be used to calculate your score. Please be sure to check your tank for leaks before coming to the competition! Significant leaks can lead to penalty points.

## 5.5 Design Ingenuity Score (15 points)

Ingenuity (**in·ge·nu·i·ty**) is how much **imagination and skill** were used in your model. Water professionals 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?

## 6. Penalties

Use the following standards when designing and constructing your model.

- The base of the model must fit in a square **1 foot on each side**. **If the model does not fit within a square 1 foot on each side, a penalty of 10 points will be subtracted from the score.**
- The tank must be **at least 18 inches tall** (measured from the base of the platform to the bottom of the storage tank). The tank must be **no more than 30 inches tall** (measured from the base of the platform to the point at which water overflows the tank when it is completely filled with water). **If tank is less than 18 inches from the base of the platform to the bottom of the storage tank, a penalty of 5 points will be subtracted from the score. If tank is more than 30 inches from the base of the platform to the point at which water overflows, a penalty of 5 points will be subtracted from the score.**
- When full, the tank must **hold between 1.00 and 2.50 gallons** of water (including the volume in the riser pipe). **If tank holds less than 1.00 gallon of water or more than 2.50 gallons of water, a penalty of 10 points will be subtracted from the score.**
- When full, the tank **should not leak or fall over**. Hint: Test your model to make sure. **If tank leaks significantly or falls over, a penalty of 5 points will be subtracted from the score.**
- 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. **If tank does not have a 2-inch diameter vent or removeable lid, a penalty of 5 points will be subtracted from the score.**



## **Model Water Tower Competition**

- The model must use the **3/8-inch connector** specified. See attached connector detail. **If tank does not have the specified 3/8-inch connector, a penalty of 5 points will be subtracted from the score.**
- **Bring receipts** for all materials purchased for your model. (Reminders: Recycled items have no cost associated with them and do not require a receipt. Receipt is not required for the connector.) **If receipts are not provided for all new purchased items (excluding the connector), a penalty of 5 points will be subtracted from the score.**

**Penalties will be assessed for not following the above standards.** These standards are demonstrated in the diagram attached at the end of this handout and summarized in the table below.

<b>Description</b>	<b>Penalty</b>
Base of the model does not fit in a square <b>1 foot on each side</b>	-10 points
Tank is <b>less than 18 inches tall</b> measured from the base of the platform to the bottom of the storage tank	-5 points
Tank is <b>more than 30 inches tall</b> measured from the base of the platform to the point at which water overflows the tank when it is completely filled with water	-5 points
Tank holds <b>less than 1.0 gallon</b> of water (including volume of water in the riser pipe)	-10 points
Tank holds <b>more than 2.5 gallons</b> of water (including volume of water in the riser pipe)	-10 points
Tank <b>leaks significantly or falls over</b> when full	-5 points
Tank does not have a <b>2-inch diameter vent or removable lid</b>	-5 points
Tank does not use <b>standard 3/8-inch connector</b>	-5 points
<b>Receipts not provided</b> for all new purchased items (excluding the connector)	-5 points



# Model Water Tower Competition

## 7. Registration Form

Register by **April 11<sup>th</sup>, 2026**, using the link or QR code below. Fill out one form **per team**.

[www.greensboro-nc.gov/WaterTowerComp](http://www.greensboro-nc.gov/WaterTowerComp)



## 8. Participant Release Forms

For **each student**, bring your completed **Participant Release Form(s)** and **City of Greensboro Liability Waiver Form(s)** on the day of the competition. These forms are available at the web site address above in Section 7.

## 9. Questions

For questions, please contact the event organizers:

- Laine Roberts at [laine.roberts@greensboro-nc.gov](mailto:laine.roberts@greensboro-nc.gov)
- Kyle Pohle at [kpohle@hazenandsawyer.com](mailto:kpohle@hazenandsawyer.com)



# Model Water Tower Competition

## 10. Example Score Calculations

Read this section if you want to learn more about how scores are calculated. See Attachment E for an example score card.

### 10.1 Cost Efficiency Score

Cost efficiency score will be calculated as follows.

$$\text{Cost Efficiency Score} = [\$25 - \text{Amount Spent (excluding connector)}] \times \frac{15}{25}$$

An example cost efficiency score calculation is shown below.

***Example Cost Efficiency Score Calculation***

*Say you spend \$3.50 on materials, excluding the connector.*

*Your cost efficiency score would be calculated as follows:*

$$\text{Cost Efficiency Score} = [\$25 - \$3.50] \times \frac{15}{25} = 12.90$$

*In this case your cost efficiency score would be 12.90 points!*

### 10.2 Interview Score

Points for the interview will be awarded for each criterion as follows:

Great	5 points
Good	3 points
Fair	1 point

Each model water tower will be judged by 3 judges, and the average score will be used to calculate the Interview Score using the following formula. The maximum possible interview score is 10 points.

$$\text{Interview Score} = \text{Average Score} \times \frac{10}{5}$$

An example interview score calculation is shown below.



# Model Water Tower Competition

## Example Interview Score Calculation

Say you receive the following points for the interview.

Category	Judge 1	Judge 2	Judge 3
Communication	5	4	5
Public Speaking	3	5	5
Excitement	5	5	5

In this case, the average score is 4.67.

Your interview score would be calculated as follows:

$$\text{Interview Score} = 4.67 \times \frac{10}{5} = 9.34$$

In this case your interview score would be 9.34 points!

### 10.3 Structural Efficiency Score

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. Structural efficiency is calculated using the following formula:

$$\text{Structural Efficiency} = \frac{\text{Weight of the tower when empty (pounds)}}{\text{Average tank height (inches)} \div 12 \left(\frac{\text{in}}{\text{ft}}\right) \times \text{Volume of water (gallons)}}$$

The structural efficiency is then converted to the **structural efficiency score** using the formula listed below. The highest possible structural efficiency score is 30 points.

$$\text{Structural Efficiency Score} = (5 - \text{Structural Efficiency}) \times 6$$

An example structural efficiency score calculation is shown below.



# Model Water Tower Competition

## Example Structural Efficiency Score Calculation

Say you build a tower with the following measurements:

- Height from the base of the platform to the bottom of the storage tank: 20 inches (minimum 18 inches)
- Height from the base of the platform to the top of the storage tank (point at which water starts to overflow the tank): 30 inches (maximum 30 inches)
- Weight of the model when empty: 1.5 pounds
- Volume of water: 2.25 gallons (minimum 1.00 gallon; maximum 2.50 gallons)

Your average tank height would be calculated as follows:

$$\frac{18 \text{ inches} + 30 \text{ inches}}{2} = 24 \text{ inches}$$

Structural efficiency is calculated as follows:

$$\text{Structural Efficiency} = \frac{1.5 \text{ pounds}}{24 \text{ inches} \div 12 \left(\frac{\text{in}}{\text{ft}}\right) \times 2.25 \text{ gallons}} = 0.33$$

Remember, a lower structural efficiency is good.

The structural efficiency is then used to calculate your structural efficiency score as follows:

$$\text{Structural Efficiency Score} = (5 - 0.33) \times 6 = 28.02$$

In this case your structural efficiency score would be 28.02 points!

## 10.4 Hydraulic Efficiency Score

The hydraulic efficiency score will be calculated so that the fastest tower in each Division (Elementary, Middle, and High School) receives a perfect score of 30 points, and the score for the remaining towers will be calculated accordingly. The hydraulic efficiency score is calculated as a constant **divided** by the average time to fill and drain in seconds. The constant is based on the fastest tower to fill and drain on the day of the competition and is calculated as 30 times the fastest time.

$$\text{Hydraulic Efficiency Score} = \frac{\text{Constant}}{\text{Average time to fill and drain (seconds)}}$$



# Model Water Tower Competition

An example hydraulic efficiency score calculation is shown below.

**Example Hydraulic Efficiency Score Calculation**

*Say the fastest tower takes an average of 40 seconds to fill and drain. The constant would be 1200 (30 x 40 seconds), and the hydraulic efficiency score would be calculated as follows:*

$$\text{Hydraulic Efficiency Score} = \frac{1200 \text{ seconds}}{\text{Average time to fill and drain (seconds)}}$$

*Say the first time it takes 53 seconds to fill and drain your tower, and the second time it takes 50 seconds to fill and drain your tower.*

*Your average fill and drain time would be calculated as follows:*

$$\frac{53.00 \text{ seconds} + 50.00 \text{ seconds}}{2} = 51.50 \text{ seconds}$$

*Your hydraulic efficiency score would be calculated as follows:*

$$\text{Hydraulic Efficiency Score} = \frac{1200}{51.5 \text{ seconds}} = 23.30$$

*In this case your hydraulic efficiency score would be 23.30 points!*

## 10.5 Design Ingenuity Score

Points for design ingenuity will be awarded for each criterion as follows:

Great	5 points
Good	3 points
Fair	1 point

Each model water tower will be judged by 3 judges, and the average score will be calculated.

The maximum possible design ingenuity score is 15 points. The design ingenuity score is calculated based on the average score from all the judges using the following formula.

$$\text{Design Ingenuity Score} = \text{Average Score} \times \frac{15}{5}$$

An example design ingenuity score calculation is shown below.



# Model Water Tower Competition

## *Example Design Ingenuity Score Calculation*

*Say you receive the following points for design ingenuity.*

<b>Category</b>	<b>Judge 1</b>	<b>Judge 2</b>	<b>Judge 3</b>
Craftsmanship	5	3	5
Imagination	4	5	5
Artistic Merit	5	5	5

*In this case, the average score is 4.67.*

*Your design ingenuity score would be calculated as follows:*

$$\text{Design Ingenuity Score} = 4.67 \times \frac{15}{5} = 14.01$$

*In this case your design ingenuity score would be 14.01 points!*



# *Model Water Tower Competition*

## **Attachment A: Participant Release Form**

\*Please go to [www.greensboro-nc.gov/WaterTowerComp](http://www.greensboro-nc.gov/WaterTowerComp) to download, print, and complete the **Participant Release Form(s)** and **City of Greensboro Liability Waier Form(s)** and bring with you on the day of the competition.



# *Model Water Tower Competition*

## **Attachment B: Materials List Form**



# Model Water Tower Competition

## Materials List

Team Name: \_\_\_\_\_

Complete and bring **this form and all receipts** on the day of the contest. List the materials used to construct your model water tower and the costs of the materials. **DO NOT LIST THE STANDARD 3/8-inch CONNECTOR ON THIS FORM.** Put an 'R' in the cost column if recycled materials were used.

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

<u>Material</u>	<u>Cost</u>





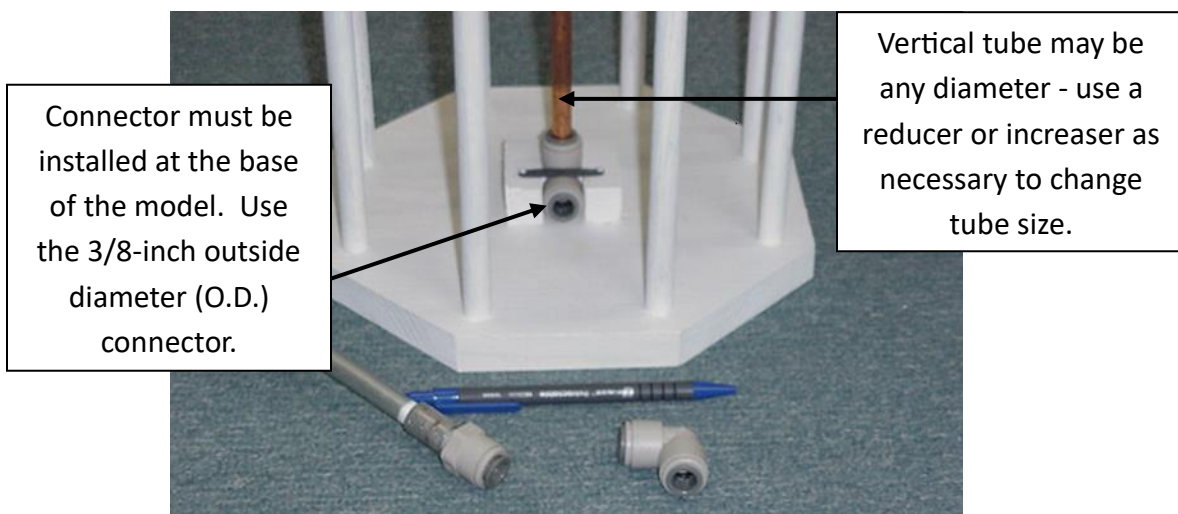
# *Model Water Tower Competition*

## **Attachment C: Model Water Tower Connector**



## Model Water Tower Competition

### Model Water Tower Connector



The proper 3/8-inch O.D. push-on connector must be used by all contestants. 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.

The connectors are available at both Home Depot and Lowes for approximately \$6.25. Do not include the connector on your Materials List. Cost of the connector will not impact your “Cost Efficiency” score.

Amazon: This is a 6-pack if teams want to share. **EZRODI 6 Pack White Plastic Push-To-Connect 90-Degree Elbow Fitting (3/8 in. O.D. x 3/8 in. O.D., Union Elbow Connector)** ([https://www.amazon.com/EZRODI-Plastic-Connect-90-Degree-Connector/dp/B09YB2QJ6Q/ref=sr\\_1\\_1?crd=4DO0SVZ5D1IF&keywords=3%2F8th%2Bod%2Bpush%2Bto%2Bconnect%2Bquick%2Bconnect%2B90%2Bdegree&qid=1694611767&sprefix=3%2F8th%2Bod%2Bpush%2Bto%2Bconnect%2Bquick%2Bconnect%2B90%2Bdegree%2Cap%2C74&sr=8-1&th=1](https://www.amazon.com/EZRODI-Plastic-Connect-90-Degree-Connector/dp/B09YB2QJ6Q/ref=sr_1_1?crd=4DO0SVZ5D1IF&keywords=3%2F8th%2Bod%2Bpush%2Bto%2Bconnect%2Bquick%2Bconnect%2B90%2Bdegree&qid=1694611767&sprefix=3%2F8th%2Bod%2Bpush%2Bto%2Bconnect%2Bquick%2Bconnect%2B90%2Bdegree%2Cap%2C74&sr=8-1&th=1))

Home Depot: **John Guest Model No. PP0312WHD - 3/8 in. O.D. Push-To-Connect Polypropylene Elbow Fitting** (<https://www.homedepot.com/p/John-Guest-3-8-in-O-D-90-Push-To-Connect-Polypropylene-Elbow-Fitting-PP0312WHD/328076435>)

Lowes: **SharkBite Model No. 25431Z - 3/8-in OD Push-to-Connect 90-Degree Elbow** (<https://www.lowes.com/pd/SharkBite-3-8-in-Push-to-Connect-x-3-8-in-Push-to-Connect-dia-Standard-Elbow-Push-Fitting/1000192665>)



# *Model Water Tower Competition*

## **Attachment D: Model Testing Diagram**





# *Model Water Tower Competition*

## **Attachment E: Example Score Card**



## Score Card

### STATION 1: REGISTRATION

Model No.:	<input type="text"/>
Division:	<input type="text"/>
Team Name:	<input type="text"/>
Student Name 1:	<input type="text"/>
Student Name 2:	<input type="text"/>
Student Name 3:	<input type="text"/>
Student Name 4:	<input type="text"/>

### STATION 2: COST EFFICIENCY

Total Amount Spent: \$

Report costs to \$0.01

Were receipts provided?  Yes  No

### STATION 3: INTERVIEW

High School Only - Please turn in your scale drawing at the Interview Station. Judges will score and submit for data entry.

Station (A or B):

### STATION 4: STRUCTURAL EFFICIENCY

Weight of empty model:  pounds

Report weight to the nearest 0.05 pound

Weight of model when full:  pounds

Height at bottom of tank:  inches

Report height to the nearest 0.25 inches

Height at top of tank:  inches

Tank footprint fits within 1 ft<sup>2</sup>?  Yes  No

### STATION 5: HYDRAULIC EFFICIENCY

Time to fill and drain 1/2 gallon of water - Test #1:  min  
 sec

Report times to nearest minute and 0.01 second. Make sure Test #1 and Test #2 are within 10%.

Time to fill and drain 1/2 gallon of water - Test #2:  min  
 sec

Does tank have a vent or removeable lid?  Yes  No

Are there visible leaks in the tank or pipe?  Yes  No

Does the model use the standard 3/8-inch connector?  Yes  No

### STATION 6: DESIGN INGENUITY

Please turn in your score card at the Design Ingenuity Station. Judges will score and then submit for data entry.

Station (A or B):