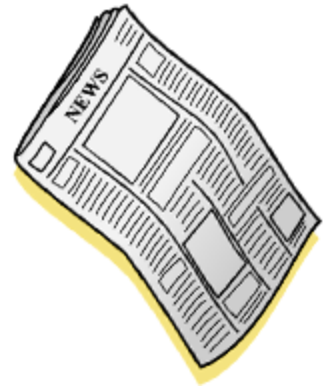
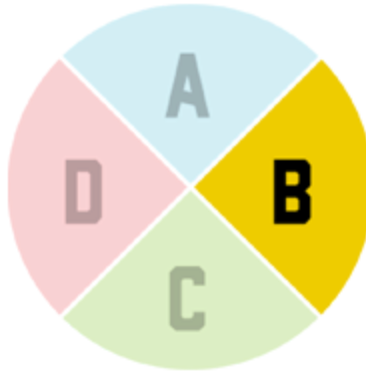


Engineering - Paper Water Tank

Criterion B - Developing Ideas

Students brainstorm then refine ideas with design specifications to guide the creation of a solution to solve the problem



B.1 - Develop Design Ideas

Develop a wide range of design ideas which can be correctly interpreted by others.

B.1.1 - Brainstorm of Tank Ideas

Quickly sketch four newspaper tank ideas with good contrast and insert the images below. Review these resources first:

[Actual Water Tanks](#) | [Tank Sketches, Paper Tanks & Data](#)

B.1.1.1

B.1.1.2

B.1.1.3

B.1.1.4

B.1.2 - Examine Brainstormed Tank Ideas

Share and examine the brainstorm sketches made by other students for B.1.1. Take photographs of any five that may help you meet the goal in the GRASPS.

Insert the five images below. Make sure that the photographs are clearly focused, properly lighted, and are as large as possible.

B.1.2.1

B.1.2.2

B.1.2.3

B.1.2.4



B.1.3 - Justify Helpful Tank Ideas

Why did you choose the ideas in B.1.2? Which tank ideas might be helpful? Summarize your thinking in four to seven sentences.

B.2 - Develop Design Specifications

Develop design specifications which clearly state the success criteria for the design of a solution.

B.2.1 - In the third column below, create clear and concise requirements for your design to be successful--these are called "design specifications". The more specific and measurable the requirements, the more accurately you will be able to judge the success of your design.

Some categories are already finished to guide you.

- Reference the GRASPS and these resources as needed: [Actual Water Tanks](#) | [Tank Sketches, Paper Tanks & Data](#)
- Example of Design Specifications for a Pencil Case (video, 2:29; You only need to view up to about 2:03): <https://youtu.be/UMH8gHI4kS4>

Category	Description/Question	Design Specification (Requirement) Make each specification sound like a requirement. Use the word " <u>shall</u> " and underline the word.
B.2.1.1 Shape	What <u>shall</u> be the primary shape of the water tank? Cone, cylinder, cuboid, other?	
B.2.1.2 Size (maximum height)	What <u>shall</u> be the maximum height of the tank? Use centimeters.	
B.2.1.3 Size (maximum width/diameter)	What <u>shall</u> be the maximum width/diameter of the tank? Use centimeters.	
B.2.1.4 Mass	What <u>shall</u> be the specific mass of the tank? Note: The average tank mass in 2017 was about 13.8 grams out of a maximum of 18 grams).	
B.2.1.5 Resources - Materials (newspaper)	How much newspaper shall be used to make the tank? Specify the height and width in centimeters. Note: The maximum amount of newspaper is 1 sheet that measures 57.5 cm high and 44 cm wide.	



B.2.1.6 Resources - Materials (masking tape)	How much masking tape shall be used to make the tank? Use centimeters.	
B.2.1.7 Resources - Materials (popsicle sticks)	How many popsicle sticks <u>shall</u> be used to make the tank?	
B.2.1.8 Resources (Tools)	What tools <u>shall</u> be used to build the tank?	
B.2.1.9 Function (General Purpose)	What <u>shall</u> the solution do? What goal <u>shall</u> the tank fulfill?	The newspaper tank shall be built from a minimum amount of masking tape, popsicle sticks, and newspaper to hold as much of the 200 mL of water as possible for three minutes.
B.2.1.10 Function (Efficiency)	How <u>shall</u> the tank show functional efficiency? How <u>shall</u> success be measured?	The tank <u>shall</u> show functional efficiency by scoring higher than 9.62 mL/gram on the 3:00-minute test (Note: Scores are based on the amount of water removed divided by the tank's mass. The number 9.62 mL/gram is the average from the October 2017 tests).
B.2.1.11 Function (Water Removal)	How <u>shall</u> the tank be designed to allow the maximum amount of water to be removed? Note: The tank shall not be squeezed like a sponge to remove water upon completing the test.	The water removal design feature (e.g., spout or nozzle) <u>shall</u> be obvious, be located along a top edge of the tank, and not leak upon removal of the water from the tank. The tank shall not be modified (cut or torn, etc.) at the end of the test to remove the water.
B.2.1.12 Cost	What <u>shall</u> be the cost of the materials?	The large construction company <u>shall</u> pay for the training materials (newspaper, tape, and popsicle sticks). These are the material costs.
B.2.1.13 Customer /Audience	Who <u>shall</u> be the target audience?	The target audience <u>shall</u> be your supervisor at the large construction company.
B.2.1.14 Storage	How <u>shall</u> the tank be stored before testing?	The completed newspaper water tank <u>shall</u> be stored for a few days to a week before testing. It <u>shall</u> be stored in a cabinet or other place where it will not be damaged before testing.
B.2.1.15 Maintenance	<u>Shall</u> the product be maintained for any period of time prior to testing? If so, what needs to be considered?	The product <u>shall</u> not need to be maintained prior to testing.
B.2.1.16 Safety and Environmental	What safety factors <u>shall</u> be incorporated into building the tank?	



Considerations (while building)		
B.2.1.17 Safety and Environmental Considerations (while testing)	What safety factors <u>shall</u> be included while the tank is being tested?	Any spilled water shall be wiped up and dried immediately to prevent anyone from slipping and hurting themselves.
B.2.1.18 Safety and Environmental Considerations (post-testing)	How <u>shall</u> the resources (e.g., scissors, newspaper, water, etc.) be managed once the test is complete? Storage? Disposal? Recycle?	

B.3 - Present and Justify the Chosen Design

Present the final chosen design and justify its selection.

B.3.1 - Best Newspaper Water Tank Idea (3D sketch)

Create one clear 3D pencil sketch of your best idea for a tank design that includes annotations (labels) that identify key features such as tape placement, popsicle stick placement, side thickness, and a water removal feature (e.g., a spout). The key features should relate to the problem you are trying to solve.

Show shading and construction lines as well. The final lines should be very dark.

Help: [Sketching](#) | [2D and 3D Sketching Help \(5 slides, animated\)](#) | [Isometric Dot Paper](#)

B.3.2 - Justification

Write a paragraph to justify why this is your best design idea so far in terms of the goal in the [GRASPS](#). Use specific [vocabulary](#) to help explain your thinking in four to seven sentences.

B.4 - Develop Planning and Drawing Diagrams

Develop accurate and detailed planning drawings/diagrams and outline the requirements for the creation of the chosen solution.

Sketch top, front and side views of your best tank design idea (i.e., make orthographic projections which are 2D views). Label all dimensions in centimeters (cm) and show any tape and popsicle sticks as well.

The three 2D views must line up and form an "L" shape.

Help: [Sketching](#) | [2D and 3D Sketching Help \(5 slides, animated\)](#)



Video Help (5:36): Multi view Practice #1 Video - <https://youtu.be/oKPtIT1P6pw>
(Note: the three views do line up and dimensions are not labeled)

B.4.1 - Top View, Front View and Side View of the Tank (all three views to show proper alignment)

B.4.2 - Top View of the Tank (close up)

B.4.3 - Front View of the Tank (close up)

B.4.4 - Side View of the Tank (close up; pick the side that shows the most information)

