

Spring 2009
Waterloo Engineering Competition
June 22 – 27

**Junior Team Design
Competition Problem**



GENERAL RULES

1. All questions regarding the competition problem must be asked during the welcome and briefing session. No questions will be answered during the design and build stage.
2. Teams are not allowed to leave the DWE and RCH buildings unless they have submitted their prototypes and presentations to competition staff.
3. All communication devices must be turned off throughout the entire duration of the competition.
4. Wireless on laptops must be turned off. Violation of this rule will result in immediate disqualification.
5. Visitors are not allowed throughout the design and build stage. Violation of this rule will result in immediate disqualification.
6. Teams may only use materials they have purchased in the shop.
7. Final prototype and presentation materials must be submitted to the submission desk prior to the end of the design and build stage. It is the team’s responsibility to bring its deliverables from the design area to the submission desk.
8. Competitors may not use the blackboard when delivering presentations.
9. Keep work spaces clean. Tidy up at the end.

SCHEDULE

The schedule of the Junior Team Design competition is as follows:

Friday, June 26	6:45 p.m. – 7:00 p.m.	Sign-In	RCH 101
	7:00 p.m. – 7:30 p.m.	Welcome/Briefing	RCH 101
	7:30 p.m. – 11:30 p.m.	Design/Build	Various Assigned Classrooms
Saturday, June 27	12:45 a.m. – 1:00 p.m.	Sign-In	RCH 301
	1:00 p.m. – 5:00 p.m.	Presentation/Demonstration	RCH 301

Drinks will be available throughout the development and build stage of the competition. Volunteers will bring pizzas around to teams between 8:30 and 9:00 p.m. Please remind the competition coordinators and volunteers of your dietary restrictions and/or allergies.

Dress code for presentation and demonstration is business casual.

There will be a question period after the problem is presented. No questions will be answered during the development and build stage to ensure fairness in the competition.

THEME

The theme of the Spring 2009 Junior Team Design is *“retrieving natural resources.”*

SCENARIO

There is a mine located on a plateau halfway up a mountain. All the collected resources are stored in a reservoir, which releases the stored contents onto a plateau for collection, and maintains a constant volume on the plateau. Your company has been contracted to design and build a prototype which moves the resources down a steep mountainous terrain.

OBJECTIVE, REQUIREMENTS & CONSTRAINTS

Build a design which retrieves as much cereals as possible from the platform on the reservoir, and empties them into the deposit box at the bottom of the ramp without spilling any while retrieving or transporting. The prototype may not damage the reservoir or displace the deposit box.

Teams are not permitted to touch the prototype during demonstration, except triggering for the design to start functioning (i.e. flipping a switch). The cost of the design prototype may not exceed \$8,250.

PROTOTYPE TESTING RULES

A portion of the terrain will be available for teams to perform prototype testing. Each testing period is 10 minutes, and is signed-up for on a first-come-first-serve basis.

Reservations

Each team may only have one reservation at any time, and must use up the testing period before reserving the next one. Teams may only reserve whichever time slot is available next (i.e. teams may not specify a time).

Cancellations

Teams are allowed to make cancellations to reservations. A cancelled time slot then becomes the next available testing period, and can be reserved by whichever team makes the reservation next. Time slots after the cancellation will not be bumped up.

Consumable Items

Some items are consumable, for example: batteries. Teams are responsible for these consumable items for presentation and demonstration.

SHOP RULES

1. A maximum of one (1) person per team may be in the shop at any time.
2. When purchasing, a team member must bring the Purchase Requisition Form.
3. All sales are final. Be sure to verify purchased items and quantities before leaving the shop.
4. Teams may not trade building materials. Violation of this rule will result in immediate disqualification for both teams.
5. When there is a discrepancy between a team's Purchase Requisition Form and the shop records in either the type or quantity of purchased items, the team's Purchase Requisition Form will take precedence. (For example: if your Purchase Requisition Form indicates you have purchased three mousetraps and the shop records indicates otherwise, the shop records will be corrected to three mousetraps.)
6. When there is a discrepancy between a team's Purchase Requisition Form and the List of Materials in the unit price, the WEC reserves the right to make corrections on the team's Purchase Requisition Form.
7. The shop will close 15 minutes before the development and build stage ends.

BUILDING MATERIALS

Building materials will be available, while quantities last, for teams to build prototypes. Teams may use only the materials listed in the List of Materials.

List of Materials

Item	Unit Price
General	
Mousetrap	\$200
Foam board (19.5 cm x 13.5 cm)	\$1800
Foam board (19.5 cm x 10.5 cm)	\$1600
Foam board (custom size)	\$11/cm ²
Wooden board (20 cm x 15 cm)	\$800
Wooden board (custom size)	\$7/cm ²
Cardboard (27 cm x 16 cm)	\$1275
Cardboard (27 cm x 10 cm)	\$1125
Cardboard (19.5 cm x 16 cm)	\$1200
Cardboard (19.5 cm x 10 cm)	\$1050
Large dowel (30.5 cm x \varnothing 1.1 cm)	\$300
Medium dowel (30.5 cm x \varnothing 0.9 cm)	\$280
Small dowel (30.5 cm x \varnothing 0.4 cm)	\$200
Popsicle stick	\$60
Nail	\$20
Paper clip	\$10
Toothpick	\$4
CD	\$190
Styrofoam ball (\varnothing 6.5 cm)	\$270
Plastic wheel (\varnothing 4.8 cm)	\$320
Tube w/ foam padding (7.7 cm x \varnothing 6 cm)	\$400
Pipe cleaner	\$50
Plastic straw	\$50

Steel wire 20 AWG (no insulation)	\$4/cm
Rope (Ø 3 mm)	\$10/cm
Utility cord (Ø 4 mm)	\$12/cm
Cotton twine	\$3/cm
Plastic spoon	\$50
Plastic plate	\$280
Plastic cup	\$300
Pot pie pan	\$350
Muffin cup	\$20
Aluminum foil	\$20/cm
Saran wrap	\$15/cm
Sand paper	\$50/cm
Paper towel	\$30/segment
Large zip tie (20 cm x 0.5 cm)	\$70
Medium zip tie (15 cm x 0.4 cm)	\$60
Small zip tie (10 cm x 0.3 cm)	\$40
Elastic band	\$40
Adhesives	
Clear packing tape	\$4/cm
Masking tape	\$2/cm
Double-sided foam tape	\$15/cm
Super glue	\$100
Glue gun	Free
White glue	Free

DELIVERABLES

At the end of the four- (4) hour development and build stage, each team is required to submit the following items:

1. A working prototype
2. A poster for presentation visual aid
3. Purchase Requisition Form (both sheets)

Posters must have the team number and names of all four team members on the reverse side.

PRESENTATION & DEMONSTRATION RULES

Each team is required to deliver a 10- to 12-minute presentation. Presentations longer than 12 minutes will be cut off. All members of each team are expected to share a reasonably equal presentation time.

Each team is allowed two trials during demonstration. Teams are not permitted to touch the prototype during demonstration, except triggering for the design to start functioning (i.e. flipping a switch).

MARKING SCHEME

The following marking scheme is specific to the Spring 2009 Senior Team Design competition and will be used by judges during presentation and demonstration.

Design & Performance	60%
Amount collected	22% (2% per rank)
Collection method/efficiency	5%
Transportation method/efficiency	5%
Deposit method/efficiency	5%
Total accuracy { = deposit / (spill + deposit)}	20%
Reusability	3%
Damage reservoir	- 20%*
Crash into deposit box	- 20%*
Presentation	25%
Design Process	6%
Meet Constraints & Criteria	6%
Quality & Flow	6%
Highlights & Usability	5%
Prototype Critique	2%
Cost below \$2000	+ 2%*
Cost over \$7000	- 2%*
Originality	10%
Daring/Outside the Box	5%
Creativity	3%
Uniqueness	2%

Teamwork	5%
Knowledge	2%
Workload Distribution	2%
Compatibility	1%
Positivity	+ 2%*
Follow Dress Code	+ 1%*
TOTAL	100%

In case of a tie in total marks, the teams will be ranked based on their points scored in Design & Performance.

Completed marking sheets will not be disclosed to competitors; however, if teams wish to know their strengths and weaknesses for improvement in future competitions, judges will be available after the competition for questions.

* The \pm signs denote bonus or penalty points, respectively. Lowest possible score for each marking category is zero (0) points.