

Fall 2009  
Waterloo Engineering Competition  
Nov 6 - 7, 2009

**Junior Team Design  
Competition Problem**



**SCHEDULE**

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

Friday, Nov 6	5:45 p.m. – 6:00 p.m.	Sign-In	TBD
	6:00 p.m. – 6:45 p.m.	Welcome/Briefing	TBD
	6:45 p.m. – 10:45 p.m.	Design/Build	Various Assigned Classrooms
	10:45 p.m. – 11:00 p.m.	Submissions/Debriefing	TBD
Saturday, Nov 7	7:45 a.m. – 8:00 a.m.	Sign-In	TBD
	8:00 a.m. – 10:30 a.m.	Tier 1 Presentations	TBD
	10:30 a.m. – 10:50 a.m.	20 Minute Break	TBD
	10:50 a.m. – 12:05 p.m.	Tier 2 Presentations	
	12:05 p.m. – 12:45 p.m.	Prizes and Closing Ceremony	RCH 101

Drinks will be available throughout the development and build stage of the competition. Volunteers will bring pizzas around to teams during the competition around dinner time when the food is ready. 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.

**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. All communication devices must be turned off throughout the entire duration of the competition.
3. Visitors are not allowed throughout the design and build stage. Violation of this rule will result in immediate disqualification.
4. Competitors may not use the blackboard when delivering presentations.

5. Keep work spaces clean. Tidy up at the end.

## **SCENARIO**

A manufacturing plant has a drying area where the products are hung to dry after being painted. After allowing some of the excess paint to drip off, the products need to be transported up an incline to the next level of the plant where there is a conveyor belt to carry the products into a drying oven. To get to the conveyor belt, the products must be moved through the wood shop where there is often small debris on the floor. Since large objects and some machinery need to be moved through the machine shop from time to time, any solution to the company's problem must be non-permanent.

## **OBJECTIVE, REQUIREMENTS & CONSTRAINTS**

Design a contraption that must function without human aid (ie: it can be started by something like flipping a switch, but once it has begun it should not be touched again until the demonstration is complete). At the bottom of the ramp, there will be a hanging wooden block. The prototype must retrieve the block, transport it up the ramp, and place it on a platform. To simulate the small debris on the floor of the wood shop, there will be sand on the ramp. The prototype must not damage the test set up or else the team may be disqualified. All prototypes must start behind the designated starting line.

## **DELIVERABLES**

At the end of the development and build stage, each team is required to submit the following items:

1. A working prototype of the machine
2. A poster for presentation visual aid

## **PROCEDURAL RULES**

The following rules must be followed during the design and build stages of the competition. Any teams in violation of these rules may be disqualified at the discretion of the WEC staff.

1. Teams have four- (4) hours to complete the design and construction of their prototype.
2. Teams are not allowed to leave the competition premises unless they have submitted their prototypes and presentations to competition staff.
3. Laptops are not permitted.

4. Teams may only use materials that they purchase from the shop.
5. Provided tools may only be used to construct the prototype and may not be used as part of the prototype. The tools must be returned at the end of the design and build phase of the competition.
6. 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.
7. Teams will receive a notification when there is one- (1) hour remaining in the design and build phase.
8. Purchase Requisition Forms at the shop are to be completed by WEC staff only.

### **PROTOTYPE TESTING RULES**

The scenario setup 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.

### **SHOP RULES**

1. A maximum of one (1) person per team may be in the shop at any time.
2. Teams must keep track of their purchases for their own records. The shop will keep track of the official purchase records. In the event that a team has lost track of their purchases, they will not be told how much they have spent.
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 shop'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 used.)

6. The shop will close 30 minutes before the development and build stage ends.

**MARKING SCHEME**

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

<b>Design &amp; Performance</b>	<b>60%</b>
Entire prototype passes the 1/4 line on the ramp	8%
Entire prototype passes the 1/2 line on the ramp	8%
Entire prototype passes the 3/4 line on the ramp	8%
The prototype reaches the top platform	8%
Effectively transports the block	8%
Successfully places block on the platform at the top	20%
Does not start behind the line	- 30%
Requires human intervention after start	- 25%
Prototype has excessive difficulty with sand	- 5%
Prototype damages test setup	- 60%
Prototype does not move	- 60%
<b>Presentation</b>	<b>25%</b>
Design Process	6%
Meet Constraints & Criteria	6%
Quality & Flow	6%
Highlights & Usability	5%
Prototype Critique	2%
Cost is below 25% of budget	+ 2%*
Cost is over 85% of budget	- 2%*
<b>Originality</b>	<b>10%</b>
Daring/Outside the Box	4%
Creativity	3%
Uniqueness	3%

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

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.

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

† The WEC marking scheme explicitly states that a vehicle not being able to move constitutes as a design fail. Be sure to keep this in mind when competing at the OEC, as the same rule applies but is not stated in the marking scheme.

**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
<b>General</b>	
Mousetrap	
Wooden board	
Cardboard	
Large dowel (30.5 cm x $\varnothing$ 1.1 cm)	
Medium dowel (30.5 cm x $\varnothing$ 0.9 cm)	
Small dowel (30.5 cm x $\varnothing$ 0.4 cm)	
Popsicle stick	
Nail	
Paper clip	
Toothpick	
CD	
Styrofoam ball ( $\varnothing$ 6.5 cm)	
Plastic wheel ( $\varnothing$ 4.8 cm)	
Plastic gear	
Tube w/ foam padding (7.7 cm x $\varnothing$ 6 cm)	
Pipe cleaner	
Plastic straw	
Steel wire 20 AWG (no insulation)	
Rope ( $\varnothing$ 3 mm)	
Utility cord ( $\varnothing$ 4 mm)	
Cotton twine	
Plastic spoon	
Plastic plate	



Plastic cup	
Pot pie pan	
Muffin cup	
Aluminum foil	
Saran wrap	
Sand paper	
Paper towel	
Large zip tie (20 cm x 0.5 cm)	
Medium zip tie (15 cm x 0.4 cm)	
Small zip tie (10 cm x 0.3 cm)	
Elastic band	
Spring	
Paper	
Thumb tacks	
Crab clips?	
Plastic cups	
<b>Adhesives</b>	
Clear packing tape	
Masking tape	
Double-sided foam tape	
Super glue	
Hot glue sticks	
White glue	





Major Changes:

- removed theme section
- created marking scheme