

WATERLOO **ENGINEERING**

**Junior Team Design
Competition Problem**

Spring 2010
Waterloo Engineering Competition
July 9-10

SCHEDULE

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

Friday, July 9	5:30 p.m. – 5:45 p.m.	Check-In	RCH 101
	5:45 p.m. – 6:30 p.m.	Welcome/Briefing	RCH 101
	6:30 p.m. – 10:30p.m.	Design/Build	Various Assigned Classrooms
	10:30p.m. – 11:00p.m.	Submissions/Debriefing	RCH 101
Saturday, July 10	7:45 a.m. – 8:00 a.m.	Check-In	RCH 3 rd Floor Lobby
	8:00 a.m. – 12:00 p.m.	Prototype Presentations	Various Assigned Classrooms
	12:05 p.m. – 12:40 p.m.	Prizes and Closing Ceremony	RCH 302

Pizzas will be available to teams around 8:00p.m. – 9:00p.m., during the design and build stage. Please remind the competition coordinators and volunteers of your dietary restrictions and/or allergies.

GENERAL RULES

1. All questions regarding the competition problem must be asked during the welcome and briefing session, after the competition problem has been presented. No questions will be answered during the design and build stage.
2. All communication devices must be turned off throughout the 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. Dress code for presentation and demonstration is business casual to business formal.
5. Competitors may not use the blackboard when delivering presentations.
6. All submitted materials must be labelled according to the following guidelines:
 - a. Prototypes must have the team number clearly labelled.
 - b. The team number and names of all team members must be written on the back of the poster.
7. Keep work spaces clean. Tidy up at the end.

THEME

The theme of the Junior Team Design competition is “Mountaineering”

SCENARIO

The Krakozhian Mountaineering Academy has long had trouble responding to SOS calls from mountaineers attempting to scale their mountainous terrain. While short and blunt in shape, the Krakozhian mountain ranges are infamous for their rocky terrain, characterized by multi-levelled cliffs. The approach to the mountains is also treacherous, torn apart by centuries of erosion. Your team has been contracted to design a supply vehicle to make rescue attempts on the part of the Academy simpler. Your vehicle must pick up and carry supplies to the mountaineers and be capable of navigating the eroded incline to the ranges. The prototype must be able to scale the multiple cliffs of a mountain securely, depositing the supplies and thereby sustaining the stranded mountaineers at the top until a rescue team may be deployed. Beware of the steep drops on the sides of the road. These are some of the most dangerous roads in the world.

OBJECTIVE, REQUIREMENTS & CONSTRAINTS

Design a contraption that must function without human aid (i.e. it can be started by something like flipping a switch or triggering a rat trap, but once it has begun there should be no further human intervention until the demonstration is complete).

The prototype must begin at the bottom of the ramp, pick up the supplies, scale the ramp and cross the obstacles ahead of it; the rocky path (simulated using gravel) and the stepped slopes to reach the line marking the end of the course. At the end of the course, the vehicle must deposit the supplies in the designated area on the top of the incline. The prototype must not fall off the sides of the course, beware that there are no walls preventing this. The prototype must not damage the test set up or else the team may be disqualified at the discretion of the WEC staff. All prototypes must start behind the designated starting line. The prototype must not exceed the size: 20 cm wide x 20 cm long x 17 cm high. The cost of building the prototype must not exceed \$3500.

Teams will have five minutes allocated for the demonstration of their prototypes. Within the five minutes, teams can have up to three attempts to complete the challenge.

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 presentation as a 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 prototypes.
2. Teams are not allowed to leave the competition premises unless they have submitted their prototypes and presentations to the 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

In the first 20 minutes of the design and build stage, the scenario setup is open to all teams to look at and take measurements. Afterwards, 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. There will be two setups available.

Reservations

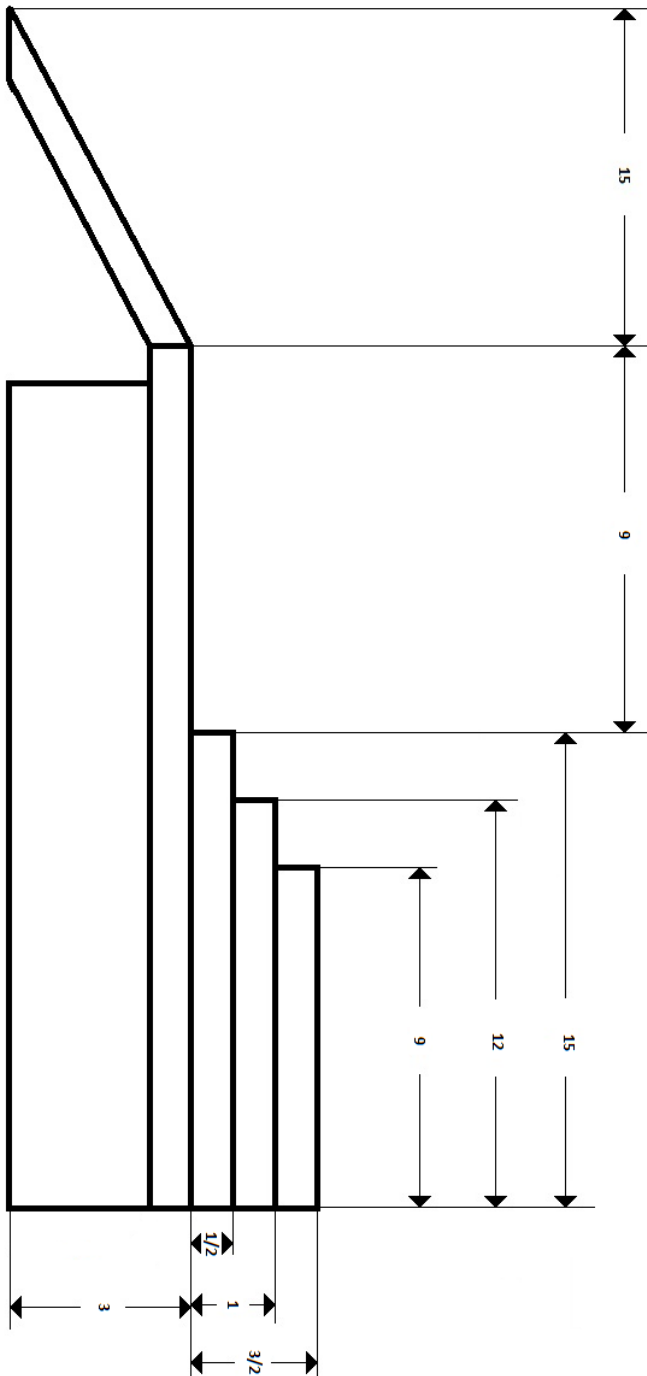
Each team may only have one reservation at any time, and must use up the testing period before reserving the next one. Teams may only reserve whichever time slot is available next (i.e. teams may not specify a time).

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.

TEST SCENARIO MEASUREMENTS

Side View



Note: All measurements stated on this sheet are in inches and the drawing is not to scale.

SHOP RULES

1. A maximum of one (1) person per team may be in the shop at any time.
2. Building materials will be available for preview at the shop. Competitors may examine the materials, but are not allowed to leave the display table with unpaid materials.
3. Teams are allowed to take pictures of building materials with a camera, but not a cell phone.
4. Teams must purchase the quantity of items that they request. If a requested quantity is not available, the team may request a new quantity.
5. 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, the team will not be told how much they have spent.
6. All sales are final. Be sure to verify purchased items and quantities before leaving the shop.
7. Teams may not trade building materials. Violation of this rule will result in immediate disqualification for both teams.
8. Please be courteous and professional to shop personnel. The shop reserves the right to refuse service to an individual who behaves unprofessionally.
9. The shop will close 30 minutes before the development and build stage ends.

MARKING SCHEME

The following marking scheme is specific to the Spring 2010 Junior Team Design competition and will be used by judges during presentation and demonstration.

Design & Performance	50%
The prototype type passes the 1/2 line on the ramp	6%
The prototype reaches the platform at the top of the ramp	10%
The prototype climbs the set of stairs (4%/step)	12%
Quantity of payload carried (1%/item)	6%
Quantity of payload dropped at the top platform (1%/item)	6%
Prototype successfully stops on the top platform	10%
Prototype does not move	- 50%†
Does not start behind the line	- 30%*
Prototype damages test setup	- 20%*
Presentation	35%
Poster	10%
Quality & Flow	7%
Design Process	5%
Meet Constraints & Criteria	5%
Highlights & Usability	5%
Prototype Critique	3%
Cost is below 25% of budget	+ 2%*
Cost is under budget	+ 1%*
Cost is over 85% of budget	- 2%*
Originality	10%
Daring/Outside the Box	4%
Creativity	3%
Uniqueness	3%

Teamwork	5%
Knowledge	3%
Workload distribution	2%
Positivity	+ 1%*
Does not follow dress code	- 2%*
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.

† The WEC marking scheme explicitly states that a contraption 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.

