



January 24, 2009 Update Challenge 2: Manufacturing Design

Team Manager—

As promised – here are more details on the materials you will be building your piece(s) of equipment to solve Challenge 2. Additionally, we have provided more details on the course and scoring for Challenge 2.

Building Materials

Your team will be given a box of materials to build the model of your team-designed equipment model:

1/2" poly tubing	1/2" galvanized hose clamps	Plastic canvas
Cardboard tubes	Jumbo craft sticks	Spatula
1/4" Round dowels	3/8" square dowels	Spools
Wheels	Cable ties	Anti-slip tape
Wire	Clothesline	Large rubber bands (can bands)
12" x 12" self-adhesive tile	Electric box	Strong tie plate
Velcro OneWraps	Cardboard box the materials come in	

However, just like any job, some materials might not be in stock and the manufacturer has replaced them with a similar material.

Additionally, your team should bring your team-supplied tools and supplies **as well as one roll of duct tape.**

Requirements for model testing:

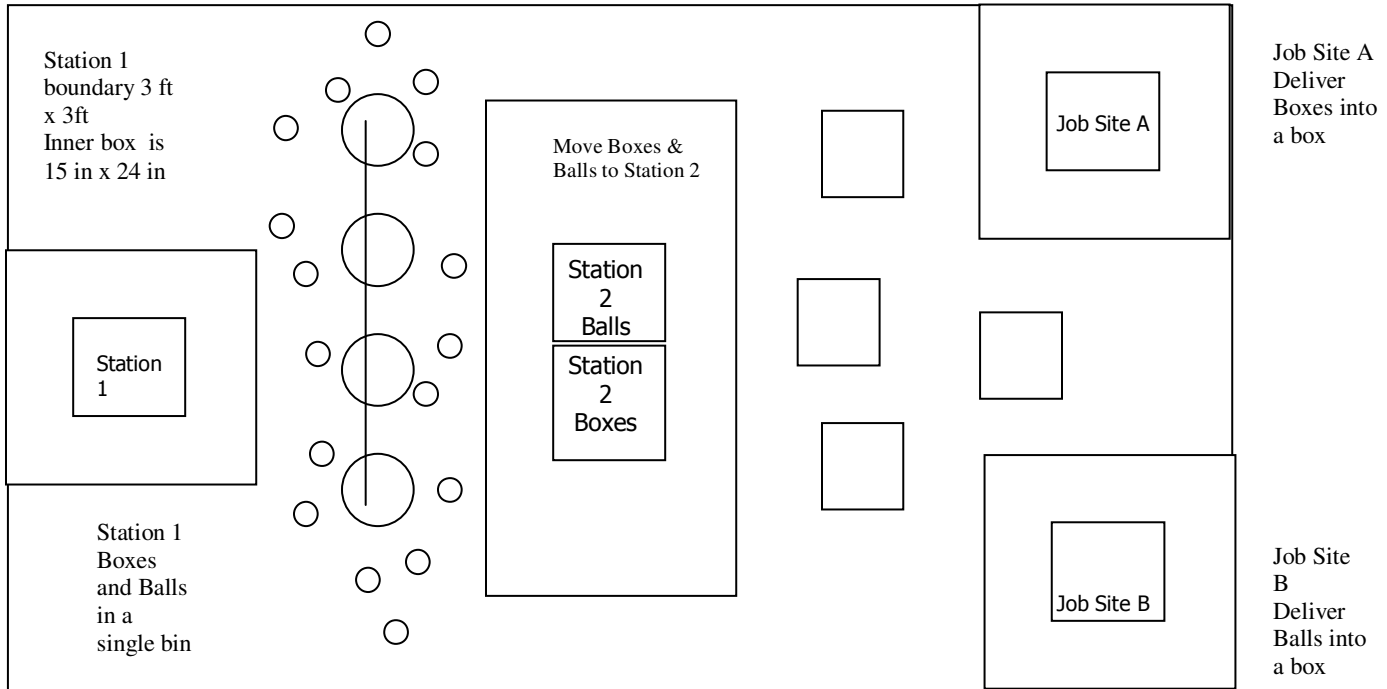
- ◆ All boxes and balls must start in Station 1.
- ◆ The model must move all boxes and balls from Station 1 to Station 2, where the model will sort the boxes and balls into the correct marked containers.
- ◆ After all the boxes and balls are in the correct boxes at Station 2, they can then be moved by the model to Job Sites A or B.
- ◆ Team members may not cross the boundary lines surrounding Stations 1 and 2 and Job Sites A and B.
- ◆ The model may be anywhere inside the Testing Site.
- ◆ Teams may not move Stations 1 and 2 or Work Sites A and B from their designated spots.
- ◆ Boxes and balls may only be touched or moved or sorted by the model. If a ball or box is touched by a team member, that ball or box is out of play and will receive a score of -1.
- ◆ Any ball or box that falls and stays inside the boundary pipe of the Testing Site may be retrieved by the model and continue to the next Station or Job Site.
- ◆ If a ball or box goes outside the outer boundary of the Model Testing Site, it will be considered out of play and will receive a score of -1.

Challenge 2 Testing Site

The Testing Site has a boundary of 16 feet x 12 feet.

Station 2 boundary is 3 ft x 7 ft
Inner boxes are 15 in x 24 in

Job Sites A and B boundary is 4 ft x 4 ft
Inner boxes are 30 in tall x 12 in x 12 in



3 ft

Between Station 1 boundary and Station 2 boundary

3 ft

Between Station 2 boundary and boundaries of Job Sites A,B

Test site is 16ft x 12ft surrounded by $\frac{3}{4}$ " PVC pipe

Stations 1, 2 are open 15" x 12" x 2"(tall) cardboard trays

Job Sites A and B are 30 in tall x 12 in x 12 in cardboard boxes with the opening on the top

Obstacles

- Large circles between station 1 and 2 are 28-in tall construction cones with a 14 x 14 inch base
- Joining the large cones is yellow plastic chain – joining top of one to the top of another
- Small circles are 7 inch tall construction cones with an approx 4 inch base
- Obstacles between Station 2 and job site are 30 in tall x 12 in x 12 in cardboard boxes
- The point of having the obstacles isn't to make the teams move to the far outside boundary to get around them, depending on the size of the equipment they design, teams should be able to move their equipment through the obstacles.

The outside boundary around each Station or Job Site is blue masking tape taped to the floor

The outside boundary around the whole Testing site is $\frac{3}{4}$ " PVC pipes.

Scoring

Teams will receive:

- 2 points for each block delivered to Job Site A by the end of time
- 2 points for each ball delivered to Job Site B by the end of time
- 1 point for each ball in the proper location at Station 2 by the end of time
- 1 point for each box in the proper location at Station 2 by the end of time
- -1 points for each block or ball remaining in any space other than the correct Job Sites or Station 2 boxes at the end of time
- -1 point for any box or ball that is considered out of play (touched by a team member or outside the boundary)
- 4 points for each specified material that is wholly unused at the end of time (the specified materials will be revealed at the Rally)
- 1 to 20 points for the design quality of the equipment as presented by the technical drawing

Bonus Scoring

- 1 to 20 points for the degree of how automatic the piece of equipment is – Teams can earn 20 bonus points if all members stay outside the outer boundary during the retrieving, sorting, and delivering of the boxes and balls. (i.e. the lower degree of manipulation of the equipment equals a higher score)
- Smaller size of scale model
 - 20 points if the equipment breaks down to fit inside a closed 10 x 10 x 10 inch box
 - 10 points if the equipment breaks down to fit inside a closed 12 x 12 x 12 inch box
- Fewer number of team members that operate the equipment (i.e. moving, sorting and delivery of boxes and balls)
 - 20 points if only 1 team member operates the scale model of the equipment
 - 10 points if only 2 team members operate the scale model of the equipment
 - 5 points if only 3 team members operate the scale model of the equipment

Challenge 2 Materials

Left – Team materials (plus box) to build the team-designed piece(s) of equipment for Challenge 2

Right – Close-up of team materials to build the team-designed piece(s) of equipment for Challenge 2



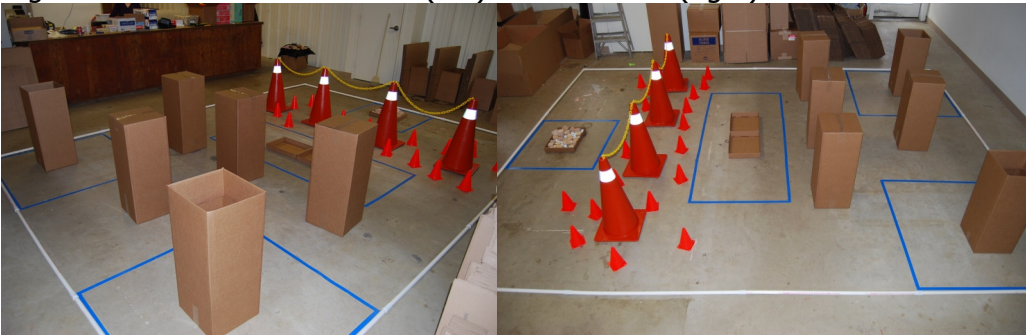
Challenge 2 Set-up

Setup for Challenge 2: Station 1 is in the foreground, Station 2 in the middle and Job Sites A and B are in the background



Left – View from Job Site A towards Stations.

Right – Side view with Station 1 (left) and Job Sites (right)



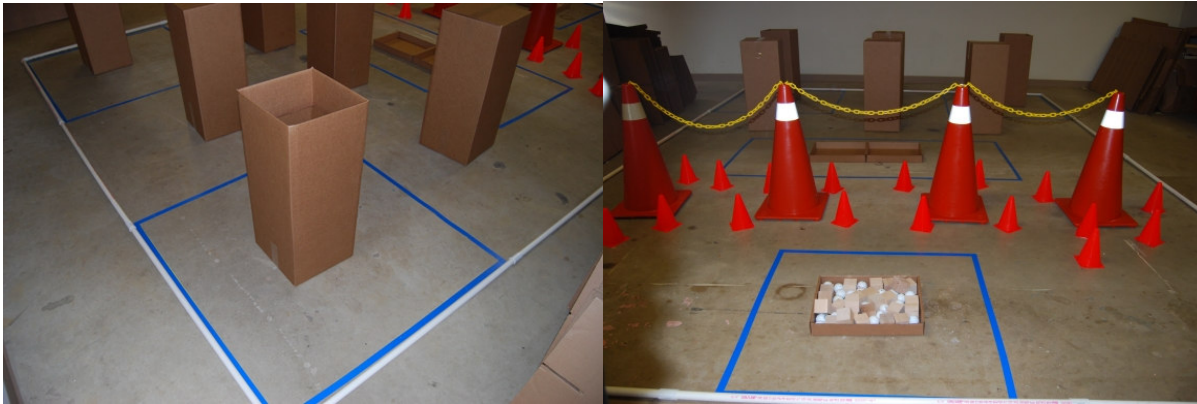
Left – Station 1 (left), obstacle cones, Station 2 (right)

Middle – Station 1

Right – Station 2



Left – Job Site Right – Station 1 with obstacle cones



REQUIRED TOOLS AND MATERIALS

On page 7 of the Registration Packet there is a list of tools and materials that your team will need to have at the Rally. Please be sure that your team has all of these items and that they are all in safe working order.

Challenge 1 Notes: The bag of decorative materials (in the Required Tools and Materials list) will be used in Challenge 1. The Rally will only supply a set of boxes for your teams to use to build your presentation/display.

Challenge 2 Notes: In addition to the tools and supplies your team is already bringing, you may also bring a roll of duct tape.