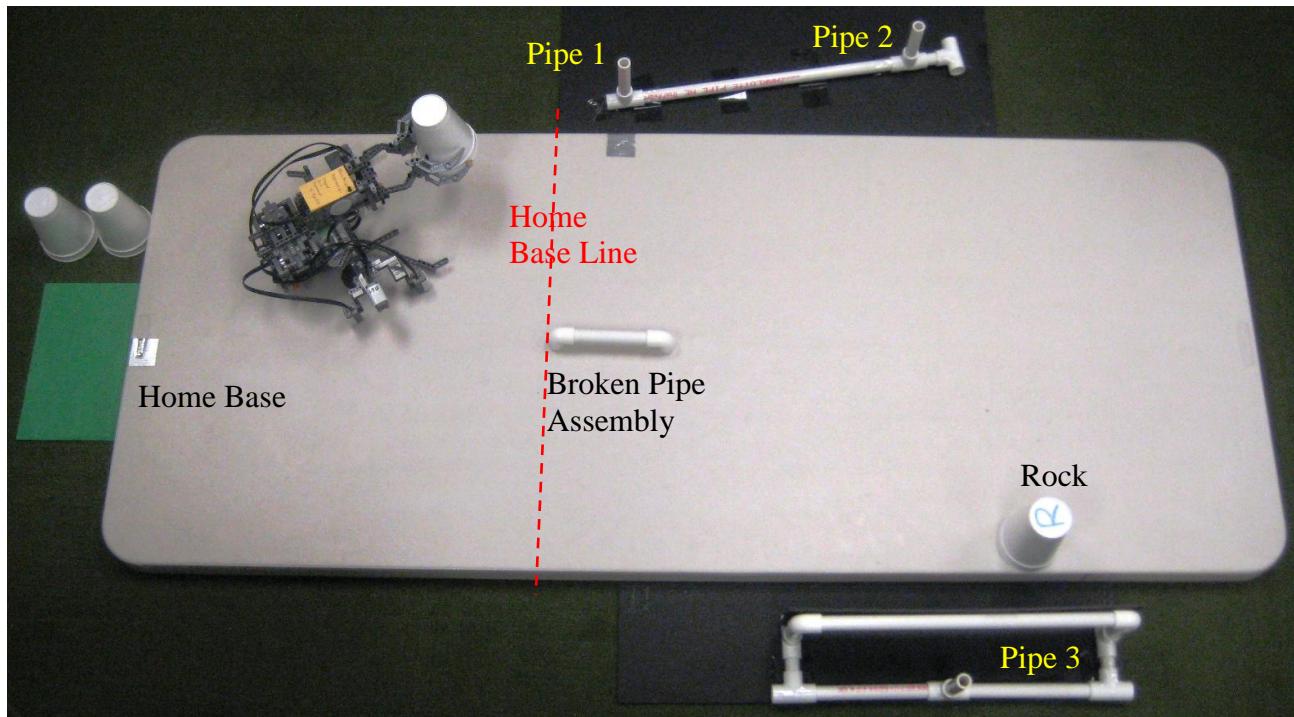


# Block the Oil Spill – ROBOFEST® 2011 Game

V1.1 2-25-10 (Major changes after 12-16-10 Official version are in red)



[Figure 1] Block the Oil Spill playing field configuration (Sr. Division)

## Mission Synopsis

Three pipes of the Deepwater Oil Well are leaking. An autonomous robot is being sent to achieve the following missions to stop the spill. (1) Carry a cup to each leaking pipe and cap it. (2) Retrieve the Broken Pipe Assembly and return it to the Home Base. (3) Remove the Rock in front of the Pipe 3 structure from the table, measure the length of the Pipe 3 structure, and report (display) the length in millimeters to Home Base at least 10 seconds after having stopped for at least 3 seconds.

**Learning Objectives:** motion, object detection, localization, logic, ratio, proportion, math operations, measuring, Pythagoras' theorem (Sr. division only), and navigation.

## How to Play and Score the Game

Each team is given 2 rounds, 2 minutes per round. There is no final match. The playing field configuration for each round will be different.

Teams will be given 30 minutes after the playing field is unveiled and unknown factors are given. However, note that teams **may** not practice on the official playing fields. Also note that practice fields will not be exactly the same as the official fields. All teams must submit their robot with a team ID tag to the restricted **impound** area when 30 minutes have expired. **The maximum robot size in any orientation is 35cm x 76cm. The size will be checked when the robot is impounded. Manual configuration changes made to the robot during the round must meet this size requirement.** No team is allowed to download new programs for the round from this moment on.

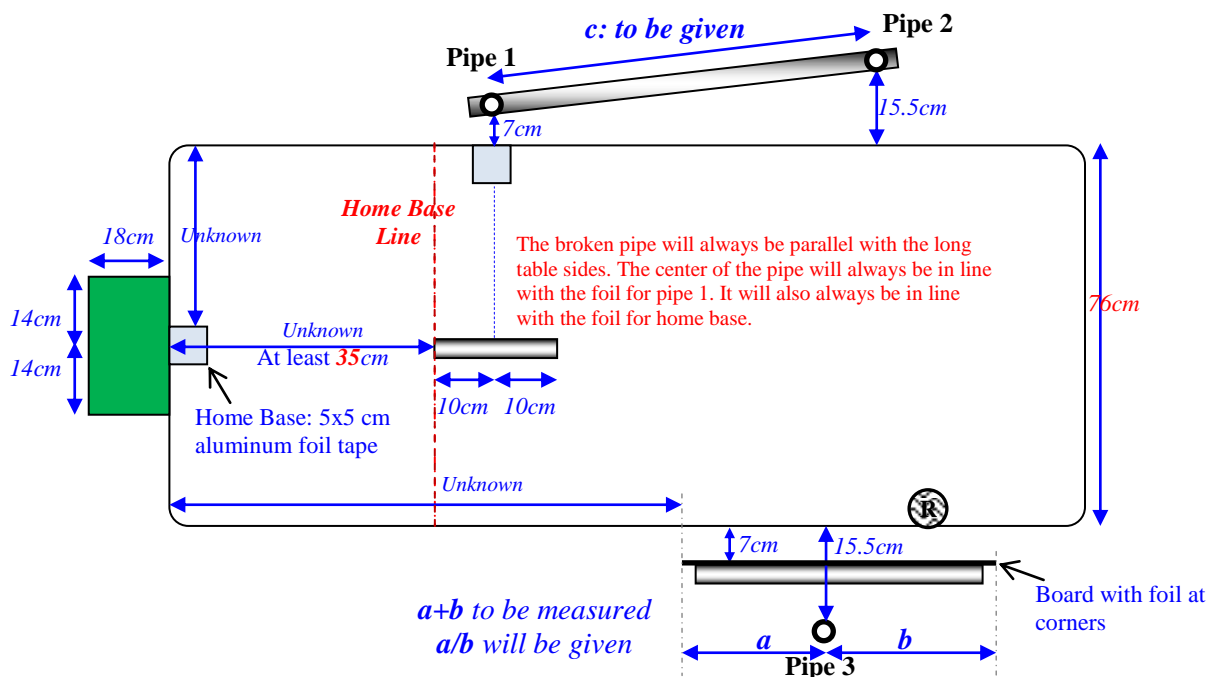
**To start, the robot can be placed anywhere in any orientation in the Home Base area as long as part of it is on or over the foil tape base and meets the size requirements; it cannot cross the Home Base Line but it may hang over the edges of the table.** Players may load the cup or touch/modify/pickup their robot without penalty only when it is on *or* over the Home Base (foil tape).

If any part of the robot is touched outside of Home Base by a player after the game is started, a penalty will be given. When a penalty occurs, the judge will show a Red Card and place it **behind** the Pipe 3 structure. If the robot is touched outside Home Base, it must re-start from Home Base. *The playing field must not be touched and it will not be reset when the robot is restarted.* If the broken pipe assembly is touched by a human player, a Red Card will be given. Note that cups (not the Rock) are not parts of the playing field. Therefore, a player may pick up unsuccessful cups **and bring them to the Home Base** to **restart** without any penalty points. Leaking oil pipes are not supposed to be touched by the robot (since it will damage it more). Using touch sensors to find out the location of the leaking pipe is a violation of the rule and will result in a Red Card. No more than two penalties may be assigned per round. For detailed missions and point values, see the scoring sheet at the end of this document. Each team must return the robot to the restricted impound area after their 2 minute round and **it must remain there** until the next unveiling and prep time.

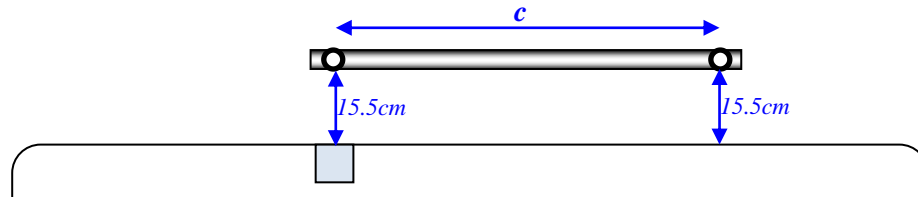
### How to Set Up the Playing Field

A 30" x 72" plastic folding table is used for the playing field. The surface is light in color (almond); however, the exact color and brightness is unknown until the competition day. The four corners of the table are rounded. Figure 2 shows a possible mission field configuration for Sr. Division. Suggested tables can be found on the web at: <http://www.buylifetime.com/Products/BLT/PID-22901.aspx> . Tables can be purchased at local discount stores (K-mart or Lowe's) for \$50. Folding tables will be re-used in future Robofest games. If your table has a darker colored surface, then cover it with white vinyl table cloth or paper. If you have a center folding (fold-in-half) plastic table, cover the gap in the center area with white tape or paper. White paper, poster boards, or plywood can be used on a dark floor to create a practice field. Please note that the thickness of the table is about 4.5cm. The table should be placed on a dark colored floor with the legs folded under.

Two aluminum foil tape squares, 5cm x 5cm, will be placed at unknown locations along the edges of the table. One of them will be Home Base. Unknown factors  $a/b$ , and  $c$  in Figure 2 will be unveiled for each round. For example,  $a/b = 0.75$  and  $c = 41$ cm.



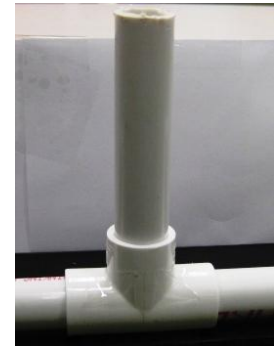
[Figure 2] Sr. Division playing field layout



[Figure 3] Jr. Division playing field layout (The rest is same as Sr. Division)



[Figure 4] Broken Pipe Assembly:  
15cm pipe and two elbows



[Figure 5] Leaking Pipe

### Broken Pipe Assembly

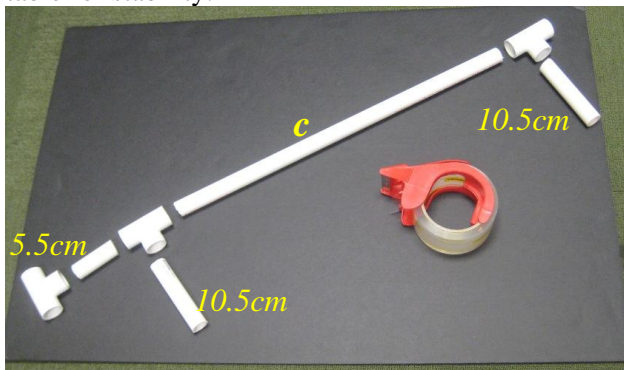
Use ½” PVC pipe with two 90 degree elbows (slip). The total length is 20cm and weight of the pipe assembly is about 62 grams. The exact color of the pipe is unknown.

### Leaking Pipes

The height of the each leaking pipe is 12.8cm from the floor (foam board). Considering the thickness of the folding table, the actual height of the pipe is around 8.3cm ( $12.8 - 4.5 = 8.3$ ) from the table. The exact color of the pipe is unknown.

### Pipe 1 & 2 Structure

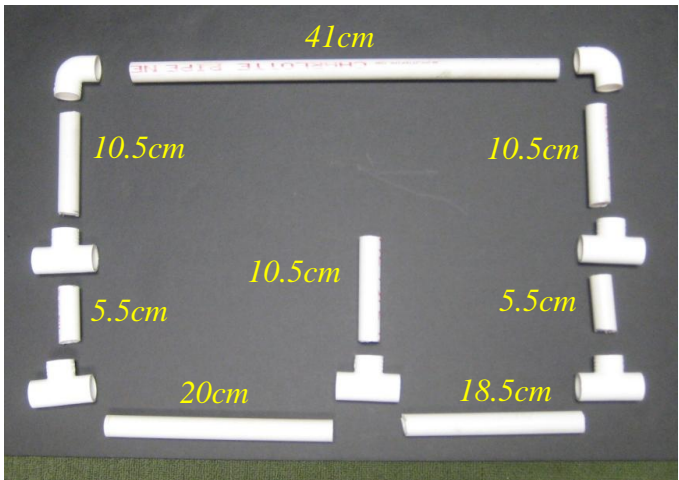
Use three T slip connectors (sockets), two 10.5cm pipes, one 5.5cm pipe, and “c” pipe (41cm for practice). Attach to black foam board with packaging tape or Velcro. At least half of the foam board should be under the table for stability.



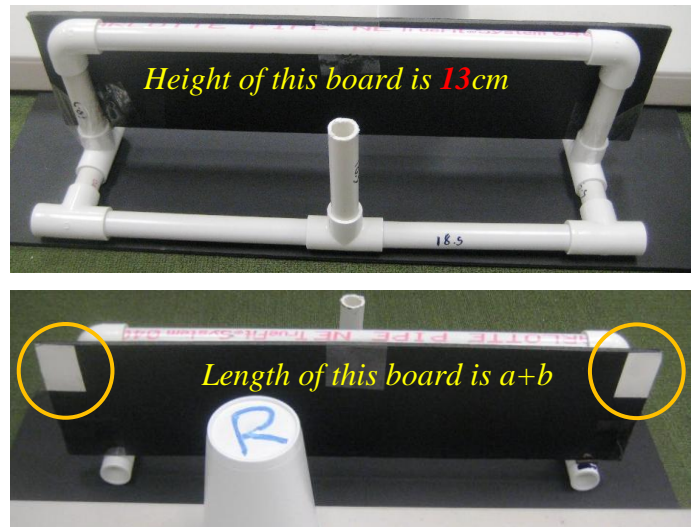
[Figure 6] Pipe 1 & 2 Structure

### Pipe 3 Structure

Two elbow and five T sockets are used to construct the structure. 13cm x 50.6 cm (at least) black foam board will be taped on (or attached to) the structure as seen in figure 7. The length of the board may change in rounds. 3cm x 5cm aluminum foil tape is attached at the upper corners of the board. See the circles in figure 7. The height of the blocking board is about 15.5cm from the floor. The rock (cup) will be placed in between two aluminum foil pieces along the edge of the table. See figures 2 and 7.

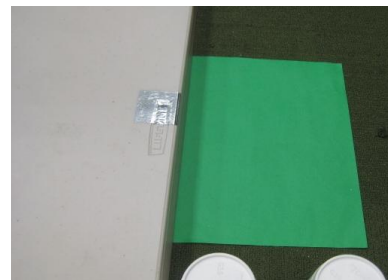


[Figure 7] Pipe 3 Structure



The pipe structures should not move. They will be secured on black foam boards. At least half of the board is under the table as shown in figures 6 and 7.

Home Base Foil tape and Color Paper  
 5"x5" aluminum foil and letter size paper in *any color* such as green will be placed as shown in figure 8. Part of the paper will be under the table so the length is 28cm and width is 18cm.



[Figure 8] Home Base and Color Paper

### Junior and Senior Divisions

	<b>Junior</b>	<b>Senior</b>
<b>Max. weight of the robot</b>	No limit	No limit
<b>Pipe Number 2</b>	Pythagoras' theorem not required	Pythagoras' theorem may be required
<b>Recommended Programming Language</b>	icon-based graphical language	C or Java

### Robot Specifications

- Maximum width and length is 35cm x 76cm
- Height and weight limitation: none
- Only one robot controller for each robot
- Any number of sensors/sensor types (unless it is harmful to humans)
- Any number/type of motors/servo motors.
- Any material/robot kit to construct your robot. Tape, glue, bolts and nuts, rubber bands, etc may be used. Teams may modify robots (add or remove fixtures) only when the robot is at the Home Base.
- Any programming language (see above table for recommended languages)
- Visible team ID tag

## Rules to play rounds

The emcee shall announce the following before each round:

*No adult is allowed in the pit area from now through the end of the competition. The use of any communications devices to remotely control robots is prohibited in this competition arena. Please turn off all such devices now. If anyone sees any suspicious activities, please get the attention of the nearest Robofest volunteer immediately. Only two team members can stay in the competition area; however, it is requested that all other members be around the competition field during the game play.*

Teams will compete in a pre-determined order decided by the site host. The emcee will visit each track for team introductions (up to 30 seconds) to the general public. Note that team introductions will not be graded.

## How to Determine Winners

- Jr. and Sr. Divisions will be judged separately.
- Winners in each division will be decided by the **average** score of the 2 rounds. Tie breakers will be: (1) completion time if perfect score, (2) best score of two rounds, (3) accuracy of the reported pipe 3 structure length, (4) rerun, if needed.

*The Chief Game Judge has all the discretion in making final decisions for the cases not considered in this rule.*

## Bill of Materials to construct a field

	Estimated Unit Cost	Quantity	Cost
Folding Tables, 30" x 72"	\$50	1	\$50
½" x 10' PVC pipe (color does not matter)	\$1.46	1	\$1.46
½" T shape slip connector	\$0.40	8	\$3.20
½" Elbow slip connector	\$0.30	4	\$1.20
Aluminum foil tape	\$7	1	\$7
Clear packaging tape (or Velcro)	\$3	1	\$3
Black foam board (20"x30")	\$6	2	\$12
White 16 fl oz foam cups (diameter of the mouth inside is 9cm)	\$0.10	4	\$0.40
Total			\$78.26

**FAQ** (Additional FAQs will be posted on the web at [www.robofest.net](http://www.robofest.net))

- Can we restart a robot after it returns home, if we want it to go out again to drop the missed cup?  
– Yes, you can send the robot again from the aluminum foil Home Base without any penalties.
- Can the robot dimensions get bigger **automatically** after the start? Yes
- Do I have to carry all the cups at the same time? – No, you do not need to. You may carry the cups one by one.
- Will there be judging of the team's programs? – You do not need to. However, judges may visit team tables to check the code for the Pipe 3 structure length display part.
- Can we use a touch sensor to measure the length of the Pipe 3 structure? – Yes, you may.
- Can we get the points for reading Pipe 3 structure, if Rock is still on table? No, the rock must be removed first to report the length.
- Is there a required sequence of missions? No, with the exception of the Pipe 3/Rock scenario above.
- Is color of the leaking pipes always white? No, it is unknown.

**Acknowledgement:** We thank all the Robofest coaches, team members, and site host organizers who gave valuable input to finalize this game rule.

# ROBOFEST 2011 “Block the Oil Spill” Challenge Scoring Sheet (v1.0)

Division: Junior / Senior

Team Name: \_\_\_\_\_

Team School / Organization Name: \_\_\_\_\_ Team Number: \_\_\_\_\_

Round: First

Second

Track No.: \_\_\_\_\_

Judging Criteria	Count	Point Value (per count)	Score Earned / Lost
1) Pipe 1 is capped?	0 1	20	
2) Pipe 2 is capped?	0 1	25	
3) Pipe 3 is capped?	0 1	30	
4) Rock is removed off the table?	0 1	5	
5) The robot removed the rock off the table (see above 4), returned home, stopped at least 3 seconds, and reported the length of the structure for pipe 3 in millimeter at least 10 seconds: _____ (**)	0 1	10	
6) Broken Pipe Assembly is fetched (any part of the assembly must touch the green paper)	0 1	10	
7) Number of <b>red cards</b> that will be given when human player touches the robot or any part of the playing field such as the pipe assembly. It will also be given when robot touches the leaking pipe intentionally.	0 1 2	-5	
8) The robot remained intact throughout Game?	0 1	5	
Max. score possible is: 105	<b>Total Score</b>		
	<b>Time If perfect score (*)</b>		( sec. xx )

(\*) a tie breaker

(\*\*) the acceptable range to earn points will be given to Judges

Judge initials: \_\_\_\_\_

Team player initials: \_\_\_\_\_

If there are multiple playing fields at the competition sites, the Chief Game Judge will check consistency between the playing fields.