E^3 Fair

2010 E^3 Engineering and Technology Fair

Engineering, Exploration, and Experimentation

Thursday, April 29, 2010 Clark Gymnasium at RIT

9:00 am to 2:00 pm

Event Coordinator
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The E^3 Fair Committee is pleased to announce the 19th annual **E^3 Engineering and Technology Fair**. The first E^3 Fair was held in 1991 and consistently through each year, it continues to be organized and funded by a joint effort between engineering societies and area industries. The Fair's mission is to increase exposure of engineering and technology related fields to middle school students (grades 6 – 8). While working on these projects, students learn about the importance of team and process concepts which include communicating and making a plan for success, and being creative and exercise independent thought in their project design. As a result, they learn about careers in engineering from their work as well as from professional engineers at the Fair.

The E3 Fair will run from 9am – 2pm with student competitions starting at 9am. When students are not involved in their competition, we encourage them to visit the booths where local engineering societies and industries will engage students with demonstrations of current technology. Students will be eligible for prizes if they visit a certain number of booths.

There are three competition options available to students:

- ***Option 1*** - Prepare a project or experiment for display that is based on engineering or technology principles.
- ***Option 2*** – 'Stationary Power Lift' Design and construct a machine, using only parts from a Lego kit #9645, capable of vertically lifting a basket of weight to a height of 4" in 30 seconds..
- ***Option 3*** – 'Robotics' Design, construct and program a robot, using parts from a **'**Robolab Team Challenge set' # 979794, capable of removing 7 coke cans out of a circle 18" in radius in as short a time as possible.

If you need assistance with obtaining LEGO kits for Options 1 or 2, please contact our LEGO representative, Tom Barrowman (windsong8@verizon.net or 1-518-793-7033)

Middle schools in Monroe and surrounding counties participate in the E^3 Fair. If you have participated in past Fairs, we hope to see you again. If you have not previously participated, join in – you will not be disappointed. It is a rewarding and fun experience. Please do not hesitate to contact us with any questions or comments.

Sincerely,

Phil Steinfeldt
E^3 Fair Chair

VISIT OUR WEB PAGE - www.e3fair.org

OPTION ONE
GENERAL DESCRIPTION

Projects submitted for Option One will consist of full-size or scale models of a physical structure or device, a detailed description of a process, device, or structure, or data obtained from a project involving experimentation. The presentation of the project at the Fair may include posters, photographs, written work as well as any actual device that may have been constructed. The project and any other supporting data or displays will be placed on the table space assigned to the entrant. This space is limited and the physical dimensions of each entry must not exceed three feet (3 FT) in height, width, or depth; nor may it exceed 30 pounds in weight.

For each grade level, the following topics are suggested to provide a thematic background to the Fair. These suggestions are not intended to limit the students. These are topical areas of wide interest technologically and serve as useful guidelines for the students. If a team of students cares to choose a topic not listed, they may do so at the discretion of the teacher/advisor.

OPTION ONE *Suggested Topics*

A. ENGINEERING THE ENVIRONMENT

- forms of energy and energy utilization
- preserving our environment; waste disposal and recycling, product packaging
- protecting our atmosphere; global warming, ozone
- how humans and technology impact the environment

B. ENGINEERING FOR EXPLORATION,TRANSPORTATION & COMMUNICATION

- land, sea, air, and space
- communication and communication systems
- robotics, telepresence
- computers and computer technology

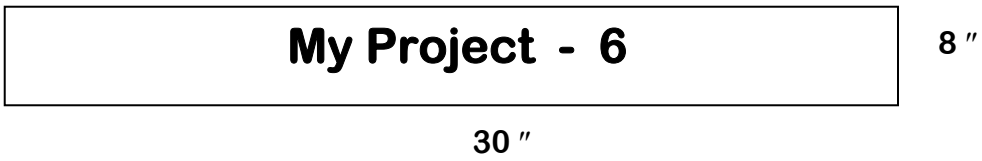
C. ENGINEERING FOR HEALTH AND BIOTECHNOLOGY

- genetic engineering
- artificial organs or limbs, medical devices
- food production, processing, storage
- new and novel ways of growing food

OPTION 1
PARTICIPATION AND EVALUATION GUIDELINES

1. The Option One project and all associated presentation materials will be displayed on a table at the Fair. The total physical dimensions are limited to 3ft long x 3ft deep x 3ft high and a maximum weight of 30 lbs.

2. Each group should bring a sign (approximately 30″ x 8″) displaying the title and grade level An example for Grade 6 is shown below. This will be taped to the table on which the project is displayed.



3. Students participating in Option One must work under the guidance of a teacher or advisor.

4. Students currently in the 6th, 7th, or 8th grades are eligible to submit a project to the E^3 Fair. Those participating may consult any resource at their disposal during the design period, however all hands-on work must be done by the group members.

5. Option One projects may not contain any projectiles or flammable fuels of any sort. This includes but is not limited to gasoline, kerosene, and any acids or bases. The use of electricity is permitted and 120V power will be provided if requested on the Option One Registration Form.

6. Projects that have been part of a classroom activity or another competition or Fair, may be entered by the group that designed and built them.

7. Members of a team must belong to the same grade level.

8. The maximum number to a team is four students.

9. There is no limit to the number of eligible student groups that may participate in Option One of the E^3 Fair from any one school.

10. A Judging Committee will determine the winners in each grade level of each category.

11. Each group must submit an entry form by the specified deadline date. Participating schools should feel free to make as many copies of this form as are necessary.

OPTION TWO – STATIONARY POWER LIFT

GENERAL DESCRIPTION:

Option Two involves an open-ended, hands on, problem solving activity. Participants will solve the problem, build their solution, and document the problem solving process in their Design Journal prior to the Fair. The teams will bring their solution of the problem to the Fair and participate in a competition. Each participating group will be required to complete a Design Journal and hand it in at the Fair for evaluation. A sample format of the Design Journal is enclosed.

PROBLEM STATEMENT:

Design and construct a machine, using only parts from a Lego kit #9645, capable of vertically lifting a basket of weight to a given height in a given time. The machine will be placed on a platform provided by the E3 committee, Figure 1, and must support itself without falling over while connected to the basket. The basket (also provided by the Committee) will be placed with its center 3 inches from the nearest edge of the platform. The machine must raise the basket, with an amount of weight selected by the competing team, vertically to a height of 4 inches within 30 seconds of beginning the lift. Flat washers, 3/8 inch in diameter, will be used for the ballast weight within the basket. The basket itself will be a 4-inch diameter, PVC cup with strings converging to a singular point for attachment to the participants' vehicle.

Choosing pre-established weight combinations will insure an efficient use of time and standardization for the judges. Each flat washer weighs approximately 0.25 ounces. This information is provided so that participants may practice with any combination prior to the event. The weight of the basket (approximately 4.2 ounces), is included in the total weight that will be recorded for each team.

TOURNAMENT GUIDELINES:

1. Only parts contained within one Lego kit #9645 may be used for the project. The Lego kit #1032 with the new motor and a 9V battery box # 9615 can also be used.
2. Neither the box the kit comes in, nor the instruction manual furnished with the kit, nor any parts from additional kits may be utilized to obtain a solution.
3. No part may be cut, sanded, whittled, polished or physically altered in any way.
4. No oils, adhesives, tape, glues or chemical additives of any type may be introduced as part of the problem solution.
5. The device must rest on the platform surface, provided by the E3 committee, Figure 1, during the entire competition and must support itself without falling over while connected to the basket. It cannot be clamped in any way, either to the platform or to the baseboard.
6. The battery pack must be attached to the device and cannot be held by the team members.

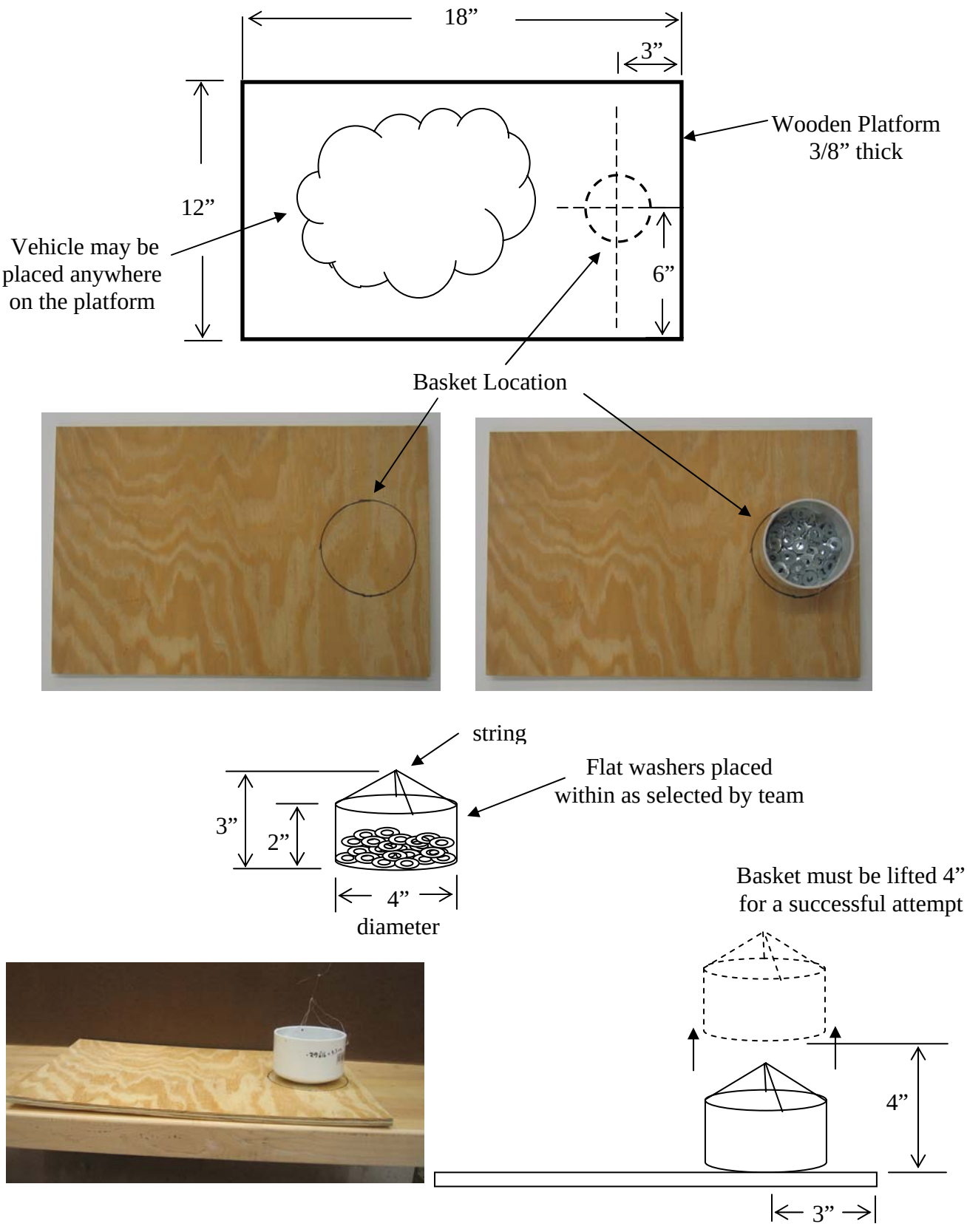


Fig. 1 Basket and Platform

7. The basket, which will be provided by the Committee, is a PVC cup 4 inches in diameter with strings converging to a singular point for attachment to the device (figure 1b). The basket will be rested on the platform with its center 3 inches from the nearest edge as shown in figure1. *Note, the basket rests on the same platform as the machine.*

8. Flat washers, with 3/8 inch hole diameter, will be used for the ballast weight within the basket. Each flat washer weighs approximately 0.25 ounces. The tare weight of the basket, approximately 4.2 ounces, will be included in the total weight that will be recorded as the team's score. (Choosing pre-established weight combinations will insure an efficient use of time and standardization. This information is provided so that, participants may practice with any combination prior to the event.)

9. After the washers are added to the basket, the team will have 30 seconds from the time the basket leaves the baseboard to complete the lift.

10. Once the lift has been initiated, the lift must continue without human intervention until either the lift is completed or the time expires. (Note: Machine cannot be held down by the contestants). No modifications will be allowed to the device during the entire run. The lift will be considered completed when any one of the following occurs
    - the basket is raised to a height of 4 inches
    - total lift time is 30 seconds
    - someone / something intervenes with the progression of the lift.

11. All design decisions, journal entries, and assembly of the Lego parts shall be performed by the students on the team. They may consult any resource at their disposal for guidance or clarification, such as teachers and mentors, while working through the problem solving process.

12. There is no limit to the number of eligible student groups that may participate in Option Two of the E^3 Fair from any one school. However, the number in each group, is limited to a maximum of four. Team members need not be of the same grade level.

13. A violation of any rule must be corrected before the team will be allowed to compete, otherwise the team will be disqualified.

14. Decisions made by the Guidelines Committee Chairpersons or by designated representatives are final.

Note: If there are any questions about any rules, you are urged to contact the Guidelines Chair.

OPTION THREE - ROBOTICS

GENERAL DESCRIPTION

Option Three involves a robotic design, computer controlled, hands on problem solving activity. Participants will solve the problem, build their solution, and document the problem solving process in their Design Journal prior to the Fair. The teams will bring their solution of the problem to the Fair and participate in a competition. Each participating group will be required to complete a Design Journal and hand it in at the Fair for evaluation. A sample format of the Design Journal is enclosed.

PROBLEM STATEMENT

Design, construct and program a robot, using parts from a **'**Robolab Team Challenge set' # 979794, capable of removing Coke cans out of a circle in as short a time as possible. The Challenge platform has a boundary circle of radius 18 inches with 7 coke cans, 6 arranged in a circle of radius 9 inches concentric with the boundary circle and one in the center, Figure 2. The robot will be placed in a 'Start Box' outside of, and facing the center of the boundary circle. The robot should be able to get across and into the boundary circle. It can then push or roll cans out of the circle for a period of 2 minutes, at which time it should turn itself off. The team score is the number of cans outside the circle and the time over which this is accomplished. The winner is the team that removes the largest number of cans in the shortest time.

TOURNAMENT GUIDELINES

1. Only parts contained within one Robolab Team Challenge set # 979794 may be used.

Note: The # 979794 kit contains 2 motors, 2 light sensors, 2 touch sensors 1 RCX programmable brick and 828 lego parts. Other kits, such as # 979790 or # 979793 or #979786 may be used., although they contain less parts. They may be upgraded with additional parts to make them equivalent to (but not exceed) the # 979794 kit. Please check with the Guidelines Chair for the admissibility of alternate kits.

2. No part may be cut, sanded, whittled, polished or physically altered in any way.

3. No oils, adhesives, tape, glues or chemical additives of any type may be introduced as part of the problem solution.

4. The diagram of the 'Challenge Field' is shown in Figure2. It is laid out on a white, masonite board, 1/8 inch thick, 4 ft by 4 ft in dimension. The boundary circle and the Start Box are laid out with good quality PVC black electrical tape of width ¾ inches. It is best not to stretch the tape as it is being applied. Also, smooth out any wrinkles so they do not interfere with the robot's movement.

5. The robot will start from inside the 'Start Box' facing the center of the circle and outside the boundary circle. It should fit in this box. Once it has been initiated, it should not change its shape, size or orientation during the entire competition. During the entire competition its size should be such that it fits in the Start Box.

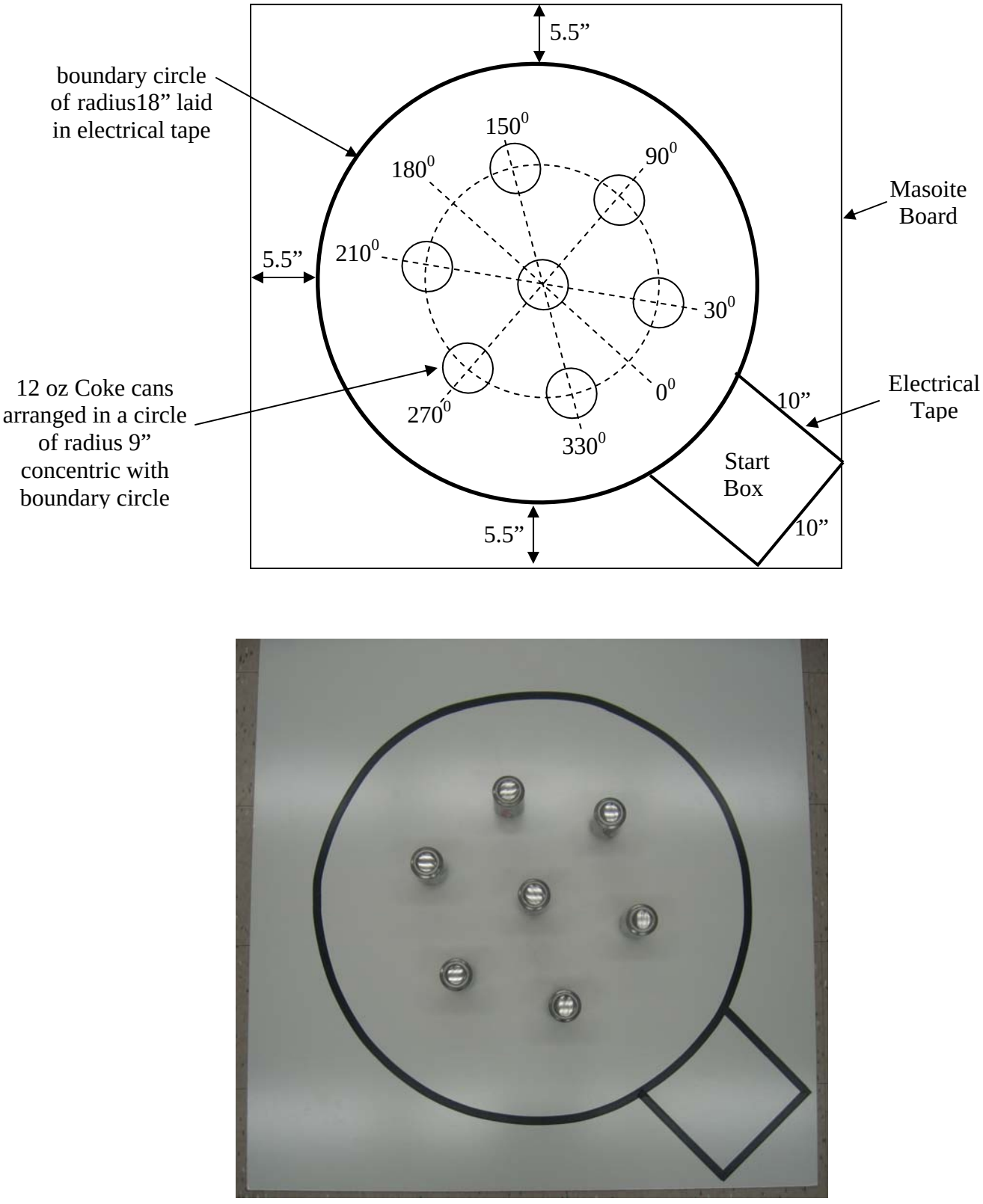


Figure 2. Robot Challenge Playing Field

6. The Coke cans, (12 oz) are arranged as shown above, six of them placed in a circle of radius 9” with one in the center. The cans are emptied, half filled with kitty litter and resealed by duct tape.

7. The robot should be able to get across and into the boundary circle. The robot can then push or roll cans out of the boundary circle.

8. Once the robot has been initiated, it must continue, without human intervention, until the run is complete.

9. A can is counted ‘out’ the moment it is completely over the boundary circle.

10. The robot may use the area outside the boundary circle for turning only. It is not advisable for the robot to leave the masonite board since the edges of the board may be curled in which case it should be capable of climbing back on the playing field again. If it stays outside the boundary circle for more than 20 sec, the round will be considered over.

11. The time for the round is 2 minutes at which time the robot should turn itself off.

12. The team score is the number of cans outside the circle and the time period over which this is accomplished. The winner is the team that removes the largest number of cans in the shortest time. Each team will be allowed two rounds. The best of the two scores will be considered.

13. All design decisions, journal entries, and assembly of the robot must be performed by the students on the team. They may consult any resource for guidance or clarification, such as teachers and mentors, while working through the problem solving process.

14. There is no limit to the number of student groups that may participate in Option Three from any one school. However, the number in each group, is limited to a maximum of four. The team members need not be of the same grade level.

15. Decisions made by the Guidelines Committee or by designated representatives are final.

Design Journals
(Option Two and Option Three)

The Problem-Solving Process is invaluable in evaluating the form and function of the vehicle. The process can be used for any problem, analytical (like this one) or otherwise. It is a powerful tool that not only allows you to solve small discrete problems, but also assists in breaking down immense problems into smaller, manageable parts that can be more easily solved. In the "real world" there is not just one correct answer; there are many correct answers. Any device that can solve the problem is a correct solution; of course some perform better than others do, but that is another matter entirely.

The Design Journal is incorporated as part of the event because the ability to communicate problems, solutions, and findings are also very important. Describing what the problem is, what possible solutions exist, how solutions are implemented, and why this particular solution was chosen over others is in many ways far more important than actually building something. In the "real world" a solution must be documented, argued, and proven on paper before anyone will pay the cost of building a prototype.

When completing this design journal, make all entries concise, clear and complete. A typed journal is recommended. Include diagrams and photographs to complement your written work (a picture really is worth a thousand words). For each attempt that you make to configure the vehicle, the following problem solving steps will assist you in executing the process and also to develop a design journal. Think before you rush into building something, taking the time to weigh several options and choosing the optimal solution.

Problem Solving Process

Problem # _____
Date: _____

1. Include a design sketch or photograph
2. Identify or select the problem
2 Analyze the problem:
3. Generate possible solutions to the problem:
4. Select and plan a solution:
5. Implement the solution:
6. Evaluate the results:

Complete a Design Journal, one for each Option (2 and 3).

PRIZES

Results will be announced at the end of the Fair. Trophies will be awarded to top performers.

Additional Activities at the E3 Fair

There will be a number of informational booths sponsored by various technical societies, local industries and area colleges and universities. These booths are intended to illustrate various aspects of engineering, science, and technology and inform both participants and visitors to the Fair of career opportunities in a wide variety of technical fields.

Local colleges and universities will be on hand to distribute information regarding their Engineering Programs and the various educational programs available to the students in order to prepare them for a technical career;

E^3 FAIR - OPTION ONE

PROJECT REGISTRATION FORM

www.e3fair.org

One copy of this registration form must be completed for each Option One project being entered in the E^3 Fair and submitted no later than **March 22, 2010.**

Please mail or email completed forms to:

Dr. Adelaide Svoboda
70 Brandywine Lane,
Rochester, NY 14618
asvobod9@naz.edu

Grade: _____

Name(s) of student(s)

1. _____

2. _____

3. _____

4. _____

School and address: _____

_____

_____

Sponsoring teacher/advisor: _____

Phone Number: _____

email : _____

Title of Project: _____

(60 characters max)

Anticipated special requirements:_____

(120-volt electrical power, compressed air, etc.)

E^3 FAIR - OPTION TWO

PROJECT REGISTRATION FORM

www.e3fair.org

One copy of this registration form must be completed for each Option One project being entered in the E^3 Fair and submitted no later than **March 22, 2010.**

Please mail or email completed forms to:

Dr. Adelaide Svoboda
70 Brandywine Lane,
Rochester, NY 14618
asvobod9@naz.edu

Team # _____

Name	**Grade**:
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

School and address: _____

_____

_____

Sponsoring teacher/advisor: _____

Phone Number: _____

email : _____

E^3 FAIR - OPTION THREE

PROJECT REGISTRATION FORM

www.e3fair.org

One copy of this registration form must be completed for each Option One project being entered in the E^3 Fair and submitted no later than **March 22, 2010.**

Please mail or email completed forms to:

Dr. Adelaide Svoboda
70 Brandywine Lane,
Rochester, NY 14618
asvobod9@naz.edu

Team # _____

Name	**Grade**:
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

School and address: _____

_____

_____

Sponsoring teacher/advisor: _____

Phone Number: _____

email : _____