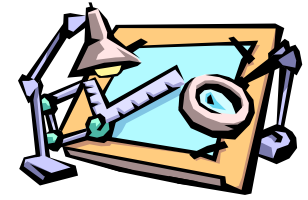


# Engineering Design Process & Points

Revised 9/24



All Teams should observe the Engineering Design Process. It should be reflected in the Nuclear Waste Cleanup Robot (NWCR) Display and Presentation as well as the Lab Notebook which must be maintained throughout its participation in the Engineering Challenge.

## 1. **Identify the problems:**

This step should include general statements or questions which correlate with the testing criteria such as, “Does our Nuclear Waste Cleanup Robot address the issues that an actual robot in these situations would? Does it have the speed, strength and agility that a robot would need to retrieve dangerous waste quickly and safely?” The specific challenges should be addressed via the testing and revising of the NWCR design.

## 2. **Set your goals:**

The goals set by the engineering team should be as specific as possible and should address the general problems they initially identified. One goal might be stated as follows: "We want to receive maximum points on the Display Portion of the challenge."

## 3. **Brainstorm design ideas:**

The key to brainstorming is to remember that no idea is a bad idea! Each idea, no matter how off-the-wall it seems, should be recorded during the brainstorming session. Encourage the students to be creative, because the more ideas that are generated, the more likely it is that a successful design will result. Brainstorm sessions may be carried out individually or as a group.



## 4. **Select and construct a design:**

After the brainstorming phase, the group should decide which ideas it likes best, and then construct a prototype which incorporates these ideas into its design.

## 5. **Test and revise your model:**

After an initial prototype has been constructed, it must be thoroughly tested to ascertain both its strengths and its weaknesses. Most likely, you will discover that some ideas which you thought were wonderful didn't work at all. At this stage, you should consider more specific problems, such as “Why does our NWCR not gain traction when torque is applied?” The team must then begin brainstorming ways to deal with the problem and/or incorporate one or more of the alternate ideas which were brainstormed earlier. The process of testing and revising will undoubtedly have to be carried out many, many times in every area of your NWCR design!

## 6. **Present your final product:**

After your NWCR has been exhaustively tested and countless revisions have been carried out to create a working vehicle, it is time to show everyone your creation. Perhaps go to other groups or classes and present your final NWCR!



# Engineering Challenge Competition

The Nuclear Waste Cleanup Robot prototypes are scored in the following areas. The following are points available for each challenge.

Challenge	Objective	Points
<b>Incline</b>	Reach the steepest level of course incline in 2 trials.	10
<b>Torque</b>	Torque represents the power behind your NWCR by seeing how many grams it can lift on a pulley system.	15
<b>NWCR "Meltdown" Speed Challenge</b>	Complete the course in the fastest time possible to stop the "spill"	15
<b>Retrieval Challenge</b>	The robot must enter the area and retrieve an object before the door closes.	15
<b>Poster Display</b>	Poster Display representing the engineering process and teamwork distribution	10
<b>Poster Presentation</b>	Verbal presentation of NWCR design process	15
<b>Lab Notebook &amp; Budget</b>	Detailed, handwritten account of team's design process	20
<b>Maximum Composite Score</b>		<b>100 points</b>

