LDSB Green Energy Skills Challenge - Gr. 7/8 (Teams of 4)

Purpose of the Contest:

To provide competitors with the opportunity to demonstrate practical and theoretical application of their skills and knowledge in the industry relevant to:

- Construction properties: structure and strength
- Measuring and working with voltage
- Motors and generators
- Renewable energy sources

Teams of four Grade 7/8 students from the same school will design and construct a wind turbine. Due to material availability this challenge will be capped at 6 teams total, and decided on a first-come-first-served basis. If schools are interested in sending more than one team, they are asked to host their own challenge to narrow the choice down to one team submission for the LDSB Skills Challenge. Participating teams will be given a full materials kit prior to the challenge date. Materials can be used at the discretion of each team, keeping in mind that efficient use is part of the criteria. Design thinking and planning will be needed. Each team must bring **two** copies of their design sketches and/or blueprints. Sketches and blueprints may be hand-drawn, a CAD design or use another computer aided drawing software. Drawings must be created and completed by student team members.

At the challenge, teams will be given 2 hours to assemble their materials to construct their wind turbines according to planning documents. All materials must come to the challenge unassembled, but can be individually altered prior to challenge to aid with efficient assembly.

Allowed prefabrication prior to challenge [ONLY]:

- DC motor mount (unattached from base/rotor). Attaching this to the final assembly will take place at the challenge; however, teams may use materials to house the motor prior to the challenge so that it can be mounted to their design.

Clothing & Safety Requirements During Challenge:

Competitors must supply and wear the appropriate clothing and protective gear:

- Safety eyewear. (There will be additional safety glasses provided at the challenge, if needed)
- Long pants and appropriate shirt (long/short sleeves. No sleeveless or oversized shirts/hoodies)
- No inappropriate slogans or messages
- No necklaces or bracelets.
- No school identification should be worn.
- Closed toed shoes.
- No cell phones allowed in the competition area.

***Please note: Failure to wear personal protective equipment in an appropriate manner could result in deductions. More than one warning may result in competitor(s) being disqualified from the contest.*

Size Requirements:

- The base of the wind turbine must be NO larger than 30 x 30 cm in width/length, and NO larger than 1 metre in height (from bottom of base to top of turbine blades).
- The diameter of the blades when attached to the rotor cannot exceed 80cm (From blade tip to opposite blade tip). Teams can choose blade design / total amount of blades.

Pre-Challenge Materials & Expectations:

Material kits will be provided to each teacher/team prior to the challenge. No additional materials can be used on the wind turbine. Tools used to create the individual components out of the materials are at the discretion of each teacher/team. Only select tools will be available during assembly. Please remember that only the DC motor mount/housing can be prefabricated and brought to the challenge. All remaining materials should be organized and brought to the challenge independent and unassembled from each other. It is recommended that teams bring all remaining materials from the kit to the challenge in case they are needed. **Please make sure that the +/- terminals on the DC motor are accessible during the challenge..*

Recommended Tools for Pre-Challenge *(available upon request from committee, if needed - please request ASAP)* **:**

- Mitre Box / Backsaw
- Hot Glue Gun (small and/or large)
- Clamps

Challenge Materials & Expectations:

The majority of assembly (i.e. base structure, blade construction, and attaching DC motor + mount) should be planned to take place during the challenge. Teams are encouraged to create detailed blueprints and design sketches to aid in assembly.

Materials/Tools Accessible During Challenge (supplied by committee)*:*

- Hot Glue Gun + 2 glue sticks (per team)
- Mitre Box and Saw
- Clamps
- Additional 2' wood lengths
- Additional cardboard
- Scissors
- Corrugated Cardboard Cutter
- Ruler/Metre Stick/Tape Measure
- Protractor
- Pencils/markers/paper

Challenge Breakdown:

1) **~2 hour Assembly**: Teams will have roughly 2 hours to construct and assemble their wind turbine based on pre-challenge planning. At this time, teams will be evaluated on their *transferable skills* and *design* criteria. Teams should submit 1 copy of their design sketches/blueprints at this time. Following the assembly, teams will be expected to submit their wind turbine. No more alterations will be allowed after the assembly period. Testing can take place at any time during this period. There is no limit to the number of tests each team wishes to complete.
2) **Performance**: Each group will place their wind turbine on the testing platform (no clamps allowed) for a 2-minute duration with wind generated by a portable fan. Teams can decide on fan distance/angle to increase turbine performance. A voltage metre will be attached to the wind turbine DC motor and monitored for output. Teams will be evaluated additionally on the *transferable skills, design* and *electrical output/rotation speed*.
3) **Questioning & Consolidation:** Following team demonstrations, each group will be asked 1 mandatory question and 3 additional questions. Answers can be prepared ahead of time, but each competitor will be expected to answer (without reading notes).

Criteria	Explanation	Points
Transferable Skills	*Collaboration*: Sharing of ideas and responsibilities.	/5
	Oral Communication: How clear and concise responses to questions were communicated.	/5
	Problem Solving: How well teams make decisions based on problems that arise during assembly.	/5
	Time Management: Effective use of time during assembly.	/5
	Critical and Creative Thinking: Evidence of design and planning (ie. concept sketches and blueprints that are organized and communicated clearly) in connection to their physical designs along with evidence of critical thinking applied in responses to questions.	/10
Design	Overall visual appeal of the completed turbine design	/5
	Efficient and effective use of materials.	/10
	Effective design of the individual blades and consistency of blades	/10

	Durability & Stability (strength and resilience of entire turbine structure)	/20
Electrical Output	The maximum measured electrical energy output power during performance.	/25
	TOTAL	/100

Questions:

Each team will answer a mandatory question and three additional questions that will be chosen at random. Each question must be answered by a different member of the team. Teams can select whom they wish to answer each question.

Mandatory Question: What are the components of a functioning wind turbine and how do these components aid in generating energy?

Additional Questions:

1. Which aspect of this challenge did you, specifically, feel you had the most impact with and why?
2. If you were to revisit this challenge, what would you do differently and why?
3. Why did you choose to participate in this challenge?
4. How do you think schools can encourage students to participate in challenges like this?
5. Do you see yourself in a career relating in any way to this challenge? Explain.

Provincial Event:

The team(s) that garner the most points following the challenge will have an opportunity to represent LDSB at the provincial level. More guidance and further understanding about qualifying for the provincial event will be communicated at a later date.

Should you have any questions regarding the challenge event or this scope, please contact:

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