Event Specifications
Disaster Relief Shelter
MESA Day 2021

LEVEL:	Middle School/High School
NUMBER OF TEAMS:	One (1) team per school can participate at the MESA Day state competition. Up to three (3) teams can participate at MESA regional events. Subject to change.
TEAM MEMBERS:	Two (2) to Four (4) Students per Team
OBJECTIVE:	Use the Engineering Design Process to develop and construct a scale model of a shelter that can be quickly erected after a disaster. Teams will create an engineering poster, product pitch to "sell" their design to potential "investors", and demonstrate the building of their shelter. Students will also be required to submit their Engineering Design Notebooks during specification check for review and scoring.
MATERIALS:	Any materials are allowed, however, pre-built shelters currently for sale are not allowed.

DESIGN PARAMETERS:

1. The structure must be designed to:
    a. Be assembled in five (5) minutes or less
    b. Be packed up for easy transport
    c. Free standing
    d. Have a rainwater harvesting system
    e. Have a ventilation system to take advantage of natural elements to cool the shelter
    f. Minimum size: 1.5 ft. x 1.5 ft. x 1.5 ft.
    g. Maximum size: 3 ft. x 3 ft. x 3 ft.
2. The maximum cost of the shelter cannot exceed $50.00. Cost reflects how much it would cost someone else to build the design, not necessarily what the team actually spent. A detailed budget must be included in the Engineering Design Notebook. Teams that go over budget or have an incomplete budget will be disqualified.
    a. Purchased items or commercially available materials or kits (i.e. legos, k'nex) must have a price listed in the budget. This includes items that were donated but would need to be bought if someone wanted to build the design.
    b. Salvaged items do not need to have a price but must be listed in the budget.

3. Salvaged items are defined as items that were designed as single-use (straws, soda bottles, paper towel tubes) or would otherwise be thrown away (scrap lumber, recycled pvc, salvaged metals). Teams should share information about the common availability of these materials in order to justify their use in the design.
4. The team will create an electronic poster to demonstrate the features of their design
5. The team will either present or record a pitch that is no more than 5 minutes in length to sell their product. Live or recorded pitch will be determined in the Spring.
6. The team will either present or record a demonstration of the erecting of the shelter that is no more than 5 minutes in length. Live or recorded pitch will be determined in the Spring.

TESTING PARAMETERS

1. At least two (2) team members are required to participate in pitch and shelter demonstration.
2. Team will submit their poster for judging
3. Teams will pitch their product to the judges.
4. Teams will demonstrate the building of their shelter
5. Team will submit an Engineering Design Notebook

SPECIFICATION CHECK:

1. Teams must submit electronic copies of their Poster and Engineering Design Notebook prior to the event.
2. Teams may be required to submit a recorded Pitch and Shelter Demonstration prior to the event.
3. After Notebook and Pitch/Demonstrations are complete judges will review design to ensure it meets design parameters. If the design fails this spec check it will assessed a penalty of 90 points.

JUDGING:

1. Team will arrive at least 5 minutes before presentation time, if applicable
2. Judges will allow teams into the virtual presentation room at their scheduled time
3. Judges will tell team to start presenting their pitch
4. The team will then have 5 minutes to present their pitch. Judges will notify the team when 1 minute remains. At the end of 5 minutes, judges will inform the team to stop speaking.
5. The team will then have 5 minutes to demonstrate the building of the shelter. Judges will notify the team when 1 minute remains. At the end of 5 minutes, judges will inform the team to stop speaking. Teams can present a video of the shelter construction in place of a live demonstration.
6. Teams may combine their pitch and shelter demonstration into one 10-minute presentation and should notify judges at the beginning if they plan to do that.

SCORING CRITERIA:

1. Teams will be judged on:
   a. Poster (100 points)
   b. Product Pitch & Demonstration (80 points)
   c. Spec Check Penalty (-90 points)
   d. Engineering Design Notebook
2. The Poster will be judged on:
   a. Description of natural disasters and needs of people who experience them
   b. Description of current solutions and how their design would improve upon them
   c. Description of required elements
      i. Rainwater harvesting
      ii. Ventilation system
      iii. Overall design
   e. Graphic of Shelter with design highlights
   f. Design Decisions - explanation of key decisions made during the design and build stages. Include rationale that lead to those decisions.
   g. Next steps (adding other needed features, ready to move to full-scale prototype, etc.)
3. The Pitch and Demonstration will be judged on:
   a. Organization of Presentation
   b. Opening and Closing Statements
   c. Product Description
   d. Key Features of Design
   e. User Impact
   f. Group Presentation Skills
4. The Performance score will be determined by adding the Poster & Pitch/Demonstration together and subtracting Spec Check penalty (max 180 points)
5. The Final Score will be determined by multiplying the Performance Score by the Notebook Multiplier (N).
6. The Notebook Multiplier will be determined by dividing the notebook score by the maximum points (25 point maximum). If a team does not submit a notebook their notebook multiplier will be .10.
   For example, if a notebook receives 20 points. The notebook multiplier will be .80 (20/25).

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School: _____

Student Names: _____

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Specification Check (circle one):	Pass	Fail
Team has submitted an Engineering Design Notebook?	Yes	No
Design dimensions are between 1.5-3 ft cube	Yes	No
Can be assembled in five (5) minutes or less	Yes	No
Is Free Standing	Yes	No
Has a rainwater harvesting system	Yes	No
Has a ventilation system	Yes	No
Cost of shelter is under $50 or less	Yes	No

If team fails specification check assess a 90 point penalty

Final Score:

Poster (100 points)	+
Pitch & Demonstration (80 points)	–
Spec Check Fail Penalty (90 points)	×
Engineering Design Notebook Score/25 (If no notebook, multiply by .1)	=
Total (180 points)	

Lead Judge Signature: _____

Student Signature: _____

Comments:

Poster:

Category	Scores					
	Exceptional (5 points)	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Explanation of Types of Natural Disasters	5	4	3	2	1	0
Explanation of Needs after a Disaster	5	4	3	2	1	0
Description of Current Solutions	5	4	3	2	1	0
Description of Why Their Solution is Superior	5	4	3	2	1	0
Prototype – Rainwater Harvesting System	5	4	3	2	1	0
Prototype – Ventilation System	5	4	3	2	1	0
Prototype – Overall Design	5	4	3	2	1	0
Graphic of Shelter	5	4	3	2	1	0
Design Decisions with Reasoning	5	4	3	2	1	0
Next Steps	5	4	3	2	1	0
					Subtotal	
					Total (Subtotal x 2)	

Presentation & Shelter Demonstration:

Category	**Scores**					
	Exceptional (5 points)	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Team delivers ideas and information effectively and includes an introduction, body, and conclusion.	5	4	3	2	1	0
The opening statement clearly explains the team's disaster being addressed	5	4	3	2	1	0
Teams explain the impact of their shelter on the user (**x2**)	10	8	6	4	2	0
Team explains how their shelter meets the user's needs in terms of aesthetics, functionality, ease of use, cost, or other needs.	5	4	3	2	1	0
Team explains key features of their design and how those features address the problem.	5	4	3	2	1	0
The closing statement is memorable	5	4	3	2	1	0
Team appears prepared and voices can be heard. All members of the team participate equally.	5	4	3	2	1	0
					Subtotal	
					Total (Subtotal x 2)	

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Rubric for Engineering Design Notebooks (EDN).

EDN Goals	3	2	1	0
1. Explore				
☐ Described Design Objective ☐ Described Success Criteria ☐ Described Constraints ☐ Described Variables and Constants	All	Most	Some	None
☐ Described Prior Knowledge ☐ Described Brainstorming ☐ Described Exploration (testing materials, modelling, etc.)	All	Most	Some	None
☐ Has Research documented with at least 5 sources (website, book, video, article, interviews, etc.) ☐ Research is reliable (i.e. experts, researched websites, etc.)	All	Most	Some	None
2. Design				
☐ Describes materials used ☐ Documents data from previous trials ☐ Documents modifications	All	Most	Some	None
☐ Includes sketch/photo of initial prototype ☐ Includes sketch/photo of final prototype	All	Most	Some	None
3. Test				
☐ Has data in graphical form ☐ Has written description of data ☐ Multiple iterations	All	Most	Some	None
☐ Describes pros and cons of data results ☐ Discusses next steps ☐ Tests are well designed	All	Most	Some	None
4. EDN Organization				
☐ Has Table of Contents or clearly labelled sections ☐ Notebook is organized	All	Most	Some	None
4.2 Labeled. Clearly labeled with School and Team Members names.			Yes	No
Column Totals (for selected categories)				
			Total (out of 25)	

Comments/Suggestions: