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.
TEAM MEMBERS:	Two (2) to Six (6) 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 erect their shelter model, present their design using a poster as a visual aid, and answer judges questions Students will also be required to submit their Video Journal two weeks prior to MESA Day for review and scoring.
MATERIALS:	Any materials are allowed, however, pre-built shelters currently for sale are not allowed

DESIGN PARAMETERS:

1. The shelter model must be:
   a. Assembled in twenty (20) minutes or less
   b. Able to be packed up for easy transport
   c. Be free standing
   d. Have a rainwater harvesting system. Teams should include an estimate for how much water can be harvested with their system.
   e. Have a ventilation system to take advantage of natural elements to cool the shelter.
   f. Minimum size of model: 1.5 ft. x 1.5 ft. x 1.5 ft.
   g. Maximum size of model: 3 ft. x 3 ft. x 3 ft.
2. The maximum cost of the shelter model cannot exceed $50.00. A detailed budget must be included in the specification check. 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.
   b. Salvaged items do not need to have a price but should be listed in the budget. 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).
3. The structure must be labeled with the school name.

TESTING PARAMETERS

1. Two (2) team members are required to be present during testing.
2. Team will have their shelter unassembled.
3. Team will assemble their shelter during the build period
4. Team will describe their shelter, including materials, rainwater harvesting features, ventilation system, and any other special features included by the team. The poster will be used as a visual aid during presentation to enhance and clarify points.
5. Judges will ask questions about shelter and features.

SPECIFICATION CHECK:

1. Teams will submit their Video Journal two (2) weeks before competition for judging.
2. All teams must arrive during the designated specification check time to check-in and receive their build space assignment. Teams not arriving during spec check will be receive a score of zero. See event agenda for exact times.
3. After checkin-in teams will take their poster and materials to the assigned build space. At least one team member should remain in the build space until the build time begins.

JUDGING:

1. All teams will construct their shelters during the designated build time. The build time will occur after spec check and before presentations begin.
2. Judges will tell team to start building and start timer.
3. Teams will have 20 minutes to erect their shelter. Judges will notify team when 1 minute remains. At the end of 20 minutes, the judge will inform the team to stop building.
    a. If the shelter is not completely set-up or is not free-standing the team will be penalized 10 points
4. At the end of the build time, teams should have at least one team member remain with their model to answer questions from spectators and watch over their model.
5. Once build time is complete, teams will present to the judges with their poster. Teams should arrive at least 10 minutes before their selected presentation time. Presentation times will be first come, first serve and time slots will be open two weeks prior to MESA Day.
6. The team will then have 5 minutes to present their shelter. Judges will notify team when 1 minute remains. At the end of 5 minutes, judges will inform the team to stop speaking.

SCORING CRITERIA:

1. Teams will be judged on:
    a. Prototype & Design Process (100 points)
    b. Presentation and Poster (80 points)
    c. Video Journal (score multiplier)
2. The Prototype 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 it
    c. Description of required elements
        i. Rainwater harvesting
        ii. Ventilation system
        iii. Overall design
    d. Discussion of scale model set up and its ease of use.
    e. Design Decisions
    f. Next steps (adding other needed features, ready to move to full-scale prototype, etc.)

3. The Presentation will be judged on:
    a. Organization of Presentation
    b. Eye Contact
    c. Body Language
    d. Ability to be heard
    e. Group Participation

4. The Poster will be judged on:
   a. Problem Statement
   b. Objective
   c. Prototype
   d. Prototype Details
   e. Testing Process
   f. Visual Data
   g. Conclusions
   h. Readability
   i. Title
   j. Size
   k. School Full Name and Logo
   l. Team Members names

5. The Performance score will be determined by adding the Prototype & Design Process score and Presentation and Poster score together (max 180 points)
6. The Video Journal Multiplier will be determined by dividing the video journal score by the maximum points (25 point maximum). If team does not submit a journal their video journal multiplier will be .10.
   For example, if a journal receives 20 points. The video journal multiplier will be .80 (20/25).
7. The Final Score will be determined by multiplying the Performance Score by the Video Journal Multiplier (V).
   For example if the Performance score is 150 points and the Vide Journal Multiplier is .8. The Final Score will be 150 x .8 = 120

School:_____

Student Names:_____

_____

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Specification Check (circle one):	**Pass**	**Fail**
Team arrive during the designated spec check timeframe	Yes	No
Team has submitted a Video Journal?		
Design dimensions are between 1.5-3 ft cube	Yes	No

Final Score:

Prototype & Design Process (100 points)	+
Presentation & Poster (80 points)	+
Shelter Build Incomplete Penalty (-10 points)	*
Video Journal Multiplier (If no journal, multiply by .1)	=
Total (max 180 points)	

Lead Judge Signature:_____

Student Signature:_____

Comments:

Prototype and Design Process:

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						
Explanation of Needs after a Disaster						
Description of Current Solutions						
Description of Why Their Solution is Superior						
Prototype – Rainwater Harvesting System						
Prototype – Ventilation System						
Prototype – Ease of Use, Set-up, Transport						
Prototype – Overall Design						
Design Decisions with Reasoning						
Next Steps						
					Subtotal	
					Total (Subtotal x 2)	

Presentation:

Category	Scores					
	Exceptional (5 points):	Excellent (4 points)	Met Criteria (3 points)	Fair (2 points)	Poor (1 point)	Not Present (0 points)
Presentation is organized and flows						
Students presented relevant information						
Students were clearly heard throughout presentation						
Student's body language was appropriate and not distracting						
Everyone participated equally						
					Subtotal	
					Total (Subtotal x 2)	

MESA Mathematics Engineering Science Achievement

Event Specifications
Design for Disaster Relief
MESA Day 2022

School Name:_____ **MS** **HS**

Poster Rubric	**Exceptional (3 points)**	**Met Criteria (2 points)**	**Poor (1 point)**	**Not Present (0 points)**
Problem Statement: The team adequately identifies the user and defines the problem being addressed in 30 words or fewer.				
Objective: The team provides a bulleted list of the primary objectives and any secondary objectives of the project, including all factors being addressed.				
Prototype: A graphic of the prototype is present and adequately highlights innovations and/or important components of the design.				
Prototype Detail: Main components are labeled, and functionality is clear. Titles and descriptions are included. If needed, a scale is present.				
Testing Process: An adequate description of the testing processes/procedures is included.				
Visual Data: A graph and/or table adequately presents relevant information from the results of testing and increases the observer's understanding of the project.				
Conclusions: The team includes an adequate assessment of how well their project meets the user requirements. The team adequately describes improvements they would make if continuing this project.				
Readability: The poster is easy to read and has a balanced amount of graphics and text.	**Graphics:** About half **Text:** Concise	**Graphics:** Some **Text:** About half	**Graphics:** A few **Text:** More than half.	Mostly text
Title: A title is included.	Creative & Memorable	Sufficiently Explanatory	Simple Summarization	None
Size: No more than 36" x 48" and no less 24" x 36"			Yes	No
School Full Name and Logo included			Yes	No
Team Member's Names included			Yes	No
COLUMN TOTALS:				
			GRAND TOTAL:	

Rubric for Video Journal (VJ).

Category	3	2	1	0
1. Define the Problem				
○ Problem is clearly identified ○ Definition of Problem aligns with problem statement in specifications ○ Definition of Problem matches solution	All	Most	Some	None
2. Initial Design				
○ Picture of sketch of initial design is present ○ Sketch can be clearly seen ○ Sketch is aligned to objective as specified objectives in specifications	All	Most	Some	None
3. Design 2				
○ Changes from Initial Design to Design 2 are visible and/or marked ○ Sketch/Prototype can be clearly seen ○ Design 2 is clearly marked as Design 2	All	Most	Some	None
4. Reasoning for change from Initial Design to Design 2				
○ Reason(s) for change(s) are based on testing ○ Reason(s) for change(s) make logical sense ○ Reason(s) for change(s) keep prototype aligned to Problem Statement	All	Most	Some	None
5. Design 3				
○ Changes from Initial Design to Design 2 are visible and/or marked ○ Sketch/Prototype can be clearly seen **o** Design 3 is clearly marked as Design 3	All	Most	Some	None
6. Reasoning for change from Design 2 to Design 3				
○ Reason(s) for change(s) are based on testing ○ Reason(s) for change(s) make logical sense ○ Reason(s) for change(s) keep prototype aligned to Problems Statement	All	Most	Some	None
7. Final Prototype				
○ Final Prototype addresses the problem statement ○ Final Prototype is clearly visible ○ Final Prototype is clearly marked as Final Prototype	All	Most	Some	None
Audio is clear and does not distract from video			Yes	No
Video Journal is 5 minutes or less			Yes	No
School name is part of journal			Yes	No
Competition name is part of journal			Yes	No
			Total	