

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 Regionals. Subject to change.
TEAM MEMBERS:	Two (2) to six (6) students
OBJECTIVE:	Students will design and present a skyscraper while considering sustainable engineering, existing techniques civil engineers use for sustainable development, and how they can improve a project overall. Teams should use Goal 11 of the UN Sustainability Goals as a resource while creating their design. More info can be found at https://sdgs.un.org/goals/goal11 Students will submit a Design Poster that provides a brief overview of the project.

DESIGN PARAMETERS

1. The Skyscraper must be:
 - a. At least 150 meters(492 feet) in height in real life
 - b. Either a scale model or digital representation (i.e. CAD file, Minecraft build, etc.) This will be referred to as “model” throughout the specifications.
 - c. A minimum of two (2) floors for commercial use (stores, restaurants, etc.)
 - d. Include a detailed floorplan of at least one commercial floor and one residential floor.
 - e. LEED Certified – see LEED Rubric
 - f. Located in either metro Tucson or Phoenix
 - g. Near public services including transportation
 - h. Have parking available (parking lot, garage. etc.) for potential users
2. Teams will prepare a presentation to discuss their skyscraper. The presentation must:
 - a. Include a physical description of the building and it’s various aesthetic and functional design features
 - b. Location - Identify the location of the building and why it was chosen
 - c. Usage - Explain the usage(s) of the building (i.e. luxury residential, low-income residential, retail, office)
 - d. Amenities - Description of the amenities and how they meet the needs of the occupants and surrounding community.
 - e. Public Spaces - Identify the public spaces nearby and how they meet the needs of the occupants and surrounding community. Examples include parks, schools, hospitals, etc.
 - f. Transportation – Identify distance to public and other forms of transportation
 - g. Parking – identify adequate parking spaces for occupants. Team should discuss how the number of parking spaces was determined.
 - h. Disaster Considerations – Discuss design features that protect the building from disasters
 - i. Renewable Energy – Identify and explain building’s energy features
 - j. Local Ecology - Explain how the building integrates into the local ecology and maintains natural habitats.
 - k. Water Usage - Explain how water is conserved in the building (low flow fixtures, gray water, etc) and how much water can be conserved.
3. **High School Only:** Have an analysis of potential lateral forces on building.

TESTING PARAMETERS

1. Two (2) team members are required to be present during testing
2. Team will present their skyscraper and explain the layout of their building, purpose (apartments, offices, combination, etc.), access to public services, and LEED certification.
3. The judges will ask questions about the building and features

JUDGING

1. Team will arrive at testing site ten (10) minutes prior to testing time
2. Team will have, at maximum, seven (7) minutes to present their skyscraper
3. Teams that go the seven minutes will be assessed a penalty.
4. Judges will have, at maximum, three (3) minutes to ask questions about the building and features

SCORING

Teams will be judged on:

1. Presentation Skills (40 points)
2. Building Features (72 points)
3. LEED Certification (50 points)
4. Poster (28 points)

School: _____

Student Names: _____

For Official Use Only

Final Score:

Presentation (40 points)	+
Building Features (72 points)	+
LEED Certification (50 points)	+
Poster	=
Total (max 162 points)	

Lead Judge Signature: _____

Student Signature: _____

Comments:

Presentation:

Category	Exceeded Criteria (3 points)	Met Criteria (2 points)	Poor (1 point)	Not Present (0 points)
Introduction: The team introduced all members and their school			YES	NO
Flow: The ideas/concepts flowed well together				
Organization: The information presented was well organized and easy to follow				
Transitions: All transitions are smooth				
Teamwork: The team worked well together				
Professionalism: The team was professional during the presentation				
Content: The team provides thorough explanations of their design				
Extra Information: All information was related to the building and no extra information was present				
Knowledge: The team's knowledge of the concepts is strong				
Presentation: The presentation has style and creativity				
Model Usage: Models or digital representations were used effectively to highlight important points or features				
Model Integration: Visual aids fit into the presentation and enhanced talking points				
Sound: Voiceover was clear and easily heard				
Team Contribution: Each team member had a chance to speak or participate				
Column Totals				
Time Penalty: Team was over the 7 minute maximum				
SUBTOTAL				
Time Penalty (Subtract 10 pointes if over time)				
TOTAL SCORE (SUBTOTAL – PENALTY)				

Building Features:

Category	Exceeded Criteria (3 points)	Met Criteria (2 points)	Poor (1 point)	Not Present (0 points)
Building: The building is a skyscraper (150 meters or 492 feet). The model is to scale	Yes and matches city skyline	Yes	Possibly but not definitely	No
Location: The building is demonstrated to be in Tucson or Phoenix where a skyscraper is appropriate. The model's location is clearly identified and marked .				
Usage: The team explains the proposed usage of the building. The usage areas are clearly marked on the model				
Amenities: The building has appropriate amenities (shops, gymnasium. etc) that align with usage of building and are clearly marked on the model				
Public Spaces: The building is within 3 miles of public services (Examples include parks, schools, hospitals, etc.). Services compliment building usage. Direction and distance are clearly marked on model.				
Transportation: The building is within walking distance of public transportation	Less than a mile	1-2 miles	More than 2 mile	More than 5 miles
Parking: Adequate parking is present for the capacity of the building within 1 square mile of the building and is clearly displayed or marked on model. Students share how they determined adequate parking.				
Disaster Consideration: The team describes how they designed the building for potential disasters (flooding, earthquake, etc.)				
Renewable Energy: The team discusses the renewable energy features (solar panels, windmills, etc) Renewable energy features are clearly marked on model.				
Local Ecology The team explains how the building integrates into the local ecology to maintain natural habitats. Ecology features are clearly marked on model				
Water Usage The team explains how water is conserved in the building (low flow fixtures, gray water, etc) Water conservation elements are clearly marked on model (x2)				
Column Totals:				
SUBTOTAL:				
SUBTOTAL x2:				
FINAL SCORE				



LEED v4 MESA for New Construction

▢ **Project Checklist**

Key:

2 = Definitely present

1 = Is partially present

0 = Not present

2	1	0	Location and Transportation		0
			LEED for Neighborhood Development Location	Location reduces vehicle usage, enhances livability of area, and improves human health by encouraging daily physical activity	
			Sensitive Land Protection	Replaces an older less environmentally friendly building OR does not harm the environment (i.e. floodplain, critical habitats, prime farmland, bodies of water, etc)	
			Surrounding Density and Diverse Uses	Integrates various building usages to expand and support neighborhood and local economies, promote walkability and low or no carbon transportation	
			Access to Quality Transit	Access to public transit (bus, streetcar, etc) is within ¼ mile of the building. The access point needs to be a high traffic point	
			Bicycle Facilities	The building must have bicycle parking within 200 yards of the building for, at minimum, 5% of building users	
			Reduced Parking Footprint	The new construction does NOT have parking in front of building. Parking is ground level or below (if under building). Spaces for carpooling/shared use are in best parking locations	
			Green Vehicles	5% of parking spaces are for green vehicles (electric, hybrid, etc) with charging stations	
2	1	0	Sustainable Sites		0
			Site Assessment	Design considered topography (the shape of the land), climate (solar access, temperatures, etc), and human use (views, access to transportation, neighborhood) to plan design.	
			Site Development - Protect or Restore Habitat	The building protects habitats of plants and animals within the building space OR works to restore habitats that are in danger of extinction	
			Open Space	The building's design creates exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities.	
			Rainwater Management	The building uses rainwater harvesting for watering plants and has a holding tank for excess to be used in times of little rain	

2	1	0	Water Efficiency		0
			Outdoor Water Use Reduction	Use native/low water plants, rainwater harvesting, and other measures to reduce water usage	
			Indoor Water Use Reduction	Use low flow fixtures, gray water, and other measures to reduce water usage	
			Building-Level Water Metering	These plans need to be in place. The sections below expand on these	
			Outdoor Water Use Reduction	The building does NOT need outside irrigation for the plants	
			Indoor Water Use Reduction	The building has plans to limit water flow and reuse water (if applicable)	
2	1	0	Energy and Atmosphere		0
			Optimize Energy Performance	The building has systems in place (solar panels, windmill, etc) to harvest and store energy for the building's use.	
			Renewable Energy Production	The building has a high percent of its energy from natural resources	
			Green Power and Carbon Offsets	At least 50% of the power used by the building is from natural resources or carbon offsets (demonstrating the drop in carbon energy by 1 metric ton)	
2	1	0	Indoor Environmental Quality		0
			Environmental Tobacco Smoke Control	Controls to prevent any smoke from tobacco users enters the building are in place	
			Enhanced Indoor Air Quality Strategies	Main entry point is, at minimum, 10 feet long to control dust entering the building, natural ventilation is used as often as possible, and rooms where hazardous gases (car exhaust, printing, etc) are present are naturally ventilated.	
			Thermal Comfort	Users of the building have access to thermal controls (i.e. thermostat) to control energy efficient HVAC systems	
			Interior Lighting	The lights are designed for at least 90% of users to have access to controls. The lights are also energy efficient and simulate natural lighting	
			Daylight	Natural lighting is used to light spaces and reduce the need for artificial lighting in at least 25% of the building.	
			Quality Views	Users of the building have multiple views of nature with a 90 degree angle of view	
			Totals		0

LEED	Certified (10 -19 points)	Silver (20-29 points)	Gold (30-39 points)	Platinum (40-50 Points)
Score				

Rubric for Design Poster

Category	Excellent (3 points)	Met Criteria (2 points)	Poor (1 point)	Not Present (0 points)
Project Overview – team summarizes the project and explains the buildings purpose, who it serves, and how it is a good example of a sustainable skyscraper.				
Building Location – Team gives the full address of the building, and why location was chosen.				
Amenities of Building – Team describes the amenities inside the building. These can include, but aren't limited to, solar power, stores, and nature. It is a bulleted list				
Floor Plans – Team has drawings of at least two floors with details about layout and usage.				
Community Amenities – Team identifies the amenities (schools, parks, transportation, etc) near the building				
Building Details – Team has a bulleted list of why their building is attractive to users				
Map of Neighborhood – Team has a map that is at least 2 mi ²				
Building Name			Yes	No
School & Team Member Names			Yes	No
School Logo			Yes	No
MESA Logo			Yes	No
Column Totals				
Total Score:				