



Company Information

Company Name	<i>Monroe Science Center</i>	Date Submitted	<i>06/16/2023</i>
Project Title	<i>Design and Build of an Earthquake Simulator Table (MSC_SHAKE)</i>	Planned Starting Semester	<i>Spring 2024</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer	1	Systems	

Company and Project Overview:

Monroe Science Center opened in January of 2023. Located in Downtown Monroe and operated by the City of Monroe, we are an educational science center focusing on STEAM. Our exhibits cover a wide range of topics such as aerodynamics, engineering, agriculture and technology. We desire a project that is safe and interactive for our guests age one through adulthood. By the end of 2024 we hope to serve 20,000 visitors.

More information can be found at www.monroesciencecenter.com



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Currently, we have an area of the science center with a hurricane simulator, topographical sand table and a graphic of the earth's atmosphere. We think the earthquake simulator will be a great exhibit to enhance the education on weather and planet earth. An exhibit like this can cover a wide range of ages by offering a place for younger children to simply build and for older children and adults to learn more about engineering and test their structures with the earthquake simulation apparatus.

This project is financially supported by the Bosch Community Fund. The Bosch Community Fund, the corporate foundation for Bosch in North America was established in 2011 to provide community engagement and philanthropic support on behalf of our company. The Fund focuses on the enrichment of science, technology, engineering and math (STEM) education and advancing environmental sustainability initiatives. We partner with 501(c)(3) organizations and educational institutions across the country to provide quality project-based learning hands-on learning opportunities for students and professional development for teachers.

Project Requirements:

The project will expand on our current exhibit space of extreme weather education. With this



earthquake simulation table, guests will be able to build custom structures with wooden blocks and test them against different levels of earthquakes. This exhibit will include a design and engineering element as well as the education of a natural disaster.

The idea for the exhibit will be a standalone unit/table with the simulator attached on top. Guests will be able to choose the level of intensity of the earthquake. Using a simulated Richter scale, the table should be able to have a selectable earthquake simulation of 1-10.

The exhibit must be functional and safe to operate for all visitors and be ADA accessible. The exhibit must fit within a 5'x5' space.

Monroe Science Center staff will work with the UNCC students to give design feedback to design a successful exhibit.

Expected Deliverables/Results:

- A 3x3' table with ADA height requirements. A guests in a wheelchair should have adequate knee clearance.
- Unit must be able to withstand five years of usage from guests of the science center.
- Unit to be safe to operate with children and not pose any physical reach. No pinch points/sharp edges or exposed areas that hair, scarfs, etc can get caught in.
- Unit interface to floor to be developed based on science center direction. (mounted to floor after final completion)
- Size to be determined by discussions with museum but expected to fit within a 5'x5' space.
- The exhibit must have multiple levels of "shake" to correlate with levels of the Richter scale.
- Motion should be in the X and Y direction.
- If design and function allows, electrical cord can be plugged in at ceiling access.
- Educational guide to further educate on history of earthquakes, what causes them, what to do if caught in one. Monroe Science Center has connections with local American Red Cross for safety information.
- Exhibit must be equipped with blocks for guests to build with that can be knocked down with force. A version of *Citi Blocks* or *something similar* would be ideal where *Legos* would not because they wouldn't knock over. Blocks should have variations that can withstand greater levels of earthquake simulation. (i.e. if every block structure fell over on setting 1, that would not be desired)
- The exhibit should incorporate accessible storage for the blocks.
- There are various mitigation strategies used in building construction in earthquake zones. Team should provide scale versions of those concepts, that when added, make the block structure survivable.
- Text for instructions for using the exhibit and for science interpreting/explaining the exhibit should also be provided by students. If budget allows, team of students should



consider a video display of real life earthquake simulation/real life earthquake footage.

- If possible, working prototypes can be tested by visitors and staff of the science center.
- The exhibit should include signage or labelling crediting the financial sponsorship by the Bosch Community Fund, and the UNC Charlotte logo recognizing the student work.

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Travel to Monroe Science Center will be required at the beginning of the first semester to understand the centers approach to exhibits. Travel will also be required to deliver and install the exhibit and possibly for test and verification. Travel will be in compliance with CDC and University guidelines.
- Interest in completing all aspects of a STEM exhibit to deliver a functional exhibit that can be immediately installed and withstand usage for up to five years.