



UNC Charlotte – Lee College of Engineering Senior Design Program Company Information

Company Name	<i>Lowe's Companies</i>	Date Submitted	<i>06/10/2021</i>
Project Title	<i>Design and Build of a Test Certification Station (LOWES_STATION2)</i>	Planned Starting Semester	Fall 2021

Senior Design Project Description

Company Name	<i>Lowe's Companies</i>	Date Submitted	<i>06/10/2021</i>
Project Title	<i>Design and Build of a Test Certification Station (LOWES_STATION2)</i>	Planned Starting Semester	Fall 2021

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	2	Electrical	2
Computer	1	Systems	
Other ()			

Company and Project Overview:

Lowe's Companies, Inc. (NYSE: LOW) is a FORTUNE® 50 home improvement company serving approximately 20 million customers a week in the United States and Canada. With fiscal year 2020 sales of nearly \$90 billion, Lowe's and its related businesses operate or service more than 2,200 home improvement and hardware stores and employ over 300,000 associates. Based in Mooresville, N.C. Lowe's supports the communities it serves through programs focused on creating safe, affordable housing and helping to develop the next generation of skilled trade experts. For more information, visit Lowe.com.

This project is being requested by the Quality Assurance department of Lowe's. QA is responsible for several things including product compliance, performance, and safety, ethical sourcing,



reducing product return rates, and customer satisfaction.

This project will have as an objective to do design work on two previous Lowes projects (LOWES_TEST and LOWES_STATION) and complete the old and new design elements.

(Part 1) This team will finish designing and building a universal test apparatus for cycle testing various Lowes products as well as evaluating furniture durability per UL.

(Part 2) This team will finish designing and building a burst pressure test apparatus that is used for testing various hoses and fittings that Lowe's sells. This tester will be controllable and can build up to 3000psi.

Project Requirements:

As part of product design, testing and evaluation, Lowes Engineering and Quality Assurance labs need to test a variety of products that are sold in Lowes stores. This is especially important when it comes to Lowe's Private Brands patio furniture, and fittings/hoses.

(Part 1) During this project, the team will finish designing and constructing a PLC based cycle test apparatus capable of testing a swivel patio chair to BIFMA (Business + Institutional Furniture Manufacturers Association) standards for backrest durability. It will need to record force applied to the chair as well as chair displacement per cycle. A system that can perform seating durability to BIFMA standard while also recording seat displacement and adjusting the drop height as needed.

In addition to testing patio chairs it should also be reconfigurable so that it can be used as a large-scale cycle tester. This large-scale cycle tester should be equipped with controllable 20A receptacles, a minimum of 4 independent controllable pneumatic solenoid valves and can log number of cycles complete, hold check points, time in between cycles, and estimated test completion time. This is especially useful when testing: mower handles, operating snow throwers, opening/closing cabinets, etc.

(Part 2) During this project the team will be responsible for finishing the design and construction of a pressure burst system using water pressure. Specific dimensions will be based on discussions with Lowes. The test chamber must safely contain the water under all test conditions and not subject an operator to any potential burst sprays. The max pressure for testing will be 3000 psi. The pressure input must be variable between 200 and 3000 psi. Flow rate capacities to be defined in discussions with Lowes. When the test is in progress, the pressure level should be displayed. There should be an easy to use control/display panel to initiate operation, start water flow, control pressure levels, hold pressure at defined time limits, capture max pressure at failure, show current status, record results and end test and drain the testing chamber. The unit under test must always be clearly visible and well-lit during the test but contained so that any burst will not injure the operators. Unit must be watertight and be easy to fill and drain without loss of control of water in test area. Fittings to accommodate the variety of products under test.

Expected Deliverables/Results (Part 1):

- A cycle testing apparatus that is capable of backrest durability and seating durability
- A system that can record force applied and total displacement while performing backrest durability
- A system that can determine seating level displacement during the seating durability test and respond accordingly.
- A universal cycle tester that is capable of cycle testing various items using power, and pneumatic.
- Instruction manuals for use of the apparatus
- Troubleshooting/repair guide
- Complete parts list

Expected Deliverables/Results (Part 2):

- A burst pressure testing apparatus per the requirements defined above
- Verification Testing using provided product samples
- Operations manual with text and photos that train an operator how to use the test apparatus
- Maintenance instructions
- Bill of material defining sourcing instructions for all parts

Disposition of Deliverables at the End of the Project:

Equipment built as part of this project will be demonstrated at Expo, then returned to Lowe's at the conclusion.

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

- Interest in PLC's, controls, Relays, Circuitry, Feedback, displays, sensors and data logging.