Company Information

Company Name	3M Scott Fire & Safety (3M Personal Safety Division)	Date Submitted	4/22/2022
Project Title	Design of Go/No-Go Verification Test Systems (3M_VERIFY)	Planned Starting Semester	Fall 2022

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		Systems	2

Company and Project Overview:

3M|Scott Fire and Safety is a premier manufacturer of innovative respiratory and personal protective equipment and safety devices for firefighters, industrial workers, police squads, militaries, homeland security forces and rescue teams around the world. The self-contained breathing apparatus is a system that provides air to the user in a situation where breathing will be difficult (i.e., a fire)

3M|Scott products protect thousands of individuals each day from environmental hazards including smoke, toxic fumes, combustible gasses, falling objects and contaminants. The 3M|Scott's product line includes self-contained breathing apparatus' (SCBA), supplied air and air-

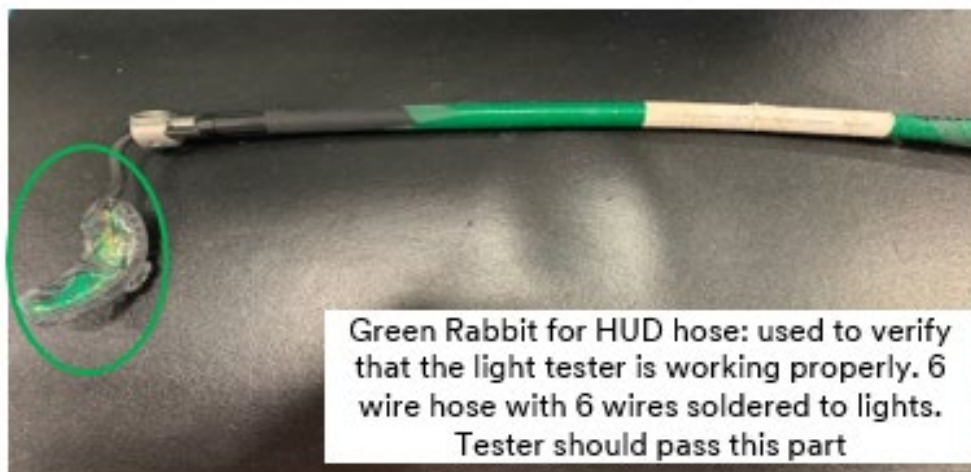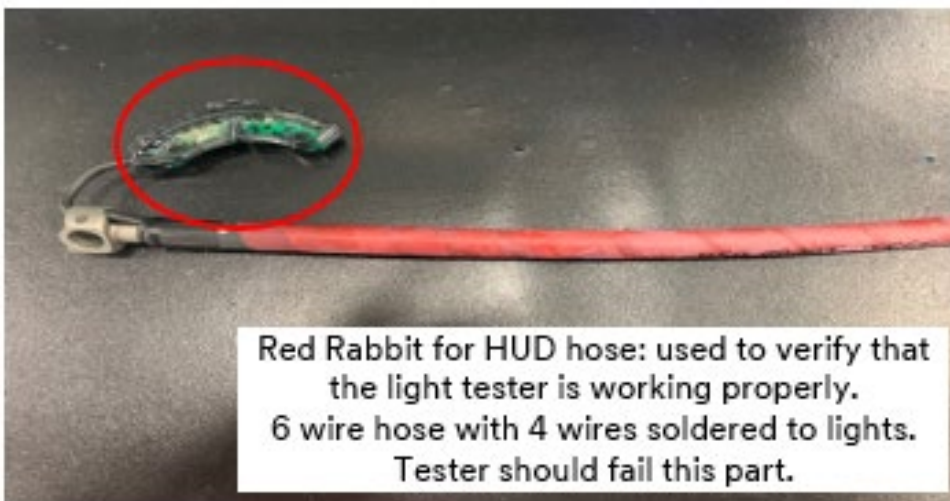purifying respirators, thermal imaging cameras and firefighter communication and accountability devices.

Headquartered in Monroe, North Carolina with corporate offices in St. Paul, Minnesota, 3M|Scott Fire and Safety generates >$500M in revenue and employs about 500 people in Monroe.

3M™ Scott™ Air-Pak™ X3 Pro SCBA with 3M™ Scott™ E-Z Flo C5 Regulator - Front

This project will involve working with "Rabbits" which is a term used in testing.

- "Red Rabbit" is a term used in manufacturing for a part with a known defect that is introduced into the system to verify that the process can detect the defect effectively
- "Green Rabbit" is a term for a part that has no defects that can verify a system is operating correctly
- The parts are colored red and green, respectively, to differentiate and ensure proper use within the system
- The parts can be used before testing begins to verify the system is operating properly, or randomly during the process if a suspected issue arises

Red Rabbit for HUD hose: used to verify that the light tester is working properly.
6 wire hose with 4 wires soldered to lights.
Tester should fail this part.

Green Rabbit for HUD hose: used to verify that the light tester is working properly. 6 wire hose with 6 wires soldered to lights.
Tester should pass this part

Project Requirements:

The UNC Charlotte team is requested to develop red and green rabbits for the 3M Scott Fire & Safety test systems. These Go (green)/ No-Go (red) reference parts will assist in the verification of 86 testers for the various assemblies throughout the facility. Tests include:

- Leak
- Pressure
- Electrical (lights, sounds, electrical connections)
- Setup Stands
- Performance

The green parts will be within the testing parameters, and the red parts will be slightly outside the parameters to determine the validity of the testers. The rabbits will be used daily in conjunction with production operations.

Expected Deliverables/Results:

- Work with the lead, calibration lead, and engineers to verify the test systems and priority level
- Work with lead and engineers to verify which systems are pass/fail or produce quantifiable outputs
- Observe and try each testing system to understand the test and outputs
- Develop a green (Go) and red (No-Go) rabbit for each system
- Each rabbit must conform to test and product specifications
- Develop a verification procedure to ensure the quality of each tester using the Go/ No-Go gaging
    - o Start of shift, after breaks, at end of shift, etc.
    - o Develop run charts (to detect any drift in testing) on each rabbit to determine if a new rabbit or test system upgrade is needed
- Rabbits must be easy and efficient for Team Leads and Operators to use with little disruption to production operations
- Build each rabbit based by priority level
- Test and verify each rabbit once built
- Work with Lead and Quality Engineers to run capability studies for the repeatability of the rabbits
- Benefits of the deliverables include:
    - If the product does not meet specifications, the safety of the end user is affected, so the rabbit testing is critical.
    - Testers with rabbit validation allow production to quickly determine if failed assemblies are caused by defective components or by a tester that is not functioning properly
    - Rabbits can be run by an operator to easily determine where the problem is, allowing them to escalate a solution quickly and accurately
    - Incorporating run charts with the rabbits also allows production to determine if the tester has "drifted" on its test capability
    - A rabbit program for testers saves time, money, scrap, and reduced confusion on the production floor

INDUSTRIAL SOLUTIONS LABORATORY

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):

- For SEGR students, pre or co-requisite of SEGR 4141and SEGR 4170
- Team must travel to the 3M Scott site in Monroe, NC as required to understand the testing process and requirement and do validation testing. Mileage will be reimbursed according to ISL policy.