



**Company Information**

<b>Company Name</b>	<i>BASF Corporation</i>	<b>Date Submitted</b>	<i>11/15/2022</i>
<b>Project Title</b>	<i>Design and Construction of a Lab Tool to Build an Asphalt Shingle (BASF_SHINGLE)</i>	<b>Planned Starting Semester</b>	<i>Spring 2023</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.

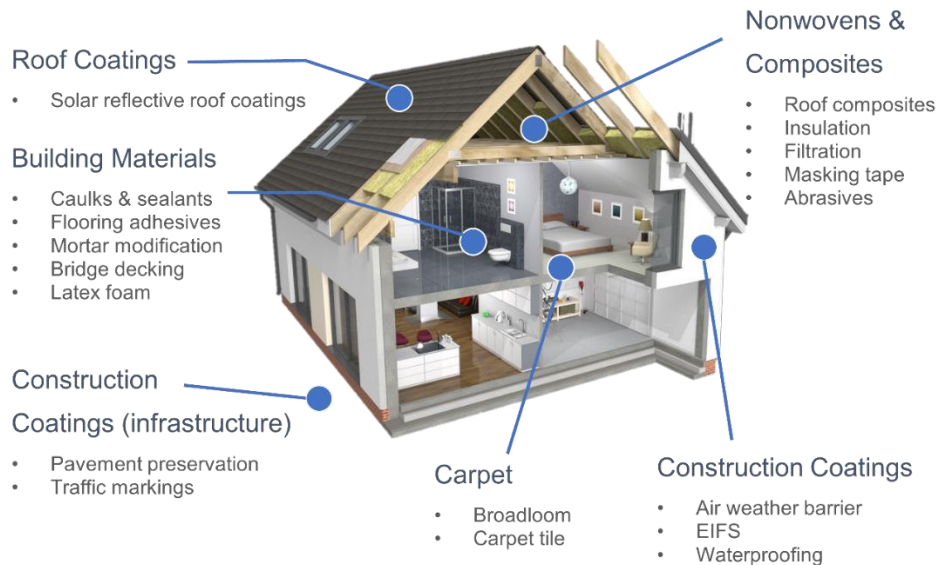
<b>Discipline</b>	<b>Number</b>	<b>Discipline</b>	<b>Number</b>
Mechanical	4	Electrical	2
Computer	1	Systems	

**Company and Project Overview:**

BASF is one of largest chemical companies in the world. Our aspiration is to be the world's leading chemical company for our customers, while creating innovative chemistry for a sustainable future. The North American Dispersions business is based in Charlotte, NC and supports a variety of industries including Construction, Adhesives, Architectural Coatings, and Infrastructure. The figure below depicts some of the places in your home and some of the brands which employ BASF's dispersion products to improve daily life.



# INDUSTRIAL SOLUTIONS LABORATORY



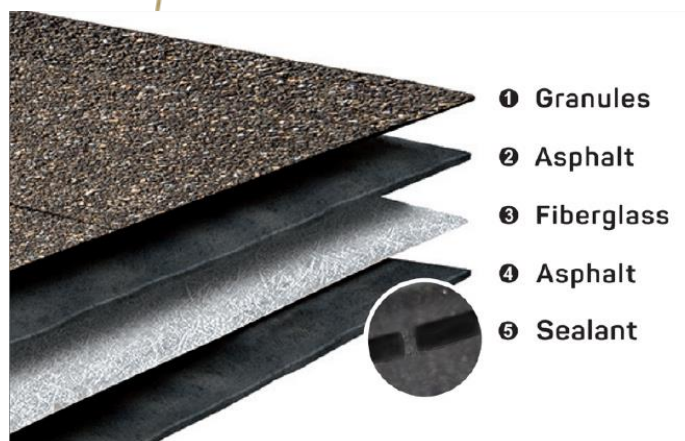
We are constantly striving to develop new products, which bring additional value or improved efficiency for our customers. Roofing is one of these markets.

Have you ever thought about what goes into a shingle? How about why commercial buildings don't typically use shingles? These products that protect the investments we live and work in are impressively complicated to manufacture and maintain. A shingle, for example, consists of multiple layers including asphalt, bitumen (rock), and nonwoven fiberglass mat.





## INDUSTRIAL SOLUTIONS LABORATORY



These materials are produced in large factories with continuous roll lines including applications of “whitewater” in the nonwoven mat production, molten liquid asphalt, and bitumen granules. Amazingly, these products can be warranted for 25 years or more!

The aim of this project is to devise a method to manufacture a shingle at the laboratory scale.

### Project Requirements:

Developing a product requires multiple steps at increasing scale. At BASF, we routinely develop polymers from small lab vessels, to small pilot reactors, and then ultimately to large reactors of 20,000gal or more. The interesting aspect to developing products for the construction industry, is that we often need to understand and screen our polymers in our customers’ formulations. In this case, the customer formulation is a shingle! We have a strong understanding of the nonwoven manufacturing process and have developed methods and procedures to create nonwoven mats in the lab with which we can perform testing and evaluate new and improved products.

The aim of this project, is to utilize these nonwoven mats and build a bench scale, shingle creation tool and process. The tools will be used to further develop high performing shingle systems through modification of both the asphalt and nonwoven components.

### Project Objectives:

- Design a process and equipment which can efficiently and reproducibly construct a shingle in the laboratory using asphalt and nonwoven fiberglass mats.
- The equipment requirements:
  - o A machine which fits on a benchtop
  - o A tool which can construct a 12”x12” shingle
  - o A tool which can create at least 1 shingle per hour.



- A tool which includes safety interlocks relevant to the use of hot asphalt
  - A tool which includes automation where appropriate to reduce process variability and simplify the execution of the process. (thermal controllers, pumps, etc.)
- The process requirements:
- Documented in a clear written procedure, including a safety analysis
  - Process reproducibility measured

### **Expected Deliverables/Results:**

- Deliverables:
  - Assembled equipment with all controllers to construct a shingle at laboratory scale.
    - Unit will be delivered and installed at BASF Charlotte Campus.
    - Full design of tool documented for future use including components and specifications utilized.
  - Documented method to operate the tool
    - Procedure
    - Safety analysis
    - Reproducibility evaluation

### **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 BASF's Charlotte facility required
- Skills expected to be helpful:
  - Curiosity
  - Knowledge of thermal management
  - Circuit design for heating vessels safely
  - Interest in machine design