



**Company Information**

<b>Company Name</b>	<i>Gerdau</i>	<b>Date Submitted</b>	<i>11/6/2023</i>
<b>Project Title</b>	<i>Design and Fabrication of Alloy Chute Dispenser for Charlotte Steel Mill (GERDAU_CHUTE)</i>	<b>Planned Starting Semester</b>	<i>Spring 2024</i>

**Senior Design Project Description**

**Personnel**

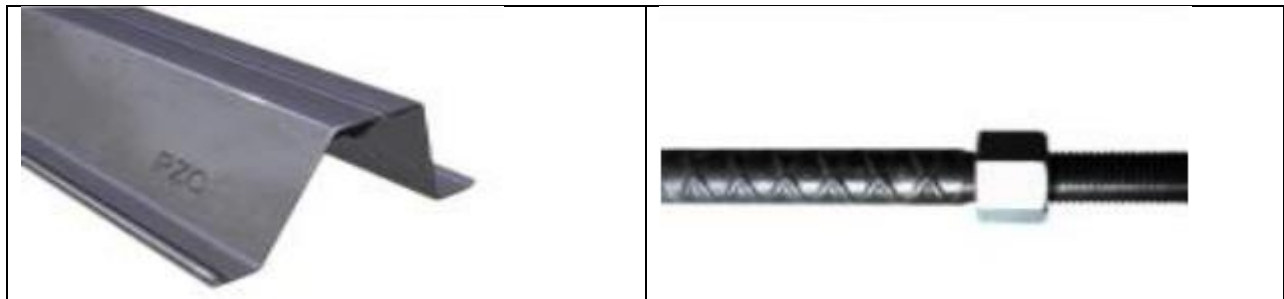
Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

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

<b>Discipline</b>	<b>Number</b>	<b>Discipline</b>	<b>Number</b>
Mechanical	3	Electrical	1
Computer	1	Systems	

**Company and Project Overview:**

Gerdau is a leading producer of long steel in the Americas, and one of the world's largest suppliers of special steel. We operate in 10 countries and employ more than 30,000 individuals. We are also one of the world's largest recyclers. Each year, Gerdau transforms more than 11 million tons of scrap into new steel products, reinforcing our commitment to the sustainable development of the regions where we operate. Some products Gerdau makes:





## INDUSTRIAL SOLUTIONS LABORATORY



Our Charlotte Mill is located 7 miles (15 minutes) from the UNC Charlotte campus, and the students working on this project can come to the site as needed for the project.

During our manufacturing process, scrap metal is melted down and impurities removed. Chemical testing then is done to determine the composition of the batch. Additives such as manganese, silicon and carbon are input into the batch to reach the desired composition for the batch. Carbon is added in large quantities, typically by adding 2-4, fifty pound bags into the molten steel filled ladles. Currently, this is done manually by hand on an alloy chute. The operators lift the 50 lb. bags into the chute entrance and push them down the slide which sends the bag into the ladle. When this happens, a reaction occurs which produces fire. The picture on the lower left shows the chute and the picture on the lower right shows the reaction after the bag enters the ladle.



Alloy chute where operators add and push material into the ladle.



Furnace tapping into ladle with alloys being added through the chute.



This project will aim to make this action safer by allowing the operators to get further away from the hazard through a semi-automated solution.

### **Project Requirements:**

The primary focus of the project is making the task of adding carbon and other materials safer. The exact design method will be left up to the student team, allowing for open ideas and creative thinking with technical support from the Gerdau team. The solution must provide a remote-controlled way to dispense bags into the ladle on command by the operators. The bags can still be loaded manually, but it is desired that the bag release to be accomplished by remote actuation so the operators distance from the ladle is increased so they are not exposed to the heat of the reaction.

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

- Design and build a system that can hold and dispense bagged material at the operator's discretion (Button, PLC automation, etc.)
- Increase the distance from operator to the process. (Eliminate potential hazard contact time)
- Develop a working prototype and test the system onsite to gather feedback and incorporate into design.
- Provide a 3D model and engineering drawings of the system for documentation purposes.

### **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):**

- Mechanical design and construction.
- Electrical design and construction.
- 3D Modelling and Engineering Drawings.
- Great people skills and ability to incorporate feedback.
- Ability to travel to company's Charlotte location, note this is a heavy industry environment.