



Company Information

Company Name	<i>Robert Bosch Tool Corp</i>	Date Submitted	<i>11/15/2024</i>
Project Title	<i>Design and Build of a new Loading/unloading Fixture for Concrete Test Blocks (BOSCH_BLOCK)</i>	Planned Starting Semester	<i>Spring 2025</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	5	Electrical	1
Computer		Systems	

Company and Project Overview:

Robert Bosch Tool Corp is part of the Bosch Group, and in the Lincolnton-Shelby-Maiden area we produce accessory Diablo-Freud-Bosch brands as part of the Power Tool division.

We are temporarily located in Shelby NC, with the plan of relocating the manufacturing lines to the new building in Lincolnton that will be ready mid 2025. This project will be associated with the Bosch masonry hammer drill bit testing operation. See examples of Bosch masonry hammer drill bits below:

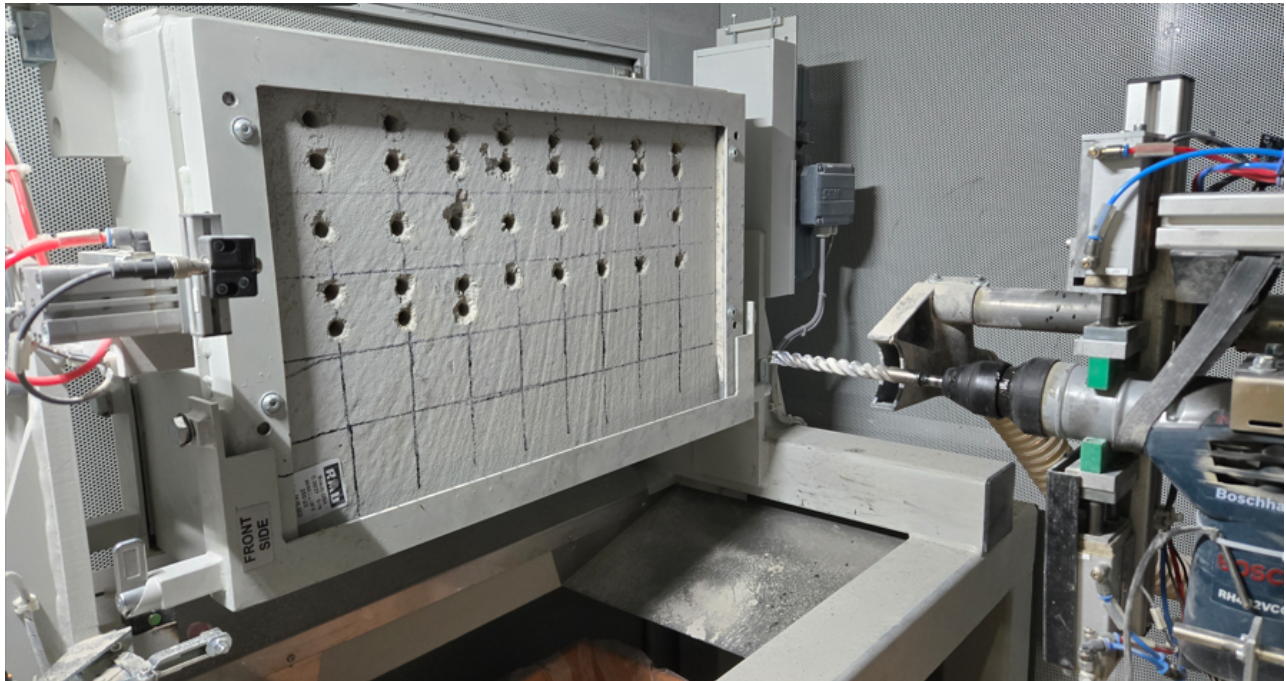


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LABORATORY**

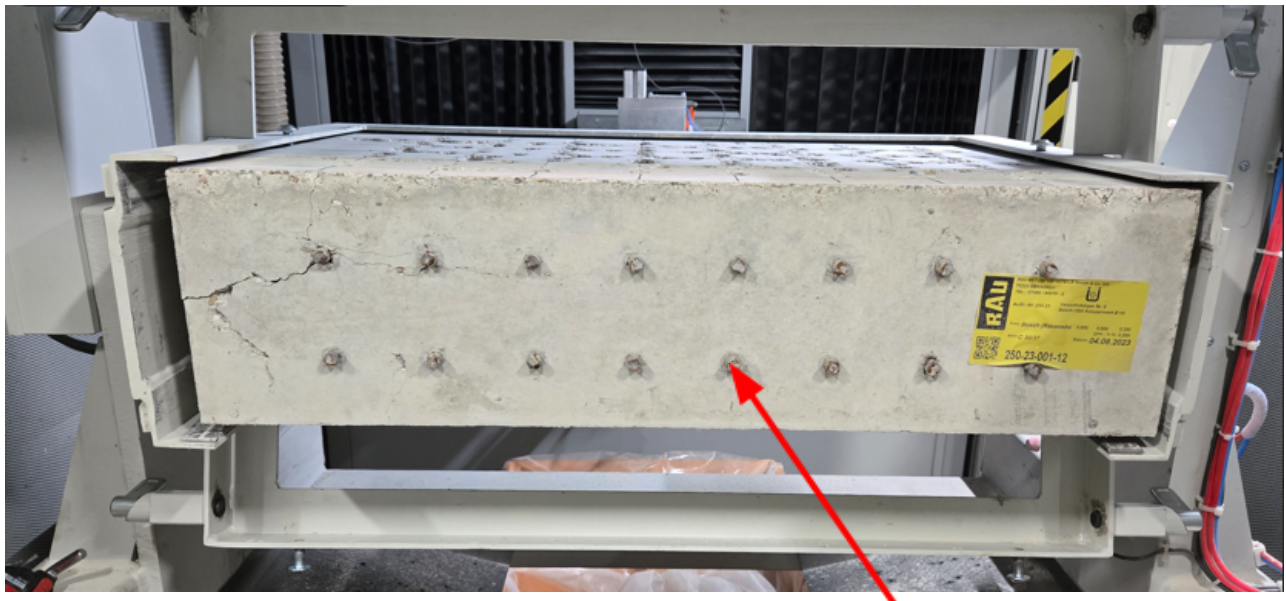


Project Requirements:

As part of the production operation, the drill bits are tested to verify design specifications are met. The testing is done on actual concrete blocks to ensure validity of the testing. To perform the testing, a 400 lb block of concrete (with rebar inside) is loaded into the test fixture. A new bit is inserted into the machine and multiple holes are drilled to test the bit performance under actual usage conditions. To maximize the demanding conditions of the test and ensure the highest quality of bits, the holes are drilled in the locations where there is rebar. See picture of this test below:



To start the test process, the concrete blocks (with rebar) are loaded into the fixture when it is in a horizontal position using a manual hydraulic lift (similar to the forks on a forklift):



Note the position of the rebar in the concrete block.

Currently the concrete blocks are loaded from the front and there is

Rebar

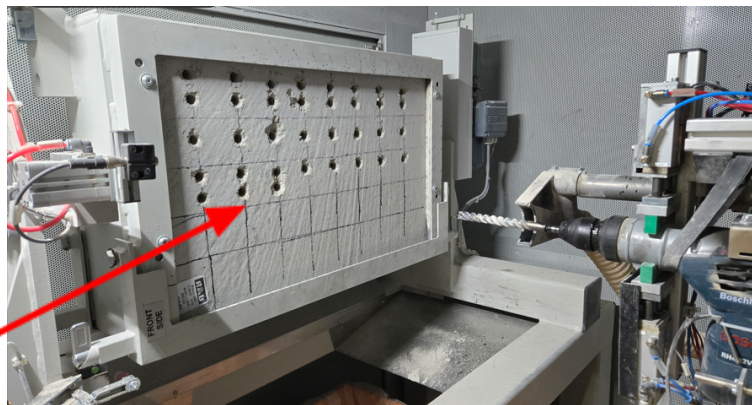
minimal clearance

in the angle iron that makes this difficult. That and an uneven floor causes issues during loading and unloading process as the space between the concrete block and the fixture within the machine is limited.

Once loaded into the fixture, Two hinged doors (one swings up / the other down) are used to secure the block once installed:



The block within the machine can be rotated from the horizontal loading position into the vertical positions to run the test. The block is rotated so that both the front side and rear side can be drilled. Once the block is loaded and rotated into the vertical position, the rebar positions can no longer be seen. Since it is critical to the test that drill holes are made into the rebar, lines are drawn on the block before it is loaded in:



Lines marking rebar locations

With the current process, the block can only be inserted or removed with a specific side up. This hinders the ability to mark lines on both sides and



once the block is inserted there is no access to see the rebar ends. We would like a redesign of the current fixture to enable the loading and unloading from the top. Furthermore, the new fixture should be opened from the top and the bottom, to give us the possibility to flip the concrete block.

Some concrete blocks contain rebar, their position needs to be marked in order to drill through it. The concrete block needs to be flipped otherwise the rebars can't be marked.

The software needs to be adapted as well, this will be done by the supplier. The objectives of the new design is to do the following:

1. A better / easier way to load / unload the blocks in the machine (revised block mounting fixture-top loading preferred).
2. A way to insert the block, rotate 180 degrees, and access to the other side of the block with the rebar ends visible.
3. Improve on the current rebar marking tool.

Expected Deliverables/Results:

- o Redesign of the fixture that holds the concrete block.
- o Loading and unloading from the top
- o Rotation of block by 180 degrees
- o Marking of rebar positions while the concrete block is inside of the machine
- o Improve current solution (bolts) that hold the concrete block in place
- o Improve the spring-loaded holder
- o Build a replacement fixture to the new design and perform validation testing at the Bosch Shelby location.
- o Develop video instructions for the operation of the test using the new fixture design.

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 background to design the fixture and build it.
- Electrical background, the machine might need additional sensors and/or rewiring to integrate the function of rotating the concrete block.
- Ability to travel to the Bosch locations in Shelby and Lincolnton, NC as needed.