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LTB Engineering in Georgetown, South Carolina

The rumors of my demise retirement have been greatly exaggerated, apologies to Clemens.

Upon our move to Georgetown mid-year 2019 we looked to invest in a technology center, consisting of new office and laboratory, located on our property. It was one of the criteria for the new property to have enough land to support an onsite tech center.

Design started in July of 2019, based on a 30 x 40 x 12 foot steel structure on a concrete slab. After getting bids collected, the project was let in February of 2020 to Andrews Fabricators of Kingstree, SC, erecting a structure of Nucor Steel design and materials, just in time for the bat-flu-demic. The facility finally went online in June of 2021, and is now the headquarters for LTB.

From the outside, it looks like many a steel building that you see around here. The inside is a little different... Not your run-of-the-mill steel building!

We will take you on a quick tour through the facility. The following slides follow a typical (hah!) project through the tech center to show off some of our capabilities.

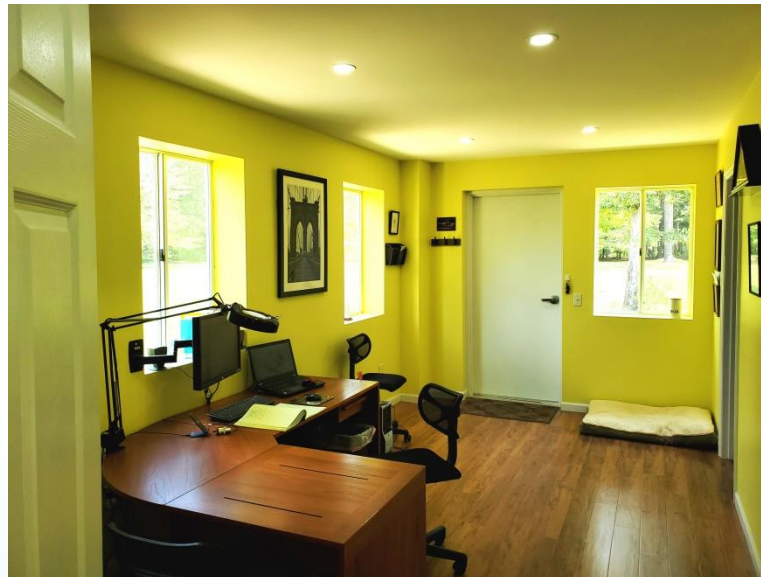


Ideation, analysis and design:

This is where it starts. The engineering office supports the design, analytic and inventive part of LTB. It is designed, finished and furnished to be conducive to imagination, invention and optimism. It is warm, wood, and populated with engineering chachkies as a reminder of the shoulders we stand on. Note dog bed in corner for Justice the Lab Dog.

The office has three windows that provide a view of the Black River for inspiration. The office is immediately adjacent the lab for quick, seamless iterations between functions. The primary design and analytic tool set is provided by SolidWorks Premium. Our typical approach reduces the challenge to applied physics, to ideation and hand sketch, to solid model to prototype to test to product design.

LTB is now a registered South Carolina Corporation (PC), and Greg is now licensed to practice in SC, in addition to NY. Practice makes perfect.



Fabrication and prototype:

Next: the machine bench is where chips are made, and prototypes and projects fabricated. It measures 25 feet x 28 inches x 40 inches in length, depth and height, respectively. Raw materials are provided at left with enough stock for most assemblies and test stands. Fastener cabinets are next moving right, with metric and English fasteners in various materials to put most prototypes, automation and experiments together quickly. Next is a grinder and drill press. The fourteen inch chop saw is located medially to the length of the lab to provide maximum length cuts of extrusion. Both the drill press and chop saw are recessed into the table, so the base heights are even with the table top. Next, in the foreground is our new Formlabs Form 2 Stereo Lithography (SLA) printer. When materials and prototype components are required that are beyond our capabilities we rely on our superb network for machined parts, SLA, SLS, etc. The wall is provided with electricity and pneumatics at convenient intervals.





Assembly and test:

The components next go to assembly. The assembly bench is the center of the lab as well as the center for prototype/project development and testing. Measuring 48 x 96 x 44 inches in width, length and height, the tabletops are configurable, removable and replaceable for flexibility. This table features the heaviest section extrusion, 90 x 90 mm, with a total weight capacity of 8,000 lb_r. It features an overhead frame of extrusion to optimize assembly stations, in addition to supporting additional lighting. 50 Amps at 240 VAC is provided by a drop from the overhead frame, along with air, both of which are on disconnects to swing very long extrusions. The bench is further equipped with 5 axes of servo motion and 7 axes of pneumatics, all programmable within the Galil Digital Motion Control (DMC) environment. In addition to prototype assembly, development and testing, the assembly table is where new test rigs and automation and robotics are developed.



Instrumentation and calibration:

The next step is to prep the project for testing. Metrology, wiring, instrumentation and testing are the focus of the inspection tables. A surface plate with height stands, inspection blocks, calibrated weights, LVDT's, force cells, thermometry, pressure gages, etc. are at left. Much of the lab's instrumentation not in use is stored beneath the table, ready for calibration and deployment to test stands. Two soldering stations are available for quick prototype assembly and test rig wiring. Digital/stereo microscopy is at right. The tables are provided with electricity and air. There is a 35 x 40 inch window between the lab and office/design space. The inspection tables are also purposed for electronics and pneumatic testing. Like all the test benches it is provided with data acquisition and control through the National Instruments LABView platform.



Materials properties, thermo and flow testing:

The next step is to test and validate. The analytic bench supports thermal, flow and chemical testing and preparation. The bench measures 19 feet x 28 inches x 40 inches in length depth and height. At left is glassware, burners and hot plates. At right is electrical, power and flow testing. Fresh water, air and propane taps are provided in the walls at convenient intervals. A recirculating pump system is integrated for heat exchange with a water reservoir outside the lab to dump large amounts of heat to atmosphere. The configuration allows for fast setup and execution of tests for prototype testing and development.





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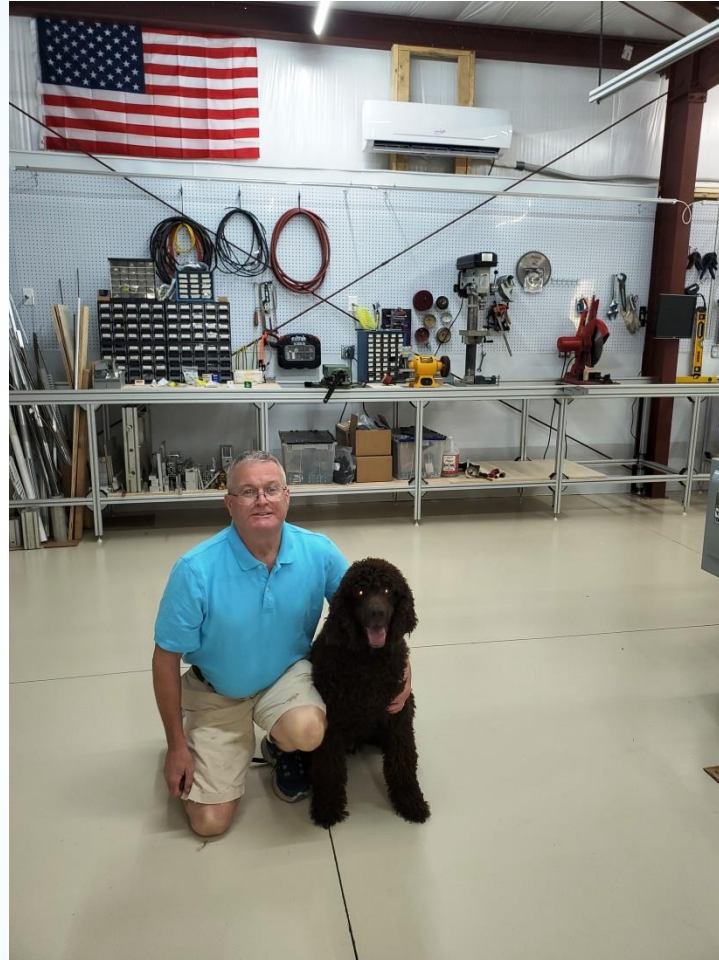
Thanks!

Thank you for indulging us if you read this far. We have taken you through a quick tour, highlighting a few of the many attributes of the tech center. We are excited about the new facility and look forward to applying our enhanced and advanced capabilities to your next engineering challenge.

Remember:

“There’s a better way to do it. Find it!”

Thomas A. Edison



Greg and Justice the Lab Dog (not really a lab)

Appendix A: General lab specifications

1. Three of the four walls in the lab are constructed with $\frac{1}{4}$ inch thick, high-strength, white pegboard for flexibility of set-ups.
2. There are a total of twenty 9,500 Lumen (LM), high temperature LED lamps in the lab. The Illuminating Engineering Society (IES) recommends about 430 Lux (LM/m²) for offices and 1,100 for detailed assembly. We're running about 2,600. We like it bright.
3. All four walls have air quick-connects in the wall.
4. The floor is a gloss epoxy paint rated for truck traffic.
5. All the benches are constructed from Bosch-Rexroth aluminum extrusion with continuous T-slots for flexibility and speed of set-ups.
6. HVAC is provided with three tons in the lab and one ton in the office.



Appendix B: A quick comparison of the Georgetown vs Mamaroneck facilities

Attribute	Georgetown	Mamaroneck
Built for mission	Yes	No
Office area	178 sq ft	144 sq ft
Distance between office and lab	Adjacent	200 ft horizontal, 80 ft vertical
Bathroom	Yes	Yes for office, no for lab ¹
Running water	Yes	No
Power	200A @ 240 VAC	30A @ 240 VAC
Freight access	10 x 10 ft	8 x 7 ft
Lab area	730 sq ft	290 sq ft
Level floors	Yes	No ²
Water view	Yes – the Black River	Yes – Guion Creek
Accessible in all weather	Yes	Carefully ³

1 though there was a canoe used for target practice

2 the Mamaroneck lab was a converted boathouse so the floors sloped to the creek to let the water run off

3 (too) easy in one direction, impossible in the other

Appendix C: The flag

You may have noticed the flags in the lab. One, over the machine bench is the flag of the United States of America. The other, over the analytic bench is the ubiquitous “Don’t Tread on Me” flag from revolutionary times. This flag was presented to Greg by another R&D Engineer/Lab Manager (and best man!) about 30 years ago to represent our fighting, irreverent engineering spirit, and has hung in every lab since. It is the first US Navy jack, flown from the first commissioned ship, the USS Alfred in 1775. The 140 foot, ship-rigged warship enjoyed an illustrious career before her eventual capture including cruises under one Captain John Paul Jones. This particular flag bears all the scars of its own service; oil mist, smoke, arcing, distress from projectiles, etc. It has been the banner of LTB Engineering for 22 years.

