

## **GA Manufacturing Suite Buildout**

### **Project Category 1: Meeting the Challenge of a Difficult Job—Specialty Contractor**

#### **Contractor: Integrity Electrical Solutions**

“Expect the best, plan for the worst, and prepare to be surprised.” ~ *Denis Waitley*

“The greater the obstacle, the more glory in overcoming it.” — Molière

(GA) was presented to us as a hard bid project with multiple general and specialty contractors competing. (GA), keeping the actual name confidential is a defense contractor and a diversified Technologies Company. “Global progress through technology” is the motto of (GA) and our company was very eager early in the bidding process to be a part of such an exciting project!

We were the successful electrical bidder at \$700k for a project that consisted of a 7 month schedule (during the height of the COVID shutdown) 6,180 sq. ft. of clean room manufacturing space, 2,310 sq. ft. of office and 2,886 sq. ft. of shipping and receiving area, a 300kW generator and projected to require a 4-person crew for the duration of the project.

After all the design changes, the project grew to \$2.1MM consisting of 10,500 sq. ft. of clean room manufacturing space, 0 sq foot of office and 2,886 sq. ft. of shipping and receiving, with a complete service upgrade to the multi-tenant building and a 1 MW generator requiring an 8 person crew with peaks of 12-14 electricians for completion.

Once construction began on the original scope, we received a Work Stoppage Order which limited us to working only in the delivery area because the entire clean room was to be redesigned. The original main electrical room was only 7’ x 7’ and it was too small even before the redesign. The redesign increased the size of the electrical room but did not double the size, creating challenges with space and code required clearances. Based on how the new gear grew, the existing electrical room should have nearly tripled in size but because there was such a premium on square footage in the cleanroom and manufacturing space, we had to redesign the entire electrical yard layout for the service to the building.

Through the design alternatives we provided as the electrical contractor, we made the 7’ x 7’ work in conjunction to our creative approach to redesign the exterior electrical yard. 90% of the delivery area was completed during the redesign because we knew that scope would not change.

The redesign came out originally at 80% complete for us to digest and begin planning on while the design team continued working toward completion of the redesign. The office space was deleted, (2) secure clean rooms were added along with a shaker room, and (2) TVAC areas within the existing footprint. These changes resulted in the service size increasing from 800A to 1200A then subsequent redesign efforts again increased the service to 2000A. At the 90% re-design completion, the service had grown to 2500A and by 100% CD's the service was up to 3000A! The base bid had also included (1) 375KW generator and two ATS's which grew exponentially to 1Mega Watt.

Below is a breakdown of how things changed due to the redesign.

	<u>March Bid</u>	<u>Redesign 80%</u>	<u>Redesign 90%</u>	<u>Redesign 100%</u>	<u>% Change</u>
Service Size	1000A	No elec.	2500A	3000A	300%
Equip Conn.	25 pieces	No elec.	35 pcs	45 pcs	80%
Generator Size	375 KVA	No elec.	1MW	1MW	167%

\*additional equipment consisted of TVAC units, cranes, shaker table, thermal chamber and chillers

	<u>ORIGINAL</u>	<u>FINAL</u>	<u>% Change</u>
Bid Hours	2393	8586	259%
Schedule Duration	Increased by only +43%		

We were not allowed to install conduits underground in the electrical yard, therefore the design we provided for the reconfiguration of the service required a wall-mounted racking system to hold 13,000 pounds of conduit and wire to be mounted on the side of the building, which is a precast, tilt-up concrete panel building. (See 3D rendering from design)

We created a 3D model of our design with the actual weights, mounting bracket locations etc. This was necessary for aesthetics and constructability. We could not go underground because of the proximity to existing gas lines, and no one could identify how deep the existing building footers were. To overcome this monumental task, we originally planned for as few shutdowns as possible. Our plan included (3) shut-downs to complete cutovers and tie-ins. We had to build a

complete, stand-alone 1200A temporary service to re-feed the entire building. Originally, this included Xcel providing a temporary transformer for the temp service.

Due to time constraints and Xcel schedule, the temporary utility transformer was no longer an option. The owner decided to rent a 1MW temporary diesel generator which required us to devise a racking tray to support the four parallel runs (20 cables) of #4/0 cam-lock power cables for the generator. The temporary service had to be built outside the existing electrical yard so that the entire electrical service could be removed. Existing tenants were not willing or able to tolerate (3) longer shutdowns, so we were tasked with yet again redesigning and preplanning our cutovers and tie-ins to incrementally reduce time amounts for each shutdown. The re-planning process was intense and required meticulously detailed coordination to be prepared for every possibility.

The resulting new plan now included (3) 8-hour shutdowns in lieu of (3) weekend shutdowns. (The only way to accommodate for the shorter time frames was to build the temporary main service large enough for the entire building) Our 3 shutdowns included:

- Shutdown to switch full building to the temporary service
- Shutdown to switch (2) tenants and house from temp to new Main Switchboard (MSB)
- Shutdown to take GA off temp and put them on new MSB

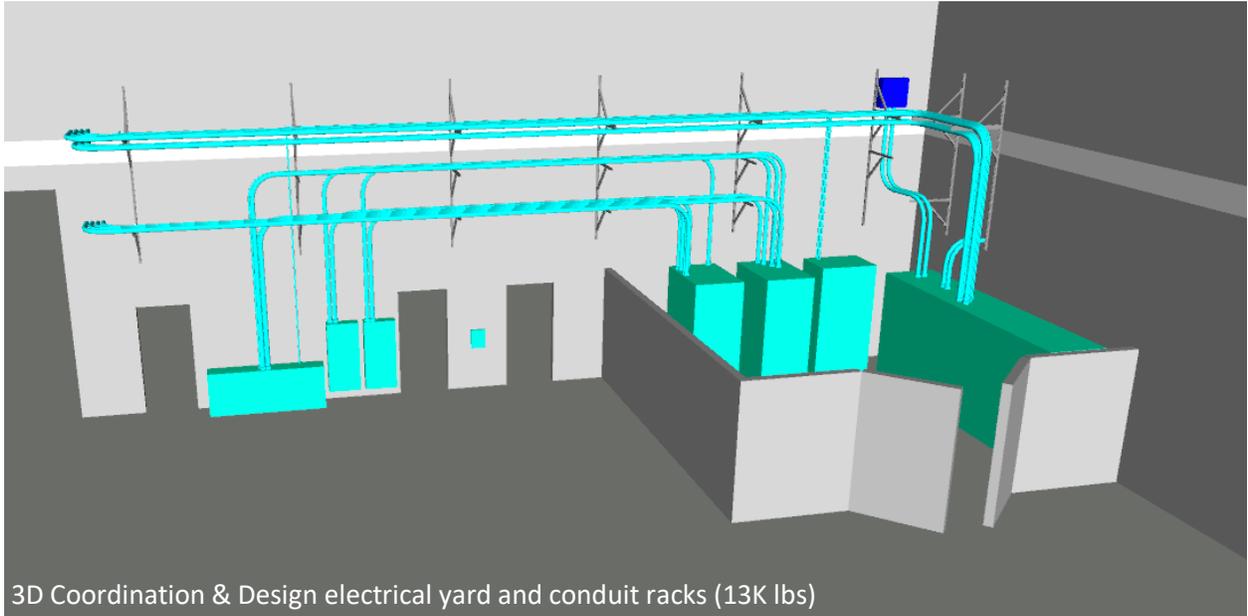
In addition to the 3 major shutdowns, we had an additional 2 shutdowns that included:

- Generator maintenance breaker testing
- Additional generator for IT racks to stay functional for satellite monitoring

The schedule was another tough hurdle to overcome. The original scope completion was set for Sept. 2020, with a revised completion of December 2020 and final completion of February 2021. We were then again challenged with other subcontractors falling behind early-on while the entire project was being redesigned. We found way to work around the slower subs which included the creation of a unique work schedule including various shifts to stay on task and ensure that we were meeting our deadlines.

Coordination proved to be another obstacle as the cleanroom ceiling HAD to be no lower than 18' above finished floor and with the red iron joists, all of our scope had to be installed within an 18" vertical window at ceiling height. We also had to deal with the challenge of adding secure/SCIF (Sensitive Compartmented Information Facility) clean rooms that were originally designed as standard clean rooms and built out as such. Construction of the standard cleanrooms had already begun by the time the Owner and design team had confirmed they needed to be SCIF cleanrooms. Meaning, we had to rebuild the work we had just completed in the 'standard' clean rooms to SCIF clean rooms standards, so all conduit, wire, etc. had to be removed and reinstalled following SCIF protocols all without a schedule extension due to this change. In addition, the IT room was to be upgraded with a new transformer and panel backed-up by the generator. To achieve this, we had to devise a plan to intercept the existing IT room feed and connect it to a generator-backed panel.

We delivered this project on time and commend our field for their flexibility especially during the height of COVID restrictions. We acknowledge that everyone had to deal with the COVID restrictions but the loss of continuity this project would have suffered as a result of having a Foreman or a lead out due to an exposure would have been devastating. Our crews and entire team's willingness to do whatever it took to get the job done and their hard work on the finished project was something we're all proud to be a part of!



3D Coordination & Design electrical yard and conduit racks (13K lbs)



Empty racks for 13k of conduit and wire





Inside electrical room



Setting 1 MW generator in place



1 MW Generator set in place



Inside clean room - incomplete



Temp cam-lock cables across temp. bridge