Category: 5 – Best Building Project – Specialty Contractor ($2-$6 Million)

Contractor: Greiner Electric

Project Name: ISO 6 Level Clean Room

In 2014, in order to maximize space, this client began an 18-month, 66,146-square-foot project that involved renovating an existing data center and moving equipment into the new space for technological research and manufacturing. There was an extensive electrical component that required adherence to exacting specifications, including the creation of 18,300 square feet of clean room space. As such, the client chose to work with Greiner Electric, a company that understands what it means to meet the highest standards.

The project presented several challenges. Extensive coordination and innovation were required because design and field installation occurred simultaneously. Construction took place in a fully operational facility, and it was important that little to no business disruption occurred. This required timing electrical shutdowns and other work to the minute.

Overall, crews disconnected, placed, and reconnected 1,363 high-tech manufacturing devices; installed 688 LED light fixtures; and installed 266,598 feet (50.87 miles) of wire and 50,620 feet (9.59 miles) of conduit with zero lost time hours. The project employed CAD and BIM Revit modeling to ensure that all trades were working within the same exacting specifications and that prefab built components were placed properly. In addition, Greiner ensured a safe workplace via asbestos awareness, innovative safe off procedures, method of procedures, morning stretch and flex exercises, and daily job hazard analysis meetings.

The project was done in three stages. First, the lower floor of Building C—a data center, UPS/battery room, and existing mechanical and electrical rooms—was gutted to make way for the new setup. The next step was new construction, and the third stage involved disconnecting the equipment in Building A, moving it, and reconnecting everything in C, ensuring seamless function and the utmost in safety.

Preventing interruption in electrical service was important, but there was another key component: noise control. Because employees were working on the upper level throughout construction, any drilling or anchoring that needed to be done in the poured deck above was limited to 6 am to 9 am and 11 am to 1 pm, Monday through Friday. An important weekly task

was planning the following week's work. Areas to be accessed had to be identified and mapped. In addition, the existing mechanical, fire alarm, security, communication, and building automated systems had to remain functional throughout.

As always, safety was a primary concern. Building C was built in the 1970s. Over its 40+ years of existence, many of the utilities had not been upgraded or, in many cases, even touched. A major aspect of the demo was dealing with the medium voltage electrical service. For the 12,470V services, there were eight combination transformer switchboards and the accompanying cable that needed to be removed.

In addition, the building was loaded with asbestos, and teams were on hand during the entire demo process for testing and abatement of any areas deemed hot. However, not every section that needed to be removed, drilled, or cut to install the new electrical system was part of the actual demo, so Greiner's crews had to be vigilant in regards to types of paint that likely contained asbestos or lead and sections of flooring that had been glued down with adhesive or mastic that could be dangerous.

The safe-off process for the electrical equipment was also challenging and time-consuming. To ensure the safety of every person working on the project and that all systems remained operational for the client's employees, an innovative and extensive lock-out/tag-out program was put into place. When a breaker was deemed critical to the day's work, it was locked off and labeled with the name of the person responsible for enforcing the strict "no hot work" policy—that person alone could turn the breaker back on when work was complete and it was safe to run electricity again.

Work began at 6 am, and a couple of key things occurred each day. First, the crews participated in a stretch and flex program. According to the U.S. Bureau of Labor Statistics, the most common nonfatal occupational injuries (resulting in days away from work) are musculoskeletal, and studies have shown that even 10 minutes of stretching can result in increased mobility, stretchability, and endurance.

This was followed by discussion of the day's potential work-related hazards and review how to recognize, mitigate, and avoid them. These job-wide pre-task planning meetings lasted 15 to 20 minutes, and then additional critical tasks were addressed with the crew specific to that aspect of the job.

Many aspects of the company's work require the controlled environment of a clean room for the virtual elimination of particulate contamination. To address this need, construction in the clean rooms was completed in stages. The highest above-ceiling work—anything that would not be accessible after the first layer of install was complete—had to be completed, cleaned, and inspected before work progressed. This process continued, layer by layer, as the mechanical, electrical, and plumbing crews worked downward to the ceiling height. Finally, the ceiling grid, light fixtures (which included yellow UV filters in some rooms), and any additional MEP work was completed, wiped, and again inspected prior to closing it up. In the clean rooms with raised floors, the same install-clean-inspect process was followed from the bottom up. Once work was complete, a 24-hour air test was performed to certify the spaces.

Next, approximately 1,200 pieces of equipment had to be moved from the existing tech center to the new space. Greiner was responsible for disconnecting all the electrical equipment for these pieces prior to the move and reconnecting each one as it arrived in its new location. The timing for moving each piece had to be carefully coordinated, as it had to be kept in operation right up until the time of the move and downtime kept to an absolute minimum. For this reason, there were some pieces that could not be 100% disconnected to verify wiring and NEMA plug configurations until the moment they were moved. Many times, changes and corrections were made on the fly. A substantial stock of breakers, cord caps, and receptacles were kept on hand to address any situation.

Timing and scheduling was a huge factor for the coordinated electrical shutdowns necessary to connect new electrical services and tie into existing services. Sometimes this involved shutting down individual branch circuit panels, and others required the cooperation of the local utilities company, which had to de-energize related transformers.

This process was extraordinarily time-consuming. First, a method of procedure (MOP) and permit to work had to be submitted. It could take between a week and two months to get approvals on the proposed shutdowns, which were forecast three to four months in advance. The affected areas had to be additionally approved by all area managers. The MOPs and outage schedules had to be completed in tremendous detail and typically were broken into 15- to 30-minute intervals. Falling behind schedule or failing to meet a deadline was not an option.

In one instance, Greiner was tying in the new 3000A 480V service and installing and terminating

new distribution breakers in the existing switchboards. Not only did the shutdown require de-energizing utility power, but the work affected both floors of Building C and the chillers that cooled the existing tech center in Building A. The chillers could be down for no more than two hours, so timing was crucial. The amount of temporary power and lighting that was put into place ahead of time just to do the work was extensive, many crews were on board, and each step was outlined to make sure all the goals were met within this very small window of time. Needless to say everything went according to plan.

CAD coordination and BIM modeling played an important role in the success of this project. Because of the sheer magnitude of the coordination required, having a model for each room that could be referenced throughout the project was key. The drawings were accessible to everyone on site. The main electric room, for example, was laid out and dimensioned using CAD. Once the room was approved, the drawings were sent to both Greiner's prefab department and to the crews in the field. Prefab bent all the feeder conduits and built all the racking. At the same time, the rest of the equipment was set into place by the field crews. The shop-fabricated material was numbered and correlated with the CAD drawings, so the field crews could refer to them and know where to place each piece—like putting together a model.

Overall, the project necessitated extraordinary attention to detail and nearly to-the-minute timing. Kevin Kreymborg, of Swinerton Builders, Greiner's partner on the project, praised the team's "excellent work," saying they were "very service-oriented and responsive," keeping the project on track and cost-effective although "the scope changed dramatically several times. Greiner was very conscientious of their daily operations, kept disruptions to a minimum, and helped keep the project on schedule." Greiner's experienced project managers and electricians used coordinated schedules and comprehensive planning to safely and efficiently complete the work.