

## **AGC ACE AWARDS 2021 SUBMISSION**

### **PLUM CREEK WATER RECLAMATION AUTHORITY**

#### **WASTEWATER PLANT EXPANSION**

##### **Doubling Treatment Capacity**

Electrical contractor and project partner Guarantee Electrical expanded the Plum Creek Water Reclamation Authority's wastewater treatment plant, laboratory, and biological nutrient removal system's permitted treatment, doubling its capacity from 3.2 million gallons processed daily to now more than six million gallons. Ownership of the plant and its processes is a cooperative venture wherein residents of Plum Creek, Castle Rock, and southern portions of Douglas County are owners and customers.

Guarantee Electrical's role was to install an upgraded electrical distribution system to enable the PCWRA to double its treatment capacity in order to keep pace with population and commercial growth, providing Plum Creek and the surrounding areas for future economic growth and development.

##### **Upgrading Capacity**

The complexity inherent in equipping a large-scale wastewater treatment plant with the ability to meet growing communities and their increasing capacity needs required a project team that understood the technical nuances of these systems. Guarantee's extensive history with installing electrical structures for water and wastewater treatment systems readied it for the job.

Guarantee's \$4 million contract with Plum Creek began in January 2019 and reached completion in December 2020. Phased subprojects included:

- Powering a new autothermal thermophilic aerobic digestion (ATAD) building to meet a need to stabilize and pasteurize increased amounts of activated sludge.
- Doubling the number of filter bays from two to four to filter changes downstream before effluence/discharge into the South Platte River.
- Upgrading the ultraviolet train for disinfection before the waste leaves the facility with a sizable row of UV lights, each of two channels measuring eight feet wide by 12 feet deep and 30 feet long, to supply redundancy power back-up.

- Upgrading UV lighting at the end of the treatment process and adding tertiary filters.
- Relocating the facility's existing headworks equipment 300 feet – the initial stage of the treatment process that reduces the incoming wastewater pollutant level – and adding new headworks equipment.

### **Preplanning and Prefabrication**

The team leveraged significant 3-D BIM modeling to accelerate design coordination and schedule challenges. All in-slab layouts, risers, racks, and control stands were meticulously modeled, allowing Guarantee's prefabrication experts to work off-site building assemblies, components and templates. Prefabrication and kitting were also deployed via duct bank templates, light fixture kits, and prefabbed control stands. This pre-planning permitted the team to shift labor hours forward in the project schedule, resulting in significant time and budget savings.

### **Specifying Electrical Installation**

Guarantee installed five miles of electrical underground conduit infrastructure embedded in concrete requiring significant civil coordination. With hundreds of stub-ups located in the slab, the team did not miss a single mark.

The specialty electrical contractor installed a 4,000-amp, 480-volt, fully redundant service with generator backup that feeds two motor control centers which break off the 4,000 amps to control the motors. These control systems and others, paired with complex programmable equipment to maintain temperature, pressure and flow rates, was the crux of Guarantee's scope of work at Plum Creek.

The motor control centers totaled more than 30 motors. Guarantee installed three 50-horsepower pumps for the effluence and three 100-horsepower blowers for the waste activated sludge (WAS) treatment process.

### **Meeting a Late-Stage Design Change Challenge**

The original design of the treatment plant system upgrade was intended to produce an open transition for the generator system, one that kills all electrical power for a few seconds until the back-up generator begins operating. Amidst construction and just before release, the owner opted

for a closed generator transition system for an entirely seamless operation. Guarantee met this challenge by quickly reconvening with the owner, design team and electrical integration firm to recreate the necessary power infrastructure to accommodate and support a closed system transition. The change altered approximately 30 percent of project completion, requiring a complete redesign of the primary switchgear and reconstruction of lower-level slabs to facilitate the installation of modified conduit distribution sleeves. Guarantee and fellow project partners successfully met the owner's new expectations and requirements.

Many potential on-site project challenges were anticipated and resolved early on through Guarantee's prefabrication and building integration departments via 3-D modeling. Guarantee worked closely with designers and other project team members to meet owner specifications and to model the building, install the electrical cable tray and route all conduit up to slab prior to building anything in the field. Determining potential electrical connection issues and anticipating any potential collision with process piping far in advance enabled Guarantee to anticipate any major roadblocks at the jobsite and propel the project forward.

Plum Creek utilized more than 17,000 man-hours for electrical installation alone. Guarantee's stringent safety policies and closely adhered to guidelines of Colorado and Tri-County Health Department regulations during an unprecedented COVID-19 outbreak in the middle of construction, contributed to a 100% injury-free project.

### **Supporting the Growth of Our Community**

Thanks to the work of Guarantee, the Plum Creek Water Reclamation Authority's greatly expanded wastewater treatment plant is powering at a capacity that is twice what it was before, actively serving residents and businesses in Plum Creek, Castle Rock and southern portions of Douglas County, Colorado for decades to come. Infrastructure work may not have the same allure as high-profile commercial construction, but they serve a foundational need in our communities. Guarantee was proud to play a role in this project.



*Prefabricated underground conduit racks being set on site.*



*Multiple prefabricated conduit rack assemblies ready for concrete.*



*Guarantee electrician preparing in-slab stub-ups in 100 degree heat.*



*Density of in-slab conduit runs.*



*Open switchgear with color feeder wire.*



*Switchgear line-up made safe with lock out tag out procedure.*



*Generator being set on site.*



*Control panels, junction boxes and overhead racking. Note the in-slab stubs-ups seen in Picture 1.*



*Completed pump room.*



*Finished space.*