

Category 2: Meeting the Challenge of a Difficult Job – Specialty Contractor

Specialty Contractor: Colorado Cleanup Corporation

Project Name: Research Bridge Demolition

Bridging the Gap from Challenge to Success

They key to growth in any industry is facing challenges and developing techniques to overcome them. In late 2018, the decision was made to demolish the Research Bridge at the old University of Colorado Health campus at 9th and Colorado. Having already completed several demolition projects at the site, including one implosion, Colorado Cleanup Corporation was at the top of the list to perform the deconstruction. The construction of the Research Bridge is very different from most of the structures we demolish on a day-to-day basis; we have demolished bridges, we have demolished buildings, but never a combination of the two. Overcoming the challenges this project would inevitably throw at us was an irresistible opportunity to learn and practice new techniques. Together with the help of Sigma Engineering, CCC demolished the building with zero lost time incidents or injuries, recycled 98% of the building debris, and completed the project 3 weeks ahead of schedule.

The Challenge

The Research Bridge structure consisted of five levels of office and laboratory space situated on top of an enormous three-span box girder system. Each girder was over fifteen feet tall and five feet thick, and reinforced by #18 rebar which is over two inches in diameter. With the offices stacked on top, the building was well over 100 feet tall. These characteristics gave rise to two main concerns: would the structure be able to maintain a balanced load on the girders during demolition to prevent toppling, and would we be able to reach the top of the building with an excavator?

In addition to the concerns with the physical demolition, there were also considerations to take into account regarding the location of the demolition itself. The bridge spanned across 9th Avenue, a key access road for Rose Medical Center and the VA Medical Hospital located just east of the project. It was important to get the work done as quickly as possible to ensure the road was not closed for too long, and to not damage the road surface. Additionally, running under 9th Avenue was a utility access tunnel, a 30 inch water main, and a 5 inch gas line. Any damage to these utility lines would have been a catastrophic for anyone nearby. Finally, the research bridge was in very close proximity to a newly finished and occupied apartment complex; merely 150

feet away. In order to cause as little an impact as possible to the residents; the project team took noise, vibration, and dust concerns very seriously.

Planning the Approach

With the risks laid out, it was determined that deconstruction with an excavator would be the best way to remove the building as quietly and causing as little vibration as possible. CCC first enlisted the help of Sigma Engineering, an international structural engineering firm out of Las Vegas, to develop a detailed demolition plan. First; Sigma tested the structural integrity of the utility tunnel to mitigate any risks of the tunnel collapsing under the weight of the demolition debris. It was determined that the tunnel was stable and that mild reinforcing would adequately protect the utilities. Then, Sigma took performed an analysis of the various loads on the girder system into account and worked closely with CCC's demolition experts (Senior project manager Chris Formanek and general superintendent Marty Nelson) to determine a sequence that would maintain the lateral stability of the structure throughout the entire demolition process, while also meeting the schedule requirements.

The next hurdle was the equipment. Conveniently, CCC had an ace up our sleeve; we had recently purchased a Hitachi 750 High Reach Excavator for other work at 9th and Colorado. The machine came to Colorado all the way from Europe and was, the only specialized demolition piece of equipment of its kind in the region. With a working height of 145 feet, it was uniquely ready to take on this massive task. CCC also employed the use of multiple Dust Boss demolition dust control units to conform to dust control requirements. The Dust Boss unit can disperse a fine mist over a larger area than the traditionally used firehose with less water used overall, and the same amount of dust control.

Executing the Plan

With these concerns fully accounted for, it was time to start demolition. First; a 1" steel plate was placed over the limits of the two utility lines, and 24" of sand were placed over the plate to soften the impact of any falling debris. This protection proved successful as no damage was done to the utilities or the road surface. Not a single bit of patching or repair was needed for the asphalt surface after the demolition was complete.

The demolition consisted of 26 phases starting at the top of the South end of the bridge. There was still a partial building capping that end of the bridge and it was the first thing to be demolished leaving the girder system and overlying offices intact. Next, the equipment was

moved to the north end of the bridge and started by removing the penthouse level to half of the North girder system's length. The roof system and support beams were then removed to a quarter of girder's length, followed by the structural systems of the top floor. The process was repeated until the top level was removed to the extent of the removed penthouse level, and then again for each subsequent floor below. The second half of the building over the North girder system was deconstructed in the same process, floor by floor, until the girder was the only thing remaining for the North third of the structure. The whole process was then repeated for the south span of the bridge, and then the center span. Some of the center span remained to maintain the lateral stability of the girders.

With the North and South girders now completely unladen, they could be demolished. The South girder span was first to be removed, and then the North. This left a single girder span in the center with office levels still above. The structure was removed with the same process as the other girder spans. Finally, the central girder system was unladen and therefore ready to be demolished. The protective measures on the roadway were removed and the road reopened to the public.

Throughout the project various steps were taken to maintain the safety of our crew and nearby residents. First of all, a restricted work zone was established. No workers were permitted to be near the structure during demolition with the exception of the excavator operator. Secondly, because dust was a risk, silica respiratory tests were conducted at regular intervals to put quantitative values to the dust mitigation. The Dust Boss units were supplemented by workers on a man lift with a firehose who could spray trouble areas with additional water as necessary. Special emphasis was made to these workers on fall protection and safety before they were allowed in the lift.

Resounding Success

The project was completed with zero lost time incidents or injuries, three weeks ahead of schedule, and with a whopping 98% of all waste materials recycled. This would not have been possible had each concern not been considered and planned for accordingly before the commencement of demolition. Thanks to careful planning, great communication, and a lot of hard work by the CCC team, we managed to overcome each challenge confidently and learn new techniques to use in the future.



Photo 1: University of Colorado Health Research Bridge Prior to Demolition Activities



Photo 2: "The Big Show," CCC's High Reach Excavator



Photo 3: Dust Boss Dust Control Unit



Photo 4: Commencement of Demolition Activities



Photo 5: Dust Mitigation Techniques in Action



Photo 6: Building Cap on South End Nearly Completely Removed



Photo 7: Demolition Begins Over the Girders (Used with permission from Reporter/Photographer Thomas Gounley)



Photo 8: Interior Structure of the Bridge (Used with permission from Reporter/Photographer Thomas Gounley)



Photo 9: North and South Sides of Structure Completely Removed (Used with permission from Reporter/Photographer Thomas Gounley)



Photo 10: Demolition Begins on the Girder Sections