

Tourism Versus Shotcrete

By Jason Myers

Fisherman's Wharf is one of the major tourist attractions in San Francisco, CA, and doing a shotcrete project underneath the hub of San Francisco's tourism is a unique challenge. Pier 31.5 sits between the tourism Mecca of Pier 39, the new cruise terminal at Pier 27, and the embarkation point for Alcatraz at Pier 33. When the rehabilitation of Pier 31.5 is complete, the next phase of the project will start making a new embarkation point for Alcatraz along with a civic plaza and historical area. Pier 31.5 was constructed in 1918 and has had many modifications and repairs over its decades of use. It was determined in 2015 that a major rehabilitation and repurposing was required of the Pier and of the entire Wharf area. During the investigation stage, it was found that major concrete repairs were required to the substructure and Dees-Hennessy Inc. (DHI) was chosen to perform the shotcrete portion of the project.

SCOPE OF THE SHOTCRETE PLACEMENT

The present portion of the scope is over 6000 ft² (560 m²) of shotcrete installation for overhead shotcrete on slabs, beams, and repairs, totaling a volume of around 200 yd³

(150 m³). Access for the project is from two access portals in the existing deck and all the work is performed off a temporary platform that was constructed under the existing deck. The upper portion of the deck under repair was still being used, limiting access to the upper deck portions of the work. Shotcrete was the perfect process to place the concrete because of the thinner repair sections and the complications from access issues. Shotcrete required minimal formwork around the beam replacements and some of the repair areas, allowing work to continue in multiple areas within a limited work time window.

PROJECT CHALLENGES

One of the scheduling challenges of the project was the coordination of the schedule with the tides and the availability of sections to be repaired. The temporary deck that was constructed is under water during large high tides so shotcrete placement could only be scheduled during a low tide and with a small high tide variation. Also, because of the large amount of daytime tourism, all work was scheduled during night shifts. Shotcrete provided a solution with the limited



Fig. 1: Beam side prepared for shotcreting with minimal formwork



Fig. 2: Underside of pier ready for shotcrete



Fig. 3: Shotcreting in limited space under pier

amount of equipment and quick setup required. Shotcrete also provided the flexibility to work in different areas as they became available around tide and access issues.

A hurdle for the project was the requirement to use a corrosion inhibitor in the shotcrete mixture. DHI completed the first portion of the project with one concrete supplier but their corrosion inhibitor also acted as a severe set accelerator. In fact, once it was added to the concrete truck in the field, even just a short load truck only had about 30 minutes before the concrete started to set. Shotcrete was helpful through this because of the speed with which we were able to place shotcrete from one location to the next. The General Contractor had a couple deck infills and we were able to more than double their production with more movement in our work than theirs.

The second portion of the project used a different concrete supplier and their corrosion inhibitor reduced the slump. We had to increase the slump at the concrete plant to hit the delivered concrete at the proper slump for our shotcrete placement. The lesson from this is to understand all the impacts admixtures have on the fresh shotcrete material properties. If an admixture is used in a concrete mixture to solve issue A, then you have to be aware that you may be causing issue B. Admixtures allow us to do a lot of creative things with concrete but there are limitations and consequences to using them. The bottom line is: it's essential to fully investigate and understand the impacts from using admixtures in our shotcrete mixtures *before* you get into production on a project.

CONCLUSIONS

Pier 31.5 has had many different uses over its decades of use in a very corrosive and aggressive environment.



Fig. 4: Shooting on underside of pier

Shotcrete is one of the tools that provided a high-quality, durable concrete repair and added significantly to its useful life and serviceability. In the near future, tourists will continue to flock to this area and never realize the role that shotcrete played in the repair work that is directly under their feet.



Jason Myers received his bachelor's degree in civil engineering from California Polytechnic State University, San Luis Obispo, CA, and his MBA with an emphasis in project management from Golden Gate University, San Francisco, CA. Myers started his professional career working for an earth retention subcontractor where he

learned the importance of budgeting, scheduling, and client relationships. Also during this time, he was introduced to the use of shotcrete and its applications. After working for a general contractor for a couple of years, he realized that he enjoyed the tighter knit of working for a subcontractor and the ability to construct multiple projects on a tighter time-frame. Myers also enjoys the process of handling most of the procedures that go into constructing a project rather than seeing only a small portion of the process. Myers joined Dees Hennessey in 2004 and has been a part owner of the company since 2007. He currently serves as the Vice President of Operations as well as the Safety Director. Myers is Chair of the ASA Membership Committee and a member of the ASA Board of Directors.