I-25 and Santa Fe Interchange

Location: Denver, CO  
Products Used: NA-50  
Date: 2011 - 2013

The Colorado Department of Transportation (CDOT) is making variety of improvements to the infrastructure and operations of the busy interchange at I-25 and Santa Fe Drive close to downtown Denver, CO. This $32.1 million project “is extremely important for the I-25 corridor, which carries around 208,000 vehicles a day,” say CDOT Resident Engineer, Ron Buck.

The project is being partially funded by Funding Advancement for Surface Transportation and Economic Recovery (FASTER). FASTER is dedicated to repairing and replacing poor bridges and making safety improvements on Colorado highways. This bridge is constructed using post-tensioned concrete. Post-tensioning is a method of reinforcing (strengthening) concrete or other materials with high-strength steel stands or bars, typically referred to as “tendons”.

Concrete is very strong in compression but weak in tension. In conventional concrete construction, if a load is applied to a slab or beam, the beam tends to deflect or sag. This deflection will cause the bottom of the beam to elongate slightly. Even a slight elongation would be enough to cause cracking. Steel reinforcing bars (rebar) are typically embedded in concrete as tensile reinforcements to limit the crack widths however, it does not carry any force until the concrete has already deflected enough to crack. Post-tensioning tendons are considered “active” reinforcing. Because it is pre-stressed, the steel is effective as reinforcement even though the concrete may not be cracked. Post-tensioned structures can be designed to have minimal deflection and cracking, even under full load.

US SPEC’s NA-50, which is on the CDOT Approved Products List, was selected for use on the project to be pumped into the voids between tendons and the ducts they are placed in. NA-50 is designed to be very fluid to allow for easier pumping over the long distances required for this project, without bleeding or segregating once placed. The grout is placed to encapsulate the steel tendons and eliminate any corrosive elements from penetrating the system and causing corrosion. NA-50 passes a 50 PSI Pressure Bleed Test. This test is done to ensure that while under pressure from the application and placing process, the grout will not bleed and allow water to rise in the ducts and expose the tendons to potentially corrosive elements.

NA-50 was mixed on site in a colloidal mixer. Colloidal mixers operate under high speeds and have two tanks on them - one for mixing and the other holding take to store and continually agitate the mixed grout. These mixers will simultaneously mix and pump grout. NA-50 was then placed in ducts located in the precast concrete bridge sections that house the steel cables used to tension the concrete. (The tendons will have already been stressed when the grout is placed.) The grout is pumped through hoses leading from the mixer to a cap on the bridge structure. There are vents (that are later closed off) along the length of the tendons to allow the contractor to ensure the grout is placed along the entire length of the tendon and there are no voids.

On this project, NA-50 was pushed about 500 feet. Some projects are much shorter distances and others are as long as 1000 feet or more. The grout is pumped until it is visually seen on the end of the tendon opposite the pump and the cap is plugged. The pumps are shut down to prevent blowouts from occurring.

VSL, the contractor, liked NA-50 for its long open time. If there is a problem with the pump, there is time to fix that problem before the grout sets up in the lines. They also liked the fluid nature of the product which allowed for easier pumping under lower pressures.