I-80 Storm Water Upgrade

Continuous deflection system addresses increasing age, traffic patterns

By Greg Sterchi

The Illinois Department of Transportation (IDOT) recently initiated a design for an I-80 (Kingery Expressway) reconstruction project stretching from I-294 to the Illinois-Indiana state line. The expressway no longer met current engineering standards and was in need of a major facelift.

Having served motorists for more than 50 years, I-80 has surpassed its initial design expectations by more than 30 years. Furthermore, since the expressway opened, average daily traffic numbers have multiplied to seven times what it was originally built to manage.

The Kingery currently handles about 160,000 vehicles each day, more than 25 percent of which are large trucks. By 2020, the expressway's average daily traffic counts are projected to reach 192,000 vehicles.

In order to improve driving conditions for motorists, the Indiana Department of Transportation (INDOT) and the Illinois State Toll Highway Authority drafted proposals and agreed to increase the number of lanes in each direction. Indiana officials became involved because staging needs called for IDOT to reconstruct a one-mile segment of I-80 (Borman Expressway) in Indiana.

Storm Water Engineering

Kingery was originally built with a deep main storm water drain. Pumping stations screened runoff for potentially damaging materials and then discharged treated water to the Little Calumet River, a Lake Michigan tributary.

The reconstruction plan, however, involved raising the expressway to eliminate these pump stations. As a result, storm water runoff would no longer pass through automated trash racks. IDOT needed a solution to continue treating I-80 runoff.

Project planners addressed the water treatment dilemma and alleviated potential flooding concerns by incorporating into the reconstruction design the installation of two best management practice (BMP) units, a pair of specially designed PSWC56_40 continuous deflective separation (CDS) systems. Fariar Kohzad, product engineering manager for CONTECH Stormwater Solutions, was instrumental in the custom design of the units and in their approval process.

The larger unit treats runoff from more than one mile of Kingery pavement, and the smaller unit handles treatment on the stretch of expressway in Indiana. The two sit adjacent to each other at the state line, near the outfall, and the site continues to discharge treated water into the Little Calumet River. The treatment system as a whole



IDOT replaced pumping stations and an automated trash rack with a pair of CDS systems.

makes for the largest structural BMP installed by IDOT to date.

The original I-80 trash rack was designed primarily to prevent large objects from entering and damaging pumping station parts. But patented non-blocking screens within the CDS units remove sediments, trash, debris and neutrally buoyant material from rainwater in a much smaller form than the automated trash rack could; the screen openings are about the size of a match head. And unlike its predecessor, the new treatment technology is capable of removing hydrocarbons and nutrients.

The CDS twin units require regular maintenance with a Vactor truck but ultimately provided project cost savings. The CDS system does not require the motors and mechanical parts that an automated trash rack system would, rather the twin units operate on hydraulic principles, so there are no moving parts to wear out.

Treatment Design Challenges

"The need to screen the water was still there, so a system was specifically

designed with special hydraulic conditions and the pollutants of concern in mind," said Entran's Terry Walloch, P.E., P.T.O.E., who worked with CONTECH on the I-80 project.

The major storm water challenge in reconstructing the expressway was to design for a large flow with minimal head loss requirements. "One of the key issues of the treatment units was that the head loss in the system could be no more than 8 in., and we needed to treat 18 cu ft/sec, which is a tremendous undertaking," Walloch said.

Construction crews laid 78-in.-diameter piping on a very flat grade, being careful to cause as little elevation change through the treatment structure as possible. This was done to prevent interstate flooding and to fulfill hydraulic requirements for the twin CDS units to work properly.

"An automated system would not work in this particular application because of the restriction of the head loss," said Walloch.

Extremely tight design parameters were another reconstruction issue; the profile of the storm sewer was dictated by the roadway profile under an overpass near the state line. And both the existing and proposed treatment systems flowed to the same location, further complicating the staging of the installation process. Under Kohzad's management, the CDS plans considered and worked around these potential difficulties.

System Solutions

Initially I-80 reconstruction planners wrote a special provision so that other contractors could recommend possible solutions. And according to Walloch, IDOT's drainage contractor proposed two other systems before the CDS units.

"We rejected the previous two for not meeting the required specifications," he said. "What we liked about the CDS units was that even if maintenance was lacking for some period of time, it wouldn't cause a hydraulic issue. That was one of the key issues we needed to address. Some of the competitor products caused concern that if they were not maintained regularly, we would have a problem."

The final cost for the I-80 reconstruction project totaled $460 million. The system went online in April 2007, and the roadway opened to the public at the end of June.

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