

NEW ENGLAND CONSTRUCTION



**New Hampshire DOT's
\$800M I-93 Widening Project
Heads Into Final Stretch**

Rebuilding of I-93 Nears Final Stage for New Hampshire DOT



The Rebuilding of I-93 from Salem to Manchester – one of the most ambitious projects ever undertaken by the New Hampshire Department of Transportation (NHDOT) – has headed into the final stretch.

According to NHDOT, approximately \$490 million worth of construction projects are active or complete, or about 80 percent of the project's estimated \$616 million in total construction.

What's more, about 90 percent of the estimated \$87 million in design work has been completed. Adding in estimated right-of-way acquisition and mitigation costs brings the total for the huge project to \$811 million.

The massive undertaking consists of widening a 20-mile segment of I-93 starting at the Massachusetts state line in Salem, New Hampshire, and extending northward through Windham, Derry, Londonderry and into Manchester, ending at the I-93/I-293 interchange. Work entails expanding the Interstate from a limited-access two-lane highway in each direction, to a limited-access four-lane highway in each direction, plus making improvements at Exits 1 through 5.

NHDOT is widening I-93 to reduce congestion and improve safety, with studies showing traffic backing up frequently between the state line and Manchester, especially during morning and evening rush hours. Built in the early 1960s to accommodate

60,000 to 70,000 vehicles per day, the highway is expected to see traffic increasing to 140,000 vehicles per day in Salem by 2020.

Priority Tasking

NHDOT prioritized construction so that red list bridges and segments of the corridor with the greatest safety, congestion and capacity problems were addressed first. This lead work included a 6-mile segment from Exit 1 in Salem to Exit 3 in Windham, and the Exit 5 interchange in Londonderry. All of the mainline priority projects are slated to be finished in 2016.

In line with prioritization, 19 red-list bridges on the Salem to Manchester corridor were removed from service. Spans on the State Bridge Red List are state-owned bridges that require two inspections each year due to poor condition or weight limit postings.

Federal funds have been available to help finance the enormous I-93 project, while New Hampshire has relied on GAR-VEE bonds to help pay for its share of the work. Under this type of financing, states must repay the bonds using federal funds expected to be received in the future.

The total construction cost to complete the final phase of the I-93 project is about \$250 million. SB 367 will fund about \$200 million of this, the state legislation creating a four-cent gas tax, with the remaining \$50 million to be federal funded.



Audley's \$49 million contract includes widening and reconstructing 8 miles of highway and four bridges.



A CAT 966 Loader waits to spread excavated material deposited by a CAT 735C Off-Highway Truck as a CAT excavator works in background.



A Link-Belt TCC1100 Crane helps assemble components for American Shoring's double wall slide-rail system being used to support trench for 12-foot by 12-foot box culvert pedestrian underpass.

Major Job Creator

Over the past decade the rebuilding of I-93 has provided much needed work for dozens of contractors, subcontractors, engineers, materials and equipment suppliers, and jobs for hundreds of construction workers. One of the first contractors to get involved in the huge project was R.S. Audley (RSA) of Bow, New Hampshire, with a \$6.65-million contract in November 2006 for the replacement of the Cross Street Bridge over I-93. In the 10 years since, RSA has bid on and won several more contracts, including two most recent ones worth more than \$80 million in construction.

The earlier of the two, Contract 13933I, which was won with a \$33 million bid, entailed the reconstruction and widening of 2.9 miles of I-93 southbound (SB) in the vicinity of Exit 3 in Windham, together with the relocation of 1.25 miles of NH Route 111 and building a new I-93 SB on-ramp. RSA began work in fall 2012 and completed the project in spring 2016. A few months before wrapping up this project, the contractor launched its latest project, a \$49 million effort located slightly to the north.

Highways, Bridges and Pedestrian Underpass

Contract 14633B actually got underway in December 2015, according to Ryan Audley, a third-generation owner of the 60-year-old company. Audley said the scope of work includes widening and reconstructing 8 miles of highway and four bridges between Exit 3 and Kendall Pond Road on I-93 in Windham and Derry. He noted that standard bridge methods, not accelerated bridge construction, would be used since the work consists mainly of widening existing structures to accommodate the additional lanes of I-93. Two of the bridges are framed with precast concrete girders manufactured by J. P. Carrara & Sons, Inc. of Middlebury, Vermont, while the other two are built with steel girders supplied by Casco Bay Steel of South Portland, Maine. RSA is erecting the bridges.

Other work consists of building an extensive soundwall and installing a 12-foot by 12-foot box culvert under both barrels and the median of I-93. This culvert serves as a pedestrian underpass that connects a rail trail from one side of the interstate to the other.

NHDOT's Contract Administrator for this project is Jay Levine, P.E.

Massive Quantities

RSA is handling massive quantities of materials for this project. According to Audley, the job requires about 334,000 cubic yards of common excavation, some 54,000 cubic yards of muck excavation, 30,000 cubic yards of miscellaneous excavation, and almost 342,000 cubic yards of rock excavation. Maine Drilling & Blasting is performing rock blasting while Continental Paving Inc. of Londonderry, New Hampshire, is crushing approximately 100,000 cubic yards of the rock. All shot rock is being reused onsite as ledge fill, crushed stone, muck backfill or rip rap for slope work.

Roadwork on RSA's latest contract also calls for a sizeable amount of embankment material, about 360,000 cubic yards, which is either harvested onsite or supplied by RSA. The general contractor is also performing fine grading in preparation for the asphalt pavement, with Continental Paving supplying and installing about 147,000 tons of asphalt base, binder and surface course.

As with any interstate project, this contract involves considerable excavation and installation of pipe and underdrain – about 35,000 linear feet and 40,000 linear feet, respectively.

Scituate Concrete Pipe of Scituate, Massachusetts, is supplying reinforced concrete pipe and Concord Winwater of Concord, New Hampshire, providing PVC pipe. CSI Concrete Systems Inc. of Hudson, New Hampshire; Michie Corp. of Henniker, New Hampshire; and Central NH Concrete, also of Henniker; are supplying precast concrete structures for the utilities and other functions.

Large Fleet, Limited Space

Audley pointed out that they're using more than 40 pieces of heavy equipment and trucks to handle the substantial amounts of materials being moved on the project.

"We have eight excavators, three dozen, six loaders, a fine grader, 16 triaxle trucks, two water trucks, a lattice boom truck crane, a hydraulic crawler crane, and four articulated off-road trucks," he said.

"There's also a multitude of smaller pumps, trucks, attenuation devices, flat racks and other miscellaneous equipment working onsite."

Audley pointed out that the most difficult aspect of this project from a construction standpoint is the shortage of space for

equipment to maneuver and for storing materials and equipment.

"Sure it's a big job, about 8 miles long, but we're not working at an interchange so we have a very narrow working zone on each side of the Interstate mainline, which has live traffic on both barrels," said Audley.

"Because of this we have to spend a lot of time planning how to minimize the space we need to stage operations.

"As much as possible we plan just-in-time construction materials deliveries, and lay out excavation segments to balance the cut and fill, since we usually have no place to store excavated soil for future use."

Choosing a Trench Support

The lack of working space due to nearby live traffic, plus the nature of existing soil, were key considerations in the selection of a trench support system for the pedestrian box culvert.

CSI Concrete Systems is providing the precast sections for the 12-foot by 12-foot (inside dimensions) pedestrian box culvert being installed by RSA under both barrels and the median of I-93. RSA is using a Link-Belt TCC1100 Self-Assembling Crane and a Caterpillar 966 Loader to install culvert sections. The trench is supported by a double wall slide rail system supplied by American Shoring Inc. of Newburgh, New York, and RSA excavated the trench and installed the culvert with CAT 349 and 336 Excavators.

RSA Project Manager Mike MacDonald chose the slide-rail trench support system because borings showed the existing soil to be rocky material too difficult for driving steel boulders, and the required trench cut was about 30 feet deep from the road surface to the bottom of the structural fill supporting the culvert.

American Shoring engineers worked closely with key RSA personnel and NHDOT engineers to gain first time approval for this type of system on a NHDOT project.

First Phase Culvert Installation

Bill Ederly of American Shoring was on site to provide any necessary guidance for the installation of the slide rail shoring, and worked closely with RSA foreman Andy Bates to install four bays of shoring each 20 feet long by 25 feet wide by 24 feet deep for the 80-foot Phase One of a multi-phase culvert installation.

Audley installed the shoring using a CAT 349 Excavator and a CAT chipping hammer to break up the rocky soil.

Once the slide rail shoring was in place the installation crew raised the slide-rail's cross-trench rolling struts to a height of 14 feet in order to fit the box culvert's outside-to-outside dimension of 13 feet, 6 inches. Since the starting end of the culvert is on a slope, the end panel was not put in place, allowing a CAT 966 Loader to drive into the shoring from an access road on the end as if it were entering a garage. Then as the Link-Belt crane lowered a section into the shoring the CAT loader pushed the culvert sections together.

With the first 80 linear feet of culvert installed, the crew planned to remove the shoring to allow backfilling, then re-route highway traffic over the top of the back-filled first-stage of culvert. For the second phase, which runs across the median, the crew planned to install the slide rail shoring over the end of the culvert where they had left off, and continue into the median where they will install approximately 90 linear feet of culvert sections. This portion of culvert will include a 20-foot-long section with built-in skylights.

Work on the second phase of the culvert was scheduled to take place in the near future.

Progress and Cooperation

RSA is making excellent progress on its latest contract for the Rebuilding of I-93, and is expected to complete the work around June 2019, according to Ryan Audley. He attributed some of their success in expediting the project to the professionalism of the state agencies involved.

"This has been an enjoyable project to perform because the DOT and DES (Department of Environmental Services) and other state agencies have been cooperative, helpful and easy to work with," he concluded. 🚧



Inside shoring, a CAT 966 Loader passes beneath rolling strut to push culvert sections together.