

# ce NEWS

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## DRAINAGE DESIGNS

**Interstate  
reconstruction**

**Water in  
balance**

**Pipe product  
guide**



# Design-build reconstruction

## Interstate project heeds lessons from the past

### Project

I-15 New Ogden Weber (NOW) County, Utah

### Design-build partners

Michael Baker Corporation  
Weber County Constructors

### Product application

HDPE pipe, proven on a past project, provides effective stormwater drainage for additional interstate reconstruction and widening.



**E**xpansion of I-15 north of Salt Lake City is following the success of the 1997 I-15 South reconstruction that was completed just before the 2002 Winter Olympic Games. The new expansion is using the same design-build process that allowed the original reconstruction to be completed under budget and ahead of schedule, as well as some of the same materials that have proven reliable during the last 10 years.

Built in the 1960s, I-15 is Salt Lake City's primary north-south route. Increasing population and vacation traffic to prime ski areas continues to cause traffic congestion. In 2006, the population of Weber County, where the I-15 New Ogden Weber (NOW) County project is located, was estimated to be 213,247, an 8.5 percent increase from the 2000 census. The most significant growth spurt occurred from 1990 to 2000 when the population jumped about 24 percent.

When the I-15 NOW project was announced in February 2006, John Njord, executive director of the Utah Department of Transportation (UDOT), said I-15 was in urgent need of repair and expansion. Evidently, residents of Weber County agreed. A survey of residents who drive I-15 at least twice a month showed that 90 percent of respondents support the I-15 NOW project.

With the roadway too small to handle the number of vehicles, and interchanges built in the 1960s outdated, UDOT decided the route should be expanded. In 2005, the Utah State Legislature approved funding for the I-15 NOW project. The contract calls for the road infrastructure to be guaranteed for 50 years.

The two-year, \$214 million project started in the spring

The I-15 New Ogden Weber (NOW) County project is a design-build operation spearheaded by design firm Michael Baker and Weber County Constructors, a team comprising Granite Construction and Ralph L. Wadsworth Construction Company.

of 2006. About 9.5 miles of road was widened from two lanes to four lanes in each direction and 24 bridges built or reconstructed, according to UDOT's Brent DeYoung, P.E., project director for I-15 NOW. DeYoung also served as segment manager for the first I-15 expansion project. At that time, when the 2002 Winter Olympics was awarded to Salt Lake City, it prompted a massive overhaul of I-15 from Salt Lake City to Sandy, Utah. The interstate was expanded to 10 lanes.

As with the 1997 expansion of I-15, UDOT is using the design-build process for the NOW project. This allows Weber County Constructors, the selected design-build team comprising Granite Construction, Inc., and Ralph L. Wadsworth Construction Company, Inc., to begin construction before all design details are finalized. According to UDOT, taxpayers will get more value for the dollar and it will enable I-15 NOW to be completed more quickly than if all details had to be finalized before construction began.

The design-build method allows UDOT to control the job while reducing costs and moving rapidly. "We used the design-build method to great success on the original I-15 project," explained DeYoung. "Sometimes we still use the design-bid-build way, and it certainly has its place. But whenever we can, design-build is our preference. We don't have to wait. We just go. All the while, we're able to watch the costs,

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refine schedules, and maximize the efficiency of our crews because construction starts as soon as the blueprints are approved. It's also easy to make any last minute adjustments."

### Designing drainage

Michael Baker Corporation, headquartered in Pittsburgh, is responsible for project design. "On a design-build, we start out with the proposal process and work with the contractor," said Jonathan Updike, P.E., of Michael Baker and the lead drainage engineer and design engineer of record for the project. "Generally, there is a conceptual roadway design presented with the request for proposal. The design-build team prepares the design and works with the contractor so they can bid the project with the materials and quantities. The drainage design is critically tied to the overall design. So, as the roadway designs come together and we start to understand what is needed, including the components that drive drainage such as barrier locations, gutters, and detention areas, we'll do our design to capture the water off the road and meet the requirements put forth in the UDOT performance specifications."

Updike and his team of 10 designers initially started by looking at existing conditions and analyzed how water drained and requirements for the terrain throughout the project. For example, the northern half of the project is flat and every few hundred feet the water would run off the right of way into private property or irrigation facilities.

"We had a challenge trying to contain a lot of that water on site and slow it down," Updike said. "Since we increased the pavement area, there would be a greater amount of runoff that would have to be routed and contained to meet existing flow rates and outfall points. We have pretty stringent requirements to maintain existing discharge rates. So we had to go through and characterize all of the existing hydrology for the project including the existing outfall points and existing flow rates for water leaving the right of way. Our proposed design had to meet those same flow rates."

The Weber River runs through the project with crossings at two places. A large part of the runoff goes into the river and there are a number of drainage divides along the 9.5-mile route of the interstate.

The typical UDOT design criteria is for a 10-year storm event. There are sag vertical curve locations on the I-15 where the system is required to convey a 50-year storm event.

"The 21st Street Interchange is flat and there were so few defined outfall points that we just created large retention ponds with no outlet within the wide diamond infield areas of the interchange," Updike said. "Right after we completed a segment, we had several back-to-back storms and had a foot of water sitting in one of the infield areas, but it evaporated

and infiltrated into the ground — functioning as designed."

Flow controls at the retention areas were designed to limit the outflow rates and water was rerouted for longer time concentrations to a given outfall point. The flow rates in some areas, such as 31st Street near the Weber River, have fairly high existing discharge rates, about 25 to 30 cubic feet per second.

### Pipe preference

As with the original I-15 expansion completed in 2001, corrugated high-density polyethylene (HDPE) pipe manufactured by Advanced Drainage Systems, Inc. (ADS) was selected for the NOW project drainage system. On the earlier project, HDPE corrugated pipe saved money and played a critical role in completing the job on time. More than 36,000 feet of ADS N-12 corrugated pipe in diameters from 6 to 36 inches is being used on the NOW project. The majority, about 29,000 feet, will be 24-inch pipe.

The ADS N-12 pipe has a smooth inner wall to provide optimum hydraulic flow. Named for its Manning's "n" rating of 0.012, the N-12 pipe is available in diameters from 3 to 60 inches. Its structural strength from a corrugated outside will support H-25 live loads with 12 inches of minimum cover for these pipe diameters.

N-12 pipe has a watertight joint and, with an integral built-in bell and factory-installed gasket, the pipe requires no extra couplers to install. According to ADS, the joint meets or exceeds the ASTM 3212 lab test and ASTM F2487 infiltration/exfiltration field test, which helps fill an essential role in meeting the new, stricter U.S. Environmental Protection Agency guidelines. The product used for this project, ADS N-12 WT IB, includes a pressure-tested coupler that provides a watertight connection meeting a full 10.8 pounds per square inch in accordance with ASTM D3212. The UDOT contract called for air testing the pipeline to ensure a watertight seal.

ADS N-12 pipe meets the requirements for Type S pipe under the American Association of State Highway and Transportation Officials specifications M 252 and M 294. It can be specified for culverts, cross drains, storm sewers, and other types of new and rehabilitation projects.

The pipe is manufactured at the ADS regional manufacturing plant in North Salt Lake. Delivery from a local plant was another reason for selecting ADS.

"Convenience, just-in-time delivery, and the fact that we can typically drop a thousand feet of pipe on one truck load, are why HDPE pipe is a natural fit for the design-build process," stated Ryan Loader, regional sales engineer for ADS. "Plus there is an environmental side benefit. Because we can load up a large amount of pipe with each delivery, there are



Advanced Drainage Systems

In one smooth, fast operation, an excavator cuts a trench and lifts a 20-foot length of HDPE pipe into place.

drainage system. As a result, the drainage pipe is subject to frequent, strong surges of rubbish-filled water.

“The pipes are in excellent condition,” said Rick Deban, UDOT area supervisor. “Our inspection of the 30-inch-diameter pipe showed no measurable deflection or any signs of structural distress. The ADS pipe is practically maintenance free. Our crews have to frequently clean out this section of the pipe because of the amount of water that comes through it. It’s easy to route with a torpedo because it won’t grab the smooth inner wall of the HDPE pipe like it does with concrete and corrugated metal pipe (CMP). Plus we find that silt and debris tend to bond more to concrete and CMP than to HDPE.”

### Staged construction

The design-build process also called for sections of pipe to be laid and covered in phases; connections would be made at a later date. “The HDPE pipe is not as fragile as the ends of a concrete section, so we could dig and tie in without worrying about chipping the bell and spigot,” DeYoung said.

“During our phased approach to construction, we constructed the inside of the highway and shifted all the traffic to the outside existing pavement,” Updike explained. “Drainage is not so easy to design or construct in a phased approach. You have to connect the lines to catch basins as soon as you have traffic, and the water needs to go somewhere. So we had a lot of overnights when a section was shut down. The pipe crews quickly excavated and laid culvert crossings or drain outfalls to the outside so we could get water out temporarily. That was an advantage of the ADS pipe from a constructability standpoint. The contractors like the long length of pipe; they can quickly lay it and it’s easy to maneuver around.”

Soil conditions were also a factor in the design. The Great Salt Lake with its high concentration of salt is in the lower part of the elevation so it didn’t directly affect the project, but it was still a consideration.

“We didn’t identify any really hot soil,” Updike explained. “But some soils were considered to be a little more basic or acidic than others. According to UDOT pipe specs, HDPE meets the highest classification for corrosivity.”

With confidence gained on the nation’s first major design-build project and the ability to examine pipe in service for more than a decade, the I-15 NOW team remained on budget and on schedule. ■

fewer trucks on the road. This saves time, money, and cuts down on dust and dirt, too.”

According to DeYoung, “Because of the success on the original I-15 project, UDOT has continued to allow HDPE pipe as an equivalent alternative to reinforced concrete pipe on high-volume roadway projects. In 2005, UDOT updated its specifications to further define the design and installation requirements for HDPE pipe.”

Prior to commencement of the new project, UDOT inspected the previous work, the first sections now nearly 10 years old. An area that sees the most use was selected for the test. North of mile marker 296 on I-15 in Sandy, Utah, the UDOT crew cleared two inlets to allow access to the pipe. Because this section of the interstate is elevated, barrier walls line the shoulder and establish the median. All stormwater runoff and debris on the road surface, therefore, enters the

This article was contributed by Advanced Drainage Systems, Inc. ([www.ads-pipe.com](http://www.ads-pipe.com)), Hilliard, Ohio.



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