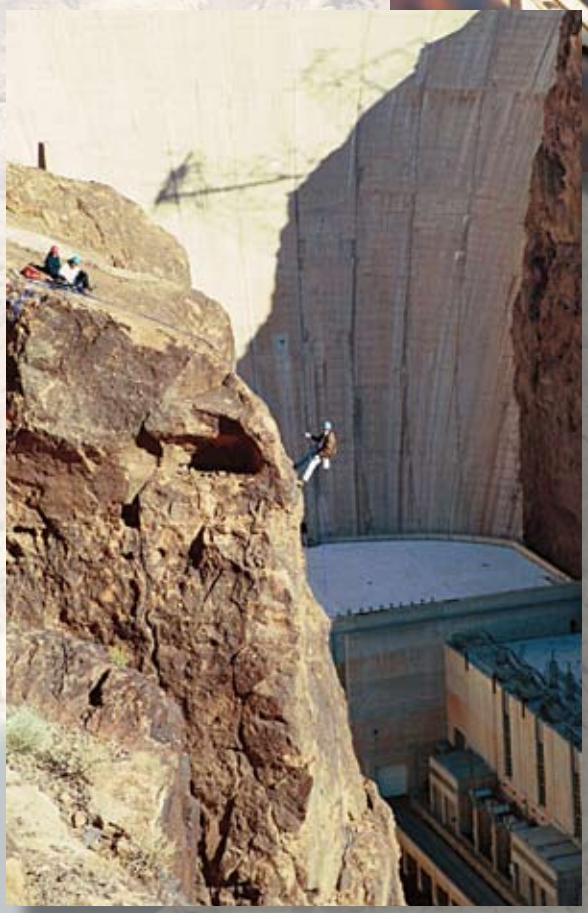
HDR's impressive growth has expanded its capabilities to better serve clients' needs



The centerpiece for the Hoover Dam Bypass Project is the Colorado River Bridge, a 2190-ft-long concrete arch structure expected to be completed in 2010. The bridge will span the Black Canyon nearly 900 ft above the Colorado River. Photos courtesy of AMEC.

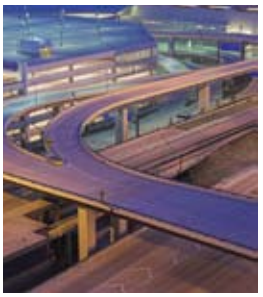


Photo courtesy of Stephen Gould.

Rendering courtesy of T.Y. Lin International.

THE RIGHT BRIDGE FOR THE RIGHT REASONS

By Craig A. Shutt

Rob Turton, Vice President and National Technical Director for Bridges

"Compared to 15 years ago, our expertise has grown substantially. We now can do things we could never have done in the past."

HDR, Inc. has seen phenomenal growth during the past decade, watching its revenues and employees more than quadruple in that time. It has added a wide range of complementary services and offices throughout the country that have expanded the company's markets and expertise. That growth has not made them lose sight of their founders' original philosophy, even as they evaluate new technologies that help expand their capabilities.

"Our motto back in our early years was 'Work Well Done,'" says Rob Turton, Vice President and National Technical Director for Bridges for the Omaha, Nebraska-based company. "That work ethic is part of our heritage and tradition. Today, our unofficial motto is, 'Do the right things for the right reasons.'" This year, the company is celebrating its 90th anniversary by reflecting on where it's been and preparing for the future.

Because of its extensive portfolio and diversity of work, it's difficult to define the HDR style for bridges, Turton says. "There is no specific style, but there is a philosophy. We have to develop solutions that are extremely project specific, and that doesn't allow us to force a particular style. The design has to be honest if it's going to stand the test of time. Our goal is to provide a full spectrum of options, so we can create the right bridge for the right reasons."

Those reasons have become diverse and complicated. "It's a new world compared to even 20 years ago," he says. "We have to make decisions about the structure type, materials, technologies, DOT preferences, public involvement, federal requirements for funding, and many other aspects that might not have been considerations in the past. You can't develop designs in a vacuum today."

Hoover Dam Bypass Bridge Construction.
Photos courtesy of Chris Offe/FHWA-CFL.

Aggressive Expansion Launched

The company's official slogan of One Company, Many Solutions has come to life in recent years as HDR embarked on an aggressive expansion program. The process began in 1996, when a group of 40 managers, led by President/CEO Richard Bell, bought back the company from its French parent of 13 years, Bouygues. The executives shared ownership with all employees through an Employee Stock Ownership Plan that had been established in the 1970s.

Shortly after this buyback, the company embarked on a strategy of buying small engineering and architecture firms to expand its expertise and national reach. That program expanded dramatically in 2006 with the purchase of nine companies across the country. Past acquisitions have included such firms as HLB Decision Economics in Washington, D.C. and Ottawa, Ontario, Canada, which advises corporations and government agencies.

"We've been experiencing phenomenal growth for a number of years, because we have a cadre of leaders with the vision to go to the next level," says Turton. "It's been interesting for me, as I joined the company in 1997, when we had about 1600 people in 65 offices. Now we have about 6000 people in 140 offices."

'. . . The need for good aesthetics has dramatically increased . . .'

That growth has been driven, he notes, by a strong market for their services. "It's important that we've had growing, solid markets with demand. But our expertise and ability to help clients has expanded, as well. Our goal is to be a full-service, extraordinarily diversified organization. Compared to 15 years ago, our expertise has grown substantially. We now can do things we could never have done in the past."

Such broad expertise is required today, he says, because owners' needs have expanded in many ways. "Our DOT clients are dealing with more diversity and more special challenges than ever." When the country's infrastructure was being greatly expanded during the 1950s, he notes, the goal was to build the projects quickly, and aesthetics weren't an issue. The result was a number of cookie-cutter designs. "Today, design drives a lot of projects, and the need for good aesthetics has dramatically increased, especially with the increased public involvement in the process."

Bridge designs are much more focused on being context-sensitive, he notes, but there are additional challenges as well. Speed of construction, and remaining in line with FHWA's "Get in, get out, stay out," philosophy, are paramount, as is maintenance of traffic while work progresses. "That wasn't as big a concern 20 years ago, because the roads weren't as full." Speed of construction and maintaining access are more often than not conflicting goals, requiring a delicate balance that creates new challenges. "Owners today want you to do it all—and they want you to do it well and very quickly."

The AASHTO Load and Resistance Factor Design Specifications adds another layer of challenges, he adds. "It's a more appropriate approach, certainly, but it's more robust and cumbersome. There is still a lot of work to be done to incorporate the specifications into the process."

Concrete Aids Designs

Concrete aids with many of these considerations, he acknowledges. "The material we ultimately use varies based on the bridge's needs, as is the selection of a cable-stayed, arch, or girder bridge. We didn't wrestle with as many factors to find an option 30 years ago. We've built bridges from wood, concrete, and steel, when each provided the best solution."

Concrete, he explains, "has absolutely phenomenal features. Number one, it's an extraordinary medium. You can create any shape you want, as if you are baking a cake. It's incredibly flexible in that sense." Precast concrete in particular becomes the material of choice for many projects where maintenance of traffic and speed of construction are both desired.

"Precast concrete plays to that extraordinarily well. And as designs and technology progress, we are better able to use it anywhere, not just in areas with low seismicity." That's important, he adds, because, "We are now identifying earthquake potential in many parts of the country that previously were not considered high-seismic zones."

Regional expertise can be a key factor in guiding the selection process, he says. "Concrete is the material of choice in many parts of the country, and it helps if you can design to the local industry's experience," he explains. "In some regions, 90 to 95 percent of the bridges are made with concrete, especially if there is a solid precasting industry in the area." In some areas, notably the southwest and parts of the southeast, he says, "the use of steel is limited because of the concrete expertise."

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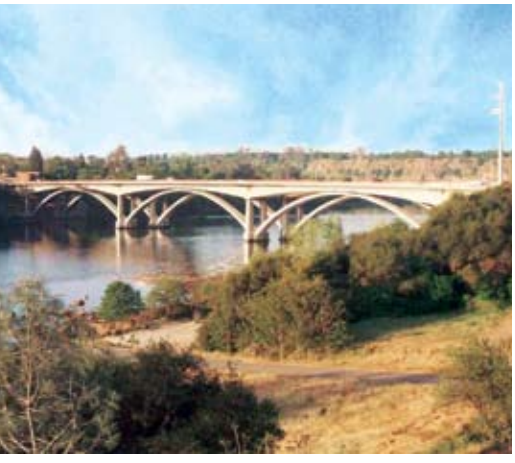
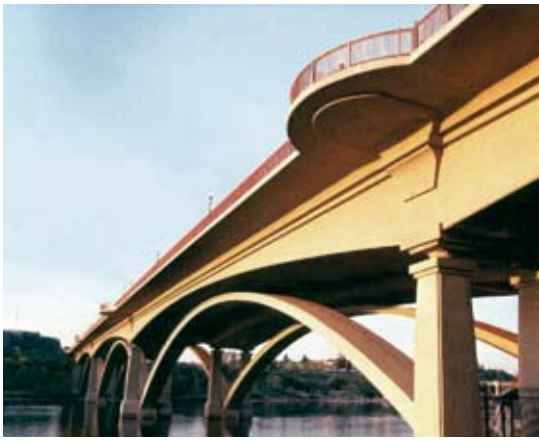


Lightweight Concrete Offers Advantages

Advances in concrete technology have expanded the applications for bridges, he notes. An example can be seen in the company's use of lightweight concrete in the Lake Natoma Crossing in Folsom, California. City officials wanted to add a bridge to span the American River where it widens to form the lake. HDR's design features graceful arches and pleasing architectural details that are visually compatible with the nearby 1917 Rainbow Bridge and the adjacent historic district. Those details include decorative brackets supporting the 4-ft overhangs, with columns and capitals resembling the Rainbow Bridge's architecture.



The Lake Natoma Crossing in Folsom, Calif., consists of a 2300-ft-long concrete box superstructure with three 328-ft-long main spans over the lake. Lightweight concrete helped reduce costs on the project.

'Someday, I expect we will have a super concrete.'

The 2300-ft-long bridge features a post-tensioned concrete box superstructure consisting of three 328-ft-long main spans over the lake with decorative arches beneath. To minimize cost, the superstructure was constructed with lightweight concrete and supported on seismic isolation bearings placed at the top of the columns and abutments. Foundations consist of large-diameter drilled shafts, penetrating the lake bottom into solid granite for protection against seismic forces and scour effects.

The design was completed ahead of schedule and below budget. "The combined use of lightweight concrete and seismic isolation bearings saved more than $2.5 million in construction costs," says Turton. "Public acceptance has been high."

The use of lightweight concrete currently is reserved for specialized cases, he notes, but that could change soon. "The lightweight concrete industry has a challenge in gaining general acceptance, and it's not there yet, particularly due to cost," he explains. "But if it provides a way to accomplish a specific solution, the cost can be justified."

The use of lightweight concrete, as well as self-consolidating concrete, high performance concrete, and other new technologies will continue to expand, he adds. "We're gaining more superior products every year. Someday, I expect we will have a super concrete with all of these benefits. But there are costs associated with these advantages, and we have to be sure we are using them where the benefits can justify the additional expense. When there are compelling reasons for its use, we definitely consider it."

HDR designed renovations for the historic Ford Parkway Bridge, Minn., which spans the Mississippi River to connect Minneapolis and St. Paul. The project involved one of the largest reinforced concrete bridges in the state.

HDR's Early Years

H. H. Henningson, a dynamic and personable engineer, began his career in the early 1900s selling energy products and engineering services to clients in Omaha, Nebraska. With the Midwest quickly emerging from the frontier following World War I, he established the Henningson Engineering Co. in 1917 and began working with the City of Ogallala, Nebraska.

The company grew through the electrification of rural communities in the 1930s and continued its expansion into the 1950s. In the 1930s, Charles Durham joined the firm and married Henningson's daughter. The two men, along with partner Willard Richardson, changed the firm's name to Henningson, Durham & Richardson, Inc.

Following Henningson's death in 1958, Durham spurred the company's growth, opening offices nationwide, starting with one in Colorado Springs, Colorado. The firm added an architectural department in the mid 1950s, becoming the first company to use airplanes to visit sites around the country.

It greatly expanded its international work during the 1960s, working throughout South America and the Far East. The company was bought by Bouygues S.A. in Paris in 1986, but was bought back by 40 managers in 1996.

Today, the company employs about 6000 people—an increase of more than 4000 in the past decade. Revenues for 2006 were approximately $700 million from 140 offices. The company ranks as the eighth largest nationally for bridge work, 10th largest for transportation and water supply projects, and in the top 20 for mass transit and rail.

HDR designed the new five-span continuous cast-in-place, post-tensioned concrete box-girder underpass carrying aircraft across Sky Harbor Boulevard at the Sky Harbor International Airport in Phoenix. The structure, 400 ft long by 214 ft wide, was designed to accommodate an aircraft load of approximately 2 million pounds.

Renovation Growing Rapidly

The country's deteriorating infrastructure, which has not kept up with maintenance needs, will drive more bridge designs in coming years, as well as the use of concrete with those designs, he says. "There's not enough capacity on our roadways, and maintenance hasn't been kept up since we finished building the interstates. As a result, DOTs are spending more and more time revisiting facilities."

Replacing bridges requires more than swapping out parts, he notes. Because of the bridges' ages—one of the key reasons they're being renovated in the first place—historical concerns can come into play. Seismic retrofits also are driving a lot of work on bridges that otherwise might still be sound. "Some of our infrastructure is obsolete, but some can be upgraded, as long as the landmark features are retained. It takes considerable thought and effort to restore these bridges, but we're seeing more of it."

An example is the Ford Parkway Bridge or the Intercity Bridge, which spans the Mississippi River between St. Paul and Minneapolis, Minnesota. Built in 1927, the 1523-ft-long reinforced concrete arch bridge carries vehicles, bicycles, and pedestrians, but it needed upgrading. The open-spandrel, two-rib, continuous-arch bridge, is listed on the National Register of Historic Places, requiring even more sensitivity in its renovation than most bridges.

The bridge features three main arches, each about 327 ft from pier to pier, flanked by two 158-ft-long arch spans, and six conventionally framed approach spans of varying lengths. One of the largest reinforced concrete bridges in the state, the structure was suffering from spalling and corrosion at and below the expansion joints.

Traffic continued to use one lane in each direction on one half of the bridge during the three-year project. To control stresses and deflections in existing members, the middle 50 percent of an

arch was removed and replaced first. After the middle portion of adjacent arches had been replaced the portions over the main pier were replaced. For each portion, the deck and all longitudinal beams except the spandrel beams were removed first, along with floor beams, brackets, spandrel beams, and columns at the existing expansion joints. At other locations, existing columns and floor beams remained to provide rigidity and lateral support.

'The transportation market has expanded far beyond roads and bridges.'

Reconstruction began with casting columns and floor beams at the fully removed locations, followed by spandrel beams that longitudinally connected the new members with the existing structure. To upgrade the bridge, 148 new post-tensioned cantilever brackets extending from the columns and supporting the shoulder and sidewalk were created. Concrete posts at the end of the brackets support the new metal railing, which had to be upgraded from the original concrete design due to new safety requirements.

Transportation Field Expands

The company's expansion also has led it into new areas that show how the industry itself has grown, he notes. "The transportation market has expanded far beyond roads and bridges," he says. "We are involved in transit, heavy-rail, commuter, and airport projects. We want to offer a full-spectrum approach."

An example of that work is the major capital-improvement program underway at the Dallas/Fort Worth Airport. The $2.7-billion program includes $244 million in infrastructure improvements, $882 million for a new automated people mover, and $1.2 billion for a new terminal. HDR's work focuses on designing access roadways, including nine cast-in-place, post-tensioned, concrete box-girder bridges totaling 134,000 ft^2 of bridge deck, as well as a precast, prestressed concrete beam bridge. Also included is 323,000 ft^2 of tri-level cast-in-place concrete beam-and-slab structures linking the new terminal to the existing roadway system.

The firm also has taken on the high-profile Hoover Dam Bypass, which includes the Colorado River Bridge project as its centerpiece. The nearly 2000-ft-long concrete arch bridge, expected to be completed in 2010, will span the Black Canyon and connect the Arizona and Nevada approach highways nearly 900 ft above the river.

The complexities of today's work require more from new engineers entering the field, he says. "A bachelor's degree used to equip you well for this work, but now, you really need a master's degree. You need that extra academic training to be able to hit the ground running."

Hitting the ground running is important at HDR, which continues to expand its offices and staff. "We're excited about the future," he says. "We're looking to continue to grow and add more resources. And barring some type of major catastrophe affecting the economy, I don't see anything that's going to slow us down. The market remains strong, our growing population is demanding more transportation, and there is a definite need for more infrastructure improvements. We're always looking for new expansion opportunities, as we think continued growth fits well with our strategic needs."

For more information on these or other projects, visit www.aspirebridge.org.

Photos courtesy of Stephen Gould.

Construction of a new terminal and infrastructure improvements at the Dallas/Fort Worth Airport includes construction of nine cast-in-place, post-tensioned, concrete box-girder bridges and a precast, prestressed concrete beam bridge.