INSPIRING A REGION

SHAPING THE FUTURE

St. Louis offers standout examples of engineering excellence, a foundation Burns & McDonnell is proud to build upon

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A REGIONAL APPROACH

St. Louis has done more than establish a gateway to the West, blaze a trail to new frontiers and build a legacy of baseball excellence. The region also has fielded a lineup of engineering achievements that continue to serve with quality and consistency — a standard that inspires today's forward-looking professionals at Burns & McDonnell, where our plans, designs and solutions make a difference here and abroad, now and in the future.

Our regional office in St. Louis opened in 1989, which was 90 years after Clinton S. Burns and Robert E. McDonnell had completed their first year as professional engineering partners across the state in Kansas City. Today our combined regional presence — in Chesterfield, Mo., Fenton, Mo. and O'Fallon, Ill. — employs more than 200 full-time professionals providing innovative and cost-effective solutions in aviation, roads and bridges, cybersecurity, water and wastewater, labs and clean rooms, electrical transmission and distribution, power generation, defense facilities, and air quality improvements.

Among our inspirations is the strong sense of place we feel here in St. Louis, a solid foundation for everything we do. Some of the region's finest examples of engineering and imagination are featured in the following pages, along with a few of our own projects that continue to build upon our firm's core mission: **Make our clients successful.**

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Union Station

Built for $6.5 million in the 1890s — which would translate to about $175 million today — Union Station in St. Louis at one time served as the world's largest and busiest train terminal. Today it appropriately stands as a testament to the region's strength, given that hometown architect Theodore Link modeled the grandiose complex after Carcassonne, a walled, medieval city in southern France. A barrel-vaulted ceiling rises 65 feet above the floor of the Great Hall. The Midway stretches longer than six football fields and spreads 70 feet wide, having once handled more than 100,000 passengers per day. And the Train Shed, at 11.5 acres, opened as the largest single-span train shed ever constructed and once covered 32 tracks, the most for the era. Today, all three sections endure thanks to a $150 million restoration in the early 1980s. The complex — a landmark on the National Register of Historic Places — is home to restaurants, shops, gathering spaces, entertainment and a hotel. In 2013, Lodging Hospitality Management, Union Station's owner, launched a new, extensive renovation to hotel rooms and meeting spaces. Also planned is the return of excursion trains featuring plush accommodations and fine dining.


Mashing Process

Anheuser-Busch Brewery

The Anheuser-Busch Brewery introduced a number of firsts to the beer industry. The brewer was the first in the United States to use pasteurization, which enabled long-distance shipments without spoiling. The company went on to introduce artificial refrigeration, refrigerated railcars and rail-side icehouses to extend deliveries nationwide. Beginning in 1892, the company's Brew House — six stories tall, with a clock tower extending upward another two stories — accommodated six kettles that together produced 1.8 million barrels of beer annually. Expansions since then have boosted the building's annual production to 15.8 million barrels, and the Romanesque structure endures as the heart of the St. Louis brewery. The entire complex covers 119 acres, includes three buildings designated as national landmarks, and anchors a network of a dozen breweries in the United States.

"The art in the simple ingredients, the tradition of the brewmaster and the legacy of the historic red brick buildings. The science in the logistics of material handling, the precise control of the brewing process and the incredibly fast packaging equipment. This brewery is engineering at its best."

— Tim O'Mara, PE
Engineering Manager

INSPIRING A REGION, SHAPING THE FUTURE

Gateway Arch

The Gateway Arch, opened in 1967, reaches 630 feet high and stretches 630 feet across at its base along the bank of the Mississippi River. It is an iconic example of clean architecture and solid engineering: Eero Saarinen's design for a Jefferson National Expansion Memorial, to commemorate Thomas Jefferson's execution of the Louisiana Purchase and vision for an America that reached all the way to the West Coast. Turns out that the shape of the project's prominent component — the Arch — is an inverted version of catenary curve: the shape a heavy chain would take when hanging freely between two supports. Coincidentally, in 1788 Jefferson recommended use of a catenary arch instead of a circular one for an iron bridge that Thomas Paine was planning to build. As scholars have noted, Jefferson — an architect himself — likely would have been pleased to see a catenary curve provide the foundation for the design of the country's largest monument built in the 20th century, one raised in honor of the third president himself. The shape required extensive engineering: Because such a curve carries a relatively high center of gravity, engineers reinforced the bottom 300 feet of the arch by pouring concrete into the space between the Arch's stainless steel surface and its structural steel interior. That concrete alone weighs 12,127 tons, or more than twice as much as all the steel in the Arch itself. The concrete total doubles again for the foundations, each of which reaches six stories below ground.

Eads Bridge

The Eads Bridge, completed in 1874, was more than an early and essential crossing of the Mississippi River. It was the world's first bridge to be made of alloy steel, first to use tubular cord members, and first to support a superstructure solely with cantilevers. James Buchanan Eads, a self-educated engineer, used pneumatic caissons to sink piers to bedrock — a first in the United States — and invented the sand pump to remove gravel, sand and silt from the iron casings to permit uninterrupted construction. The bridge still stands strong today, in use for rail and auto traffic.

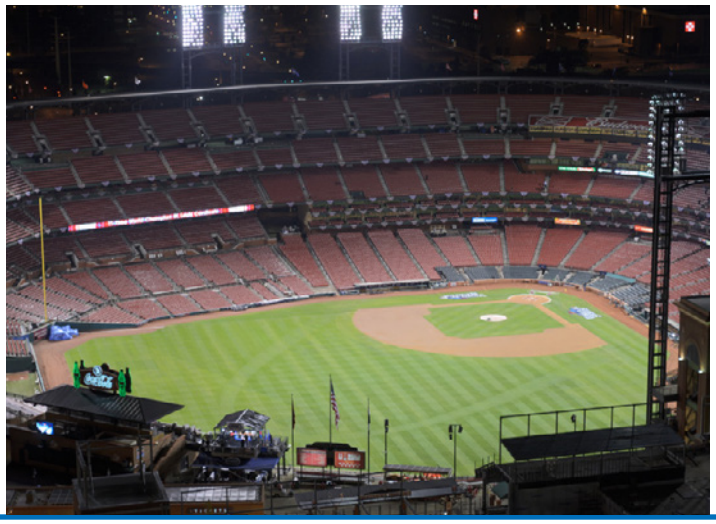
"Eads looked at a problem — how to cross the Mississippi — and turned countless challenges into solutions, ones that advanced the profession. I'm glad we get to see and use the Eads Bridge today. It's an enduring example of what forward-thinking engineering can do."

— Kevin Heffern, PE, SE
Senior Structural Engineer


Adam's Mark Hotel

Busch Memorial Stadium

This circular, multipurpose replacement for the original Busch Stadium opened in 1966 as Civic Center Busch Memorial Stadium, the focus of a downtown revitalization project. The stadium featured a “crown” of 96 open arches surrounding the field from high above, an architectural nod to the nearby Gateway Arch. The stadium was home to the National Football League’s St. Louis Cardinals until 1987 and, briefly, the St. Louis Rams in 1995. But the stadium was best known as the home of the baseball Cardinals, who won the National League pennant six times while playing in the stadium, which welcomed World Series games in 1967, 1968, 1982, 1985, 1987 and 2004. Early on the baseball club engineered its roster with the stadium’s artificial turf in mind, assembling a team blessed with speed both to defend and take offensive advantage of expansive outfield gaps. Little-known fact: Per direction from the National League, the stadium was designated for home Chicago Cubs playoff or World Series games — should such games become necessary — from 1986 through 1988, until lights finally were installed at Wrigley Field. The stadium’s precursor, Sportsman’s Park, was renamed Busch Stadium in 1953 when Anheuser-Busch bought the St. Louis Cardinals baseball team. The multipurpose stadium, named Busch Memorial Stadium, was vacated at the end of the 2005 season, then demolished as the Cardinals moved into a new, baseball-only stadium next door.



"It's easy to forget how much aviation history is built into Lambert Airport. From becoming the nation's first municipally owned airport, in 1928, to the recent successful modernization of the the historic 1950s Terminal 1 facility, Lambert continues to exemplify the spirit of St. Louis."

— Jim Rosick, PE, LEED AP, Aviation & Federal Group Leader

Lambert-St. Louis International Airport

Lambert-St. Louis International Airport remains the region's major center for air traffic, and its influence and history continue to inspire and endure. The airport's four-domed terminal — built in 1956 to accommodate rising passenger traffic following World War II — remains in service today. The design also inspired larger terminals that would be built at John F. Kennedy International Airport in New York and Paris-Charles de Gaulle Airport in France. Back in 1929, the airport was the first in the United States to employ air traffic control — in the form of Archie William League, who as the nation's first air traffic controller waved flags at planes from an umbrella-covered wheelbarrow. After installation of a radio tower he became the airport's first radio controller and went on to earn an aeronautical engineering degree from Washington University in St. Louis. League eventually became director of air traffic service for the Federal Aviation Administration.

McDonnell Planetarium

The hyperbolic structure — designed by St. Louis architect Gyo Obata, of Hellmuth, Obata + Kassabaum (HOK) — is itself a feat of engineering: a poured-concrete shell, virtually all of it no more than 3.5 inches thick, supported by 12 pillars around the edges. Built in 1963, it is named for a major benefactor: James S. McDonnell, founder of McDonnell Aircraft Corp., the St. Louis-based company that built Mercury and Gemini space vehicles.

Cathedral Basilica of St. Louis

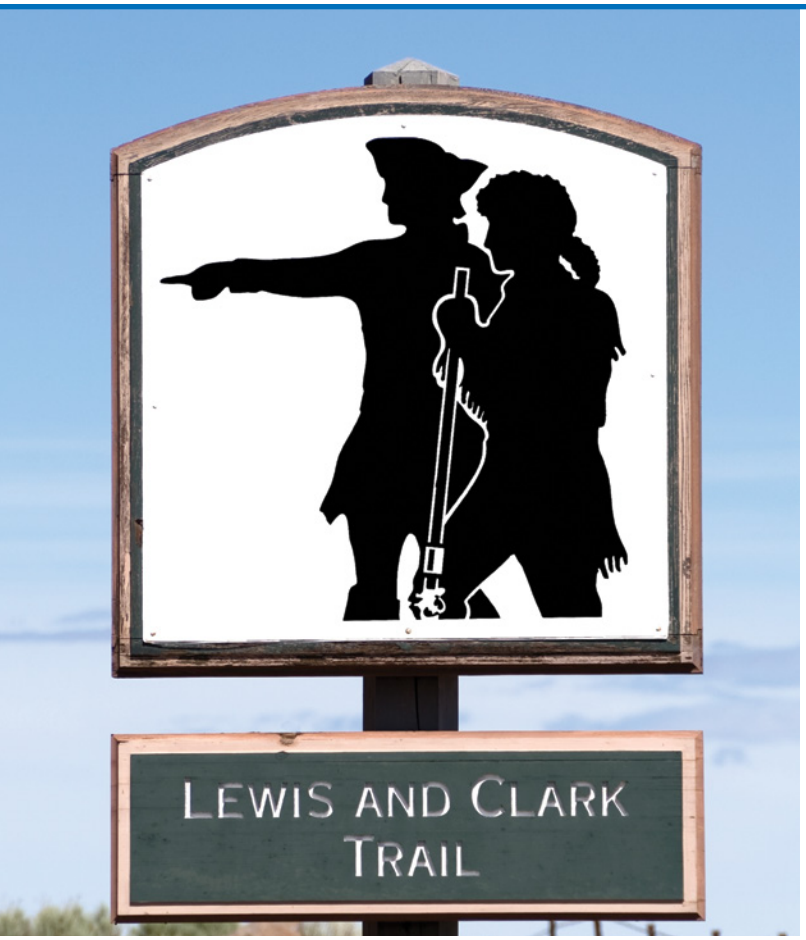
The architecture firm of Barnett, Haynes & Barnett won a competition in 1906 to design the new cathedral, a Romanesque and Byzantine structure opened in 1914 that today features a large dome, two towers and — completed in 1988 — interior mosaics containing more than 41 million pieces of glass covering 83,000 square feet. In 1997, Pope John Paul II designated the cathedral a basilica, a place of worship of special distinction, and he led a prayer service there in 1999.

MetroLink

The light rail system serving the St. Louis metro area debuted in 1993, and today includes 37 stations, stretches for 46 miles and accommodates more than 1 7 million boardings a year for people traveling to and from Lambert-St. Louis International Airport; Shrewsbury, Mo.; downtown St. Louis; and communities as far east as Scott Air Force Base near Shiloh, Ill. Commercial and residential development along the system has amounted to more than $2 billion during the past two decades.

River des Peres Sewage and Drainage Works

Flooding from a 1915 storm that dropped 11 inches of rain in just 17 hours led to the River des Peres Sewage and Drainage Works. The $11 million project, from 1924 to 1933, used advanced techniques for hydrologic computation and installation of large-diameter reinforced concrete pipe, earning the project designation as a Historic Civil Engineering Landmark by the American Society of Civil Engineers. Today it serves as the backbone for the 110-square-mile St. Louis drainage basin.



Lewis and Clark Trail

As Capt. Meriwether Lewis, 2nd Lt. William Clark and their Corps of Discovery departed St. Charles, Mo., in May 1804, their venture into the wilderness of the American West traversed what would become 11 states en route to the Pacific Ocean, establishing a course for settlement that thousands would follow. They returned to St. Louis and reported their findings in September 1806. Today the Lewis and Clark National Historic Trail extends for more than 3,700 miles, from the western edge of Illinois through Missouri, Kansas, Nebraska, Iowa, South Dakota, North Dakota, Montana, Idaho, Washington and Oregon.

Mississippi River Barge System

Billions of tons of grain, rock, oil, coal, fertilizer, lumber and more float up and down the Mississippi River, and St. Louis is at the heart of this critical commercial activity. The Port of Metropolitan St. Louis — defined as 71 miles of the Mississippi River and including both sides of the river — ships and receives millions of tons of commodities, ranking it as the country's second-busiest inland port and among the top No. 20 overall.

OUR WORK

All of us in the St. Louis Office of Burns & McDonnell are proud of our region's heritage and we work each day to help build a successful future for the area. In all cases, our employee-owners take the company's mission seriously: Make our clients successful. We know, better than anyone, that our success flows from that of our clients. Here's a look at a few of our projects that promise to endure and excel for years to come.

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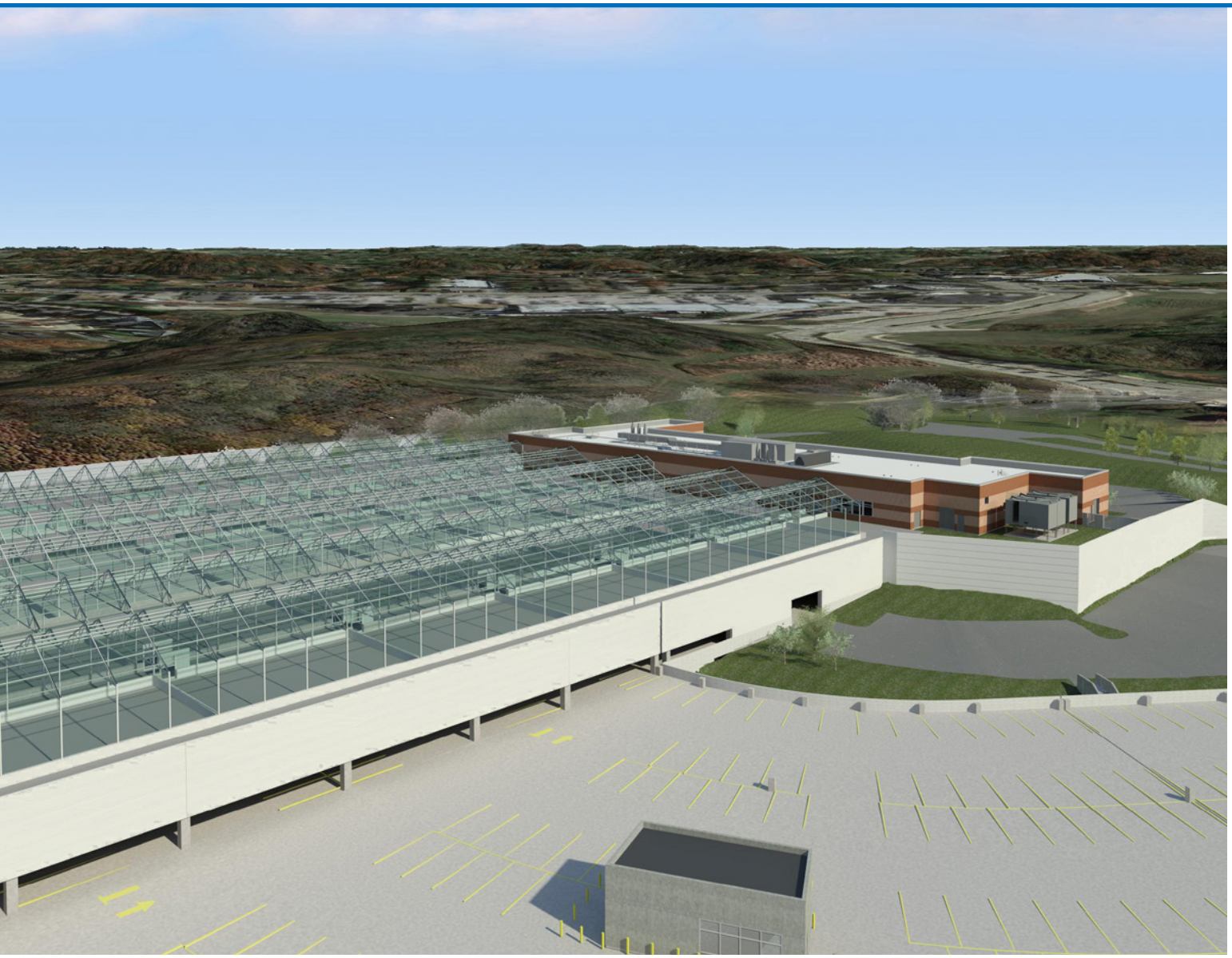
Flare Gas Recovery

With ConocoPhillips (now Phillips 66) facing a 17-month deadline to recover and treat all routine flared gas from the company's Wood River Refinery just outside of St. Louis, Burns & McDonnell employed modular design and construction support to deliver projects that went online and secured Environmental Protection Agency approval ahead of schedule.

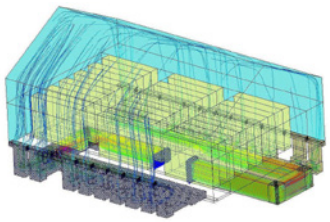
Biorefining Project

Burns & McDonnell engineers in St. Louis provided design-build services for ZeaChem Inc.'s 250,000 gallon-per-year cellulosic biorefining demonstration plant in Oregon. The plant uses a hybrid biochemical and thermochemical process, based on fermentation that does not produce carbon dioxide, to create cellulosic ethanol and biobased chemicals, offering a potentially viable solution for commercialization.



Monsanto Greenhouse & Headhouse Facility

As part of Monsanto's Chesterfield Village Expansion, Burns & McDonnell provided front-end planning and feasibility support for the Greenhouse & Headhouse Project, a state-of-the-art, 150,000-square-foot structure that includes sealed, conditioned zones. Planning included coordination with many other design firms, each representing a portion of the overall expansion project, including a three-story parking garage to be built beneath the greenhouses. The structure is designed to an American Institute of Architects-recognized Building Information Modeling (BIM) Protocol 300/400 Level, and includes the use of software to coordinate a reduction in the project's overall costs and timeline.



Scott Air Force Base

A five year contract provided definite results for the U.S. Air Force. Burns & McDonnell delivered planning, design and construction services for aviation projects at Scott Air Force Base that included airfield aprons, taxiways, runways, lighting, design of hangar repairs, administrative facilities, terminals, flight operations centers, fire stations, security projects, hydrant fueling systems and facility upgrades. The $1.2 million Air Mobility Command Center Heritage Hall showcases Air Force achievements in air mobility and refueling. The design itself was honored with a Merit Award for Interior Design.

Daniel Boone Bridge

Burns & McDonnell is engineer of record on a new span for the Daniel Boone Bridge, a $125 million design-build project to cross the Missouri River. The project includes a bridge for auto traffic, plus a protected bike-pedestrian lane between the Chesterfield and Katy trails.

Transmission Capacitor Banks

Having opted to close several coal-fired power plants in Illinois to meet mandated environmental standards, Ameren moved to boost voltage support along its transmission system. That included hiring Burns & McDonnell to design and manage installation of seven 138-kV capacitor banks, providing stability as the banks were connected to existing substations.

Overflow Control Plan

More than 80 years after the River des Peres Sewage and Drainage Works came online, the St. Louis Office is compiling a three-phase system improvement plan for the Metropolitan St. Louis Sewer District's sanitary sewer systems, which together serve more than 1 million people in the metro area.

Boschert Trail

Lewis & Clark blazed a trail. Nearly 200 years later, Burns & McDonnell broke ground closer to home for the Boschert Trail, a hiking/biking greenway between New Town Boulevard and Fox Hill Park, a first in St. Charles for the Great Rivers Greenway District.

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