Seattle Daily Journal of Commerce

ACEC2023

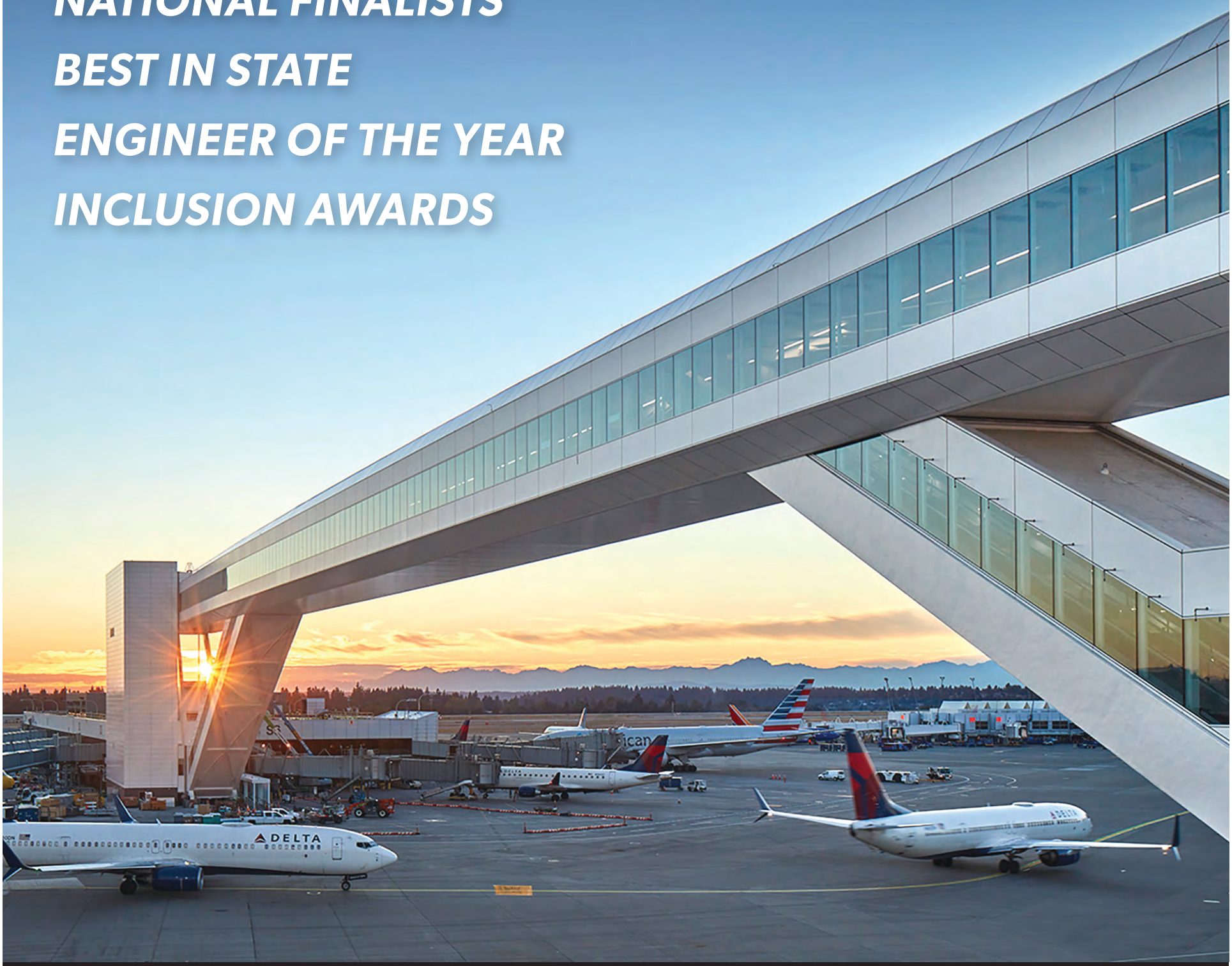
ENGINEERING EXCELLENCE AWARDS

NATIONAL FINALISTS

BEST IN STATE

ENGINEER OF THE YEAR

INCLUSION AWARDS



February 6, 2023

NATIONAL FINALIST: PLATINUM AWARD

TRANSPORTATION

The new Grand Hall for international arrivals at Seattle-Tacoma International Airport.

PHOTO COPYRIGHT SOM/DAVE BURK

KPFF Consulting Engineers

Project: SEA International Arrivals Facility
Client: Port of Seattle

The Port of Seattle recently opened its new International Arrivals Facility, replacing a 1970s facility with a dynamic structure nearly five times in size, doubling capacity and significantly speeding up the international arrivals process. Prior to the pandemic, Seattle-Tacoma International Airport experienced nine years of record-setting passenger growth, which the existing international facilities could not accommodate.

Upon arrival, passengers are greeted by a 780-foot-long aerial walkway 85 feet above an active jet taxilane. At the end, travelers enter the soaring Grand Hall, a multi-level, 450,000-square-foot light-filled space with an expanded baggage claim area and enhanced U.S. Customs and Border Protection facilities with staff offices. The new secure international corridor along the existing Concourse A can be configured to accommodate eight widebody aircraft gates for international flights with direct access to the IAF, or easily switch for a greater number of narrow-body domestic aircraft, depending on air traffic and airline needs.

Constructability constraints and a challenging environment required a creative structural system and construction process. It was critical for the port to maintain continuous airport operations with minimal interruption during construction. This meant that extensive phasing was required, so that only two gates were closed at any time.

Prefabricating many of the structural components saved time and space, including the 320-foot-long center span of the aerial walkway. The prefabricated center span weighed more than 1,500 tons and included deflection-sensitive systems, such as exterior cladding, plumbing and a moving walkway. This innovative construction process reduced active taxilane closures by at least 10 weeks and was key to maintaining critical operations at the airport.

The IAF features a unique aerial walkway that is the longest of its kind in the world. Spanning 600 feet and nearly 800 feet in total length, the new walkway soars 85 feet above the ground, allowing wide-body aircraft to taxi underneath. Striking views of nearby Mount Rainier greet visitors, orienting travelers amid the take-offs and landings on adjacent runways. The walkway connects arriving international passengers from the South Satellite across the top of Main Terminal to the new IAF. Innovative engineering allowed this steel structure to achieve its long span with minimal size and materials. The engineers created an economical structural design and saved hundreds of tons of steel by using cable trusses, steel pins, tuned mass dampers, and slide bearings.

Structural elements are prominently exposed throughout the Grand Hall including longspan (up to 165 feet) inverted kingpost roof trusses. The trusses feature high-strength tension cables and custom, tapered angle assemblies that form each center V-post. Supporting each truss along the west side of the building are precast concrete shear walls that range in height from 42 feet to 80 feet to match the sloping roof geometry.

The precast walls serve double duty as gravity support for the roof and lower levels, and for resisting seismic and wind loads in the transverse direction of the building. This allows for a column-free space throughout the new concourse level.

ON THE COVER

An aerial walkway carries passengers over a live jet taxilane to connect to the new Grand Hall at Seattle-Tacoma International Airport. The project, called the International Arrivals Facility, won a Platinum Award from ACEC Washington. PHOTO COPYRIGHT SOM/DAVE BURK

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KPFF WINS TOP AWARD FOR SEA-TAC IAF PROJECT

KPFF Consulting Engineers is the top winner in the American Council of Engineering Companies of Washington's annual Engineering Excellence Awards program. The firm took the Platinum Award for the International Arrivals Facility at Seattle-Tacoma International Airport, featuring an ingenious 780-foot-long aerial walkway 85 feet above an active jet taxilane.

Sponsored by ACEC's Washington state chapter, the awards program recognizes projects that represent a wide range of engineering achievements and demonstrate the highest degree of skill and ingenuity. Nineteen projects were honored in this year's program, as well as the Engineer of the Year, and two awards for diversity and inclusion. The top national awards will go on to compete in the ACEC national competition in Washington, D.C.

Project entries were evaluated by a five-judge panel: Robert Axley, engineer emeritus, Wood Harbinger; Steve Johnston, engineer emeritus, Landau Associates; Supriya Kelkar, senior design manager, Sound Transit; Benjamin Minnick, construction editor, Daily Journal of Commerce; and Kathy Robertson, engineer emeritus, Picketts Engineering.

ACEC Washington is a professional trade association representing consulting engineering, land surveying and affiliated scientific and planning firms statewide.

NATIONAL FINALISTS

PLATINUM AWARD

TRANSPORTATION
Firm: KPFF Consulting Engineers
Project: International Arrivals Facility at Seattle-Tacoma International Airport
Client: Port of Seattle

GOLD AWARD

STRUCTURAL SYSTEMS
Firm: Thornton Tomasetti
Project: Climate Pledge Arena
Client: Populous

Firm: WSP USA
Project: West Seattle Bridge rehab and strengthening
Client: Seattle Department of Transportation

SPECIAL PROJECTS
Firm: Magnusson Klemencic Associates
Project: Presidio Tunnel Tops park
Client: The Presidio Trust

SURVEYING/MAPPING TECHNOLOGY
Firm: David Evans and Associates
Project: Downtown Seattle Transit Tunnel
Client: Sound Transit

TRANSPORTATION
Firm: Perteet
Project: Fairview Avenue North Bridge replacement
Client: Seattle Department of Transportation

SILVER AWARDS

TRANSPORTATION
Firms: GeoEngineers, KPFF Consulting Engineers, Granite Construction
Project: Padden Creek fish passage design-build
Client: Washington State Department of Transportation

STRUCTURAL SYSTEMS
Firm: HDR
Project: Umtanum Suspension Bridge rehabilitation
Client: U.S. Bureau of Land Management

BEST IN STATE

GOLD AWARDS

UNIQUE OR INNOVATIVE APPLICATION OF NEW OR EXISTING TECHNIQUES
Firm: Herrera Environmental Consultants
Project: Park Place Stormwater Facility rebuild
Client: City of Bellingham

EXCEEDING CLIENT/OWNER EXPECTATIONS
Firm: KPFF Consulting Engineers
Project: JBLM emergency culvert repair
Client: Seattle District, U.S. Army Corps of Engineers

COMPLEXITY
Firm: Jacobs Engineering Group
Project: West Sammamish River Bridge replacement
Client: City of Kenmore

SOCIAL, ECONOMIC AND SUSTAINABLE DESIGN
Firm: Exeltech Consulting
Project: Beverly Bridge rehabilitation
Client: Washington State Parks and Recreation Commission

FUTURE VALUE TO THE ENGINEERING PROFESSION
Firm: P2S Inc.
Project: Thurston County Readiness Center
Client: Washington Army National Guard

SILVER AWARDS

UNIQUE OR INNOVATIVE APPLICATION OF NEW OR EXISTING TECHNIQUES
Firm: RH2 Engineering
Project: George Landon Pump Station
Client: Highline Water District

FUTURE VALUE TO THE ENGINEERING PROFESSION
Firm: P2S Inc.
Project: Fire Station 45
Client: City of Bothell

EXCEEDING CLIENT/OWNER EXPECTATIONS
Firm: Tetra Tech
Project: Hungry Harbor tidal marsh restoration
Client: Columbia River Estuary Study Taskforce

Firm: AECOM
Project: Woodinville sports fields turf replacement
Client: City of Woodinville

SOCIAL, ECONOMIC AND SUSTAINABLE DESIGN
Firm: David Evans and Associates
Project: SR 520 bike trail grade separation at Northeast 40th Street
Client: City of Redmond

Firm: Natural Systems Design
Project: Wynoochee River Watershed tributary restoration
Client: Grays Harbor Conservation District

ENGINEER OF THE YEAR

Larry Swartz
P2S Inc.

DIVERSITY AND INCLUSION AWARDS

LARGE FIRM
HDR

MID-SIZE FIRM
KBA Inc.

NATIONAL FINALIST: GOLD AWARD

STRUCTURAL SYSTEMS

The historic 160,000-square-foot arena roof was supported for construction to happen underneath it.

PHOTO FROM MORTENSON

Thornton Tomasetti

Project: Climate Pledge Arena
Client: Populous

Seattle's historic Key Arena, dating back to the 1962 World's Fair, was transformed into Climate Pledge Arena during a $930 million renovation in 2021. The new world-class arena is double the size of the original building, featuring an 800,000-square-foot, mostly below-grade venue with a capacity for 17,000 fans attending hockey, basketball, concerts, and other events.

This extensive renovation project presented a unique set of complex issues for the engineers at Thornton Tomasetti. The required preservation of the historically landmarked, 44 million-pound roof structure and exterior curtain wall and near-total demolition of the structure below was much like building a ship in a bottle.

How do you support a roof the size of three football fields, weighing more than eight 737 jets, in a high seismic zone, during construction work below? With plenty of expertise and ingenuity. The team designed a temporary support system using 3,700 tons of steel framing to uphold most of the roof's gravity load and resist wind and lateral seismic forces during the 20 months of construction that would undermine nearly all existing roof supports.

Thornton Tomasetti performed a seismic retrofit of the existing roof to ensure it would resist the seismic demands of modern codes. The advanced performance-based design process relied on realistic ground motions based on site-specific seismicity and accounted for the structure's nonlinear behavior. This technique significantly reduced the number of steel roof members requiring retrofitting.

Evaluation, design, and construction planning for the temporary lateral force-resisting system required extensive collaboration among project team members. Thornton Tomasetti designed a perimeter shoring system of soldier piles, tiebacks, lagging, and shotcrete to support the excavation and removal of 680,000 cubic yards of soil and to support permanent building and soil loads. This dual-purpose system was cost-efficient compared to a more traditional shoring system used for temporary conditions. The system configuration changed as excavation progressed. As excavation areas proceeded in alternate quadrants, the contractor installed bracing trusses in a top-down sequence as soon as soil removal allowed.

An integrated approach to solving challenges is critical to overall success on complex projects like this. The construction engineering and structural design teams at Thornton Tomasetti worked in parallel with the steel contractor to provide a full Tekla model for the 8,700 tons of permanent steel for the arena and parking garage. Complete shop drawings for the 3,700 tons of temporary roof shoring structural steel and this design approach allowed the team to accelerate the steel procurement and detailing process while enabling fabrication to begin much earlier, shaving months off the schedule. The project team worked together seamlessly to address these challenges and transform a historic venue into a first-class sports and event facility, which opened in time for the NHL's 2021-2022 season.

NATIONAL FINALIST: GOLD AWARD

STRUCTURAL SYSTEMS

A view of the new post-tensioning, concrete deviator diaphragms and inspection platforms installed in the main span of the bridge inside the box girder.

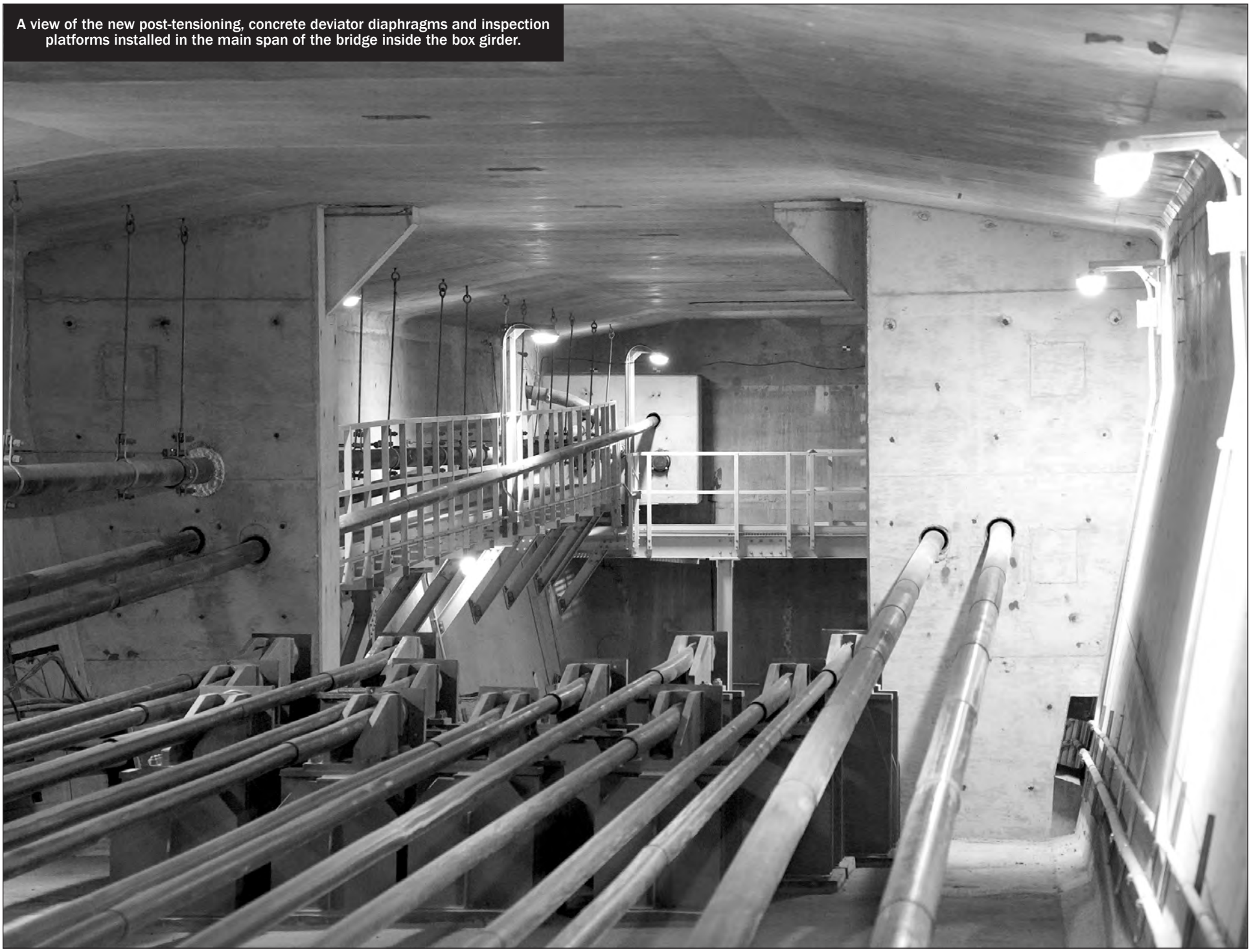


PHOTO PROVIDED BY WSP USA

WSP USA

Project: West Seattle Bridge rehab and strengthening
Client: Seattle Department of Transportation

The city of Seattle received some surprise results during a requested assessment of the heavily traveled West Seattle Bridge, indicating that the bridge was substantially degraded in cracked areas, triggering immediate closure of the bridge.

In response to the loss of service of this critical structure, the Seattle Department of Transportation started working to stabilize the bridge. Led by WSP USA, the team conducted non-destructive testing of the bridge, designed rehabilitation measures to first stabilize the bridge and then restore service to the bridge, and implemented a structural health monitoring system. While the stabilization work was constructed, a detailed cost-benefit analysis was conducted to assess the economic and technical feasibility of further rehabilitation relative to a replacement structure.

The cracks in the West Seattle high-rise bridge resulted from a phenomenon called “creep,” a concept that is widely debated to this day and was not fully understood when the bridge was designed in the 1980s. Creep is a manner in which permanent deformation of material occurs under constant load and temperature within the concrete structure over time.

Many factors affect the calculation of creep that are hard to detect on an existing structure, including timing of stage construction in which the bridge element was subjected to loading, environmental factors such as humidity, and the material make-up of a non-isotropic material such as concrete. The bridge is also located in an area known to have soft, highly liquefiable soils with the potential for lateral spreading.

Another uniqueness of the West Seattle high-rise bridge was how it was detailed, with the longitudinal bottom slab post-tensioning terminating at two discrete locations within the main span.

To design a successful repair of the bridge, the WSP team consulted with the authors of the modified compression field theory, Dr. Michael Collins from the University of Toronto, and his associate, Dr. Evan Bentz. Through consultation, it was determined that the only way to determine the actual shear capacity of the distressed sections of the bridge was to run a non-linear analysis of the localized distressed region.

The findings showed the capacity of the bridge was very sensitive to the amount of degradation the bridge had already gone through, which was unknown since the existing cracks had been previously epoxy injected with no records of crack widths before injection.

Innovative data studies were utilized to assess recorded bridge thermal movements relative to AASHTO predictive models using 20 years of collected weather data. This data helped to explain the accelerated cracking that was observed and reassured the team that their structural analysis models could adequately predict the bridge movements.

The extremely detailed assessment of the issues with the West Seattle Bridge provided critical information to a timely and cost-effective solution. The city of Seattle did not have the plans or the budget to build a new bridge. A design to repair the existing bridge, using conventional construction, was a welcome solution for the 100,000 residents that use the bridge and to the city.

NATIONAL FINALIST: GOLD AWARD

SPECIAL PROJECTS

The expansive 14-acre Presidio Tunnel Tops park offers the expected 2 million annual visitors panoramic views of the Golden Gate Bridge and San Francisco Bay from landscaped overlooks and open space.

PHOTO COURTESY OF RACHEL STYER

Magnusson Klemencic Associates

Project: Presidio Tunnel Tops park
Client: The Presidio Trust

The design of San Francisco's new Presidio Tunnel Tops park provides a preview of the future of civil engineering. This 14-acre, $118 million landmark destination — built atop two highway tunnels — is the newest addition to America's National Park system.

Magnusson Klemencic Associates created forward-thinking design solutions to restore the natural landscape, overcome challenging site conditions, improve the environment, reconnect visitors to nature, prepare for earthquakes and what the future may bring in climate change, and more.

The engineers put sustainability and resilience at the top of the criteria list. The park's design also focuses on the users and harmonizing with nature instead of trying to conquer it, minimizing traditional concrete infrastructure that would detract from the beauty of this popular park with a long history.

Reshaping the site's steep bluff into a gradual embankment created the opportunity to build an ADA-compliant path winding nearly two miles throughout the park, making it accessible to everyone. Replacing the previous 75-year-old elevated highway with tunnels below the park created an elegant and unobstructed pedestrian connection from the hilltop Presidio parade grounds to the bay's waterfront — for the first time in nearly 80 years.

The PTT includes many innovations and firsts in its civil engineering design. An innovative restorative water management system uses a specially engineered backfill throughout the park to restore the park's natural hydrologic function, recharging the groundwater while reducing stormwater runoff instead of using typical massive concrete stormwater detention tanks.

A resilient design trifecta anticipates potential climate change, resisting, absorbing and adapting to saltwater intrusion concerns, groundwater rise, and increasing precipitation. The innovative layered embankment design uses a variety of newly developed materials to fill over the rigid tunnels and soft bay mud, providing added resilience against liquefaction during a seismic event, reducing the load on the tunnels and solving the problem of differential settlement.

The reimagined park now features areas that provide a traditional National Park camp-like experience in an urban setting. A campfire circle features seating for up to 75 people and space for ranger talks and community events. The Cliff Walk and scenic overlooks thread the edge of a 30-foot-tall bluff, providing sweeping views of the Golden Gate Bridge, Alcatraz and the San Francisco Bay. Visitors can enjoy views, watch performances in the amphitheater below from the stepped lawn terraces overlooking the bay, and use the new picnic area. The park also includes gardens and natural plantings to provide a place for migratory birds to rest, play areas for children, and facilities for environmental learning and youth programs, with more to come in future phases to maximize the use of this park.

NATIONAL FINALIST: GOLD AWARD

SURVEYING/MAPPING TECHNOLOGY

An extremely detailed existing conditions 3D scan (BIM) of the International District Station was developed from laser scan (LiDAR) data.

IMAGE PROVIDED BY DAVID EVANS AND ASSOCIATES

David Evans and Associates

Project: Downtown Seattle Transit Tunnel
Client: Sound Transit

The Downtown Seattle Transit Tunnel provided a valuable transit solution through the heart of downtown Seattle for over 20 years, carrying bus traffic through the 1.3-mile-long twin-bore tunnel with four passenger stations. When Sound Transit assumed ownership of the DSTT, it first needed to document the ownership rights and prepare for the numerous improvements to the facility to transition the bus tunnel to carry light rail trains and improve public access and safety.

To help accomplish this monumental task, Sound Transit created the DSTT State of Good Repair Program and enlisted the expertise of David Evans and Associates, under contract to WSP, with management support from KPFF, to survey the facilities and prepare the necessary documentation.

The three-dimensional elements of the ownership rights and improvement plans required an innovative solution to create a detailed conditions survey. The field surveying would occur while the facility remained fully operational, adding to this project's complexity.

The David Evans Associates team applied innovative 3D laser scanning (LiDAR) and 360-degree digital photography to document the existing conditions, combined with traditional land surveying, for survey control and boundary monuments. This combination emerged as the most thorough, accurate, and efficient way to complete the field surveys.

The existing conditions survey was created using state-of-the-art 3D laser scanning technology to gather highly accurate and detailed pointcloud (LiDAR) data throughout the twin bores, the four stations, and the surface entrances to the underground facilities. The resulting 3D model featured colossal scale and detail and was used as the sole source of truth by the owner and supports design modifications, operations, maintenance, security and safety.

The second essential tool DEA developed was an interactive web map created from 360-degree digital photography, providing virtual views of the entire facility from any internet-connected device. These highly detailed representations of the facility's as-built conditions also facilitated more efficient operations and maintenance work without the constraints of track access permits.

This highly complex and unique project will benefit the public for many years. The existing conditions (BIM) will simplify future improvement designs, operations, maintenance, security and safety. Ensuring that Sound Transit has all the ownership and access rights necessary for the tunnels and stations is vital to protecting the public rights to this valuable public asset.

NATIONAL FINALIST: GOLD AWARD

TRANSPORTATION

The new Fairview Avenue Bridge provides a safe crossing and beautiful lake views and access at the South End of Lake Union.

Perteet

Project: Fairview Avenue North Bridge replacement
Client: Seattle Department of Transportation

The new Fairview Avenue North Bridge, located just north of downtown Seattle along Lake Union, is a 540-foot-long prestressed concrete girder bridge replacing two bridges built 70 years ago.

As a critical link in Seattle's transportation network, the existing bridges were no longer structurally sufficient or functionally capable of accommodating the increasing vehicular loads and non-motorized demands placed upon them. The supporting timber piles on the west bridge were decaying, and the concrete girders on the east bridge were cracking. Over 185 buses and nearly 9,000 vehicles cross the bridges daily. Pedestrians on the west side of the bridge were separated from traffic by a mountable curb. Just west of the old bridges is a floating walkway that is part of the Cheshiahud Lake Union Loop trail that was in generally good condition but had poor access from the south end.

The engineers at Perteet designed a new bridge and creatively improved the non-motorized use and access to the Cheshiahud trail and the environment around the site. The urban and congested location presented numerous construction challenges that the team worked to solve. Construction would occur in a very tight corridor with high-voltage transmission lines on one side and the ZymoGenetics building housing sensitive laboratory equipment on the other.

To mitigate geotechnical challenges encountered during design, the geotechnical and structural engineers performed extensive analysis, not typical for bridges of this magnitude. Lake Union is an essential habitat for endangered salmon, making it critical to protect the environment as part of the project.

To minimize vibration impacts to the adjacent ZymoGenetics building and to resist lateral earth pressures during a seismic event, the new bridge design included 8-foot-diameter drilled shafts that supported 3.5-foot-diameter concrete columns. Drilled shafts were installed to depths between 80 and 135 feet below the water surface to ensure that the bridge could withstand a 1,000-year seismic recurrence interval event. The proximity of the high-voltage transmission lines on one side and the buildings on the other required several special construction techniques. For example, reinforcing cages were constructed, picked, and installed in two pieces rather than the traditional single piece because of the limited room to work.

The new bridge provides two northbound lanes, one southbound lane, and facilities for pedestrians and bicyclists with several belvederes as lookouts towards Lake Union. The project design goal was to create a safe and comfortable space for all types of users. With the future in mind, the design also includes the option to add a future extension of the South Lake Union streetcar line.

The floating walkway improvements for the Cheshiahud trail provide better access and wayfinding to the walkway. New lookout points along the widened sidewalk provide secondary value to the public for appreciation of the natural beauty of Lake Union and this vibrant part of the city.

BEST IN STATE: GOLD AWARD

UNIQUE OR INNOVATIVE APPLICATION OF NEW OR EXISTING TECHNIQUES

Herrera's redesign uses multiple cells filled with a custom blend of filtering media to treat about 95% of the average annual runoff volume from a 168-acre tributary basin.

PHOTO PROVIDED BY HERRERA

Herrera Environmental Consultants

Project: Park Place Stormwater Facility rebuild
Client: City of Bellingham

The city of Bellingham hired Herrera to solve issues with too much phosphorous in Lake Whatcom and to maximize the potential of the Park Place Stormwater Facility, which receives flows from one-third of the Lake Whatcom watershed. The solution included Herrera's team developing a high-performance, cost-effective stormwater treatment technology optimized for phosphorus removal that is scalable for projects around Washington state.

Herrera teamed with Western Washington University for the initial R&D phase to conduct laboratory column experiments, evaluating over 14 media components and 10 different media blends. After experimenting with several media blends, the team identified the optimal combination of components for hydraulics, phosphorus removal, and cost, naming the new technology the Phosphorus-Optimized Stormwater Treatment (POST) system.

Following the pilot scale testing, Herrera designed and prepared bid-ready construction documents for a total reconstruction of the Park Place Stormwater Facility using the POST system to increase phosphorus removal performance for approximately 180 acres (35% of the Lake Whatcom watershed within the city limits of Bellingham).

To maximize flexibility and allow the use of the POST system across the Lake Whatcom basin, the city opted to get the POST system approved through the state Department of Ecology's TAPE (Technology Assessment Protocol — Ecology) verification program. After 18 months of pilot scale field testing, the POST system achieved a general use level designation from Ecology for phosphorus and sediment removal. In addition, a new design guide will assist others in implementing this new technology.

With the Park Place Stormwater Facility completed, the city of Bellingham can monitor the facility's pollutant reduction performance starting this fall. The new systems will deploy automated samplers, flow sensors, a rain gauge, telemetry, and an intelligent logging and control system to accurately assess the water quantity and quality at both the inlet and outlet of the facility. The collected data will verify the facility's performance and document the removal of phosphorus.

BEST IN STATE: GOLD AWARD

EXCEEDING CLIENT/OWNER EXPECTATIONS

KPFF Consulting Engineers

Project: JBLM emergency culvert repair
Client: Seattle District, U.S. Army Corps of Engineers

The sudden collapse of two rusted, 70-year-old, 12-foot-diameter culverts crossing under JBLM's airfield forced an emergency closure of half of the runway. The team of KPFF and Brice Civil Constructors creatively worked to find solutions and reopened the runway in less than seven months, finishing 25 days ahead of schedule. The new design also improved the critical fish ecosystem by providing a more natural environment with a meandering gravelly streambed.

Utilizing an accelerated design-build approach, the team worked quickly to develop innovative solutions to solve this complex, imperative issue as sinkholes suddenly appeared around the airfield. The danger posed to the 62nd Airlift Wing and its C-17 aircraft meant half the runway and taxiway remained off limits, significantly impacting the ability of the Air Force to provide global airlift support. It was integral to the project that there was a seamless flow of moving pieces, impacting active military operations as little as possible.

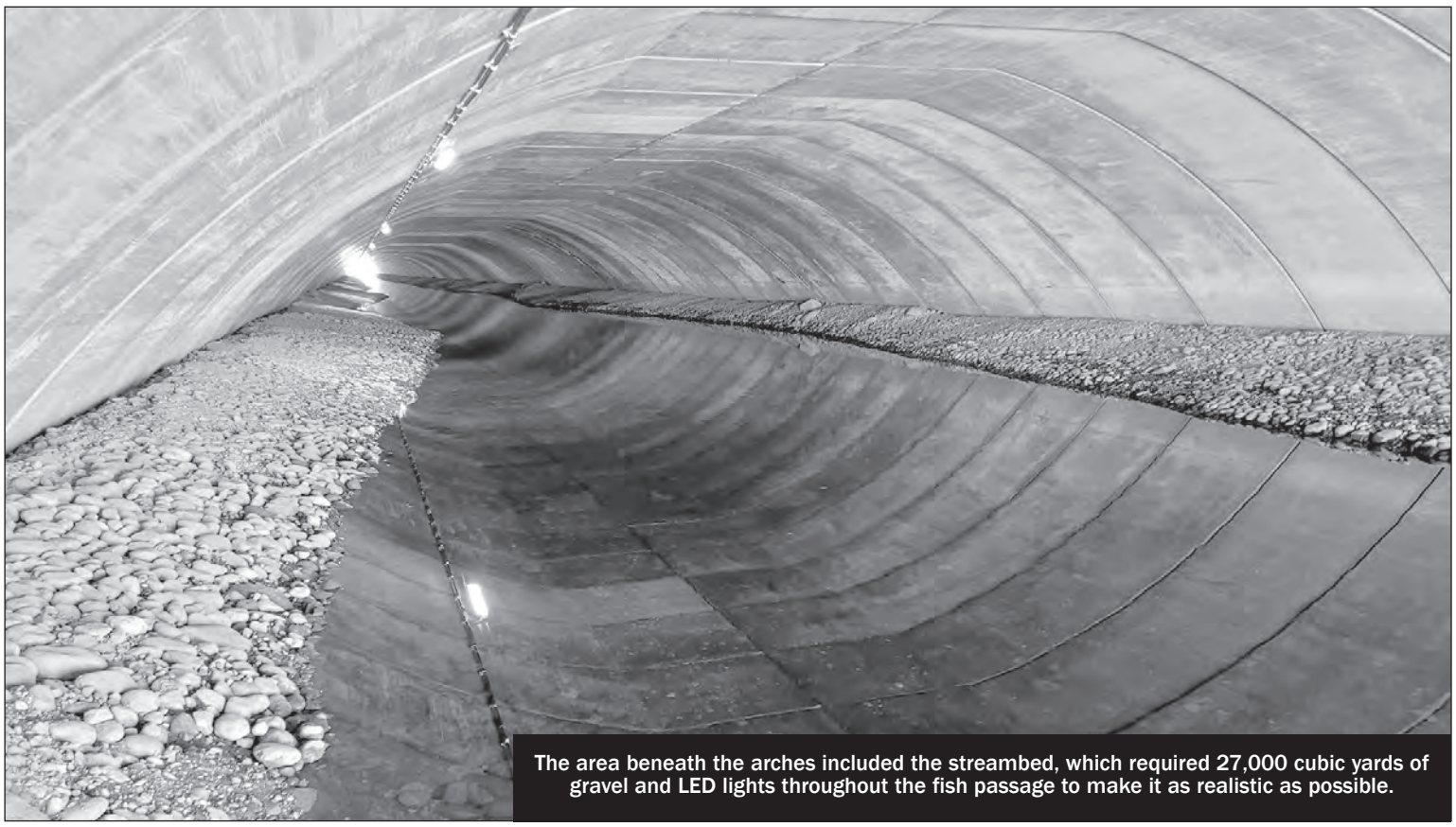
The project was fast-paced and high-risk, and separated into two phases. The first phase included restoring the use of the runway and required restoration of all areas disrupted by construction within 225 feet of the runway center. The second phase focused on completing all remaining work and included the construction of the taxiway and apron without impacting aircraft operations.

The team's challenges included: diverting Clover Creek during construction; lowering the groundwater table and treating 850 million gallons of contaminated groundwater; demolishing the existing culverts; excavating over 300,000 cubic yards of soil; and constructing and backfilling a 1,800-foot-long, 50-foot-wide arched precast fish passage with a natural streambed. Phase 2 included 240,000 cubic yards of backfill and repaving 60 acres of the runway, taxiway, and apron during freezing temperatures.

The innovative cost and time-saving design used to construct the fish passage included a modular precast Bebo bridge system from Contech Engineered Solutions. This structure consisted of 600 arched segments, 50 feet wide by 1,800 feet long, and buried 30 feet deep. It is the longest viable fish passage facility in North America. Subsequent observations have proved that salmon are migrating through this subterranean creek designed to mimic a natural stream, aided by LED lights and a manmade streambed.

Construction of the new fish passage required dewatering and treating over 850 million gallons of contaminated groundwater before discharging into the environmentally sensitive Clover Creek. Brice Civil Constructors designed a system that treated an unprecedented 10,000 gallons per minute, 24/7, without a single discharge event exceeding the treatment threshold of 70 parts per trillion. The treatment effort was the largest known volume of water ever treated at this level of flow rates on a single project.

The design priorities emphasized sustainable features through consistent cooperation with the U.S. Army Corps of Engineers — which will positively impact the quality of life for generations of U.S. service members and the communities around JBLM, leaving a lasting legacy.



The area beneath the arches included the streambed, which required 27,000 cubic yards of gravel and LED lights throughout the fish passage to make it as realistic as possible.

PHOTO FROM KPFF

BEST IN STATE: GOLD AWARD

COMPLEXITY

The new bridge includes a gathering space at center span overlooking the river.

PHOTO COURTESY OF JACOBS ENGINEERING GROUP

Jacobs Engineering Group

Project: West Sammamish River Bridge replacement
Client: City of Kenmore

The city of Kenmore knew replacing the West Sammamish River Bridge would be challenging. The old concrete bridge dating to the 1930s was structurally vulnerable. The busy bridge carries more than 20,000 travelers daily, and construction would require lengthy traffic closures in a significant corridor to access Kenmore and the highly traveled state Route 522.

The Jacobs team investigated bridge scour conditions around the in-water piers, assessed geotechnical conditions, and conducted a bridge load rating analysis to determine the bridge's load-carrying capacity. The team then evaluated bridge rehabilitation versus replacement alternatives and decided that replacing the bridge was the best option. The team worked with the city to obtain approximately $35 million through various funding sources.

Priorities for the new bridge included improving safety and mobility for all modes of transportation. The new bridge design consists of a wide multiuse, nonmotorized path with an architectural railing, an aesthetic finish on the concrete barriers, LED lighting enhancements, and an overlook bench featuring historical oars and interpretive signs. The design also provided a gathering place in the middle of the bridge, where pedestrians can pause to enjoy views of Lake Washington.

The construction of a new bridge would need to consider many complex elements. The design needed to achieve the city's objectives for the project while also safely maintaining mobility through the corridor during construction.

The Jacobs team evaluated many options to determine the best solution — featuring a five-span, 600-foot-long bridge with precast concrete tub-shape girders supported on 8-foot-diameter drilled shafts driven a maximum of 90 feet into the existing ground. Construction started in January 2020 but soon faced a supply-chain shutdown and delay due to the COVID-19 pandemic. However, the team and the city worked together to make up time and keep the project on schedule.

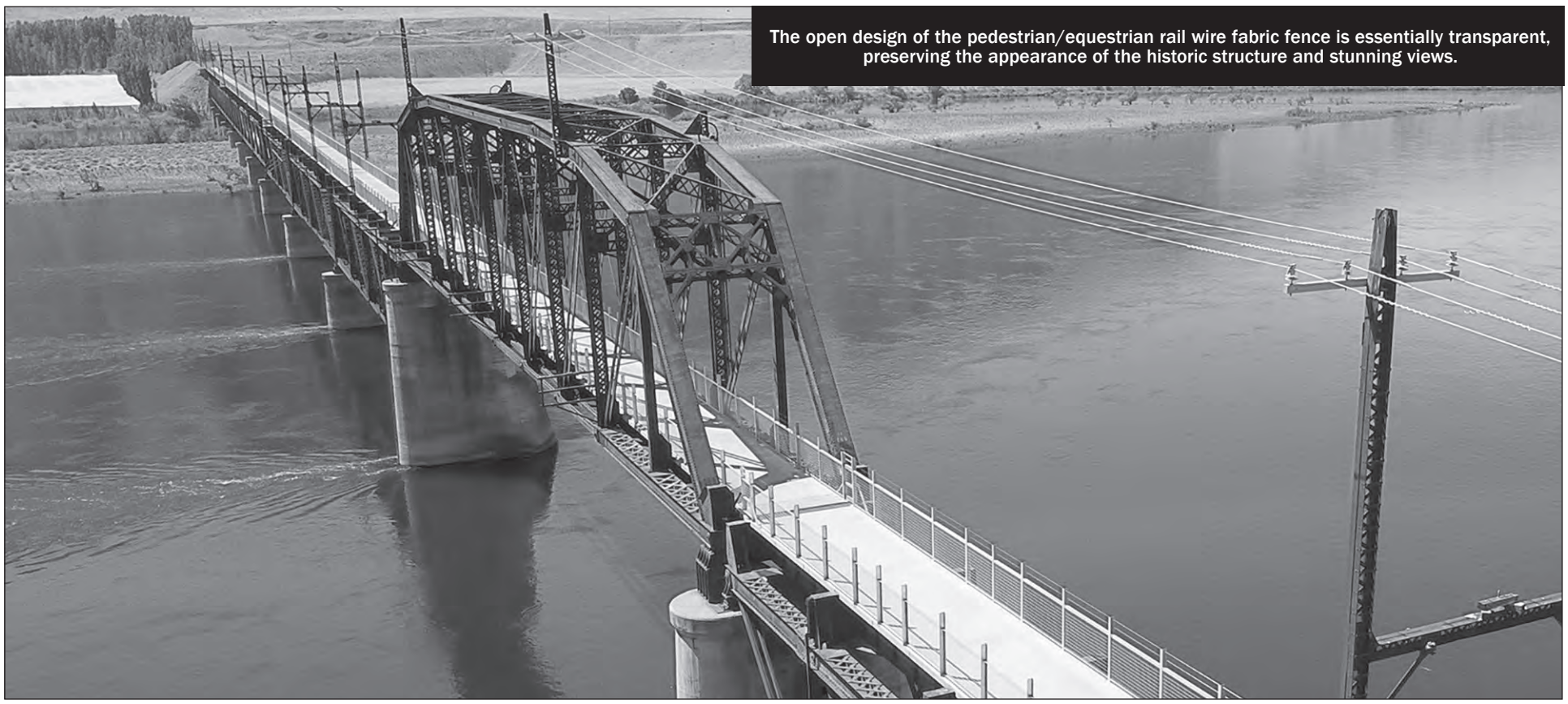
During preliminary design, Jacobs developed detailed construction impacts documents, and scheduled to accommodate limitations on construction staging duration, including a short in-water work window and space constraints due to the existing northbound bridge's proximity to the replacement bridge.

A highly visible project, the West Sammamish River Bridge included restricting traffic during the summertime — when this corridor experiences heavy use due to the nearby golf course, boat launch, and proximity to parks and Lake Washington. The Jacobs team worked with the city to provide community outreach as the project progressed.

The new bridge will serve a variety of travelers for decades to come as a result of a collaboration that enabled the team to provide an updated transportation solution to serve the community.

BEST IN STATE: GOLD AWARD

SOCIAL, ECONOMIC AND SUSTAINABLE DESIGN



The open design of the pedestrian/equestrian rail wire fabric fence is essentially transparent, preserving the appearance of the historic structure and stunning views.

PHOTO BY KEN GAER/EXELTECH CONSULTING

Exeltech Consulting

Project: Beverly Bridge rehabilitation
Client: Washington State Parks and Recreation Commission

Once a missing link to non-motorized trail travel across Washington, the historic Beverly Bridge now provides hikers, cyclists, equestrians, and residents a safer route between the eastern and western sections of the 284-mile-long Palouse to Cascades State Park Trail across the Columbia River. Originally built in 1909, this bridge is now the longest rail-to-trail bridge in Washington and the only non-motorized crossing of the Columbia River.

Exeltech Consulting designed the rehabilitation of the 3,000-foot-long former railroad bridge for the Washington State Parks and Recreation Commission. The bridge was added to the National Register of Historic Places in 1982 and has been closed since the 1980s. In 2014, a wildfire destroyed the bridge deck.

The Exeltech team led the Beverly Bridge rehabilitation project design, engineering, environmental documentation, and permitting — and supported State Parks' community outreach activities. Several priorities guided all decisions, including preserving the aesthetics of the structure and mitigating impacts on sensitive cultural and natural resources.

The bridge is in the traditional home of the Wanapum and the Sinkayuse tribes, and is a historic route for explorers, fur traders, and homesteaders. Numerous pre-contact archaeological sites, historic buildings and structures were documented within and near the project area.

Considering the sensitive site, the team applied accelerated bridge construction principles to design and permit a cost-effective rehabilitation that preserved the grand appearance of the historic structure and the stunning views with minimal site disturbance. The approach also helped to expedite complex agency coordination and approvals.

Exeltech engineers designed nine sizes of deck slabs that would work for all spans, and included cutting a small notch in 22 slabs in the location of the knee braces on the existing span. This design allowed for the placement of new decking/walkway panels with no loss of structural integrity or modifications to the underlying floor beams or plate girders while maintaining the appearance of the historic bridge, solving a complex design challenge.

Transporting prefabricated deck slabs and railing for rapid erection and construction with simplified on-site connection details was both timely and cost-effective.

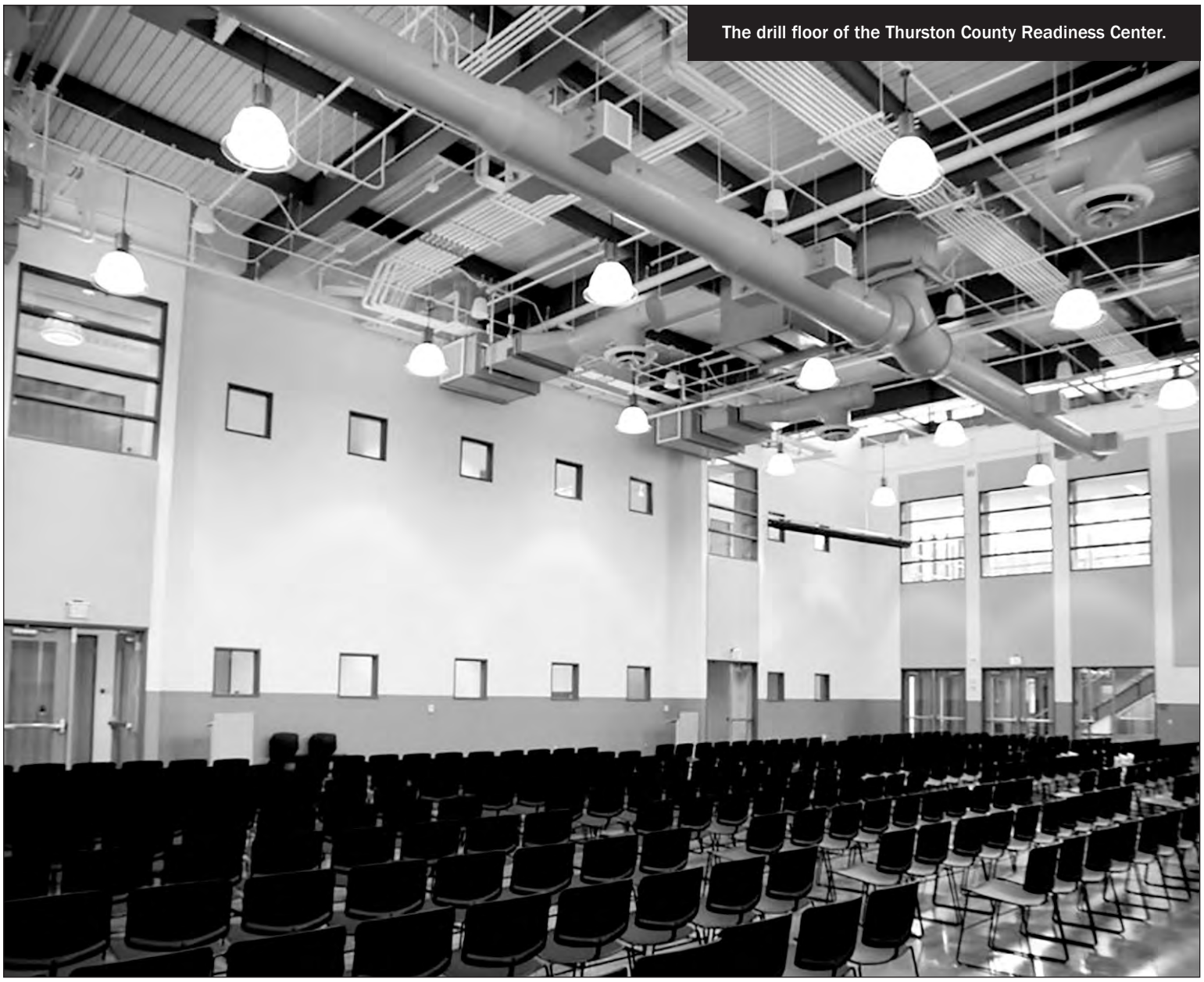
The bridge design also includes power lines, restoring reliable electrical service to remote areas along the west bank of the Columbia River that are difficult to access. This power redundancy supports economic development for communities within Kittitas and Grant counties. As an added benefit, community outreach efforts indicated that the bridge would also serve as a pedestrian commuter pathway for orchard employees living east of the Columbia River to cross daily.

BEST IN STATE: GOLD AWARD

FUTURE VALUE TO THE ENGINEERING PROFESSION

P2S Inc.

Project: Thurston County Readiness Center
Client: Washington Army National Guard



The drill floor of the Thurston County Readiness Center.

U.S. NATIONAL GUARD PHOTO BY JOSEPH SIEMANDEL

The new Thurston County Readiness Center is a specialized training and emergency response facility serving the Washington National Guard 2nd Battalion, 146th Field Artillery Regiment. The 80,000-square-foot center provides the unit with multiple training areas, maintenance bays, a 6,400-square-foot drill floor, fitness rooms, a state-of-the-art kitchen and dining area, and ample spaces for collaboration and comradery building among the soldiers.

This building has a widely variable occupant load with around 20 core occupants that use the building as a home base for their office environment, increasing to several hundred during a training event (or if there were to be an actual emergency).

The P2S engineers carefully considered how all areas of the building would be used while designing dynamic and energy-efficient systems for heating, cooling, water usage, commercial cooking, and emergency systems. This new system also needed to meet or exceed LEED Silver standards.

The plumbing engineers designed a modular approach to producing hot water. There is a 20- to 30-fold difference between the typical hot water demand and during an "event." The water heating system uses an array of instantaneous water heaters and a storage tank. This array of instantaneous heaters can simultaneously respond to a low demand for just a few lavatories or a high demand for 20 showers and a commercial kitchen. This engineering approach conserves energy compared to using conventional domestic hot water tanks.

The facility's mechanical system design incorporates several sustainable features, building on a comprehensive energy life-cycle cost analysis. This HVAC system using variable refrigerant flow (VRF) with energy recovery ventilation can provide a 43% annual cost reduction compared to a baseline building HVAC system.

Additional sustainable design features for this facility include 30% water savings through low-flow fixtures, and indoor air quality controls that monitor and automatically respond to ensure excellent air quality. Seismic positional retention systems, a backup generator, and a propane utility plant that can synthesize natural gas provide resiliency in the case of an emergency.

The facility also houses the "Firefinder" radar system — specialized equipment stored in a heated space inside the building's maintenance area, ventilated by both general exhaust and vehicle exhaust snorkel explicitly designed for the Firefinder equipment area.

P2S's systems design exceeded the owner's goal for a Silver LEED building, while providing a cost-effective solution aligned with the forecasted budgeting. This building represents excellent value to the National Guard, the state of Washington and the taxpayers that provide funding.

DIVERSITY AND INCLUSION AWARD: MID-SIZED FIRM

KBA

KBA actively practices its corporate commitment to diversity and inclusion in all areas of its business. It looks for opportunities to reach out to and engage its diverse staff, clients, and partners and make itself readily accessible. In 2022, KBA saw an increase in overall staff diversity and intentionally strives for more.

Creating a diverse workforce is one of the best strategies for building innovative and successful internal and external teams. Women and minorities hold firm leadership positions, and KBA's staff makeup includes 35% women, 31% diverse ethnicities other than white, and includes veterans and people with disabilities. In 2022, KBA recognized a need to assist a group of employees that were limited in career advancement opportunities due to insufficient English language skills. KBA engaged the services of an English language learning school to assist employees and elevate their oral and written language skills.

KBA believes that competition and a diverse and inclusive staff are good for business and the consulting engineering industry. KBA actively mentors and supports emerging firms by working to include a diverse range of subcontractors in key roles, and building relationships with leaders at large and small firms to encourage teaming opportunities. The firm actively recruits and trains a diverse group of student interns to develop the pipeline of future talent to the engineering community.

DIVERSITY AND INCLUSION AWARD: LARGE FIRM

HDR

HDR's vision for inclusion, diversity and equity creates a culture that welcomes and celebrates everyone and seeks to build social health and strengthen communities. This goal shapes its collaborative culture, encourages organizational trust and connects HDR closer to the clients and communities it serves.

HDR recently hired a director of ID&E to expand inclusion, diversity and equity initiatives as a large global company and strengthen its culture of inclusion.

From the CEO down, HDR strives to encourage an environment that accurately reflects the rich culture and individual differences of the local communities where its staff live and work. HDR is committed to a company culture in which employees of differing nationalities, generations, genders, races, sexual orientations, disabilities and ethnicities embrace each other's differences.

This diversity allows HDR to combine creativity and innovation with technical excellence to benefit its employees and communities and deliver one-of-a-kind services to clients. In alignment with HDR culture, the firm provides training on policies and procedures concerning human rights relevant to business operations.

ENGINEER OF THE YEAR

Larry D. Swartz P2S Inc.

Larry Swartz began his career at Notkin Mechanical Engineers in 1989 as a mechanical designer and received his Washington State Mechanical Engineer registration in 1990. He ascended to Notkin's leadership team as a partner in 1997, eventually serving as the firm's president until the firm's acquisition by P2S Inc. in 2020. He currently serves as vice president of P2S, directing four multi-disciplinary engineering groups, and is a licensed mechanical engineer in five states and certified for Alaska Cold Regions. Drawing on 37 years of engineering experience, Swartz leads P2S's QA/QC efforts working with the design teams primarily on projects in Washington state.

Early in his career, Swartz designed systems for health care and higher education facilities before championing Notkin's entry into the federal market in the mid-1990s, for which he gained recognition as a trusted advisor to the national and military engineering community, including the Navy, Coast Guard, Army Corps of Engineers, Forest Service, and General Services Administration. Over three decades, the firm held eight prime IDIQ contracts and completed hundreds of projects for which Larry served as lead mechanical engineer and principal.

"Larry has a passion for engineering excellence that is unmatched in this industry. Throughout his career, he has maintained the highest level of integrity, always looking out for what is best for his staff, projects, clients, and the entire engineering community," said Brad Lentz, principal and federal market leader at P2S. "Larry's 'lead by example' approach brings out the best in others, and every project team benefits from his multi-discipline approach to ensuring the whole team is providing what is best for the client."

The long list of notable projects in which Swartz was instrumental in the design includes the Evergreen Health East Wing expansion, the Naval Hospital Bremerton expansion, the University of Washington Foege Hall, the University of Washington Medical Center expansion, the replacement of Pier B at Puget Sound Naval Shipyard, and the P8A aircraft apron expansion at Naval Air Station Whidbey Island.

Swartz excels at directing design teams for engineering studies and designing complex, multi-disciplinary projects. This experience includes project scopes ranging from design-build RFP preparation to complete engineering design with construction administration focused on serving regional and federal entities. He has a strong understanding of energy codes, FAR regulations, UFC criteria, and industry best practices for multiple types of facilities for civic and municipal buildings, hospitals and medical clinics, federal defenses, maritime and aviation ports, and higher education campuses.

When asked about his favorite projects over the years, Swartz replied, "I am proud to say that most of the projects I have done have been able to support our clients' valuable missions. For example, in higher education — the mission is to provide an educational environment to train the next generation of citizens. For health care — the mission is to provide health care services to our communities and improve our standard of life. The important mission of the Department of Defense is twofold. They need to provide facilities that support the sailor/soldier/rescuer for their housing, fitness, and basic life services. They also need facilities to maintain and support ships, aircraft and other valuable assets to preserve the way of life U.S. citizens expect."

One project that stands out as Swartz's favorite over the decades is the Naval Air Station Whidbey Island P-8A aircraft apron expansion. On that massive project, he led a team of 14 consultants to expand parking for 30 additional aircraft programmed for the base. Designing the apron parking required significant geotechnical and civil/structural coordination due to the poor soils in the area and the heavy foundations necessary to support the aircraft. It also required the demolition of four buildings and the construction of four new ones. A corrosion control wash rack was designed for aircraft to drive through (automatic start and stop — similar to a car wash) and get thoroughly rinsed to extend the plane's lifespan and protect this valuable taxpayer asset. The importance of this project cannot be understated, supporting the P-8A aircraft's mission to patrol the oceans (in this case, the Pacific Ocean) to ensure the safe passage of imports and exports from the United States to Asia.

"During that project, I had originally designed one of the buildings that was demolished back in 1995. You know you have been in the business a long time when you start demolishing or renovating buildings that you designed. That project was exciting and rewarding, including many complex issues to solve, and was highly successful, receiving several design awards and an extremely satisfied client," said Swartz.

The scope and depth of the projects Swartz has worked on for the federal government throughout his career range from small ($250,000 in construction cost) to large (over $100 million in construction cost). Projects as varied as new and renovation of buildings such as Bachelor Enlisted Quarters to house Navy sailors, maintenance facilities to support aircraft carrier maintenance, and hangars for maintenance of helicopters and planes. He has become an expert in mechanical designs for waterfront structures such as dry docks, piers and wharves. These facilities have large pumps, complicated utilities that support ships in port, and design challenges due to corrosive environments and freezing weather conditions.

Throughout his distinguished career, Swartz has demonstrated his passion for engineering and excellence outside the office, striving to make things better by continually providing leadership and service to his industry as an active advocate for the engineering community and its role in the built environment. He is an active member of the American Council of Engineering Companies, currently the past board chair of ACEC Washington. He is engaged in initiatives serving the profession's interests, particularly in quality-based selection and diversity, equity, inclusion and belonging.

Swartz also shares his knowledge widely, seeking opportunities to grow and strengthen the engineering community. He is recognized by many for his leadership and guidance to the next generation of engineers. He actively serves on the Seattle board of the ACE Mentoring Program of America, an institution that promotes the architecture, construction, and engineering industries to high school students. His firm has provided engineering mentors since the program's inception 25 years ago. He has also volunteered as a mentor to engineering students at Everett Community College, the University of Washington, and countless professionals within his own company.

"Larry has been an excellent leader in his firm and the teams he's led. He continually demonstrates his strong commitment to mentorship and education of younger engineers in the art, science, and business of engineering, in addition to instilling a strong ethical character. The young engineers from his firm we've worked with are uniformly highly knowledgeable in their discipline, great to work with, but also understand when to consult others", said Brad Fogle, principal at Fraser + Fogle Architects. "We have been privileged to work on multi-discipline teams led by Larry for various projects. He is an uncommon engineer who is not focused solely on his discipline but listens to the entire team."

ACEC
American Council of Engineering Companies
of Washington

Why should your firm be a member of the American Council of Engineering Companies of Washington?

It's Simple.
Ask our Members!

- ACEC Washington is the primary advocate for the protection and promotion of your business interests
- ACEC Washington is your primary resource for business practice information and education
- ACEC Washington is the voice of the consulting engineering industry in Washington State

ACEC Washington
American Council of Engineering Companies

Working for Washington's Engineering Community

"One of the primary functions of ACEC of Washington is to lobby in Olympia on behalf of the consulting engineering community regarding proposed new legislation critical to our industry and members statewide. We find the advocacy one of the biggest benefits, among many, that makes our membership a good investment for our company."

Larry Swartz, Principal/ Engineering Group Leader - P2S, Inc.

"ACEC is a world of information about everything you need to know in the context of running your engineering business. As a new member, I have found this such a great opportunity for networking, collaborating and education."

Sherry Harris, CEO, Ergosynch Engineering

"Our membership to ACEC of Washington provides benefits well above the annual membership fee. The education and training opportunities for our employees at all levels are invaluable, from the Core Competencies for Professionals series and conferences to the educational seminars provided each month. We rely on ACEC to keep us informed on emerging issues and current best practices in our industry."

Ben Upsall, Associate Geotechnical Engineer, GeoEngineers, Inc.

"I am a member of ACEC of Washingrton because advocacy for small engineering firms has never been more important. ACEC provides invaluable tools, information and networking opportunities to help my business thrive in a highly competitive, rapidly evolving market."

Robin Kirschbaum, PE, LEED AP, ENV SP, President, Robin Kirschbaum, Inc.

"Through the efforts of ACEC, we continue to build paths that help us collaborate more successfully with our clients and be more innovative on the projects we help develop for our communities. ACEC is the voice that represents our collective business interests."

Mike Clark, Transportation Group Manager, David Evans and Associates, Inc.