David Goodyear, PE, SE, NAE

Consulting Engineer

REGISTRATIONS

Professional Engineer:
California, No. 3493 (Structural)
California, No. 45735 (Civil)
Washington, No. 17596 (Civil and Structural)

FORMER REGISTRATIONS

Alabama, No. 35034-E
Arizona, No. 24622 (Structural)
Colorado, No. 31070
Florida, No. 42149
Hawaii, No. 6732 (Structural)
Idaho, No. 5735 (Civil and Structural)
Illinois, No. 081-005339 (Structural)
Indiana, No. 11200474
Kentucky, No. 18678
Louisiana, No. 32064
Massachusetts, No. 31560
Maine, No. 6589
Michigan, No. 6201 40651
Minnesota, No. 46967
Missouri, No. 27309
Mississippi, No. 15241
New Jersey, No. 24GE-4521500
Nevada, No. 15457
Ohio, No. 67806
Oregon, No. 13182 (Structural)
Pennsylvania, No. 34959
Rhode Island, No. 3887
Texas, No. 61859
Utah, No. 4883538-2202
Virginia, No. 402030160
Wyoming, No. 13806

ACADEMIC ACHIEVEMENTS

Master of Engineering, Structural Engineering, Cornell University, 1974

BS, Civil Engineering, Cornell University, 1973

David Goodyear is a consulting engineer specializing in long span bridge design and construction, construction specifications and dispute resolution. He was the Chief Bridge Engineer for T.Y. Lin International until the December of 2018. During his 45-year career, Mr. Goodyear has been a hands-on engineer who has developed innovative design and construction engineering programs for concrete, steel, segmental, and cable-stayed bridges. He is a nationally recognized structural engineer with the ability to deliver innovative, constructible design products. Mr. Goodyear has worked with public agencies and contractors across the nation, on small rural projects as well as large urban projects with a particular focus on arch, segmental, and cable-stayed bridge design, foundation engineering, and waterfront structures. This engineering experience includes a full spectrum of bridge design, from small stream and pedestrian bridges to large cable-stayed bridges and major foundation works. He has a proven history of designing signature projects considering both the construction process and service life, and keeping projects on schedule. Mr. Goodyear received the "Golden Beaver Award" from the Beavers Heavy Civil Engineering Contracting Industry group, recognizing his excellence in bridge construction engineering; and was elected to the National Academy of Engineering for his leadership in cable-stayed bridge and segmental arch design and construction.

His capabilities range from preparing analysis reports and feasibility studies, developing final plans, specifications, and estimates (PS&E), and providing quality control, construction, dispute resolution and value engineering services. Mr. Goodyear's professional contributions includes over 35 years serving on the PTI Committee on Cable-Stayed bridges, 10 years of which he served as chairman. Mr. Goodyear was a member of the PTI Ad-Hoc Committee that authored the original concrete segmental bridge design specifications, and authored AASHTO construction specifications for portions of the segmental bridge criteria. Mr. Goodyear's project experience includes:

Hoover Dam Bypass Bridge (Mike O'Callaghan-Pat Tillman Memorial Bridge), Clark County, Nevada/Mojave County, Arizona | Nov 2001 – Aug 2010)

Mr. Goodyear was the lead designer and Chief Bridge Engineer for the new Hoover Dam Bypass Colorado River Bridge. David created the initial concept design as well as directed the preliminary and final design for this composite deck arch bridge spanning the Colorado River. The project was part of the 3.5-mile highway corridor between Nevada and Arizona. The new bypass is located 1,500 feet south of the Hoover Dam. Directing a combined production staff with several subconsultants, Mr. Goodyear's work included design of the main crossing and managing the work of subconsultants within the project team for engineering support of foundation design, rock blasting, aerodynamics, and seismology.

The new 1,900-foot-long bridge (which was a major element in the total $234 million project) is the longest concrete arch span in the United States and

PROFESSIONAL ACTIVITIES

Member, National Academy of Engineering

Member, American Segmental Bridge Institute

American Concrete Institute

American Society of Civil Engineers

Member, IABSE

Past President, Structural Engineers Association of Washington

Past Chairman of PTI Committee on Cable-Stayed Bridges/PTI Fellow

AWARDS

2012, ASCE OPAL Award, Hoover Dam Bypass Bridge

2009, Golden Beaver Award in the Category of "Engineering." (The Beavers is a social, honorary organization formed, organized and managed by the construction companies and individuals who are or have engaged in heavy engineering construction).

2004, American Segmental Bridge Institute Leadership Award – Outstanding Contributions in Design of First Cast-in-Place Segmental Concrete Arch Bridge in the United States

PTI Cagley Medal for Committee Leadership

NCSEA Outstanding Design Award, Hoover Dam Bypass Bridge

ACEC Grand Conceptor Award, Hoover Dam Bypass Bridge

CELSOC, Design Excellence Award, Crooked River Bridge

featured the tallest precast segmental concrete columns of any bridge in the world. It has a main span of 1,060 feet. The deck arch design was cost-effective and designed to comply with the environmental impact statement (EIS) commitment to minimize view obstruction of viewshed from Hoover Dam. The deck arch provided for the efficient use of both concrete and steel using each to the best of their ability—concrete in compression and steel for tension and bending. The combination of the economical twin rib concrete arch and lightweight steel superstructure allowed for rapid, efficient construction.

Sellwood Bridge (**CM/GC**), Portland, Oregon | Dec 2010 – Feb 2017

Mr. Goodyear served as the Chief Bridge Engineer responsible for the design of this replacement project in Portland, Oregon. The bridge is a two-lane steel deck arch with two sidewalks and two shoulders/bike lanes. David also served as the Chief Structural Engineer during the environmental impact statement (EIS) phase for preparation of engineering concepts and the analysis of four bridge types as well as for the final design. David provided senior technical direction to T.Y. Lin International (TYLI) bridge staff and participated in project team meetings, citizen task force meetings, and senior agency staff meetings, as well as participation in public involvement events with Multnomah County staff and the prime consultant.

Crooked River Bridge, Redmond, Oregon | 1994 – Oct 2000

Mr. Goodyear served as Principal-in-Charge and Chief Engineer responsible for design of this landmark, award-winning crossing over the Crooked River (a 328-foot-deep basalt gorge in central Oregon). His optimized design resulted in a bridge with a 410-foot arch span and a 6.5-foot-thick arch rib at the canyon rims that tapers to just a little over four feet at the crown. The 79-foot-wide structure carries four lanes of traffic with a 410-foot arch span that supports a concrete box girder that is 79 feet wide, almost 6.5 feet deep and spans 52.5 feet between spandrel columns. Because of the steep to vertical canyon walls and inconsistent foundation rock at the site, Mr. Goodyear recognized early in the design process that the final design would be dependent on the construction scheme. The T.Y. Lin International (TYLI) team generated a detailed time-dependent analysis of each construction segment, providing precise projections of structural behavior that the deck arch design was ultimately based upon.

Mr. Goodyear provided conceptual, preliminary, and final design services, and contract management. He worked closely with the contractor during construction to ensure that construction followed the approved design, met environmental requirements, as well as Oregon Department of Transportation's expectations for project delivery. The structure was designed for stayed erection from each rim, using cable-stayed technology with concrete form travelers.

Tilikum Crossing, Bridge of the People Design-Build, Portland, Oregon | Nov 2010 – Sept 2015

Mr. Goodyear served as the Chief Bridge Engineer for the design of a unique cable-stayed bridge which carries light rail, buses, cyclists, pedestrians, and eventually streetcars, but no private vehicles. The design-build project was a vital element of the Portland-Milwaukie Light Rail project. The Tilikum Crossing is the nation's largest transit bridge for only light rail trains, pedestrians, and bicycles. The 1,720-foot-long bridge is a hybrid between a traditional cable-stayed layout and an extradosed bridge, with two towers and landside piers.

Port Mann Bridge Design-Build, Vancouver, British Columbia, Canada | Sept 2008 – Dec 2012

Mr. Goodyear was the Chief Bridge Engineer for a new crossing of the Fraser River in Vancouver, BC. The new Port Mann Bridge is a unique ten-lane twin roadway bridge supported on single mast pylons. At a 1,542-foot main span and deck width of 171 feet, the bridge is one of the largest cable-stayed bridge decks in North America. T.Y. Lin International (TYLI) was the design manager of the 1.25 miles river crossing, and the lead designer for the 465,840 square foot cable-stayed main crossing.

Olympia-Yashiro Friendship Bridge (4th Avenue Bridge), Olympia, Washington | June 2001 – May 2004

Mr. Goodyear was the Project Manager and Lead Designer for this high-profile replacement of an historic Luten arch bridge built in the 1920s. Throughout the active public process, he directed a team of designers and architects and interfaced with a Citizen's Advisory Committee and City Project Management consultants. The design was recognized with a Federal Highway Administration (FHWA) Award of Excellence for Major Bridge Structures.

Tacoma Narrows Bridge Design-Build, Tacoma, Washington | 2001 – 2002

Mr. Goodyear served as the Project Manager and Lead Engineer as advisor to Washington Department of Transportation (WSDOT) for design review, design specifications, and construction cost estimating for the design-build of the Second Tacoma Narrows Bridge. David worked to develop both a complete means and methods for construction of the new suspension span, and a complete cost-based construction estimate, developed from basic labor and material pricing into a final bid format for construction costs. This "bottom-up" cost estimate was far more elaborate than the traditional engineers cost estimate, and parallels the process of a general contractor for bidding bridge work. Mr. Goodyear also led the T.Y. Lin International (TYLI) engineering staff in performing a design review of the basic configuration, with special emphasis on review of earthquake engineering and non-linear dynamic analysis for design of the caisson and suspension structure.

Greenville Bridge, Chicot County, Arkansas/Washington County, Mississippi | Aug 2001 – May 2006

The Greenville Bridge was the third longest cable-stayed span in North America and one of the longest bridge spans of any type on the Mississippi River. Mr. Goodyear served as the Chief Engineer for the contractor to provide caisson engineering for the 24 meter x 37 meter concrete caisson, including sinking calculations, cutting shoe redesign, design of the caisson sinking guide and breakwater, and design of the follower cofferdam.

Erection engineering included the development of step-by-step erection procedures for the cable-stayed superstructure. Time dependent analysis was used to review stress and displacement conditions at each stage of erection. The results of the analysis were presented in the form of an erection manual prescribing deck geometry and cable tensions at each intermediate erection stage. Analysis of the intermediate erection stages also included the design of a temporary back span-stabilizing pier for wind loads during construction.

Bill Emerson Memorial Cable-Stayed Bridge, Cape Girardeau, Missouri | 2000 – 2003

Mr. Goodyear was responsible for developing the erection procedures and erection program, providing engineering services for tower and caisson foundation construction, and developing a manual of procedures for erecting the main spans. This 1,150-foot span cable-stayed structure crosses the Mississippi River in the southeast corner of Missouri. It is a composite steel main span, erected from deck-mounted equipment to avoid interfering with river navigation. He developed a fully engineered erection scheme, including full fabrication camber and stay cable erection process. The bridge was closed within 1-inch of target without any unscheduled cable adjustments.

San Francisco-Oakland Bay Bridge East Span Replacement, San Francisco, California | 1998 conceptual development – Dec 2001

Mr. Goodyear was in charge of conceptual development and preliminary design for Phase I development of the cable-stayed alternative of this landmark bridge replacement project in the highest seismic zone in the United States. His unique design of a shear linked single-pylon tower produced a structure with previously unattained seismic reliability for single-tower cable-stayed structures, which has now been incorporated on the suspension bridge alternative in construction, as well as other California bridges.

Leonard P. Zakim Bunker Hill, Boston, Massachusetts (Construction Engineering: 1997 – 2002

Mr. Goodyear served as the Project Manager and Principal-in-Charge responsible for developing erection analysis and planning for this cable-stayed bridge construction. He developed erection procedures, process, and field requirements for control of erection as well as designs for supporting temporary structures. This one-of-a-kind structure is highly asymmetrical normal to station, which involved unprecedented complexity in erection analysis and design review. Mr. Goodyear's erection engineering eliminated an entire phase of cable adjustments by forecasting the bridge to final geometry targets.

Foss Waterway Bridge, Tacoma, Washington | 1991 – 1997

Mr. Goodyear developed the concrete cable-stayed design alternative, providing specialty consulting services for the design of a main cable-stayed crossing, followed by proof engineering and complete erection engineering for the construction stage details that were included on the contract plans. He also developed a unique program for testing stay cable materials and corrosion protection to address the life cycle cost for stay cable specifications.

OR 38: Elk Creek to Hardscrabble Creek Design-Build (Bundle 401), Oregon

Mr. Goodyear served as a Service Review Engineer for the replacement of five bridges along OR 38 between the cities of Drain and Elkton using the design-build delivery method ($49 million total project), and Lead Engineer for the rapid replacement portion of the project. The project included upgrades to the OR 38/OR 138 intersection. Two of the five bridges were replaced using a rapid replacement technique, in which the new structures were built adjacent to the existing structures, then "slid" into place after removal of the existing structures. Solutions were designed at five of the six project sites to maintain two lanes of traffic at all times during construction. The project also included public involvement coordination that integrated the local high schools into the project development. Students designed and constructed the formwork for the architectural concrete pylons that were constructed at the four corners at the bridge near Elkton.

Clark Bridge, Alton, Illinois | 1991 – 1993

As Principal-in-Charge and Chief Construction Engineer, Mr. Goodyear was responsible for developing complete erection analysis and procedures for the cable-stayed erection as well as temporary works to support the main span erection process. He also provided on-site consulting for main span erection. This unique cable-stayed crossing of the Mississippi has a single, central pylon with a unique cable-saddle design. The complications for construction were significant, with the unusual challenge of cable slip and simultaneous jacking operations compounding the normal erection engineering issues for cable-stayed construction.

East Huntington Cable-Stayed Bridge, West Virginia | 1980 – 1985

Mr. Goodyear was Lead Engineer and Senior Designer for Arvid Grant and Associates on this pioneering cable-stayed bridge project. Mr. Goodyear's work on this project included development of cable-stayed bridge analysis methods for time dependent analysis and cable installation to grade, force, or cable length, offering the first tool for direct programming of cable-stayed bridge construction in the domestic engineering marketplace. This bridge was one of the early major single pylon cable-stayed bridges in the United States, and with a major single span of 900 feet was equivalent to the largest concrete segmental cable-stayed bridges in the world. The design was innovative in the use of high strength concrete and hybrid construction of the main deck girder, and was key in the development of the current PTI Recommendations for cable-stayed bridges.

Allegheny River Bridge, Hamar Township, Pennsylvania

Mr. Goodyear served as the Construction Engineer for the general contractor, Walsh Construction Company. The twin bridges, approximately 2,350-feet-long and up to 120-feet-high were constructed as cast-in-place concrete box girders using the balanced cantilever method. Construction engineering work consisted of designing the main river cofferdams, access trestle and marine bulkheads, the tieback wall allowing construction against the steep north bank of the river, the design of temporary works for constructing the piers and pier tables, and evaluating the segmental superstructure for camber and stress control during erection. The work also included scheduling and planning construction operations and erection sequences for the various portions of the work.

Ting Kau Cable-Stayed Bridge, Hong Kong

Mr. Goodyear was retained by Kumagai Gumi (HK) to review design concepts, develop design options and develop construction methods for their entry into the design-build competition for this 2 billion dollar HK crossing of Rambler Channel. He worked directly with a major international contractor consortium to evaluate design concepts and cable-stayed bridge erection methods, evaluate the design and construction economics for various deck sections and erection methods, and to assist the estimators in developing construction scheduling and equipment utilization for deck and tower construction. He also served as special consultant to Kumagai Gumi on the cable-stayed Kap Shui Mun Bridge in Hong Kong, which was being constructed as part of the rail and road line to the new airport.

VA Hospital Pedestrian Bridge, Portland, Oregon

Mr. Goodyear provided lead engineering services for preliminary design, planning services, and engineering the erection of the cable-stayed portion of

the project for a novel pedestrian connection of a University and VA Hospital. He performed the dynamic motion studies and guided the development of the statical system for this cable-stayed structure. His duties followed with development of the complete erection engineering scheme, included stress analysis, cable installation requirements, fabrication cambers, and erection procedures to be used by the contractor.

John Wayne Airport Guideway, Irvine, California

Mr. Goodyear designed this elevated transit guideway connecting Douglas Plaza to the new John Wayne Airport. The design has post-tensioned guideway beams, reinforced concrete columns, and drilled shaft foundations, all engineered for a .6g earthquake at a near site fault. The design was 90 percent complete when the private funding for the project was withdrawn.

Weirton-Steubenville Bridge, West Virginia

As a result of Mr. Goodyear's close working relationship with the Bridge Engineer in West Virginia on the East Huntington Bridge, he was requested to assist the State in evaluating the protracted dispute between the designer and construction engineer for this major cable-stayed crossing of the Ohio River. Mr. Goodyear utilized his proprietary cable-stayed bridge software to evaluate construction to date, and to project the eventual bridge condition for the construction that was planned. Through this evaluation, he had a unique opportunity to verify his software against actual field stress measurements, and found remarkable correlation. Mr. Goodyear's work was used to modify the erection program, and to assist the Owner in inspection and review of project completion.

Washington I-90, LA County Emergency Management Center, Colorado Hanging Lake and Shoshone Dam Bridge Project Dispute Review Boards
David was one of three members of these major construction project dispute review boards, recommending adjudications for construction disputes through the project delivery phase.

Mogollon Rim Bridge Arbitration Panel
David was the chairman of the 3 person arbitration panel convened to resolve construction claims on this Arizona Bridge project.

Expert Witness and Related Experience

- Claims documentation and support for contractor clients on cable-stayed bridge projects.
- Claim documentation and testimony for crane failure for Hoover Dam Bypass Project
- Arbitration panel chair for ADOT (Mogollon Rim Bridge).
- Expert Witness for Wando Bridge, James River Bridge and Escambia Bay Bridge claims (TL James, SJ Groves and Al Johnson)

Selected Publications:

Goodyear, D.; Smith, M.; "A Practical Look at Creep and Shrinkage in Bridge Design," PTI Jnl, May-June 1988

Goodyear, D.; "Stay Cable Fatigue Design Loading," PTI Jnl, May-June 1987

Goodyear, D; Sun, J; "New Developments in Cable Stayed Bridge Design"; Structural Engineering International , Febr, 2003 IABSE, Zurich, Switzerland (www.iabse.ethz.ch)

Goodyear, D; "Elements in the Design and Construction of Cable-Stayed Bridges", OTEC 2002, October 22, 2002

Goodyear, D; Turton, R; "The New Mike O'Callaghan Pat Tillman Memorial Bridge at Hoover Dam", ARCH2010 6th International Conference on Arch Bridges, Fuzhou, China

Goodyear, D; "Respect for Tradition – The New Crooked River Gorge Bridge"; ARCH2001, Paris, France, September, 2001

Goodyear, D; "Life-Cycle Design Basis for the Port Mann Cable-Stayed Bridge"; World Steel Bridge Symposium, Toronto, Canada, March 2014

Goodyear, D; Lund, H; NCHRP Synthesis of Practice 532, "Seismic Design of Non-Conventional Bridges, 2019

Professional Associations:

- Member, National Academy of Engineering
- Member of ASCE, ACI, IABSE, PTI, SEAW, ASBI
- Past president of the Structural Engineers Association of WA
- Past SE Exam Writing Committee Member for Western States Structural Exam
- Past Member (since founding) of PTI Committee on Cable-Stayed Bridges
- Past Chairman of the PTI Cable-Stayed Bridge Committee; and ad-hoc Subcommittee chairman for cable installation and corrosion protection provisions
- Member of PTI/NCHRP ad-hoc panel 20-7/32, authors of the AASHTO Guide Specification for Segmental Concrete Bridges
- Recognized in "Who's Who in Science and Technology", Featured on Discovery Channel's "Buildings, Bridges and Tunnels"
- Member, NCHRP Committee 35-07, Inspection and Maintenance of Cable Stayed Bridges
- ASBI Leadership Award for Engineering of Concrete Segmental Arch Bridges
- Beaver's Award for Engineering, 2009