



## **MARK D. ANDERSON P.E.**

*consulting engineer*

### **Structural Engineering & Seismic Hazard Mitigation**

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#### **SUMMARY**

More than 35 years experience in Alaska in all aspects of structural engineering including analysis and design, specification and design criteria development, seismic qualification and seismic hazard evaluation & mitigation, pipe stress analysis and piping system support/restraint design, failure analysis, peer review, and QC.

#### **REGISTRATION:**

Civil Engineer; Alaska, Washington.  
Structural Engineer, Alaska

#### **EDUCATION:**

- 2/14 Short course "Fall Protection – Qualified Person" by Greg Small, High Engineering Corp.
- 4/13 Short course "ASME B31.3 Process Piping Design" by Glynn Woods, ASME Fellow
- 9/96 Short course "Fracture and Fatigue Control" by Rolfe and Barsom, Univ. of Kansas.
- 5/85 Short course "Design of Welded Structures" at Lincoln Electric Co., Cleveland, OH.
- 4/81 Short course "Measurement Systems Engineering" by Peter K. Stein of Stein Engineering Services, Inc., Phoenix, Arizona.
- 8/80 to 11/81 University of Idaho - Moscow, Idaho  
Master of Science in Civil Engineering - December, 1983
- 8/75 to 5/80 Bachelor of Science in Civil Engineering - May, 1980

#### **PROFESSIONAL ACTIVITIES:**

- Member of the American Institute of Steel Construction (AISC)
- Member of the American Society of Civil Engineers (ASCE)
- Life Member of the American Welding Society (AWS)
- Member of the Earthquake Engineering Research Institute (EERI)
- Member of the International Conference of Building Officials (ICBO)
- Co-author (with D.J. Nyman and J.L. White) "Verification of Trans-Alaska Pipeline Operating Systems for Seismic Integrity", Sixth U.S. National Conference of Earthquake Engineering.
- Co-author (with C.P. Mortgat, D.J. Nyman, and J-P. Conoscente) "Seismic Design Verification of Cable Tray Systems", Sixth U.S. National Conference on Earthquake Engineering.
- Co-author (with D.C. Perry, H. Thurston) "Current and Proposed Revisions of Wind Load Standards and Codes in the United States", an invited paper presented at the Fourth U.S. National Conference on Wind Engineering Research.
- Past Chairman, Professional Engineers in Private Practice (PEPP) Anchorage Chapter of NSPE.
- 2-Term Board Member, Alaska Professional Design Council (APDC)
- Past President, Structural Engineers Association of Alaska (SEAA)
- Adjunct Instructor, University of Alaska, Anchorage - senior level design courses in timber and concrete.

- Associate Member, Building Seismic Safety Council (BSSC) TS 13 Committee (Non-Building Structures) Seismic Provisions for National Earthquake Hazard Reduction Program - NEHRP 97 Provisions (FEMA 302/303).

**EMPLOYMENT RECORD:**

- 1/98 to Present **Mark D. Anderson, consulting engineer**  
**Mark D. Anderson, consulting engineer** is a sole proprietorship licensed in Alaska, serving primarily industrial clients. Mark D. Anderson PE, is the owner and principal structural engineer. Services provided include structural analysis, design and review, integrated piping analysis and support system design, as well as specialty services in seismic hazard evaluation/mitigation and seismic qualification of equipment, design and evaluation of off-highway bridges, and design and load rating of custom lifting devices.
- 7/89 to 12/97 **Alyeska Pipeline Service Co. (APSC)**  
Engineering Coordinator/Seismic Coordinator. In addition to providing direct support for the design and review of a wide variety of projects, Mark was responsible for re-establishing the Trans-Alaska Pipeline System (TAPS) seismic program. This included a reassessment of TAPS stipulated seismic criteria, revision of the Earthquake Design Basis, and development of implementing procedures and technical specifications. He actively worked throughout the company and with the government to achieve and maintain regulatory compliance and design control in the structural and seismic areas.
- 11/86 to 7/89 **Kramer Chin & Mayo, Inc., Anchorage, AK**  
Branch Manager and Senior Structural Engineer. Responsibilities in addition to design functions included marketing, contract negotiations, construction administration, and staff supervision.
- 2/86 to 11/86 **Anderson & Anderson Consulting Engineers, Anchorage, AK**  
Owner and Principal Structural Engineer. Provided computer modeling, seismic design, and specialty support to other consulting offices, along with technical peer reviews and failure analysis for various clients.
- 9/85 to 2/86 **Tippets-Abbett-McCarthy-Stratton (TAMS), Anchorage, AK**  
Senior Structural Engineer. Responsible for conceptual through final structural designs on two major projects at the Anchorage Airport.
- 7/84 to 9/85 **Porath/Berry Architects & Engineers, Anchorage, AK**  
Senior Structural Engineer. In charge of design and preparation of plans, specifications, and construction surveillance for shopping center and other facilities. Developed two comprehensive computer programs for steel design.
- 11/81 to 7/84 **Skilling Ward Rogers Barkshire Inc., Anchorage, AK**  
Project Engineer/Structural Design Engineer. Primary responsibilities were conceptual design, plan layout and organization, supervision of project design engineers, project review and budget control, and coordination with clients and contractor. Other duties included supervision and scheduling of the drafting staff, participation on the in-house education committee, and organization and development of the office technical files and library. Design experience was primarily focused on steel and timber design, and involved extensive computer modeling and analysis.

## PROJECT EXPERIENCE

The following projects, GROUPED BY TYPE, illustrate Mark's experience as engineer-in-responsible-charge:

### INDUSTRIAL

- Liberty Project, Endicott Is., Alaska – Mark was retained by BPXA to stand-in for their structural Subject Matter Expert as reviewer of the structural design of the Liberty Drilling Rig, the world's largest horizontal-reach drilling rig.
- Berth Operations Centers, Valdez Marine Terminal, Alaska – under a 3 year ongoing term authorization from Alyeska Pipeline Service Company, Mark identified a significant structural deficiency in the seismic integrity of these elevated control centers on the loading berths. Upon confirmation by Degenkolb Engineers, Alyeska requested a fast-track solution to restore life-safety protection for these essential facilities, which Mark provided using slotted-bolted energy-dissipating bracing connections in the lower level to limit shaking intensity transmitted to the operator/control room level.
- Module 55 Vibration Study and Retrofits, Milne Point – Mark designed a number of modifications to bring damaging vibrations of two large reciprocating compressors within acceptable limits. These included: a foundation bracing system, overhung motor bracing, pedestal and skid bolting and stiffening upgrades, and cylinder & discharge bottle bracing. He was also responsible for the evaluation of several vibration studies completed by others, supported investigation and mitigation of liquids ingestion as a cause of recurring component failures, and his work contributed to resolution of the performance issues and the continued service of the gas compression module at a savings (relative to module replacement) of over \$100MM.
- Davis Pt. Pipeline, Parachute, CO – as a sub-consultant to D. J. Nyman & Assoc. (Houston), Mark provided detailed design input to pull a 3,000+ ft. string of heavy-wall 36-inch gas line up a steep canyon slope deemed un-feasible to construct with conventional pipe laying or aerial methods.
- North Pole Power Plant Expansion – Phase 1, North Pole, Alaska – as a subconsultant to the prime engineering contractor, prepared the structural bid drawings and specifications for a 60 megawatt combined cycle plant, including building and major equipment foundations in conjunction with a Metal Building System to house the plant.
- Centrilift Tool Shop, Kuparuk, Alaska – as a consultant to the fabricator, Mark provided structural design for this modular 16 x 100 foot shop, that was designed for tail-roll handling and included a 40-foot long uninterrupted window in the side wall for handling of long pump strings.
- Miscellaneous Small Projects, Milne Point, Endicott, Northstar, Lisburne, & Prudhoe Bay Fields – under a 16+ year succession of ongoing term contracts from BPXA, Mark has provided support on numerous small tasks addressing dozens of specialized lifting and handling devices, new access platforms, pump vibration and alignment issues, fall protection, mezzanine loading, vessel support modifications, etc.
- Wellhouse Safety and Subsidence Project, Endicott, Lisburne, & Prudhoe Bay Fields – with an inventory of over 2,000 wellhead “houses”, BPXA asked Mark to develop integrated “best practice” approaches to address roof & internal platform fall protection and subsidence issues. Mark prepared designs with innovative solutions including conductor-supported framing systems and grade beams to reduce safety hazards and recurring maintenance costs.
- Alyeska Corrosion and Reinsulation Projects - these projects included the Pump Station 3 bypass and mainline remode, design and construction surveillance of numerous basements beneath existing buildings to provide access for inspection and replacement of buried piping, and design of the remode of the 36 inch relief piping systems at Pump Stations 3, 5, and 6. Mark also served as the Lift Engineer for the releveing (while in service) of several thousand feet of mainline, pumpstation and Valdez Marine Terminal piping, utilizing real-time strain monitoring and authored a technical specification to guide this procedure. The work included evaluation of “blind-hole” drilling strain-gaging techniques to evaluate in-situ stress.

**PROJECT EXPERIENCE (cont.)**

- Mobile Drilling Office/Camp Trailer - North Slope, Alaska – After recurring failure of the trailer suspension, Mark was retained by ASRC to analyze the camp trailer frame and design/specify a replacement suspension system using custom components from Peerless.
- Alyeska IMO Trailer Modifications - Alyeska's fleet of IMO trailer/tankers for transportation of Drag Reduction Agent (DRA) were experiencing fatigue damage to the forward frame area of the trailers. Mark provided support to the Welding Engineering Group, which resulted in a completely different philosophy of repair based upon structural principles. These repairs were successfully implemented throughout the fleet and no further problems reported.
- Bulk Chemical Storage Tanks and Skids, Prudhoe Bay, Alaska, for the Standard Alaska Production Company - Project structural engineer for the design of two projects: one with six 20,000 - gallon carbon - steel storage tanks, the other with six 10,000-gallon stainless-steel tanks, including pile-supported skids and extensive elevated catwalks.
- 24 Inch High-Pressure Off-Gas Line Analysis, Prudhoe Bay, Alaska, for the Standard Alaska Production Company - Project structural engineer for the computer modeling and stress analysis of 1,500 feet of pile supported stainless steel piping.
- Corrosion Monitoring Platforms, Prudhoe Bay, Alaska, for the Standard Alaska Production Company - Structural engineer for the design of 12 access platform structures.
- Lifting Device Analysis for Production Facilities, Prudhoe Bay, Alaska, for the Standard Alaska Production Company - Structural engineer for the analysis and load rating of 18 non-engineered lifting devices of up to 10-ton capacity.

**BUILDINGS**

- Fish Processing Plant, Akutan, Alaska – Mark performed a structural condition assessment for Trident Seafoods of their Akutan Pollock Plant, the largest seafood processing facility in North America. Services included a load evaluation of the upper level process floor systems, and an innovative solution to the problems arising from structural modifications necessary to accommodate changing processing and conveying equipment in a challenging corrosion environment.
- Scout Readiness Centers, Alakanuk, Chevak, Kake, Kasigluk, Kipnuk, Kwigillingok, Newtok, Quinhagak, and Scammon Bay, Alaska – Structural engineer for the site-adaptation and design of 3 consecutive projects each involving 3 National Guard Readiness Centers. These facilities are supported on surface foundations, and all of the building framing is provided with structural-insulated-panels. The last set of buildings was designed with the new Arctic Surface Foundation system ( [www.arcticsurfacefoundation.com](http://www.arcticsurfacefoundation.com) ), developed especially for sites where neither pile foundations nor substantial gravel pads are economical/practical.
- New Water Treatment Facilities, City of Sandpoint, Alaska – Mark completed a design under contract with the City of Sandpoint (through ANTHC) to design a new pump house and water treatment buildings, that were stick-framed on conventional concrete footings.
- Woodside Manor, Kodiak, Alaska – Mark performed a field assessment of the treated-wood foundations beneath 6 multi-unit apartment buildings, and prepared retrofit designs to replace the badly deteriorated foundations, that were implemented while the units remained occupied.
- SERVS/VEOC, Valdez, Alaska – Structural engineer for the seismic evaluation of this facility housing a regional emergency-response center.
- DOT/PF Statewide Building Structural Evaluations – as a subconsultant with another firm, Mark completed assessment reports on 9 existing buildings throughout Alaska, and the Potter Weigh Scale, to assess collapse potential and structural integrity.
- IBEW Training Center, Anchorage – Mark provided the structural design of this 2-story braced steel frame facility, as a subconsultant to the design-build contractor.

**PROJECT EXPERIENCE (cont.)**

- National Guard Armory, Camp Denali, Fort Richardson, Alaska - Project manager for civil, mechanical, and structural design, and lead structural engineer for the two-story, 225,000 sq. ft. facility, and associated 15,000 sq. ft. Organizational Maintenance Shop.
- Gastineau Salmon Hatchery, Juneau, Alaska, for Douglas Island Pink and Chum Inc. - Lead structural engineer for the steel frame building housing this \$6.4 million project.
- Mt Edgecombe High School, Phase III Classroom and Library Building, Sitka, Alaska, Alaska DOT/PF - Lead structural engineer for this 24,000 sq. ft. wood-frame brick-veneered addition.
- Sikusuilaq Warehouse, Sikusuilaq Hatchery, Alaska – this 950 sq. ft. warehouse at a remote site was designed to accommodate poor frozen soil conditions and provide interior storage for a JD 544 front end loader and other equipment. A timber post/pad/shear panel foundation was used for the above-grade support of the wood framed structure.
- Dimond Center Expansion, Anchorage - Project structural engineer for this 350,000 sq. ft. fast track addition, with four stories of office space over two stories of retail mall area, and a full-height atrium over a skating rink in the lower level.
- University Center Expansion, Anchorage - Project structural engineer for a 115,000 sq. ft. addition with two large vaulted skylights. This \$7.1 million project was completed with contractor-initiated structural change orders of \$10,000.
- Carr's Jewel Lake Expansion, Anchorage - Project structural engineer for this fast-track expansion that included 85,000 sq. ft. of steel-braced frame construction.
- Jane Mears Junior High School, Anchorage - Project structural engineer and responsible for introducing a unique method of lateral analysis used for design of this 150,000 sq. ft. multi-level structure to ensure compatible force distribution and displacements under seismic loading. Total construction cost for this project was \$17 million, \$2 million under budget with 0.2 percent structural change orders.
- Yakatat Hangar, U.S. Navy, Adak, Alaska - Structural engineer for evaluation of existing roof conditions and design of a standing-seam replacement system.
- High School Addition, Upper Kalskag, Alaska, for the Lower Kuskokwim School District - Structural engineer for major addition including analysis and restoration for the existing facility foundations.
- Loussac Public Library, Anchorage - Structural engineer for the circular Collections Building and the grand staircase, both of which withstood the scrutiny of a rigorous post-design review process.
- Anchorage Airport South Terminal Expansion, Anchorage - Project structural engineer for an 80,000 sq. ft. expansion (1983+ construction) with concrete ductile moment frames, cast-in-place shear walls and diaphragms, structural precast panels, steel-braced frames, and moment-resisting steel frames.
- Eagle Financial Center, Eagle River, Alaska - Project structural engineer for design of this two-story, 50,000 sq. ft. steel moment frame structure that included provision for ice glaciation of 300 psf on the entrance canopy. The project was executed on a negotiated design-build basis.
- Industrial Indemnity (now Xerox) Office Building, Anchorage - Project structural engineer for this four-story, 45,000 sq. ft. facility with moment-resisting steel framing.
- Fire Lake Recreation Center, Chugiak, Alaska - Project structural engineer for this 50,000 sq. ft. steel framed facility to house the second Olympic-sized skating rink in Alaska. Contractor-initiated structural change orders on this \$4.28 million facility totaled less than \$6,000.



**PROJECT EXPERIENCE (cont.)****BRIDGES, DOCKS, AND RELATED STRUCTURES**

- Quartz Hill Mine Property Access Road Bridges, Ketchikan District, Alaska – As a subconsultant to RECON LLC, Mark provided a field assessment of the 9 bridges along the access road, and load rating for 6 now 30+ year-old native log stringer bridges. Ongoing follow-up has continued on a 2-year interval.
- POGO Mine Access Road, Delta Junction, Alaska – Mark provided designs for 6 river and stream crossings of the mine access road, up to 400 feet in length, for 100 ton off-highway equipment loads. The design of the 400 ft. crossing of the Goodpaster was ultimately performed by a design-build contractor, and bridges salvaged from logging road service were procured and modified for the shorter crossings. Mark continued to serve as the owner's bridge consultant through road/bridge construction.
- Kennicott River Crossing, McCarthy, Alaska – Mark was retained by the owner/builder for the in-stream pier design and modification of owner-procured flatcars to achieve a 40-ton load rating for this private controlled-access service-vehicle crossing.
- Private Access Bridge, Houston, Alaska – Mark worked with the owner/builder and the owner's engineer to prepare the design for this 40-foot span bridge with 33-ton capacity to allow removal of a restrictive culvert. The bridge field erection was entirely bolted, with no equipment support following placement of the primary girders, permitting all assembly work to be completed by the owner, for total in-place material (including concrete abutments) costs under \$500/ft.
- TAPS Workpad and Access Road Bridges, TAPS Right-of-Way – Structural Engineer for the evaluation, repair, and load rating of 10 bridges in 1998, and evaluation of 18 bridges in 2002.
- Central Creek Bridge, Milne Point – This bridge was reportedly damaged by uncontrolled welding transverse to the bottom flange of the steel girders. Mark led a fast-track study that evaluated the fracture potential of the bridge, and concluded that 1.7 million pound drilling rigs could cross the bridge without repair. Ongoing evaluations are requested to assess the bridge for additional large mobile rigs with up to 1,000,000 lb axle loads.
- TAPS Crossing @ PLMP 704.2, Kenny Lake, Alaska – Provided a design for an 85 ton capacity “dry-land” bridge over the TAPS pipeline for an access road to a new agricultural development.
- Alyeska Valdez Marine Terminal Oil Spill Response Base - Mark prepared the seismic design criteria for the dock structure and provided structural review and revision of the design that greatly improved the expected earthquake performance of the original design for the dock.
- Anchorage Airport South Terminal Lobby and Pedestrian Tunnels, Anchorage, Alaska – Structural engineer for the design of 10,000 sq. ft. of below-grade, reinforced-concrete and post-tensioned flat slab construction, including AASHTO loading.

**SEISMIC HAZARD MITIGATION**

- Alyeska Pipeline Service Company, Strategic Reconfiguration (SR) Project – PS1, 3, 4, 5, & 9, Alaska - Since 2003, Mark has been continuously involved as a sub-consultant to APSC, later as a consultant to the prime engineering contractor and to the supplier of the stand-by power generation equipment, and now as direct consultant to assist in closure of the issues related to earthquake preparedness and documentation closure. His initial work included preparation of project specific structural and seismic specifications and design criteria. He served as APSC's seismic reviewer, responsible for seismic evaluation and field seismic walkdown for all field- installed equipment related to the modernization of the station control and pumping systems.
- Liberty Dialysis, Anchorage, Alaska – as a consultant to Liberty Dialysis Alaska, Mark was responsible for design of all seismic bracing of the process equipment.

**PROJECT EXPERIENCE (cont.)**

- Homer Water Treatment Plant, Homer, Alaska – as a consultant to GE Water & Process Technologies (Canada), Mark provided design review and seismic anchorage of all the major water treatment equipment for the city's new (2009) plant.
- Alyeska Pipeline Service Co., AT&T Alascom Backbone Communications System – Serving as the Alyeska technical representative, Mark completed review and assessment of the Phase 1 Digital Upgrade and System-Wide Seismic Design Verification of the TAPS Backbone Communication System performed by AT&T Alascom.
- Armin F. Koernig Dam, Sawmill Bay (Evans Is.), Alaska – Mark performed and documented an evaluation of expected seismic performance of this retention dam, formerly known as the San Juan Lake Dam, which provides a critical water supply to the AFK Hatchery located near tidewater. Also included was a walkdown of the 1900 foot pipeline between the dam and the hatchery to assess seismic vulnerability.
- North Pole Metering Facilities, North Pole, Alaska – Structural engineer for the seismic design verification of the TAPS metering facility feeding the Fairbanks area refinery.
- Knik Arm Power Plant, Anchorage – Structural engineer for the Phase 1 structural code review, which served to provide a preliminary basis for scoping the extent of seismic deficiencies and repairs.
- Alyeska Pipeline Service Co., Earthquake Monitoring System – Mark completed a revised post-earthquake inspection database for the entire pipeline and terminal system to guide post-earthquake inspection efforts on TAPS.
- Alaska Fiber Star, LLC, Anchorage – Completed a seismic assessment of the existing central office facilities to identify the existing vulnerabilities, and prepared designs for seismic retrofits.
- Caldon Inc., Pittsburgh, PA – Prepared seismic qualification reports for electronics equipment to be installed in TVA and Consolidated Edison Co. nuclear power plants.
- Pipeline Systems Incorporated, Anchorage – Provided a seismic evaluation of existing central office equipment to assess compliance of the installation with the project seismic design criteria.
- Alyeska Seismic Design Verification – As Alyeska's technical representative, Mark managed a program to evaluate the seismic integrity of all existing operating systems comprising the Trans-Alaska Pipeline System (TAPS). Mark oversaw the \$ 1.5 million engineering effort, which included design review and approval of all seismic retrofits.
- Alyeska Cable Tray Seismic Integrity Evaluation and Upgrade - Provided oversight and accountability as Alyeska's technical representative for all phases of this \$8 million project, undertaken to resolve questions raised by auditors in 1993, concerning the seismic integrity of existing cable tray systems throughout TAPS.

**DESIGN REVIEW/PEER REVIEW**

- Mechanical Electrical Building (MEB), Ft. Greely, AK. The MEB was required to be a Risk Category V facility based on UFC 3-310-04 Seismic Design of Buildings. Mark served on the Seismic Design Review Panels for the Structure and for the Nonstructural Component Designs as required of DOD RC V facilities.
- Kettleon Memorial Library, Sitka – Mark provided third-party independent review of the design after construction was underway and most foundations were completed. A primary focus of the review was the design drawings, and the myriad of unique details which comprise the structure which was no longer regular, repetitive, and uniform as was typical of the original design(s).
- Alascom Headquarters Building, Anchorage - Lead structural reviewer, provided input for the review of this 90,000 sq. ft. combined braced and moment frame steel structure that led to a redesign incorporating a structural curtain wall system to adequately resist seismic loading.

**PROJECT EXPERIENCE (cont.)**

- School Building Code Compliance Review, Nikiski, Soldotna, Kenai and Hope, Alaska - Provided structural reviews for the construction manager for four school projects, representing \$53 million in construction costs.
- Terminal No. 1 rehabilitation, Port of Anchorage – Provided project review for addition and renovation project, including 16,000 sq. ft. of new office space and an observation walkway atop the existing transit roof shed.

**CONSTRUCTION SUPPORT**

- Anchorage Airport South Terminal Railroad Station, Anchorage – structural engineer retained by the General Contractor for resolution of field structural retrofits.
- Hydrant Fuel System Pipeline Releveling – Elmendorf AFB, Alaska – Mark was retained by the installation contractor to define a basis and methodology for the releveling of buried fuel system piping that had not yet been placed in service.
- Begich, Boggs Visitor Center, Portage Glacier, Alaska, - Mark was special consultant to the General Contractor for wind load analysis and bracing of this pre-cast concrete facility which experienced winds in excess of 130 mph during construction (1985) without the sustaining any damage.
- Orion Elementary, Anchorage, Alaska – Provided shoring design to the Contractor for extensive structural modifications.
- Lifting Beams and Devices – Mark has designed numerous lifting beams, up to 60 feet in length, and specialized rigging and handling components for handling large valves, pipeline stopping equipment, building erection, etc, for various contractors.

**OTHER**

- Boston Street Retaining Wall, Anchorage – Mark prepared the structural design of a replacement 700 foot long wall utilizing driven steel pile and economical steel lagging.
- Various Insurers and Owners – Mark has completed numerous collapse and failure investigations, including the collapse of the RV storage building in Whittier (originally the US Army Base Gymnasium).
- Spill Prevention Control and Countermeasure Plan for Power Plant, University of Alaska, Fairbanks, Alaska - responsible for site survey, preparation of the SPCC plan, and design of necessary site improvements for compliance with EPA regulations.
- TVRO Dish Antenna Support system, Prudhoe Bay, Alaska, for the Standard Alaska Production Company - Structural engineer for the design of a support structure for a 7-meter dish atop a lightly framed existing two-story module, which has since withstood 100+ mph winds.
- 500-kV Transmission Tower Failure, Idaho Falls, Idaho - Special consultant to Idaho Power for the structural investigation of a partial collapse of a tower that occurred during cable-stringing operations.