



**FEWELL
GEOTECHNICAL
ENGINEERING, LTD.**

**STATEMENT OF QUALIFICATIONS
AND
GENERAL INFORMATION**

OAHU OFFICE

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MAUI OFFICE

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Introduction - Fewell Geotechnical Engineering, Ltd. (FGE) was established in 1976 to provide a wide range of professional geotechnical engineering services, including subsurface investigations, drilling services, geotechnical reports, studies, and construction monitoring and testing services throughout Hawaii and the Pacific Basin. FGE's main office is at 96-1416 Waihona Place in the Pearl City Industrial Park on Oahu. A fully staffed office is also maintained in Kahului on the Island of Maui.

Professional Qualifications – Members of FGE currently hold professional registration, collectively in 5 states plus Guam. Our current staff includes four licensed engineers with over a total of 100 years of experience in geotechnical engineering services and four staff level engineers or geologists with M.S. or B.S. degrees in geotechnical related subjects. Mr. Alan J. Shimamoto has 30 years of experience in Hawaii and is very familiar with the local conditions. Mr. Richard B. Fewell has over 35 years of experience including over 30 years in Hawaii.

PRINCIPALS AND STAFF

ALAN J. SHIMAMOTO

Principal Engineer – Chief Executive Officer

Education

Cornell University, B.S.E.E.
University of Hawaii, B.S.C.E.

Professional Registration

Civil Engineer: Hawaii

Mr. Shimamoto has been with FGE and an associated firm since 1970 and has worked on over 2500 projects. He is currently the President and Chief Executive Officer and is responsible for the firm's operations including engineering and administrative activities for both the Oahu and Maui Offices. His experience includes performance of the major portions of the engineering analysis on difficult projects and handling larger projects requiring greater experiences.

TIMOTHY J. CAVANAUGH

Senior Engineer – Head Geotechnical Engineer

Education

University of Arizona, B.S.C.E.

Professional Registration

Civil Engineer: Hawaii, Nevada

Timothy Cavanaugh has been with the firm for over 18 years working in the capacity of Senior Engineer. He has direct supervision of field technicians/engineers performing subsurface investigations and quality control inspection and testing of construction of residential, commercial, and industrial projects.

CHET ROBINSON

Project Engineer

Education

Brigham Young University, Provo, Utah, B.S.C.E.
University of Hawaii, Manoa Campus, M.S.C.E.

Professional Registration

Civil Engineer: Hawaii

Mr. Robinson has 4½ years of geotechnical experience, which includes 2 years with FGE. He has direct supervision of field technicians performing quality control inspection and testing of construction on residential, commercial, and industrial projects.

MYRA AU

Staff Engineer

Education

University of Massachusetts, B.S.C.E.
Northeastern University, M.S.C.E.

Professional Registration

E.I.T. – Massachusetts

Ms. Au has been with the firm for approximately 2 years. Her responsibilities include logging of test borings, performing quality control inspection and testing, engineering analysis, grading observations; and assisting in the testing laboratory.

SHENTANG WANG

Staff Engineer

Education

University of Hawaii – PhD Candidate in Geotechnical Engineering
Tongji University – M.S. in Underground Structure
China University of Mining and Technology – B.S.C.E.

Mr. Wang is a recent addition to the FGE engineering staff and has approximately 3 years of geotechnical and 4 years of structural engineering experience prior to his arrival. His current responsibilities include engineering analysis, logging of test borings, performing quality control inspection and testing and assisting in the testing laboratory.

RICHARD B. FEWELL

Exclusive Consultant for FGE

Education

West Virginia Institute of Technology, B.S.C.E.
West Virginia University, M.S.C.E.

Professional Registration

Civil Engineer: Hawaii, Guam, Ohio, W. Va., Pennsylvania

Geotechnical Services – FGE, Ltd. Provides a broad range of geotechnical services including: 1) Geotechnical Engineering, 2) Laboratory Testing, 3) Groundwater Investigations, 4) Drilling Services, 5) Construction Monitoring, and 6) Materials Testing. The main office in Pearl City includes the engineering offices, laboratory testing facilities, computer lab and drilling equipment. The Maui Office maintains a laboratory for construction-related testing.

Geotechnical Engineering – FGE, Ltd.'s engineering services include subsurface and groundwater investigations and studies for design, construction, and remedial work. FGE, Ltd. Can provide engineering analysis for the design of foundations; earth slopes, embankments, and retaining structures including earth dams and mechanically stabilized earth structures using geotextiles; pavements; earth stabilization; seepage; and settlement analyses in marginal land reclamation over compressible soils.

In addition to the normal geotechnical analytical methods, FGE, Ltd. has performed and is very familiar with AASHTO, HDOT, and GHWA design methods and special cost-effective foundations such as helical piers, minipiles and other special methods. FGE, Ltd.'s Computer Laboratory features IBM and Macintosh networks for engineering analysis, groundwater modeling, image processing, and graphic output.

The drafting department can receive CAD plans via email and plot the drawings directly to expedite review and evaluation. Completed boring logs can be transmitted via DWG format to allow our clients to install the logs on their construction plans.

Laboratory Testing – A complete geotechnical testing laboratory, capable of performing nearly all of the soils and material testing required for project design and construction, is maintained at the Oahu Office. The lab can perform all of the normally requested soil tests including permeability, consolidation, direct shear, compaction, CBR, triaxial compression, and classification tests, as well as Concrete tests.

Drilling Services – FGE provides its drilling services through HTB, Inc. and has available five truck-mounted drilling rigs. Two additional portable drilling rigs are maintained for areas of limited access, and a trailer-mounted rig is used for soft conditions. Two skid rigs, which can be disassembled and helicoptered are used for the exploration of remote mountainous areas. One drilling rig is maintained on the Island of Maui.

Construction Monitoring and Materials Testing – FGE Ltd. provides a complete range of monitoring and testing services for the geotechnical phases of construction, including the inspection of shallow foundations systems, drilled piers, driven piles, helical piers, and minipiles; earthwork construction, installation of utilities and site improvements; Soil and Concrete Testing, both in the field and in the laboratory.

Performance Record – FGE Ltd.'s performance record is best illustrated by the long and continuous relationship with our clients. Two of the largest developers in Hawaii, The Gentry Companies and Castle & Cooke Homes Hawaii, Inc. have used FGE, Ltd. for over 20 years. Within the last 15 years, FGE, Ltd. has worked extensively for Costco, The Lanai Company, Hawaiian Electric Company, Inc., and its subsidiaries, D.R. Horton, Grove Farm Properties, C. Brewer Properties, Inc. and A & B Properties on Maui. Our performance record also includes five Design/Build projects for Dick Pacific Construction.

FGE, Ltd. has worked on over 100 projects with the Department of Accounting and General Services of the State of Hawaii over the past 30 years, and on major projects for the State of Hawaii Department of Transportation, the City and County of Honolulu and the Counties of Maui and Hawaii.

These clients' requirements for quality of work, cost control and meeting schedules are very demanding due to their financing costs and marketing requirements. This long association is the best evidence of our ability to perform the work in terms of cost control, quality of work and in compliance with the project schedule.

FGE, Ltd. received Engineering Excellence Awards in 1993 and 1995 for geotechnical methods and solutions exhibiting engineering ingenuity and innovation, resulting in significant savings in project costs to our clients.

Quality Assurance – FGE, Ltd. is a member of ASFE, The Association of Engineering Firms Practicing in the Geosciences, and has incorporated their quality control practices into our operation. Errors and Omissions insurance is obtained through an affiliated firm, Terra, which works closely with ASFE in developing loss prevention programs. Terra and ASFE stress a high level of quality control as the main goal of providing error-free projects, thereby minimizing liability exposure. FGE, Ltd. is peer reviewed regularly as part of the ASFE Peer Review Program.

The Oahu Office maintains a Certified Laboratory accredited by AASHTO and the U.S. Army Corps of Engineers. The laboratory testing methods are checked twice each year with samples from the Bureau of Standards. Soil samples are tested in our lab and the results compared with those from over 400 labs across the nation.

The maintenance of drilling and laboratory testing services in-house results in excellent control of project scheduling, since FGE, Ltd. does not depend upon outside services. Specialized training and increased quality assurance is provided without compromising project deadlines.

The major quality assurance provision is the review of all reports by the Principal Engineers before they are issued. This review takes advantage of their years of experience to assure that the recommendations are not only correct, but also that they are reasonable and economical solutions.

Past Projects

The geotechnical engineering services, which we provide are not significantly influenced by the type of structure being investigated or the location of the project. Most projects require that the subsurface and groundwater conditions be established. These conditions must be determined through subsurface exploration and geotechnical testing to determine the physical properties of the subsurface soils.

FGE, Ltd. has undertaken over 2600 projects for more than 100 public and private clients including local, state and federal government, architectural and engineering firms, private developers and commercial or industrial clients in Hawaii and the Pacific Basin. The geotechnical information obtained through the investigations, studies, and monitoring services over the past 30 years has resulted in a vast library of knowledge regarding the geotechnical conditions throughout the State of Hawaii. The available information is extremely valuable in anticipating a site's subsurface conditions, its ramifications on the project design, developing the most cost-effective scope of the geotechnical services and solutions, and budgeting realistic design and construction costs in the initial stages of the project.

FGE, Ltd.'s projects vary from residential and commercial development and utility line installations to major hotels, interstate highway interchanges, and bridges. A brief listing of FGE, Ltd.'s Design/Build and highway/bridge projects, and other typical projects for which FGE, Ltd. provided geotechnical investigations, foundation design, and/or construction monitoring is included below.

Design/Build Projects

- **N62742-98-C-1353, FY00 MCON P-112 Design/Build Pacific Command Headquarters, Camp H.M. Smith, Oahu, Hawaii (Construction Cost \$74,000,000)** – Developed geotechnical recommendations of pile-supported, 7-story building underlain by residual soils. Vertical and horizontal pile load tests were performed on the driven piles. Soil anchor tiebacks were used to provide lateral support for 2-story basement retaining wall.
- **N62742-00-C-1337, Design/Build Navy Lodge at Ford Island, Pearl Harbor, Oahu, Hawaii (Construction Cost \$18,900,000)** – Developed geotechnical recommendations of a 3-story building residing on a fill crust over loose/compressible alluvial and coral deposits. Helical piers were designed for the new elevator shaft in the existing Building 78. Seismic analysis of the existing Building 78 was also performed.
- **N62742-99-C-1330, FY01 MCON P-593 Design Build Regional Bachelor Enlisted Quarters, Pearl Harbor, Oahu, Hawaii (Construction Cost \$23,000,000)** – Developed geotechnical recommendations of a 4- to 5-story building with a retaining wall handling surcharge loads from the building.

Highway/Bridge Projects

- **Sand Island Bridge and Parkway** – Design and construction of major parkway and the foundation system for fixed-span bridge across 45-foot deep Kalihi Channel in accordance with HDOT and FHWA requirements. Difficult geotechnical data gathering due to prior excavation of the channel to service Honolulu Harbor and the depth of water at the pier locations.
- **Interstate Route H-3 Windward Viaduct Haiku Valley, Oahu, Hawaii, F.A.I.P. No. 1-H3-1(36)** – Design and construction of foundations and earthwork for elevated interstate highway on 1H:1V slopes using large drilled pier foundations, 80-foot high tie-back walls and geotextile stabilizing fabrics in accordance with AASHTO, HDOT, and FHWA requirements.
- **Interstate Route H-3 Haiku Valley Bridges, Haiku Valley, Oahu, Hawaii, F.A.I.P. No. 1-H3-1(52)** – Developed geotechnical recommendations for pile-supported piers and abutments of twin bridges over the steep slopes of Haiku Valley.
- **Interstate Route H-3 North Halawa Valley Highway, Unit 1, Phase 1B, Halawa Valley, Oahu, Hawaii, F.A.I.P. No. 1-H3-1(68)** – Provided design services for the value engineering of the drilled shaft foundations for twin viaducts in Halawa Valley. Completed extensive stability evaluations for deep construction excavations for pile caps and access roads.
- **Interstate Route H-3 Halawa Portal Building Finish, Unit 111, Halawa Valley, Oahu, Hawaii, F.A.I.P. No. 1-H3-1(75)** – Performed geotechnical design of 30-foot high soil nail walls to support basement excavation adjacent to existing portal structures. Performed geotechnical design of 60-foot high MSER wall constructed on steep slopes.
- **Interstate Route H-3, North Halawa Valley Highway, Unit 1, Halawa Valley, Oahu, Hawaii, F.A.I.P. No. 1-H3-1(59)** – Provided design services for the value engineering of the drilled shaft foundations and 30-foot high road embankment.

- **Interstate Route H-2, Mililani Interchange, Southbound and Northbound On/Off Ramps, Mililani, Oahu, Hawaii** – Design, consultation and construction monitoring for new on- and off-ramps at Mililani over a previously filled gulch and compressible soils. Work included HDOT pavement design, obtain HDOT approval to use and subsequently design and develop specifications for segmental block mechanically stabilized earth retaining walls (MSERW) using geotextile reinforcing in accordance with AASHTO, HDOT, and FHWA requirements.
- **ISTEA 1-97 Rehabilitation of Streets, FY98 Unit 7, Honolulu, Oahu, Hawaii** – Performed pavement investigation to determine the re-surfacing and reconstruction requirements for over 9 miles of roadway for the Federal Aid Resurfacing project for the City and County of Honolulu.
- **Reconstruction of Streets, Various Locations, Islands of Maui, Lanai, Molokai, and Hawaii** – Performed pavement investigation to determine the re-surfacing and reconstruction requirements for over 34 miles of roadway for the Federal Aid Resurfacing project for the County of Maui.
- **Mamalahoa Highway Improvements, Waimea, Hawaii, Hawaii, F.A.P. No. STP-0190(12)** – Performed pavement investigation for State Highway widening project in an area underlain by weak volcanic ash.

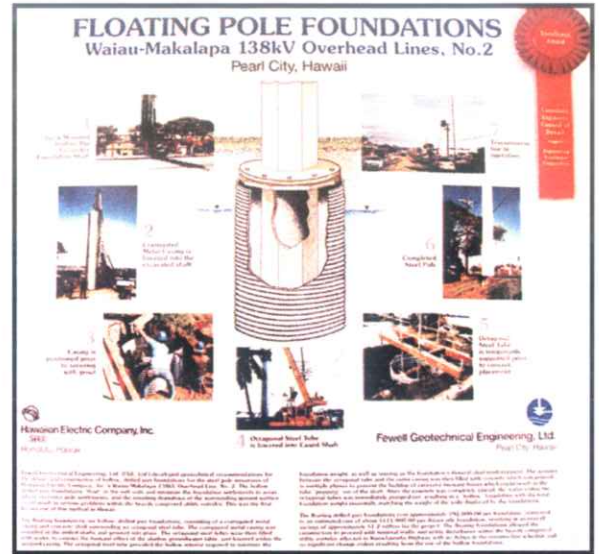
Other Typical Projects

- **Waiau-CIP/Waiau-Makalapa 138 kV Transmission Lines** – Design and construction of the support towers for over 25 miles of high voltage lines throughout Campbell Industrial Park (CIP), and extending from CIP to the Ewa Nui Substation, including the Kalaeloa and AES Substations, and from the Waiau Power Plant to the Makalapa Substation. Alignment crosses 6 different geologic formations, including highly compressible soil. Innovative foundation system resulted in \$1.2 million savings in project cost and FGE, Ltd.'s 1995 Engineering Excellence Award.
- **Automated People Mover** – Foundation design using different foundation systems in variable and erratic subsurface conditions for nearly mile-long elevated railway system over aircraft hardstands at the Honolulu International Airport to move passengers across the airport.
- **Honolulu Corporation Yard** – Development of nearly 30 acres for various service departments and equipment of the City and County of Honolulu at Sand Island. Included the geotechnical design, field testing, and consultation for the mass grading and foundations for 9 buildings and shops for the Department of Wastewater Management, Division of Engineering, Etc. on a site covered with uncompacted fills and debris over highly compressible soils.
- **Gentry-Waipio 600-Acre Development** – 600-acre development consisting of single-family residential subdivisions, and multi-family cluster developments, a light industrial commercial subdivision, shopping centers, an elementary school, streets and their related site improvements.
- **Iolani School Settlements** – Groundwater investigation to determine underlying hydrology beneath the site and its relationship with the geology and construction in Waikiki to determine the cause(s) of severe settlement at the school.
- **Kainehe Street, Hamakua Drive, and Keolu Drive Sewer Rehabilitation** – Evaluation of existing 7,500 feet of 18- to 36-inch diameter RCP sewer line through deep deposits of soft, highly compressible soils and depressed water conditions in the Kailua Road and Enchanted Lakes portions of Kailua. Analysis included evaluating various trenchless technologies such as microtunneling, slip-lining, pipe bursting, jet grouting and horizontal drilling.
- **Waikalua Force Main** – Geotechnical design and construction monitoring of buried force main beneath Kaneohe Stream. Included the use of friction piles for support of appurtenant structures and directional drilling methods beneath the Kaneohe Stream due to thick deposits of compressible soils underlying Kaneohe Stream and the surrounding areas.
- **Halawa Medium Security Facility** – Design and construction monitoring of medium-rise 500-bed prison and its related infrastructure improvements in Halawa Valley in difficult soils conditions consisting of highly expansive boulder-colluvial and alluvial formations with seepage conditions. Included channelizing South Halawa Stream, design of tie-back retaining walls, extensive subdrain system, and construction of 300,000 cubic yards of fill embankments to support the facility.

Excellence Awards

Floating Pole Foundations - FGE developed geotechnical recommendations

for the design and construction of hollow, drilled pier foundations for the steel pole structures of the Waiiau-Makalapa 138kV Overhead Line, No. 2. The hollow drilled pier foundations “float” in the soft soils and minimize the foundation settlements in areas where excessive pole, and the resulting drawdown of the surrounding ground surface, could result in serious problems within the heavily congested utility corridor. This was the first know use of this method in Hawaii. The floating drilled pier foundations cost approximately \$92,000.00 per foundation, compared to an estimated cost of about \$171,000.00 per driven pile foundation, resulting in an overall savings of approximately \$1.2 million for the 15 pole sing floating foundations. The floating foundations allowed the construction to proceed with minimal traffic and utility disturbance within the heavily congested utility corridor adjacent to the Kamehameha Highway with no delays in the construction schedule or significant change orders resulting from the use of hollow foundations.



Ash Rock Synthetic Aggregate - The AES Barbers Point Plant is a \$383 million dollar coal-fired cogeneration facility capable of supplying over 189 megawatts of electricity to Hawaiian Electric Company, approximately 18% of Oahu’s electricity needs. The plant is one of the cleanest coal-fueled plants in the world and is designed to minimize emissions using clean coal technology which reduces particulate emissions to less than half of the new source performance standards of the Federal Clean Air Act. The process results in between 100 and 200 tons of fly ash byproduct being produced each day.

FGE, working with AES Barbers Point, Inc. and using geotechnical testing and engineering techniques, developed a process to convert the

ash into a lightweight construction aggregate, thereby eliminating the need to dispose of over 100 tons of ash per day in landfills. The aggregate has the strength properties of similar natural aggregates but less than 70% of their weight. The Ash Rock is uniquely suited as structural fill behind retaining walls due to its light weight which reduces lateral pressures. It can be used for all applications where Select Borrow is required and at about half the cost. FGE developed the placement, compaction, curing, and crushing methods to obtain the maximum aggregate strength. This is one of the first uses in the United States of ash byproduct for the production of a synthetic construction aggregate.

