Zhāo Chéng

ITASCA Consulting Group, Inc.
An Itasca International Company

Senior Geomechanics Software Engineer II

Expertise Numerical Modeling, Geotechnical Engineering, Software Development

Education

Ph.D. (Civil & Environmental Engineering), 2006
University of California, Davis, California

M. Eng. (Hydraulic Structure Engineering), 2000
B. Eng. (Hydraulic Structure Engineering), 1997
Wuhan University, Wuhan, China

Registration Licensed Professional (Civil) Engineer, State of California, USA

Professional Affiliations

Member, American Society of Civil Engineers (ASCE)
Committee Member, Earthquake Engineering and Soil Dynamics, ASCE
Member, International Society of Soil Mechanics and Geotechnical Engineering
Member, Deep Foundations Institute

Mentorships

Itasca Education Program, Itasca Consulting Group, Inc.
Women in Engineering Program, University of California, Davis

Professional Experience

Itasca Consulting Group, Inc., Minneapolis, Minnesota

2021 – Present *Senior Geomechanics Software Engineer II, FLAC3D Product Manager*
2015 – 2021 *Senior Geomechanics Engineer*
2011 – 2015 *Geomechanics Engineer*

2007 – 2010 *Earth Mechanics Inc., Oakland, California*
Geotechnical Staff Engineer

2002 – 2006 *University of California, Davis, California*
Graduate Student Researcher

2000 – 2002 *Shanghai Jiao Tong University, Shanghai*
Postgraduate Researcher

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Software Development and Support

FLAC3D development and management.
FLAC3D technical support.
FLAC3D training.
Constitutive model development.
Model parameter calibration.

Selected Project Experience

Baihetan Dam — Stress and Seepage Analysis: Coupled fluid-mechanical elasto-plastic simulations were carried out to simulate the effect of dam impoundment at the high arch Baihetan Dam site using *FLAC3D*. Two main mechanisms for the valley deformation after impoundment were identified: a "mattress effect" prevailing a short time after impoundment; and a "swelling effect" developing in the longer term. The mattress effect is caused by the mechanical loading from the impounding water. This loading causes points to move downwards and inwards in the valley behind the dam. The swelling effect is caused by the increase in fluid pressure that occurs when the impounding water flows around and under the dam, downstream in the valley. A realistic *FLAC3D* model of the Baihetan valley and dam was constructed, including site stratigraphy, main faults and bedding planes, grout curtain, drainage volumes, and the planned schedule of stage impoundment. The model was used to predict the valley and dam deformation, both during filling and over long-term operation of the Baihetan dam.

Review of FLAC3D Analyses of LPV-148 Levee Section, Lake Pontchartrain Levee, New Orleans, USA: Independent review of the *FLAC3D* model of back-analyses of levee settlement versus time, and numerical sensitive study on future levee performance subjected to storm surge loadings.

Wind Farm Turbine Project: Consultant of the static and dynamic analysis with a 3D pile-foundation model for the 150 MW sea wind-farm turbine project in China. Particular *FLAC3D* development of strain-dependent modulus reduction logic and lumped rotational structural masses, which are keys to the soil material parameter calibration, simulation of the pile tests and the natural frequency analyses. Dynamic analyses of the pile subjected to wave, wind and wave-wind combined loads.

Slurry Wall Stability Template: Development of a *FLAC3D* slurry wall template for the U.S. Army Corps of Engineers to analyze the stability of levee during the construction of the panel-type slurry wall trench in the vicinity of the toe of the levee. The 3D model geometry is produced by geometrical extrusion of a representative 2D cross-section of the levee. The template provides flexibility to modify the ground parameters, ground surface, subsurface profiles and panel length to adjust to the conditions at a particular cross-section location. A factor of safety calculation based on the strength reduction technique is included as part of the template functionality.

Mulepe Open Pit Stability Analysis: Development of a *FLAC3D* model to analyze the pit stability. The rocks are modeled with Modified Hoek-Brown model. Ground water conditions and rock mass weathering effect are carefully taken into account. Strength Reduction Method is used for the

stability analyses.

Dumbarton and Antioch bridge seismic retrofit: One of the key engineers to assign geotechnical lab tests, to characterize subsurface soil conditions, to conduct liquefaction analysis for the sites, to conduct down-drag and lateral spreading analysis for some key piers, to help evaluating ground motion criteria and foundation characterization for the seismic response of the bridges based on the 1993 USGS seismic source model and Next Generation Attenuation model. The ARS design curves developed for the bridges represent the current state-of-the-art practice that has been scrutinized by the Seismic Peer Review Panel. Conducted pushover analysis for typical piers considering nonlinear p-y, t-z, q-u springs using finite element model to evaluate lateral displacement demands, to provide load-deformation behaviors using performance-based design methods. Complex damping effect analysis on permanent foundation displacement for this project.

BART station seismic retrofit for Glen Park BART station and Church Street MUNI Station: Responsible engineer to provide seismic design parameters, perform seismic site response analysis and liquefaction potential analysis, and perform soil-structure interaction analyses for underground buried stations and present geotechnical recommendations for retrofit of the stations.

South Park bridge replacement: Responsible engineer for the generation of artificial spectrum-compatible time histories, seismic site response analysis using 2D finite element method by SASSI, soil-structure-interaction analysis using 3D numerical tool, considering soil nonlinearity and soil-caisson interface gapping effect, caisson foundation designs for the main span, providing the structure engineers the depth-varying time histories and deformation compatible spring parameters.

San Francisco-Oakland Bay Bridge east span replacement: Role was to conduct drivability analysis for construction support and perform dynamic pile driving tests using PDA system during construction.

Bridge foundation design for interstate highway 405: Role was to perform liquefaction analyses, design the ARS curves, design highway bridge foundations, perform 2D/3D finite element analysis in order to evaluate the impact of the bridge foundation construction to the buried pipeline nearby.