Evidence 2: Contributions by Jian-Hua Yin

(1) Two methods by JH Yin for calculating settlements of building foundations have been included in "Canadian Foundation Engineering Manual" (CFEM) (5th edition)

The two methods by Yin and co-authors for calculating/predicting consolidation-creep settlements of foundations/soil grounds have been adopted in Canadian Foundation Engineering Manual (CFEM) (5th edition) (in Chapter 7: Settlement and Deformation) (see a letter from two Co-Editors). Two subsections in 7.9.2.1 and 7.9.2.2 were drafted by JH Yin and contain the two method:

7.9.2 Methods for consolidation analysis of clayey soils exhibiting viscous compression

7.9.2.1 Fully coupled consolidation analysis of clayey soils

The one-dimensional (1D) consolidation theory by Terzaghi (1943) and 3D consolidation theory by Biot (1941) are for fully-coupled consolidation analyses of clayey soils or porous media using a combination of linear elastic behaviour and hydromechanics. However, normally consolidated and lightly over-consolidated clayey soils often exhibit viscous behavior, such as time-dependent creep and relaxation, and effects from changes in strain (or stress) rates. To consider such viscous behavior in consolidation analyses of clayey soils, Yin and Graham (1996) extended Terzaghi's 1D theory using a 1D Elastic Visco-Plastic (1D EVP) model (Yin 1990, Yin and Graham (1989, 1994) to replace a linear elastic model for coupled consolidation analysis of soils. By extending the timeline concept proposed by Bjerrum (1967) for delayed compression of clayey soils , Yin and Graham developed a new equivalent time concept that divides the total strain rate into an elastic strain rate. This allowed derivation of a 1D EVP model which was initially verified by laboratory test data. The consolidation analysis using this 1D EVP model was conducted and verified by lab model test data (Yin and Graham 1996).

7.9.2.2 Method for consolidation analysis of clayey soils with viscous behaviour

Calculating settlements using the constitutive model requires a numerical method for solving a set of partial differential equations, however, few suitable programs are available for this purpose. Yin and a series of co-workers (Yin and Feng 2017; Feng and Yin 2017; Yin and Zhu 2020; Yin et. al. 2022) developed a method for calculating consolidation settlements of layered clayey soils that exhibit viscous behavior. The method is described in a series of published articles that are listed in a recent publication by Yin et. al. (2022). They include solutions for applications with or without vertical drains under staged loadings. The method for a single-layer case is presented below.

A letter dated 9 April 2022 from two Co-Editors of this manual (5th Edition):

THE CANADIAN GEOTECHNICAL SOCIETY
LA SOCIÉTÉ CANADIENNE DE GÉOTECHNIQUE

April 09, 2022

To: Yin Jianhua, Professor, Hong Kong Polytechnic University

Re: Committee Considering Hong Kong Code of Practice for Foundations, Building Department, Government of Hong Kong

As Co-Editors of the next edition of the Canadian Foundation Engineering Manual (CFEM), now the 5th edition of this Manual, we are pleased to advise the Hong Kong Committee that a section of our new online Manual, the chapter on Settlements, will include the Hypothesis B method of estimating foundation settlements that was developed by Professor Yin Jianhua of the Hong Kong Polytechnic University. The new manual is in publishing and will be available for sale, online at the CGS website in late 2022.

We emphasize that the CFEM is aimed at practising engineers. It is a guide to good practice, not a textbook, and not a legally binding code that must be adopted. We can say, however, that practice defined by the Manual has been well received as acceptable in many legal cases here.

Please do not hesitate to contact the undersigned with any questions you may have.

Yours respectfully,

Rob Kenyon, Ph.D., P.Eng., FEIC, Co-Editor (rkenyon@kgsgroup.com)

Ken Skaftfeld, M.Sc., P.Eng., Co-Editor (CFEM 2021 <cfem2021@trekgeotechnical.ca>)

National Building Code of Canada 2020

Volume 1

Design of foundations in the Code refers to "Structural Commentaries (User's Guide – NBC 2020: Part 4 of Division B)"

"Commentary K" in "Structural Commentaries (User's Guide – NBC 2020: Part 4 of Division B)" is for Design of Foundations.

Commentary K

Foundations

Introduction

1. This Commentary provides guidance, compatible with sound engineering practice, for the design of foundations and temporary excavations in accordance with the provisions of NBC Section 4.2. NBC Subsection 4.1.3. requires the use of limit states design for the design of buildings and their structural components. This Commentary deals with this approach for the design of shallow and deep foundations. The material herein is intended as a first approximation dealing with routine problems of foundation design and construction. Neither this material nor the papers or texts to which it refers should substitute for the experience and judgment of a professional engineer competent in dealing with the complexities of foundation design practice.

A-4.2.4.1.(5) Design of Foundations for Differential Movements. Information on the design of foundations for differential movements can be found in the Commentary entitled Foundations in the "Structural Commentaries (User's Guide – NBC 2020: Part 4 of Division B)."

A-4.2.4.4.(1) Depth of Foundations. When adfreezing has occurred and subsequent freezing results in soil expansion beneath this area, the resulting uplift effect is sometimes referred to as frost jacking.

A heated building that is insulated to prevent heat loss through the foundation walls should be considered as an unheated structure unless the effect of the insulation is taken into account in determining the maximum depth of frost penetration.

A-4.2.5.1.(1) Excavations. Information on excavations can be found in the Commentary entitled Foundations in the "Structural Commentaries (User's Guide – NBC 2020: Part 4 of Division B)."

A-4.2.6.1.(1) Shallow Foundations. Information on shallow foundations can be found in the Commentary entitled Foundations in the "Structural Commentaries (User's Guide – NBC 2020: Part 4 of Division B)."

Design of geotechnical parts of foundations refer to CFEM (Canadian Foundation Engineering Manual)

Commentary K

54. **Cohesive soil.** The settlement of a structure on cohesive soil is affected by a number of complicating factors usually requiring experience and judgment to assess. The most important of these is an estimate of the preconsolidation pressure, that is, the maximum past consolidation pressure on the in situ soil. Because of the various uncertainties, errors of a factor of 2 are not uncommon in the calculation of settlement. Cohesive soils also display significant time-dependent (post-construction) settlement. Elastic theory, with appropriate modifications, can predict settlement with reasonable accuracy. Many other theoretical and empirical methods are available to predict settlement of shallow foundations (CFEM,[1] and CSA S6 and its Commentary, CSA S6.1).

For National Building Code of Canada: 2020, please visit the website below:

https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-building-code-canada-2020

The two methods by Yin and co-authors are referenced by National Building Code of Canada *via* CFEM.

Evidence 2: Contributions by Jian-Hua Yin

(2) Explanation and successful modelling of excessive porewater pressure increase in marine clays underneath Tarsiut Island used for oil and gas explorations in Canada by JH Yin for the first time

(a) A number of artificial islands were constructed on seabed in Canadian Beaufort Sea for oil and gas explorations in Canada. It was observed that some measured porewater pressures in the marine clays in seabed continued to increase even though the islands were completed and the surface loads were constant. This was a big concern on the stability of the islands since "increasing porewater pressures are associated with strength decrease and reduced stability" as stated in Becker et al. (1985).

Please see the paper by Becker et al. (1985) and part of the first page on the right:

Dr Becker: Former President of Canadian Geotechnical Society (CGD) and Chief Editor of Canadian Geotechnical Journal (CGJ)

POREWATER PRESSURE IN CLAYS BELOW CAISSON ISLANDS

D.E. Becker(1), M.G. Jefferies, M. ASCE(2), S.B. Shinde(3) and J.H.A. Crooks, M.ASCE(1)

INTRODUCTION

Unfrozen lightly overconsolidated clays are a significant factor in the design and performance of exploration caisson retained islands in the Canadian Beaufort Sea. At two sites (Tarsiut and Kadluk) the porewater pressures in the soft clay foundations were observed to increase significantly over periods of several months following completion of construction. These observations give rise to concern because, in conventional geotechnical experience, increasing porewater pressures are associated with strength decrease and reduced stability.

Becker et al. (1985) found that this abnormal phenomenon of excess porewater pressure which continued to increase under constant loading could not be predicted through their finite element modelling using the Cam-clay model.

(b) When JH Yin was working as a Research Engineer (PEng) at the Centre for Cold Ocean Resources Engineering (C-CORE), Memorial University of Newfoundland, St. John's, Newfoundland, Canada under Dr Jack Clark, Director of C-CORE, he studied this engineering problem. Please see Yin et al. (1994) (see the right side). Yin et al. (1994) successfully, for the first time, simulated unanticipated porewater pressure increase in soft clays using a full coupled consolidation simulation with Yin and Graham's 1D Elastic Visco-Plastic (EVP) constitutive model. They firstly explained that the mechanism of the "porewater pressure increase under constant loading" is due to creep and relaxation of the soil skeleton. Please see part of the first page of Yin et al. (1994) on the right above.

Modelling unanticipated pore-water pressures in soft clays

JIANHUA YIN
Centre for Cold Ocean Resource Engineering, Memorial University of Newfoundland, St. John's, NF A1B 3X5, Canada
JAMES GRAHAM
Department of Civil and Geological Engineering, University of Manitoba, Winnipeg, MB R3T 5V6, Canada
AND
JACK I. CLARK AND LONGJUN GAO
Centre for Cold Ocean Resource Engineering, Memorial University of Newfoundland, St. John's, NF A1B 3X5, Canada

Received April 26, 1993
Accepted April 14, 1994

Field observations in thin soft clay layers may show pore-water pressures that increase for some time after the loading is applied. Reasons for these observations are not well understood. The paper shows how an elastic viscoplastic constitutive model incorporated into the consolidation equation can predict these pore-water pressure increases in soils that exhibit significant creep behaviour (or secondary compression). The phenomenon has been related to relaxation in regions of the profile from which drainage has not yet begun.

Key words: clay, consolidation, creep, secondary compression, viscous, relaxation, pore-water pressure, elastic–plastic.

(c) Later, JH Yin did additional research work and established a 2D fully coupled finite element model for simulating Tarsiut Island using Yin and Graham's 3D Elastic Visco-Plastic (EVP) constitutive model. Please see Yin and Zhu (1999) (see the right side). Yin and Zhu (1999) successfully simulated and explained the porewater pressure increase in the marine clay underneath Tarsiut island under constant loading using Yin and Graham's 3D EVP model and explained the mechanism. Please see part of the first page of Yin and Zhu (1999) on the right above.

Elastic viscoplastic consolidation modelling and interpretation of pore-water pressure responses in clay underneath Tarsiut Island

Jian-Hua Yin and Jun-Gao Zhu

Abstract: It has been reported that the excess pore-water pressure in clay underneath Tarsiut caisson retained island increased for many months following completion of construction (with vertical load unchanged). It was thought that this increase might be caused by the creep behaviour of the soft clay. However, the phenomenon of excess pore-water pressure increase under constant loading has not been simulated successfully at the Tarsiut Island site. In this paper, a newly developed elastic viscoplastic (EVP) model is implemented in a finite element (FE) program for consolidation analysis. This FE program is used to model the consolidation behaviour of the clay under Tarsiut Island loading. The phenomenon of pore-water pressure increase with time following completion of construction of the island has been successfully simulated using the FE program with the new EVP model. The mechanism of the pore-water pressure increase is explained. It is found that the creep compression nature of the clay is the main internal factor causing the increase. However, the volumetric strain (change) produced due to the dissipation of excess pore-water pressure is the external factor which combines with the internal factor to cause decreasing effective stress and increasing pore-water pressure.

References:

Becker, D.E., Jefferies, M.G., Shinder, S.B., and Crooks, J.H.A. (1985). Porewater pressure in clays below caisson islands, In Proceedings of the American Society of Civil Engineers Arctic 85 Conferences, San Francisco, March 1985, 75-83.

Yin, J.-H., Graham, J., Clark, J.I., and Gao, L. (1994). Modelling unanticipated porewater pressures in soft clays. Canadian Geotechnical Journal, Vol. 31. 773-778.

Yin, J.-H. and Zhu, J.G. (1999). Elastic visco-plastic consolidation modelling and interpretation of porewater pressure responses in clay underneath Tarsiut island. Canadian Geotechnical Journal, Vol.36, No.4, 708-717.

(3) Yin's model and framework used for analysis and prediction of long-term settlement of Waba Dam in Canada

(a) Please see a report entitled "Numerical Investigation of Long-Term Settlement of Waba Dam - A Project Jointly Funded by MITACS and Ontario Power Generation Inc." by Liu et al. (2017) with part of "Executive Summary" page on the right side. In the "Executive Summary", it is stated that "The Yin's elasto-viscoplastic model with consideration of destructuration feature is applied in the FEM analyses to predict the long term settlement of Waba Dam. The dam in Area 1 Region is expected to settle approximately 2.3 m by 2051." This is an evidence that JH Yin's research work and constitutive model have been adopted to predict the long-term settlement of Waba Dam in Canada.

Liu et al. (2017). Numerical Investigation of Long-Term Settlement of Waba Dam

EXECUTIVE SUMMARY

This report presents the results of experimental tests conducted on Champlain Sea clay samples extracted from the foundation of Waba Dam and the prediction of the long-term settlement of the dam foundation using the finite element method (FEM). Waba Dam is located 2 km upstream of the Arnprior Generating Station (AGS). It was designed as a containment structure to isolate the reservoir feeding the AGS from entering the Mississippi valley. Due to a more than 60 m deep Champlain Sea clay deposit underlying the dam, there have been substantial settlements accumulated since its construction in 1976. This study is part of a new geotechnical investigation program conducted on Waba Dam since its previous 1987 Investigation. This investigation program is to evaluate the existing engineering properties of foundation clay and predict the long-term settlement of the dam. A field drilling program was carried out in November 2015 by Qualitas. Two boreholes were drilled in the field along with two piezocone penetration tests conducted near the sampling boreholes. A total of 98 Laval samples and 72 Shelby tube samples were collected for laboratory tests.

This report presents laboratory test results conducted at Ryerson University, including index properties, compressibility, and shear strength properties. The Yin's elasto-viscoplastic model with consideration of destructuration feature is applied in the FEM analyses to predict the long-term settlement of Waba Dam. The dam in Area 1 Region is expected to settle approximately 2.3 m by 2051.

(b) Please see a PhD thesis entitled "A Deviatoric Softening Model to Simulate Compressibility Properties of Soft Clays" by Cong Shi of Ryerson University and past of the PhD thesis abstract copy below. "Secondly, a new model named MEVP-DS, has been incorporated into the framework of Yin's elaso-viscoplastic model to consider deviatoric softening, destructuration and yield surface anisotropy of soft clay." "MEVP-DS predicts reasonably well the long-term settlement prediction of Waba Dam over the course of 40 years. The consideration of deviatoric softening is shown to improve also other aspects of the simulation, especially the predictions of lateral spreading."

A Deviatoric Softening Model to Simulate Compressibility Properties of Soft Clays

Cong Shi, Doctor of Philosophy, 2019

Department of Civil Engineering

Ryerson University, Toronto, Canada

ABSTRACT

Soft clays are often associated with high compressibility due to its high void ratio, low permeability, and low strength. Structures built on top of it can experience excessive settlement issues over a long period of time. The prediction of these settlements has attracted attentions from many researchers for over a century, but accurately predicting them still remains a difficult issue due to complex properties of soft clays, including plasticity, viscosity, anisotropy, soil structure and so forth. Therefore, studying the compressibility of soft clay is of significant importance. This dissertation aims to investigate the influence of plastic deviatoric strains on the compressibility of soft clays.

First of all, the dissertation reviews a number of published incremental anisotropic consolidation tests on Finnish clays. The results demonstrate the dependence of soil compressibility on stress ratios. Based on the results, a modified yield surface deviatoric softening law has been introduced. This softening law describes yield surface softening to be related to plastic deviatoric strain increments.

Secondly, a new model named MEVP-DS, has been incorporated into the framework of Yin's elaso-viscoplastic model to consider deviatoric softening, destructuration and yield surface anisotropy of soft clay.

(c) Regarding the above works, please see a letter dated 15 Sept 2019 from Prof Jinyuan Liu (see a copy of this letter on the right side). In this letter, he stated "This is to acknowledge your significant contributions to research and education at Ryerson University in Toronto, Canada. With your generous support and kind help, we have successfully applied your Elastic Visco-Plastic (EVP) software in predicting the long-term settlement of Waba Dam and graduating one PhD student, Cong Shi on modelling of soft clay."

RYERSON UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING
FACULTY OF ENGINEERING AND ARCHITECTURAL SCIENCE
Civil Engineering • Structural Engineering Option

September 15, 2019

Dear Professor Yin:

Subject: *Acknowledgement for Your Contributions to Ryerson University in Canada*

This is to acknowledge your significant contributions to research and education at Ryerson University in Toronto, Canada. With your generous support and kind help, we have successfully applied your Elastic Visco-Plastic (EVP) software in predicting the long-term settlement of Waba Dam and graduating one PhD student, Cong Shi on modelling of soft clay.

Waba Dam is a zoned earth fill structure in the city of Amprior, ON. Due to its 65 m deep sensitive Champlain Sea clay foundation, the 18 m tall dam has accumulated more than 1.7 m settlement over the course of 40 years. With your EVP software, we could accurately simulate the existing settlement and predict the settlement of the dam by 2050. Currently, Ontario Power Generation, the owner of the dam, is relying on our prediction to lift up the existing dam for its safe operation.

In addition, my PhD student, Cong Shi, modified your EVP code to consider the deviatoric softening in better simulating the compressibility of soft marine clays. Soft marine clay is one of the most challenging geotechnical materials. With your code, Cong was able to apply the deviatoric softening model on your EVP code and successfully defended his thesis on August 22, 2019.

In summary, your pioneering and innovative work in EVP modelling of soft clay helped us advance our research and education in Ryerson University. I really appreciate your help and support.

Sincerely yours,

Dr. Jinyuan Liu, PE, PEng
Professor, Geotechnical Engineering

References:
Liu, Jinyuan, Shi, Cong, Afroz, Mohammad & Andrew Kirstein, Andrew (2017). "Numerical Investigation of Long-Term Settlement of Waba Dam - A Project Jointly Funded by MITACS and Ontario Power Generation Inc.", Final Report submitted to Dr. Tareq Salloum on December 15, 2017.
Liu, Jinyuan (2019). A private letter dated 15 Sept 20190 to JH Yin,
Shi, Chong (2019). A Deviatoric Softening Model to Simulate Compressibility Properties of Soft Clays. PhD thesis, Ryerson University, Toronto, Canada.

Evidence 2: Contributions by Jian-Hua Yin

(4) JH Yin served Canadian Geotechnical Journal as an Associate Editor for twelve years and a highly cited author

(a) JH Yin serviced Canadian Geotechnical Journal (CGJ) as an Associate Editor for more than 13 years (2001 to 2014) (see the right page). CGJ is the flagship journal of Canadian Geotechnical Society (CGS) and a top international journal. For more info, please contact Miss Donna R. Hartson, Secretary of CGJ office by email: cgj@cdnsciencepub.com

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Canadian Geotechnical Journal | **Revue canadienne de géotechnique**

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(b) JH Yin published a good number of papers in Canadian Geotechnical Journal (CGJ) since 1989. Many of his papers were highly cited. This is a good indication of his research works which have been recognized by both engineers and researchers in geotechnical field. Please visit the website below (*the exact ranking may vary with time*):
https://exaly.com/author/5841500/jian-hua-yin/rankings

1st **most cited author** in *Canadian Geotechnical Journal* (1989)
1st **most cited author** in *Canadian Geotechnical Journal* (1994)
2nd **most cited author** in *Canadian Geotechnical Journal* (2010)
6th **most cited author** in *Canadian Geotechnical Journal* (Lifetime) ***("Lifetime" means ranking among all authors from past to present)***

(5) JH Yin has had close co-operations with top/senior engineers and scholars in Canada including visits, talks, and meetings (selected examples from present to past)

12 July 2023: JH Yin visited and had meetings with Prof. Serge Leroueil (PEng, Fellow of Engineering Institute of Canada – FEIC, Fellow of Royal Society of Canada - FRSC), Prof. Jean Côté (PEng, FEIC, Chaire CRSNG/ Hydro-Québec CRIBAR) and a few other seniors) at Laval U and gave a talk entitled "Fully Coupled Numerical Methods and a Simple Method for Consolidation Analysis of Clayey Soils". Please see an appreciate letter below from President Julie Therrien and Regional Director Dr Vincent Castonguay dated 19 July 2023 (see the right side).

CANADA | La Société canadienne de géotechnique | Section régionale de l'Est-du-Québec de la Société canadienne de géotechnique

Québec, July 19th, 2023

Subject: Lecture given to the Eastern Quebec section of the Canadian Geotechnical Society

Mr. Yin,

We wish to thank you for the lecture titled «Fully coupled numerical methods and a simple method for consolidation analysis of clayey soils »», given on July 12th as part of the activities held by the Eastern Quebec section of the Canadian Geotechnical Society (SCG-EQ). The lecture was a success and it was greatly appreciated by our members.

Once again, on behalf of the SCG-EQ, we sincerely thank you for your valuable contribution to our local geotechnical community.

Best regards,

Julie Therrien, ing., M. Sc., MBA.
Président

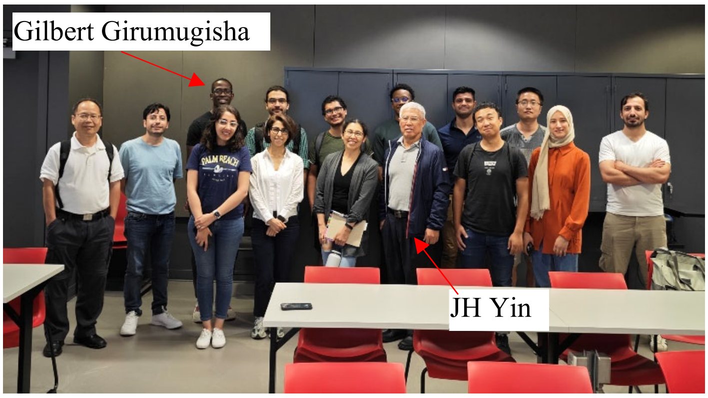
Vincent Castonguay, ing., Ph.D.
Regional Director

Société Canadienne de Géotechnique – Section de l'Est du Québec

AM of 17 July 2023: JH Yin visited and met student members of Canadian Geotechnical Society (CGS) in Montreal in Polytechnique Montreal. Contact person: Gilbert Girumugisha (Ph.D. Candidate, VP & Secretary of the Student Chapter CGS-Montreal, Department CGM, Polytechnique Montreal; email: gilbert.girumugisha@polymtl.ca. JH

Evidence 2: Contributions by Jian-Hua Yin

Yin gave a talk entitled "Optical Fibre Sensing Technologies for Smart Monitoring of Civil and Geotechnical Structures: Principle, Innovations, and Applications" in Polytechnique Montreal. Please see a photo with all students and professors after my talk on the right side.



Evening of 17 July 2023: JH Yin gave a talk entitled "Fully Coupled Numerical Methods and a Simple Method for Consolidation Analysis of Clayey Soils". For Canadian Geotechnical Society – Western Quebec Section. Please see the talk flyer below left.

Société canadienne de géotechnique
Section Ouest du Québec

Canadian Geotechnical Society
Western Quebec Section

Reza Saghaee, Ph.D.	Président	Philippe Legault-Capozio, B.Comm.	Responsable de l'administration
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Fully Coupled Numerical Methods and a Simple Method for Consolidation Analysis of Clayey Soils

Prof. Jian-Hua Yin

Professeur chaire de mécanique des sols et chef de l'unité géotechnique
Département de génie civil et environnemental
Université polytechnique de Hong Kong

LIEU / PLACE :	Plaza Centre-Ville, 777 Boulevard Robert Bourassa, Montréal, Québec, H3C3Z7
DATE:	Le lundi 17 juillet 2023 / Monday, July 17, 2023
HEURE / TIME :	17h30 Réception et buffet, 18h30 présentation / 5:30 pm reception and buffet, 6:30 pm lecture
LANGUE / LANGUAGE:	Anglais / English
COÛT:	30$ (gratuit pour les étudiants/ free for students)

RÉSUMÉ

Récemment, des méthodes numériques entièrement couplées et une méthode simple d'analyse de consolidation des sols argileux ont été adoptées dans la 5e édition du « Canadian Foundation Engineering Manual » (CFEM) aux sous-sections 7.9.2.1 et 7.9.2.2 du chapitre 7. C'est l'occasion pour l'orateur d'expliquer les deux types de méthodes et leurs applications.

Dans cet exposé, l'orateur donne d'abord une brève introduction aux problèmes des grands tassements de fondations ou d'îles artificielles sur des sols meubles. Les cas incluent la tour de Pise, les remises en état de l'aéroport du Kansai au Japon et de Hong Kong. La plupart de ces grands tassements sont causés par le fluage du squelette du sol argileux dû aux contraintes effectives. Le mécanisme du fluage est brièvement expliqué. L'orateur présente ensuite les méthodes de l'hypothèse A et de l'hypothèse B pour le calcul des tassements de consolidation des sols argileux, l'historique et les équations des deux méthodes, en expliquant les erreurs logiques inhérentes à la méthode de l'hypothèse A. Après cela, l'orateur présente brièvement des méthodes numériques entièrement couplées avec différents modèles élastiques visco-plastiques (EVP) pour l'analyse de la consolidation des sols argileux. L'orateur introduit ensuite une méthode simplifiée de l'hypothèse B, c'est-à-dire une méthode simple, pour les monocouches et les multicouches de sols argileux. Les étapes pour dériver cette méthode simple sont présentées. Deux exemples d'utilisation de cette méthode simple à la main ou avec des calculs Excel sont expliqués. Des vérifications de la méthode simple par comparaison avec des données de laboratoire et des valeurs de méthodes numériques entièrement couplées sont présentées. Une méthode générale simple et sa vérification sont présentées plus loin. Des conclusions et des remarques sont présentées à la fin de l'exposé.

SUMMARY

Recently, fully coupled numerical methods and a simple method for consolidation analysis of clayey soils have been adopted in the 5th edition of "Canadian Foundation Engineering Manual" (CFEM) as subsections 7.9.2.1 and 7.9.2.2 of Chapter 7. The speaker takes this opportunity to explain the two types of methods and their applications.

In this talk, the speaker firstly gives a brief introduction to issues of large settlements of foundations or artificial islands on soft soil grounds. Cases include the Tower of Pisa, Japan Kansai Airport Reclamations, and Hong Kong reclamations. Most of such large settlements are caused by creep of clayey soil skeleton due to effective stresses. The mechanism of creep is briefly explained. The speaker then presents Hypothesis A and Hypothesis B methods for calculating consolidation settlements of clayey soils, the history and equations of the two methods, explaining the inherent logical mistakes of Hypothesis A method. After this, the speaker presents briefly fully coupled numerical methods with different Elastic Visco-Plastic (EVP) models for consolidation analysis of clayey soils. The speaker then introduces a simplified Hypothesis B method, namely simple method, for one-layer and multi-layers of clayey soils. Steps of how to derive this simple method are presented. Two examples of using this simple method by hand or Excel calculations are explained. Verifications of the simple method by comparing with lab data and values from fully coupled numerical methods are presented. A general simple method and its verification are presented later. Conclusions and remarks are presented at the end of the talk.

McGill University

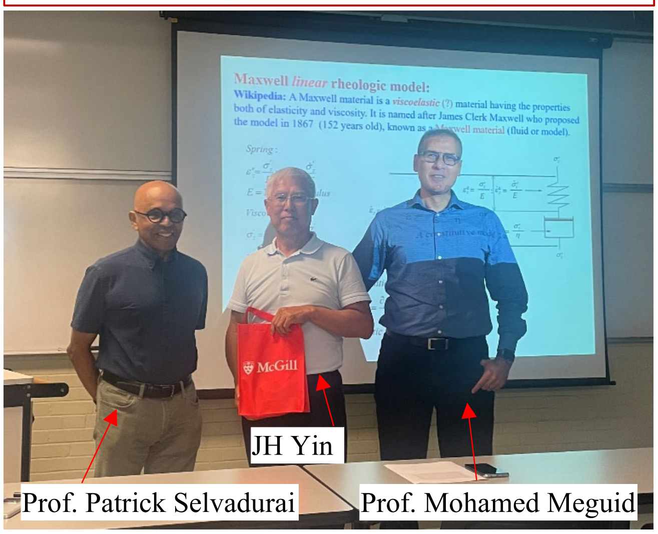
RESEARCH SEMINAR IN GEOTECHNICAL ENGINEERING

Nonlinear Rheological Models of Clayey Soils and Applications

Dr Jian-Hua Yin
Chair Professor of Soil Mechanics
Leader of Geotechnical Unit
Department of Civil and Environmental Engineering
The Hong Kong Polytechnic University, Hong Kong, China
Email: cejhyin@polyu.edu.hk

The speaker firstly gives a brief introduction to issues of large settlements of foundations or artificial islands on soft soil grounds. Most of such large settlements are caused by creep of clayey soil skeleton due to effective stresses. The mechanism of creep is briefly explained. The speaker then presents a number of one-dimensional (1D) linear rheological models, including Maxwell model, Kelvin model, and a few composite models and their applications in 1D consolidation analyses. After this, the speaker introduces an 1D Elastic Visco-Plastic (1D EVP) model proposed by Yin and Graham (1989, 1994) and its applications in 1D consolidation analysis of soft soils by different researchers. How to derive this 1D EVP model, its calibration, and verification are included in his ppt, but may not be presented due to time limit. The speaker then introduces a 3D EVP model based on (i) Perzyna's work (1966), (ii) Modified Cam-Clay model (Roscoe and Burland 1968), and the 1D EVP model (Yin and Graham 1989, 1994), the application of this 3D EVP model, and its comparison with Soft Soil Creep model in Plaxis. After this, nonlinear functions for creep and compression in 1D straining are presented overcoming a few limitations of logarithmic function, followed by other new works by the speaker and others. Conclusions and remarks are given at the end.

Location of Lecture:
Room 497 Macdonald Engineering Building
Date: Tuesday, 18th July, Time: 11.00 am to 12.00 noon
For further information Please contact
Professor APS Selvadurai
(E-mail: patrick.selvadurai@mcgill.ca)



AM of 18 July 2023: JH Yin visited Prof. Patrick Selvadurai (PEng, FEIC, FCAE, FRSC) and Prof. Mohamed Meguid (Head), Dept of Civil Engineering, McGill U. JH Yin gave a talk entitled "Nonlinear Rheological Models of Clayey Soils and Applications". Please see the flyer above right and a photo on the right.

From 1995 to 2023: JH Yin visited and/gave talks in UBC, U of M, U of T, Ryerson U, Queen's U, Western U, SFU, RMC, … details of which are not presented here. Top/senior engineers and professors in Canada were invited by JH Yin to visit and give talks (or short courses) in HK.

Evidence 2: Contributions by Jian-Hua Yin

(6) JH Yin's Elastic Visco-Plastic (EVP) models for consolidation analysis of soils considered one of "main milestones in the evolution of geotechnical analysis in the past 60 years …" and successful application to a field embankment in UK

(a) Please refer to Zdravkovis and Carter (2008) with part of the first page and other pages below. Geotechnique is Top 1 journal in geotechnical engineering. Dr Zdravkovis is a professor in Imperial College in UK and Dr Carter is an Emeritus Professor of University of Newcastle, former Vice-President (R&D), in Australia and Fellow of the Australian Academy of Technological Sciences and Engineering (FTSE). JH Yin's Elastic Visco-Plastic (EVP) modelling of consolidation analysis of soils was considered one of "main milestones in the evolution of geotechnical analysis in the past 60 years. "However, it is the model of Yin & Graham (1996), which introduces the equivalent time concept, that **makes a step forward in modelling creep**."

Zdravkovic, L. & Carter, J. (2008). *Géotechnique* **58**, No. 5, 405–412 [**doi:** 10.1680/geot.2008.58.5.405]

Contributions to *Géotechnique* 1948–2008: Constitutive and numerical modelling

L. ZDRAVKOVIC* and J. CARTER†

A review of the first 60 years of *Géotechnique* publications shows clearly how the subject of soil mechanics has evolved. In terms of constitutive and numerical modelling of soil, early forms of numerical analysis involved hand calculations of ultimate states applying classical methods of analysis: limit equilibrium, limit analysis or stress field solutions. Consequently, the soil was considered to behave as a rigid plastic material, and to follow one of the two basic failure laws of classical soil mechanics, namely the Tresca or Mohr–Coulomb failure criteria. For assessing the deformation of structures, soil was normally considered to be linear elastic. The foundations of modern numerical analysis and constitutive modelling were laid in the early to mid 1960s, with the development of the finite element method and the postulation of the critical state framework of soil behaviour respectively. Clearly, the continuous advancement of computer power has been essential in applying new developments to modern geotechnical analysis. This paper reviews some of the main milestones in the evolution of geotechnical analysis in the past 60 years, commenting, where appropriate, on what problems still lie ahead.

Un examen des 60 premières années de publications de *Géotechnique* démontre clairement l'évolution suivie par la discipline de la mécanique des sols. En ce qui concerne la modélisation constitutive et numérique des sols, les premières formes d'analyse numérique comportaient des calculs manuels d'états limites avec l'application de méthodes d'analyse classiques : équilibre limite, analyse limite ou solutions sur place pour les contraintes. C'est ainsi que l'on estimait que le sol se comportait comme une matière plastique rigide en suivant une des deux lois de base sur la rupture de la mécanique des sols classique, à savoir les critères de rupture de Tresca ou de Mohr–Coulomb. Pour l'évaluation de la déformation des structures, le sol était normalement considéré comme étant élastique linéaire. C'est vers le début ou la moitié des années soixante que l'on posa les fondations de l'analyse numérique et de la modélisation constitutive modernes, avec le développement de la méthode aux éléments finis et la postulation du cadre de l'état critique respectivement dans le comportement des sols. Le progrès continu de l'informatique a joué manifestement un rôle essentiel dans l'application de nouveaux développements dans

behaviour. Here, the total strain consists of elastic and plastic time-independent strains, evaluated from the MCC yield surface, and time-dependent plastic strains, evaluated from creep rate expressions empirically derived from triaxial tests. However, it is the model of Yin & Graham (1996), which introduces the equivalent time concept, that makes a step forward in modelling creep. Although this paper showed model development for one-dimensional consolidation only

(a complete model was published later, but not in *Géotechnique*), it assumed that the total strain consists of elastic and viscoplastic parts. The use of equivalent time allows the model to have stress–strain-equivalent time states independent of stress path (i.e. total strain rate is equal to creep strain rate). The model also introduces the limit time line, which helps to model soils that do not experience creep: that is, if the equivalent time is set to be very large (infinity), the creep rate will be equal to zero.

Yin, J.-H. & Graham, J. (1996). Elastic visco-plastic modelling of one-dimensional consolidation. *Géotechnique* **46**, No. 3, 515–527.

(b) Dr Nash and Dr Ryde (2001) applied Yin and Graham's Elastic Visco-Plastic (EVP) constitutive model (1989, 1994, 1996) in numericl consolidation back-analysis of field data from construction of embankments on soft soils in UK. Please see the first page and other parts of the paper by Nash Ryde (2001) below. In their copnclusion, cited here "The elastic visco-plastic constitutive model developed originally by Yin & Graham (1989, 1996) **reproduces** many features of soft clay behaviour commonly **observed in the field** and laboratory, and provides a helpful framework for the interpretation of data from high-quality oedometer tests and field instrumentation." "The incorpation of this EVP model in the finite difference procedure BRISCON **enables predictions to be made for full-scale problems**."

Nash, D. F. T. & Ryde S. J. (2001). *Géotechnique* **51**, No. 3, 257–273

Modelling consolidation accelerated by vertical drains in soils subject to creep

D. F. T. NASH* and S. J. RYDE†

The settlement of embankments and reclamations over soft soils is frequently accelerated by the use of vertical drains. The magnitude of long-term settlement is sometimes reduced by the use of surcharge, although there is often uncertainty about how long the surcharge should be maintained to minimise creep movement. The design of vertical drains is generally based on closed-form solutions of Terzaghi's consolidation equation, and rarely takes into account non-linear stiffness and creep of the soil. In this paper a one-dimensional finite difference consolidation analysis is outlined showing how vertical and radial drainage of a multi-layer soil profile in the zone of influence of a vertical drain may be modelled. The analysis allows inclusion of a zone of peripheral smear around the drain and drain resistance, permeabilities may be varied with void ratio, and creep is modelled both during and after primary consolidation. The application of the model is illustrated with back-analysis of field data from construction of an embankment with temporary surcharge over estuarine alluvium.

Le tassement des berges et la reconquête de sols tendre se trouvent fréquemment accélérées par l'utilisation de drains verticaux. L'ampleur du tassement à long terme est parfois réduite par l'utilisation d'une surcharge, bien qu'il existe souvent une incertitude quant à la durée de maintien de la surcharge pour minimiser le mouvement de glissement. L'étude de la forme des drains verticaux est généralement basée sur des solutions en forme fermée de l'équation de consolidation de Terzaghi et prend rarement en compte la rigidité non linéaire et le glissement du sol. Dans cette étude, nous décrivons une analyse unidimensionnelle de consolidation à différence finie, montrant comment le drainage vertical et radial d'un profil de sol à plusieurs couches dans la zone d'influence d'un drain vertical peut être mis en maquette. L'analyse tient compte de la zone de salissure périphérique autour du drain et des effets de la résistance de drain, les perméabilités pouvant être variées en fonction du taux de vide ; le glissement est mis en maquette pendant et après la consolidation primaire. L'application du modèle est

idation. Accordingly a finite difference analysis was developed by Ryde (1997), to model one-dimensional consolidation arising from vertical and radial flow, incorporating an elastic visco-plastic constitutive model developed recently by Yin & Graham (1989, 1996). This finite strain analysis includes the effects of non-linear stiffness, creep, and permeability varying with void ratio as well as drain resistance and smear around the vertical drain. In this paper the finite difference algorithm is outlined,

DISCUSSION AND CONCLUSION

The consolidation of soft soils accelerated by vertical drains frequently presents difficulties to designers of embankments and reclamation schemes over soft clays if there is significant creep. The elastic visco-plastic constitutive model developed originally by Yin & Graham (1989, 1996) reproduces many features of soft clay behaviour commonly observed in the field and laboratory, and provides a helpful framework for the interpretation of data from high-quality oedometer tests and field instrumentation. It is axiomatic that the field and laboratory stress–strain paths predicted by the model are different on account of the longer drainage paths and slower strain rates in the field. The incorpation of this EVP model in the finite difference procedure BRISCON enables predictions to be made for full-scale problems. Parametric studies may be undertaken where there is uncertainty over soil properties such as permeability and creep parameters, and to examine the effects of varying the size and permeability of the smear zone and the effects of drain resistance.

one-dimensional problems such as reclamations. Where significant shear strains may occur, a more comprehensive analysis is required using procedures such as those developed by Hird *et al.* (1992), in which the vertical drains are incorporated into a full two-dimensional finite element model. However, such analyses have not hitherto used a constitutive model incorporating creep, and would necessitate using a more comprehensive model such as that developed recently by Yin & Graham (1999).

Yin, J.-H. & Graham, J. (1989). Viscous-elastic-plastic modelling of one-dimensional time-dependent behaviour. *Can. Geotech. J.* **26**, No. 2, 199–209.

Yin, J.-H. & Graham, J. (1994). Equivalent times and one-dimensional elastic visco-plastic modelling of time-dependent stress–strain behaviour of clays. *Can. Geotech. J.* **31**, No. 1, 42–52.

Yin, J.-H. & Graham, J. (1996). Elastic visco-plastic modelling of one-dimensional consolidation. *Géotechnique* **46**, No. 3, 515–527.

Yin, J.-H. & Graham, J. (1999). Elastic viscoplastic modelling of the time-dependent stress–strain behaviour of soils. *Can. Geotech. J.* **36**, No. 4, 736–745.

References:

Nash, DFT and Ryde, SJ (2001). Modelling consolidation accelerated by vertical drains in soils subject to creep. Geotechnique 51(3), 257~273

Zdravkovic, L. & Carter, J. (2008). Contributions to Geotechnique 1948–2008: Constitutive and numerical modelling. Geotechnique 58, No. 5, 405–412.

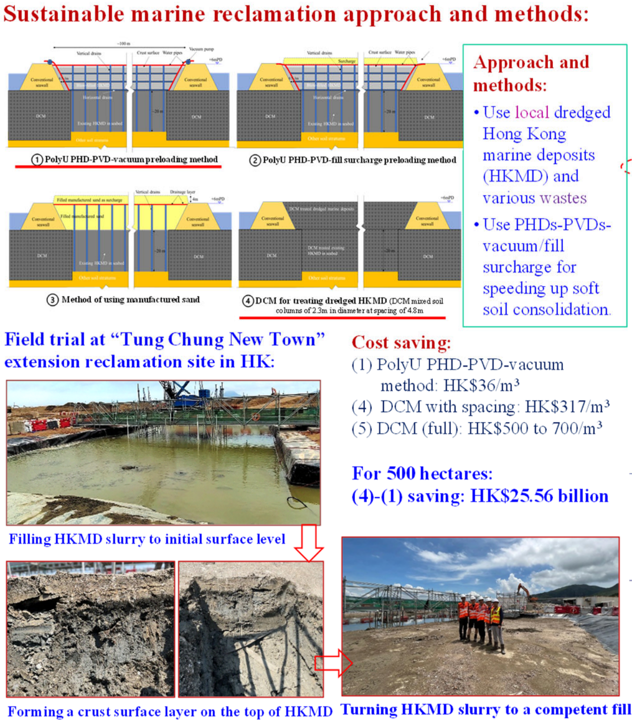
(7) JH Yin's new approach and methods demonstrated to save billions of dollars and a lot of time for marine reclamation constructions in Hong Kong and other coastal cities

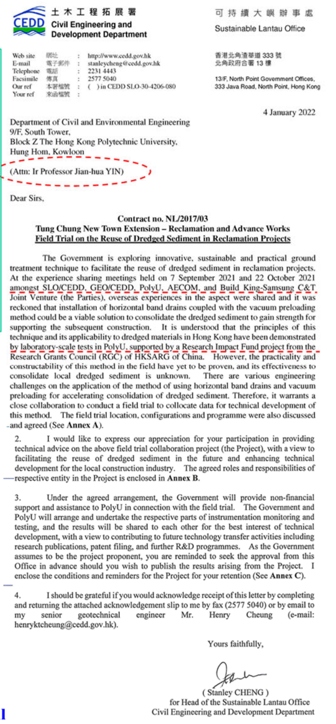
(a) In 2018 policy address, the previous Chief Executive Carrie Lam of Hong Kong Government proposed the creation of a third core business district by constructing artificial islands, called "Lantau Tomorrow Vision", also known as the Kau Yi Chau Artificial Islands. These islands have a total area of about 1,700 hectares (4,200 acres) through massive land reclamation near Kau Yi Chau and Hei Ling Chau in HK. The construction cost was estimated HK$580 billion (US$73.8 billion) for providing houses for 700,000 to 1.1 million people. See detailed info at: https://en.wikipedia.org/wiki/Lantau_Tomorrow_Vision

The new Chief Executive of HK Government in 2021 finalized the reclamation of three artificial islands around the Kau Yi Chau natural island with 1000 hectares of land for meeting part of the medium to long-term land requirement of Hong Kong for a population of 500,000 to 550,000 people (see the drawing on the right side).
See detailed info at: https://www.lantau.gov.hk/en/our-projects/artificial-islands.html

(b) JH Yin is the leader (Project Coordinator) of a Research Impact Fund (RIF) project entitled "Study of Super-fast Large-area Economical Marine Reclamations for Housing and Infrastructural Developments in the Guangdong-Hong Kong-Macau Greater Bay Area" (RIF grant no.: R5037-18 and project period: 30 Jun 2019 - 29 Jun 2024) with a total of HK$14.26 million (C$2.377 million), 70% (HK$9,876,160) of which is from Research Grants Council (RGC) of HK Government and 30% (required match) from PolyU. Please visit the website for this RIF project information of JH Yin's RIF project (2018/19):
https://www.ugc.edu.hk/eng/rgc/funding_opport/rif/funded%20research/rif1819.html

One primary objective of this RIF project is to provide a new sustainable approach and innovative-economical methods for "Lantau Tomorrow Vision" marine reclamations. Since 2019, extensive lab tests, physical model tests, and analytical-numerical analyses (Yin, Chen, Feng, 2022). have been done. Additional protype field trial was supported by Civil Engineering and Development (CEDD) of HK Government with additional money of HK$6 million (C$1 million) to cover field trial construction cost. Please see the letter dated 4 Jan 2022 and photos of the field trial on the left side. A drawing showing "sustainable marine reclamation approach and methods" is the top left of the plate on the right side. Local free dredged Hong Kong Marine Deposits (HKMD) are used as fill materials. PolyU PHD-PVD-vacuum method or fill surcharge method is used to improve both newly dredged HKMD slurry and existing HKMD in seabed. PHDs mean Prefabricated Horizontal Drains and PVDs are Prefabricated Vertical Drains (Yin, Chen, Leung, 2023).





土木工程拓展署
CEDD Civil Engineering and Development Department

可持續大嶼辦事處
Sustainable Lantau Office

Web site 網址 : http://www.cedd.gov.hk
E-mail 電子郵件 : stanleycheng@cedd.gov.hk
Telephone 電話 : 2231 4443
Facsimile 傳真 : 2577 5040
Our ref 本署檔號 : ( ) in CEDD SLO-30-4206-080
Your ref 來函檔號 :

香港北角渣華道 333 號
北角政府合署 13 樓

13/F, North Point Government Offices,
333 Java Road, North Point, Hong Kong

4 January 2022

Department of Civil and Environmental Engineering
9/F, South Tower,
Block Z The Hong Kong Polytechnic University,
Hung Hom, Kowloon

(Attn: Ir Professor Jian-hua YIN)

Dear Sirs,

Contract no. NL/2017/03
Tung Chung New Town Extension – Reclamation and Advance Works
Field Trial on the Reuse of Dredged Sediment in Reclamation Projects

The Government is exploring innovative, sustainable and practical ground treatment technique to facilitate the reuse of dredged sediment in reclamation projects. At the experience sharing meetings held on 7 September 2021 and 22 October 2021 amongst SLO/CEDD, GEO/CEDD, PolyU, AECOM, and Build King-Samsung C&T Joint Venture (the Parties), overseas experiences in the aspect were shared and it was reckoned that installation of horizontal band drains coupled with the vacuum preloading method could be a viable solution to consolidate the dredged sediment to gain strength for supporting the subsequent construction. It is understood that the principles of this technique and its applicability to dredged materials in Hong Kong have been demonstrated by laboratory-scale tests in PolyU, supported by a Research Impact Fund project from the Research Grants Council (RGC) of HKSARG of China. However, the practicality and constructability of this method in the field have yet to be proven, and its effectiveness to consolidate local dredged sediment is unknown. There are various engineering challenges on the application of the method of using horizontal band drains and vacuum preloading for accelerating consolidation of dredged sediment. Therefore, it warrants a close collaboration to conduct a field trial to collocate data for technical development of this method. The field trial location, configurations and programme were also discussed and agreed (See **Annex A**).

2. I would like to express our appreciation for your participation in providing technical advice on the above field trial collaboration project (the Project), with a view to facilitating the reuse of dredged sediment in the future and enhancing technical development for the local construction industry. The agreed roles and responsibilities of respective entity in the Project is enclosed in **Annex B**.

3. Under the agreed arrangement, the Government will provide non-financial support and assistance to PolyU in connection with the field trial. The Government and PolyU will arrange and undertake the respective parts of instrumentation monitoring and testing, and the results will be shared to each other for the best interest of technical development, with a view to contributing to future technology transfer activities including research publications, patent filing, and further R&D programmes. As the Government assumes to be the project proponent, you are reminded to seek the approval from this Office in advance should you wish to publish the results arising from the Project. I enclose the conditions and reminders for the Project for your retention (See **Annex C**).

4. I should be grateful if you would acknowledge receipt of this letter by completing and returning the attached acknowledgement slip to me by fax (2577 5040) or by email to my senior geotechnical engineer Mr. Henry Cheung (e-mail: henryktcheung@cedd.gov.hk).

Yours faithfully,

(Stanley CHENG)
for Head of the Sustainable Lantau Office
Civil Engineering and Development Department

(c) The unit price for using PolyU PHD-PVD-vacuum method for improving soft HKMD is HK$36/$m^3$. The unit price for using DCM method with DCM mixed soil column of 2.5 m in diameter and 4.8 m spacing for improving soft HKMD is HK$317/$m^3$. The coast saving for 500 hectares of HKMD reclamation (assuming thickness 15~16 m) is HK$25.56 billion (C$4.26 billion). The construction time can be reduced to 1/10 to 1/5 of conventional methods using sand fill and DCM.

For a public video of this project with impact by PolyU, please visit: https://youtu.be/uNguuFwH2Qc

References:

Yin, JH, Chen ZJ, WQ Feng WQ (2022). A general simple method for calculating consolidation settlements of layered clayey soils with vertical drains under staged loadings. Acta Geotechnica 17 (8), 3647-3674.

Yin JH, Chen WB, and Leung YF (2023). A Sustainable Approach to Marine Reclamations and a Field Trial at Tung Chung New Town Extension Site in Hong Kong. A R&D project report (94 pages) submitted to CEDD, HK Government on 6 Feb 2023.

Evidence 2: Contributions by Jian-Hua Yin

(8) JH Yin's R&D projects and know-hows serving international company in Hong Kong and Development Bureau of Hong Kong Government for large infrastructural projects and geo-hazards reduction

(a) Fugro is a well-known Dutch multinational public company headquartered in Leidschendam, Netherlands. Please visit: https://www.fugro.com/. Fugro Technical Services Limited (MateriaLab) is one of branch companies of Fugro and is the largest material testing company (also called MateriaLab) in Hong Kong. Please see a letter below dated 12 July 2022 from Ir Ricky Lo (Senior Engineer, email: r.lo@fugro.com) of Fugro Technical Services Limited. Cited here are "Your group have done very special tests on …" and "These tests provide professional technical results and advice on the design and construction works of several major projects in Hong Kong, including Third Runway of Hong Kong International Airport (HK$141 billion) (https://www.hongkongairport.com/en/media-centre/press-release/2022/pr_1619), artificially island of Hong Kong Boundary Crossing Facility (https://www.hyd.gov.hk/en/our_projects/road_projects/hzmb_projects/hkbcf/index.html) (HK$30.4 billion, and Tuen Mun-Chek Lap Kok tunnel link project – a major infrastructural project (HK$44.8 billion) (https://www.hyd.gov.hk/en/our_projects/road_projects/hzmb_projects/tmclkl/index.html), etc." .

FUGRO

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Date: 12 July 2022

Department of Civil and Environmental Engineering
The Hong Kong Polytechnic University
Kowloon
Hong Kong

Professor Jian-Hua Yin

Dear Professor Yin,

ADVANCED LABORATORY TESTING SURVICE PROVIDED BY POLYU GEOTECHNICAL GROUP FOR VARIOUS MAJOR PROJECTS IN HONG KONG

I am very glad to write this letter to endorse the excellent consulting works provided by your geotechnical group. Our laboratory was one of the first commercial testing laboratories to be formed recognized in 1989 by HOKLAS as having the appropriate expertise in respect of construction materials testing and equipment calibration. To date, FTS has been developed to one of largest commercial labs in the region of Southeast Asia with over 600 test items accredited by HOKLAS. Our parent company, Fugro N.V., is an international consultancy headquartered in Holland and has over 8000 employees based in 275 offices in more than 50 countries around the world.

Our laboratory and your group have had a long history of collaboration on the advanced laboratory tests on geomaterials. Your group have done very special tests on vertical and radial consolidation tests on HKMD using large-size Rowe Cell (the only one in Hong Kong), special stress-path controlled triaxial test on typical Hong Kong soils with small strain measurement, and anisotropic consolidated compression/extension tests. These tests provide professional technical results and advice on the design and construction works of several major projects in Hong Kong, including the Third Runway project of Hong Kong International Airport, artificially island of Hong Boundary Crossing Facility, and Tuen Mun-Chek Lap Kok tunnel link, etc.

I have visited your Soil Mechanics Laboratory for several times to view the execution of various tests. I was very much impressed by the conventional and advanced apparatuses for soil testing, which I believe is up to world-leading level. Wish to have more close collaboration with your group and the outcomes of your research work will not only benefit the geotechnical engineers in Hong Kong, but also engineers and researchers in other countries and regions.

Yours faithfully,

Ricky Lo
Senior Engineer

15 July 2022

Department of Civil and Environmental Engineering
The Hong Kong Polytechnic University
Hung Hom, Kowloon, Hong Kong SAR,
People's Republic of China
(Attention: Prof. Jian-Hua YIN, Chair Professor of Soil Mechanics)

SMEC Asia Ltd
27/F Ford Glory Plaza
37-39 Wing Hong Street
Cheung Sha Wan, Kln

Dear Prof. YIN,

Letter of Corroboration for the Research Impact Case on Monitoring the Risks of Masonry Retaining Walls, Stonewall Trees, and Large Trees under Extreme Climate Events

As I was formerly the Project Geotechnical Engineer of Greening, Landscape and Tree Management Section of Development Bureau who had provided day-to-day support to Prof. Jian-Hua YIN on the project under the TechConnect Block Vote in *Provision of Consultancy Services for Technical Study on Application of Optical Fiber Sensing Technology in Monitoring of Masonry Retaining Walls, Stonewall Trees and Large Trees* (**HKD 2.997 million**) in 2020-2021, it is my pleasure to corroborate on the research impacts of the geotechnical unit led by Prof. YIN.

Prof. YIN and his research team had substantially achieved the objective of the project in March 2021. An automatic monitoring system for dynamic deflections of large trees and stonewall trees and the movement of masonry retaining walls based on the innovative optical fiber sensing technology was developed. The results of the four-month monitoring work (September 1st, 2020 to December 31st, 2020) at those three sites located in the Lei Yue Mun Park and Holiday Village and the Warehouse Teenage Club on Hong Kong Island proves that the optical fiber sensing technology is feasible in monitoring the movement of large trees, stone wall trees and masonry walls in Hong Kong. Optical signals collected from the Fiber Bragg Grating (FBG) sensors are inert to the influence of electromagnetic waves especially under adverse weather conditions. In amalgamation with the modern day Internet-of-things (IoT) technique and powered by a solar-energy back-up system, an undisruptive continuous supply of real-time and high accuracy monitoring data on movement of large trees, stonewall trees and masonry walls under all weather conditions was finally realized.

In recent years, typhoons have caused damages to countless trees and have resulted at injuries and loss of lives in Hong Kong. In 2018, typhoon Mangkhut alone has resulted at over sixty thousand tree failure incidents. The research results of Prof. Yin and his team in this project has made a significant contribution to our understanding on the proper maintenance and preservation of trees in Hong Kong by making use of the innovative optical fiber sensing technology.

Yours sincerely,

(Philip Chu)
BEng, MSc, LLM, MHKIE, RPE (CVL & GEO)
Email: philp.chu@housingauthority.gov.hk
T. +852 2129 3957; M. +852 9230 1103

PC/pc

(b) Please see a letter dated 15 July 2022 from Ir Philip Chu (email: philip.chu@housingauthority.gov.hk), who was former manager of this R&D project and Project Geotechnical Engineer of Greening, Landscape and Tree Management Section of Development Bureau of HK Government and former manager of this R&D project. Total R&D project fee was HK$2.997 million (C$0.5 million). Yin and his group developed 3 sets of optical fibre sensor systems for automatic monitoring with warning of masonry retaining walls and large trees at 3 sites in HK Island. "Results of the four-month monitoring work … proves that the optical fibre sensing technology is feasible …".

(c) All high-level consulting and technical services by Prof JH Yin have been done via PolyU Technology & Consultancy Company Limited (PTeC) under PolyU: http://www.ptec.com.hk/

Please see stamped copy pages from PTeC: From 2015 to 7 Oct 2022, Prof JH Yin completed **34 projects** with a total income of **HK$8,286,770 (C$1,382,000)**.

Evidence 2: Contributions by Jian-Hua Yin

Prof. Yin Jian-hua (project list as at 7 Oct 2022) - from agreement signed date since 2015

Project No.	OAS Appl. ID	Customer Type	Project Name	Agreement Signed Date	Actual Start Date	Estimated/ Actual Completion Date	Currency	Project Fee	Project Fee(HKD)	Project Status
P20-0199	CA20-00200	Construction Company	Large Direct Shear Box Tests for South East New Territories Landfill Extension	26/04/2021	08/02/2021	30/04/2021	HK	88,200.00	88,200.00	Closed
P21-0168	CA21-00209	Government Department	Service Contract for Monitoring Using Fibre Optic Sensors in Diaphragm Wall of Launching Shaft of Trunk Road T2 (Phase 2)	29/12/2021	30/12/2021	28/02/2022	HK	140,000.00	140,000.00	Closed
P21-0170	CA21-00200	Consultant	Temperature Monitoring of Two Bored Concrete Piles	24/01/2022	24/01/2022	31/05/2022	HK	250,000.00	250,000.00	Active
P21-0174	CA21-00225	Technical Service Company	Special Tests on Soils and Rocks	31/01/2022	31/01/2022	10/05/2022	HK	56,000.00	56,000.00	Closed
P21-0211	CA21-00262	Technical Service Company	Standard Penetration Test (SPT) Study	23/03/2022	23/03/2022	30/06/2024	HK	180,000.00	180,000.00	Active
P21-0259	CA21-00346	Engineering Company	Lab Test Services - Integrated Waste Management Facilities Phase 1	21/06/2022	21/06/2022	30/06/2023	HK	136,000.00	136,000.00	Active
								Total in HKD:	8,286,770.00	

Total income: HK$8,286,770

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Prof. Yin Jian-hua (project list as at 7 Oct 2022) - from agreement signed date since 2015

Project No.	OAS Appl. ID	Customer Type	Project Name	Agreement Signed Date	Actual Start Date	Estimated/ Actual Completion Date	Currency	Project Fee	Project Fee(HKD)	Project Status
P14-0263	CA14-00308	Consultant	Review of Stone Column Design: HK-Zhuhai-Macao Bridge HK Link Rd Section between Scenic Hill & HK Boundary Crossing Facilities	19/01/2015	19/01/2015	28/02/2015	HK	25,000.00	25,000.00	Closed
P14-0282	CA14-00341	Contractor	Direct Shear Box Tests on Cement (or Grouted Soil) - Diamond Hill to Kai Tak Tunnels	12/01/2015	12/01/2015	30/04/2015	HK	140,000.00	140,000.00	Closed
P14-0382	CA14-00467	Contractor	CU Tests and Permeability Tests	04/03/2015	04/03/2015	31/05/2015	HK	77,000.00	77,000.00	Closed
P15-0101	CA15-00108	Consultant	Review and Advice on Hong Kong Boundary Crossing Facility - Reclamation Works	21/09/2015	21/09/2015	31/03/2018	HK	51,000.00	51,000.00	Closed
P15-0509	CA15-00589	Consultant	Testing of Kaolin Clay	23/05/2016	23/05/2016	21/06/2016	HK	32,500.00	32,500.00	Closed
P15-0559	CA15-00661	University	工矿区矸石山复垦区边坡稳定性数值分析	01/07/2016	01/07/2016	31/05/2017	RM	50,000.00	58,940.00	Closed
P15-0560	CA15-00660	University	基于光纤光栅的矿用测力锚杆开发	01/07/2016	01/07/2016	21/12/2017	RM	100,000.00	117,880.00	Closed
P16-0174	CA16-00229	Contractor	Small-scale Physical Model Tests for use of Geotextile Separator	15/11/2016	15/11/2016	31/05/2017	HK	39,000.00	39,000.00	Closed
P16-0277	CA16-00364	Laboratory Company	Inter-Laboratory Validation Tests on DCM Specimens used in the 3rd Runway Project	18/01/2017	18/01/2017	30/04/2017	HK	30,000.00	30,000.00	Closed
P16-0411	CA16-00529	Contractor	Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section	18/05/2017	05/04/2017	06/02/2018	HK	285,850.00	285,850.00	Closed
P16-0485	CA16-00635	Technical Service Company	HY/2012/08 Tuen Mun to Chek Lap Kok Link Southern Landfall - Anisotropically Consolidated Compression and Extension Triaxial Tests and CRS Oedometer Tests	15/06/2017	15/06/2017	12/10/2018	HK	344,500.00	344,500.00	Closed
P17-0035	CA17-00046	Technical Service Company	Large-size Rowe Cell Tests	01/12/2017	01/12/2017	30/04/2019	HK	260,400.00	260,400.00	Closed
P17-0229	CA17-00252	Engineering Company	One Physical Model Test on Bentonite Slurry with Vertical Drains Subjected Vacuum Pre-loading	14/12/2017	02/02/2018	12/11/2018	HK	80,000.00	80,000.00	Closed
P17-0509	CA17-00634	Construction Company	Triaxial Consolidated Undrained (CU) Tests with Small Strain Measurement	20/12/2018	28/06/2018	08/03/2019	HK	70,000.00	70,000.00	Closed
P18-0074	CA18-00071	Technical Service Company	Eight Constant Rate-of-strain (CRS) Tests with Multi-staged Oedometer Tests and Property Tests	31/12/2019	10/08/2018	30/07/2019	HK	142,400.00	142,400.00	Closed

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Prof. Yin Jian-hua (project list as at 7 Oct 2022) - from agreement signed date since 2015

Project No.	OAS Appl. ID	Customer Type	Project Name	Agreement Signed Date	Actual Start Date	Estimated/ Actual Completion Date	Currency	Project Fee	Project Fee(HKD)	Project Status
P18-0240	CA18-00290	Consultant	Triaxial Tests for Determination of Soil Stiffness at Small Shear Strain Level for Proposed New Acute Hospital at Kai Tak	04/12/2018	04/12/2018	31/12/2018	HK	80,000.00	80,000.00	Closed
P18-0282	CA18-00338	Technical Service Company	Provision of Rowe Cell Tests on Gypsum Sample	23/01/2019	23/01/2019	29/07/2019	HK	60,000.00	60,000.00	Closed
P18-0298	CA18-00376	Construction Company	CRS Tests and Multi-staged Oedometer Tests - Tung Chung New Town Extension - Reclamation and Advance Works	29/01/2019	29/01/2019	31/07/2019	HK	219,200.00	219,200.00	Closed
P19-0019	CA18-00642	Construction Company	Small-Strain Stress-Path Controlled Triaxial Tests with Unloading/Reloading (Central Kowloon Route - Kai Tak West)	13/12/2019	30/08/2019	16/12/2019	HK	204,000.00	204,000.00	Closed
P19-0152	CA19-00178	Engineering Company	Small-strain Consolidated Drained Triaxial Tests	08/11/2019	08/11/2019	03/01/2020	HK	510,000.00	510,000.00	Closed
P19-0234	CA19-00281	Government Department	Provision of Consultancy Services for Technical Study on Application of Optical Fiber Sensing Technology in Monitoring of Masonry Retaining Walls, Stonewall Trees and Large Trees	13/02/2020	13/02/2020	24/03/2021	HK	2,977,000.00	2,977,000.00	Closed
P19-0242	CA19-00280	Engineering Company	The Large-Scale Laboratory Test for the Compressibility of Public Fill Materials	02/06/2020	01/03/2020	31/08/2020	HK	108,000.00	108,000.00	Closed
P19-0279	CA19-00348	Engineering Company	Small-strain Consolidated Drained Triaxial Tests	08/05/2020	08/05/2020	21/06/2020	HK	102,000.00	102,000.00	Closed
P20-0018	CA20-00029	Construction Company	Special Triaxial Tests - Outstanding Issues for Removal of Temporary Toe Loading Platform	06/08/2020	06/08/2020	02/11/2020	HK	100,000.00	100,000.00	Closed
P20-0020	CA20-00014	Technical Service Company	Constant Rate of Strain Tests on Soils in Hong Kong	01/09/2021	01/09/2021	03/10/2022	HK	293,400.00	293,400.00	Closed
P20-0053	CA20-00053	Government Department	Service Contract for Monitoring using Fibre Optic Sensors in Diaphragm Wall of Launching Shaft of Trunk Road T2	21/08/2020	24/08/2020	24/03/2022	HK	700,000.00	700,000.00	Closed
P20-0063	CA20-00081	Construction Company	Large Direct Shear Box Tests	30/11/2020	30/11/2020	31/03/2021	HK	28,500.00	28,500.00	Closed
P20-0125	CA20-00136	Government Department	Service Contract for Monitoring for Review of Installation of Fibre Optic Sensors in Diaphragm Wall of Launching Shaft of Trunk Road T2	10/11/2020	11/11/2020	01/04/2022	HK	300,000.00	300,000.00	Active

HK Government project of R&D on optical fibre sensor systems for automatic monitoring of retaining walls and large trees at 3 sites in HK Island with income: HK$2,977,000

Page 2/3

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References:

Wu PC, Tan DY, Lin SQ, Chen WB, Yin JH, Malik N, Li A (2022). Development of a monitoring and warning system based on optical fiber sensing technology for masonry retaining walls and trees. Journal of Rock Mechanics and Geot. Eng., 14 (4), 1064-1076.

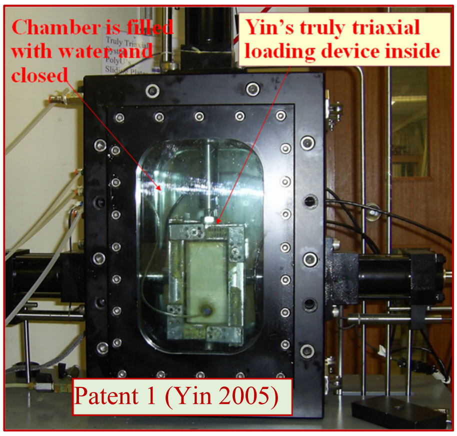
Wu PC, Tan DY, Chen WB, Malik N, Yin JH, Malik N (2021). Novel fiber Bragg Grating-based strain gauges for monitoring dynamic responses of Celtis sinensis under typhoon conditions. Measurement 172, 108966.

(9) JH Yin's inventions and know-hows having been used by Tsinghua University for a large rock fill dam project

(a) JH Yin has had more than 10 patents granted in Chinese Mainland and/or USA. Two selected patents are listed below:

- Yin, J-H. (2005). "A Truly Triaxial Cell with Combination of Innovative Rigid Sliding Plate Loading and Flexible Membrane Loading" (Chinese Patent Number: ZL200410094697.X). (See a photo of the "device" in Patent 1 below and Chinese patent page below.)
- Yin, J-H and his team (2022). "Effective Stress Cell for Direct Measurement of Effective Stress in Saturated Soil" (US Patent Number: US 2020/0181864 A1). (See a copy of USA patent page on the right side as Patent 2) (Yin, Qin, Feng 2020.)

(b) The patent of "truly triaxial loading device:" in Yin (2005) has been used by Tsinghua University (Top 14 in QS World University Rankings 2023). Results from the true trial tests were used of design & construction of a large "Rumei Core Wall Rockfill Dam of 315 m high with total investment of RMB60 billion (C$12 billion). Please see a letter dated 6 May 2022 from Tsinghua University.



Patent 1 (Yin 2005)

US011473260B2

(12) **United States Patent**
Yin et al.

(10) **Patent No.:** **US 11,473,260 B2**
(45) **Date of Patent:** **Oct. 18, 2022**

(54) EFFECTIVE STRESS CELL FOR DIRECT MEASUREMENT OF EFFECTIVE STRESS IN SATURATED SOIL

(71) Applicant: **THE HONG KONG POLYTECHNIC UNIVERSITY**, Hong Kong (CN)

(72) Inventors: **Jian-Hua Yin**, Hong Kong (CN); **Jie-Qiong Qin**, Hong Kong (CN); **Wei-Qiang Feng**, Hong Kong (CN)

(73) Assignee: **THE HONG KONG POLYTECHNIC UNIVERSITY**, Hong Kong (CN)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 359 days.

(21) Appl. No.: **16/689,163**

(22) Filed: **Nov. 20, 2019**

(65) **Prior Publication Data**
US 2020/0181864 A1 Jun. 11, 2020

Related U.S. Application Data

(60) Provisional application No. 62/777,404, filed on Dec. 10, 2018

(51) **Int. Cl.**
G01L 9/00 (2006.01)
G01L 1/24 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC *E02D 1/027* (2013.01); *G01L 9/0041* (2013.01)

(58) **Field of Classification Search**
CPC G01L 1/24; G01L 9/00; G01L 1/02; G01L 1/22; G01L 25/00; G01L 5/00;
(Continued)

(56) **References Cited**

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FOREIGN PATENT DOCUMENTS

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CN 102519630 A 6/2012
(Continued)

OTHER PUBLICATIONS

Clayton, C. R. I., and Bica, A. V. D. 1993. The design of diaphragm-type boundary total stress cells. Géotechnique, 43 (4): 523-535.
(Continued)

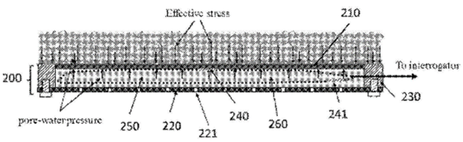
Primary Examiner — Brandi N Hopkins
(74) *Attorney, Agent, or Firm* — Spruson & Ferguson (Hong Kong) Limited

(57) **ABSTRACT**

The present disclosure provides an effective stress cell for direct measurement of effective stress in saturated soil. The effective stress cell comprises a sensing diaphragm, a porous diaphragm, a connector and a strain sensor. The porous diaphragm allows pore-water to enter the interior space between the sensing diaphragm and the porous diaphragm to provide complete balance of pore-water pressures in the front and back of the sensing diaphragm. Thus, the effective stress cell can directly and accurately measure the effective stress in saturated soil using only one diaphragm at one location without measuring pore-water pressure.

18 Claims, 15 Drawing Sheets

Patent 2 (Yin et al 2022)



[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
G01N 3/08 (2006.01)
G01N 3/00 (2006.01)

[12] 发明专利说明书

专利号 ZL 200410094697.X

(Chinese Patent Number: ZL200410094697.X)

[45] 授权公告日 2009 年 7 月 29 日

[11] 授权公告号 CN 100520345C

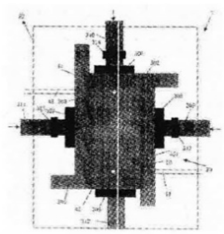
[22] 申请日 2004.11.12
[21] 申请号 200410094697.X
[73] 专利权人 香港理工大学
地址 香港九龙红磡
[72] 发明人 殷建华
[56] 参考文献
US3975950A 1976.8.24
FR2611904A1 1988.9.9
EP0422601A2 1991.4.17
JP2003－50188A 2003.2.21
审查员 唐峰涛

[74] 专利代理机构 隆天国际知识产权代理有限公司
代理人 王玉双 王艳江

权利要求书 2 页 说明书 6 页 附图 5 页

[54] 发明名称
用于岩土力学性能测试的真三维测试系统

[57] 摘要
一种用于测试岩土力学性能的真三维测试系统，包括：一测试室，其为充满了液体的密闭室；一加载装置，其设置在该测试室内部，用于对由该加载装置夹持的岩土样本施加载荷；测力计，设置在该测试室内部，用于感测该加载装置施加的载荷的大小；位移传感器，设置在该测试室外部，用于感测该岩土样本在该载荷作用下的应变。其中，所述加载装置由四个刚性滑动加载板彼此搭接而成，围成一个中央容置空间。加载装置还包括分别作用于滑动加载板中间位置的四个加载活塞，用于对该滑动加载板施加载荷，该滑动加载板以这样的方式搭接，使得它们在加载活塞的作用下，可沿水平方向和垂直方向彼此相对滑动。



清華大學
Tsinghua University

殷建华教授
土木及环境工程系
香港理工大学
香港，中国

2022 年 5 月 6 日

殷教授：

We found that your invented "true trial loading device" was the most advanced and feasible.

殷建华教授发明的真三轴加载装置方案

应用于清华大学大型岩土静动真三轴试验机的设计为中国高土石坝研究和设计服务

土石坝是我国水利工程中最常用的坝型之一，随着我国施工技术和能源需求的提高，我国已建、在建和拟建的很多土石坝也越来越高，例如澜沧江糯扎渡工程（坝高 261.5m）、大渡河双江口工程（坝高 314m）以及如美心墙堆石坝（坝高 315m）等。

在土石坝建设和蓄水过程中，堆石料经受了极其复杂的应力状态变化过程。有关堆石料的静力学特性主要采用常规三轴试验进行研究，而在实际工程中堆石料所受三个主应力一般并不相等，处于三向受力状态。目前建立的堆石料本构模型多基于常规三轴试验资料，如推广到三维情况，也需要真三轴试验资料进行验证。正是在这种背景下，我们于 2008 年开始着手开发大型岩土静动真三轴试验机。

其中的核心器件是"真三轴加载装置"。经过充分调研和交流，特别是阅读了您的论文(Yin, Zhou, Kumruzzaman and Cheng 2011)以后，我们认为您研发制造的"真三轴加载装置"最为先进实用。我与殷昆亭高级工程师于 2011 年 6 月专门去您实验室调研取经，并承蒙您亲自为我们毫无保留地介绍了"真三轴加载装置"的关键特点和使用技巧。在比较了国内外各种方案后，我们决定选用您的专利"用于岩土力学性能测试的真三维测试系统"(ZL 200410094697.X)。我们衷心感谢您慷慨地允许我们免费参考使用您的专利来设计和制造清华大学大型岩土静动真三轴试验机，基于此，加上清华大学团队和制造商的共同努力，该设备于 2013 年成功投入使用，试样尺寸为 200×200×400 mm，当时在国内外尚极为少见。

我们团队已利用清华大学大型岩土静动真三轴试验机完成了三个国家自然科学基金项目、"十三五国家重点研发计划"项目中的两个课题、一个国家重点实验室项目、一个企业委托项目共 7 个项目中的堆石料等材料的试验内容，这些项目的总经费约 800 万元。相关研究成果为我国高土石坝关键问题研究提供了一手资料，为规划中的如美心墙堆石坝（坝高 315m，预计工程总投资约 600 亿人民币）可行性论证和设计提供了技术支撑。

于玉贞
长聘教授
土木水利学院水利水电工程系
清华大学，北京，中国

Results from the true trial tests used of design & construction of a large "Rumei Core Wall Rockfill Dam of 315 m high with total investment of RMB60 billion (C$12 billion).

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Yin JH, Cheng CM, Kumruzzaman Md, and Zhou WH (2010). New Mixed Boundary True Triaxial Loading Device for Testing Study of the 3-D Stress-Strain-Strength Behaviour of Geomaterials. Canadian Geot J. Vol.47(1), 1~15.

Yin JH, Zhou WH, Kumruzzaman Md, and Cheng CM (2011). A Rigid-Flexible Boundary True Triaxial Apparatus for Testing Soils in a Three-Dimensional Stress State. Invited paper for a special issue in ASTM Geotechnical Testing Journal, Vol.34, 265~272.

Yin JH, Qin JQ, and WQ Feng WQ (2020). Novel FBG-based effective stress cell for direct measurement of effective stress in saturated soil. International Journal of Geomechanics 20 (8), 04020107.

Evidence 2: Contributions by Jian-Hua Yin

(10) JH Yin's contributions to international and local professional organizations and journals

(a) International professional organizations (selected)

(i) JH Yin has been a Vice-President of International Association for Computer Methods and Advances in Geomechanics (IACMAG) (funded in USA) since 2008 (the only representative in Asia in early 8 years). See website: https://www.iacmag.net/board.

(ii) JH Yin was Chairman of "International Workshop on Constitutive Modelling - Development, Implementation, Evaluation, and Application" held at The Hong Kong Polytechnic University, Hong Kong, 12-13 January 2007 jointed organized by PolyU and IACMAG. For the Proceedings of the International Workshop (JH Yin was leading editor), please see https://www.google.com.hk/books/edition/Constitutive_Modelling/noT0HgAACAAJ?hl=zh-TW .

(iii) JH Yin is the Honorary Chair of "The 17th international conference of the International Association for Computer Methods and Advances in Geomechanics" to be held at the Hong Kong Polytechnic University, Hong Kong, Dec 18 - 21, 2025. Please see website: http://iacmag2025.com/organizers.html

(iv) JH Yin was Chair of "One-day International Symposium on Advances in Laboratory Testing of Geomaterials", 3 June 2006 (Saturday), in The Hong Kong Polytechnic University. jointly organized by the Geotechnical Division of HKIE, Hong Kong Geotechnical Society and the Polytechnic University under the auspices of TC 29 - Laboratory Stress Strain Strength Testing of Geomaterials, The International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE).

(v) JH Yin was Secretary General of "The 3rd International Conference on Soft Soil Engineering", held at the Hong Kong Polytechnic University, Hong Kong, 6 to 8 Dec 2001 and Co-Editor of the proceedings. Please see: https://www.taylorfrancis.com/books/edit/10.1201/9780203739501/soft-soil-engineering-kwong .

(v) He was committee members of TC17 - Ground Improvement of ISSMGE, TC36 - Foundation Engineering in Difficult Soft Soil Conditions of ISSMGE, ATC12 - Land Reclamation and Coastal Structures in Asia (only representative from Hong Kong) under ISSMGE.

(vi) He was a Co-Chair of "The 14th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering" held in The Hong Kong Polytechnic University, 23–27 May 2011, jointly organized by The Hong Kong Geotechnical Society (HKGES) and The Hong Kong Polytechnic University (PolyU) under the auspices of The International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). Please see the proceedings (ISBN: 978-1-62748-383-4 at: http://toc.proceedings.com/18182webtoc.pdf . See the cover of the proceedings (cover design by JH Yin) below:

(b) Local professional organizations (selected)

(i) JH Yin was founding key member of The Hong Kong Geotechnical Society

(ii) He was founding key member of Association of Geotechnical & Geoenvironmental Specialists (Hong Kong)

(iii) He was Executive Member and Treasurer of The Hong Kong Society of Theoretical and Applied Mechanics

(iv) He was Founding Chairman of Engineers Division Committee of China Universities Alumni (HK) Association.

(c) Co-editor or editorial panel member (selected) of international journals

(i) Co-Editor of International Journal of Geomechanics (USA)

(ii) Co-Editor of GeoMechanics and GeoEngineering – an International Journal (UK)

(iii) Editorial Board member of Marine Georesources and Geotechnology (since Jan 2006) (USA)

3.3 Contributions to Canadian and International Journals (5 selected cases)

(i) JH Yin served Canadian Geotechnical Journal (CGJ) as an Associate Editor for 13 years from 2001 to 2014. CGJ is the flagship journal of Canadian Geotechnical Society and a top international journal. This journal is published by the National Research Council of Canada (please see the copy of pages below and on the right side).

Volume 38, Number 1, February 2001 | Volume 38, numéro 1, février 2001

Canadian Geotechnical Journal | **Revue canadienne de géotechnique**

Published by the National Research Council of Canada | Publié par le Conseil national de recherches du Canada

Editor / directeur scientifique DENNIS E. BECKER

Assistant to the Editor / adjointe au directeur scientifique Philomena D'Souza

Associate Editors / directeurs scientifiques associés

M. Aubertin, S.L. Barbour, F. Barone, K. Biggar, J.P. Carter, D.M. Cruden, R.J. Fannin, J.-M. Konrad, K. Kosar, F.H. Kulhawy, D. Leahy, C.D. Martin, I. Moore, R.K. Rowe, J. Shang, L. Smith, J. Sobkowicz, A.J. Valsangkar, J.-H. Yin

NRC Research Press / Presses scientifiques du CNRC

Editor-in-chief / directeur général Bruce P. Dancik

Assistant Editor-in-chief / directeur général adjoint Iain E.P. Taylor

iii

NRC Research Press

NOTE OF APPRECIATION / NOTE DE RECONNAISSANCE

The peer review process is essential to the success of the Canadian Geotechnical Journal, ensuring that our high standards are maintained and providing authors with assessments from appropriate experts. On behalf of the authors and the Editorial Board, we thank all the reviewers whose names appear with this note of appreciation. The demands on the time of individuals in industry and academia continue to rise, and we greatly appreciate the assessments provided by these busy individuals. A total of 474 manuscripts were received in 2013, and over 500 are currently expected in 2014.

The Board has experienced some changes. In addition to the appointment of a second Editor, a number of new Associate Editors were appointed. Our sincere appreciation to the four Board members who stepped down over the past 12 months: Murrray Grabinsky, Chris Haberfield, Jayantha Kodikara, and Jianhua Yin.

All of us on the Board rely on support from the Editorial Assistants Donna Hartson and Nicole Huskins, and we thank them for their excellent work. Thanks also to Managing Editor Jennifer Stewart, and other staff at Canadian Science Publishing such as Lesia Beznaczuk and Louis Lafleur.

Ian Moore and Daichao Sheng
Editors
Canadian Geotechnical Journal

Le processus d'examen par les pairs est essentiel au succès de la Revue canadienne de géotechnique. Il nous assure non seulement la publication d'articles de grande qualité, mais aussi une évaluation de manuscrits par des spécialistes du domaine. Ainsi, au nom des auteurs et du Comité de rédaction, nous désirons remercier tous les examinateurs dont le nom apparaît sur la présente note de reconnaissance. La charge de travail des personnes œuvrant dans les secteurs privé et universitaire ne cesse d'augmenter, et nous sommes grandement reconnaissants du temps que nous accordent ces examinateurs déjà bien occupés. En 2013, nous avons reçu 474 manuscrits, et selon les prévisions actuelles, plus de 500 manuscrits auront été soumis en 2014.

Le Comité de rédaction a connu certains changements. En plus de l'ajout d'un second rédacteur en chef, plusieurs nouveaux membres du Comité de rédaction ont été désignés. Nous tenons également à exprimer notre gratitude aux quatre membres du Comité de rédaction qui ont tiré leur révérence au cours des douze derniers mois, à savoir Murrray Grabinsky, Chris Haberfield, Jayantha Kodikara et Jianhua Yin.

Au Comité de rédaction, nous sommes heureux de pouvoir compter sur le soutien de nos adjointes, Donna Hartson et Nicole Huskins, et nous les remercions de leur excellent travail. Nous tenons également à remercier la directrice de la rédaction, Jennifer Stewart, ainsi que d'autres membres du personnel des Éditions Sciences Canada comme Lesia Beznaczuk et Louis Lafleur.

Ian Moore et Daichao Sheng
Rédacteurs en chef
Revue canadienne de géotechnique

Abbo, Andrew	Bareither, Christopher	Bussière, Bruno	Choudhury, Deepankar
Abd Elaziz Ahmed, Ahmed	Barone, Frank	Busslinger, Matthias	Chow, Yean Khow
Abichou, Tarek	Barreto, Daniel	Buttling, Stephen	Chrysikopoulos, Constantinos
Achmus, Martin	Barroso, Madalena	Buzzi, Olivier	Chu, Jian
Adam, Dietmar	Basu, Dipanjan	Cabral, Alexandre	Chun'an, Tang
Agharazi, Alireza	Bate, Bate	Cai, Fei	Civjan, Scott
Airey, David	Bathurst, Richard	Cai, Ming	Clarke, Samuel
Al Heib, Marwan	Baudet, Beatrice	Canbulat, Ismet	Clementino, Renato
Albright, Bill	Bayat, Alireza	Cao, Zijun	Collingwood, Ben
Alfaro, Marolo	Beaty, Michael	Carey, Sean	Comodromos, Emilios
Allotey, Nii	Becker, Dennis	Carter, John	Coop, Matthew
Almeida, Márcio	Beckett, Christopher	Cascini, Leonardo	Côté, Jean
Alonso, Eduardo	Beddoe, Ryley	Casini, Francesca	Cotecchia, Federica
Alonso-Marroquin, Fernando	Been, Ken	Chai, Jin Chun	Craig, Peter
Alshibli, Khalid	Begaj, Leonora	Chang, Ching	Cristesco, Nicolae
Anastasopoulos, Ioannis	Bergado, Dennes	Chapman, David	Crosta, Giovanni
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(ii) JH Yin has been a founding Co-Editor of Geomechanics and Geoengineering – an International Journal (the editorial office is in UK), published by Taylor & Francis since 2006. Please see the related journal page below.

Geomechanics and Geoengineering: An International Journal
Vol. 1, No. 1, March 2006, 1

The first issue in 2006

Editorial

We are delighted to announce the launch of *Geomechanics and Geoengineering: An International Journal* in 2006.

The idea of starting this journal was initially conceived in 2000 by a number of us who were attending the historical GeoEng2000 conference in Melbourne, Australia, where the three sister societies (i.e. the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), the International Society for Rock Mechanics (ISRM), and the International Association of Engineering Geology and the Environment (IAEG)) and other more specialised societies came together to discuss the many synergies and cross-disciplines which exist between them. Through a wide consultation, the idea of the journal has gathered widespread interest and support.

Geomechanics and Geoengineering: An International Journal aims to achieve the following objectives:

- To provide a major research publication channel of high quality with a scope that is wider than most existing geotechnical journals. It is hoped that this will facilitate the interaction of the three sister societies (i.e. ISSMGE, ISRM and IAEG) and their associated research/practising activities in geo-related engineering and science disciplines.
- To promote the international exchange of innovative ideas, especially between researchers and practitioners working in Asia and those working elsewhere. This is a response to the rapid expansion of geotechnical activities in Asia and the surrounding regions. A regional Editorial Office, equipped with qualified staff and necessary resources, has been set up in Beijing to help solicit high quality papers from Asia.
- To bridge the ever increasing gap between theory and practice in our disciplines by proactively encouraging more practically-orientated publications (e.g. case histories). This commitment is reflected in the title of the journal.

We would like to express our sincere thanks and deep gratitude to many colleagues and organizations (too many to name here) for their full support of the journal. We are particularly grateful to all the members of the Advisory Board and the Editorial Board for their encouragement and commitment.

Finally we thank the publisher, Taylor & Francis, for sharing our vision and making the journal a reality. In this respect, we particularly wish to thank Meloney Bartlett, Lindsey Fountain, Russell Stevens, Alison Evans and Angela Dickinson for their wonderful support without which this journal would have remained just an idea.

We look forward to welcoming you as readers and authors of this exciting new journal.

Editors-in-Chief: H.S. Yu, M. Jamiolkowski
Honorary Editors: J.K. Mitchell, Z.J. Shen, B. Simpson, H.P. Xie
Co-Editors: A. Gens, A.B. Huang, F. Schnaid, A.J. Whittle, J.H. Yin, J. Zhao

iii) JH Yin has been a Co-Editor of International Journal of Geomechanics (ASCE - American Society of Civil Engineers) since 2007. Please see a 2007 issue page below and visit the journal website: https://ascelibrary.org/page/ijgnai/editorialboard

Evidence 2: Contributions by Jian-Hua Yin

ASCE
American Society of Civil Engineers

2007 issue page

International Journal of Geomechanics

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International Journal of Geomechanics

Aims & Scope

The International Journal of Geomechanics (IJOG) focuses on innovative aspects of geomechanics with emphasis on theoretical aspects, including computational and analytical methods, and the development of model validations using laboratory and field measurements toward the solution of practical geotechnical problems.

Applications of interdisciplinary topics such as geotechnical and geoenvironmental engineering, mining and geological engineering, rock and blasting engineering, underground structures, infrastructure and pavement engineering, petroleum engineering, engineering geophysics, offshore and marine geotechnology, geothermal energy, lunar and planetary engineering, and ice mechanics fall within the scope of the journal. Specific topics covered include numerical and analytical methods; constitutive modeling including elasticity, plasticity, creep, localization, fracture and instabilities; artificial intelligence, expert systems, optimization and reliability; statics and dynamics of interacting structures and foundations; liquid and gas flow through geologic media, contaminant transport and groundwater problems; borehole stability, geohazards such as earthquakes, landslides and subsidence; soil/rock improvement.

Editorial Board