




**Tunnels et ouvrages  
souterrains en site urbain:  
un premier bilan des travaux des  
Commissions Techniques TC204 et  
TC305 de l'ISSMGE**

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**JOURNEE TECHNIQUE CHANTIERS LINEAIRES SOUTERRAINS EN SITE URBAIN- 26 MARS 2015**

Influence de la géologie, de l'hydrologie et de la géotechnique  
sur la conception et la réalisation des ouvrages





# Tunnels et ouvrages souterrains en site urbain: un premier bilan des travaux des TC204 et TC305 de l'ISSMGE

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# ISSMGE et ses Technical Committees

The mission of the TCs is to provide a forum for active participation by the individual members of the ISSMGE, and to promote the objectives, activities and results of the TCs throughout the ISSMGE membership. The TCs are a forum for discussing, developing and applying specialist geotechnical knowledge related to the behaviour of geo-materials, geotechnical engineering and engineering

- ▶ **Objective 1:** Disseminate and develop knowledge and practice within the TC's subject area to the membership of the ISSMGE.
- ▶ **Objective 2:** Establish guidelines and technical recommendations within the TC's subject area.
- ▶ **Objective 3:** Assist with technical programs of international and regional conferences organized by the ISSMGE.
- ▶ **Objective 4** Interact with industry and overlapping groups working in areas related to the TC's specialist area.



# ISSMGE et ses Technical Committees

- ▶ 4 catégories

Category	TC Official Name	TC#
Fundamentals Society	<a href="#">Experimental Studies in the Field Testing of Geosynthetic Reinforcement for Shore Protection</a>	TC101
	<a href="#">Forecasting of Geotechnical Engineering from In-Situ Tests</a>	TC102
	<a href="#">Natural and Cultural Heritage Geotechnical Mitigation and Rehabilitation Problems</a>	TC103
	<a href="#">Physical Modelling in Geotechnical Engineering</a>	TC104
	<a href="#">Safety and Reliability of Mining for New Capitals</a>	TC105
	<a href="#">Geotechnical Engineering Design</a>	TC106
	<a href="#">Safety and Reliability of Geotechnical Retaining Walls</a>	TC107
	<a href="#">Large Scale Geotechnical Engineering Practice</a>	TC108
Applications IAEG/ISRM	<a href="#">Offshore Geotechnical Slides</a>	TC209
	<a href="#">Representation of Geotechnical Engineering Data</a>	TC210
	<a href="#">Ground Improvement</a>	TC211
	<a href="#">Deep Foundations</a>	TC212
	<a href="#">Scour and Erosion</a>	TC213
	<a href="#">Foundation Engineering for Difficult Soft Soil Conditions</a>	TC214
	<a href="#">Environmental Geotechnics</a>	TC215
	<a href="#">Frost Geotechnics</a>	TC216
	<a href="#">Land Reclamation</a>	TC217

# ISSMGE et ses Technical Committees

TCs are composed of:

- ▶ the Chair, the Secretary and possibly the Vice Chair;
- ▶ **2 members appointed by the Member Societies;**
- ▶ maximum 4 members nominated by the Chair; and
- ▶ **corresponding members proposed by the Member Societies.**

The composition of TCs should hence ensure a mix of academics, researchers and practitioners on the committee appropriate to the subject area of the TC.

As a guideline, **practitioner involvement should preferably exceed 25% on any TC**, increasing to 50% or more in the case of TC of a mainly practical nature.



# TC204 - Underground construction in soft ground

Historique 1994-2015

- ▶ Proposé à la suite du Symposium New Delhi 1994 organisé par K. Fujita
  
- ▶ Initialement TC28
  - ▶ Conférence Londres 1996
  - ▶ Conference Tokyo 1999
  - ▶ Conference Toulouse 2002 – commune avec l'AFTES
  - ▶ Conference Amsterdam 2005
  - ▶ Conference Shanghai 2008
  - ▶ Conference Rome 2011
  
- ▶ Désormais TC204
  - ▶ Conference Seoul 2014
  - ▶ A venir Conference Foz do Iguaçu 2017
  
- ▶ Chairman:
  - ▶ K. Fujita 1994-1996
  - ▶ R. Mair 1996-2005
  - ▶ R. Kastner 2005-2011
  - ▶ A. Bezuijen 2011-



# TC204 - Underground construction in soft ground

Membres

Type	Full Name	Member Society
<b>Chair</b>	<a href="#">Adam Bezuijen</a>	<b>Netherlands</b>
<b>Vice Chair</b>	<a href="#">Chungsik Yoo</a>	<b>Korea</b>
<b>Secretary</b>	<a href="#">David Chapman</a>	<b>United Kingdom</b>
Member	Hirokazu Akagi	Japan
Member	Lou Areias	Belgium
Member	Rui Carrilho Gomes	Portugal
Member	Fabrice EMERIAULT	France
Corresponding Member	John Endicott	Hong Kong
Member	Mete Erdemgil	Turkey
Member	Yung-Show Fang	Chinese Taipei
Corresponding Member	Jochen Fillibeck	Germany
Member	Irawan Firmansyah	Indonesia
Member	Achim Hettler	Germany
Member	Tony Ho	Hong Kong
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Corresponding Member	Hervé LeBISSONNAIS	France
Member	Monika Mitew-Czajewska	Poland
Member	Michael Mooney	USA
Member	Mustafa Nalcakan	Turkey
Member	Chang-Yu Ou	Chinese Taipei
Member	Richard Pang	Hong Kong
Member	Hubert Quick	Germany
Member	D.E. RAZVODOVSKY	Russia
Member	Jacques ROBERT	France
Member	Manuel Romana	Spain
Member	César Sagaseta	Spain
Member	Anna Siemińska-Lewandowska	Poland
Member	Mitsutaka Sugimoto	Japan
Member	Markus Thewes	Germany
Corresponding Member	Kiwamu Tsuno	Japan
Member	Ilkka Vähäaho	Finland
Corresponding Member	Weidong Wang	China



# TC204 - Underground construction in soft ground

Objectifs – Terms of Reference 2013-2017

The main topics addressed by TC204 concern the geotechnical aspects of the analysis, design, construction and maintenance of deep excavations, tunnels and large underground structures, with particular emphasis on the development, effects and control of ground movements, their interaction with existing structures, mitigation measures and risk management.





# TC204 - Underground construction in soft ground

Objectifs – Terms of Reference 2013-2017

**Objective 1: To disseminate knowledge and practice in the field of underground construction**

- ▶ At an international level
  - ▶ To deliver the 9th Int. Conf. “Geotechnical Aspects of Underground Construction in Soft Ground” in Seoul, 25-27 August, 2014
  - ▶ To prepare the organisation of the 10th Int. Conf. “Geotechnical Aspects of Underground Construction in Soft Ground” in 2017 in Brazil.
  - ▶ To promote a session or a workshop during the next ICSMGE, Seoul 2017.
  - ▶ Develop a database of all proceedings of the previous symposia.
  - ▶ To actively encourage the preparation of papers from TC204 members to be published in refereed journals and in particular for the ISSMGE Int. J. of Geo-Engineering Case histories.
  - ▶ Proposal for the 2nd Fujita lecture 2017 to be held at the TC204 symposium in Brazil.
- ▶ At a regional level
  - To organise regional workshops on the occasion of large or challenging projects.
  - To encourage the active participation (papers, lectures, workshops) of TC204 members at regional conferences.



# TC204 - Underground construction in soft ground

Objectifs – Terms of Reference 2013-2017

**Objective 2: To establish guidelines and technical recommendations**

- ▶ To edit a list of codes and guidelines existing worldwide in the field of geotechnical aspects of tunnelling
- ▶ To link in with continuing work on the seismic behaviour of tunnels

**Objective 3: Interaction with other TCs and organisations concerned by underground construction**

- ▶ To cooperate with TC104 “Physical modelling” to extend the guidelines for comparing field or physical model observations with numerical simulations.
- ▶ To establish or maintain contact with TCs having close interests such as TC206, TC207, TC305 and TC203.
- ▶ To strengthen links with the ITA and investigate future cooperation.

# TC204- Underground construction in soft ground

## Réalisations

- ▶ Symposium New Delhi 1994
- ▶ Conférence Londres 1996
- ▶ Conference Tokyo 1999
- ▶ Conference Toulouse 2002 – commune avec l'AFTES
- ▶ Conference Amsterdam 2005
- ▶ Conference Shanghai 2008
- ▶ Conference Rome 2011
- ▶ Conference Seoul 2014
- ▶ A venir Conference Foz do Iguazu 2017
  
- ▶ Conference Proceedings: disponibles sur <http://www.issmge.org/en/tc204-paper-database>
  
- ▶ Cette base de données contient à l'heure actuelle **821 papiers** des proceedings de New Delhi '94 à Rome '11
- ▶ Avec en particulier de nombreux rapports généraux, nationaux et résultats d'enquêtes nationales et internationales



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## Database of Proceedings of Interational Symposia organized by Technical Committee TC204 "Underground Construction in Soft Ground"

The symposium Geotechnical Aspects of Underground Construction in Soft Ground is an event organized by the ISSMGE TC204 (formerly TC28). The symposium's first edition took place in New Delhi (1994) and was followed by London (1996), Tokyo (1999), Toulouse (2002), Amsterdam (2005), Shanghai (2008), Rome (2011) and Seoul (2013).

This database currently includes 821 papers from the proceedings from New Delhi '94 to Rome '11, which can be searched by Symposium, Session, Title and Authors. All papers should still be referenced to their original sources, whose bibliographic information can be found on the acknowledgment session.

[Acknowledgements](#)

### Search Proceedings

Sessions:

- IS NEW DELHI '94
  - General Reports '94
  - 1 National reports on braced excavations in soft ground
  - 2 National reports on braced excavations/ tunnelling in soft ground
  - 3 National reports on tunnelling in soft grounds

Paper Title Keyword:

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# TC204- Underground construction in soft ground

## Réalisations

- ▶ Workshops pendant conférences internationales ISSMGE
  - ▶ Madrid 2005
  - ▶ Alexandrie 2009
  - ▶ Paris 2013
- ▶ Joint conferences
  - ▶ Joint conference with TC32, TC38, TC41 in Moscow, June 2010
  - ▶ TC41, Geotechnical Construction in Mega-cities conference in Rio de Janeiro, August 2008
- ▶ Regional workshops
  - ▶ Budapest 2001 et 2008
- ▶ Création de la Fujita Lecture (1ère édition à Séoul 2014): Dr. Hugh D. St John (Geotechnical Consulting Group , UK), Urban Development: Decision Making Processes in the Planning of Sub-Structure Construction
- ▶ Numéros spéciaux de Soils and Foundations avec des articles sélectionnés des conférences de Toulouse 2002 et Rome 2011.
- ▶ Soutien à la diffusion du CD Underground Construction Technology in Japan, produit par Prof. Akagi et la Japanese Geotechnical Society



# TC204- Underground construction in soft ground

## Réalisations

- ▶ Groupes de travail
  - ▶ Database on
  - ▶ Guidelines for
  - ▶ with numerical
  - ▶ Survey of des (tunnelling qu
  - ▶ Seismic design
    - Links in
    - some pi tests at

*Geotechnical Aspects of Underground Construction in Soft Ground – Viggiani (ed)  
© 2012 Taylor & Francis Group, London, ISBN 978-0-415-88367-8*

### Urban tunnels in soft ground: Review of current design practice

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*Terravol, Paris, France*

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**ABSTRACT:** Current design practice for urban tunnel construction in soft ground as perceived worldwide is reviewed and discussed. The review is based on answers to a questionnaire prepared and sent out by a TC204 working group in 2010 to practitioners involved in the design or in the design supervision of tunnelling projects. The results of this investigation are carefully considered to identify trends and needs for development.

**Keywords:** urban tunnels, soils, design practice, survey.

### 1 INTRODUCTION

The first assessment of the design practice involving urban tunnels driven in soft ground (i.e. not rock) was carried out in 1993 through a survey performed in Brazil. The results from this were published in the 1st International Symposium on Underground Construction in Soft Ground in New Delhi by the former TC28 now TC204 (Negro and Leite, 1995).

In 2006 another Brazilian assessment was made, but this time cut-and-cover structures were not included and the review covered underground openings of any shape with more than 0.5 m diameter; directional drilling was not included. The survey was not limited to tunnels built in Brazil but covered any tunnel project conducted with criteria and procedures presently adopted in Brazil. Results from the second assessment were published in the TC28 Shanghai International Symposium (Negro, 2008). TC204 then created a working group to adapt this survey format to review the world design practice.

The present survey focuses on underground openings of any shape with more than 0.5 m diameter and covers tunnel projects conducted all around the world. In all cases tunnels were designed and built in areas with overlying surface buildings and subsurface utilities, both liable to damage induced by ground movements associated with tunnel excavation.

Multiple choice questions to which one or more answers could be selected were sent to professionals involved in the design or in the design supervision of tunnel projects over the past few years. Considering the multi-disciplinary nature of tunnel design, the questionnaire, with 46 questions, was sent to practitioners with a variety of expertise and included topics beyond a strict geotechnical context. Accordingly, questions were sent to geotechnical engineers, geologists, structural engineers and experts in numerical modelling.

These professionals could opt not to answer questions outside their fields of specialisation. In 51% of the cases the respondents were consultants working on tunnelling projects and 15% referred to

# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

Historique 2009-2015

- ▶ Initié par A. Negro et la société brésilienne
- ▶ Initialement TC41
  - ▶ Joint conference with TC32, TC38, TC41 in Moscow, June 2010
  - ▶ TC41, Geotechnical Construction in Mega-cities conference in Rio de Janeiro, August 2008
- ▶ Désormais TC305



# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Membres

Type	Full Name	Member Society
<b>Chair</b>	<a href="#">Askar Zhussupbekov</a>	<b>Kazakhstan</b>
<b>Secretary</b>	<a href="#">Der-Wen Chang</a>	<b>Chinese Taipei</b>
Corresponding Member	Hirokazu Akagi	Japan
Member	Dipanjan Basu	USA
Member	Eugeniusz Dembicki	Poland
Member	Fabrice EMERIAULT	France
Member	Patrick Ganne	Belgium
Member	Tadashi Hashimoto	Japan
Member	Saeed Heidari	Iran
Member	V.A. ILYICHEV	Russia
Member	Masyhur Irsyam	Indonesia
Member	Kazuhito Komiya	Japan
Member	Rupert Leung	Hong Kong
Member	Manuel Matos Fernandes	Portugal
Member	Axel Ng	Hong Kong
Member	Baris Trak	Turkey



# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Objectifs – Terms of Reference

The main goal of this technical committee is to contribute to the general practice of those working in a Mega City scenario, to gather and share their experience on foundations, tunnels, excavations, earthquake engineering, slope stability, soft soils, environmental geotechnics, and others.

Mega Cities demand a General Practitioner Geotechnical Engineer and requires the need for gathering and collating previous experience to encourage technical development.



# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Objectifs – Terms of Reference

Objective 1: To stimulate interaction between infrastructure geotechnical engineers for mega cities, new capitals and twin (sister) cities

- ▶ At an international level
  - ▶ To promote a workshop during the 14th Asian Regional Conference, Hong Kong, May 2011;
  - ▶ To promote organization of the Twin Cities Geotechnical Seminars (basic planning in annex) in 2012;
  - ▶ To promote a session or a workshop during the next ICSMGE, Paris 2013;
  - ▶ To encourage and stream the preparation of papers from TC305 members to the ISSMGE International Journal of Geo-Engineering Case histories.
- ▶ At a regional level
  - ▶ To organise regional workshops at the occasion of large or challenging projects:
  - ▶ To encourage the active participation (papers, lectures, workshops) of TC305 members at regional conferences.



# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Objectifs – Terms of Reference

### Objective 2. To gather and collate geotechnical information

- ▶ To set up data and cartographic instrument specification;
- ▶ - To establish access to public data;

### Objective 3: Interact with other TCs and organisations concerned by Geotechnical Infrastructure for Mega Cities:

- ▶ - To establish or maintain contact with TCs having close interests such as TC204 - (Underground Construction in Soft Ground), TC211 - (Ground Improvement), TC212 – (Deep Foundation), TC215 – (Environmental Geotechnics).
- ▶ - To cooperate with Deep Foundation Institute during the 4th International Conference on Grouting and Deep Mixing, 15 - 18 February 2012, New Orleans, LA, United States.



# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Réalisations

- ▶ Workshop "Recent Projects in Megacities and New Capitals" during the 14th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, held on 23 to 26 May 2011, in Hong Kong, China
- ▶ TC204/305 Joint Special Session "Underground Constructions in Megacities", during the 18th International Conference on Soil Mechanics and Geotechnical Engineering, held on 4 September 2013, in Paris, France
- ▶ International Geotechnical Symposium on TC 305 "Advances in Research and Education", 25-27 June, 2014.
- ▶ Local Twin Cities Seminar "Soils of Metropolitan Area of Sao Paulo and Curitiba", held on 5 and 6 December 2012, in Sao Paulo, Brazil
- ▶ Local Twin Cities Seminar "Soils of Metropolitan Area of Sao Paulo and Curitiba", held on 28 November 2013, in Curitiba, Brazil
- ▶ Kazakhstan-USA Joint Geotechnical Seminar June 28 to July 3, 2011 Astana, Kazakhstan;
- ▶ Kazakhstan-Taiwanese Geotechnical Joint Seminar 8 September 2011, Astana, Kazakhstan;
- ▶ Kazakhstan-Japanese Geotechnical Joint Seminar 22 September 2011, Astana, Kazakhstan;
- ▶ Kazakhstan- Korean Geotechnical Joint Seminar 20 to 23 August, 2012 Astana, Kazakhstan;
- ▶ Kazakhstan-Singapore Geotechnical Joint Seminar 10 April, 2013, Astana, Kazakhstan;
- ▶ Kazakhstan-Estonia Geotechnical Joint Seminar 18 April, 2013 Astana, Kazakhstan;
- ▶ Kazakhstan-Japan-Slovakia Geotechnical Joint Seminar 24 November 2013, Astana, Kazakhstan;

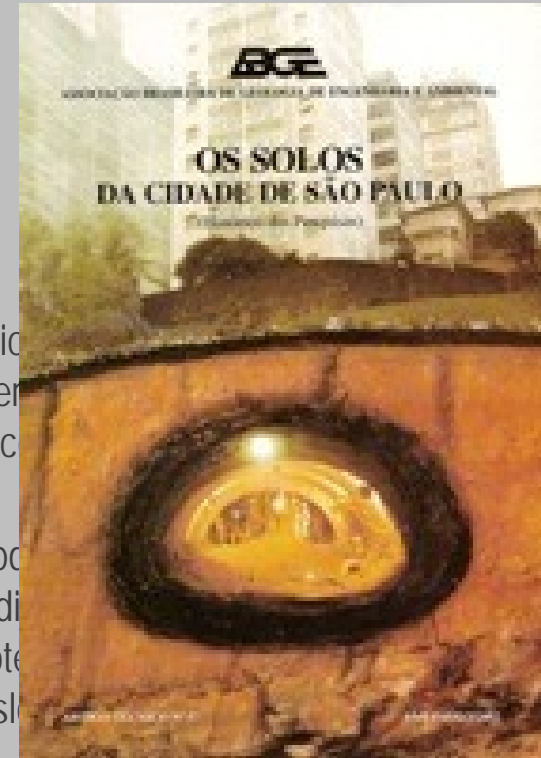


# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Réalisations

### TWIN CITIES GEOTECHNICAL SEMINARS

- ▶ Tradition of the Sao Paulo branch of the Brazilian Geotechnical Society (ABGE) to organize, every ten to twenty years, a local seminar to gather and disseminate geotechnical and geological data related to Sao Paulo City, covering the sedimentary Paleocene stiff and dense soils.
- ▶ Different contributors are invited to prepare contributions, upon selected topics such as local geology, hydro-geological conditions, strength and deformability of local soils, performance of geotechnical pavements, shallow and deep foundations, natural and cut slopes, tunnels, etc.
- ▶ A book is usually edited based on the proceedings of the seminar, under the title "Soils of the City of Sao Paulo". Published books resulted in noted editorial successes within the local community.
- ▶ To increase national coverage and interest on such publication, a second city was invited to participate in the coming local seminar and the choice was Curitiba with geology conditions very similar to Sao Paulo.



- The idea now is to spread out internationally this type of meeting in the proposed format.

# TC305 - Geotechnical Infrastructure for Mega Cities and New Capitals

## Projets

The pending action that the next Chair may give priority is the continuity of the **Twin Cities Seminars**.

The following countries agreed to conduct local seminars:

- ▶ Chile (with Santiago and Valparaiso),
- ▶ Italy (cities not yet defined, possibly Rome and Torino or Naples),
- ▶ China (with Shanghai and Hong Kong),
- ▶ Kazakhstan (with Almaty and Astana),
- ▶ Russia (with Moscow and St. Petersburg),
- ▶ Japan (Tokyo and Osaka)
- ▶ Portugal (Lisbon and O Porto).



# En guise de conclusion

- ▶ 2 Technical committees concernés par les travaux souterrains en site urbain
- ▶ Des lieux d'échanges avec les communautés scientifiques et techniques
- ▶ Une communauté française représentée mais qui pourrait être plus active



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