



2015/2016 Executive Committee

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2016 CGS Cross Canada Lecture Tour

Controlling Tunnelling-Induced Ground Movements: The Barcelona Metro Case

Thursday, April 28, 2016

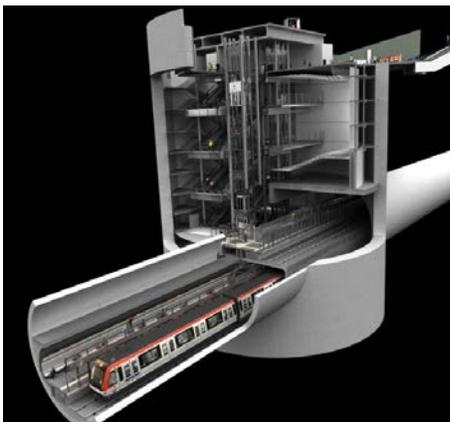
Mastro's Ristorante Italiano, 890 Wilson Ave., Downsview, ON

Evening Program:	5:30 PM	Cocktails and Socializing
	6:30 PM	Dinner
	7:30 PM	Lecture

Abstract: A new Metro line, said to be one of the longest in Europe, is under construction in the Barcelona metropolitan area. It has a total length of 47.8 km and involves the construction of 52 stations. It crosses a great variety of ground profiles ranging from soft soils to hard rocks. Deep underground tunnelling using a variety of TBMs is by far the predominant construction mode. In the majority of the line (27.2 km) a large 12.3 m diameter tunnel section has been used whereas a more conventional 9.4 m diameter tunnels have been constructed in most of the remaining of the line (11.9 km). The intricate layout of the urban area crossed by a large part of the line implies that the tunnels often underlie or are close to existing buildings. The control of the tunnelling induced movements is therefore of paramount importance given the size of the tunnel excavation and the high sensitivity of public opinion following an unrelated tunnel collapse in the town.

After presenting the general features of the project and of the extensive monitoring system, the lecture focuses on a number of examples of ground movement control using different techniques involving i) the installation of a screen of jet grouted columns or piles, ii) structural jacking and iii) compensation grouting. The technique of compensation grouting is examined in some detail including a case where it was not successful and it had to be abandoned.

The lecture finally summarizes the experienced gained in this large project and discusses the counterproductive results that are often associated with an excessively tight requirement for admissible ground movements. It also highlights that, if TBMs are used, the most effective ground movement control is probably the adoption of good tunnelling practices.



**The Canadian Geotechnical Society
Southern Ontario Section
Toronto Group**



**La Société Canadienne de Géotechnique
Section Sud de l'Ontario
Groupe de Toronto**

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Speaker: Dr. Antonio Gens. Antonio graduated from the Technical University of Madrid and he obtained a M.Sc. and a Ph.D. degree from Imperial College in London. He is a professor of Geotechnical Engineering at the Technical University of Catalonia in Barcelona where he has been Head of the Department of Geotechnical Engineering and Geosciences and member of the Governing Council of the University.

He has been involved in geotechnical research, consulting and education for more than 30 years. He is the author or co-author of more than 250 scientific papers and he sits in the Editorial Board of several International Journals. He is a member of TC105 (unsaturated soils) and TC215 (environmental geotechnics) of the ISSMGE. He has consulted widely and has given geotechnical advice on a series of landmark projects, both at home and abroad.

In recent years, he has been presented with the Case History Award by the American Rock Mechanics Association in 2006, the R.M. Quigley Award by the Canadian Geotechnical Society in 2009 and the Outstanding Contributions Award by the International Association for Computer Methods and Advances in Geomechanics (IACMAG) in 2011. Also, the UK Institution of Civil Engineers has awarded him the Telford Medal twice (in 1994 and 2007), the George Stephenson Medal also twice (in 2008 and 2012) and the Geotechnical Research Medal in 2014. In 2007, he delivered the 47th Rankine Lecture. He is a member of the Royal Academy of Doctors of Spain and in 2011 he became a Fellow of the UK Royal Academy of Engineering. In 2014, he has been awarded a Doctorate Honoris Causa by the University of Grenoble in France and the Honour Medal of the Colegio de Ingenieros de Caminos (Institution of Civil Engineers) of Spain. He has been elected Vice-President for Europe of the ISSMGE for the period 2013 - 2017.

CGS Members – Early Bird:	\$25.00	<p>*Students: Please note that a limited number of spaces are available on a first come, first served basis through corporate sponsorship.</p> <p>Student Sponsors, who subsidize CGS-SOS events, will be recognized at the Dinner Lecture. Please purchase student sponsorships on Eventbrite to contribute to this worthwhile initiative and your company will be recognized at the event. We thank you for your support!</p>
CGS Members:	\$35.00	
Non-Members – Early Bird:	\$30.00	
Non-Members:	\$40.00	
Student Sponsorship:	\$25.00	
Students*:	Free	
<p>Please confirm your attendance by March 15, 2016, 11:30 PM to qualify for the Early Bid price or by April 25, 11:30 PM, using Eventbrite: http://www.cgs-sos.eventbrite.ca/</p> <p>This event will be booked solely through Eventbrite.</p> <p>If you have difficulties using Eventbrite, please contact Andrew DeSira (Andrew.DeSira@ontario.ca) for assistance.</p>		

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