



# TU1406

COST ACTION

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QUALITY SPECIFICATIONS FOR ROADWAY BRIDGES,  
STANDARDIZATION AT A EUROPEAN LEVEL

## WG1 WORKSHOP OF COST ACTION TU1406



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# Standardization of Performance Indicators Data Base – WG1 Meeting

## **COST ACTION TU1406**

QUALITY SPECIFICATIONS FOR ROADWAY BRIDGES,  
STANDARDIZATION AT A EUROPEAN LEVEL

DATE OF MEETING  
January 29, 2016

Place of Working Group  
Budapest University of Technology and Economics (BME)  
1111 Budapest, Műegyetem rkp. 3  
Budapest, Hungary

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## CONTENTS

1.	Introduction .....	4
1.1.	About COST .....	4
1.2.	COST Action TU1406.....	5
1.2.1.	Abstract.....	5
1.2.2.	Action TU1406 Working Groups.....	5
2.	Standardization of Performance Indicators DataBase – WG1 Meeting.....	7
2.1.	Objectives.....	7
2.2.	Programme.....	7
2.3.	Location, Dates and Travelling .....	8
2.3.1.	Location and Date .....	8
2.3.2.	How to get to BME .....	8
2.4.	Accommodation.....	11
2.5.	Important Deadlines .....	11
2.6.	Committees .....	11
2.6.1.	Scientific Committee .....	12
2.6.2.	Organizing Committee .....	12
2.6.3.	Secretariat.....	12
2.6.4.	Local Organizers.....	12
3.	participatIOn.....	13
3.1.	Funding and Reimbursement .....	13
4.	Social Events and Location Events.....	14
4.1.	Social Event .....	14
4.2.	Location Details.....	14
4.2.1.	About BUDAPEST .....	14
4.2.2.	About BME .....	15

# 1. INTRODUCTION

## 1.1. ABOUT COST

Founded in 1971, COST – European Cooperation in Science and Technology – is the first and widest European framework for the transnational coordination of nationally funded research activities. It is based on an inter-governmental agreement and comprises currently 35 European Member Countries plus one Cooperating State.

COST's mission is to strengthen Europe's scientific and technical research capacity by supporting cooperation and interaction between European researchers, covering from basic to applied or technological research and including research addressing issues of pre-normative nature or of particular societal importance.

As a precursor of advanced multidisciplinary research, COST plays an important role in the construction of the European Research Area (ERA), by anticipating and complementing the activities of the Framework Programmes, acting as a "bridge" spanning the scientific communities of Europe as a whole, increasing the mobility of researchers across the continent, and fostering the establishment of large Framework Programme projects in many key scientific domains.

The funds provided by COST support the coordination costs of the pan-European research networks (COST Actions), ultimately multiplying the potential of nationally funded research work. In this way, COST has leveraged during the last seven years approximately EUR 5 billion of research funding through its support and reaches out to over 30.000 researchers across Europe. COST is funded from of the EU RTD Framework Programmes budget.

During the last eight years, COST scientific organisation was based on 9 scientific domains embracing all fields of research:

- Biomedicine and Molecular Biosciences (BMBS);
- Chemistry and Molecular Sciences and Technologies (CMST);
- Earth System Science and Environmental Management (ESSEM);
- Food and Agriculture (FA);
- Forests, their Products and Services (FPS);
- Individuals, Societies, Cultures and Health (ISCH);
- Information and Communication Technologies (ICT);
- Materials, Physics and Nanosciences (MPNS);
- Transport and Urban Development (TUD).

COST also supports research networks spanning over several scientific domains (Trans-Domain) with broad, interdisciplinary dimension.

The scientific organisation of COST is currently being scrutinised in order to best fit the needs of the European research communities in the new context of Horizon 2020.

The key features of COST are:

- Open to all fields in Science and Technology through a "bottom up" approach - the idea and subject of a COST Action comes from the European scientists themselves;
- Fosters inclusiveness and equality of access;
- Commits to build capacity by connecting high-quality scientific communities throughout Europe and worldwide;
- Focuses strongly on providing networking opportunities for early stage researchers;
- Aims at increasing the impact of research on policy makers, regulatory bodies and national decision makers as well as the private sector.
- Offers a flexible structure, easy implementation and lean management of the networking activities.

## 1.2. COST ACTION TU1406

### 1.2.1. ABSTRACT

During the implementation of asset management strategies, maintenance actions are required in order to retain assets at a desired performance level. In case of roadway bridges, specific performance indicators are established for their components. These indicators can be qualitative or quantitative-based, and they can be obtained during principal inspections, through a visual examination, a non-destructive test or a temporary or permanent monitoring system. Then, obtained indicators are compared with performance goals, in order to evaluate if the quality control plan is accomplished. It is verified that there is a large disparity in Europe regarding the way these indicators are quantified and how such goals are specified. Therefore, this Action aims to bring together, for the first time, both the research and practicing communities in order to accelerate the establishment of a European guideline in this subject. An important aim is to define formal indicators related to sustainable performance of roadway bridges.

### 1.2.2. ACTION TU1406 WORKING GROUPS

In order to adequately achieve the objectives of the Action, six Working Groups (WG) have been established:

#### WG1: PERFORMANCE INDICATORS

**Leader:** Alfred Strauss  
**Vice-Leader:** Ana Mandić Ivanković

**E-mail:** alfred.strauss@boku.ac.at  
**E-mail:** mandicka@grad.hr

Working Group 1 focuses on the characterization of bridge performance indicators, which can address: (a) the safety: the load factor, the reliability index to ULS; (b) the serviceability: the condition index, the reliability index to SLS; (c) the availability, robustness; (d) the costs: the total LCC, values related to durability aspects; and (e) aspects of environmental efficiency: CO2 footprint. A technical report on performance indicators will be developed at the end.

#### WG2: PERFORMANCE GOALS

**Leader:** Irina Stipanovic  
**Vice-Leader:** Lojze Bevc

**E-mail:** i.stipanovic@utwente.nl  
**E-mail:** lojze.bevc@zag.si

The main objective of Working Group 2 is to identify existing performance goals (where the term goal pertains to quantifiable requirement and/or threshold value) for the indicators previously indicated in WG1. The performance goals will vary according to technical, environmental, economic and social factors. A technical report on performance goals will be developed at the end.

#### WG3: ESTABLISHMENT OF A QUALITY CONTROL PLAN

**Leader:** Rade Hajdin

**E-mail:** rade.hajdin@grf.bg.ac.rs

**Vice-Leader:** Matej Kušar

**E-mail:** matej.kusar@fgg.uni-lj.si

Based on results from WG1 and WG2, as well as on a survey of existing approaches in practice, the objective of Working Group 3 is to provide a report with detailed step-by-step explanations for the establishment of QC plans for different types of bridges. The QC plans will address the dynamics and uncertainty of the processes that may significantly compromise bridge performance.

#### **WG4: IMPLEMENTATION IN A CASE STUDY**

**Leader:** Amir Kedar

**E-mail:** akedar@kedmor.co.il

**Vice-Leader:** Sander Sein

**E-mail:** sander.sein@mnt.ee

A series of benchmarks will be developed during Working Group 4. To this end, some of the performance indicators identified in WG1 will be computed for a set of roadway bridges over EU. These indicators will be then compared with specific goals, as identified in WG2. At the end of the process, a QC plan will be applied to those bridges utilising recommendations from WG3. A data basis will be then established for benchmarking.

#### **WG5: DRAFTING OF GUIDELINE/RECOMMENDATIONS**

**Leader:** Vikram Pakrashi

**E-mail:** v.pakrashi@ucc.ie

**Vice-Leader:** Helmut Wenzel

**E-mail:** wenzel@vce.at

Working Group 5 focuses on the development of guidelines, drawing support from all the other WGs. These guidelines for a systematic maintenance and management of highway bridge assets will acknowledge the variation of philosophical, technical and implementation methodologies throughout the EU, with the expectation that the delivered framework will be scalable and portable for standardised implementation in existing or new infrastructure networks.

#### **WG6: DISSEMINATION**

**Leader:** Guðmundur Guðmundsson

**E-mail:** gudmundur.v.gudmundsson@vegagerdin.is

**Vice-Leader:** Stavroula  
Pantazopoulou

**E-mail:** pantaz@ucy.ac.cy

The aim of this WG is to disseminate all results which were obtained in all the other WGs. Dissemination consists in establishing liaisons with existing national and international associations, conferences, working groups and journals. Also, this group will be responsible to continuously update the website as well as all the other dissemination frameworks.

## 2. STANDARDIZATION OF PERFORMANCE INDICATORS DATABASE – WG1 MEETING

### 2.1. OBJECTIVES

The objective of the WG1 workshop is to give an overview on the results of the screening process of the inspection and evaluation documents. Furthermore, and according to the Scientific Work Plan, the workshop aims the finalization of the database containing bridge performance indicators, thresholds and target values used in quality control plans.

### 2.2. PROGRAMME

The WG1 meeting of COST TU1406 will take place after two *fib* events held on the previous days: T8.4 meeting (27 January) and Commission 8 meeting (28 January). It is believed that the majority of COST participants will take part of these events as well.

**Friday, January 29<sup>th</sup>, 2016**

- |               |  |
|---------------|--|
| 09:00 – 09:15 | Opening of WG #1 meeting by A. Strauss   |
| 09:15 – 10:15 | <b>Status report about</b> <ul style="list-style-type: none"> <li>• the obtained inspection, evaluation and scientific documents</li> <li>• the country specific screening results</li> </ul>  |
| 10:15 – 10:45 | <b>Coffee break</b>  |
| 10:45 – 12:00 | <b>Open Discussion on</b> <ul style="list-style-type: none"> <li>• the required improvement and final layout of the database</li> <li>• the glossary associated with the database</li> <li>• the European wide clustering of indicators</li> <li>• the incorporation of findings from further PI associated projects</li> <li>• the user requirements with respect to the PI database</li> <li>• the structure and the contribution of the WG1 interim report<br/> <b>“Performance indicators for road bridges”</b></li> </ul>   |
| 12:00 – 13:00 | <b>Lunch</b>   |
| 13:00 – 14:00 | <b>“COMPONENT LEVEL”</b> performance indicators/goals/thresholds <ul style="list-style-type: none"> <li>• Clustering and homogenization of national specific indicators obtained from inspection and evaluation documents - with respect to the components/systems (foundation, abutment, ...) of the road bridges and associated networks</li> <li>• Adjustment of the database with respect to the clustering and homogenization findings</li> <li>• Adjustment of the glossary with respect to the clustering and homogenization findings</li> <li>• Determination of the content and structure of the interim report associated with the national and international findings of performance indicators.</li> </ul> |
| 14:05 – 15:15 | <b>“SYSTEM LEVEL”</b> performance indicators/goals/thresholds <ul style="list-style-type: none"> <li>• Procedure and targets as sketched in the 1<sup>st</sup> workshop</li> </ul>   |
| 15:15 – 16:15 | <b>“NETWORK/COST AND SUSTAINABILITY LEVEL”</b> performance indicators/goals/thresholds   |

- Procedure and targets as sketched in the 1<sup>st</sup> workshop
- 16:15– 16:30    **Coffee break**
- 16:30 – 17:00    **Collecting findings of the workshop**
- The definition and assignment of further necessary steps for finalizing the first work package
- 17:00 – 17:15    **Other Action Items and Assignments**  
 Closing of WG #1 workshop by A. Strauss

## 2.3. LOCATION, DATES AND TRAVELLING

### 2.3.1. LOCATION AND DATE

The workshop will take place in the historical central building of the Budapest University of Technology and Economics (BME), the first in Europe to award engineering degrees to students of land surveying, river control, and road construction. The venue is located in the close vicinity of the heart of Budapest, with an amazing view of the Danube river bank with several types of road bridges across the river and the Pest-side of the capital. The city centre can be reached by not more than 10 minutes' walk. The outstanding building, built in 1782, has already hosted various international engineering conferences and has been operating as the largest education centre of Hungarian engineers.

The workshop will be held in the meeting room of the Department of Structural Engineering, Faculty of Civil Engineering at 29<sup>th</sup> of January 2016 following *fib* commission (Com8) and task group (T8.4) meetings on the previous days. The full address of the meeting room is as follows:

Budapest University of Technology and Economics (BME)  
 Faculty of Civil Engineering  
 Department of Structural Engineering  
 H1111 Budapest, Műegyetem rkp. 3.,  
 K.mf.85 (Building "K", high-downfloor, door no. 85)  
 Phone: +36 (1) 463-1751  
 Fax: +36 (1) 463-1784  
 GPS Coordinates: 47.4816676334 (lat) 19.0559487888 (long)

### 2.3.2. HOW TO GET TO BME

The venue building (K) of BME is well accessible either by public transport services from the international airport and the main railway stations in downtown or by car through the motorways.



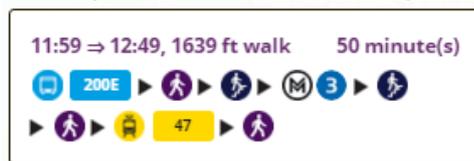
a) **Public transport** in Budapest to the venue

**Metro M4:** Szent Gellért tér  
**Tram n° 4, 6:** Petőfi híd, budai hídfő (Goldmann György tér)  
**Tram n° 18, 19, 41, 47, 48, 49:** Szent Gellért tér  
**Bus n° 7, 86, 107, 133, 233:** Szent Gellért tér  
**Bus n° 153, 212:** Petőfi híd, budai hídfő (Goldmann György tér)

b) From the **Liszt Ferenc International Airport** to the venue

Possible options are: public transport, taxi or shuttle (recommended).

• **Public transport** from the international airport:



**Bus n° 200E:** stop "Kőbánya-Kispest"  
**Metro "M3":** stop: "Kálvin tér"  
**Tram n° 47:** stop: "Szent Gellért tér"

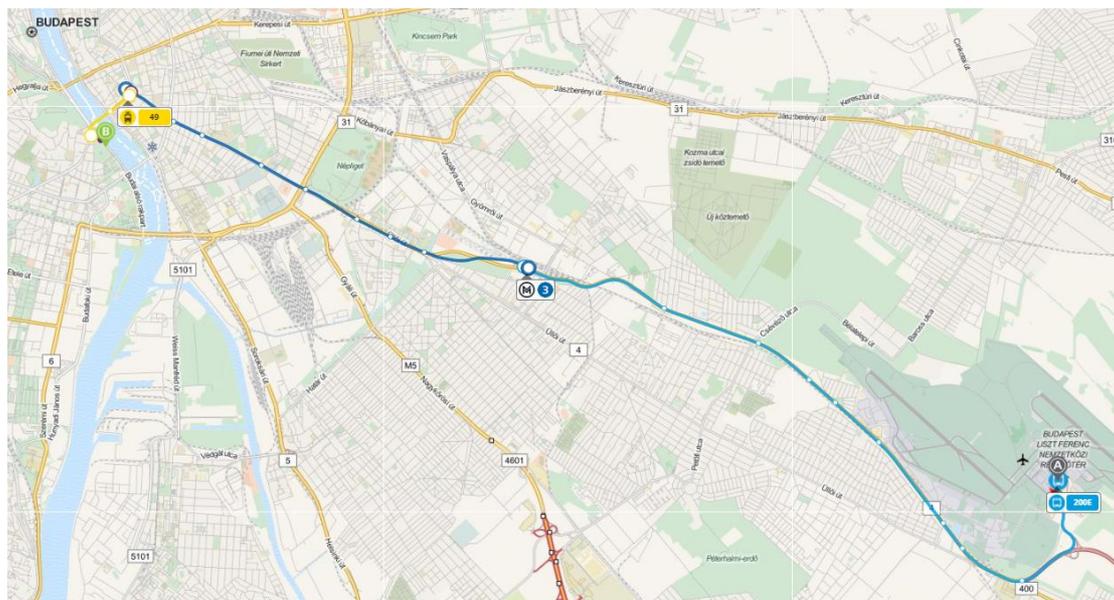


Figure 1. Travelling from the airport to BME

- **Taxi:** Special fares are available from the airport to downtown.
- **Shuttle:** AirportShuttle minibus service operates between the airport and any location in Budapest. Special rates are available for airport-hotel travels. Tickets can be purchased at the desk on arrival in the baggage reclaim hall. Use the <http://www.airportshuttle.hu/en/> website to get further information.

c) From the main **railway stations** to the venue

**Keleti station:** Metro M4, stop: „Szent Gellért tér”  
**Nyugati station:** Tram n 4 or n 6, stop: „Petőfi híd, budai hídfő”  
**Déli station:** Tram n 18, stop: „Szent Gellért tér”  
**Kelenföld station:** Metro M4, stop: „Szent Gellért tér” (recommended)

d) From the **motorways** to the venue by car

**M1 (E60, E75), M7 (E71): M1-M7** - Budaörsi út - Nagyszőlős u. - Bocskai út - Október 23. u. - Irinyi József u. - Műegyetem rakpart

**M3 (E71): M3** - Hungária körút - Könyves Kálmán körút - Rákóczi híd - Pázmány Péter sétány - Műegyetem rakpart

**M5 (E75): M5** - Nagykőrösi út - Gyáli út - Könyves Kálmán körút - Rákóczi híd - Pázmány Péter sétány - Műegyetem rakpart

The public parking (~300 places) in front of the venue building is free of charge.

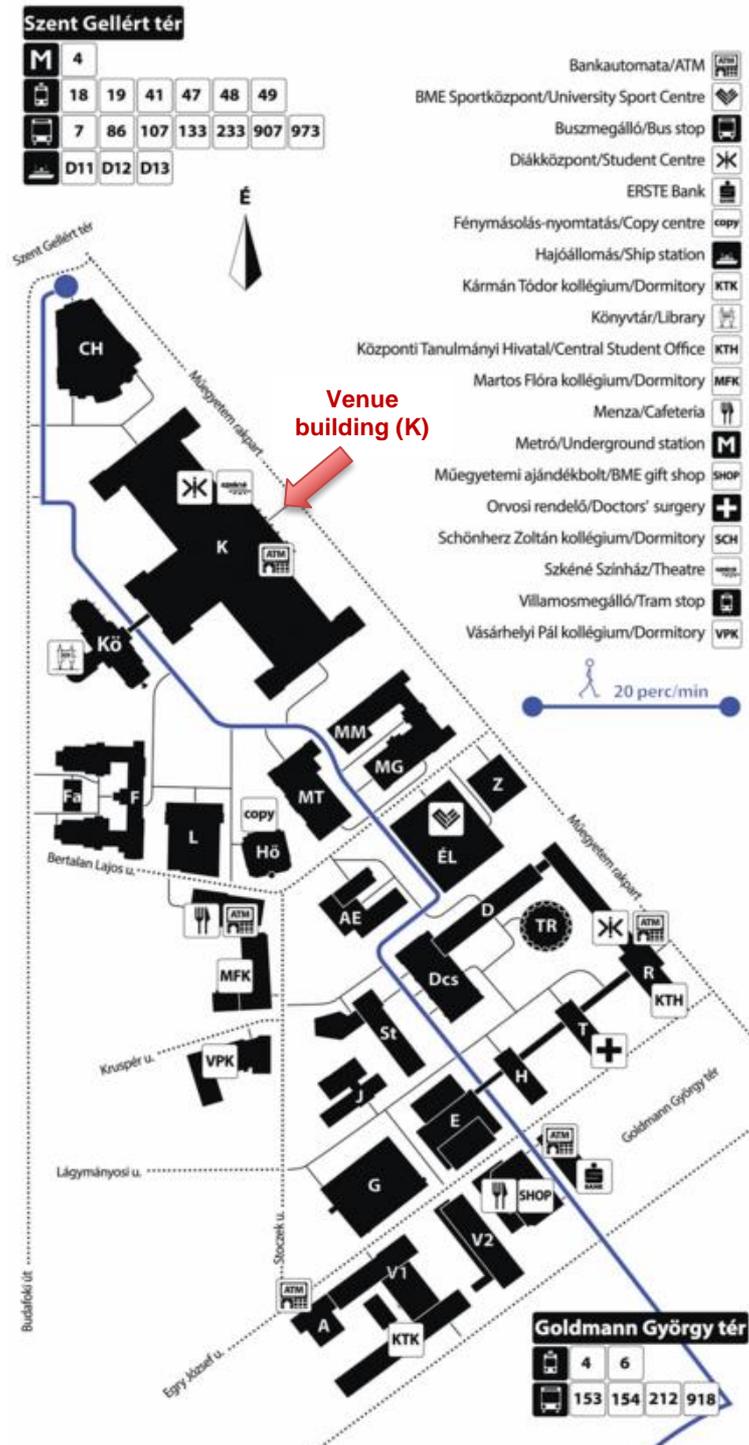


Figure 2. BME surroundings

Useful websites:

[www.bme.hu](http://www.bme.hu)

<http://futar.bkk.hu> (from <http://www.bkk.hu>)

<http://www.airportshuttle.hu/en>

## 2.4. ACCOMMODATION

Local organizers suggest using the following listed hotels for accommodation, as they are conveniently located near the venue:

### **Danubius Hotel Gellért \*\*\*\* (RECOMMENDED)**

Szent Gellért tér 1  
 H-1111 Budapest  
 Tel.: +36 1 889-9999  
 Fax: +36 1 889-5528  
 e-mail: [gellert.reservation@danubiushotels.com](mailto:gellert.reservation@danubiushotels.com)  
 web: <http://www.danubiushotels.hu/szallodak-budapest/danubius-hotel-gellert>

### **Mercure Budapest Duna Hotel \*\*\***

Soroksári út 12  
 1095 Budapest  
 Tel.: +36 1 455-8300  
 Fax: +36 1 455-8385  
 e-mail: [H2025@accor.com](mailto:H2025@accor.com)  
 web: <http://www.mercure.com/gb/hotel-2025-mercure-budapest-duna-hotel/location.shtml>

Accommodation prices (EUR) per hotel are summarized in the following table.

<b>HOTEL</b>	<b>Rank</b>	<b>Applicable Rate</b>	<b>Applicable Rate</b>	<b>City Tax Rate</b>	<b>Breakfast</b>
		<b>for</b>	<b>for</b>		
		<b>Single Occupancy</b>	<b>Double Occupancy</b>	<b>per Person</b>	<b>Rate per</b>
				<b>per Night</b>	<b>Person per</b>
		28/01/2016	28/01/2016		<b>Night</b>
Danubius Hotel Gellért	4*	from 60	from 100	incl.	incl.
Mercure Budapest Duna Hotel	3*	41.42	41.42	4%	13.97

Rooms with special price will be available for a limited time for the participants at **Danubius Hotel Gellért** through the following link: [accommodation request form](#), which is available on a first come first serve basis. This hotel is located max. 5 mins walk from the venue as well as next to the restaurant of the networking dinner.

## 2.5. IMPORTANT DEADLINES

The only deadline set for participants is related to hotel booking according to the above.

## 2.6. COMMITTEES

An executive scientific committee as well an organizing committee were defined.

### 2.6.1. SCIENTIFIC COMMITTEE

<i>Name</i>	<i>TU1406 Position</i>	<i>E-mail</i>
José Matos	Chair	<a href="mailto:chair@tu1406.eu">chair@tu1406.eu</a>
Joan Casas	Vice-Chair	<a href="mailto:vicechair@tu1406.eu">vicechair@tu1406.eu</a>
Eleni Chatzi	Technical Secretariat	<a href="mailto:tecsec@tu1406.eu">tecsec@tu1406.eu</a>
Alfred Strauss	WG1 Leader	<a href="mailto:wg1@tu1406.eu">wg1@tu1406.eu</a>
Irina Stipanovic	WG2 Leader	<a href="mailto:wg2@tu1406.eu">wg2@tu1406.eu</a>
Rade Hajdin	WG3 Leader	<a href="mailto:wg3@tu1406.eu">wg3@tu1406.eu</a>
Amir Kedar	WG4 Leader	<a href="mailto:wg4@tu1406.eu">wg4@tu1406.eu</a>
Vikram Pakrashi	WG5 Leader	<a href="mailto:wg5@tu1406.eu">wg5@tu1406.eu</a>
Guðmundur Valur Guðmundsson	WG6 Leader	<a href="mailto:wg6@tu1406.eu">wg6@tu1406.eu</a>
Jan Bieñ	STSM Coordinator	<a href="mailto:stsm@tu1406.eu">stsm@tu1406.eu</a>
Raffaele Landolfo	Monitoring & Evaluation	<a href="mailto:landolfo@unina.it">landolfo@unina.it</a>
André Orcesi	Innovation	<a href="mailto:andre.orcesi@ifstar.fr">andre.orcesi@ifstar.fr</a>
Kenneth Gavin	Research & Development	<a href="mailto:kenneth.gavin@ucd.ie">kenneth.gavin@ucd.ie</a>

### 2.6.2. ORGANIZING COMMITTEE

<i>Name</i>	<i>TU1406 Position</i>	<i>E-mail</i>
José Matos	Chair	<a href="mailto:chair@tu1406.eu">chair@tu1406.eu</a>
Alfred Strauss	WG1 Leader	<a href="mailto:wg1@tu1406.eu">wg1@tu1406.eu</a>

### 2.6.3. SECRETARIAT

<i>Name</i>	<i>TU1406 Position</i>	<i>E-mail</i>
Eleni Chatzi	Technical Secretariat	<a href="mailto:tecsec@tu1406.eu">tecsec@tu1406.eu</a>
Lara Leite	Administrative Secretariat	<a href="mailto:adminsec@tu1406.eu">adminsec@tu1406.eu</a>

### 2.6.4. LOCAL ORGANIZERS

<i>Name</i>	<i>TU1406 Position</i>	<i>E-mail</i>
Tamás Kovács	MC & WG1 member	<a href="mailto:kovacs.tamas@epito.bme.hu">kovacs.tamas@epito.bme.hu</a>
György Farkas	MC & WG1 member	<a href="mailto:farkas.gyorgy@epito.bme.hu">farkas.gyorgy@epito.bme.hu</a>

### **3. PARTICIPATION**

#### **3.1. FUNDING AND REIMBURSEMENT**

COST organization provides a certain amount of financial means for organizing such meetings and to reimburse participants. This includes for example accommodation costs, meals, transport expenses, etc. For more information about travel reimbursement request please visit the following [webpage](#). Please book your flight and hotel as soon as possible in order to find cheap solutions.

## 4. SOCIAL EVENTS AND LOCATION EVENTS

### 4.1. SOCIAL EVENT

Considering the *fib* events on the previous days, a networking dinner will be organized, on the 28<sup>th</sup> of January (Thursday) by 18.30, in a traditional Hungarian restaurant close to the bank of the river Danube, 6 minutes walk from the meeting venue,. The restaurant “Szegeđ” ([www.szegeđvendeglo.hu](http://www.szegeđvendeglo.hu)) is located next to the building of the Hotel Gellért.

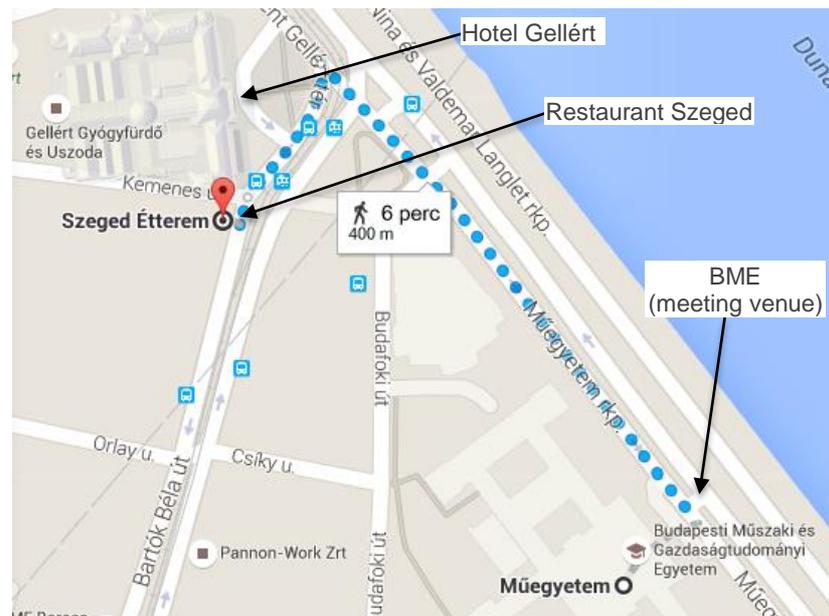


Figure 3. Location of the restaurant “Szegeđ”

Upon arrival you will receive a “pálinka”. The dinner includes two optional menus served with Hungarian red and white wines. During dinner a folklore programme will be presented. A dinner ticket of 40 Euro will be available for purchase during registration. Please note that COST will refund 20 Euro for those participants who are approved for reimbursement. Payments must be made in cash.

It is necessary to provide the restaurant with the exact number of dinner participants until mid-January. Intentions to participation on the dinner together with menu choice will be counted by an invitation poll circulated between the participants of the *fib* and COST events until mid-January.

### 4.2. LOCATION DETAILS

#### 4.2.1. ABOUT BUDAPEST

There are those who fall in love with the city at first sight and those who warm to it after a longer relationship, but everyone agrees that Budapest, the capital of Hungary, is one of the most beautifully situated towns in the world. The huge river Danube cuts the city in two and separates the hills and valleys of the western Buda side from the flat eastern side of Pest. The Chain Bridge, as a highly artistically created jewellery, crowns the river. Caves, thermal springs, nature preservation areas, all are in a bustling city of two millions which is the political, economic and cultural centre of the country. The city has a history dating back over 2000 years.



Figure 4. Budapest, Hungary

Its main characteristics reflect the atmosphere of the end of the 19<sup>th</sup> century when the millennium of the Hungarian State was celebrated. The panorama of Budapest and the Buda Castle Quarter are part of the World Heritage. As Budapest is a traffic junction in Eastern Central Europe, it can be easily reached by air, train, car or even ship.

#### 4.2.2. ABOUT BME

In 1635, Péter Pázmány, Primate, Archbishop of Hungary, has founded the first Hungarian University of the New Age at Nagyszombat. In the late 18th century The University moved to Buda and becomes the University of Buda. In 1782, Emperor Joseph II established the Institutum Geometricum as part of the Faculty of Liberal Arts at the University of Buda. The Institutum, the direct predecessor of the Budapest University of Technology and Economics, was the first in Europe to award engineering degrees to students of land surveying, river control, and road construction. In 2000 the official name changed to Budapest University of Technology and Economics (BME).



Figure 5. A historical view of the central building of BME

At present more than 110 departments and institutes operate within the structure of eight faculties. About 1100 lecturers, 400 researchers and other degree holders and numerous invited lecturers and practising expert specialists participate in education and research at the Budapest University of Technology and

Economics. Approximately 800 of the university's 14.000 students are from 50 countries abroad. The Budapest University of Technology and Economics issues about 70% of Hungary's engineering degrees.



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[WWW.TU1406.EU](http://WWW.TU1406.EU)