

COST

Domain Committee “Transport and Urban Development”

COST Action TU0904

Start Date 1st July 2010

Integrated Fire Engineering and Response (IFER)

MONITORING PROGRESS REPORT

Reporting Period: from 29th March 2010
to 27th May 2011

This Report is presented to the relevant Domain Committee.
It contains three parts:

- I. Management Report prepared by the COST Office/Grant Holder***
- II. Scientific Report prepared by the Chair of the Management Committee of the Action***
- III. Previous versions of the Scientific Report; i.e., part II of past reporting periods***

The report is a “cumulative” report, i.e. it is updated annually and covers the entire period of the Action.

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.D. Self evaluation*.

Based on the monitoring results, the COST Office will decide on the following year’s budget allocation.

Executive summary (max.250 words):

Fire safety is nationally managed in the EU, and practice is determined by specific national experiences. This can lead to similar processes being re-researched and re-invented country by country. With the introduction of common standards in areas related to fire safety, COST TU0904 is intended to share experience and research across the whole field. Fire engineering researchers tend to specialise in fire dynamics, structural fire engineering, environmental protection or human response, and these disciplines scarcely interact. Practitioners, including fire engineers, building/fire control authorities and fire-fighters, take a holistic view of fire safety but, being outside academic networks, lack in-depth awareness of research. Through encouraging interaction between different aspects of fire safety across these key players in different countries, the network intends to propagate the necessary awareness of the current state of the art and best practice, and to avoid repetition of research.

After one year the Action has 20 signatory countries. Its first “deliverable”, bringing together the current state of knowledge and practice, mainly in the 20 signatory countries but in the worldwide context, is a 237-page State of the Art Report, published in April 2011. Two major events have been organised; a Workshop in Barcelona, and an International Conference in Prague, both of which were designed to encourage dissemination activity in different ways. It has initiated a programme of Short-term Scientific Missions for young researchers, although budgetary constraints have so far limited this activity as well as forcing the postponement of a planned Training School for young researchers.

I. Management Report



I.A. COST Action Fact Sheet

- **COST Action TU0904** – Integrated Fire Engineering and Response (IFER)
- **Domain** Transport and Urban Development

- **Action details:**

CSO Approval: 2/12/2009

End date: 28/03/2014

Entry into force: 20/01/2010

Extension:

- **Objectives** *The main objective of this Action is to break down the barrier preventing the exchange of information and experience between researchers from different disciplines on the one hand and between academia and practitioners (including fire-fighters) on the other hand. Thanks to the exchange of international experience, ideas and state-of-the-art on fire risk concepts and assessment methods, the Action aims at providing concrete applications of the performance-based fire safety design methods to practitioners and at introducing the latest research into standards for fire design. Fire engineering researchers are specialists working in specific areas, such as fire dynamics, structural fire engineering, active/passive fire protection, environmental protection and human response. Since the background sciences of these disciplines are different at present there is little interaction between researchers. Practitioners, including fire engineers and building/fire control authorities, tend to consider fire safety as a whole, but lack in-depth awareness of recent advances in research. Through encouraging integration of different aspects of fire engineering and response, the Action will enable researchers with different fields of expertise and coming from different countries to understand better the recent advances in research in parallel fields, as well as their limitations, so that they see their own research in context, and identify opportunities in involvement of early-stage researchers and application of the results in national standards. Practitioners, fire fighting authorities and building control authorities will benefit from exposure to advanced research findings, discussion with the research community, and the sharing of best practice and others’ experiences. On the other side their input will make researchers aware of real-world constraints, as well as current requirements for new research and for the development of European standards.*

- **Parties:**

Austria 03/02/2010	Greece 10/03/2010	Romania 03/02/2010
Belgium 03/02/2010	Hungary 12/07/2010	Slovakia 10/05/2010
Czech Rep. 12/07/2010	Iceland 05/07/2010	Spain 20/01/2010
Finland 20/01/2010	Italy 03/02/2010	Sweden 10/05/2010
FYR of Macedonia 03/02/2010	Malta 23/02/2011	Switzerland 12/07/2010
France 10/02/2010	Poland 20/01/2010	United Kingdom 20/01/2010
Germany 20/01/2010	Portugal 26/01/2010	

- **Intentions to accept:**

- **Other participants:** HERA, New Zealand

Chair: Prof. Frantisek WALD
Czech Technical University in Prague,
Faculty of Civil Engineering, Thakurova
7, Praha 6 , Czech Republic CZ 16629,
+420 224 354 757
wald@fsv.cvut.cz

DC Rapporteur: Prof. Gintaris KAKLAUSKAS
Vilnius Gediminas Technical University Bridge
and Special Structures Faculty of Civil
Engineering Vilnius Gediminas Technical
University (Vilnius, Lithuania)
Gintaris.Kaklauskas@vgtu.lt

Science Officer: Dr. Thierry Goger
thierry.goger@cost.eu

Administrative Officer: Ms. Carmencita
Malimban, carmencita.malimban@cost.eu

• **Action Web site:** <http://fire.fsv.cvut.cz/ifer>

• **Grant Holder Representative:** Prof. Ing. Vaclav Havlicek, Rector, havlicek@fel.cvut.cz

• **Working Groups**

WG1: Fire Behaviour and Fire Safety

WG2: Structural Safety

WG3: Integrated design

Prof. Gintaris Kaklauskas	DC
Dr Ana Maria Lacasta	WG1
Dr Bart Sette	WG1
Dr Bin Zhao	WG1
Dr Dan Pintea	WG1
Dr Dimitrios Tsatsoulas	WG1
Dr Florian Block	WG1
Dr Jean-François Cadorin	WG1
Dr Lajos Gábor Takács	WG1
Dr Mariusz Maslak	WG1
Dr Ulf Goransson	WG1
Dr Zenon Drabowicz	WG1
Mr Antalné Lörík	WG1
Mr Bodvar Tomasson	WG1
Mr Carlos Couto	WG1
Mr Guillermo Rein	WG1
Mr Christoph Klinzmann	WG1
Mr Joao Paulo Rodrigues	WG1
Mr Krzysztof Biskup	WG1
Mr Zdeněk Sokol	WG1
Ms Kamila Horova	WG1
Prof. Emidio Nigro	WG1
Prof. Fabio Casciati	WG1
Prof. Gianfranco De Matteis	WG1
Prof. Jean-Marc Franssen	WG1
Prof. Markku Heinisuo	WG1
Dr Buick Davison	WG2

Dr Frederic Marimon	WG2
Dr Gaetano Della Corte	WG2
Dr Jochen Köhler	WG2
Dr Jochen Zehfuss	WG2
Dr Leslaw Kwasniewski	WG2
Dr Markus Knobloch	WG2
Dr Martin Gillie	WG2
Dr Miquel Ferrer	WG2
Dr Mónika Hajpál	WG2
Dr Pawel Krol	WG2
Dr Raul Zaharia	WG2
Dr Stephen Hicks	WG2
Mr Christos Tsalikis	WG2
Mr Jan Bednar	WG2
Mr Kamil Vargovský	WG2
Mr Koce Todorov	WG2
Mr Thomas Kirsch	WG2
Mr Tomas Jana	WG2
Ms Cécile Haremza	WG2
Ms Cvetanka Filipova	WG2
Ms Dafni Pantousa	WG2
Ms Milica Jovanoska	WG2
Ms Monika Oswald	WG2
Prof. Abdelhamid Bouchair	WG2
Prof. Aldina Santiago	WG2
Prof. Andrea Frangi	WG2
Prof. Dan Dumitrescu	WG2
Prof. Ezio Cadoni	WG2

<i>Prof. Frantisek Wald</i>	<i>WG2</i>
<i>Prof. Ljupcho Lazarov</i>	<i>WG2</i>
<i>Prof. Magdalena Stujberova</i>	<i>WG2</i>
<i>Prof. Martin Mensinger</i>	<i>WG2</i>
<i>Prof. Meri Cvetkovska</i>	<i>WG2</i>
<i>Prof. Milan Veljkovic</i>	<i>WG2</i>
<i>Prof. Peter Schaumann</i>	<i>WG2</i>
<i>Prof. Raffaele Landolfo</i>	<i>WG2</i>
<i>Prof. Venkatesh Kumar Kodur</i>	<i>WG2</i>
<i>Prof. Yong Wang</i>	<i>WG2</i>
<i>Dr Beatrice Faggiano</i>	<i>WG3</i>
<i>Dr Dhionis Dhima</i>	<i>WG3</i>
<i>Dr Ionel - Puiu Golgojan</i>	<i>WG3</i>
<i>Dr Jens Upmeyer</i>	<i>WG3</i>
<i>Dr Jyri Outinen</i>	<i>WG3</i>
<i>Dr Nuno Lopes</i>	<i>WG3</i>
<i>Dr Robert Kowalski</i>	<i>WG3</i>
<i>Mr Antonio Bilotta</i>	<i>WG3</i>
<i>Mr Carlos Souto</i>	<i>WG3</i>

<i>Mr Csaba Szilagyi</i>	<i>WG3</i>
<i>Mr Jim Marsden</i>	<i>WG3</i>
<i>Mr Niels Peter Hoj</i>	<i>WG3</i>
<i>Mr Paul Jenkins</i>	<i>WG3</i>
<i>Mr Petr Kučera</i>	<i>WG3</i>
<i>Mr Ruben Paul Borg</i>	<i>WG3</i>
<i>Mr Rudolf Kaiser</i>	<i>WG3</i>
<i>Ms Fernanda da Rocha de Carvalho Lopes</i>	<i>WG3</i>
<i>Ms Petra Kallerova</i>	<i>WG3</i>
<i>Prof. André De Naeyer</i>	<i>WG3</i>
<i>Prof. Dan Dubina</i>	<i>WG3</i>
<i>Prof. Euripidis Mistakidis</i>	<i>WG3</i>
<i>Prof. Federico Mazzolani</i>	<i>WG3</i>
<i>Prof. Georgios Stavroulakis</i>	<i>WG3</i>
<i>Prof. Ian Burgess</i>	<i>WG3</i>
<i>Prof. Paulo Vila Real</i>	<i>WG3</i>

I.B. Management Committee member list

Name	E-mail	Country
<i>Dr Florian Block</i>	<i>Florian.Block@BuroHappold.com</i>	<i>UK</i>
<i>Mr RUBEN PAUL BORG</i>	<i>ruben.p.borg@um.edu.mt</i>	<i>MT</i>
<i>Prof. Abdelhamid Bouchair</i>	<i>bouchair@cust.univ-bpclermont.fr</i>	<i>FR</i>
<i>Prof. Ian Burgess</i>	<i>ian.burgess@sheffield.ac.uk</i>	<i>UK</i>
<i>Prof. Ezio Cadoni</i>	<i>ezio.cadoni@supsi.ch</i>	<i>CH</i>
<i>Prof. Meri Cvetkovska</i>	<i>cvetkovska@gf.ukim.edu.mk</i>	<i>MK</i>
<i>Mr Jesus de la Quintana</i>	<i>jq@labein.es</i>	<i>ES</i>
<i>Prof. André De Naeyer</i>	<i>denaeyer.andre@gmail.com</i>	<i>BE</i>
<i>Prof. Dan Dubina</i>	<i>dan.dubina@ct.upt.ro</i>	<i>RO</i>
<i>Dr beatrice faggiano</i>	<i>faggiano@unina.it</i>	<i>IT</i>
<i>Dr Miquel Ferrer</i>	<i>miquel.ferrer@upc.edu</i>	<i>ES</i>
<i>Prof. Andrea Frangi</i>	<i>frangi@ibk.baug.ethz.ch</i>	<i>CH</i>
<i>Prof. Jean-Marc Franssen</i>	<i>JM.Franssen@ulg.ac.be</i>	<i>BE</i>
<i>Dr Martin Gillie</i>	<i>m.gillie@ed.ac.uk</i>	<i>UK</i>
<i>Dr Ulf GORANSSON</i>	<i>ulf.goransson@fsd.se</i>	<i>SE</i>
<i>Dr Mónika Hajpál</i>	<i>hajpal@gmail.com</i>	<i>HU</i>
<i>Prof. Markku Heinisuo</i>	<i>markku.heinisuo@tut.fi</i>	<i>FI</i>
<i>Dr Stephen Hicks</i>	<i>stephen.hicks@hera.org.nz</i>	<i>NZ</i>
<i>Mr Thomas Kirsch</i>	<i>kirsch@stahl.uni-hannover.de</i>	<i>DE</i>
<i>Dr Leslaw Kwasniewski</i>	<i>l.kwasniewski@il.pw.edu.pl</i>	<i>PL</i>
<i>Dr Jochen Köhler</i>	<i>jochen.koehler@ibk.baug.ethz.ch</i>	<i>CH</i>
<i>Dr Ana Maria Lacasta</i>	<i>anna@fa.upc.edu</i>	<i>ES</i>
<i>Prof. Ljupcho Lazarov</i>	<i>lazarov@gf.ukim.edu.mk</i>	<i>MK</i>
<i>Dr Frederic Marimon</i>	<i>frederic.marimon@upc.edu</i>	<i>ES</i>
<i>Dr Mariusz Maslak</i>	<i>mmaslak@pk.edu.pl</i>	<i>PL</i>
<i>Prof. Federico Mazzolani</i>	<i>fmm@unina.it</i>	<i>IT</i>
<i>Prof. Euripidis Mistakidis</i>	<i>emistaki@uth.gr</i>	<i>EL</i>
<i>Ms Monika OSWALD</i>	<i>monika.oswald@tuwien.ac.at</i>	<i>AT</i>
<i>Dr Jyri Outinen</i>	<i> jyri.outinen@ruukki.com</i>	<i>FI</i>
<i>Prof. Aldina Santiago</i>	<i>aldina@dec.uc.pt</i>	<i>PT</i>
<i>Prof. Peter Schaumann</i>	<i>stahlbau@stahl.uni-hannover.de</i>	<i>DE</i>
<i>Prof. Georgios Stavroulakis</i>	<i>gestavr@dpem.tuc.gr</i>	<i>EL</i>
<i>Prof. Magdalena STUJBEROVA</i>	<i>magdalena.stujberova@stuba.sk</i>	<i>SK</i>
<i>Dr Lajos Gábor Takács</i>	<i>ltakacs@epsz.bme.hu</i>	<i>HU</i>
<i>Mr Bodvar Tomasson</i>	<i>bodvar.tomasson@efla.is</i>	<i>IS</i>
<i>Prof. Milan Veljkovic</i>	<i>milan.veljkovic@ltu.se</i>	<i>SE</i>
<i>Prof. Paulo Vila Real</i>	<i>pvreal@ua.pt</i>	<i>PT</i>
<i>Prof. Frantisek Wald</i>	<i>wald@fsv.cvut.cz</i>	<i>CZ</i>
<i>Prof. Yong Wang</i>	<i>yong.wang@manchester.ac.uk</i>	<i>UK</i>
<i>Dr Raul Zaharia</i>	<i>raul.zaharia@ct.upt.ro</i>	<i>RO</i>
<i>Dr Bin ZHAO</i>	<i>binzhao@cticm.com</i>	<i>FR</i>

I.C. Overview activities and expenditure

1.st year Budget

Total Action Budget:
92.000,00

Remaining Action Commitment: *accrued expenses are marked with **

Meetings

Meeting Type	Date	Place	Nb of participants	Nb of reimbursed P.	Cost	Total
<i>MC, WG, Workshop, Conference</i>	<i>05-06/07/2010</i>	<i>Barcelona (ES)</i>	<i>72</i>	<i>56</i>		48.333,86
<i>MC, WG, Workshop, Conference</i>	<i>29-30/04/2011</i>	<i>Prague (CZ)</i>	<i>40</i>	<i>32</i>		24.816,18*

STSM

Beneficiary	Date	Place	Host	Topic	Cost	Total
<i>Kamila Horova</i>	<i>21/02-07/03/2011</i>	<i>Tampere (FI)</i>	<i>Markku Heinisuo</i>	<i>Design Fires</i>		1.300,00
<i>Gang Dong</i>	<i>19-25/06/2011</i>	<i>Coimbra (PT)</i>	<i>Luis Simoes da Silva</i>	<i>Reverse channel component</i>		550,00*

Workshops

Title	Date	Place	Cost	Total
				0

General Support Grants

Beneficiary	Date	Cost	Total
			0

Schools

Title	Date	Place	Cost	Total
				0



Dissemination

Title	Date	Place		Details	Cost	Total
<i>Action Website</i>	<i>13/12/2010</i>	<i>Prague (CZ)</i>		<i>Preparing and service from 6/2010 to 6/2011</i>		2.000,00
<i>Integrated Fire Engineering and Response, State of the Art Report</i>	<i>31/05/2011</i>	<i>Prague (CZ)</i>		<i>240 pages</i>		1.000,00*
<i>Proceedings of International Conference Application of Structural Fire Engineering in Prague, 29 April 2011</i>	<i>31/05/2011</i>	<i>Prague (CZ)</i>		<i>465 pages</i>		2.000,00*

Others

<i>Financial and Scientific Administration and Coordination</i>	12.000,00
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II. Scientific Report

II.A. Networking during the Action Year 2010 – 2011

1.1. Kick-off Meeting, Brussels 29-30 March 2010

The Management Committee (MC) kick-off meeting in Brussels was attended by representatives of 13 of the 14 countries which had joined the Action at that time. The Chair and vice-Chair of the Action were elected. It was explained that new COST Actions were part of a grants framework, and that CVUT Prague would therefore be considered as the grant holder. The Action budget had been calculated on the basis of the current number of signatories, with the implication that the joining of subsequent signatories would demand careful budget management during the year; this has influenced the activities of the year considerably, as will become apparent. The role and scope of each of the Working Groups (WGs) was debated, an initial allocation of MC members among the 3 WGs was made, and Chair and vice-Chair of each were elected.

1.2. Workshop at UPC Barcelona on 5-6 July 2010

The initial Workshop included presentations by all WG members, and meetings were held of the MC and the three WGs. In order to begin the process of integration, which is the major theme of the Action, all presentations were made to the whole membership and illustrated the current themes and expertise of the presenters' research groups. There were 52 10-minute presentations, all of which are now available on the Action website. As an additional means of communicating background information among the membership, participants prepared poster displays; 55 posters were produced which are also available via the Action website. Within the 3 WGs the scope of expertise is reflected in the subjects presented:

WG1: Fire Behaviour and Fire Safety: The presentations (12) showed a balance between:

- summaries of fire science and fire safety research in various of the represented countries (Poland, Finland, Spain, Romania, Greece),
- research problems concerned with thermal analysis of steel and aluminium structures in fire,
- observation of thermal behaviour in real tests,
- approaches to the behaviour of fires and heating of structure in unusual design cases.

WG2; Structural Safety: Among the academic research participants in COST TU0904 this is the most developed area of active research, and this provided the largest single group of presentations (26) on a variety of structural fire engineering themes:

- summaries of structural fire engineering research and practice in various of the represented countries (Poland, Switzerland, Spain, Romania, Slovakia, Germany, Macedonia),
- new design proposals for fire safety in the Nordic countries,
- current research summaries for academic groups at ETH Zurich, TU München and CVUT Prague,
- the structural behaviour of concrete materials and structural elements, both during and after fires,
- observation and modelling of timber joints in fire,
- the effect of elevated temperatures on the structural behaviour of natural stone masonry,
- tests on loaded connections in car parks under the effect of localised fires,
- thermal analysis of steel connections in composite structures in fire,
- advanced numerical simulation of structural response to building fires,
- analyses of structural fire effects on structures already damaged by earthquake actions,
- steel beams under end moment in fire,
- temperature-dependent properties of fire protection materials,
- the need for design for robustness in future structural fire engineering practice.

WG3: Integrated design: At the start of the Action it was important to update participants on the current context linking the engineering disciplines of fire safety and structural fire resistance design with national regulations and practice. There were 14 presentations from WG3 members:

- summaries of regulations and current practice in various of the represented countries (Romania, Portugal, Czech Republic, UK),
- case studies in fire safety engineering from Portugal and Italy,
- case studies on protection of built heritage - report on recent projects and their possible impact on integrated design (Belgium),
- current research on fire safety at Warsaw University of Technology,
- analytical design studies of buildings for the case of fire after being damaged by earthquakes,
- mathematical and stochastic modelling in fire safety and design against extreme loadings in general.

Working Group meetings before and after these presentation sessions concentrated on planning for the State-of-the-Art Report (WP1). The discussions produced different formats from the WGs, reflecting the different contexts, and the intensity of current research activity, of each of the subject areas:

WG1: Fire Behaviour and Fire Safety: a subject-based subdivision;

WG2; Structural Safety: summaries of research expertise in the participants and the countries of the Action;

WG3: Integrated design: a contextual summary for each country, based on a common questionnaire.

The Barcelona MC meeting was forced to take immediate account of a serious shortfall in the annual budget which, in conjunction with a post-budget increase in signatories from 14 to 20, made it necessary to abandon the objective of holding an Autumn MC meeting in Luleå. It was fortunate that the final conference of COST C26 in Naples was to be attended by all countries of TU0904; this enabled the Autumn 2010 MC meeting to be reorganised at no cost to the Action.

1.3. MC Meeting, Naples 17 – 18 September 2010

The main discussion of this MC meeting concerned the feasibility of proceeding with the remaining planned events for 2010-11, given the budgetary shortfall in this year. It was decided to defer the Prague Conference from 29-30 February 2011 to 29 April 2011, and to run it in a one-day format in order to minimise expenses. Reimbursement to COST TU0904 members would be limited to whatever the budget available at the time could afford; the conference would go ahead regardless of external support.

1.4. Conference on Applications of Structural Fire Engineering, Prague 29 April 2011

The Conference was held as planned, in a one-day format. In order to maximise value for the participants it was decided to limit oral presentation time to 6-7 minutes per paper, while still keeping to a single session, but to encourage discussion by placing emphasis on poster presentation, including open voting for the best poster overall. The Conference Proceedings, including all 72 papers, 62 slide presentations and 55 posters, all in PDF form, are available for download from the Action's website, and so the subject areas covered need not be detailed here. In order to encourage young researchers to develop their presentation and dissemination skills an award was made for "Best Young Researcher", judged on the basis of their oral and visual presentations and their posters. Although the one-day format was intense, the conference was undoubtedly successful. Future events, whether one- or two-day, would clearly be enhanced by running a full 2-hour poster session at which voting and discussions could take place.

1.5. MC Meeting, Prague 30 April 2011

Once again the need to work meaningfully within a very tight 2010-11 budget was a major influence on the discussion. The decision to postpone the Training School for young researchers was inevitable, since this could have been very expensive if places were taken up by all the partner countries. The State-of-the-Art Report had been published before the Prague meeting, and was distributed to members. Meetings of WGs, and a full session of all three, focused on the next deliverable, a collection of practical design Case Studies. As a first step, it was decided to issue a check-list as an aid to the groups developing the Case Studies; Dr Florian Block (UK) agreed to produce this check-list. The Chair of the Action will prepare a template to standardise the structure and presentation of the Case Studies.

II.B. Inter-disciplinary networking

Inter-disciplinarity is at the heart of this Action, and the nature of the State-of-the-Art reports, as well as two open events held without specialist sessions, is to disseminate knowledge from within the 3 WGs across the entire group of disparate specialists. This spreads awareness of research, issues and practice in the complementary disciplines. For researchers in WGs 1 and 2 the Barcelona presentations from fire responders on national attitudes and policies concerning performance-based design provided invaluable information about the context in which their results will be practised, and the key drivers for building control authorities. A similar but wider benefit was gained from the WG3 State-of-the-Art questionnaire responses on the national controls and processes in different countries; this will be useful even across European control authorities. Clearly there is benefit for researchers in both the "fire science" and "structural fire" communities in making associations between progress in their complementary fields.

It is perhaps too early to state categorically whether socio-economic impacts will be observed within the period of the action. However, if the two research-based WGs can influence control authorities on policy, and designers on the practice of performance-based methods, there is a very clear route to socio-economic impacts. In most countries only prescriptive fire resistance methods are commonly used or permitted at present. Although lip-service is paid to the need to move to performance- and risk-based methods, regulators need more knowledge of these methods, and the ways in which colleagues in the leading countries are taking them into account.

II.C. New networking

- Additional members joining the Action during 2010-11: Czech Republic, Hungary, Iceland, Slovakia, Sweden, Switzerland
- Total number of individual participants involved in the Action work: At present there are 91 individual participants, of which 14,3% are female, and 16,5% are Early Stage Researchers.
- STSMs: Because of the restricted budget available in the year 2010-11 only two STSMs have been

granted, although 2 more are expected before June 2011. Current approved STSMs are:

1. Kamila Horová, 21/2/2011 – 7/3/2011 from Prague to Tampere (M. Heinisuo), (Design fires),
 2. Gang Dong, 19/6/2011 – 25/6/2011 from Sheffield to Coimbra (L. Simoes da Silva), (Reverse channel components in fire).
- Conference funding for young researchers: Requests were made at the Prague MC meeting for conference attendance grants for Petra Kallerová (CVUT Prague); Guillermo Rein (Edinburgh); Antonio Bilotta (Naples). They were asked to submit the forms as soon as possible. Members have been asked to submit applications for the 2011-12 Action year.
 - Training Schools: It has been necessary to postpone the Training School scheduled for June-July 2011 because of insufficient funding. It is very much hoped that it will be possible to reschedule this for later in the action.
 - Involvement of researchers from outside the COST Countries: At this stage one external participant (Dr Stephen Hicks, HERA, New Zealand) has joined the Action. In 2010-11 his active participation was curtailed by the NZ earthquake, but he will be invited to participate in subsequent phases. One international expert (Prof Venkatesh Kodur, Michigan State University, USA) participated in the Prague conference.
 - Publications and other outreach activities: Apart from the State-of-the-Art Report and the Proceedings of the International Conference, which represent the main outputs of the Action so far, some local articles have been published in national journals. Two articles are already in print (Konstrukce 4/2010, Czech Republic; Inzynieria i Budownictwo 11/2010, Poland), and others are in the pipeline.

II.D. Self evaluation

In difficult budgetary circumstances the first year of TU0904 has succeeded in running the Action much as originally envisaged. Two major scientific events have been staged, in Barcelona and Prague, producing documents (72 research papers, 110 posters and 114 slide presentations) which provide an excellent picture, freely available, of current performance-based fire engineering research, particularly in Europe which is the principal centre of this research worldwide. In addition, the 238-page State-of-the-Art Report gives an overview of the background knowledge relevant to performance-based fire engineering, in fire science and safety, structural behaviour, and the regulatory context within which it must be practised, in a wide range of countries. This last is vital for the growth of performance-based practice in the design of buildings to resist fire; regulators need to be persuaded that their national building construction and maintenance regimes and objectives do not differ fundamentally from those of other countries, and that it is possible to adapt practices which have proved successful elsewhere.

The relative failures of the year have been caused by financial constraints. It is a matter of particular regret that it was not possible to stage the planned Training Course for young researchers in this year, because a key objective is to accelerate and enhance the training of the next generation of world-class researchers in the fire engineering field by bringing them together with established experts, so that their future research will complement that in other parts of Europe rather than duplicating it. It is very much hoped that a future year's budget will allow this course to be run.

The fact that the Action Conference became a single-day, rather than a two-day, event had both positive and negative aspects. The printed papers published as Proceedings allowed a relatively detailed document of record for fellow workers in their fields, while short oral presentations maintained interest for participants in cognate fields. The requirement for posters was a stimulus for detailed discussions with their authors; the only problem was the lack of time for a further 2-hour session which could have been devoted to these discussions. This lesson will influence the organisation of the future public events of the Action.