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cost TU0904

Integrated Fire Engineering and Response

State of the Art Report

March 2011

COST- the acronym for European **CO**operation in the field of **S**cientific and **T**echnical Research- is the oldest and widest European intergovernmental network for cooperation in research. Established by the Ministerial Conference in November 1971, COST is presently used by the scientific communities of 35 European countries to cooperate in common research projects supported by national funds.

The funds provided by COST - less than 1% of the total value of the projects - support the COST cooperation networks, COST Actions, through which, with only around € 20 million per year, more than 30.000 European scientists are involved in research having a total value which exceeds € 2 billion per year. This is the financial worth of the European added value which COST achieves.

A bottom up approach (the initiative of launching a COST Action comes from the European scientists themselves), à la carte participation (only countries interested in the Action participate), equality of access (participation is open also to the scientific communities of countries not belonging to the European Union) and flexible structure (easy implementation and light management of the research initiatives) are the main characteristics of COST.

As precursor of advanced multidisciplinary research COST has a very important role for the realisation of the European Research Area (ERA) anticipating and complementing the activities of the Framework Programmes, constituting a ridge towards the scientific communities of emerging countries, increasing the mobility of researchers across Europe and fostering the establishment of Networks of Excellence in many key scientific domains such as: Biomedicine and Molecular Biosciences; Food and Agriculture; Forests, their Products and Services; Materials, Physics and Nanosciences; Chemistry and Molecular Sciences and Technologies; Earth System Science and Environmental Management; Information and Communication Technologies; Transport and Urban Development; Individuals, Society, Culture and Health. It covers basic and more applied research and also addresses issues of pre-normative nature or of societal importance.

COST Action TU0904
Integrated Fire Engineering and Response
fire.fsv.cvut.cz/ifer

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PREFACE

"Integrated Fire Engineering and Response"

When the COST Action TU0904 was proposed, its "big idea" lay in including the word **Integrated** in its title.

Current practice in the European Union is that Fire safety is nationally managed, and the ways in which this happens are determined by the specific experiences of each country. A good example of this influence of history is the United Kingdom, for which a single event, the Great Fire of London in 1666, radically changed the way houses were constructed, with the avoidance of fire spread being the most important objective. Fire regulations in the UK (particularly in England) still reflect the determination of legislators to avoid similar events. While the political motivations for this approach are obvious, and local circumstances vary between countries, it can easily lead to similar processes having to be re-researched and re-invented country by country. In the context of the European Union and the introduction of common standards in areas related to fire safety, it seems obvious that in such an important area the sharing of experience and research should be facilitated, and hence the need for networks in the COST model.

Figure 1: The Great Fire of London, 1666. A contemporary engraving

However, the need for integration has a further dimension. Fire engineering researchers tend to specialise in areas such as fire dynamics, structural fire engineering, active/passive fire protection, environmental protection or human response. Since the background sciences of these disciplines are different there is little interaction between them. Practitioners, including fire engineers, building/fire control authorities, and fire-fighters tend to consider fire safety as a whole, but lack in-depth awareness of recent advances in research and are outside the academic research networks. Through encouraging the exchange of information on different aspects of fire engineering and response between researchers in different countries, the network intends to create an awareness of the current state of the art, and to avoid repetition of research. The non-research community will benefit from exposure to advanced research findings, discussion with researchers, and the sharing of best practice. Their input will make researchers aware of real-world constraints, and where new research and standards are needed.

The Action divides its membership *loosely* into three themed Working Groups, although clearly its overall mission of promoting integration means that these groups must interact on many of the key activities. The Working Groups are:

WG1. Fire Behaviour and Life Safety focuses on the behaviour and effects of fire in buildings, combining this research-based knowledge with the most effective means of protecting human life against the occurrence of fire in the built environment. This includes active measures in fire-fighting with the effects of building form on the inherent risk to inhabitants.

WG2. Structural safety covers the response of different building types to fires and the rapidly developing research field of structural fire engineering, including new materials and technologies and passive protection measures. Crucial problems of structural fire engineering concern change of use of buildings and the current imperatives of sustainability, energy saving and protection of the environment after fire.

WG3. Integrated Design brings together design, practice and research across the disciplines of fire in the built environment. In structural design this includes integration of fire resistance with all the other functional requirements of a building, from concept onwards, rather than simply adding fire protection

after all other processes are complete. Active input from practitioners, regulators and fire-fighters through this group is vital to the success of the Action.

The Action started in July 2010, and now has 22 nations of the EU as participants. Its first "deliverable", which attempts to bring together the current state of research, mainly in the participating countries but set into the context of knowledge world-wide, is this State of the Art Report. For this document the material is grouped according to its relationship to the three Working Groups, and has been collated by their chairmen from theiur membership. In the case of WG1 and WG2, which are active academic research fields, the articles comprise brief résumés of key research topics, together with the current state of progress, and themes, of the research centres of the participating nations. For WG3 the baseline is rather different, being based on current practice and the regulatory régimes within which fire engineering is carried out. Hence an attempt has been made, via a detailed questionnaire sent to individual country representatives, to bring together relevant information on these issues. It is clear that further contextual issues will become apparent within the next 3 years of the Action, and both the questionnaire and its responses can be updated as the network reveals these issues.

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1 April 2011