High-rise Evacuation Evaluation Database (HEED): Methodologies Used in the Elicitation and Storage of Human Factors Data

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This presentation describes the methodologies employed in the collection and storage of first-hand accounts of evacuation experiences derived from face-to-face interviews of evacuees from the World Trade Center (WTC) Twin Towers complex on 11 September 2001. In particular the presentation describes the development of the High Rise Evacuation Evaluation Database (HEED). This is a flexible research tool which contains qualitative type data in the form of coded evacuee experiences along with the full interview transcripts. The data and information captured and stored in the HEED database is not only unique, but provides a means to address current and emerging issues relating to human factors associated with the evacuation of high-rise buildings. The evacuation of the WTC complex in 2001 is one of the largest full-scale evacuations of people in modern times with over 14,000 people escaping from the buildings. The people who evacuated can thus be regarded as unique witnesses who are able to give first-hand accounts of their evacuation experiences within the rapidly changing high-rise building environment. Their memories of the evacuation provide insights into the inter-related processes associated with high-rise building egress.

Project HEED – High-rise Evacuation Evaluation Database - is funded by the UK Engineering and Physical Science Research Council (EPSRC - project GR/S74201/01 and EP/D507790). It involves a collaboration between the Universities of Greenwich (Prof E.R.Galea, Ms R.Day, Dr L.Hulse, Mr A.Siddiqui, Mr G. Sharp), Ulster (Prof J.Shields, Dr. K.Boyce, Ms L.Summerfield) and Liverpool (Prof D.Canter, Mr. P.V. Greenall, Ms M. Marselle) and aims to collect first hand evacuation experiences of survivors from the WTC twin towers evacuation. Thus far some 270 evacuees have been interviewed. The analysis of the information collected in HEED is intended to address a number of engineering and psychological research questions associated with evacuation. Key amongst the engineering questions that the HEED project will address are:

- **Occupant response times:** Currently, engineers use arbitrary values to represent occupant response times, often simply taking, for example, 0 to 2 minutes. We hope to determine a representative range of response times and explore issues such as the factors influencing response times, eg proximity to incident, risk perception, group behaviour.
- **Group Formation:** All engineering evacuation analysis currently assumes that occupants evacuate as individuals. This assumption has an important influence on the unfolding evacuation dynamic and potentially the overall evacuaton efficiency. We hope to identify the presence, size, group cohesion, factors driving formation, factors driving dissolution, nature of group membership and behaviour exhibited by groups during the WTC evacuation.
- **Merging Flows and Deference behaviours:** In high-rise building evacuations a key behaviour which determines how the evacuation unfolds and how quickly any particular floor can empty into the staircase is the nature in which people on the floor merge with people on the stairs. We hope to develop a better understanding of this behaviour and address key questions such as : Will the merging process follow a one-for-one pattern, or will one flow dominant?
- **Travel Speeds:** A basic piece of data essential in all engineering evacuation analysis is the travel speed of people on stairs. There is some evidence to suggest that the travel speeds in the WTC evacuation were significantly smaller than those typically used in engineering analysis. What was the speed of people on the stairs and what contributed to it?
- **Fatigue:** All engineering analysis of high-rise building evacuation currently either ignores the impact of fatigue or treats it in a crude and arbitrary manner. Was fatigue an issue in the WTC evacuation, did it exert an influence on the overall evacuation and if so, in what way?

This presentation describes the methodologies employed to address these important issues related to high rise building design and reports on some of the early findings.