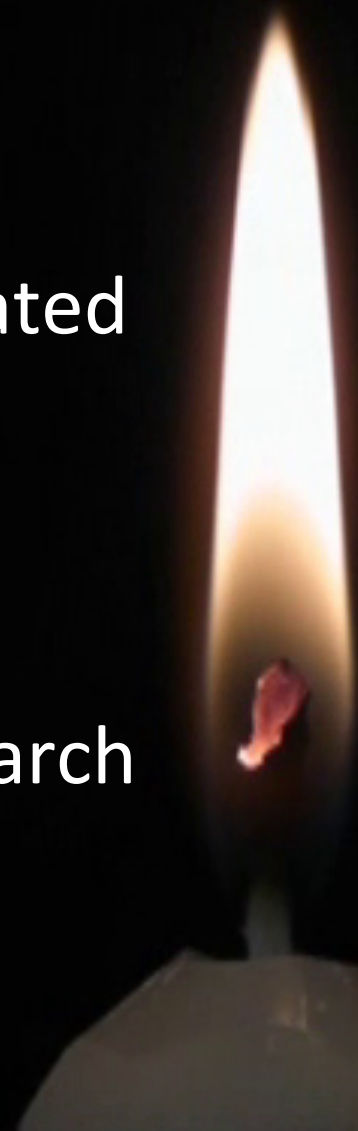
Edinburgh:
40 Years Redefining Fire Safety Engineering Education

José L. Torero
School of Civil Engineering
The University of Queensland
Australia

Research Based Engineering Education



Discipline

- Fundamental discipline related studies
- Technology development
- Applied Research

Education

- Educational Theory – Teaching Methods
- Curriculum Development
- Teaching methods for the stakeholders needs

Specificity

- Extensive research on general education/teaching/learning practises
  - Engineering as applied science
- Less research on Engineering education/teaching/learning practises
  - Is there a case for discipline specific education/teaching/learning practises
  - What can be extrapolated/what cannot be extrapolated?
- How important proper education/teaching/learning practises are for a discipline?
  - Edinburgh as an innovator in Fire Safety Engineering Education

Fire Safety Engineering

Context

- Ubiquitous
- Traditionally a strictly prescriptive environment
  - Codes
  - Standards
- Operated within the context of a trade
  - Heavily regulated activity
  - No regulation on the practitioner
- Limited Higher Education offerings

Today: Design for Implicit Performance

One Size Fits All

Standardization of Space

- Means of Escape
- Compartmentation
- Geometry

Standardization of Response

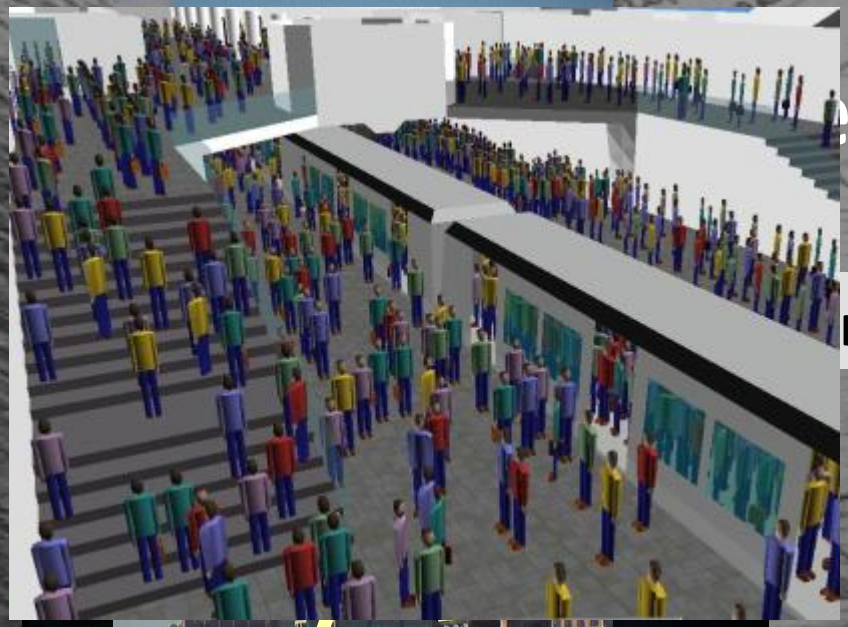
- Active
- Passive
- Fire Service

Consequence: Enormous Safety Factors

- Loss of Function
- Compromised Aesthetics

- Waste
- Unidentified Mistakes

ty Factors: Sustainable



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Reactive Flow

Burning

Material Science

Smoke/Heat

Materials

Architecture

People

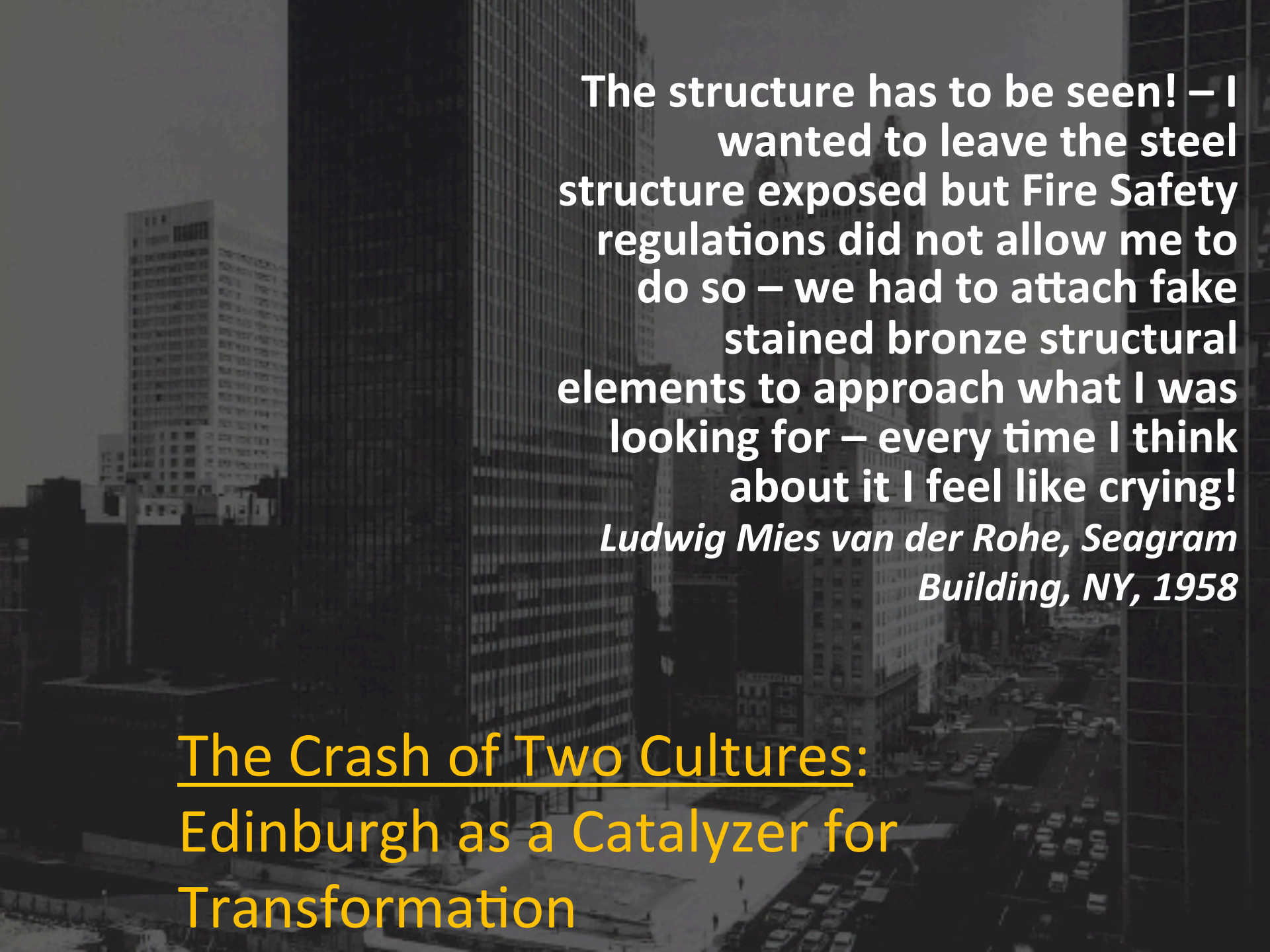
Physiology
Psychology
Sociology

Solid Mechanics

Fluid Mechanics
Heat Transfer

Structure

Tomorrow: Design for Explicit Performance



The structure has to be seen! – I wanted to leave the steel structure exposed but Fire Safety regulations did not allow me to do so – we had to attach fake stained bronze structural elements to approach what I was looking for – every time I think about it I feel like crying!

Ludwig Mies van der Rohe, Seagram Building, NY, 1958

The Crash of Two Cultures: Edinburgh as a Catalyzer for Transformation

Redefining Competence

- From Trade to Profession
  - New attributes
  - Complex context
- Educating professionals to transform a Trade into a Profession
  - Regulatory barriers
  - Economic barriers
  - Social barriers
  - Professional barriers

Brief History

Knowledge

- Pre-1940's -Basic Experiential Leading to the development of "Code Based Design Framework"
- 1940-1960 – Core fundamental science allowing the improvement of codes
- 1960 -1990 – Application of Science – Defining professional tools and learning how to calculate, bringing engineering to the codes
- 1990 – present – Refinement computational tools and integrating fire dynamics to building technology – professionalizing engineering practise

Prescriptive Framework

Professional Framework

Education

- 1903 Armory Institute of Technology (IIT) – Chicago (USA)
- 1956 University of Maryland (USA) – [illegible]
  - Oklahoma State, Ohio State, etc.
- 1974 University of Edinburgh – MSc (UK)
  - Leeds University (1995), Southbank University (1991), Ulster University (1992), UCLan (1994), Glasgow Caledonian, etc.
- 1979 Worcester Polytechnic Institute of – MSc (USA)
- 1982 University of Maryland – MSc (USA)
- Lund University (Sweden)
  - University of Canterbury (NZ), UWS, Victoria University (Australia), etc.
- 2004 University of Edinburgh – MSc Structural Fire Safety
- 2008 International Masters in Fire Safety Engineering (Edinburgh, Ghent, Lund)

Prescriptive Framework

Knowledge Framework

Professional Framework

Professional Attributes

- Lloyds Register Education and Research Trust Seminars – 1st Fire Safety Leaders, 2nd Broader Professional Leaders, 3rd Sociologists & Legislators
  - Professional:
    - Masters the available tools to design within a professional context and the bounds of professional ethics
  - Technical Specialist – Knowledge Based
    - Masters the available tools to provide answers to questions raised by the professional while operating in the context of a trade
  - Code Consultant & Regulator:
    - Masters the tools to provide solutions equivalent to prescriptive solutions and to be approved by a regulator
  - Code Practitioner:
    - Masters the direct application of the code to deliver solutions to be approved by a regulator

Educating the "Professional"

- Curriculum vs. Learning Process
  - The Knowledge: "Curriculum"
    - Magnusson, S., Drysdale, D., Fitzgerald, R. *et al* (1995). A Proposal for a Model Curriculum in Fire Safety Engineering, Fire Safety Journal, 25, 1-88.
  - The Learning Process (P.A.S.) – "The Attributes":
    - Research Based Education – "Learning how to Learn"
      - Purpose: "Purpose is the reason why we do what we do"
      - Autonomy: "The opposite of control is autonomy; and where control leads to compliance; autonomy leads to engagement"
      - Structure: "Structure is the assembly of limits intended to support autonomous learning. Limits help learners develop a sense of what is possible in our world, and our society

Edinburgh: 40 Years Redefining Fire Safety Engineering Education

- Edinburgh is at its core an educational programme (Dr. Frank Rushbrook, Prof. David Rasbash and Prof. Drysdale)
- For 40 years Edinburgh has been a pioneer in Fire Safety Engineering Education
  - At the origin of knowledge based education
  - At the origin of research lead education
  - At the origin of attribute based education
- Edinburgh is now at the core of Professionalization

…still a long way to go!

2003 – Opening of the Rushbrook Fire Safety Engineering Laboratory

- It is difficult to talk about the future because it is simply ones vision. Ones vision is biased by ones own perception of what is important and what is not, this is why most speeches that talk about the future tend, with time, to prove themselves wrong … nevertheless …
- I believe that within the next years this field will be starving from leadership
- I believe that within the next years this field will see very little technical innovation
- I believe that within the next years this field will lack vision
- I believe our role is to be the generation that will try to revert that trend
- I believe that we have to survive, and if we do, the next generation will see a strong and healthy Fire Safety Engineering, not only at Edinburgh but disseminated elsewhere.

- I believe that Edinburgh has a tradition that makes it a unique environment to foster innovation
- I believe that Edinburgh can capture the talented young minds that are necessary to lead this field into the revolution that is Performance Based Design
- I believe that in Edinburgh there is the breadth and depth necessary to educate professionals that will be critical of their own practices
- I believe that Edinburgh will remain as a focus of the highest level research and education that will allow to form the much needed leaders of this field
- In summary, I believe that Frank Rushbrook's original vision of education was and still is the right one

…This is also my vision of the future


Thank you!