The Role of Fire Investigators

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Introduction

- Fire Investigation and the Building Control Process
- Fire Investigation Process – establishing origin, cause
- Development and Spread of Fires
- Fire Investigation and Building Control / Design
- Some Issues Arising
- Solutions

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Why Is Fire Investigation Important in the Building Control Process?

- Fire Investigation confirms adequacy of building systems with respect to fire
  - E.g. Compartmentation, fire stopping
- Fire Investigation identifies failures in building systems
  - E.g. Spread of flames, collapse of structural supports

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Fire Investigators Establish:

- Origin of the Fire
- Cause of the Fire
- Development and Spread of the Fire
- Effects of the Fire
The Scientific Method

Inductive Reasoning is defined in NFPA 921 as: “The process by which a person starts from a particular experience and proceeds to generalizations. The process by which hypotheses are developed based upon observable or known facts and the training, experience, knowledge, and expertise of the observer.”

Deductive Reasoning is defined in NFPA 921 as “The process by which conclusions are drawn by logical inference from given premises.”
Establishing the Origin of the Fire

• Determining Compartment of Fire

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Determining Point of Origin

- Geometrical patterns
- Time temperature patterns
- Electrical indicators
  - Operation of fuses / MCBs
  - Arc mapping
Establishing the Origin of the Fire

Determining Point of Origin

- Protection patterns
- Alarm and detection systems
- Excavation and Reconstruction
- Witness evidence

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Establishing the Cause

Possible causes?
- Deliberate Act
- Discarded Smokers’ Materials
- Fault in Electrical Installation
- Fault in Electrical Appliance
- Ignition by Radiant Heat or Naked Flame
- Explosion
- Self-heating / Spontaneous Combustion

Hypothesis testing
- Compare the hypotheses to know facts and scientific knowledge by using physical and “thought” experiments
- Investigators can use research previously undertaken to inform the investigation

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Development and Spread of Fires

Stages of Fire Development

1. Growth Phase
2. Flashover
3. Fully Developed Fire
4. Decay Phase
Did Building Components Resist the Spread of Fire?

- External structural components e.g. steel frame, timber frame, external walls, windows, roof
- Internal components e.g. walls, ceilings, floors, doors
Did Building Components Perform as Expected / Required

- Fire-rated plasterboard – 30 mins/60 mins fire resistance
- Fire doors – 30 mins/+ fire resistance, door closers
- Fire stopping – intumescent seals, pipe sleeving, dampers

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Good Fire Investigation Involves:

- Systematic evidence gathering
- An analytical approach
- Understanding fire behaviour
- Analysing data using Inductive Reasoning
- Developing and testing hypotheses using Deductive Reasoning
- Knowledge of scientific processes
Building Regulations Aim: Prevent Loss of Life

- Focus on escape

**BUT**

- High rise buildings and other complex buildings such as hospitals focus on “stay put”

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Building Regulations (Northern Ireland) 2012 Part E Fire safety

• Technical Booklet E – Fire Safety

• Purpose is to provide practical guidance with respect to technical requirements of Building Regulations (Northern Ireland) 2012

• A range of information on Fire Safety is presented including sections on testing of materials used for external surfaces, outer cladding, insulation and cavity barriers
External fire spread

36. The external walls and roof of a building shall be so designed and constructed that they afford adequate resistance to the spread of fire over them, and from one building to another, with regard to-

(a) In the case of an external wall – the use, position and height of the building: and

(b) In the case of a roof – the use of position of the building
Requirements for external walls – Surface spread of flames – Technical Booklet E

- Set out in Clauses 5.2 to 5.4 and Table 5.1
Requirements for External Walls / Cladding Systems

External Surfaces, Cladding Systems, Insulation Material, Cavity Barriers

Elemental method/desktop assessment

Meet performance in Table 5.1

Materials should be:
Class 0 (National)
or Class B – s3, d2 (European)

Fire classification of construction products and building elements Part 1: Classification using data from reaction to fire test

Assessment of overall construction/large scale testing

Meet criteria in Fire Note 9 (BR135) – Testing to BS 8414 Parts 1&2

Class 0
Composed of material of limited combustibility
or Class 1 material with fire propagation index (I) not more than 12 and sub-index (I1) not more than 6 (Tested under BS 476 Parts 6&7)
A material tested to BS 476 Part 4 and which passes the non-combustibility test, satisfies the Class 0 criteria. Those that do not, require to be tested to BS 476 Part 6 and BS 476 Part 7

Definition
or National classes by reference to BS 476 Part 11

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Latest Legislation Updates

- New Government policy - ban on combustible materials on external walls of high-rise buildings - to cover all existing buildings and those currently under construction
- Applies to England and Wales currently and not Northern Ireland
- Northern Ireland Building Regulations Advisory Committee (NIBRAC) is in the early stages of reforming – will take time for new rules to filter through given the current political situation in NI

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Some Issues Arising

Compliance with Building Regulations does not guarantee life safety

- Fire tests have not kept pace with materials e.g.
  - BS476 Parts 6 and 7 which are cornerstone of testing to Class 0 classification do not adequately test rain screens with plastic cores.
  - Intumescent fire barriers do not react quickly enough to stop spread of fire up a rain screen cavity
Solutions

Minimum:

- Integrated detection and warning systems. Fire in more than two compartments triggers evacuation
- Install sprinklers

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Case Study – Inadequate Compartmentation

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Case Study – Inadequate Compartmentation

Void at the apex of the compartment wall between two properties

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Case Study – Inadequate Compartmentation

Fire Spread – 15:18

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Case Study – Inadequate Compartmentation

Fire Spread – 15:33

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Case Study – Millfield Manor, Co. Kildare

Technical Excellence : Rapid Response
Case Study – Millfield Manor, Co. Kildare

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Case Study – Renovation

Technical Excellence: Rapid Response
Case Study – Renovation

Stairwell

Apartment 64

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Case Study – Warehouse

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Case Study – Warehouse

Steel faced sandwich panels with polystyrene insulation

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Summary

• Review of Building Regulations and testing of materials
• Essential to ensure they are appropriate to the materials in use in our buildings
• Ensure responsibility on all parties involved at all stage of building design, construction and use
• Implementation of measures that we know make a difference
Investigation of Fires and Explosions

Domestic
Residential
Commercial
Industrial
Vehicles

Marine
Rail
Air
Plant
Machinery

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Fire risk assessment
- Offshore and petrochem
- Industrial
- Power
- Commercial: shopping centres
- Prisons

Training

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IFIC's Distinctives

- Concentrated pool of fire engineering knowledge
- 25 year track record of winning cases
- Investigation and reports tailored to client needs
- Fee levels match client requirements
- Strict cost control
- Only fire investigators to have ISO 9001
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