

"Fire Load: Single parameter of key influence on heat flux to building façade"



A simple *Law* governs heat flux to façade

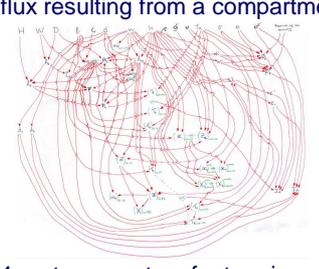
C. ABECASSIS-EMPIS & J. L. TORERO

BRE Centre for Fire Safety Engineering

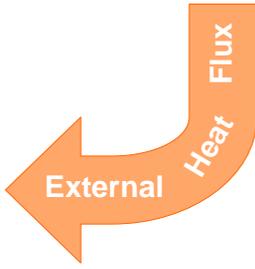
Initial Experimental Research into Fundamentals
 Several experimental programs researching the Fundamentals of Compartment Fire Dynamics identify correlations that still form our key knowledge base
(conducted by Fujita, Yokoi, Kawagoe, Webster, Seigel, Thomas, CIB Test Consortium, etc.)

1950s
1960s

The Law Model
 Several correlations linked to determine external heat flux resulting from a compartment fire



Over 14 root parameters feature in model with complex parameter interrelation. Methodology still in use today (Eurocodes 1 & 3, etc.)



Limitations carried through to further research and tools developed

(related to size, fuel type, fuel distribution, aspect ratio, range of ventilation factors)

1970s

Dalmarnock Fire Test One



DFT1: A realistic modern day compartment scenario fire, comprehensively instrumented to enable thorough characterisation of compartment fire. External heat flux distribution to façade in good agreement with Law Model but not conservative as expected for design.

2006

Several inherent limitations of Law Model identified

Law Model is laborious and requires clear limits of applicability to avoid misuse

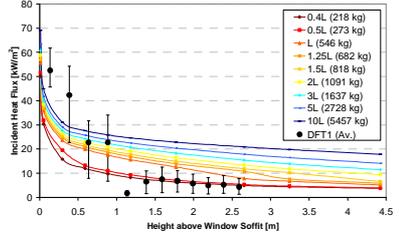
Sensitivity Study

21st C Scenario

Benchmark Scenario

Identifying Important Parameters

A computational implementation of Law Model (*FirExHeat*), adapted to determine heat flux to a façade, enables thorough parameter sensitivity study. Using DFT1 as a benchmark scenario, all model input parameters are varied independently to determine their influence on the resultant distribution of heat flux to building façade.

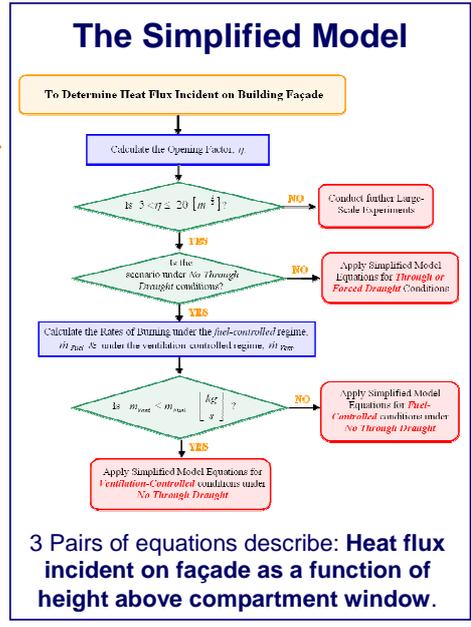


The **Fire Load** is found to be the single parameter of key influence on resultant heat flux to façade, dwarfing the relative effect of other parameters.

Propose

New Model

Easy use and imposes clear limits of applicability



2010

It is **imperative** that we further investigate the **fundamentals of compartment fire dynamics** to determine governing correlations for scenarios **out with the limits of applicability** of the Law Model, in order to ensure our knowledge and tools are **adequate** for most **21st Century compartment scenarios** (open plan, atria, etc.).

Today