2ND INTERNATIONAL SYMPOSIUM K-FORCE 2019

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COMPARTMENT FIRE MODELLING USING ZONE AND PARAMETRIC FIRE MODELS

INTRODUCTION

Fire is defined as the uncontrolled combustion which puts in danger materials, the environment and especially the health and the lives of people. Its severity si affected by different factors such as: characteristic of the space where the fire initiates, available combustion material and the ventilation conditions.The starting location and growth of fire depend on so many parameters that is imposible to certainly predict the fire-development.In order to get essential data for structural fire design, different fire models are used, that rely on differnt strategy to predict fire development in defined enclosures.

Two fire models, parametric fire curves and zone model, will be described and compared while defining the fire development in different compartments.

Methodology

- **Parametric Fire Curves**

Parametric fire models consider differnt environmental conditions, such as the thermal properties at the boudaries of the fire compartment, the total amount of fuel or cumbustibile material and ventilation conditions, which affect the fire development. Parametric fire curves as described in Eurocode Annex A are defined as a set of temeperature-time curves depending on various fire loads and opening factors (0.02-0.2).

- **Zone Model**

Advanced models like zone model are based on mass and energy balance equations. In zone model it is assumed that in the whole compartment, conditions like gas temperature, gas density, pressure and energy are uniform. In this case the OZone software was used to obtain the data.

Case Study

The fire development in five different compartments in a residential building was analysed under the assumption of both parametric fire curves based on Annex A and E of Eurocodes and zone model by using Ozone software. Every compartment was different in area and opening factor (Table-1). All enclosure were assumed to be rectangular in shape and only the outer walls with specified layers.

Table 1- Compartments details

Compartment	Floor area (m^2)	Opening factor ($m^{1/2}$)
3Ga-2	22.72	0.095
3Gb-2	30.77	0.076
3Da-2	56.66	0.096
3Ti-2	102.31	0.078
3C-2	120.15	0.078

Results

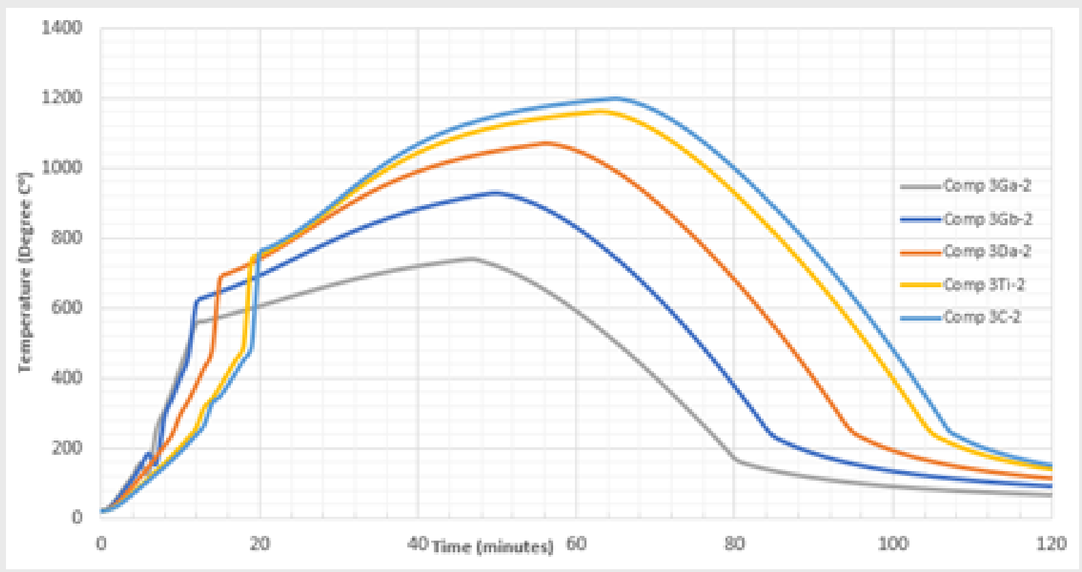

Figure-1 Temperature-time curves for zone model

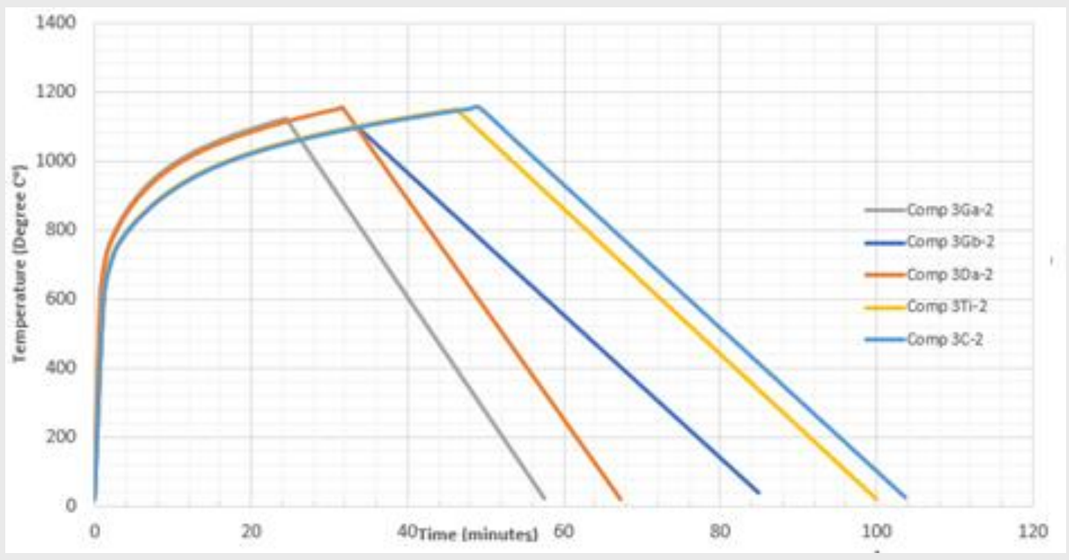

Figure-2 Temperature-time curves for parametric fire model

Conclusions

- In both cases the rate at which the fire developed and decayed was similar, they follow a similar slope. The duration of fire was similar in most of the cases for both procedures.
- In the parametric fire curves, the compartment fires usually reached a maximum temperature in the range from 1100 to 1200°C, no matter the size of the enclosure, while in the zone model, the maximum temperature increases constantly from 650 to 1200°C as the area of the compartment increases. Since the parametric

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