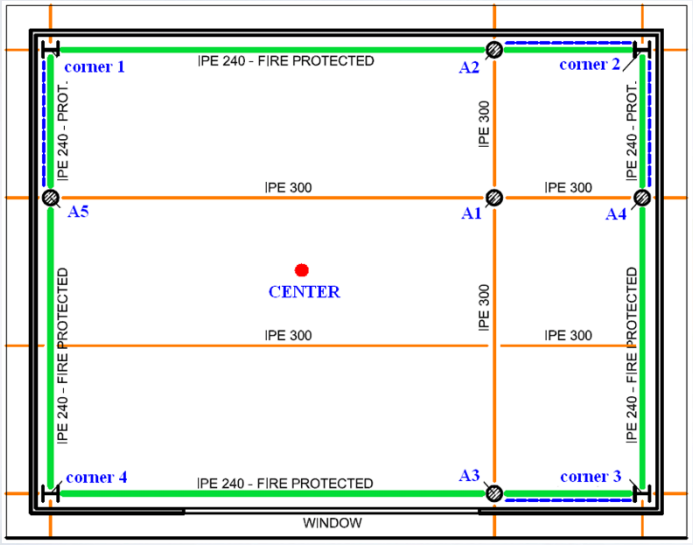
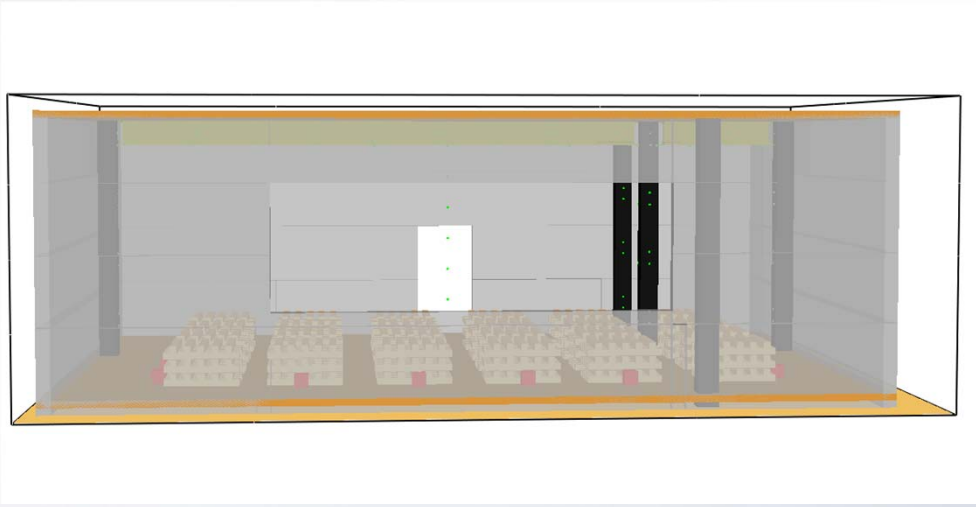
Prediction of temperature variation in an experimental building

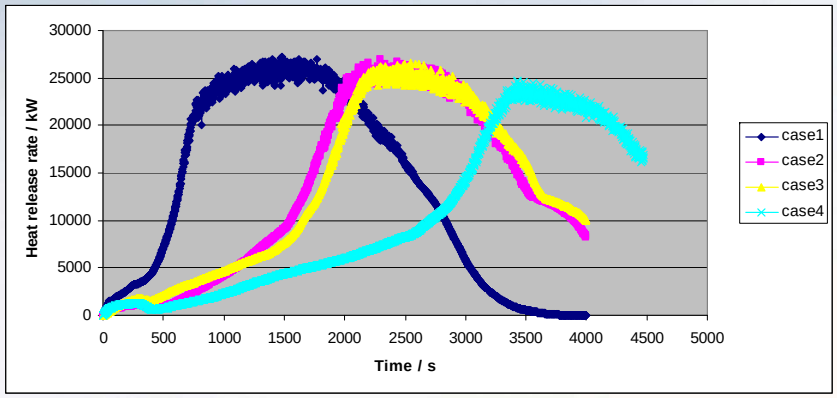


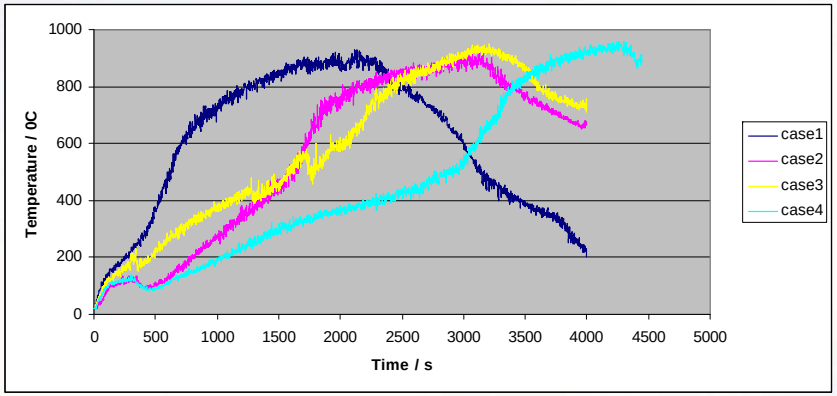


FDS simulation purpose:

- Investigate the effect of ignition source on fire development
- Predict the temperature variation of structural components during fire

Heat release rate and hot smoke temperature





$$Q_{peak} \approx 1500 A_0 \sqrt{H_0} = 1500 \times 14 \times \sqrt{2} kW \approx 29674 kW = 29.67 MW$$

$$\Delta T = 6.85 \left(\frac{Q^2}{A\sqrt{H}\, h_k A_T} \right)^{1/3} = 6.85 \times \left(\frac{29674^2}{14 \times \sqrt{2} \times 0.041 \times 370} \right)^{1/3} \approx 980 K$$

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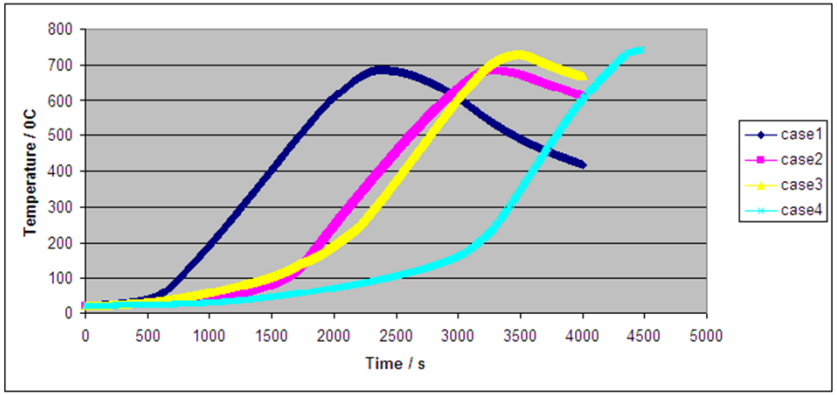
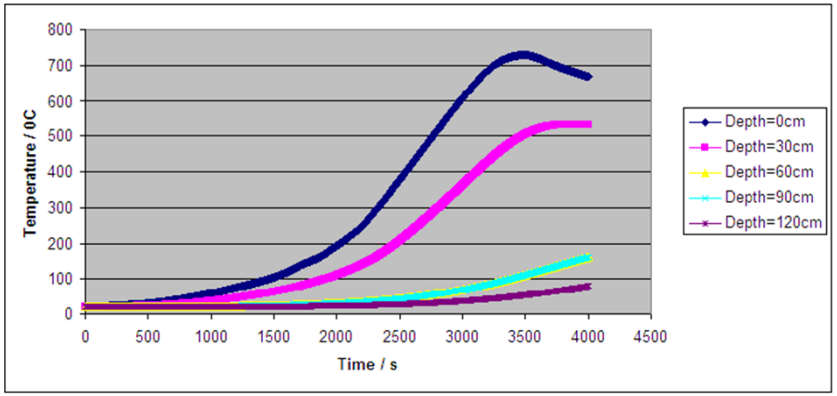
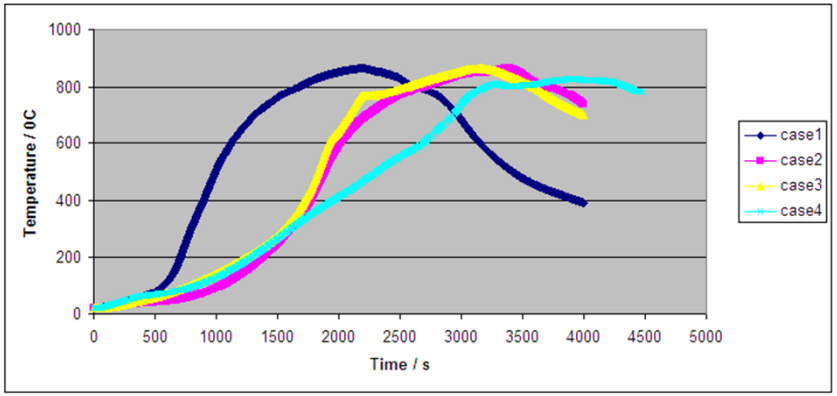
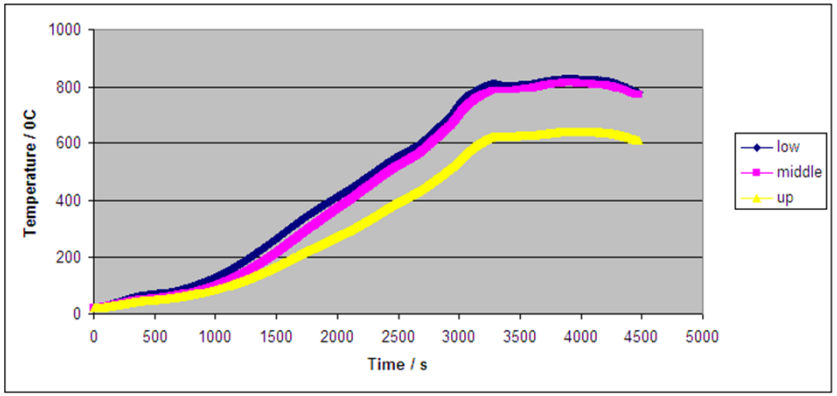
Temperature of column and beam





Column





Beam

Conclusion

- **Fire growth rate is greatly affected by the position of ignition source, but the peak value of HRR is the same.**
- **The highest temperature of the column surface is about 700 ^{o}C. There is a high temperature gradient along the depth near the surface, but low temperature gradient near the kernel.**
- **The temperature of the beam increases rapidly during the fire as well as the hot smoke, and the temperature of the top flange of the beam is obviously lower than the other two parts.**