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FLAMMA

Fire Scenario analysis with FDS,
Vulcan and Smartmove

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Team introduction

Guan Quan



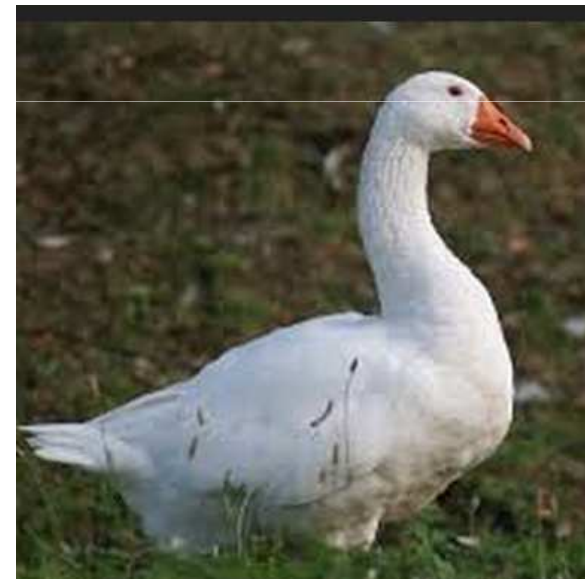
Laszlo Szabo



Daphne Pantousa

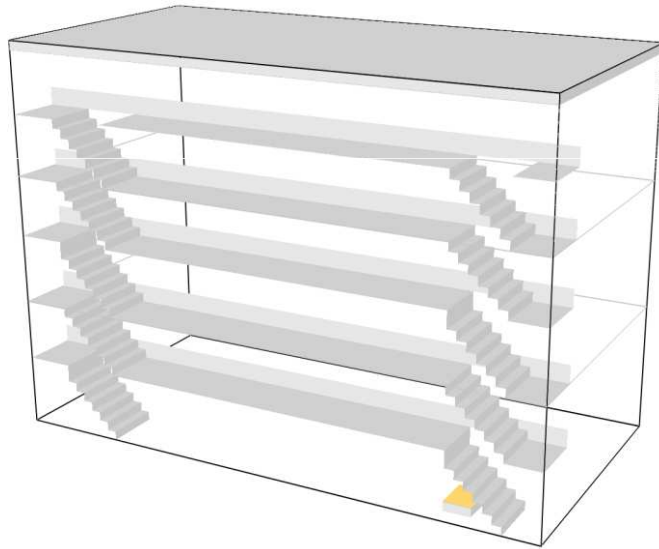


Kamila Horova

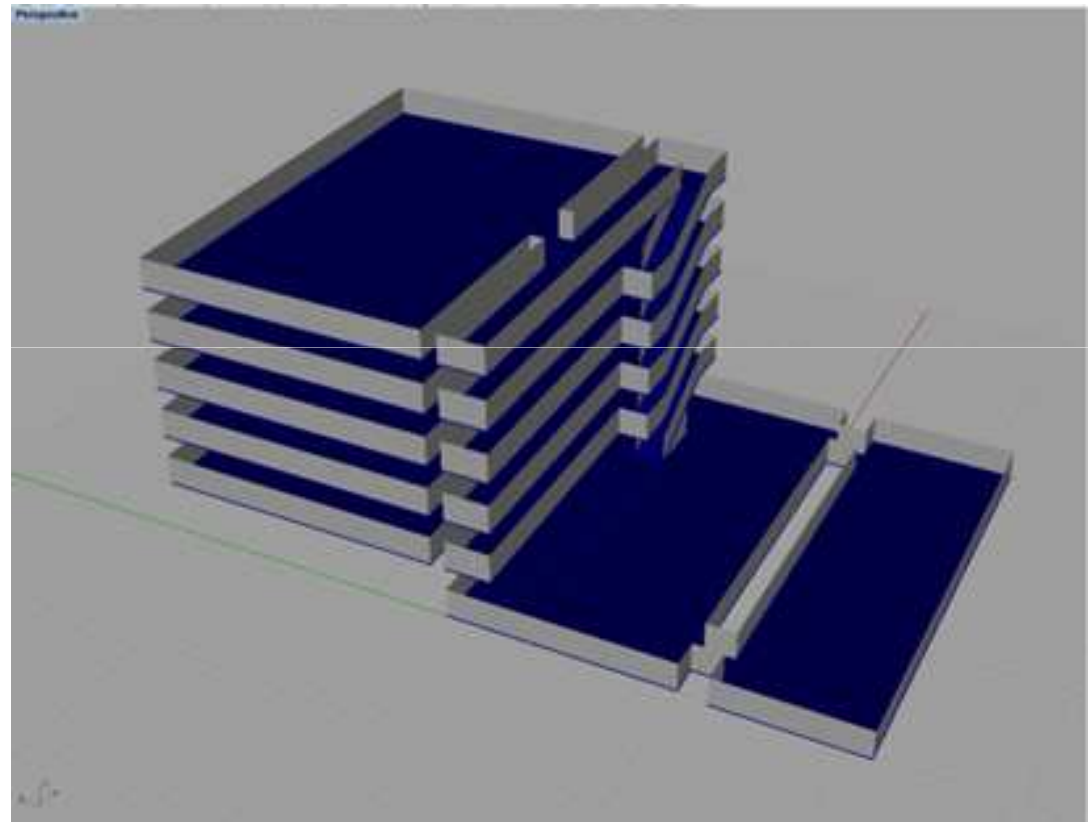




Scenario Introduction

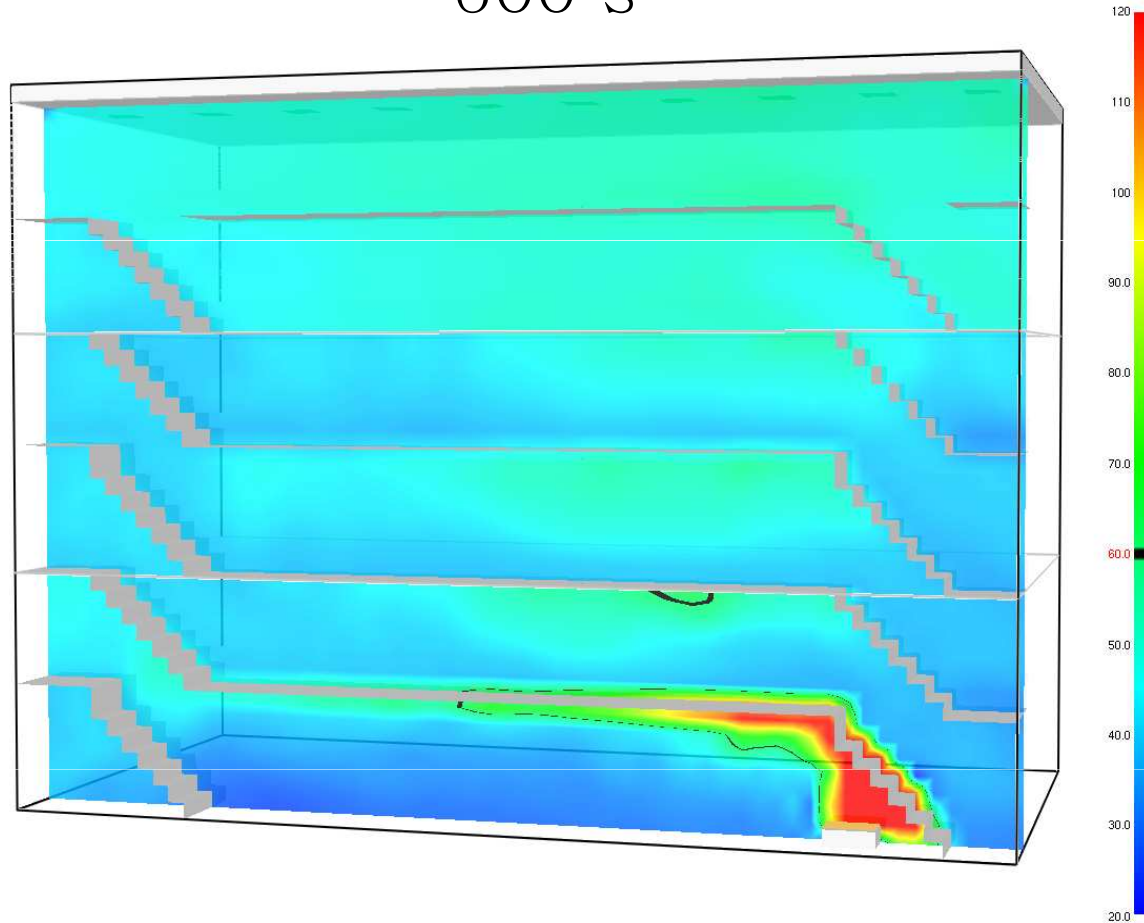


- Single stair
- Fire comes from the balcony
- One exit is blocked





600 s



- 60 degrees – people can still breathe
- A problem can only appear at the first floor below the ceiling

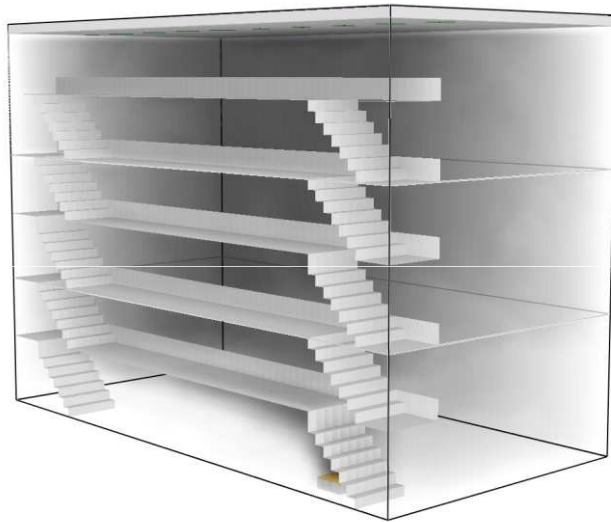


Fig 1. Smoke simulation

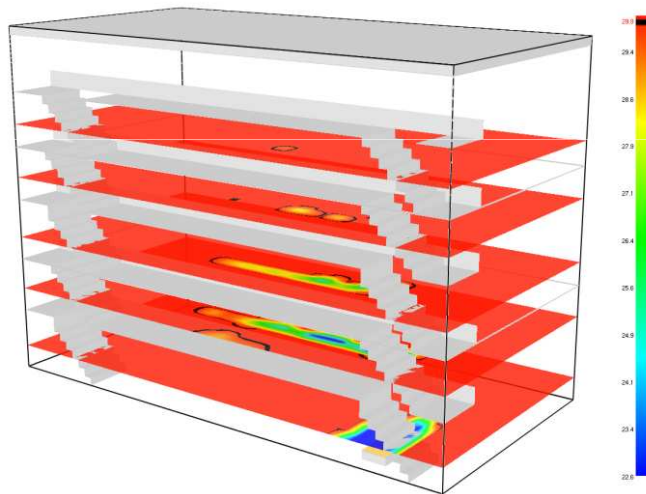


Fig 2. Visibility in 440th sec

- 30 meters is the limitation of visibility for people.
- From Fig 2, in the 440th sec, visibility started to be beyond this limitation at the balcony on the first floor.



After 500th second, the visibility is below 30 meters in all the escape routes (balcony).

At the end of simulation time, visibility is lower than limit in all the floors except for the ground floor.

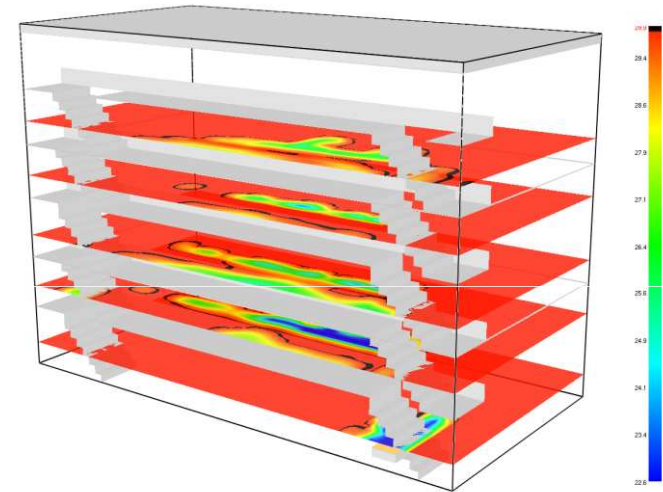


Fig 3. Visibility in 500th sec

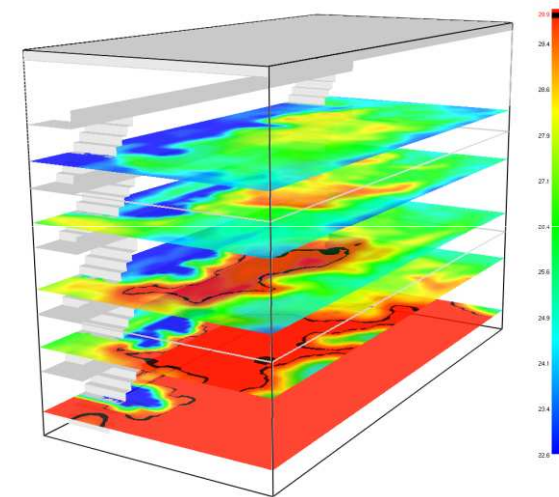
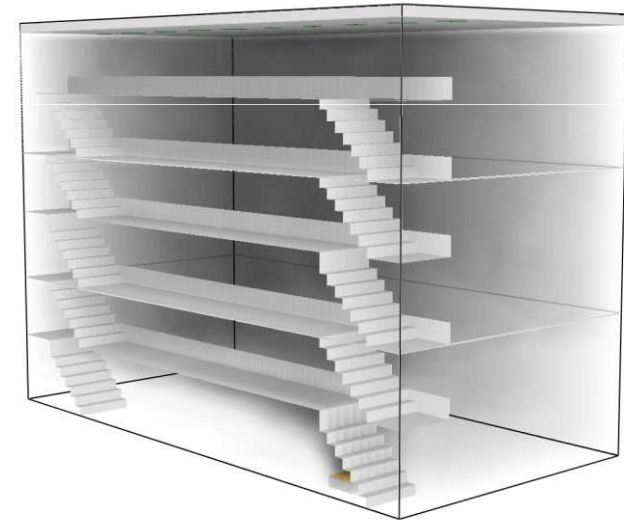
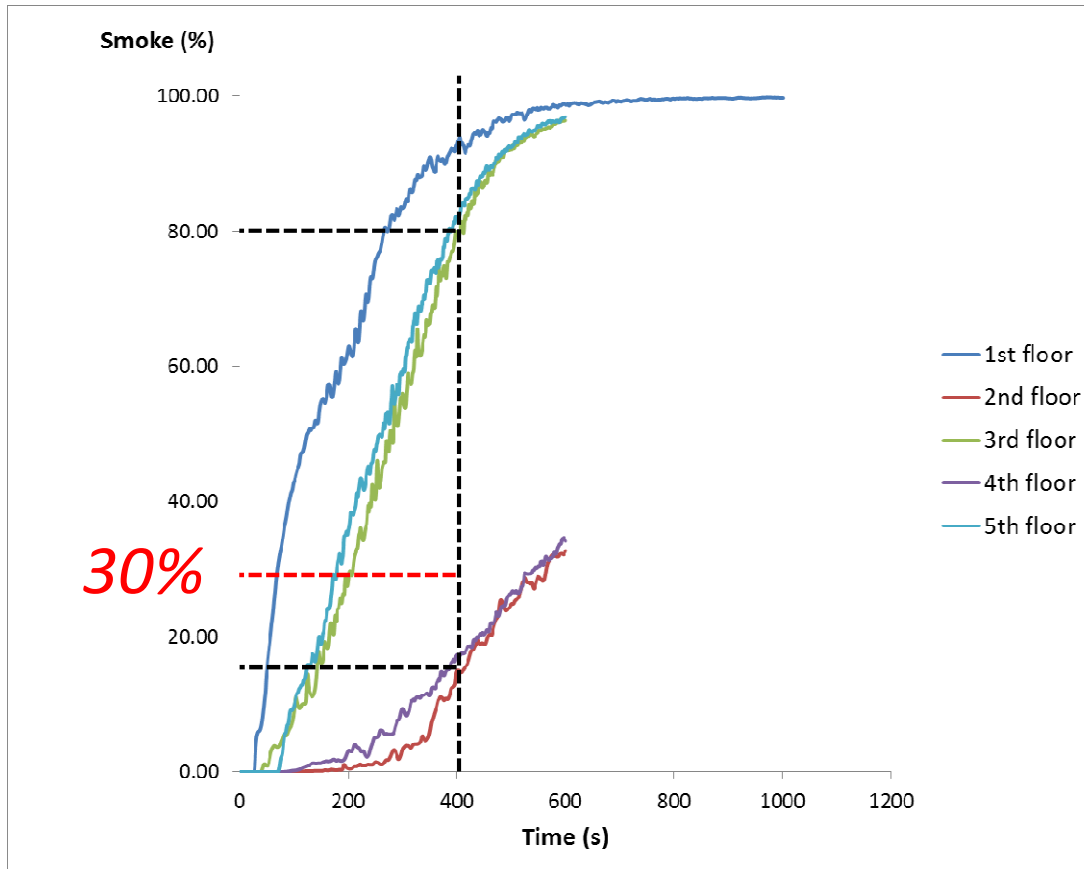
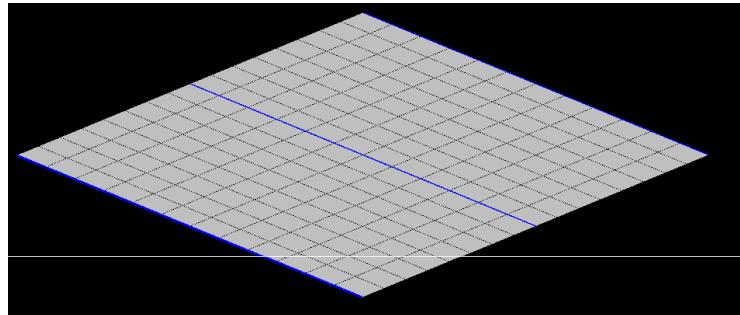


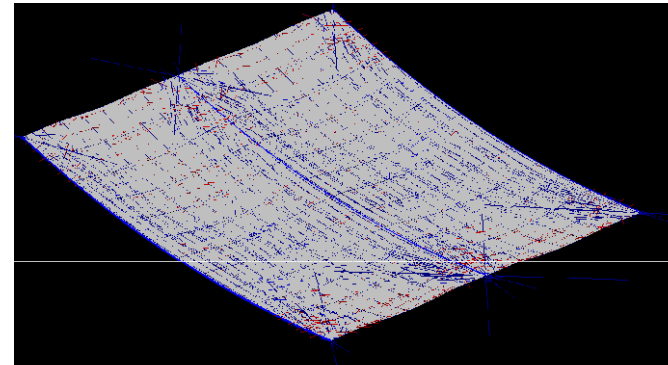
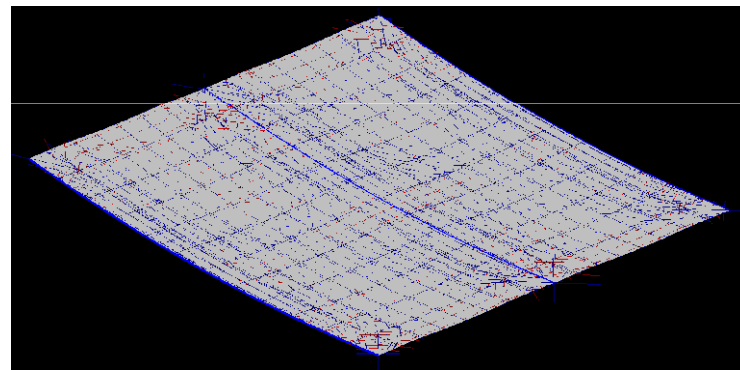
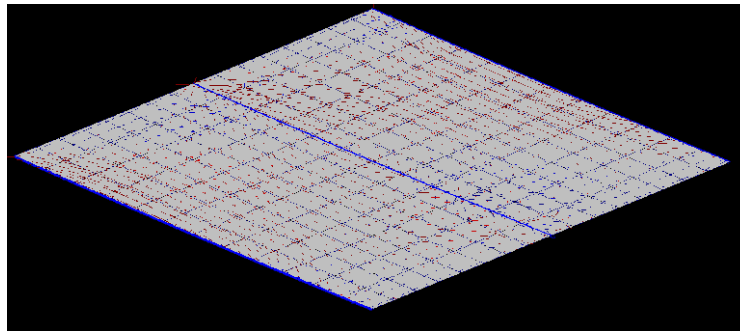
Fig 4. Visibility in 600th sec



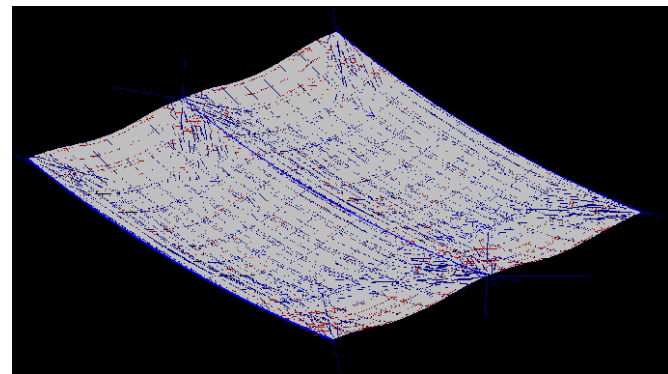
- People can stay when the smoke is below 30%
- There is a certain time span that people can stay in the smoke. However, for conservative simulation, no time is permitted.



0 min

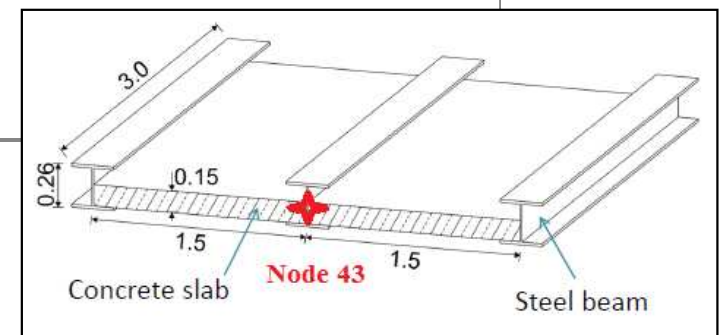
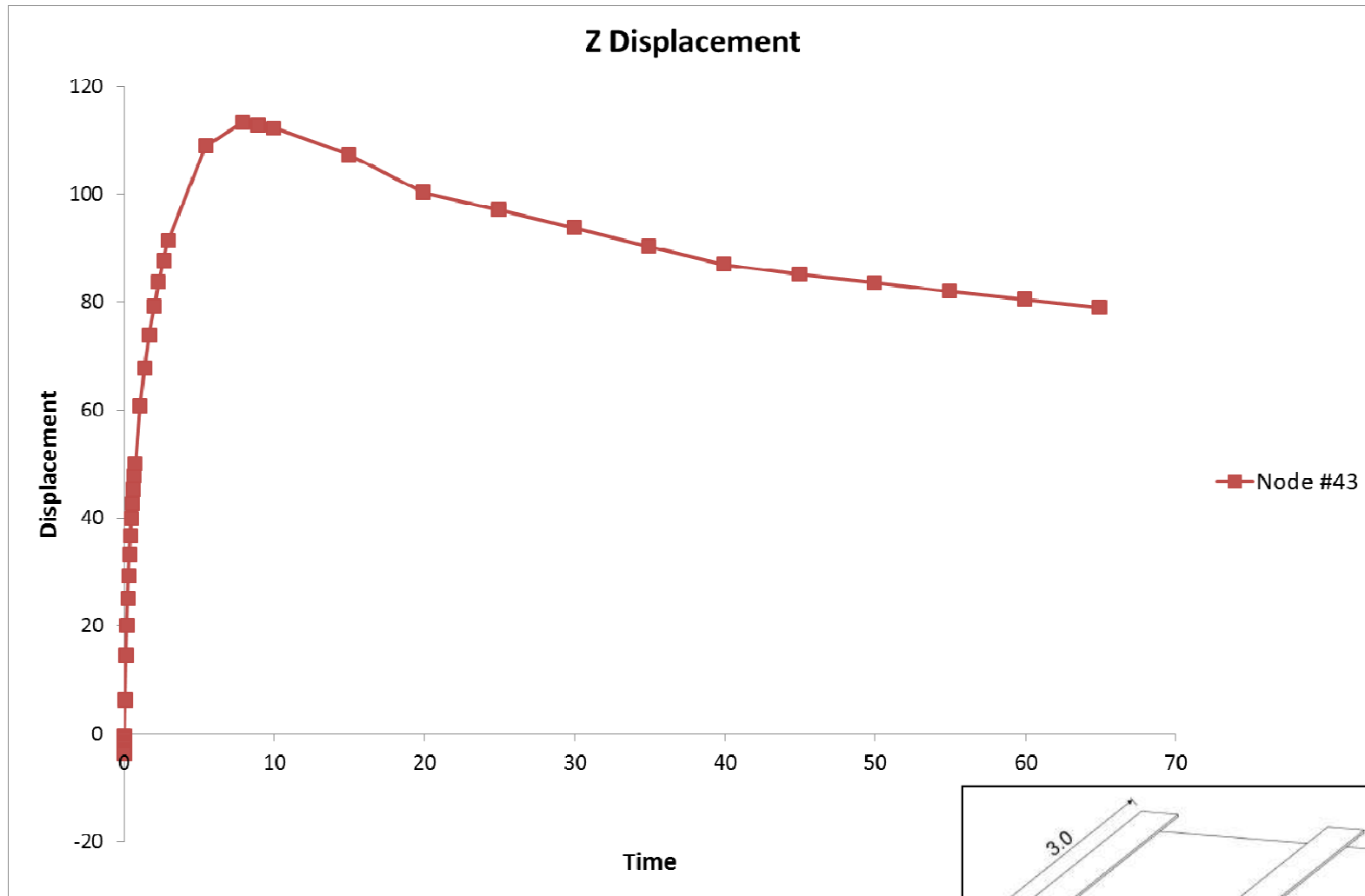


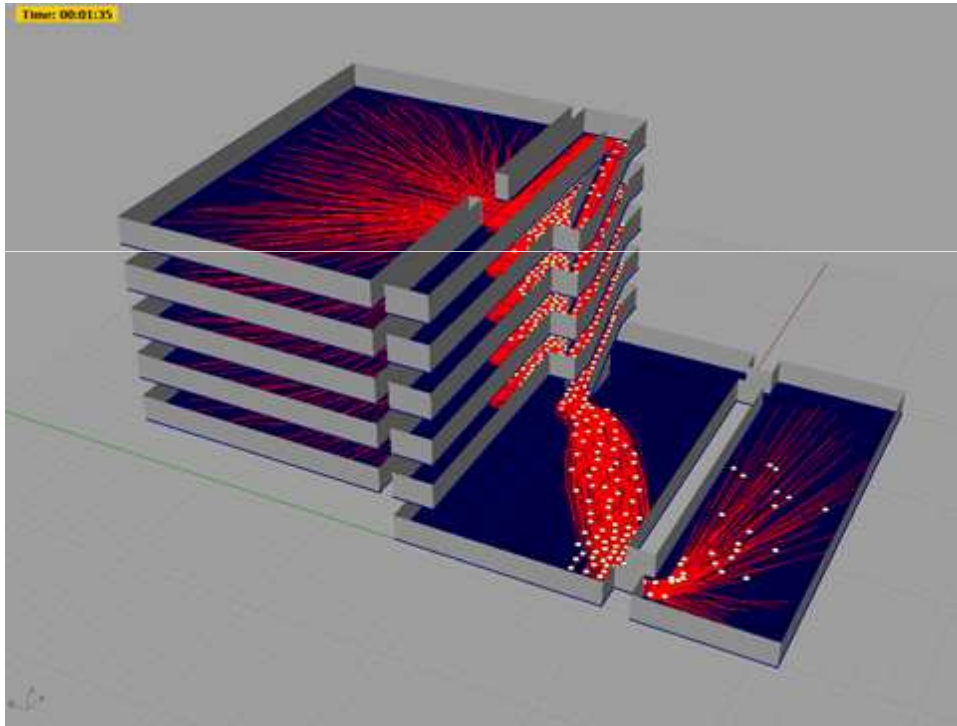
60 min



Structure

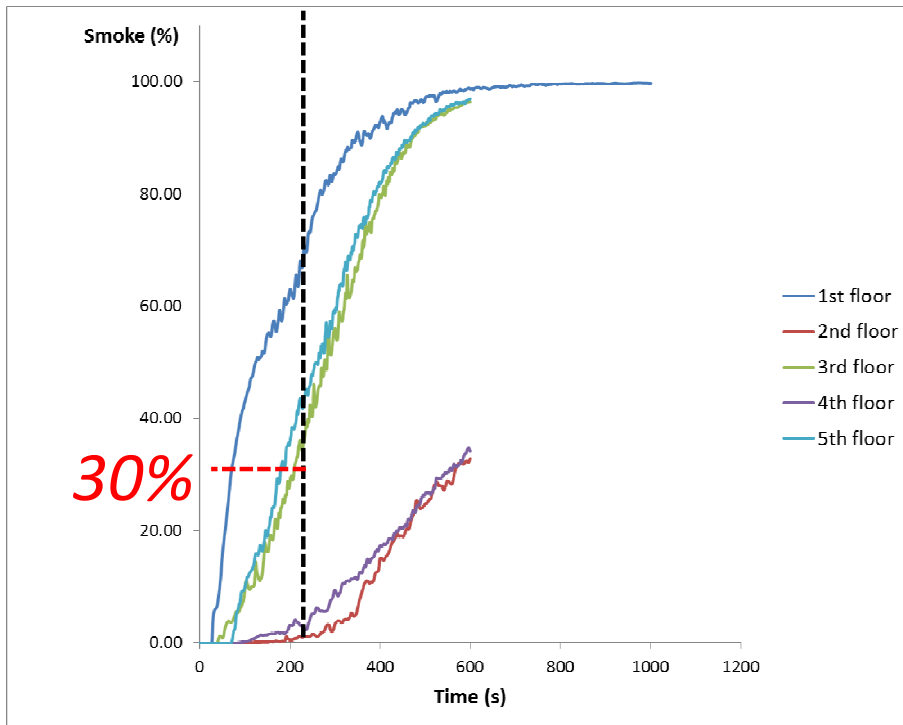
- 3m cantilever supported by 3 beams HEB 260, steel 275, concrete 150mm, C25/30
- Loaded by 10.75 kN/m² and ISO fire curve
- Development of deformation in time
- membrane forces are highlighted





Evacuation	Time
5 th Floor	1.66 min
4 th Floor	1.99 min
3 th Floor	2.65 min
2 rd Floor	3.66 min
1 st Floor	5.33 min
Leave the building	5.73 min
Leave the front gate	6.39 min

Comparison and conclusion

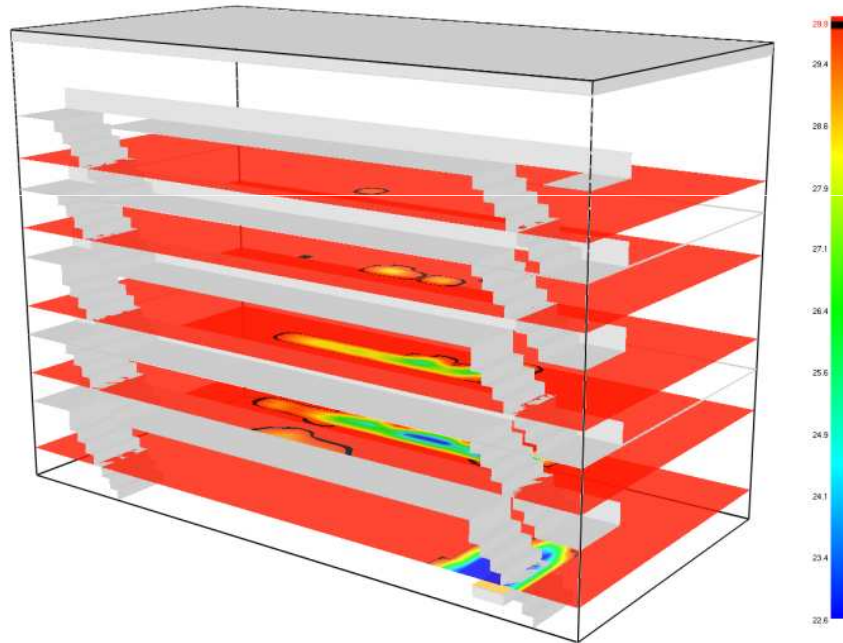


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- Comparing to concentration of smoke, people can escape from above the 3rd floor.



Comparison and conclusion



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5 th Floor	1.66 min
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- Comparing to visibility limits, people can escape from all floors.



To allow all people to escape we recommend following:
(we assume that there are smoke and heat detectors)

- Add water mist system (cheaper than sprinkler system)
- Make wider stairs or more stairs
- Protect balconies and stairs by fire resistant glass
- Make forced ventilation system
- Broaden gates
- Put obstacles in front of gates in order to let them move faster



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Thanks for your attention!