FSC

Fire Safe Consultant

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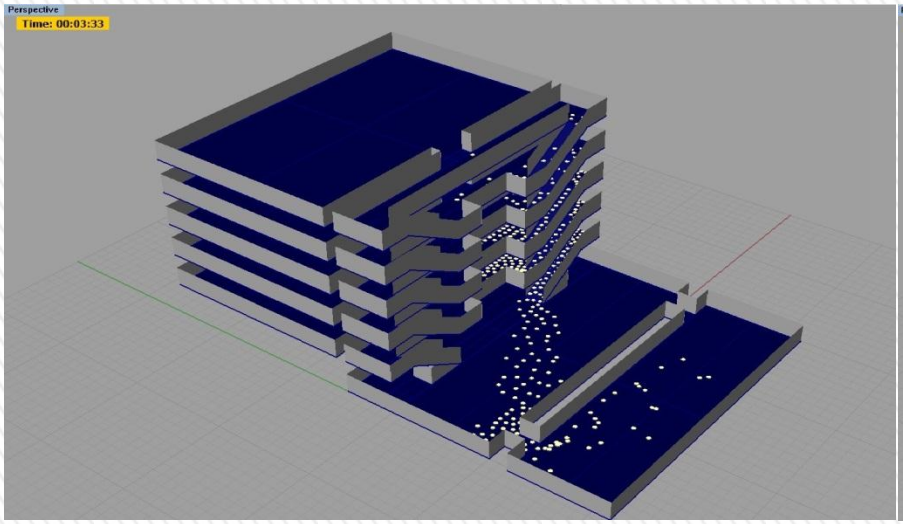
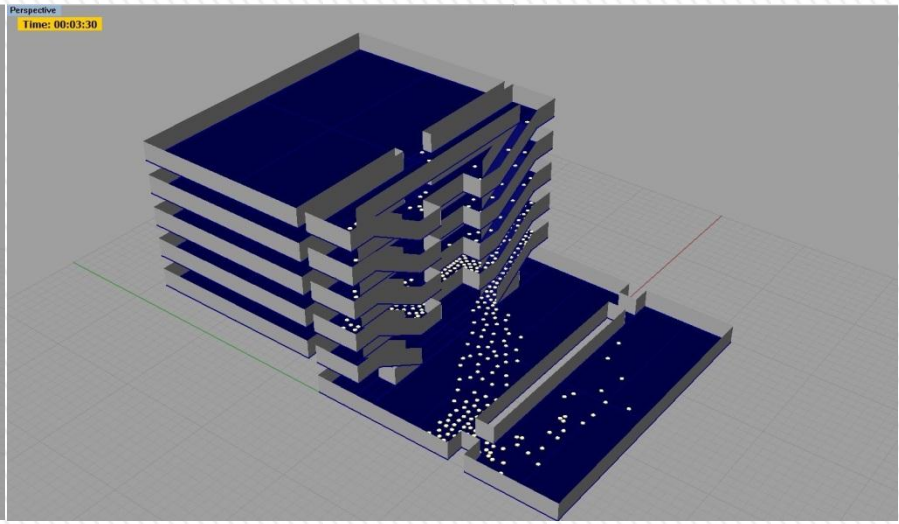
Smart Move

Scenario 1



Scenario 2



Departure rate: 60 person/min

	Scenario 1	Scenario 2
Top floor evac. (min)	3:30	3:30
Second last floor evac. (min)	3:30	3:30
Total evac. (min)	7:15	7:20

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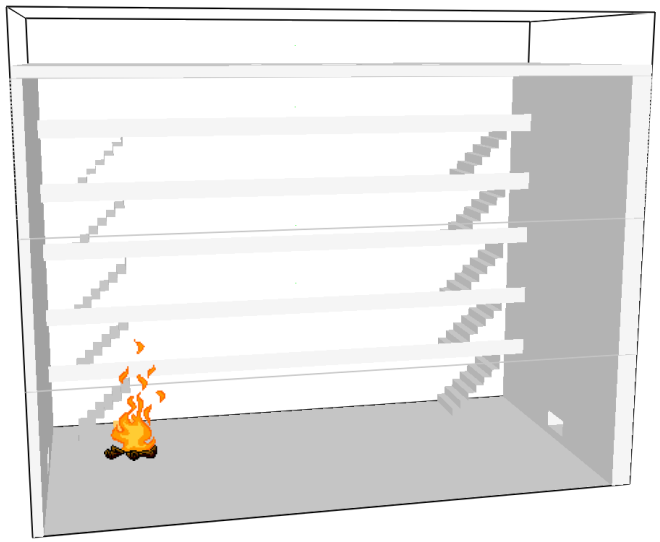
Assumptions:

- Office building
- Fire underneath the balcony
- Medium flow rate [α = 0.0117]
- 30 % smoke spread through the radiation



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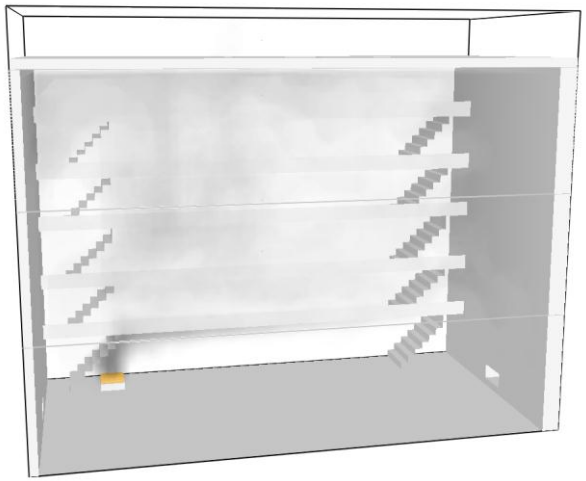
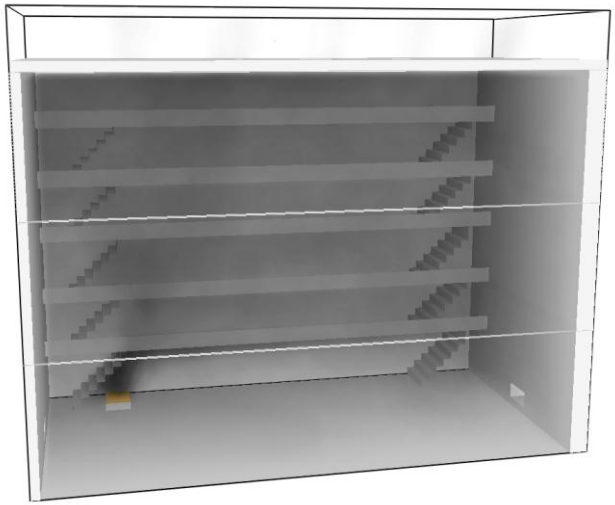
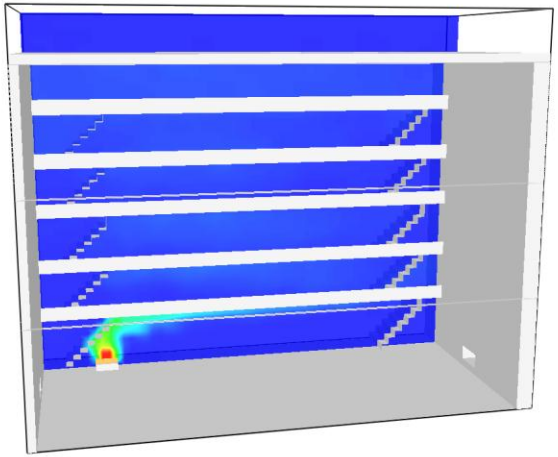
Smoke after 3:30 mins



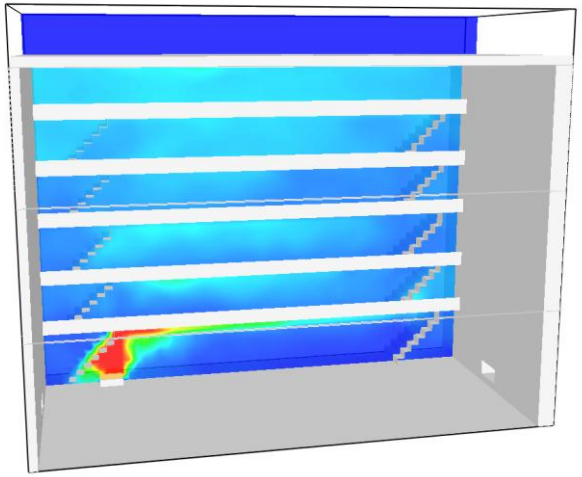
Smoke after 7:15 mins



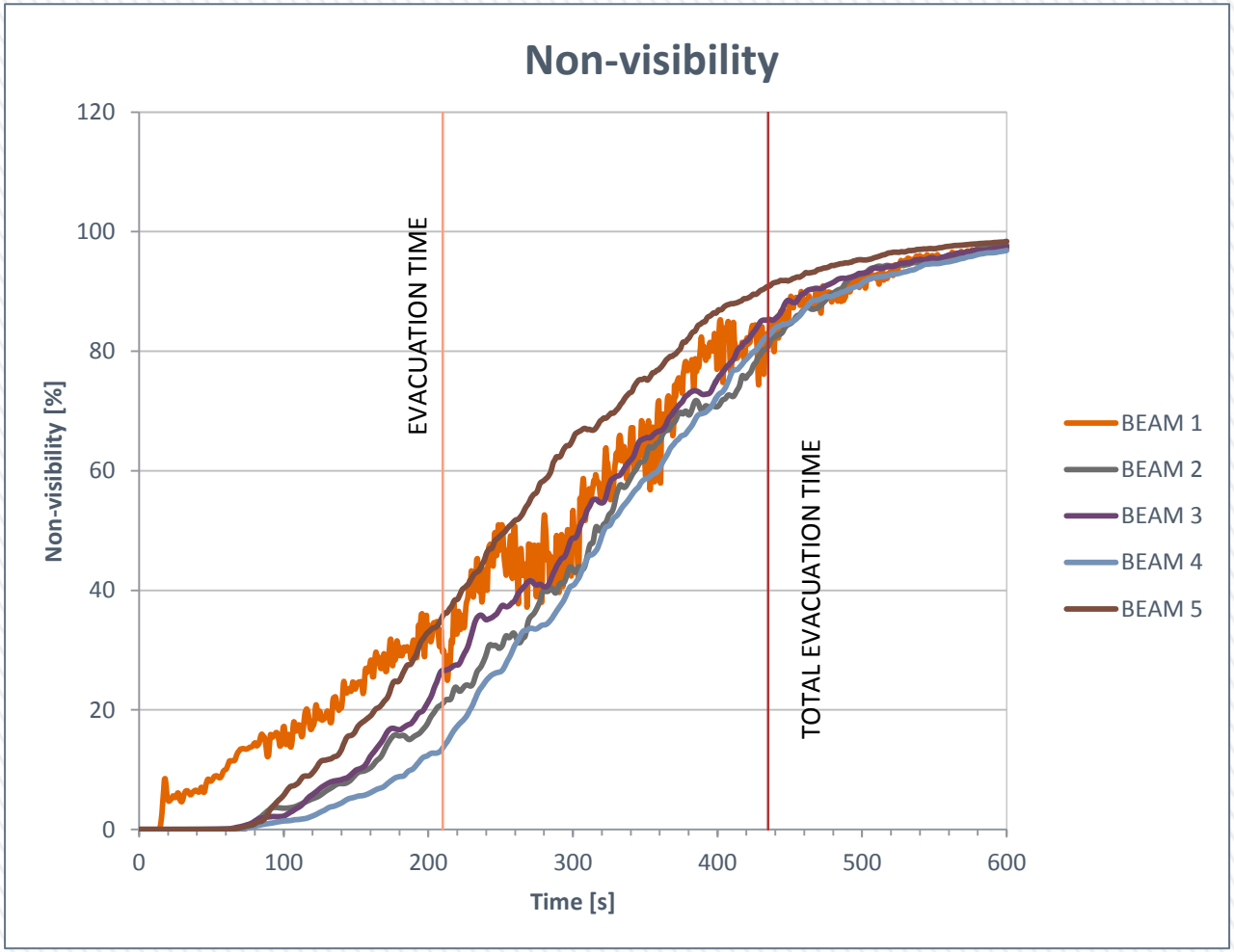
Temperature after 3:30 mins



Temperature after 7:15 mins

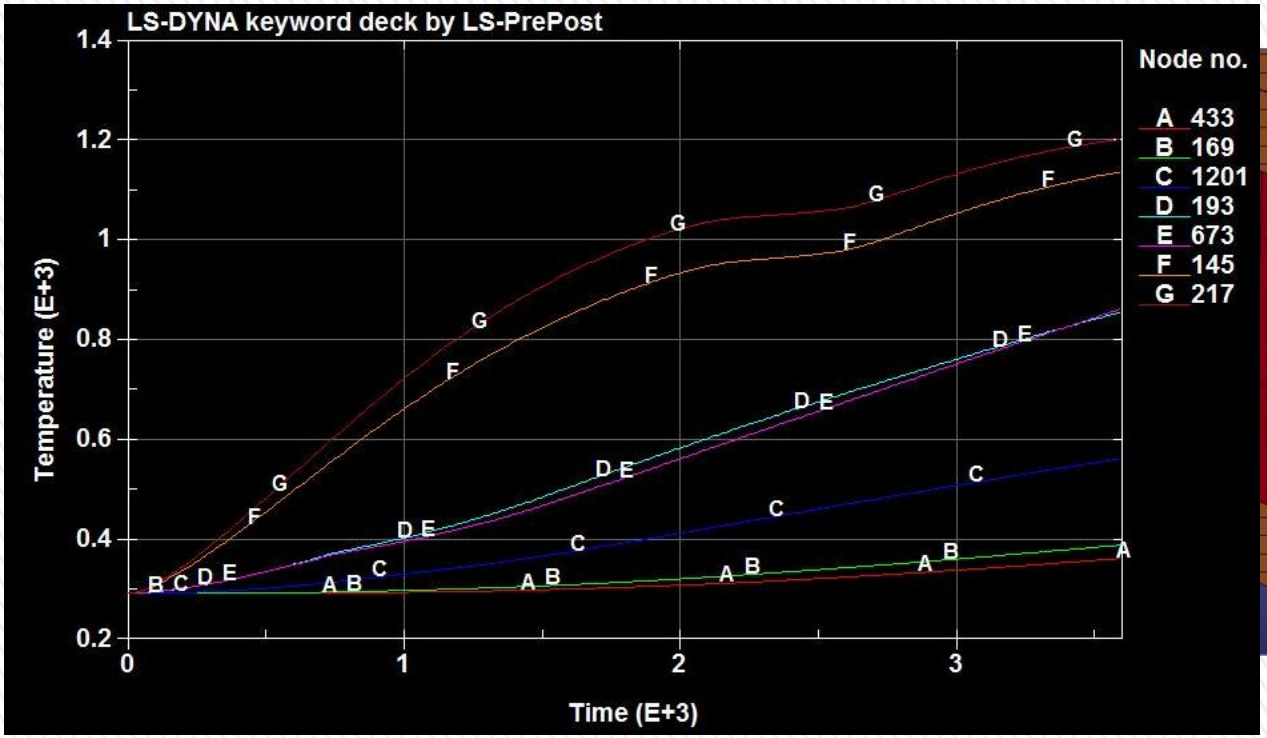


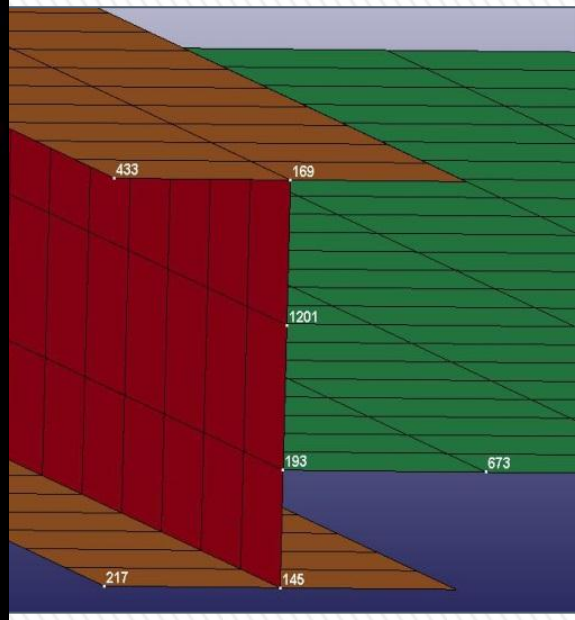
FDS


Non-visibility
120
100
80
60
40
20
0
Non-visibility [%]
0
100
200
300
400
500
600
Time [s]
EVACUATION TIME
TOTAL EVACUATION TIME
BEAM 1
BEAM 2
BEAM 3
BEAM 4
BEAM 5

LS-DYNA

Temperature-time curves:



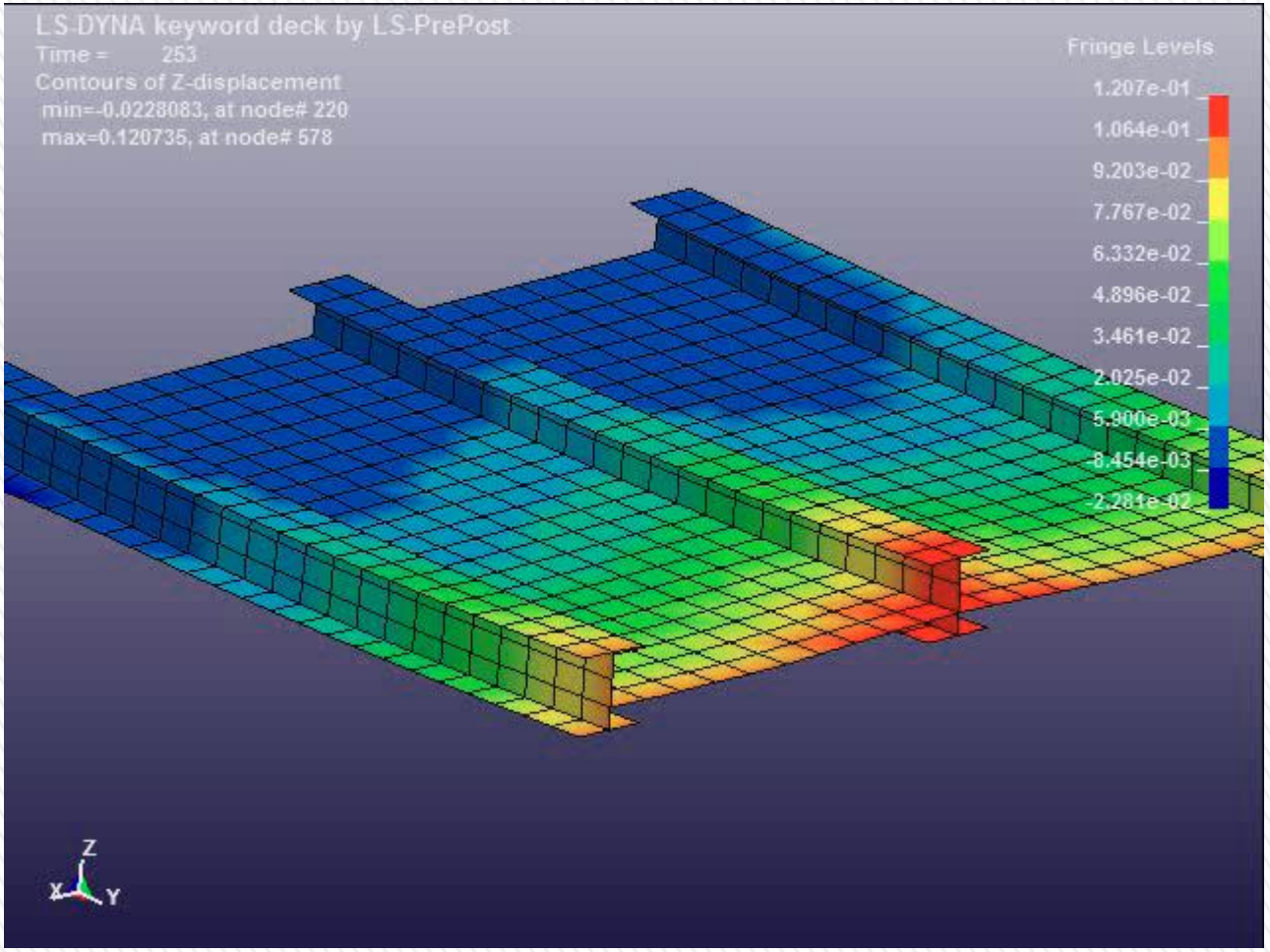


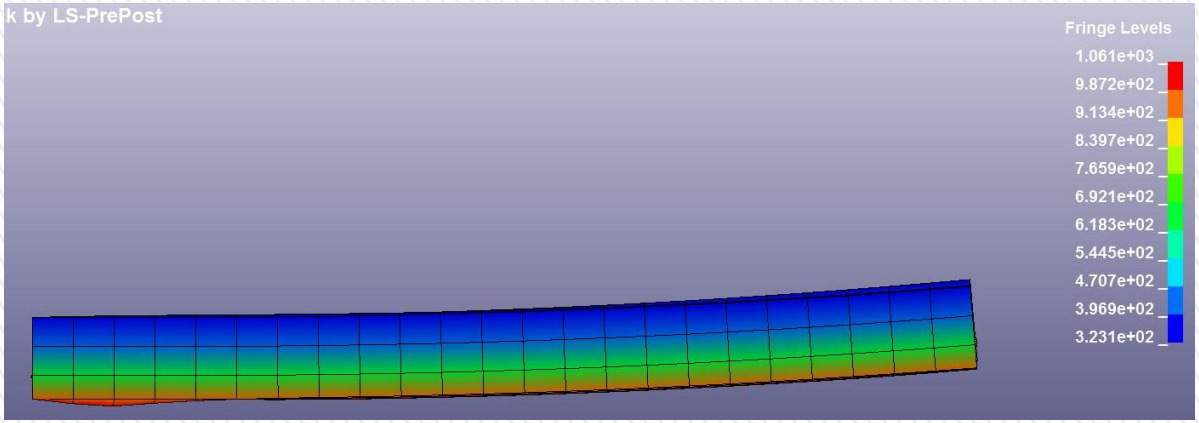
LS-DYNA

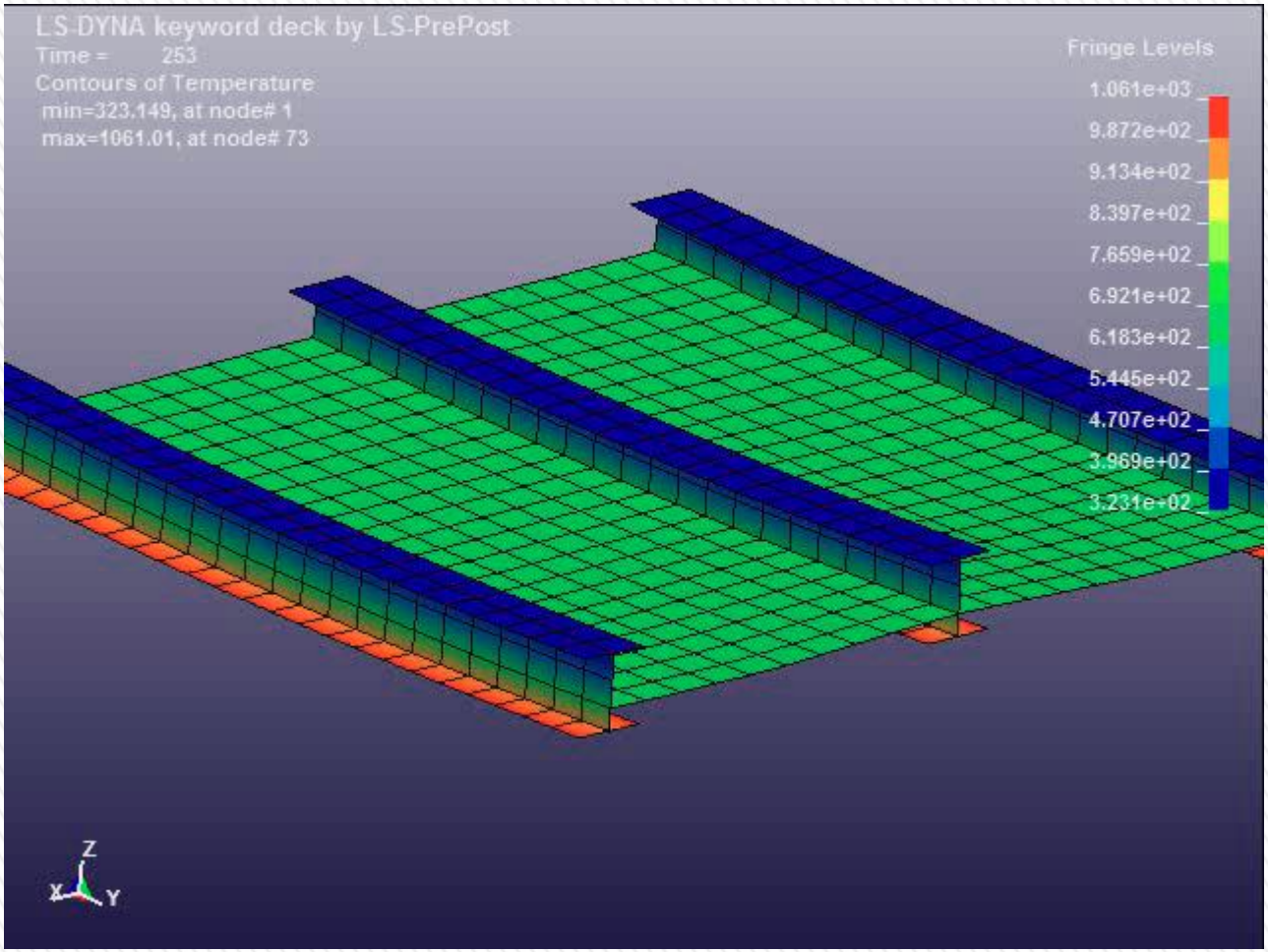
Assumptions:

- ISO fire curve
- Bottom expsoure of the balconey
- Steel beam weight 93 kg/m
- Concrete slab density 25 kN/m^3
- Dead load 2 kN/m^2
- Live load 5 kN/m^2

Heat transfer Analysis→temperature-time curves→coupled temperature-disp model


LS-DYNA keyword deck by LS-PrePost
Time = 253
Contours of Z-displacement
min=-0.0228083, at node# 220
max=0.120735, at node# 578
Fringe Levels
1.207e-01
1.064e-01
9.203e-02
7.767e-02
6.332e-02
4.896e-02
3.461e-02
2.025e-02
5.900e-03
-8.454e-03
-2.281e-02
Z
X
Y


k by LS-PrePost
Fringe Levels
1.061e+03
9.872e+02
9.134e+02
8.397e+02
7.659e+02
6.921e+02
6.183e+02
5.445e+02
4.707e+02
3.969e+02
3.231e+02


LS-DYNA keyword deck by LS-PrePost
Time = 253
Contours of Temperature
min=323.149, at node# 1
max=1061.01, at node# 73
Fringe Levels
1.061e+03
9.872e+02
9.134e+02
8.397e+02
7.659e+02
6.921e+02
6.183e+02
5.445e+02
4.707e+02
3.969e+02
3.231e+02
Z
X
Y

Conclusions:

- Scenario 2 evacuation is more realistic and preferable as it causes less congestion
- Ventalition system is not effective and there has to be mechanical ventilation
- Increasing the hole size that supplies fresh air to the atrium can improve air flow
- The results from LS-DYNA are only upto the time of evacuation of the top floor but the assumption is that the structure will hold itsself before total evacuation

Thank you for your attention!