FIRE BUSTERS

Evaluation of fire scenarios in atrium building

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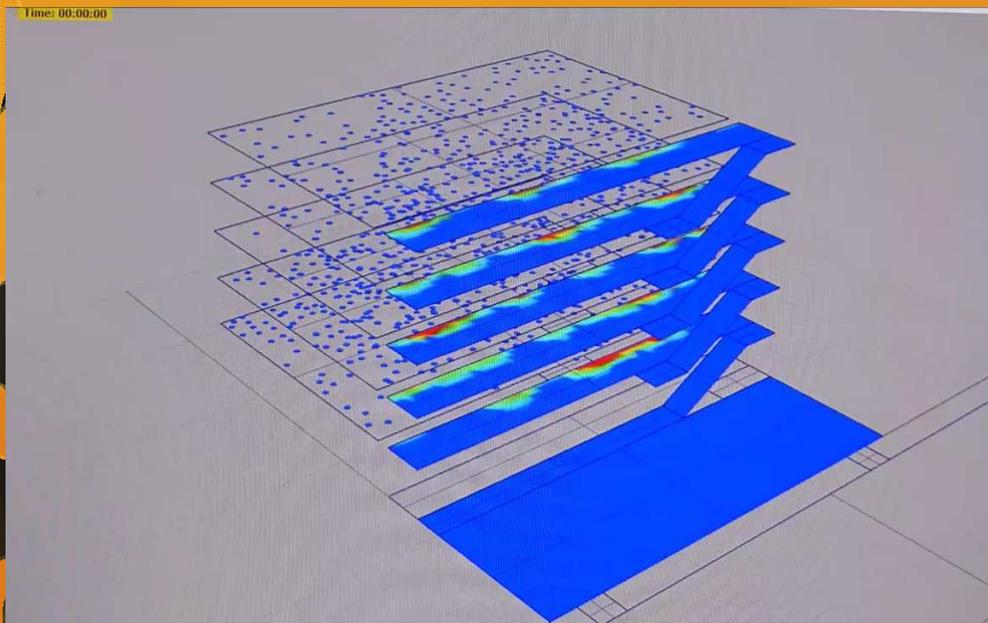
No escape rate

5th floor 1:28

4th floor 2:28

3th floor 3:31

2th floor 4:28

1th floor 5:23

Total evacuation time **6:36**
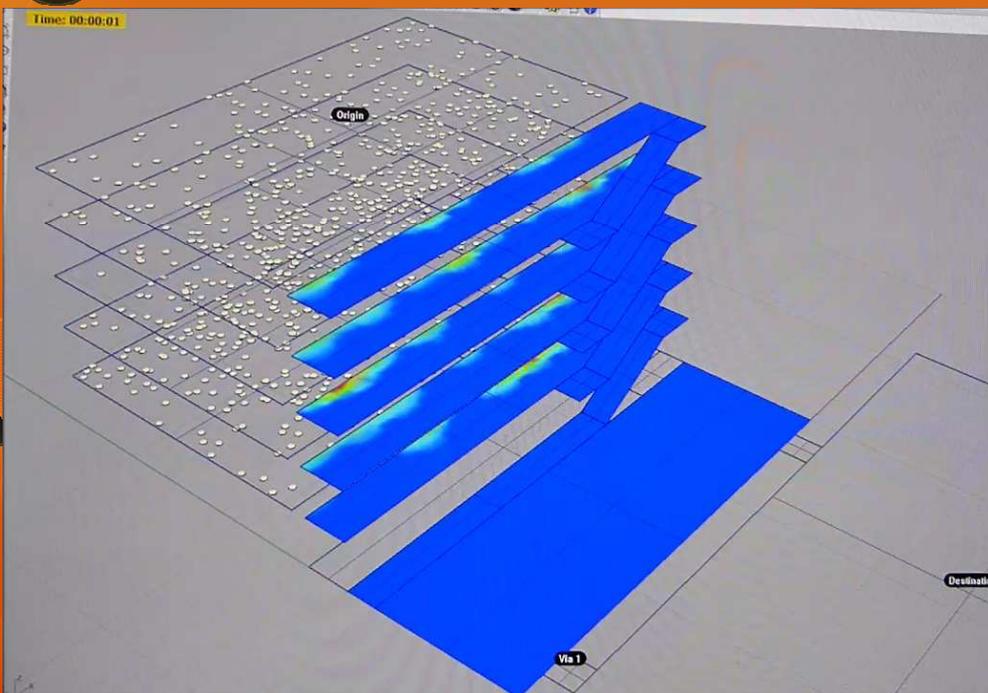
**Escape rate 60p/min**

5th floor 3:48

4th floor 4:11

3th floor 4:34

2th floor 5:23

1th floor 6:21

Total evacuation time **7:16**

STRUCTURE ANALYSIS
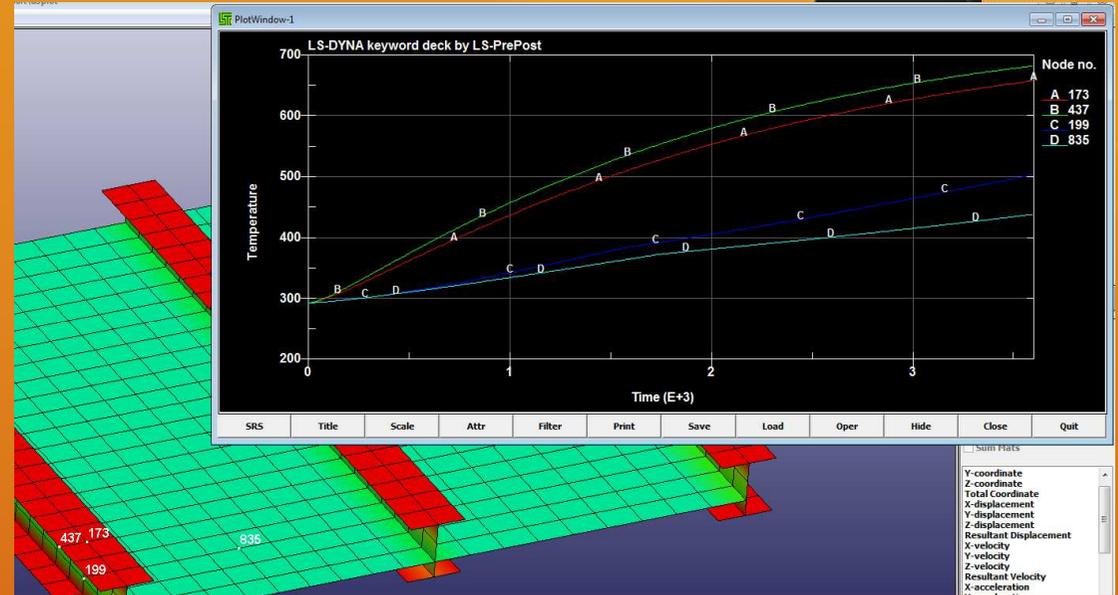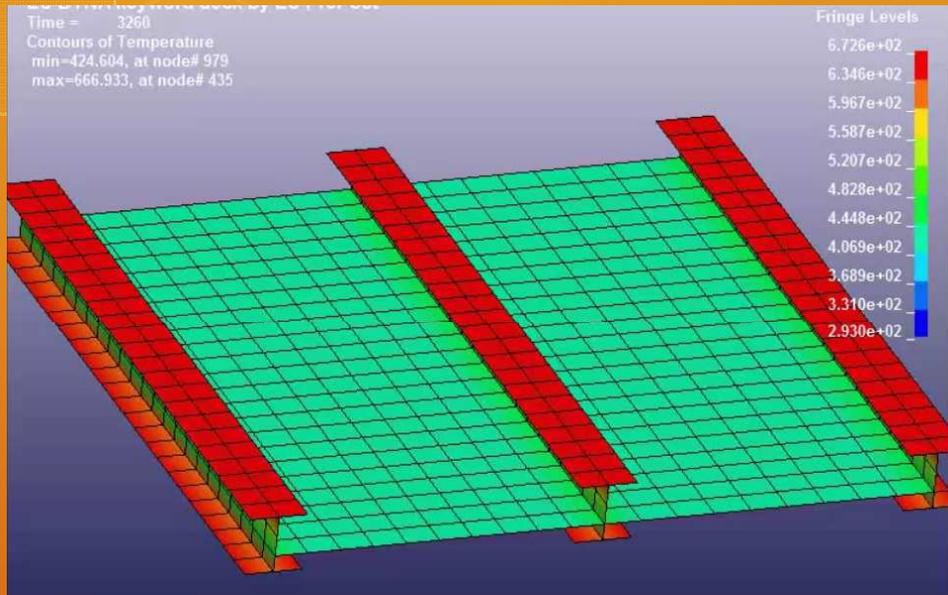
Temperature [C]		TIME OF EVACUATION FOR BUILDING AREAS			
		TOTAL	4th FLOOR	5th FLOOR	FINAL
TIME [s]		216	148	88	1900
Instant departure rate	steel	30	18	0	303
	concrete	6	3	2	85
TIME [s]		436	251	228	1900
60 person/min departure rate	steel	68	36	32	276
	concrete	15	7	6	85

STRUCTURE ANALYSIS
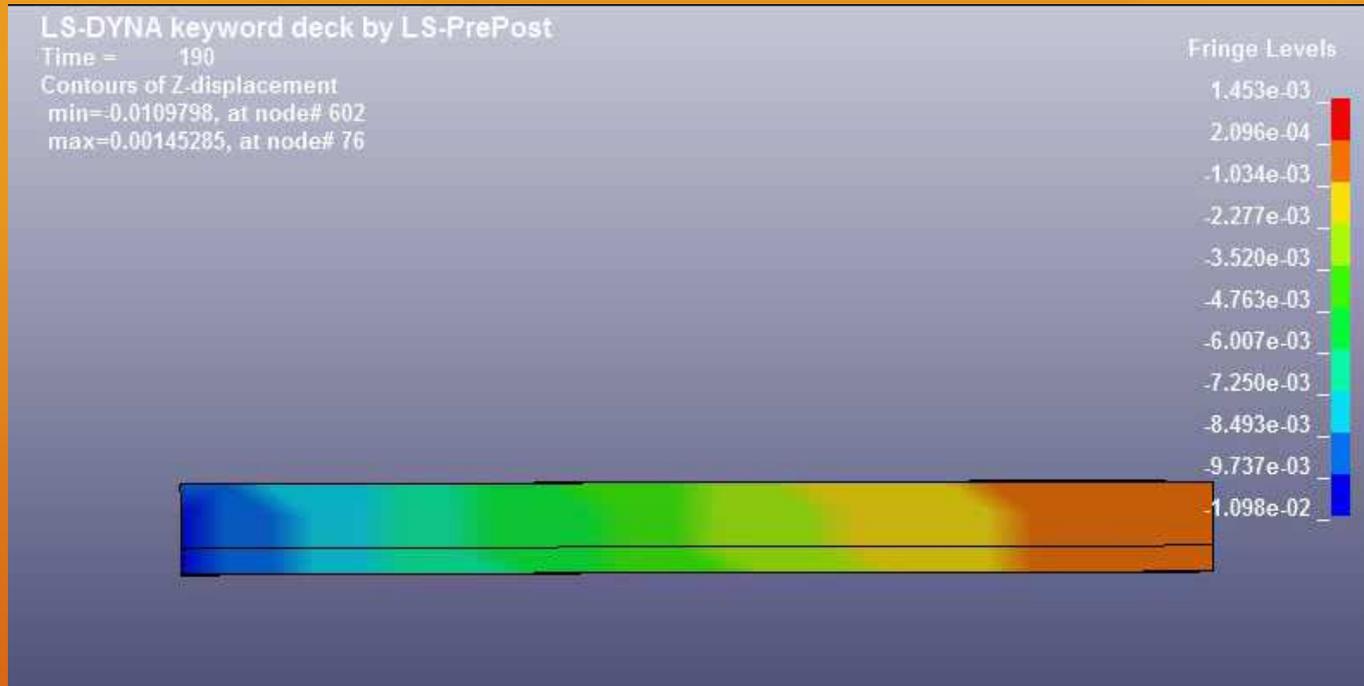
Z displacement [mm]		TIME OF EVACUATION FOR BUILDING AREAS			
		TOTAL	4th FLOOR	5th FLOOR	FINAL
TIME [s]		216	148	88	1900
Instant departure rate	max	6,2	5,97	5,19	10,98
	min	0,44	0,04	0,03	1,45
TIME [s]		436	251	228	1900
60 person/min departure rate	max	7,12	6,35	6,27	10,98
	min	0,15	0,04	0,04	1,45

Fire modeling
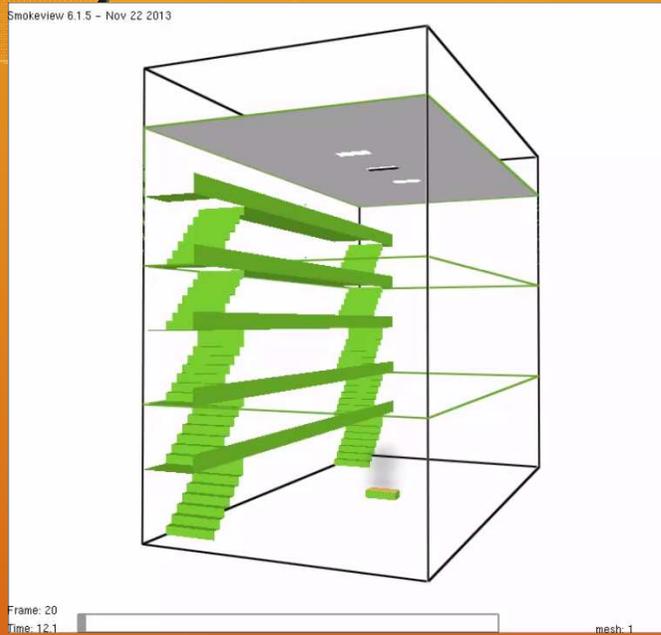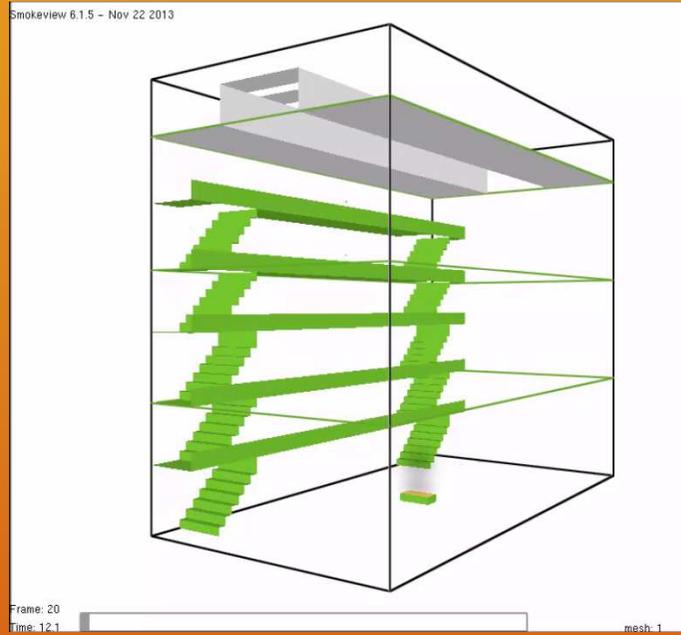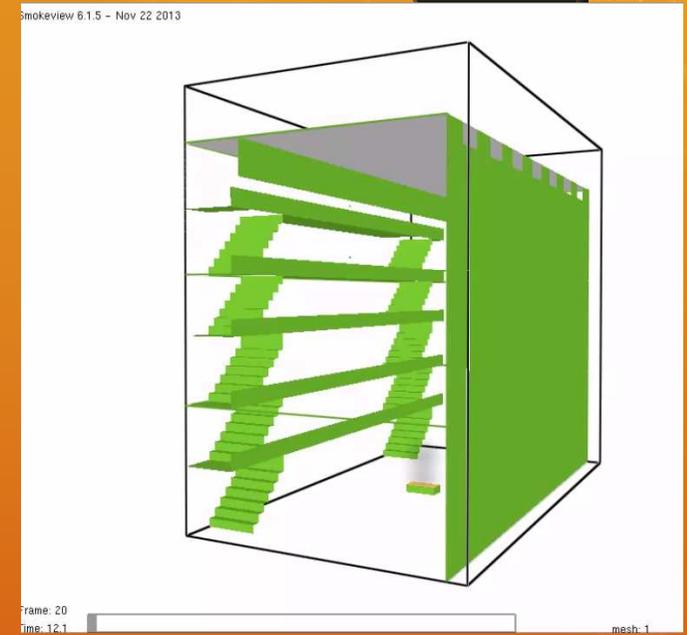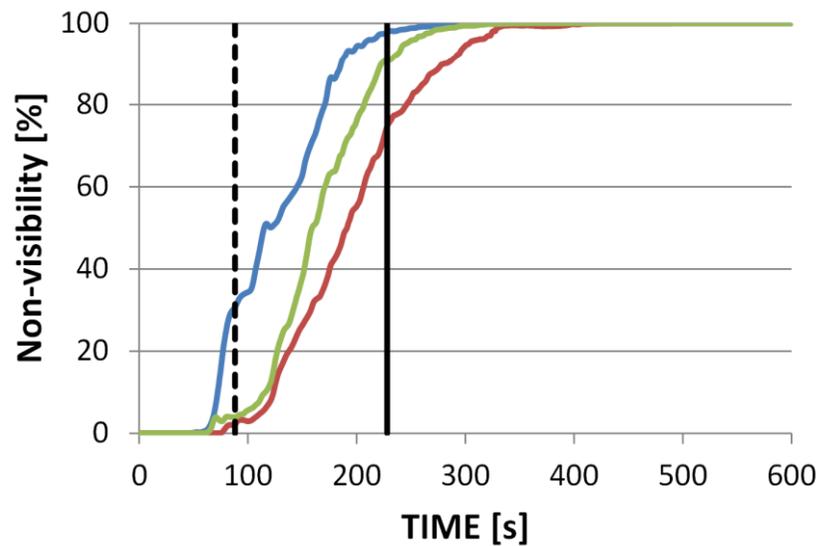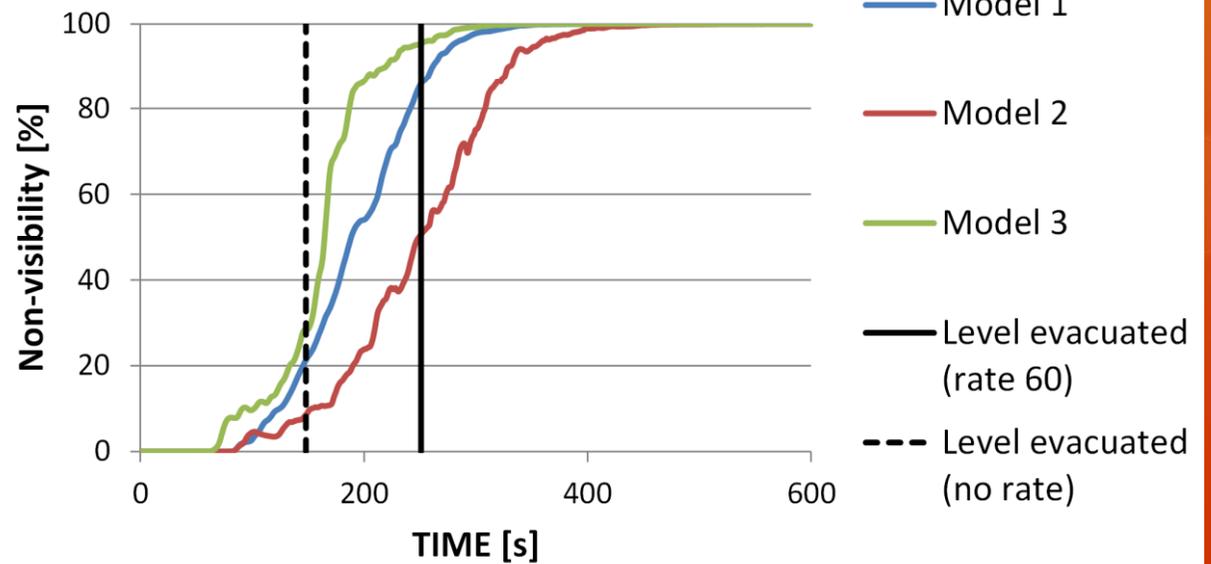
Evaluation of T_{evac}

Evacuation time for one person: T_1

Smart move: 115s

Hand calc: 125s

Smart Move places one person arbitrarily and final position is not precisely established

$$T_i = k \cdot (v_h \cdot d_h + v_{incl} \cdot d_{incl} + v_h \cdot d_{queue})$$

k is dependent on

i= number of persons
k= coefficient

v= speed

h=horizontal

incl=inclined

$d_{queue} = i \cdot 0.6m$

$k = q_1 \cdot q_2 \cdot q_3 \cdot \ldots \cdot q_i$

Reccomended values

$$k = \begin{cases} 1.05 & i < 50 \\ 1.23 & i < 100 \\ 1.5 & i > 100 \end{cases}$$

stair width
age
gender
shoes
season
high/low hills
psychological
profile

Evaluation of T_{evac}

Evacuation time for entire biulding: T_{1000}

Smart move: 435 s

Hand calc: 375 s

Relative error of 14%. But further research is needed to prove the hand calculation model.

$$T_i = k \cdot (v_h \cdot d_h + v_{incl} \cdot d_{incl} + v_h \cdot d_{queue})$$

Thank You for attention