

The comparison of the results of a full scale evacuation test to the calculation method of Hungarian regulations and to the Pathfinder software

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COST TU0904 meeting

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Hungarian evacuation calculation:
Analog method like a ball bearing model.

$$t_{lb} = \frac{N_1}{kx_l}$$

t:time [s]

N. the number of occupants

k: the coefficient 41,7

x: width of the doors or corridors

Evacuation simulation can be the alternative method of the national regulation, but the AHJ is really sensitive to the validation of these softwares.

The three calculation method of Pathfinder are:

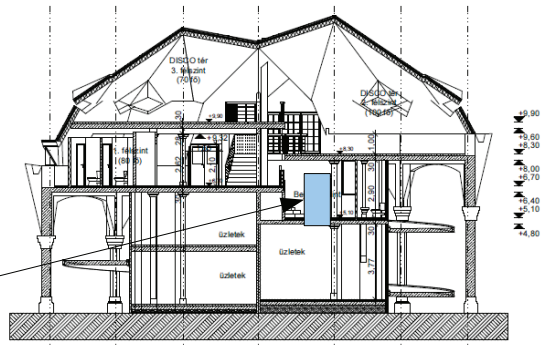
Steering: It combines the path design, navigation and the collision of participants to coordinate the movement of the participants.

SFPE mode: It uses a flux-based evacuation model, which was published in SFPE Handbook of Fire Protection Engineering (Nelson and Mowrer, 2002) and the SFPE Engineering Guide: Human Behaviour in Fire (SFPE, 2003).

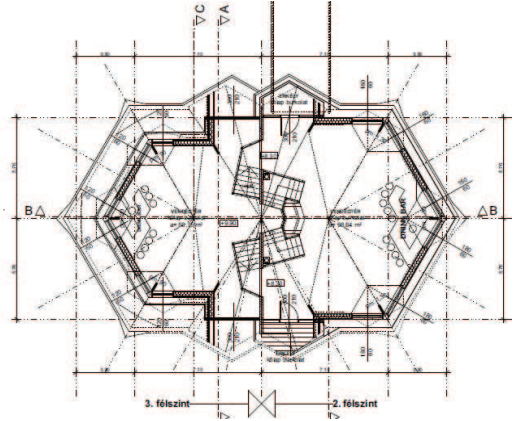
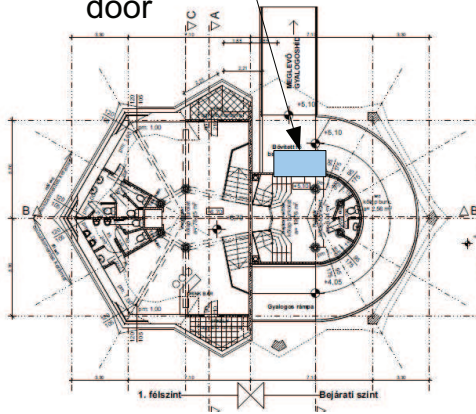
SFPE+ mode: It is really similar to SFPE, but it also handles with collision than in the Steering method.

Description

Club Chrome	Floor	Gross area	Net area
	1.	19,76 m ²	8,35 m ²
	2.	78,25 m ²	49,4 m ²
	3.	98,64 m ²	50,3 m ²
	4.	58,75 m ²	35 m ²



EXIT door



The Dance club just uses the four upper level. The exit door is on the lowest level. All of the occupants can leave the building just across this door.

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Real experiment

The upper level



The lowest level

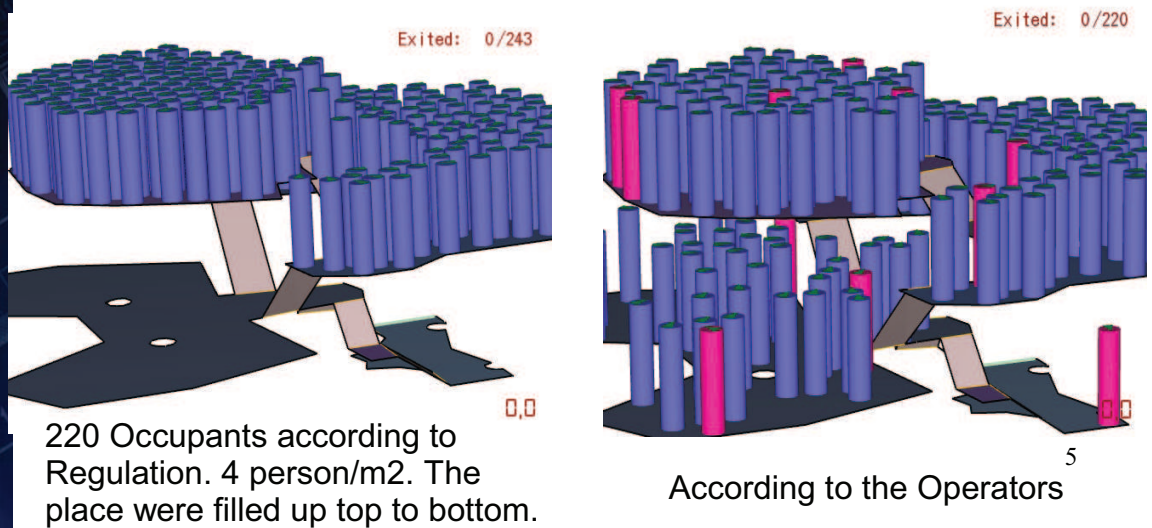


Exit door

Description of variation

Regulation: 4 persons/m². We need to calculate the worst distribution so we need to fill the place top to bottom with occupants. It means 243 person. In the repetition we just used 239 person not 240.

Operators: We assumed that there are 14 employees and 206 Occupants can be found in the building (220 total). The distribution of occupants was according to the operators experiment. Notice: Employees could only begin to leave the building after everyone else has left the level they were on. We have done twice the experiment in both situation, and we modeled all of them in each three calculation method, which is used by Pathfinder Steering, SFPE, SFPE+ (with collision handling).



Number of people evacuated in 90 seconds

	Operators	Regulation	Ratios
	220 person	243/239 person	
Real experiment	164/170	158/176	
Calculations by Regulation	100	100	1.64x; 1.58x
Pathfinder steering	90	78	1.82x; 2.02x
Pathfinder SFPE	90	64	1.82x; 2.46x
Pathfinder SFPE ⁺	94	63	1.74x; 2.50x

Full evacuation time

	Operators	Regulation		Ratios
	220 person	243 person	239 person	
Real experiment	137s/120s	136s	120s	
Calculations by Regulation	198s	216s	219s	1.44x; 1.58x
Pathfinder steering	218s	261s	263s	1.59x; 1.91x
Pathfinder SFPE	255s	313s	316s	1.86x; 2.32x
Pathfinder SFPE ⁺	250s	318s	338s	1.82x; 2.33x

Thank you for your attention