

Secrets of smoke extraction and HPWM in the new underground garage beside Hungarian Parliament

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Table of contents

1. Overview of building photos
2. Relation between HPWM and smoke extraction
3. Savings
4. Initial data's for FDS simulation
5. Evaluations FDS simulation results



4 levels, 560car parking, 22.000m²



Relations between smoke extraction and HPWM in Hungarian National Regulation of Fire Safety

1. Why do we need automatic fire fighting systems?

More than one level underground garages must be equipped by automatic fire extinguishing system and detection system.

2. What would be the smoke extraction due to National Regulations?

541§ Machinery smoke extraction can ransom gravity natural smoke extraction. Each effective m2 open surface shall be considered as 2m3/sec machinery ventilation. For garages 1% of total fire section shall be the min open surface for natural smoke extraction.

We have: 3750m2 maximum fire section
 1% = 37,5m2 smoke extraction x 2m3/sec = **270.000m3/h**

3. How can we reduce smokk extraction, without loss of safety ?

506§ SUBJECT SMOKE EXTRACTION

For non standardised cases, individual designed solutions must be controlled by computer simulations (software must be accepted by Hungarian Nationa Disaster Ministry=FDS). Due to this simulation we could reduce down to **0,5%**.

135.000m3/h

4. Which are these paragraphs support us on optimising system?

507§ SUBJECT SMOKE EXTRACTION

(1) The application of smoke extraction is forbidden for rooms where total flooding automatic fire fighting system is designed. (high expansion foam, gas, **open nozzle HPWM**)

(2) For those rooms where **water mist** system is installed (**bulb system**), Hungarian National Disaster Ministry will define the need and density of smoke extraction.

5. How can we reduce the heat resistance requirements by HPWM?

515 § Smoke extraction equipments (fan motor, cable duct must be at least **400C°** heat resistant for 90min operation designed. Due to the results of FDS simulation, the max temperature has been improved not to exceed **300C°**.



3. SAVINGS

- Instead of 400C resistant JET and extraction fans 300C installed, thanks to FDS simulation and HPWM. Only seining on equipments
- Saving on 50% of air volume (duct, cables, extraction fans) due to FDS simulation and HPWM
- -1 level total flooding system, open HPWM system, therefore we totally save smoke extraction for this level. Fans, cabling ducting

170.000€

100.000€

150.000€

Surplus cost for HPWM on conventional sprinkler system

420.000€



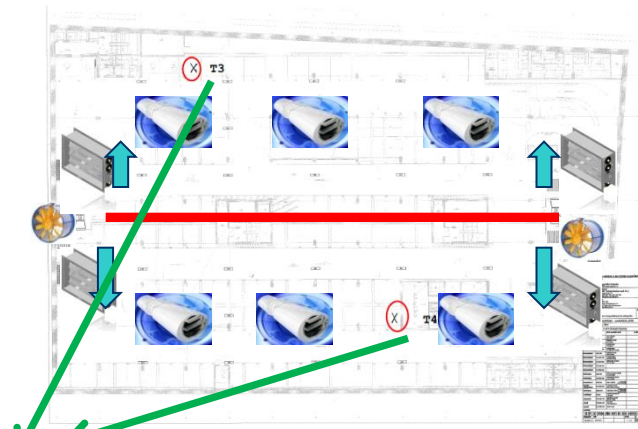
420.000€

What benefits does the project win, by applying HPWM?

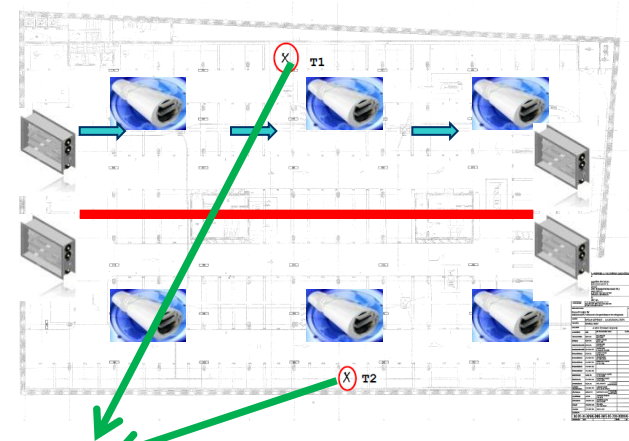
1. Reduced size of smoke extraction ducts on level -4, -3, -2
2. No smoke extraction on level -1 except evacuation corridors
3. Better fire suppression system
4. Long life span stainless steel piping
5. No ugly air intake and outlet louvers above ground, fit to architect design



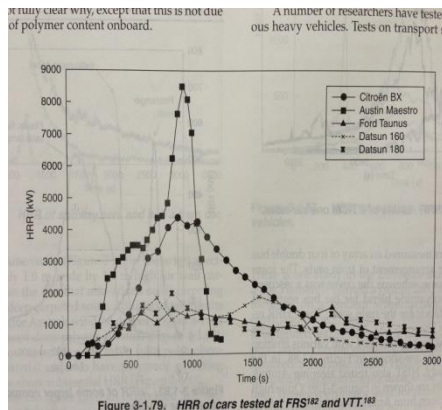
4. Initial data's for FDS simulation



-2. level ignited car position defined by authority



-4. level ignited car position defined by authority

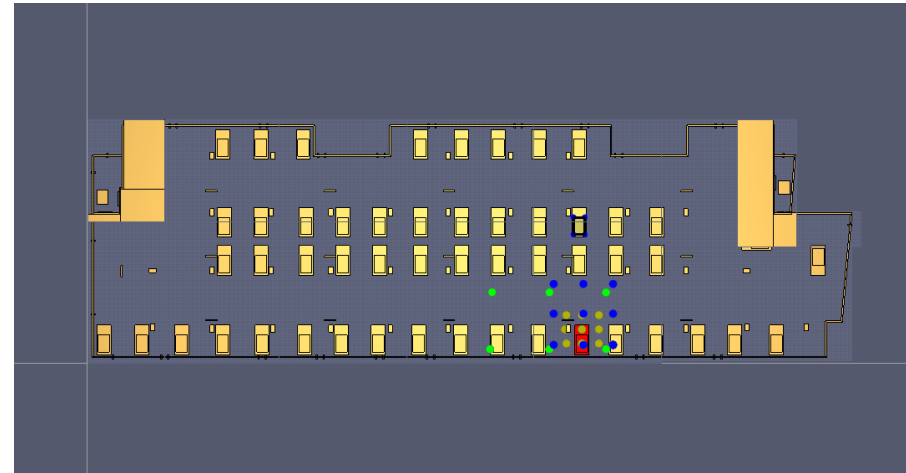


- 1 car 4,7MW Citroën
- Every 2nd parking place one car
- 9 nozzles and 6 smoke detection sensors added to simulation

Timing delay criteria for visibility

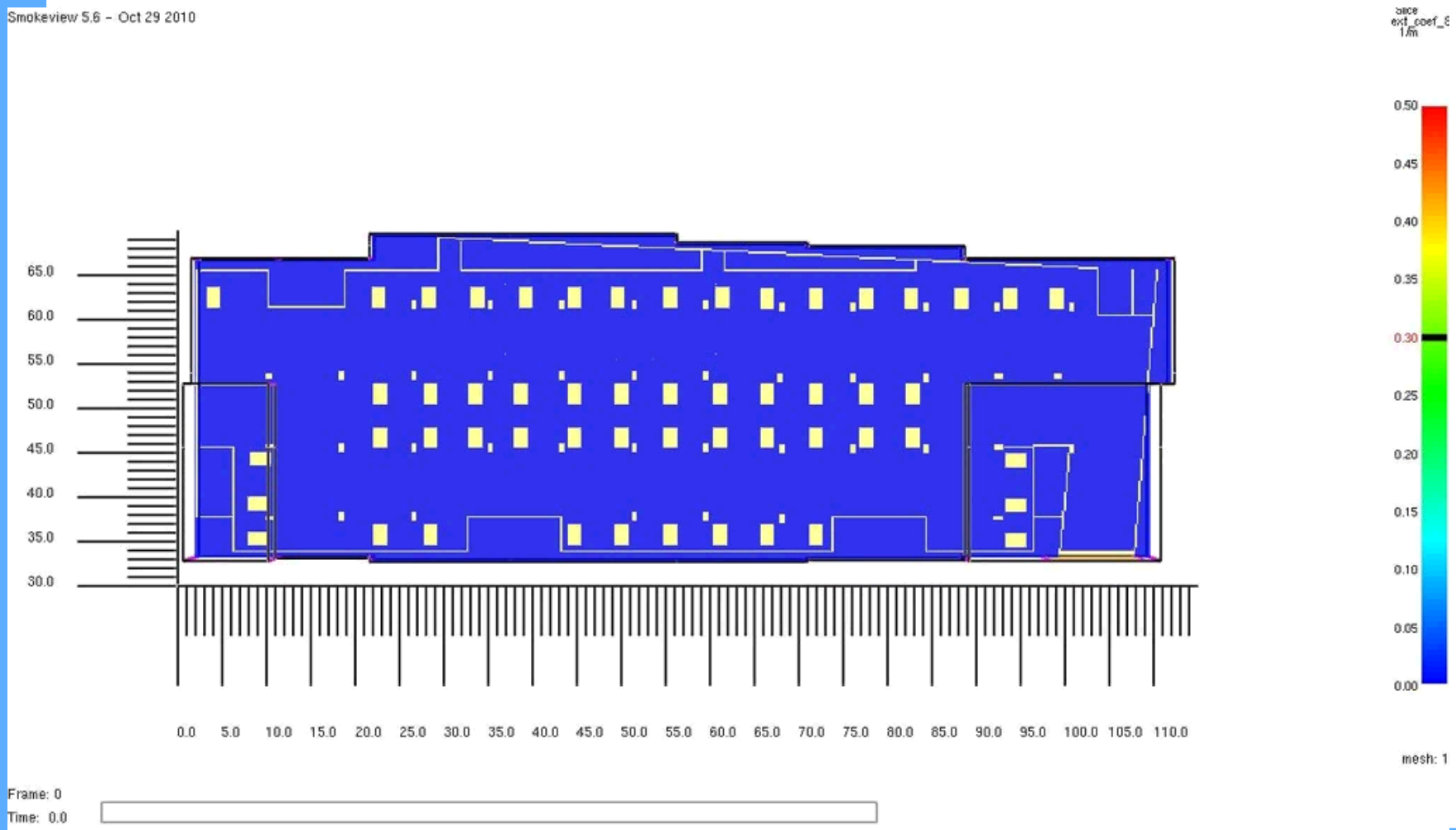
Smoke detection system	2sec
Preparation at fire department	120sec
Arrival of fire brigade 2,2km*40km/h=	198sec
<u>Access unpacking at destination</u>	<u>180sec</u>
Total	500sec=8,3 minutes

- 2 nozzles will be activated
- Maximum temperature 277Celsius
- The visibility has to be checked after 8 minutes, so that the access to fire seat is ensured by smoke extraction



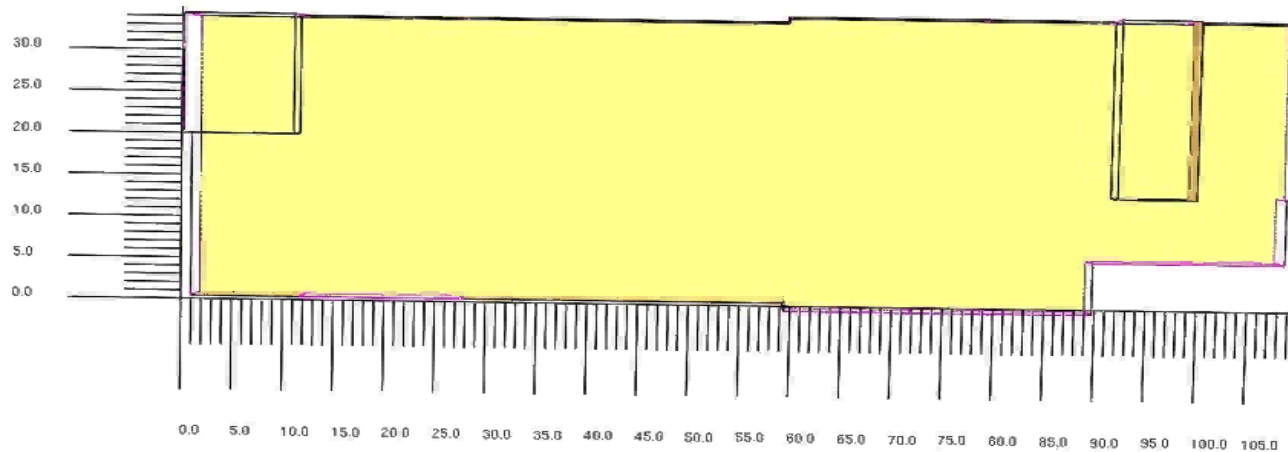
Visibility on – 4 level

Smokeview 5.6 - Oct 29 2010



Water mist development -2 level

Smokeview 5.6 - Oct 29 2010

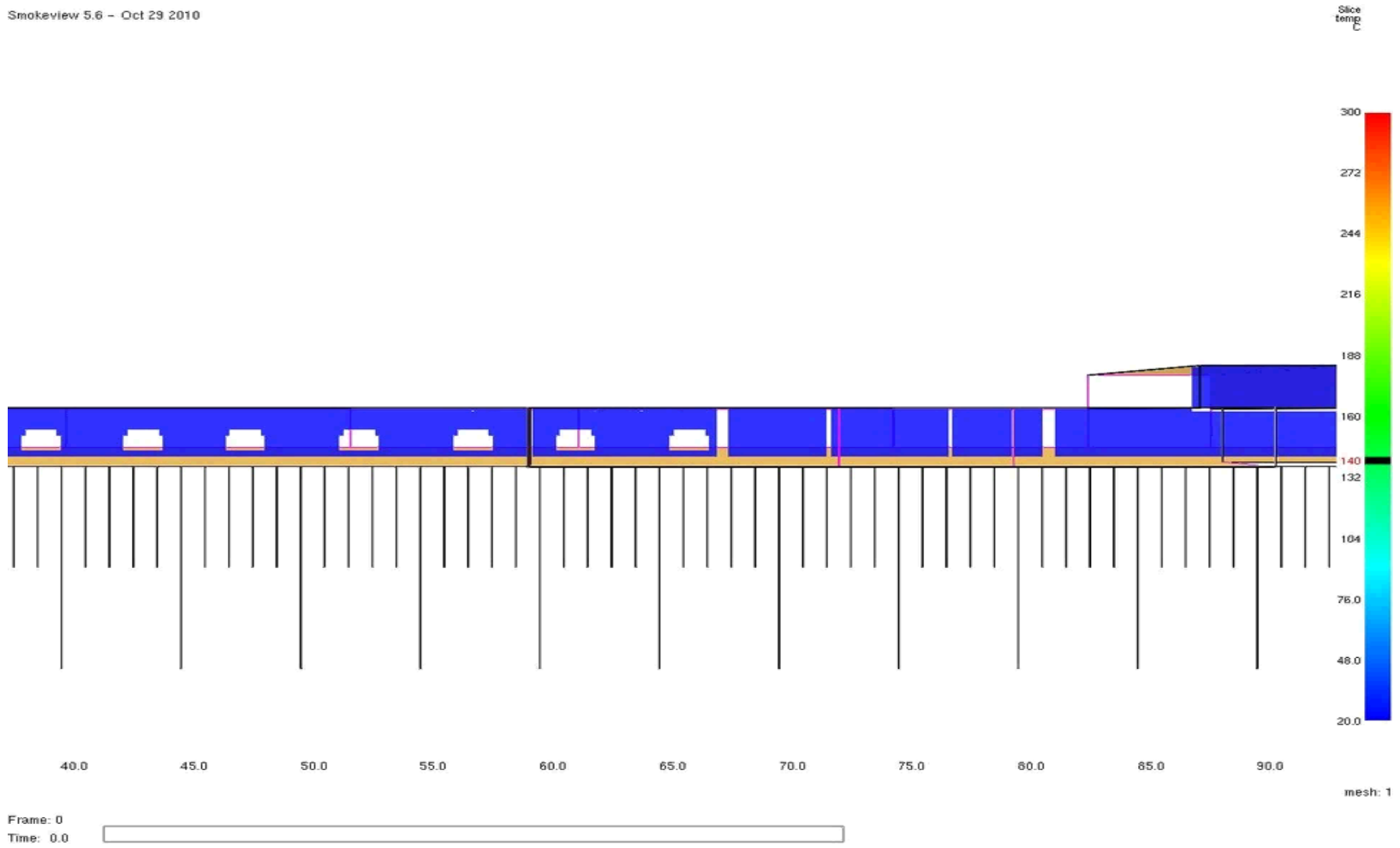


mesh: 1

Frame: 0
Time: 0.0

-2 level Temperature y

Smokeview 5.6 - Oct 29 2010



**Thanks for your attention!
Questions?**