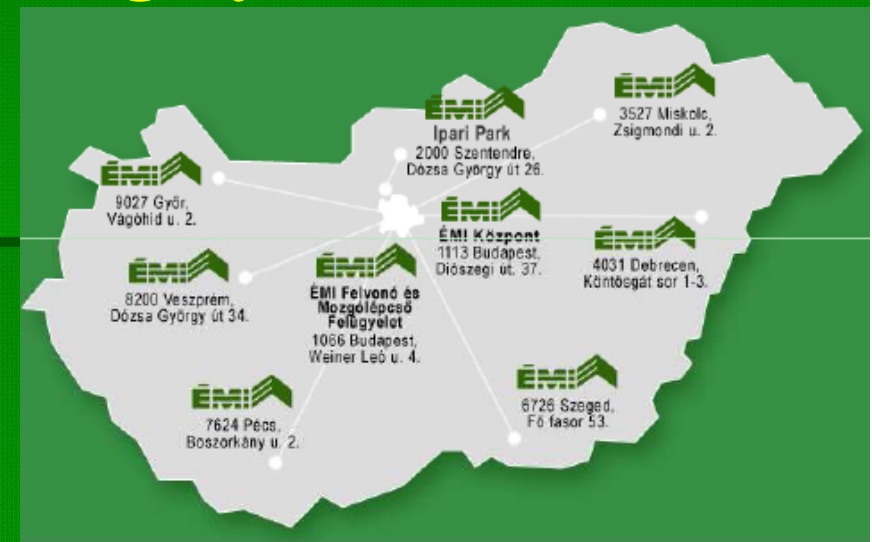


Laboratory fire resistance tests of building structures in Hungary



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MC, WG2

Non-profit Ltd. for Quality Control and Innovation in Building,
Fire Protection Division





ÉMI - Non-profit Company for Quality Control and Innovation in Building

Main activities:

- Attestation of conformity of construction products
- Attestation of production control systems
- Initial type testing of products
- Elaboration of European Technical Approval (ETA)
- Issue of Building Technical Approval (ÉME), that is a national technical approval, in the lack of a valid standard or an ETA
- Engineering expert opinion and advice
- Research and development
- Technical regulation

The Company is in 100 % state ownership.



ÉMI - Non-profit Company for Quality Control and Innovation in Building

Memberships:

- EOTA - European Organization for Technical Approvals
- UEAtc - Union Européenne pour l'Agrément technique dans la construction
- EGOLF - European Group of Organisations for Fire Testing, Inspection and Certification
- ENBRI - European Network of Building Research Institutes
- WFTAO - World Federation of Technical Assessment Organizations
- CIB - International Council for Research and Innovation in Building and Construction



ÉMI - Non-profit Company for Quality Control and Innovation in Building

Accreditation background:

- 15 professional and regional laboratories
- Accredited about 1200 testing methods (MSZ EN ISO/IEC 17025:2005)
- Inspection body: MSZ EN ISO/IEC 17020:2005, MSZ EN ISO/IEC 17021:2007
- Certification: MSZ EN 45011
- Quality Management System: ISO 9001
- ÉMI is the Coordinating institute at the Hungarian Construction Technology Platform (founded in Sept. 2007)

Fire Protection Division

Fields of activity:

- Investigation into the condition of buildings that have suffered fire damage
- Determination of the fire protection suitability criteria and scope of application of building structures and building materials
- Participation in the regulation and various research and development projects, and working out such projects

3 Groups:

- Passive
 - Building materials and elements
 - Building structures
- Active





Fire Protection Division

Fields of investigation:

- Determination of the fire resistance limit value of building structures
- Determination of fire protection ability for fire protection suspended ceilings and coating and covering systems
- Testing of wall breakthroughs, penetration seals and limiting structures of mechanical and technological equipment for fire resistance limit value
- Fire spread test of the facade of multi-storey buildings performed on the front wall structures containing glazing or window or door structures and on claddings made of "combustible" material
- In the field of material tests determination of combustibility, spread of flames, rate of dripping of burning material, flash point, ignition temperature, testing of smoke generation capability and determination of combustion heat
- Fire protection suitability tests of fire alarm units and their elements, built-in fire extinguishers and their elements



Fire Protection Division

Fields of investigation:

- Smoke detection tests
- Heat detection tests
- Flame detection tests
- Gas detection tests
- On-site test and inspection of the efficiency of fire protection ventilation
- On-site test and inspection of deployed and functioning fire alarm units and fire extinguishers and their elements



Hungarian Fire Code (OTSZ)

- The Hungarian Fire Code (OTSZ) is the state regulation for fire protection in building
- Principles of fire code: it is sets of law, no standard !!!
- OTSZ (28/2011) was updated - 06.09.2011
- Prescriptive: requirements for building materials and structures
- Fire resistance of construction and the safety of construction during a fire.
- Qualification for fire protection of building materials and structures investigation according EN standards



Fire resistance tests

- Fire resistance tests for non-load bearing elements. Walls. MSZ EN 1364-1:2009
- Fire resistance tests for non-load bearing elements. Ceilings.
MSZ EN 1364-2:2000
- Fire resistance tests for load bearing elements. Walls.
MSZ EN 1365-1:2000
- Fire resistance tests for load bearing elements. Ceilings.
MSZ EN 1365-2:2000
- Fire resistance tests for load bearing elements. Beams. MSZ EN 1365-3:2000
- Fire resistance tests for doors, shutters and openable windows.
MSZ EN 1634-1:2009
- Smoke control doors and shutters. MSZ EN 1634-3:2005
- Landing doors fire resistance test. MSZ EN 81-58:2004
etc.

Fire tests of building structures



Horizontal testing furnace



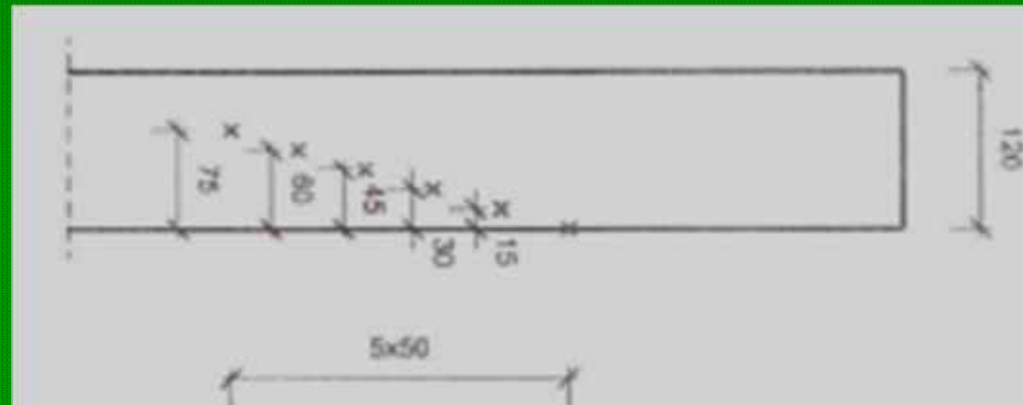
Vertical testing furnace



Tester for building facade

Calculation – simulation - fire tests

- Using of EC is obligatory – 1. January 2012
- FEM – temperatures and stresses in the structure
- FDS – temperature at the surface of the structure
- 1:1 laboratory fire test – limited size (extension)
- Compare the results from the 3 method
 - e.g. reinforced concrete slab, (thermocouples in different depth)





Samples for recently important fire tests in Hungary

- Fire resistance tests. Alternative and additional procedures.

Impact test. MSZ EN 1363-2:1999

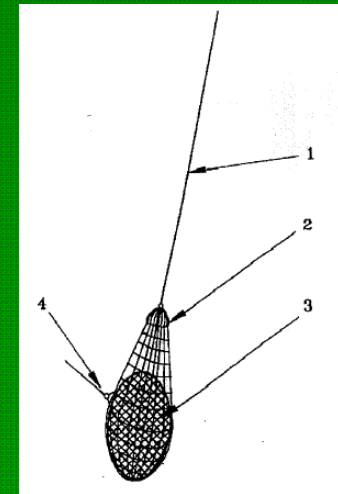
- load bearing and non-load bearing fire resisting walls

- Landing doors fire resistance test. MSZ EN 81-58:2004

- Fire propagation test for building facades. MSZ 14800-6:2009

Fire resistance tests. Alternative and additional procedures. Impact test. MSZ EN 1363-2:1999

- Resistance to fire performance characteristics, M – mechanical action
- Impact body is 200 kg (sphericoconical bag filled with lead shot)
- 3 impacts within 5 minutes after the end of the classification period
- By load bearing walls the first 2 impacts applied on loaded specimen, the 3. impact after removing of the test load
- Observations and measurements after 2 minutes after the 3. impact



Fire resistance tests. Alternative and additional procedures. Impact test. MSZ EN 1363-2:1999

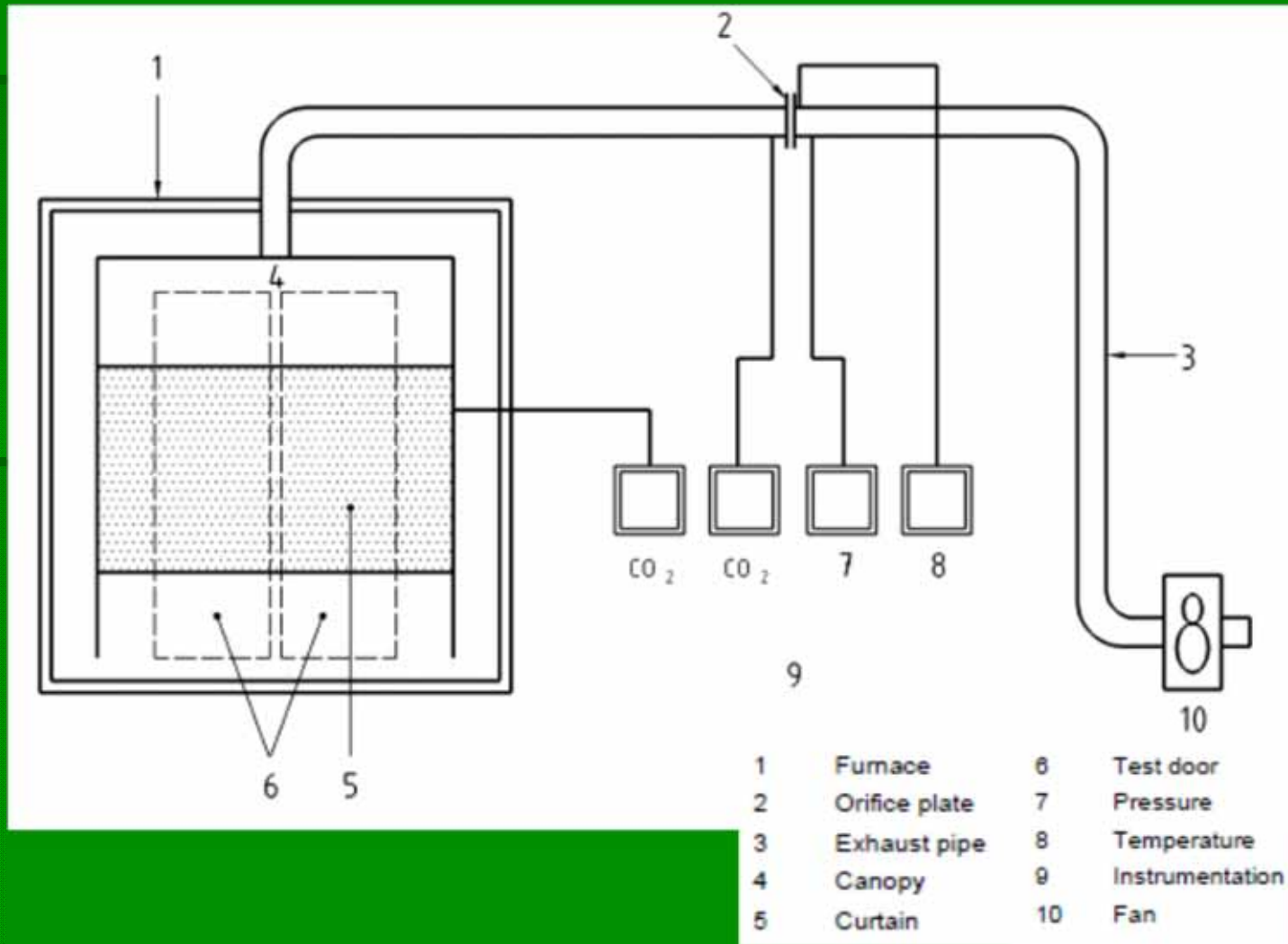




Landing doors fire resistance test. MSZ EN 81-58:2004

- Pre-test examination (constructional details, clearance gap measurements, depth of penetration, opening-closing)
- The landing side of a lift landing door is exposed to fire (heating)
- Positive pressure over the whole height of the door (exposed side) \Rightarrow inducing the leakage of furnace gases to the unheated side
- A canopy is collecting the leaked gases on the unexposed side, a suction fan draws, measuring the volume flow
- The concentration of CO_2 is measured in the furnace and at the airflow measuring point
- By monitoring the gas flow rate and its temperature it is possible to calculate the leakage rate of hot gases through the test door

Landing doors fire resistance test. MSZ EN 81-58:2004





Landing doors fire resistance test. MSZ EN 81-58:2004

Measuring

- In the furnace
 - CO₂ concentration
- At the gas flow measuring point
 - CO₂ concentration
 - the gas temperature
 - the gas pressure
 - the pressure difference over the flow measuring device

Criteria of performance

- Integrity (E)
- Thermal insulation (I)
- Radiation (W)

Landing doors fire resistance test. MSZ EN 81-58:2004



at the beginning of the fire test



at the end of the fire test

Fire propagation test for building facades (MSZ 14800-6:2009)

- Rehabilitation of panel building (in the 60-70ties years, industrialized technology)
- Fire cases in panel building (e.g. Miskolc in 2009, 3 people died)





Fire propagation test for building facades (MSZ 14800-6:2009)

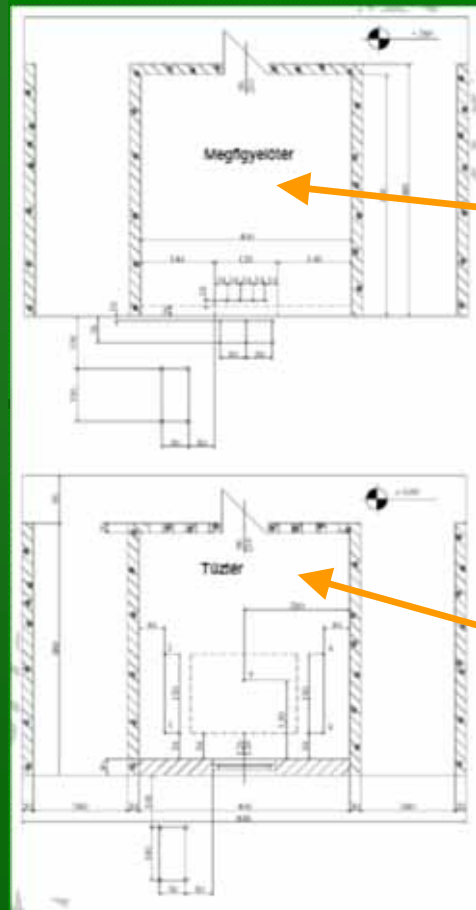
- Critical limit of horizontal and vertical fire propagation at building facades
- Building facade with openings (windows)
- Cladding, coating – facade insulation system
- Using of fire propagation barrier
- Model building, ceiling and walls A1, fire resistance value > 3 hours
- Windows $1,2 \times 1,2$ m at the ground and 1st floor, vertical distance is min. 1,3 m
- Room at the ground floor is the fire space, 650kg of pine bonfire (given size), air dried (moisture content $12\% \pm 2\%$)
- At the ignition the lower window is closed
- Standard fire curve
- 5 minutes after fire beginning the lower window will be opened
- At the monitoring level is a temperature measuring panel
- The fire test is 45 minutes

Fire propagation test for building facades (MSZ 14800-6:2009)

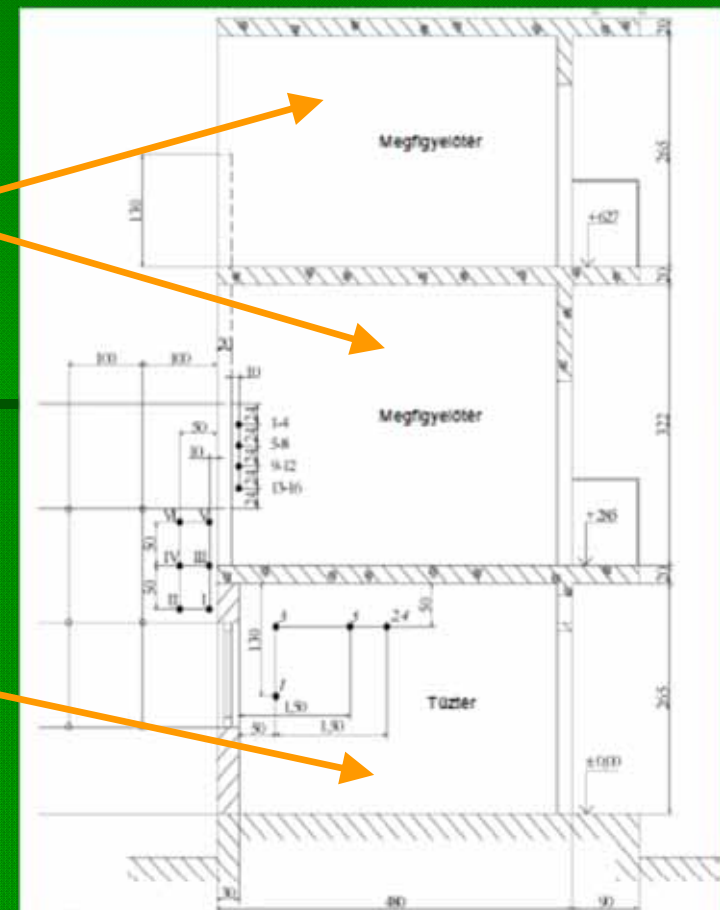


Fire propagation test for building facades (MSZ 14800-6:2009)

Model building



horizontal section



vertical section

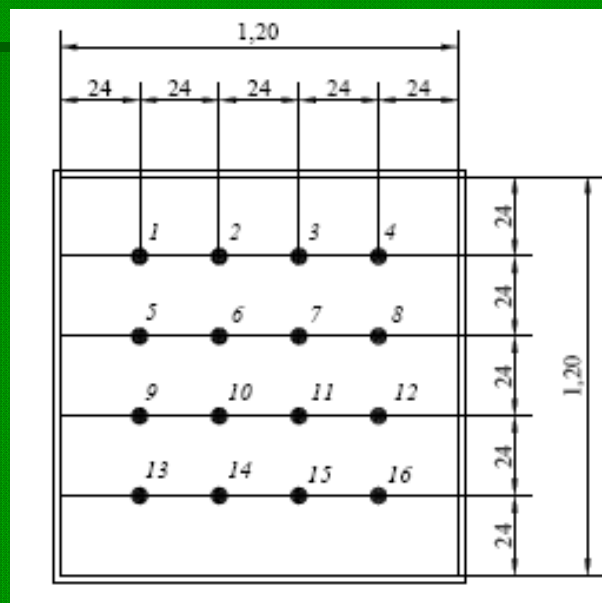
observation space

fire space

Fire propagation test for building facades (MSZ 14800-6:2009)

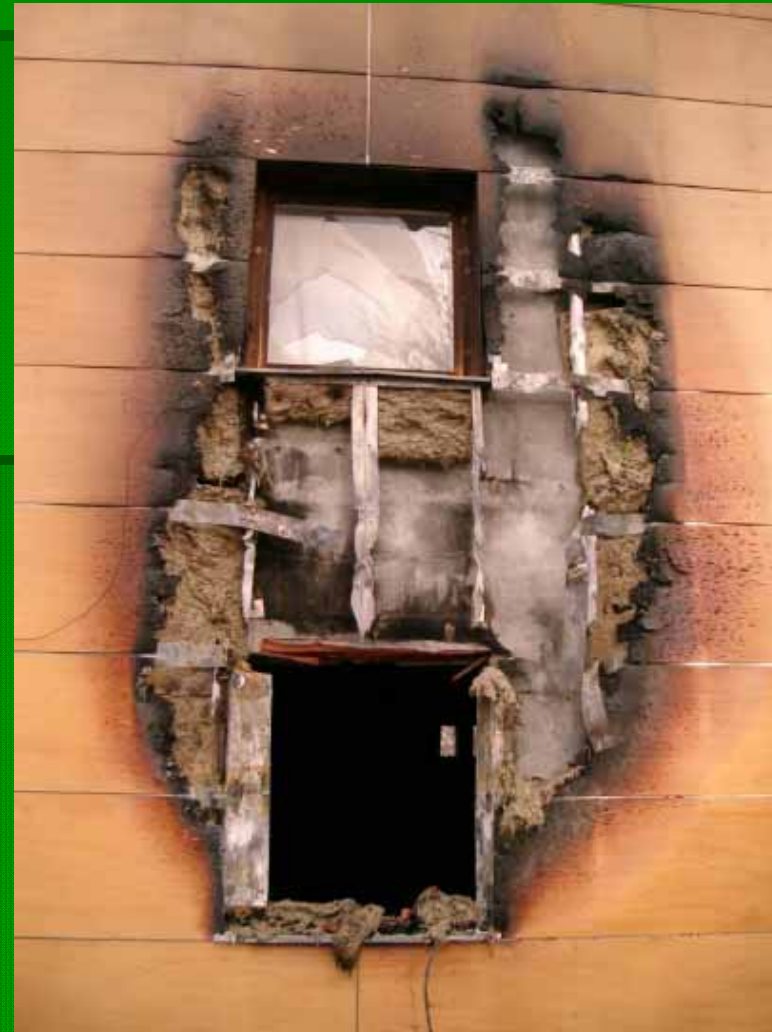
Temperature measuring

- During the test temperature must be measured continuously in all 10 sec.
- 5 thermocouple in fire space
- In front of the facade between the windows at 9-9 thermocouple (10, 50 cm)
- At the observation space with a measuring panel 16 thermocouple



measuring panel

Fire propagation test for building facades (MSZ 14800-6:2009)





11-14. April 2012 Malta, COST TU0904 training school

Fire propagation test for building facades (MSZ 14800-6:2009)



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Thank you for your attention!

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