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Fire resistance of timber doors – Part II
Technical solutions and test results

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Abstract: This paper discusses the main issues related to the fire resistance of timber windows. Technical solutions which help to achieve the expected fire resistance class have been described. Moreover, an example of temperature rise results for unexposed surface of the tested specimen has been presented.

Keywords: *timber glazed window, fire resistance, integrity, thermal insulation, radiation*

Technical solutions

The structure of the hinged, swinging, glazed fire resistant timber window leaf consists usually of the following:

- window leaf frame of the specific cross-section depending on the expected fire resistance class (two horizontal members: head and sill, and two vertical members: lock and hinge), made of hardwood or softwood; the frame members are bonded together or jointed using e.g. steel staples,
- fire resistant glass panes.

All components of the window leaf filling are jointed to the frame and lining using a special adhesive.

An important component of the entire window assembly is the window frame, consisting of vertical members and the head, usually jointed together using steel screws. The window frame is made of timber or MDF. The window frame cross section and density of its material depend on the expected fire resistance class.

Fire resistant timber window assemblies should also be equipped with intumescent (temperature expandable) seals. They are mounted in specially milled grooves or directly bonded along all edges of the door leaves and frame.

Timber windows may be equipped with a wooden sill, and in such case the sill edge of the window leaf is equipped with a special falling seal.

Temperature rises during the fire resistance test of glazed timber double leaf, hinged, window assemblies heated from hinged and opposite to hinge sides.

Fig. 1 shows graphs of temperature rises on unexposed surface of the timber window frame of EI_1 30 type heated from opposite to hinge side in comparison with temperature rises on unexposed surface of the timber window frame of the same type heated from hinged side.

Fig. 2 shows graphs of temperature rises on unexposed surface of the timber inactive window leaf profile of EI_1 30 type heated from opposite to hinge side in comparison with temperature rises on unexposed surface of the timber inactive window leaf profile of the same type heated from hinged side.

Fig. 3 shows graphs of temperature rises on unexposed surface of the timber active window leaf profile of EI_1 30 type heated from opposite to hinge side in comparison with temperature rises on unexposed surface of the timber active window leaf profile of the same type heated from hinged side.

Fig. 4 shows graphs of temperature rises on unexposed surface of the timber active window leaf (additional procedure) of EI_1 30 type heated from opposite to hinge side in comparison with temperature rises on unexposed surface of the timber active window leaf (additional procedure) frame of the same type heated from hinged side.

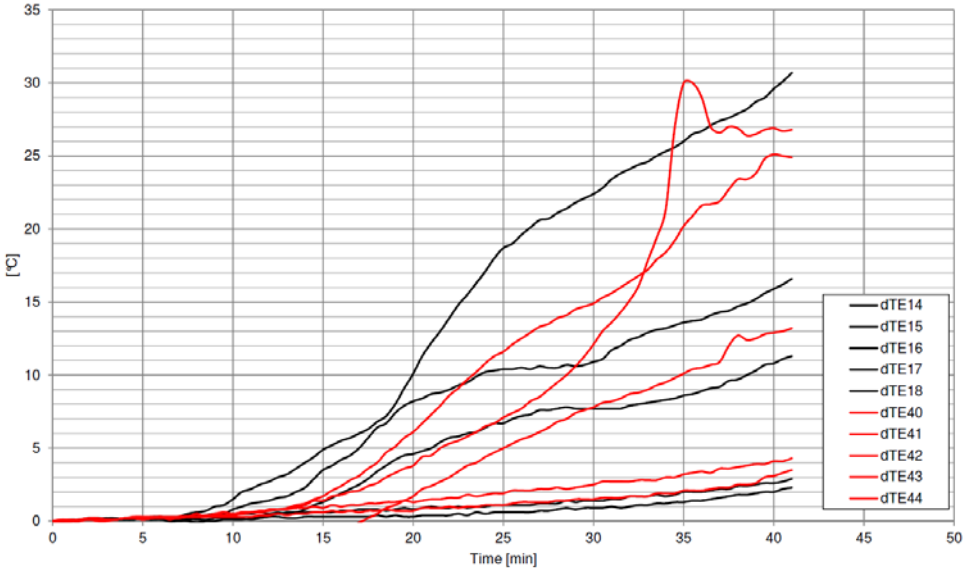

Figure 1 Temperature rises on unexposed surface of the timber window frame of EI_1 30 type heated from opposite to hinge side (dTE14 ÷ dTE18) in comparison with temperature rises on unexposed surface of the timber window frame of the same type heated from hinged side (dTE40 ÷ dTE44)

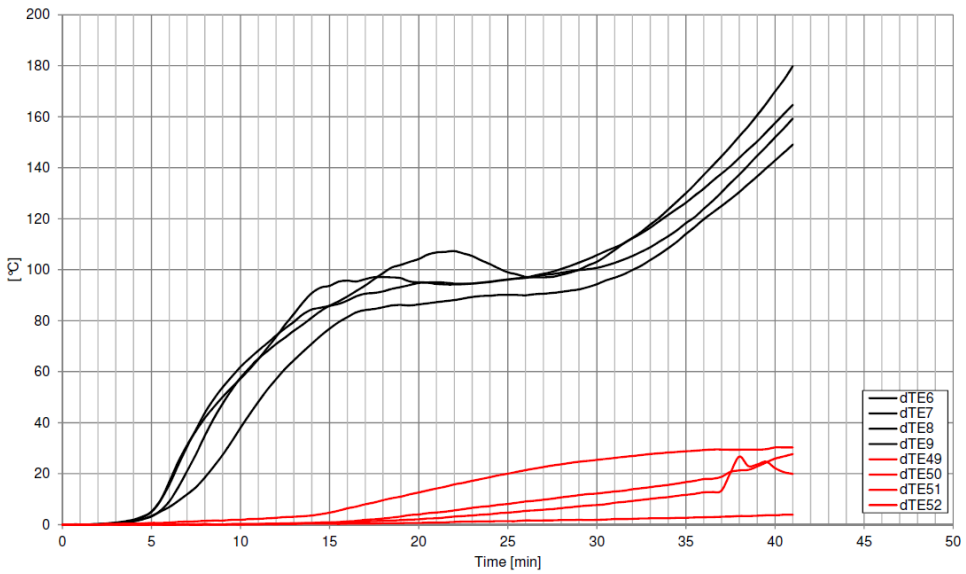

Figure 2 Temperature rises on unexposed surface of the timber inactive window leaf profile of EI_1 30 type heated from opposite to hinge side (dTE6 ÷ dTE9) in comparison with temperature rises on unexposed surface of the timber inactive window leaf profile of the same type heated from hinged side (dTE49 ÷ dTE52)

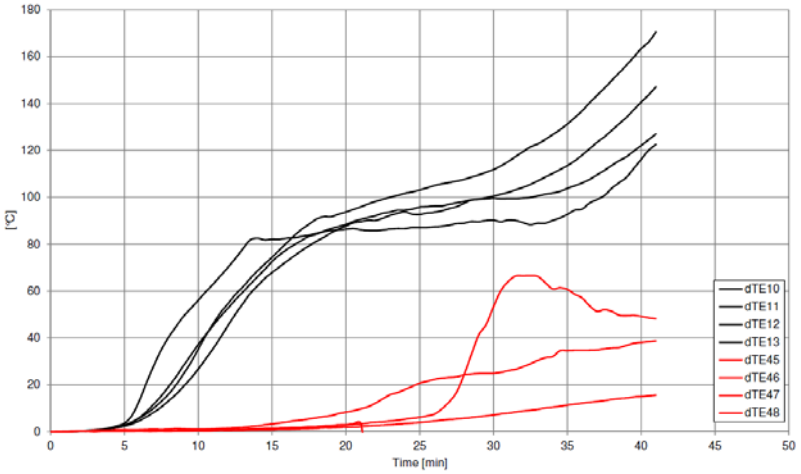

Figure 3 Temperature rises on unexposed surface of the timber active window leaf profile of EI_1 30 type heated from opposite to hinge side (dTE10 ÷ dTE13) in comparison with temperature rises on unexposed surface of the timber active window leaf profile of the same type heated from hinged side (dTE45 ÷ dTE48)

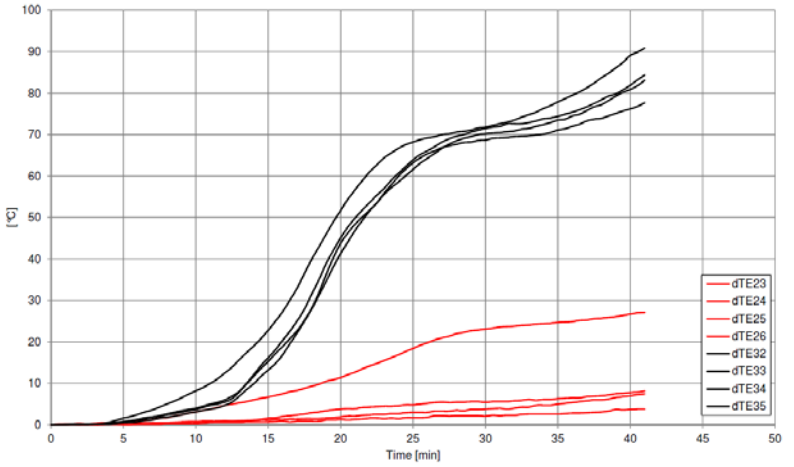

Figure 4. Temperature rises on unexposed surface of the timber active window leaf (additional procedure) of EI_1 30 type heated from opposite to hinge side (dTE23 ÷ dTE26) in comparison with temperature rises on unexposed surface of the timber active window leaf (additional procedure) of the same type heated from hinged side (dTE32 ÷ dTE35)

The timber window assemblies were tested according to standard EN 1634-1 [2] (by heating from the hinge side and from opposite to hinge side). The EI_1 30 fire resistance class window had thickness of 51 mm, the frame was made of pine wood, and had a cross section of 90 x 92 mm.

Summary

The presented test results indicate that the properly designed glazed timber windows make an excellent fire barrier. Temperature rises on the unexposed door frame surfaces of the window frames and leaves are relatively low, which indicates that the glazed timber window assembly can be an excellent solution. The only problem in designing the fire resistant timber structure

to achieve the expected fire resistance class is to select the appropriate thicknesses, densities, cross sections and proper jointing of the door structure components. Graphs also shows that hinged side is indeed the "worse" side, as it was pointed out in first part (*Fire resistance of timber doors – Part I Technical solutions and test results*) of this work.

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Streszczenie: *Odporność ogniowa okien drewnianych – Część 2: Rozwiązania techniczne i wyniki badań.* W niniejszym artykule omówione zostały główne problemy związane z odpornością ogniową rozwierno – uchylnych okien drewnianych, przeszklonych. Przedstawione zostały rozwiązania techniczne pozwalające na osiągnięcie oczekiwanej klasy odporności ogniowej takich zespołów drzwiowych. Ponadto zaprezentowano oraz porównano przykładowe wyniki przyrostów temperatury na nienagrzewanej powierzchni drewnianych okien.

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