

Research on fire protection properties of chosen kinds of exotic wood

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Abstract: *Research on fire protection properties of chosen kinds of exotic wood.* Use of wood in buildings, as construction or finishing element becomes more and more popular. In order to get acquainted with the fire protection properties of ten popular kinds of exotic wood, research was conducted checking the reaction of wood on direct fire action in accordance with the standard PN-EN ISO 11925-2:2010. After the conducted research it was stated that all kinds of exotic wood comply with the above standard and are resistant to fire.

Key words: exotic wood, wood combustibility, combustion process

PURPOSE AND SCOPE OF THE PAPER

The purpose of the conducted research was to define the combustibility of 10 kinds of exotic wood which is the most commonly used in construction industry. The tested samples came from America, Australia, Africa and Asia.

Before the research, the samples were weighted, their humidity and density was defined and then the reaction to the action of single flame in several time options were checked– 15s, 45s, 1min 45s, 3min 25s, 6min 25s. After research, a percentage loss of mass was defined, as well as the samples' charring. 40 samples with specially prepared dimensions of 250x90x15mm were burnt.

RESEARCH METHODOLOGY

Research was conducted in the Main School of the Fire Service in Warsaw where the research on combustibility of materials subject to direct flame action was performed in accordance with the standard PN-EN ISO 11925-2:2010 *Research on reaction to fire – Flammability of products subject to direct action of flame -- Part 2: Research with action of single flame.*

RESEARCH POSITION

Combustion chamber (fig. 1) made of stainless steel plates with two glass sides – resistant to high temperatures. Such system provides with the possibility to conduct observations during the combustion process. Chamber ventilation is free thanks to the square lattice made of stainless steel of 1,5 mm in thickness installed at the bottom. For the needs of proper ventilation, the chamber was placed on four centimeters thick supports. Additionally, in order to get rid of harmful vapors, a ventilating hood is installed. The fire source for samples inflammation (inflammation – from standard definition is an occurrence of fixed flame – lasting longer than 3 seconds) is a burner with construction enabling its use in 45° vertical slope. The burner was installed on a jib enabling free regulation of distance from the tested sample, additionally, it is equipped with precise gas valve enabling the regulation of flame height.

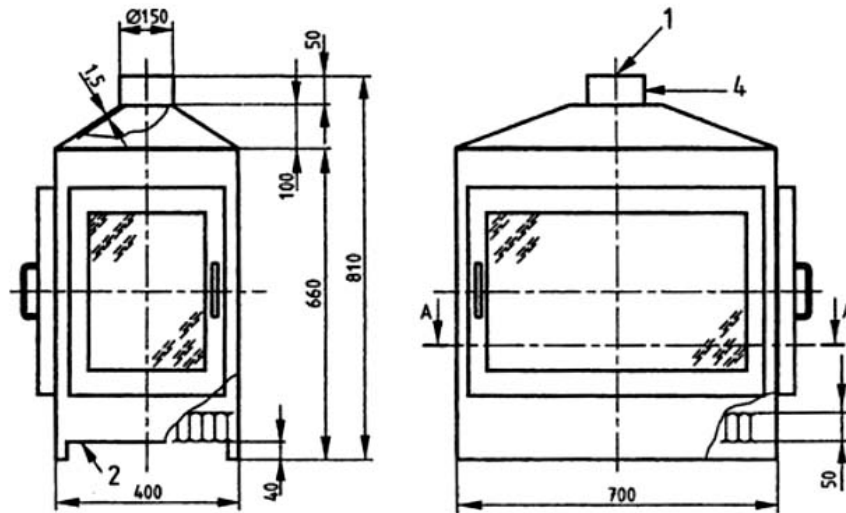


Fig. 1 Scheme of the combustibility testing chamber in accordance with the standard PN-EN ISO 11925-2:2010

RESEARCH RESULTS

As it may be noticed on diagrams 1 and 2, merbau turned out to be very resistant to single flame. After research, the charring was only 20% of the samples' height, which corresponds to 5%. No smoke or chips were observed. Wood did not cause any snaps and cracks. Loss in weight oscillated around 0,5% - similarly as massaranduba. On the other hand, the biggest loss in weight was observed in case of Teak which lost around 7,5% of weight during combustion and the final charring amounted to 60% of the sample's height.

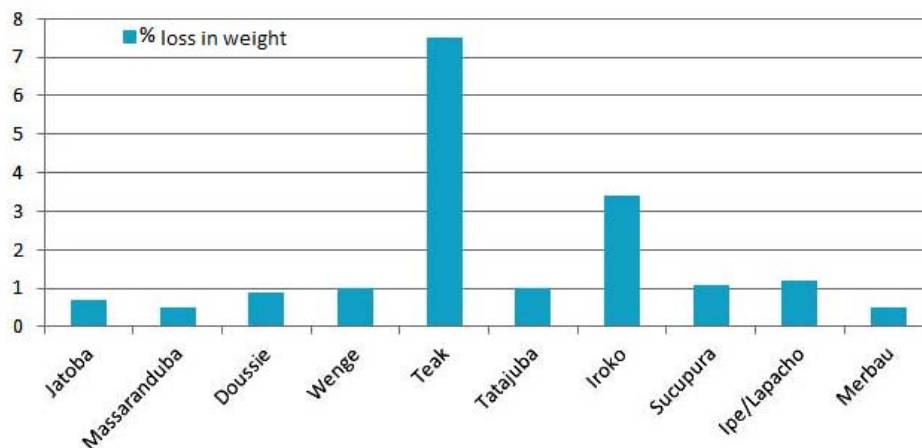


Fig 1. Cumulative comparison of loss in weight of the tested kinds of wood (source: own elaboration)

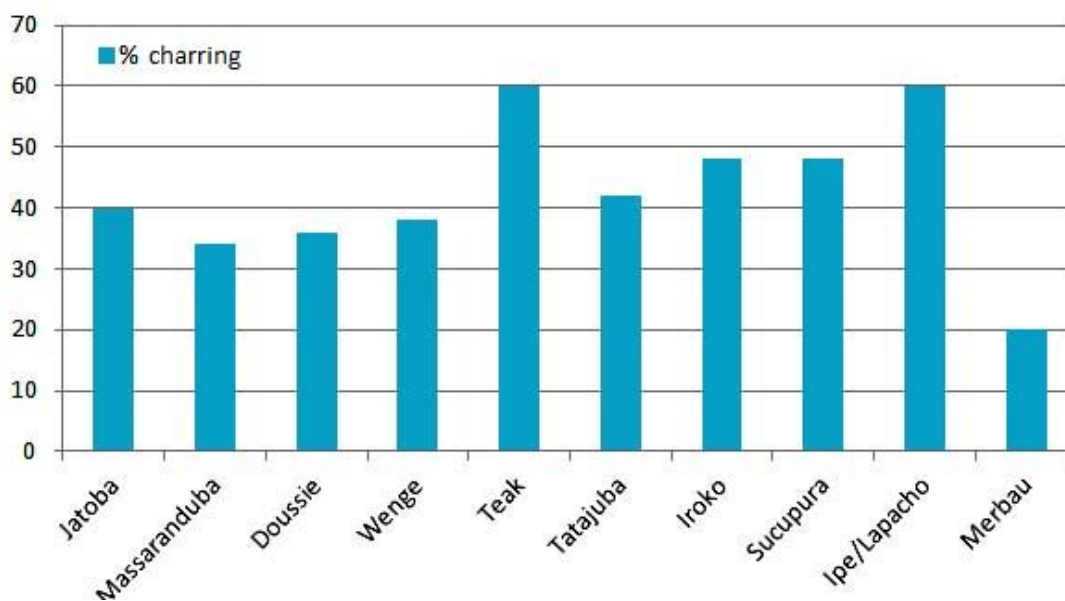


Fig 2. Cumulative comparison of charring of the tested kinds of wood (source: own elaboration)

CONCLUSIONS

The conducted research concerning the test of combustibility of chosen kinds of exotic wood enabled to draw the following conclusions:

1. Exotic wood which is the most resistant to action of single flame is merbau, the sample of which was charred at the level of 20% on average, with simultaneous loss in weight of about 0,5%.
2. High density wood (800 kg/m^3 and more) i.e. jatoba, massaranduba, merbau generates smaller loss in weight than the kinds with lower density, they are also less flammable.
3. The biggest loss in weight was generated by teaku wood – 7,5%. Moreover, it turned out to be the most quickly flammable from among the tested kinds of wood – free combustion occurred already after 105 seconds of direct flame action and next to ipe wood - 60%, it had the highest percentage of surface charring. Teak as the only wood kind had 15 cm flame indicating the completion of research on the given sample.
4. Iroko as the lightest kind – 565 kg/m^3 – indicated one of the highest percentage of sample charring and 3,4 % of loss in weight.
5. In accordance with the standard PN – B – 02874:1996 - 8 from 10 tested wood kinds turned out to be flash-resistant materials, and 2 of them - teak and ipe are easily inflammable materials.

The presented research and the obtained results constitute only an attempt to define the inflammatory properties of exotic wood. In order to assign them to proper inflammability classes, one has to conduct specialist research based on legal standards and proper procedures.

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Streszczenie: *Badanie właściwości ogniochronnych wybranych gatunków drewna egzotycznego. Zastosowanie drewna w budynkach, jako element konstrukcyjny bądź wykończeniowy staje się coraz popularniejsze. W celu poznania właściwości ogniochronnych dziesięciu popularnych gatunków drewna egzotycznego zostały przeprowadzone badania, sprawdzające reakcję drewna na działanie bezpośredniego ognia zgodnie z normą PN-EN ISO 11925-2:2010. Po przeprowadzonych badaniach stwierdzono, iż wszystkie badane gatunki drewna egzotycznego spełniają powyższą normę i są odporne na działanie ognia.*

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