

## ROOM/CORNER TESTS OF WALL LININGS WITH 100/300 kW BURNER

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The primary objective of our joint U.S.-Slovak project is to develop an alternative system to assess reaction to fire of materials. The severity of an 100/300 kW program with materials on both walls and ceiling results in short and fairly close values in the times to flashover for building products with normal reaction to fire. In contrast, an 40/160 kW program with materials on wall only is insufficient to result in flashover for some materials. Some melting materials may only melt and shrink away from the flames during the 40 kW and leave insufficient material near the burner after the change to 160 kW to cause flashover. The test series conducted in this study indicate that more useful results are obtained by combining the two test protocols. The resulting protocol calls for the 100/300 kW burner program, but the test samples on walls only.

Twelve room/corner tests of common wall linings were conducted with gypsum-lined ceiling and exposure to a propane ignition burner at 100 kW for ten minutes (0 to 600 s) followed by 300 kW for ten minutes (600 to 1200 s). This burner program and Nordic burner is used in the Nordic countries (Kokkala 1993, Ostman 1993) and is in the ISO room test standard (ISO 9705). The burner was located in one of the rear corners. The enclosure is 2.44 m wide, 3.66 m deep, and 2.44 m high with a doorway (0.8 m wide and 2 m high) in the front wall. All products of combustion emerging through the doorway are collected in a hood and extracted via an exhaust duct. Heat and smoke release rate are measured continuously in the duct. The principal performance criterion is time to flashover.

All materials but the gypsum and fire-retardant-treated (FRT) polyurethane foam were wood products (Table 1). Materials used in tests 50, 53, 54 and 55 were left over from the ASTM Institute for Standards Research round robin (Beitel 1994). In that project, the 40 for five minutes/160 kW for ten minutes program and an ASTM burner were used with the materials on the walls only. Materials used in tests 51 and 52 were obtained from Forintek Canada Corp. which has a similar project with the National Research Council of Canada (NRCC). In the Forintek/NRCC project, all four possible combinations of the two burner programs and two test specimen configuration (three walls only, three walls and ceiling) are being evaluated (Sumathipala and others 1994). Materials for tests 56 to 62 are from a wood industry material bank for fire research. Some of these materials were tested previously using the 40 kW for five minutes (0 to 300 s), 160 kW for five minutes (300 to 600 s) burner program (Tran and Janssens 1991). The 40/160 kW data (Table 1) based on the 20 kW to the floor criterion are from the ISR round robin and the previous tests at the Forest Products Laboratory. Results based on different criteria for flashover are fairly consistent. Plans are to test six additional wood products between now and the spring of 1997.

In addition to the room tests, the project includes cone calorimeter tests and the development of fire growth models. Results for the first year (tests 50 to 55) are discussed in more details in a series of three papers presented at the 1995 Fire and Materials Conference (Dietenberger and others 1995, Grexa and others 1995, Janssens and others 1995). Funds for this "Room/Corner Test and Reaction to Fire of Wood and other Building Materials" project is being provided by the Slovak-U.S. Science Technology Program under project number 94072.

By using wall linings with gypsum-lined ceiling exposed to propane burning at 100 kW for ten minutes followed by 300 kW for 10 minutes, the room/corner tests of common materials indicate an effective differentiation of fire performance for the materials tested. Time to flashover of untreated plywood was less than 10 minutes, whereas that of FRT materials was greater than 10 minutes. Gypsum board did not flashover (NFO). Ranking of the untreated wood products was consistent with expectations.

Table 1. - Flashover times for tested materials.

Materials	Test No.	Density (kg/m <sup>3</sup> )	Thickness (mm)	Flashover times for 100/300 kW exposure (s)		Flashover times for 40/160 kW exposure (20 kW to floor) (s)
				Flames out door	1000 kW	
Gypsum	49, 55	755	16	NFO <sup>1</sup>	NFO	NFO
FRT Plywood "F"	52	600	12	895	882	-
FRT Plywood "A"	50	560	12	870	909	NFO
FRT Polyurethane foam	54	29	23	630	630	358
Douglas-fir plywood "M"	57	515	12	521	561	378
Redwood lumber	62	420	19	499	522	378
Douglas-fir plywood "A"	53	540	12	465	477	391
Southern pine plywood	58	605	11	320	330	348
Particleboard	59	790	13	242	282	342
Hardboard	61	1025	6	225	255	-
Oriented strand board	60	645	11	196	219	270
Oak veneer plywood	51	480	13	173	180	-

## References

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