

Window Pane Failure During Exterior Fire Exposure: Supplementary Information

Supplementary information. Tables that provide additional information about the experimental setup and results are presented in the sections below. Table [S1](#) contains the layout of the window pane assemblies for each experiment. The time relative to flashover, heat flux, and heat load at failure for the individual 1.8 m SD and 4.3 m SD experiments with fixed frames and the individual 3.0 m SD experiment with vinyl frames are presented in Tables [S2](#), [S3](#), and [S4](#), respectively. For the 1.8 m and 3.0 m SD experiments with fixed frames, single values are listed because only one type of each pane assembly was tested at each position. For the 3.0 m SD experiment with vinyl frames, the median and range (minimum, maximum) of the values are provided because two of each pane assembly type were tested at two of the four positions. The number of pane failures (N) is also listed in each table.

S.1 Experimental Configuration of Window Pane Assemblies

Table S1 Experimental Configuration of Window Pane Assemblies Mounted in the Target Facade

Frame Type	Separation Distance (m)	Sash	Left Side				Right Side			
			A	B	C	D	A	B	C	D
Fixed	3.0	Top	TT	PT	PP	TP	PT	TT	TP	PP
		Bottom	TP	PP	PT	TT	PP	TP	TT	PT
Fixed	3.0	Top	PP	TT	TP	PT	TT	PP	PT	TP
		Bottom	PT	TP	TT	PP	TP	PT	PP	TT
Fixed	3.0	Top	TP	PP	PT	TT	PP	TP	TT	PT
		Bottom	TT	PT	PP	TP	PT	TT	TP	PP
Fixed	3.0	Top	PT	TP	TT	PP	TP	PT	PP	TT
		Bottom	PP	TT	TP	PT	TT	PP	PT	TP
Fixed	3.0	Top	PP	TP	PT	TT	TP	PP	TT	PT
		Bottom	PT	TT	PP	TP	TT	PT	TP	PP
Fixed	1.8	Top	PP	TP	PT	TT	TT	PT	TP	PP
		Bottom	PT	TT	PP	TP	TP	PP	TT	PT
Fixed	4.3	Top	TP	TT	PP	PT	PT	PP	TT	TP
		Bottom	TT	TP	PT	PP	PP	PT	TP	TT
Vinyl	3.0	Top	TT	PT	PP	TP	PT	TT	TP	PP
		Bottom	TT	PT	PP	TP	PT	TT	TP	PP

PP = plain glass fire side, plain glass back side
PT = plain glass fire side, tempered glass back side
TP = tempered glass fire side, plain glass back side
TT = tempered glass fire side, tempered glass back side

S.2 Time, Heat Flux, and Heat Load at Failure for Additional Experiments

Table S2 Number of Pane Failures (N) and Time Relative to Flashover, Heat Flux, and Heat Load at Failure from the Individual 1.8 m Separation Distance Experiment for the Fire Side and Back Side Panes of each Assembly Type at each Window Position

Fire Side Pane					
Window Position	Pane Assembly	N	Time of Failure (s)	Heat Flux at Failure (kW/m ²)	Heat Load at Failure (MJ/m ²)
A	PP	1/1	3	77.2	1.19
	PT	1/1	2	60.5	1.05
	TP	1/1	19	94.3	2.97
	TT	1/1	23	99.8	3.61
B	PP	1/1	-7	50.5	1.04
	PT	1/1	-4	73.8	1.32
	TP	1/1	17	126.0	3.67
	TT	1/1	16	116.8	3.30
C	PP	1/1	16	56.1	1.47
	PT	1/1	4	56.5	1.01
	TP	1/1	65	72.5	6.04
	TT	1/1	54	74.6	4.52
D	PP	1/1	-9	37.8	0.81
	PT	1/1	1	53.3	1.13
	TP	1/1	35	100.1	4.16
	TT	1/1	30	105.3	4.22
Back Side Pane					
Window Position	Pane Assembly	N	Time of Failure (s)	Heat Flux at Failure (kW/m ²)	Heat Load at Failure (MJ/m ²)
A	PP	1/1	56	82.4	5.75
	PT	1/1	80	85.9	7.09
	TP	1/1	35	87.3	4.40
	TT	1/1	169	94.3	17.64
B	PP	1/1	12	130.5	3.15
	PT	1/1	80	138.3	11.97
	TP	1/1	13	119.4	3.15
	TT	1/1	65	111.3	9.02
C	PP	1/1	87	74.2	6.05
	PT	1/1	233	81.9	17.20
	TP	1/1	76	80.2	6.93
	TT	0/1	—	—	—
D	PP	1/1	38	115.0	5.54
	PT	1/1	173	106.8	18.78
	TP	1/1	35	100.4	4.16
	TT	1/1	146	99.9	16.56

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Table S3 Number of Pane Failures (N) and Time Relative to Flashover, Heat Flux, and Heat Load at Failure from the Individual 4.3 m Separation Distance Experiment for the Fire Side and Back Side Panes of each Assembly Type at each Window Position

Fire Side Pane					
Window Position	Pane Assembly	N	Time of Failure (s)	Heat Flux at Failure (kW/m ²)	Heat Load at Failure (MJ/m ²)
A	PP	1/1	11	23.6	0.69
	PT	1/1	44	19.9	1.42
	TP	0/1	—	—	—
	TT	0/1	—	—	—
B	PP	1/1	28	24.9	1.16
	PT	1/1	15	23.7	0.85
	TP	1/1	260	29.3	7.95
	TT	0/1	—	—	—
C	PP	1/1	52	21.8	1.31
	PT	1/1	45	17.3	1.16
	TP	1/1	430	29.0	12.07
	TT	0/1	—	—	—
D	PP	1/1	18	24.5	0.84
	PT	1/1	23	19.6	0.95
	TP	0/1	—	—	—
	TT	0/1	—	—	—
Back Side Pane					
Window Position	Pane Assembly	N	Time of Failure (s)	Heat Flux at Failure (kW/m ²)	Heat Load at Failure (MJ/m ²)
A	PP	1/1	166	22.8	4.65
	PT	0/1	—	—	—
	TP	1/1	310	29.0	7.52
	TT	0/1	—	—	—
B	PP	1/1	136	26.5	4.38
	PT	0/1	—	—	—
	TP	1/1	165	31.9	4.96
	TT	0/1	—	—	—
C	PP	1/1	200	23.5	4.97
	PT	0/1	—	—	—
	TP	1/1	269	28.1	7.24
	TT	0/1	—	—	—
D	PP	1/1	160	31.0	4.79
	PT	0/1	—	—	—
	TP	1/1	213	31.6	6.78
	TT	0/1	—	—	—

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Table S4 Number of Pane Failures (N) and Median and Range (Minimum, Maximum) of Time Relative to Flashover, Heat Flux, and Heat Load at Failure from the Individual 3.0 m Separation Distance Experiment with Vinyl Frames for the Fire Side and Back Side Panes of each Assembly Type at each Window Position

Fire Side Pane					
Window Position	Pane Assembly	N	Time of Failure (s)	Heat Flux at Failure (kW/m ²)	Heat Load at Failure (MJ/m ²)
A	PP	—	—	—	—
	PT	2/2	16 (14, 19)	35.3 (33.4, 37.3)	1.12 (1.03, 1.20)
	TP	—	—	—	—
	TT	2/2	137 (126, 148)	51.1 (50.7, 51.5)	7.07 (6.66, 7.48)
B	PP	—	—	—	—
	PT	2/2	10 (9, 10)	52.9 (50.8, 55.0)	1.23 (1.22, 1.25)
	TP	—	—	—	—
	TT	2/2	158 (143, 172)	57.9 (57.6, 58.3)	8.76 (7.92, 9.61)
C	PP	2/2	16 (16, 16)	34.8 (32.7, 36.9)	1.08 (1.02, 1.14)
	PT	—	—	—	—
	TP	2/2	209 (204, 214)	52.0 (50.1, 54.0)	8.94 (8.26, 9.62)
	TT	—	—	—	—
D	PP	2/2	15 (14, 16)	39.0 (36.6, 41.5)	1.17 (1.16, 1.19)
	PT	—	—	—	—
	TP	2/2	185 (173, 197)	64.3 (47.8, 80.9)	9.86 (8.64, 11.08)
	TT	—	—	—	—
Back Side Pane					
Window Position	Pane Assembly	N	Time of Failure (s)	Heat Flux at Failure (kW/m ²)	Heat Load at Failure (MJ/m ²)
A	PP	—	—	—	—
	PT	2/2	263 (263, 263)	34.3 (32.8, 35.8)	12.64 (12.49, 12.79)
	TP	—	—	—	—
	TT	2/2	211 (203, 219)	58.7 (57.7, 59.6)	11.25 (11.01, 11.49)
B	PP	—	—	—	—
	PT	2/2	200 (179, 221)	81.9 (80.3, 83.4)	12.69 (11.14, 14.24)
	TP	—	—	—	—
	TT	2/2	189 (188, 190)	84.2 (83.6, 84.8)	10.90 (10.79, 11.01)
C	PP	2/2	112 (102, 123)	42.8 (41.2, 44.3)	4.89 (4.68, 5.10)
	PT	—	—	—	—
	TP	2/2	136 (132, 141)	40.6 (40.1, 41.1)	5.63 (5.58, 5.68)
	TT	—	—	—	—
D	PP	2/2	88 (71, 104)	50.0 (49.3, 50.7)	4.47 (3.82, 5.11)
	PT	—	—	—	—
	TP	2/2	104 (104, 105)	52.7 (50.4, 54.9)	5.38 (5.14, 5.63)
	TT	—	—	—	—

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