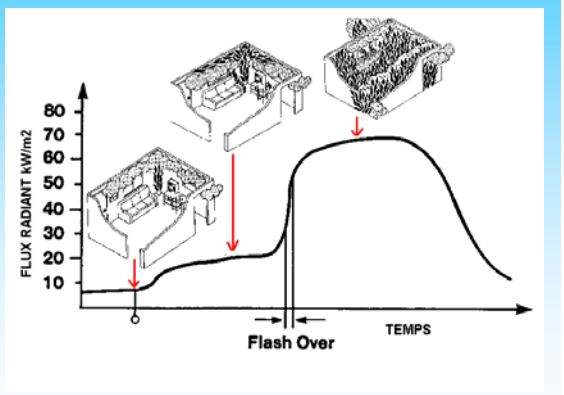
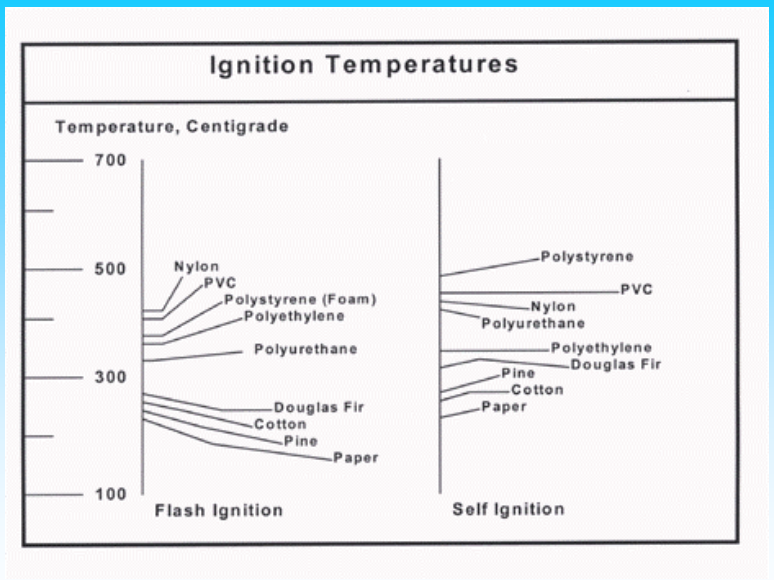
PVC en brand

Fire development scenario

- Ignition of a flammable material
- Release of heat → ignite other materials
- Propagation of fire by gases, droplets
  - Importance of delay for intervention

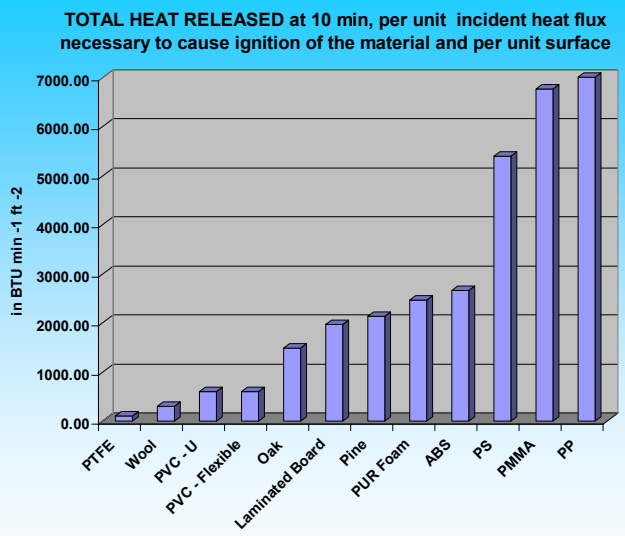




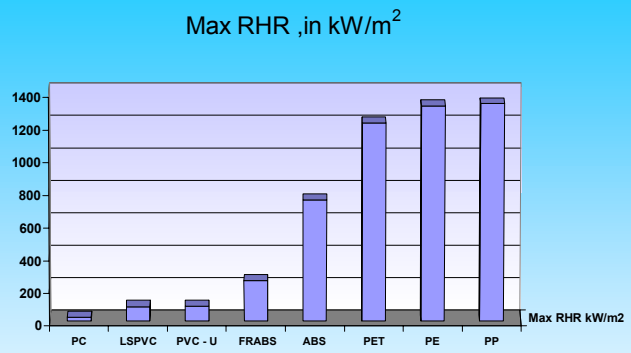
Gross Heat Release Rate (PCS) of some Materials (MJ/kg)

Coal	21 to 32.6
Oil	42 to 46
Natural Gas	52
Dry Wood	17 to 19
Wool	20
Paper/ Cardboard	15.5 to 18.5

PE	46
PS	41
PVC - U	8.4 to 18.5
PVC - Soft	4.2 to 27.2
PET	18.8 to 30.1
PA	19 to 37



- "A burning material will only spread a fire to adjacent materials if it releases sufficient heat to ignite this material"
- Total Heat Released and maximum Rate of Heat Release for a material are extremely important variables to consider when determining the fire hazards for materials



From Ohio State University: rate of heat release calorimeter OSU-RHR, it is obvious that PVC is less likely to ignite other adjacent items than most other materials

Some Hints on Fire …& PVC

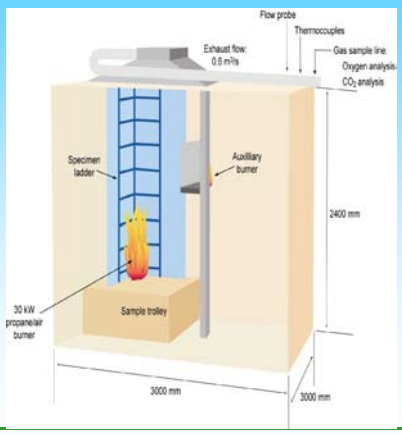
- "If a material doesn't ignite, it will not endanger lives and goods or contribute to an increased fire hazard"

PVC is among the least easily ignitable polymers

- PVC is one of the least flammable polymeric materials and one of those with the lowest flame spread rate

PVC will not continue burning unless a large, continuous heat source is applied to it, nor will it readily spread flame

SBI Test Pr EN ISO 13823



Ignition source :
100 % propane
200 X 200 right angled triangle
Input Heat : 30 kW
Test duration : 20 min
Total Heat Input : 36 MJ

Sample position : Vertical
1.5 length / m of non metallic component
1500 x 150
adjacent to bottom of sample

Single Burning Item or SBI test is connected with

Euroclasses A2, B, C and D

SBI test reproduces the reaction to fire of a product confronted with an ignited insulated object.

The test specimen of big size (1.5 m height) consists of two contiguous rectangular walls laid out in right angle.

It allows to evaluate, measure or calculate :

- Rate of heat release (RHR)
- Total heat release (THR)
- Smoke density
- Ignitability
- Flame spread
- Dripping effect

SBI Tests on PVC & PP Pipes, pre-normative Tests

according to Pr EN ISO 13823

Pipes Samples	FIGRA , in W/s	THR 600s , in MJ	LFS	SMOGRA , in m^2/s^2	TSP 600s , in m2	Classification
1 pipe PVC M1 OD 110 mm - 4 collars under spigot + 1 collector H OD : 40 mm	16	1.7	NO	9.1	96	B - S 3 - D 0
1 pipe PP FR OD 110 mm - 4 collars under spigot + 1 collector H OD : 40 mm	627	41	Yes	47	393	D - S 3 - D 2
2 pipes PVC M1 OD 110 mm - 4 collars under spigot + 1 collector H OD : 40 mm	58.8	5.8	NO	85	933	B - S 3 - D0
2 pipes PP FR OD 110 mm - 4 collars under spigot + 1 collector H OD : 40 mm	>1000	>25	NO	> 100	> 280	E
	stopped & extinguished after 4 min 30 s because of too dense fire					

FIGRA Fire Growth Rate Heat Release/ time (duration of the test)
THR 600s Total Heat Release after 600s testing
LFS Lateral Flame Spread
SMOGRA Smoke Growth Rate Smoke Release/time (duration of the test)
TSP 600s Total Smoke Production after 600s testing

Smoke Generation

Test at the NBS Smoke Chamber : samples in vertical configuration + measurement of smoke density via light obscuration

Note : in vertical exposition to flames some materials melt or drip and do not burn completely

resulting smoke measurements will be artificially low in comparison with other materials that do not melt or drip

PVC neither forms flaming drips nor melts away from the source of heat

	LOI	NBS Smoke Vertical, in Dm/g		BF Goodrich Test	
		NF	F	Smoke index	Char index
PVC 1	28	12	23.1	624	41.9
PVC 2	42	15	42.6	477	35.4
PVC 3	27	16.7	20.3	459	48.2
PVC 4	34	12.9	29.3	340	50.2
PVC 5	49	24.5	24.2	106	30
XLPE - 1	21	20.5	11.1	2069	0
XLPE - 2	28	29.8	4.1	505	46.3
XLPE - 3	24	34.9	12	751	48.2
XLPE - 4	24	36	10.1	642	35.5
XLPE - 5	42	8.2	8.5	118	70.9