FORO IBÉRICO

El PVC and Fire

Dear Sir,

I am writing to you on behalf of the Iberian PVC Forum, an association integrated in the Spanish Confederation of Plastics Entrepreneurs (ANAIP), which represents the PVC industry in the Iberian Peninsula.

In response to your inquiry, first of all, let me inform you about the excellent fire behavior of PVC.

- PVC is a **FLAME-RETARDANT** and **SELF-EXTINGUISHING** material.

Thanks to the presence of the element chlorine in its molecule, which represents more than half of its weight, PVC only combusts at a temperature between 330 and 400 degrees Celsius. (comparatively, wood burns between 210 and 270 degrees Celsius.). It is therefore a naturally flame-retardant material, a property that makes it particularly suitable for construction use.

Most PVC products are hardly flammable. As indicated above, very high temperatures and a constant application of the heat source on the material itself are necessary for it to start burning.

When the temperatures to which it is subjected are not high enough to cause it to burn, PVC softens (like all thermoplastics) but never leaks. This characteristic is very important when assessing the fire's ability to spread.

In addition, PVC is a self-extinguishing material. This means that as soon as the heat source is removed, PVC stops burning. This feature also contributes to the fact that PVC's fire behavior is better than that of alternative materia

- PVC is a **NON FLAME PROPAGATIVE** material with a **VERY LOW HEAT RELEASE SPEED**.

The UL94V Laboratory vertical flame spread test is widely accepted, and PVC compounds generally achieve a high rating (94V.0). As a general rule, PVC compounds have a flame spread speed of less than 50mm per minute.

Another important measure of a material's potential contribution to fire spread is the heat released in the first three minutes after ignition. Also, PVC performs splendidly, with a much lower heat release than other fireproofed or non-fireproofed materials, like wood.

These inherent properties of the material have led PVC products to obtain the following classifications according to the different European and world standards and test standards:

Country	**Test method**	**Classification**
France	NF P92-501	M1
Germany	DIN 4102-1	B1
United Kingdom	BS 476-6 i -7	Class 1
Italy	CSE RF3	Class 1
USA	ASTM E84	Class 1
Europe	*EN 13501-1*	*Euroclass B*

The different classifications obtained by PVC refer to products that are "*hardly flammable*".

Regarding your inquiry about dioxins and hydrochloric acid emitted from the combustion of PVC products, let me clarify certain concepts.

Dioxins exist in nature (volcanic eruptions, various fires). They can be formed during the combustion of mineral or organic chlorinated compounds in the presence of carbon, oxygen and hydrogen.

There are more than 200 different products commonly called "dioxins" of which only 17 have proven toxicity.

The combustion of PVC in an accidental fire does not produce more dioxins than the combustion of wood.

Professor CH. RAPPE, a world-renowned dioxin expert, specifically studied the case of the fire that occurred in Holmsund, Sweden, in a wood warehouse where 200 tons of PVC and 500 tons of PVC mats were burned. Professor Ch. RAPPE estimated the amount of dioxins formed in the soot at 3 mg, which represents approximately 7 micrograms of dioxins per ton of PVC, without taking into account the contribution of wood. Analysis of other fires confirms this position.[1]

In comparison, burning wood in an open fire produces between 13 and 18 micrograms of dioxins per ton, according to TNO.[2]

Measurements carried out after different fires involving PVC products have shown that the formation of these substances was limited to very low levels. These results were found in several cases in Germany: Herford (1985), Overath (1987) and Mülheim and Lengerich (1992).[3]

---

[1] *"Formation of dioxins and dibenzofurans during incineration and pyrolysis"*, Pr. Ch. RAPPE, S. MARKLUND y I. FAENGMARK, presentation given at" PVC 90", Brighton, UK, 24 April, 1990.
[2] *"Emissies van dioxinen in Nederland"*, H.J. BREMMER et coll., TNO/RIVM, nº 770501003 April 1993.
[3] Dr. G. Binder: *"Expériences d'incendies impliquant du PVC"*, AGPU, July 1993

Finally, if the conditions necessary for the combustion of PVC are met, it releases hydrogen chloride gas, not hydrochloric acid. This gas is not asphyxiating and is not narcotic in nature. However, it is irritating and detectable at a very low concentration, which also gives it the property of alertness. HCl is much less dangerous than carbon monoxide (CO), a gas produced by the incomplete combustion of most organic substances and which, being colorless and odorless, is lethal in small doses.

In the case at hand (garages in a shopping center), the amount of hydrogen chloride gas that can be released from the combustion of PVC pipes is nothing comparable to the toxic gases that emanate from the combustion of gasoline, car, floor and wall paints, tires and most of the other materials used in the construction of a parking lot.

The aforementioned arguments and contrasted by different independent international entities, as well as the intrinsic properties of the material, make PVC a suitable product for construction, since its qualities allow it to offer a high level of safety for human beings.

I hope these points will be useful to you, and I would like to enclose a booklet with general information on PVC, as well as a copy of the book that our association has just published on "PVC and fire".

Should you require any further information, please do not hesitate to contact the PVC Iberian Forum.

Sincerely,

Beatriz Meunier
General-Secretary
Iberian PVC Forum
Phone. 902 28 18 28
foropvc@anaip.es