pinfa
Phosphorus, Inorganic & Nitrogen Flame Retardants Association

Your newsletter for non-halogen fire safety solutions n° 152 September 2023

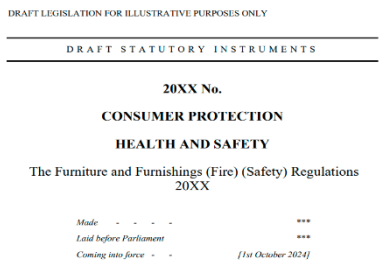
CONSULTATIONS AND CALLS

GOV.UK

Summary

We are seeking views on a proposed new approach to the fire safety of domestic upholstered furniture and furnishings.

This consultation closes at
11:59pm on 24 October 2023



DRAFT LEGISLATION FOR ILLUSTRATIVE PURPOSES ONLY

DRAFT STATUTORY INSTRUMENTS

20XX No.

CONSUMER PROTECTION

HEALTH AND SAFETY

The Furniture and Furnishings (Fire) (Safety) Regulations 20XX

Made - - - - ***
Laid before Parliament ***
Coming into force - - [1st October 2024]

UK consults on Furniture Fire Regulations

Public consultation on recast of UK's 1988 Furniture Fire Safety Regulations open to 24th October 2023. The consultation includes a draft regulatory text "to illustrate the approach".

The proposed new regulations would require (art. 12) the finished upholstered furniture item, and all (polyurethane) foam used in it, to both be resistant to an open flame and to smouldering ignition and also to be self-extinguishing or slow burning. A compulsory "Flame Retardant Technology Hierarchy" is defined (art. 14), requiring to assess practicability of using "inherently flame-retardant materials" and of adapting design rather than using "chemical flame retardants". Any FRs used (art. 11) must not (as present in the furniture) "jeopardise the safety of any consumer or other person". An obligatory label must indicate that "Carelessness causes fire", must specify that the furniture contains "chemical flame retardants" if this is the case, and must list all FRs used (the importance for end-of-life recycling of knowing which FRs are used, is noted). The scope of the Regulations is modified: for example, floor cushions and pet pads are now included, baby equipment is excluded, smaller items are excluded. Outdoor upholstered furniture is excluded, subject to being labelled "Do not use or store inside due to risk of fire". Reinforcement and supply chain responsibility are emphasised.

The Ministerial foreward states "The Government is clear that upholstered furniture placed on the market in the UK must be fire safe to protect consumers in their homes. The Furniture and Furnishings (Fire) (Safety) Regulations 1988 have reduced deaths by fire and are recognised and recommended internationally as a gold standard for furniture fire safety to this day".

The consultation introduction indicates "a new and more proportionate approach that is directly focused on risks, potential hazards, and harm, while ensuring accountability throughout the supply chain". It notes that "Manufacturers are already increasingly finding innovative ways to meet fire safety requirements. This includes developing new chemical flame retardants solutions which are mineral, phosphorus and nitrogen-based that, as yet, have no known hazards …".

The consultation document notes that naked flames still today represent the ignition source in 30% of fires where furniture is the first item ignited and in 9% of all domestic fires, but that smouldering ignition sources have developed, in particular ubiquitous electronics and batteries. It therefore concludes that both flame and smouldering ignition tests should be required. The document also notes that because polyurethane foam is a highly flammable and lethal in fire, and that fire barriers can be breached, foams themselves should be fire tested, as well as fire testing the finished furniture item.

The consultation is supported by publication by the Office for Product Safety and Standards of a report by consultants and academics which develops a "matrix", for different upholstered items and sizes, of fire risk against flame retardant exposure. This report cites four risk assessments of FRs in upholstered furniture stating "The starkly contrasting conclusions of these studies exemplifies the difficulty in evaluating the relative risks and benefits of CFR use in furniture."

pinfa notes several technical questions:

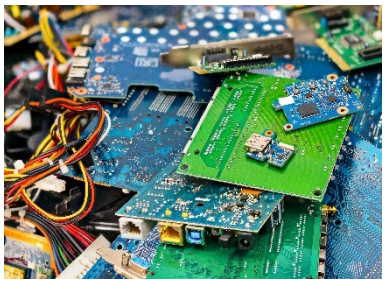
- Reactive and polymeric FRs: How will the "Flame Retardant Technology Hierarchy" implement the requirement to consider "inherently flame-retardant materials", for which the proposed definition (art. 7) is "A material which offers a level of flame resistance without the use of additional chemical additives or treatments". Does this authorise use of materials containing polymeric or reactive FRs?
- Why only polyurethane and latex foams? The current definition (art. 7) of "foam" covers only polyurethane and latex foams. The specific fire testing requirements for foams (as naked foam, not as in the final product) would thus not apply to any other polymer foam.
- Enforcement for imported furniture. How will testing requirements and documents be ensured for importers (e.g. respect of the "Flame Retardant Technology Hierarchy", list of FRs in an item of furniture)? In 2014, BBC "Fake Britain" showed that furniture and mattresses sold by leading UK retailers (Tesco Direct, Argos, Amazon, Homebase, SCS, Harveys) badly failed UK furniture fire safety regulations (pinfa Newsletter n°41).

pinfa:

- **Fully supports the overall approach of the proposed new Regulations, but clarifications will be needed to ensure feasible applicability by manufacturers and retailers**
- **Welcomes the strong commitment to a high level of furniture fire safety and the recognition of the effectiveness in saving lives of the 1988 UK Furniture Fire Safety Regulations.**
- **Notes the recognition that flame retardants can be effective in preventing and slowing fires**
- **Supports that FRs should only be used where appropriate**
- **Supports that only FRs which are safe as used should be authorised**
- **Recommends to modify the label wording from "contains chemical flame retardants" to "contains flame retardants to reduce fire risk".**
- **Underlines that need for better enforcement and to ensure that imported furniture fully respects fire safety specifications and FR documentation**

UK public consultation on recast of the 1988 Furniture Fire Safety Regulations, open to 24th October 2023 (midnight, UK time). "Smarter Regulation: Fire safety of domestic upholstered furniture". Includes: public consultation document (19 questions), Impact Assessment, draft regulations ("Draft legislation for illustrative purposes only". https://www.gov.uk/government/consultations/smarter-regulation-fire-safety-of-domestic-upholstered-furniture

Research Report for the UK Office for Product Safety and Standards, April 2023, contributors Nia Bell, Oakdene Hollins Ltd, Stuart Harrad, University of Birmingham, T Richard Hull, University of Central Lancashire, Paul Whaley, Whaley Research, 114 pages. "Fire risks of upholstered products" https://www.gov.uk/government/publications/fire-risks-of-upholstered-products



Public consultation on WEEE Directive

Questionnaire to evaluate EU WEEE Directive effectiveness, impacts, links to other EU legislation and standards. This is part of the evaluation process of the 2012 Directive on Waste Electrical and Electronic Equipment. Questions target relevant industries, waste operators and the general public and centre on collection, recycling and material recovery. Chemicals are not mentioned.

EU public consultation open to 22nd September 2023. 47 questions plus possibility to submit document. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13420-Waste-from-electrical-and-electronic-equipment-evaluating-the-EU-rules_en

PINFA-NA ELECTRIC VEHICLES FREE WEBINAR

Automobile expert on EV developments

Alan Amici, Center for Automotive Research (CAR), will discuss production forecasts and R&D needs for electric vehicles. With 35 billion US$ committed by industry to EV assembly and battery production alone, the transition to electric vehicles will be the biggest change ever in the automotive industry. This free webinar will discuss production forecasts, research needs, digital engineering and legal policies.

"The EV Transition Begins", free pinfa-na webinar with Alan Amici, Center for Automotive Research (CAR), September 28th 2023 11h30-12h30 EST (18h30-19h30 CEST). https://www.pinfa-na.org/electronicvehicles

FULL-SCALE HOUSE BURN VIDEO

House burn reaches ¾ million viewers

TV New Zealand with fire services broadcast full-scale furnished house burn trial showing how a scooter battery fire becomes unsurvivable after three minutes. A derelict house was repaired as necessary and furnished. An electric scooter lithium-ion battery was short circuited to catch fire, placed near a sofa and a small basket of clothes in the house living room. Within 30 seconds the fire is past the time you could control it yourself. At 1'30'' the couch is ingulfed in fire, igniting curtains at the other side of the room, with flashover at around 2'30''. To show the "inferno" of heat, firefighters show a bunch of plastic flowers at the door of the room being instantly incinerated. By 4 minutes the whole house is full of unsurvivable smoke, including rooms at the other side of the house, and by 4'30''the whole house is engulfed in fire whereas the fire service arrive at around 7 minutes. By 20 minutes the house is totally destroyed.

Commentators underline the impact of window and door frames melting, windows breaking, and the dangers of the black smoke, which includes toxic and narcotic chemicals which inhibit escape, and which causes disorientation. The speed of fire spread is repeatedly visible and underlined by the firefighters and commentators, with the need for multiple escape routes and smoke alarms in every room.

"Live house burn broadcast demonstrates fire's rapid escalation", International Fire Safety Journal
https://internationalfireandsafetyjournal.com/live-house-burn-broadcast-demonstrates-fires-rapid-escalation/

"Live on TV house burn reaches 700,000 to show the speed and danger of fire", Fire & Emergency New Zealand
https://www.fireandemergency.nz/incidents-and-news/news-and-media/live-on-tv-house-burn-reaches-700000-to-show-the-speed-and-danger-of-fire/

NZTV (New Zealand TV) Seven Sharp, 15th August 2023, TV audience of 700 000, already 50 000 view on YouTube. Photos from video YouTube NZTV Seven Sharp.

Watch the video:
https://www.facebook.com/sevensharp/videos/844161003587032/
(fire from 2 – 15 minutes)

POLICY AND REGULATION

Regeringskansliet

Sweden E&E "ecotax" update

Updated Swedish ecotax covers all halogenated and phosphorus FRs with a 50% reduction for non-halogenated. The tax covers electrical and electronic goods sold in Sweden (but online sales escape the tax). From 1st July 2023, the tax is modified. Simplified, a 95% tax reduction will be applied if the product does not contain chlorine, bromine or phosphorus, and a 50% reduction if it does not contain bromine or chlorine (but does contain phosphorus), whether these elements are in flame retardants or in other chemicals or polymers. The currently applicable differential treatment for reactive FRs and the annex list of FRs will be deleted from July 2023, because considered unworkable. The tax will also be slightly increased to 12 SEK/kg (white goods) or 181 SEK/kg (other electronics), capped at 497 SEK/item (c. 43€). The tax has been much criticised (see pinfa Newsletter n°131) as failing to promote preferable PIN FRs.

Sweden State summary in English here (not up to date). KPMG summary of changes from July 2023 here.

Carcinogenicity of chlorinated FR TCPP

US National Toxicology Programme concludes evidence of carcinogenic activity of the halogenated FR TCPP = Tris(chloropropyl) phosphate. The 240-page report presents results of four long-duration (3 month, 2 year) studies of rats and mice, concluding that there was some evidence of carcinogenetic activity of TCPP in male rate and male mice (liver and kidney), some evidence for female rats (uterine) and clear evidence in female mice (liver). A five day oral dose study in male rats showed upregulation of 122 genes in the liver and 20 genes in the kidney. One study showed no mutagenic activity in mice. The report refers to US EPA and OPPT (Environmental Protection Agency, Office of Pollution Prevention and Toxics) conclusion that TCPP is not bioaccumulative but that association with particles in air can increase environmental persistence and that population exposure is expected by vapour inhalation and skin contact with consumer products containing TCPP in offices, homes and indoor environments. Studies show that TCPP can decompose to organo-chlorinated metabolites. pinfa expects that this new evidence of carcinogenicity of this halogenated FR will accelerate regulation to restrict its use. Indeed, Denmark has updated (August 2023) the REACH art. 48 Evaluation Conclusion (Corap) for TCPP recommending identification as SVHC (Substance of Very High Concern) and Harmonised Classification and Labelling and restrictions.

"NTP Technical Report on the Toxicology and Carcinogenesis Studies of an Isomeric Mixture of Tris(chloropropyl) Phosphate Administered in Feed to Sprague Dawley (Hsd:Sprague Dawley® SD®) Rats and B6C3F1/N Mice", Technical Report 602, U.S. Department of Health and Human Services, National Toxicology Program, June 2023
https://ntp.niehs.nih.gov/sites/default/files/2023-06/tr602_508.pdf

"Substance Evaluation Conclusion" report on reaction products of phosphoryl trichloride and 2-methyloxirane (TCPP), Danish Ministry of the Environment, August 2023.

Joint letter for EU holistic fire safety

18 industry, technical and science organisations call for structural coordination of EU initiatives on fire safety of buildings in a letter to the European Commission led by the European Sire Safety Alliance and signed by pinfa. The new fire risks of innovative materials, green buildings, renewable energy systems and electric vehicle charges are underlined, indicating that updated and appropriate fire safety standards are essential for deployment of solutions to decarbonise the built environment. The letter calls for coordination of existing EU initiatives: energy Performance of Buildings Directive, Construction Products Regulation, Fire Information and Exchange Platform, R&D funding, Civil Protection Mechanism.

Joint letter to the European Commission, 12th June 2023.

Clarification CPR fire resistance Annexes

Proposed consolidation, tidying and update of EU Construction Products Regulation fire resistance classes. The European Commission's proposed Delegated Act would replace fire classification specifications for a number of construction products, with the aims of consolidating and clarifying various already-validated updates, improving terminology (Resistance, Integrity, Insulation, Stability....) and defining new fire resistance classes for specific elements. Products concerned include fire-resistant cables, fire protective coatings and claddings, wall and ceiling coverings, partitions, roofs, certain façade walls, penetration seals, smoke control and fire resistant doors, ducts and grilles, fire dampers, smoke barriers, smoke ventilators.

EU public consultation closed 3rd August 2023

Orientations for EU Ecodesign

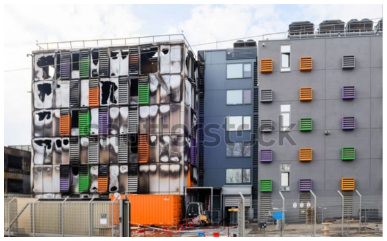
Questionnaires will input to EU Ecodesign criteria for cooking equipment and imaging equipment (i.e. printers). Both questionnaires address energy efficiency, durability and repairability and do not address fire safety, nor chemicals. These seems to be the direction of EU Ecodesign criteria: the new criteria for tablets and smartphones (published 16th June 2023) which include no chemical requirements other than labelling of polymer types on parts and information on content of four Critical Raw Materials (cobalt, tantalum, neodymium, gold).

EU public consultation closed 15th August 2023 on "Environmental image of imaging equipment, including printers"

EU public consultation closed 31st August 2023 on "Cooking appliances – ecodesign requirements"

Directive laying down ecodesign criteria for smartphones, mobile phones, cordless phones and slate tablets, C(2023) 3538, 16th June 2023 https://single-market-economy.ec.europa.eu/system/files/2023-06/C_2023_3538_1_EN_ACT_part1_v6.pdf

FIRE SAFETY



Data centre fires a "significant threat"

Digital infrastructure specialists DgtlInfra explains data centre fire risks, consequences and causes, with 19 examples of major data centre fires over the last decade. Outages of data centres can cost 500 000 US$/hour, and can also take out local community internet access, data loss, as well as loss of expensive installations. Data centres contain electronic equipment, data and power cables, cabinets, insulation, UPS (uninterruptable power supply) batteries, storage material, furniture, all of which include potentially flammable materials, and fires can be caused by overheating, electrical failures, power surges or failure and thermal runaway of batteries, or human error. The fire which totally destroyed the Maxnod data centre fire, France, 2022 (making your pinfa Newsletter author's email inaccessible for nearly a week), was caused by batteries of the site's solar PV panels. Other examples summarised, with photos, involved companies including Google, Apple, BT, Samsung, Comcast, OVH (photo), AT&T …

"Data Center Fires: A Detailed Breakdown with 19 Examples", M. Zhang, DgtlInfra, 25th May 2023 https://dgtlinfra.com/data-center-fires/

Car transport ship fires

The "Fremantle Highway" car transport ship fire is raising questions about electric vehicle (EV) transport safety. The ship, chartered by K Line Japan, owned by Shoei Kison Japan, registered in Panama, with an Indian crew of 21, caught fire off the Netherlands island of Ameland on 25th July and burned for a week, before being successfully towed to port avoiding potential pollution. The ship was transporting 3 783 cars of which 498 were EVs. Media have reported an emergency responder saying that the fire started in an EV and that an EV exploded but this is not confirmed. The fire has led to experts from the IMO (International Maritime Organisation), shipowners federations and insurers and suggesting that tighter regulations may be needed for EVs on car transport ships where isolating or safely accessing a burning vehicle is impossible. The Fremantle Highway fire follows the Grande Costa d'Avorio fire, New Jersey, 5th July (no EVs on board) and the Felicity Ace fire, Azores, 18th February (involving EVs).

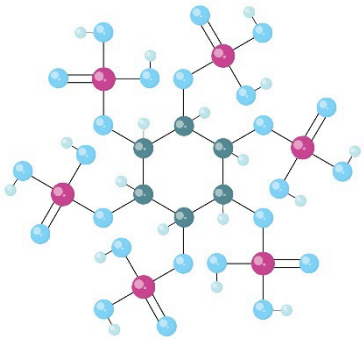
"Ocean shippers playing catch up to electric vehicle fire risk", Reuters, 27 July 2023 https://www.reuters.com/world/us/two-firefighters-killed-battling-cargo-ship-fire-new-jersey-port-abc-2023-07-06/

Siemens white paper on EV garage fires

Specific new fire risks of electric vehicles require new approaches to prevention, detection and extinction. Garage parking fires cited include Liverpool UK 2017 and Stavanger Norway 2020. These fires showed that fire can spread to an additional vehicle every 30 seconds and led to destruction of hundreds of vehicles and of the building. Fires in EVs in garages can result from battery failures or short-circuits during charging. At temperatures above 70°C the highly-flammable electrolyte in EV batteries starts to evaporate and, if it escapes from the battery cell, can ignite or explode. EV fires pose particular problems because batteries can reignite. Fire fighter vehicles are often too high to access garage buildings. Siemens underlines the need to update safety standards for garages housing increasing numbers of EVs and to deploy new fire detection technologies and rapid fire suppression systems.

"Fire safety in parking garages with electric vehicles", White Paper, Siemens and Danfoss Fire Security, 2023, International Fire Safety Journal 11/8/2023 https://internationalfireandsafetyjournal.com/siemens-unveils-new-whitepaper-on-fire-safety-in-parking-garages-with-electric-vehicles/

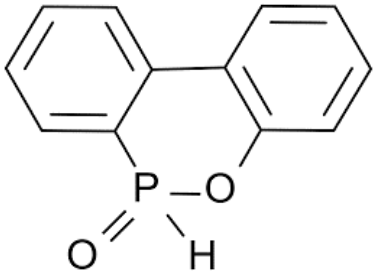
RESEARCH AND INNOVATION



Phytic acid based PIN FR for PVA

Bio-based phosphorus flame retardant achieves UL 94 V-0 in polyvinyl alcohol with good mechanical and UV performance. The bio-based PIN FR was produced by reacting phytic acid (phosphorus-rich and widely available in plant seeds) and ethylenediamine at room temperature (both dissolved in ethanol, 3:1 ratio). With 15% loading of the PIN FR, PVA achieved UL 94 V-0 (0.5 mm) with no burning dripping, versus Non Rated for neat PVA. LOI was increased by c. 50% and peak heat release rate decreased by nearly 70%. Tensile strength and elongation at break of PVA-15%FR were not significantly different from neat PVA (both are actually improved at 5% FR), probably because of hydrogen bonding between PVA and the PIN FR. 15% PIN FR also decreases UV transmission by 20-45% (in 0.1 mm film). Despite the PIN FR being bio-based, tests suggest some cytotoxicity of the PVA-FR composites, compared to neat PVA or to control.

"Design of a bio-based flame retardant for polyvinyl alcohol with superior flame retardant, mechanical and UV-blocking properties", C. Wang et al., J. Polymer Research (2023) 30:228, https://doi.org/10.1007/s10965-023-03611-y



DOPO coating of polyamide fibres

Phosphorus PIN FR DOPO was coated on PA6 textile achieving vertical burn self-extinguishing and wash semi-durable. DOPO cannot be compounded into polyamide because it is not stable at the polymer extrusion temperature. In this study, PA6 fabric (113 g/m^2) was coated by dipping in a water – ethanol solution of DOPO (adjusted to pH 4.5) at 80°C for one hour, then curing at 140°C for five minutes, then washing in water. With a phosphorus content of 0.1% - 0.2%, up to 21% reduction in peak heat release rate was achieved and self-extinguishing in vertical burn test. However, with higher DOPO loading, melt-dripping occurred, resulting in failure of the vertical burn test, possibly because DOPO increases melt fluidity. The coated fabric retained vertical burn test performance after 15 wash cycles, probably because of hydrogen bonding between DOPO and PA6, but lost this after 20 cycles.

"Preparation of durable coating for polyamide 6: analysis the role of DOPO on flame retardancy, anti-dripping and combustion behavior", W-J. Jin et al., Polymer Degradation and Stability, vol. 215, Sept. 2023, 110418
https://doi.org/10.1016/j.polymdegradstab.2023.110418

Pathway to sustainable PIN FRs

Review suggests that AI could enable design of cost-effective and safe new PIN FRs and underlines need for LCA. The review notes that PIN FRs are recognised as more environmentally friendly than halogenated FRs but that for some PIN FR types more data is needed to avoid persistency and toxicity issues. Machine learning has been applied to design of gas membranes and plastic depolymerisation and could be used for PIN FR design if more data was available concerning heat release and steric effects of chemical groups in different PIN FR – polymer matrices. In particular, FR development must target efficiency with low loadings in polymers, to reduce cost and impacts on polymer properties. Further data is also needed on persistence and toxicity of breakdown products. Bio-sourced materials, such as cellulose, phytic acid, chitin can potentially provide bio-sourced C, P and N, so improving PIN FR Life Cycle Analysis. LCA should also take into account end-of-life (recycling) and impacts on smoke toxicity.

"Rethinking the pathway to sustainable fire retardants", J. Feng et al., Exploration 2023;3:20220088, https://doi.org/10.1002/EXP.20220088

PUBLISHER INFORMATION

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