2022

pinfa Advisory Board

Thirteenth Meeting

Thursday, 13th December 2022
09:00 – 11:15 CET
HYBRID

pinfa

Contents of this report

pinfa Advisory Board Meeting Participants

External representatives

Krzysztof Biskup, European Fire Safety Alliance
Hervé Feuchter, Crepim
Peter Fisk, Green Chemical Design
Frank Kuebart, eco-INSTITUT
Thomas Mayer-Gall, Deutsches Textilforschungszentrum Nord-West DTNW
Margaret McNamee, Lund University
Christian Panofen, Huber
Rudolf Pfaender, Fraunhofer Institute for Structural Durability and System Reliability LBF
Franck Poutch, Crepim
Spencer Salek, Kingfisher
Arne Schirp, Fraunhofer Institute for Wood Research WKI
Heiko Tebbe, Lanxess
Laurent Tribut, Schneider Electric

pinfa Representatives

Adrian Beard, Chairman
Esther Agyeman-Budu, Sector Group Manager
Francesca Filippini, Sector Group Manager
Thomas Futterer, Vice Chair
Vincent Mans, Technical Advisor

External moderators

Simon Levitt, Moderator, Harwood Levitt Consulting
Veronica Corsi, Assistant moderator, Harwood Levitt Consulting
Ginevra Sponzilli, Assistant moderator, Harwood Levitt Consulting

The pinfa Advisory Board Meetings

Purpose of the pinfa Advisory Board meetings

A Sector Group of Cefic, the European Chemical Industry Council, pinfa is the Phosphorus, Inorganic and Nitrogen Flame Retardants Association. We represent the manufacturers and downstream users of non-halogenated phosphorus, inorganic and nitrogen flame retardants (PIN FRs).

United by a commitment to improving the environmental, health, and safety profiles of FR products, we constantly seek to foster dialogue between the FR and the fire safety and the environmental fields. Bringing together a diverse group of stakeholders, including FR manufacturers and downstream users, academics, and experts from testing and research institutes, our Advisory Board meetings provide a venue for engaging with world-leading experts in these areas and sharing ideas and activities.

The meetings of the Advisory Board take place on a biannual basis. The meetings do not have fixed participation, and attendees are encouraged to extend the invitation to relevant stakeholders. This report does not capture the contents of the previous meetings. The latter is recorded in a separate document, available here.

Competition, compliance and confidentiality

The meetings of the Advisory Board are held in strict compliance with EU and international antitrust laws, as well as Cefic dos and don'ts.
The meetings of the Advisory Board follow the Chatham House Rule, whereby attendance and the contents of the discussions are reported, but the affiliation of each individual speaker is not revealed.

Sustainable and Fire Resilient Built Environment (SAFR-BE)

The focus of the first session was on the concepts of a Sustainable and Fire Resilient Built Environment (SAFR-BE) framework and how such holistic thinking can be implemented in building design to ensure that the built environment is safe as well as sustainable.
A presentation by project collaborator Margaret McNamee, Professor of Fire Safety Engineering at Lund University, was followed by a discussion.

Background

Over the past few years, there have been several major fire events that involved sustainability choices in buildings. Notable examples are the tragic Grenfell Tower fire in London, United Kingdom (involving combustible insulation), the Dietz & Watson cold storage warehouse in Delanco, New Jersey (involving photovoltaic panels and combustible insulation), and the energy storage system (ESS) explosion and fire in Surprise, Arizona. This has prompted changes and additions to regulations and standards around managing and mitigating fire risk associated with 'green' attributes of buildings. Additionally, there has been significant research into the environmental and other impacts of fire events, supported by the Fire Protection Research Foundation (FPRF) and the Society of Fire Pro (SFPE) Foundation among others.

Building on this work, Margaret McNamee, Brian Meacham, Håkan Frantzich, and Erik Kimblad have developed a Sustainable and Fire Resilient Built Environment (SAFR-BE) framework to support the creation of a safe as well as sustainable built environment. More detail on SAFR-BE is available in the recently published New Handbook of Fire and the Environment.

SAFR-BE: Key concepts

In 1987, the World Commission on Environment and Development (WCED), established by the United Nations (UN) in 1983, published a report entitled Our common future, which came to be known as the "Brundtland Report" after WCED chairwoman Gro Harlem Brundtland. The Brundtland Report defined sustainability as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.

In 1989, the Report was debated in the UN General Assembly, prompting the decision to organise a UN Conference on Environment and Development (UNCED) in 1992. A major outcome of UNCED was Agenda 21, which affirmed the integration of economic, social and environmental sustainability as different dimensions of sustainability that need to be considered together.

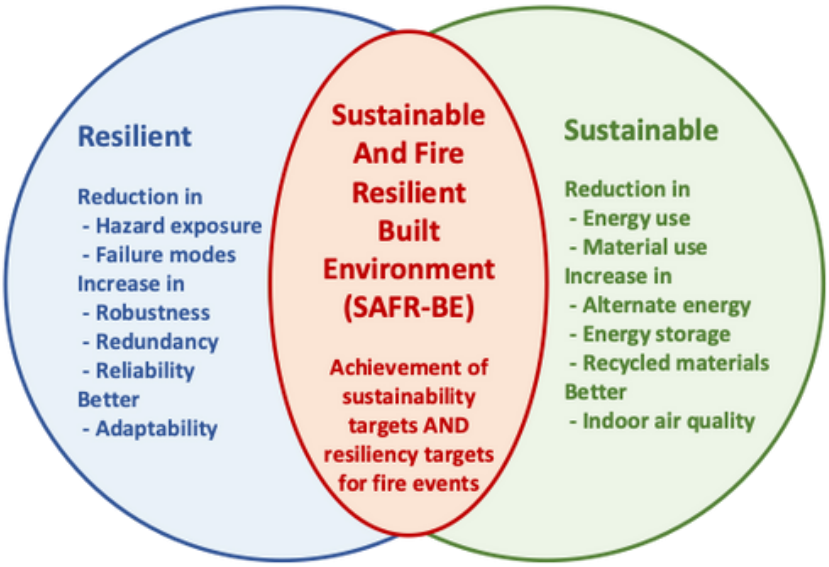
Building on the understanding of sustainability enshrined in the Brundtland Report and Agenda 21, the SAFR-BE framework considers the notion of resiliency, construed as the ability to prepare and plan for, absorb, recover from and more successfully adapt to adverse events. This is predicated on the time that it would take to return to a level of functionality of the building that is deemed acceptable after an adverse event, such as a fire.

Recognising the need and the benefits of sustainable as well as safe buildings, the SAFR-BE framework attaches equal importance to sustainability and safety. These two concepts are not viewed as in any way competing with one another, but rather as part of one and the same multifaceted approach to reduce the environmental and other impacts of fires on the built environment and achieve overall societal benefit.

SAFR-BE: Methodology

The SAFR-BE framework considers resiliency and sustainability design objectives in an interactive way.

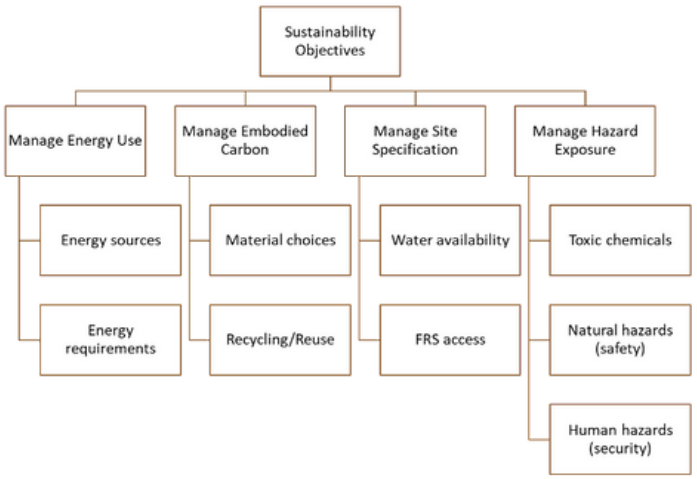
Design Strategies

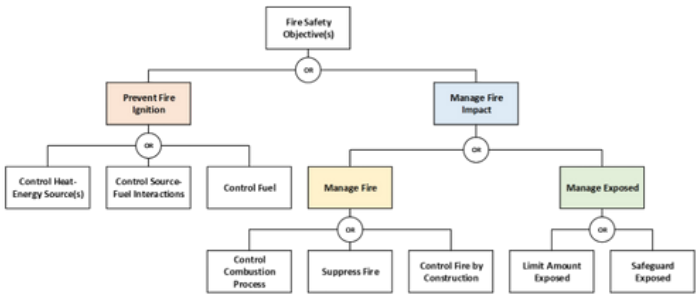


Material from: Meacham, B.J. and McNamee, M., Fire Safety Challenges of 'Green' Buildings and Attributes, Fire Protection Research Foundation, Quincy, MA (2020)

By applying the concepts tree methodology that supports fire safety risk assessment to sustainability, it identifies a number of possible strategies to achieve resiliency and sustainability objectives:

SAFR-BE Strategies





By leveraging the analytical hierarchy process (AHP) approach, it identifies different types of attributes of buildings and enables to gauge their impacts in terms of resiliency or sustainability:

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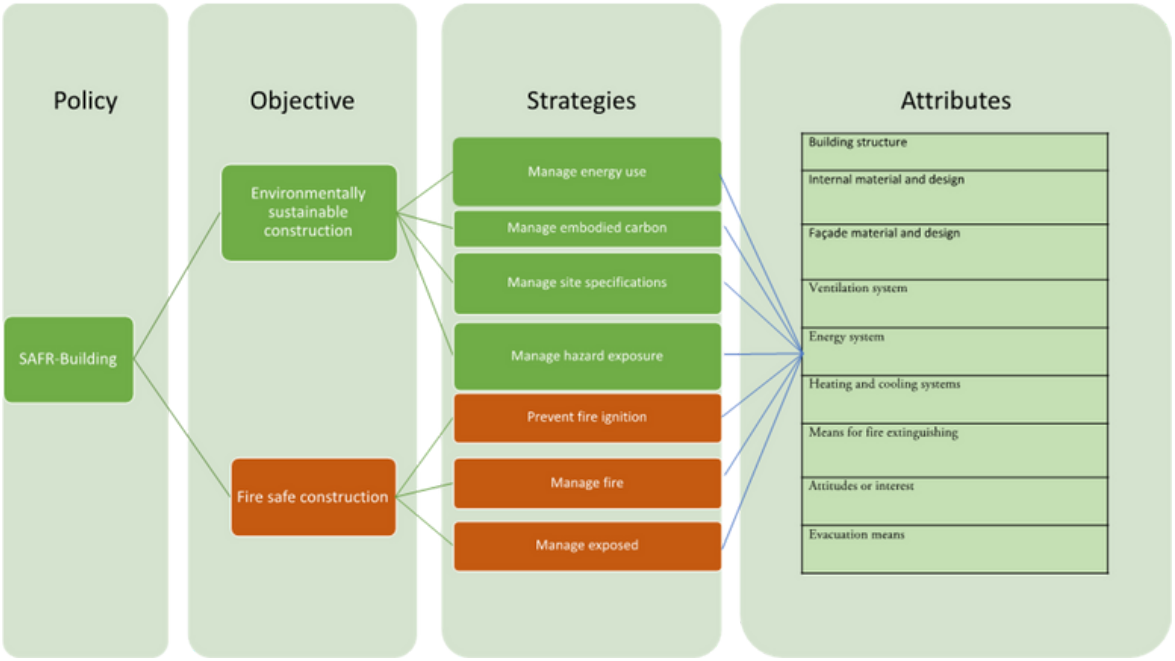
Assessment hierarchy approach to SAFR-BE (under development)



Achieving a SAFR-BE

Building on the understanding of sustainability enshrined in the Brundtland Report and Agenda 21 and recognising the environmental impact of fire as a fundamental aspect of this multidimensional concept, the SAFR-BE framework supports the potential of fire safety to be an enabler of innovation.

In practical terms, solutions to sustainability issues must be economically palatable to be bearable, ecologically viable to be acceptable, and socially equitable to create lasting positive change.

Discussion

Which fire scenarios are considered the main priorities to ensure safe building construction?

What we're currently looking to do is to work out all the various pieces of the puzzle. We will be reaching out to experts, including people in this group, to help us make prioritization comparisons between different pairs of sustainability or fire safety attributes and weigh them. We will look at the actual fire scenario at a later stage, when we try to apply the model in this project to a design building and see if the model is able to identify whether there are any sustainability and fire safety conflicts in a building design.

Those initiatives that work towards more sustainable buildings and building materials used to be separate from the fire safety world and your approach is trying to bring them together. What would this look like in practice? Will it be through regulation? Will it be through standards?

In the long term, we might look at EU-level building regulations or national-level implementation, but there's a long way to go before we get to that point. What is needed now is the dialogue with and between fire safety specialists and sustainability specialists, and this kind of methodology will hopefully encourage exchange between these two communities - at least at building project-level.

There is also a need to increase awareness of the fact that building regulations are unfortunately unable to keep up with changes that are implemented based on design choices. The sustainability community pushed sustainability through extra regulatory processes, and this is something that we can learn from in the safety community. We need to be willing to push for more than the basic requirements in terms of fire safety to have sustainable and fire resilient buildings. That could mean extra-regulatory approaches.

And how will people be made to bear the added costs of safety and sustainability?

Often, financial aspects are driving the sustainability as well as the fire safety design choices that are being made because both are potentially very costly. But there is an initiative in Sweden - and I believe that there are similar initiatives throughout Europe - whereby the building regulations require that all new buildings submit a "climate declaration" for the building and a carbon footprint budget for the building process. And at the moment, there are no requirements on what the acceptable level of carbon emissions should be. The building regulators are going to collect this data for all new buildings for five years and will then set requirements on what that level should be, depending on the building type and other factors. So, we're going to see a shift not only in terms of budgetary requirements for building entrepreneurs, but also climate requirements.

One for all and all for one? To what extent can phosphorus-based flame retardants be treated as groups?

The focus of the second session was on organophosphorus flame retardants (OPFRs), examining novel technical approaches to the topic of the grouping of chemical substances for regulatory scrutiny.

A presentation by Peter Fisk, Consultant at Green Chemical Design and author of a recent study on the grouping of OPFRs, was followed by a discussion.

Background

In October 2020, the European Commission published its Chemicals Strategy for Sustainability (CSS) to bring about a toxic-free environment and to protect people and the environment from hazardous substances. In order to speed up the decision-making process, the CSS moves away from evaluating chemicals on a substance-by-substance basis towards a grouping approach to substances registered under REACH.

The Restrictions Roadmap, published in April 2022 under the CSS, proposed a 'rolling list' of substances that are prioritised for restriction based on a grouping approach. Organophosphates used as flame retardants (OPFRs) are being considered as part of this list. Within this context, Peter Fisk was asked by pinfa to review independently whether OPFRs can be considered for regulatory purposes in one or more groups based on science.

Scientific methods

Two steps were followed:

1. Collect property data from REACH Chemical Safety Reports (CSRs) or other reliable published sources, such as pre-REACH regulatory risk assessments, where necessary.

2. Examine the possibility of any coherent grouping in structure-based groups, which should be consistent with the hazard-related registration data and existing hazard classifications.

Due to the vast amount of reliable Klimisch scores of 1 and 2 or comparable guideline studies from the REACH dossiers, no immediate or urgent need of further data collection was identified.

Key findings

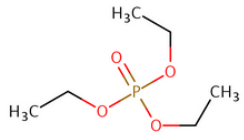
In headline terms, it was found that OPFRs cannot be grouped together in one single group as this cannot be justified by conclusive scientific means following the basic rules for grouping, i.e.:

- Different chemical structures
- Different physical-chemical properties
- Different toxicological properties
- Different eco-toxicological properties
- Different environmental fate properties

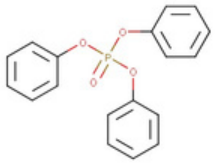
Based on structural features and physicochemical properties, six structural groups can be identified, i.e.:

- Trialkylphosphates
- Triarylphosphates
- Monoalkyldiarylphosphates
- Chloroalkylphosphates (already grouped in EU)
- Bisarylphosphates
- Phosphonates

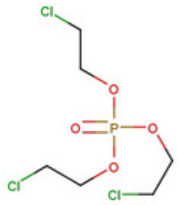
Annex: Examples



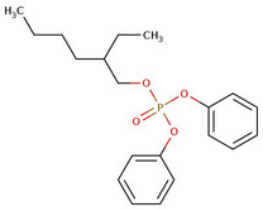
trialkyl phosphate



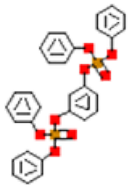
triaryl phosphate



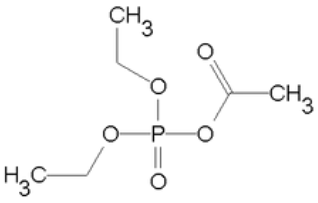
chloroalkyl phosphate



diaryl alkyl phosphate



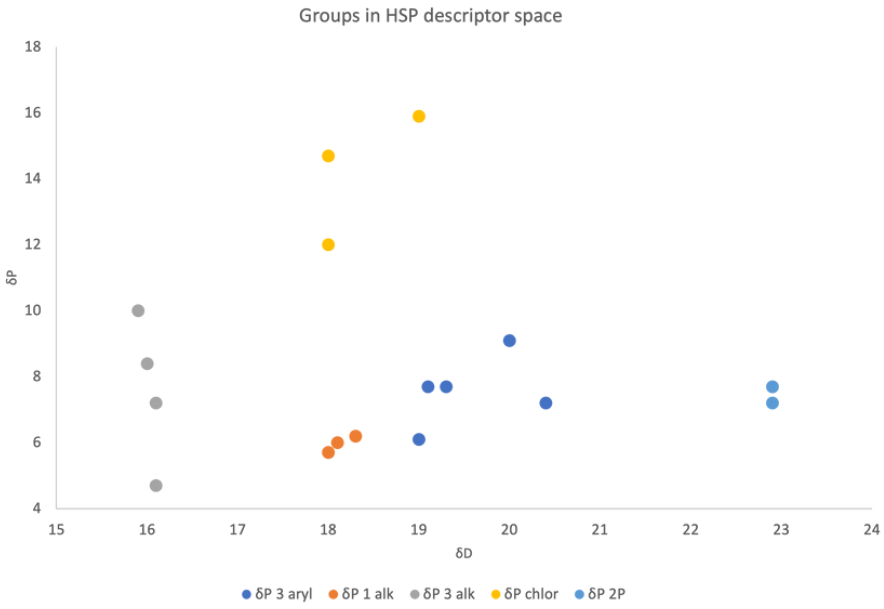
aryl bisphosphate



phosphonate

It was discovered that Hansen Solubility Parameters (HSPs), which relate directly to fundamental molecular properties in respect of absolute intermolecular energies, were useful molecular descriptors to discern distinct groups. The properties of the substances were highly homogeneous in each of the identified groups. HSPs, however, are not widely used for regulatory purposes.

GROUPING OF PHOSPHATE ESTERS FROM STRUCTURE AND HSP VALUES



Conclusions

The main conclusion of the report is that OPFRs cannot be grouped together as one group as this cannot be justified by conclusive scientific means following the basic rules for grouping and due to their different chemical structures, their different physical-chemical, their toxicological, eco-toxicological and their environmental fate properties. Regulatory approaches that are science-based would reflect this.

Discussion

Is there a way to rank the risk of regulation of the different OPFR groups that you're that you've identified?

The report includes the hazard classification of the different substances listed here. A simple way of doing the ranking would be to look at the relationship of the chemical structural types to the hazard classification.

Are there any organophosphate substances that are not FRs and are being considered for restriction?

Yes, although it has not been disclosed what they are. The approach is to start from a "seed structure" to identify similar chemicals and look at their properties in the dossiers that have been submitted. That is in the first instance regarded as one group. Once they (ECHA) come to a conclusion on the group, they will likely list a list of all the chemicals included in the group.

How much of the organophosphorus that can be found in the environment comes from OPFRs?

There's a lot of pressure from certain NGOs to say that most of the substances that are being considered for restriction can be found in the environment, and therefore we must stop using them. Whilst that's a powerful argument, the problem is that the sources are not always known. For example, there can be historical releases from all sorts of different uses. Finding something in the environment doesn't necessarily tell you where it came from. So that was not part of the criteria for this work, although it is a topic that close to my heart that I spent a lot of time working on over the years.

Conclusion and Next Steps

The participants of the Advisory Board meeting were again positive about the initiative. The fact that there were participants from the scientific community was especially welcome, as the range of backgrounds in the room provided the conditions for sharing expertise and learnings across fire safety and environmental topics.

There was a recognition that the structure adopted within the meetings of the Advisory Board, which provides a venue for these worlds to come together and dialogue, is an effective way of sharing knowledge and will yield positive outcomes.

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Once agreed by the participants, this document can be used by any member of the group for discussions with others, to show the areas of exchange and to encourage collaboration on the topics involved.

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A sector group of Cefic

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