RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

Project Idea Form

Instructions:

- This form is intended to gather project ideas from our stakeholders. It is not an application for a research grant. The consideration and implementation of all project ideas will be in accordance with FPRF Policies, Operating Principles, and Vetting Criteria.
- By submitting this form to the FPRF, the submitter acknowledges that the Foundation may conduct a research project by issuing an open request for proposals for a project contractor in accordance with the FPRF Policies (unless waived in certain circumstances).
- This project idea form may be considered for the Research Fund selection process. For more information about the Research Fund evaluation process, please visit www.nfpa.org/NFPAresearchfund.
- To submit a research project idea, complete all fields below and send to research@nfpa.org.

1) Proposed Project Type (Select all that apply):

- ☐ Small Project (e.g. Literature Review, Gap Analysis, Code Comparisons, Loss Summaries)
- ☑ Large Project (e.g. Fire Testing, Computer Modelling, Field Surveys, Risk Assessments)
- ☐ Concept from NFPA Technical Committee
- ☐ Research Planning Meeting (e.g. Workshop)
- ☐ Other, please specify:

2) Proposed Project Title (75 characters or less):

Artificial Snow Drops - Means of Fire Protection

3) Problem Statement (One or two sentences addressing "What is the problem?" Examples include: New/Emerging technology, Lack of technical substantiation or guidance) (750 character limit):

Wind driven wildfires bolstered by firebrands and spot fires have increasingly caused deadly conflagrations in recent years spurred potentially by global warming. Specific details are needed for chemicals and shapes for firebrand neutralizing particles as we propose effecting the interception of firebrands as they land on vulnerable fuels including developed structures and human residences. In particular, we address the shape and properties of particles resembling somewhat rounded snow flakes or snow drops. Here, we address the need for technical and laboratory testing of the chemistry and physical elements that may promise efficient fire protection in a safe manner with this model of intervention.

4) **Research Objective (One or two sentences addressing "What is needed to solve the problem?" Examples include: Develop guidance for a specific issue, Determine effectiveness of current code/standard requirement) (750 character limit):**

Polymers like polyimide and other similar chemicals may have suitable flammability resistance for this application, which chemicals need to be researched and tested for safety and all the properties anticipated in this description, including the possibility of other chemicals, composites or substances that may be relatively safe and suitable. Efficacy and safety of chemicals and foam plastic particles and means of implementation need to be tested in realistic laboratory settings. Safety concerns need to be studied and standards established regarding various means of distributing these small airborne particles at different altitudes and distances from the fire front as well as directly atop vulnerable structures.

5) **Project Description (One or two paragraphs describing how to achieve the objective, including expected tasks. Project tasks can include literature reviews, data collection, loss summaries, field usage surveys, code comparisons, statistical analysis, computer modeling, hazard analysis, risk assessments, fire testing, recommendation development, and gap identification.) (3000 char. limit):**

A firebrand neutralizing agent consisting of a synthetic wafer of foam plastic with a thickness of about 1-2 mm, and diameter of about 10-20 mm and other variations will be comprised of polymers, such as polyimide as an example, and composites that begin to melt or vitrify when in contact with a hot object, such as a firebrand, and adhere to the surface of said object. The heat threshold to initiate melting to a glassy state or vitrification and adhering to the hot object will be in the range of 400^{o} to 700^{o} F, within the temperature flux of smoldering firebrands in the solid state. While the synthetic strip melts as it merges with the firebrand, it will also be able to withstand up to 800^{o} F temperature without combustion and will ultimately transform into a hardened, fire-resistant shell, baked by the heat. These foam plastic wafers will be applied in adequate quantities by aircraft directly above a vulnerable fuel source or developed residential community.

In contrast, conventional air drops of fire retardants do not normally target structures due to the chemical design of the retardants to effectively interact with vegetation fuels. Their heavy weight also presents a known risk to firefighters on the ground.

Foam plastic wafers, can safely be dropped directly on the roofs of structures to form a prophylactic shield against approaching firebrands. Both the artificial snow drops and firebrands will accumulate in the same corners or indentations for optimum contact propensity. In this application, a strategic alternative may be to soak the flyers with water prior to dropping, much like retardants, so that they land and stick on surfaces for at least a while until they dry and skip around like firebrands. Artificial snow drops?

By adhering to at least one side or section of the firebrand as it melts, the foam plastic strip will choke part of the source of oxygen from the air and stifle continued smoldering. The chemistry of vitrification consumes energy in the form of heat from the firebrand resulting in less fuel remaining in the firebrand.

The proper selection of chemicals will prevent the foam plastic wafers from contributing added fuel to smoldering firebrands in the scenarios anticipated.

Firefighting aircraft coming into contact with airborne foam plastic wafers may be exposed to hazards which scenario also needs to be carefully examined and any risk adequately mitigated with appropriate standards.

Expanded polystyrene foam (EPS) is often used to supply packing peanuts of dimensions similar to the proposed flyers. A flame retardant (Hexabromocyclododecane - HBCD) is added to EPS foam which allows EPS foam insulation to meet the stringent fire safety requirements governed by the International Code Council and National Building Code of Canada. Such materials in various shapes and sizes may be useful in tests of interacting with firebrands in various situations, possibly to establish low-bar guidelines for flammability.

6) **Data Collection (If data collection is part of the project scope, does data exist? If data exists, is it available to be used in the study? Please identify potential data sources.) (750 character limit)**

A number of research papers on the distribution of firebrands, heat flux and stochastic formulas to estimate range of distribution are published and available. Laboratory tests may be applied to the movement of artificial snow drops in various windy conditions in comparison with firebrands, with the objective to determine optimum shapes and sizes of snow drops that will predict close proximity between snow drops and firebrands on a range of typical roof shapes, corners, pits, openings, and other areas. The properties of related foams should be analyzed and compared with regard to suitability for this application, especially the flammability and the propensity for the foams to melt upon contact with firebrands.

7) **Impact of Project Deliverables on relevant NFPA Document(s) (500 character limit):**

NFPA Standard 1144, Standard for Reducing Structure Ignition Hazards from Wildland Fire, and NFPA 1141, Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas, address hazards to structures at the wildland interface and appropriate mitigation measures (NFPA, 2013; 2012). Understanding the potential benefits of artificial snow drops and their contribution to mitigate fire risk will help inform future editions of these NFPA standards.

8) **Organizations That Could Possibly Fund (Examples: government grants, industry consortia, stakeholders) (500 character limit):**

Fire retardant suppliers, DHS/FEMA fire grant, DARPA, various states and university research funds.

9) **When Do You Need Project Deliverables (when is information needed to coordinate with document revision cycles or other deadlines, sense of urgency) (100 characters):**

Yesterday!

10) **Submitted By and Date Submitted:**

Point of Contact

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