



# RESEARCH FOUNDATION

## RESEARCH FOR THE NFPA MISSION

### STUDENT PROJECT PROSPECTUS

## Digitized Fuel Load Survey Methodology: Data Collection and Statistical Analysis

23 April 2020

**Background:** NFPA 557: Standard for Determination of Fire Loads for Use in Structural Fire Protection Design, was developed to provide fire load data for structural fire protection design that uses either occupancy-based fuel load data or surveying fuel load density. Fuel load surveys using current methodologies are a substantial undertaking, the availability of fuel load data is currently hindered by the lack of an efficient method for surveying of buildings. [Fire Protection Research Foundation Project completed in 2019](#) addressed this need to provide reliable fuel load data to quantify design fires for buildings. This project developed and applied a new methodology for fuel load surveys that can facilitate the collection, storage, and analysis of fuel load data for a variety of building occupancies. This new methodology uses recent developments in mobile electronic devices, cloud storage, and machine vision to efficiently complete fuel load surveys in buildings. The proof of concept for the new methodology through phase I study illustrated the feasibility and practicality of the approach. A wide adoption of this method could provide more benefits by progressively populating such digital fuel load database. The results can then be used to provide design guidelines for fuel load density in codes and standards, for application in performance-based design. In order to accomplish this, there is a need to further enhance the database with large inventory of images and the corresponding fuel load density values.

**Research Goal:** This project aims to expand the existing database of fuel load survey in buildings and corresponding fuel load density values using the new methodology developed in the Phase I project. The project will also aim to conduct a statistical analysis on the fuel load data collected from this effort.

#### Project Tasks:

- **Task 1: Survey Buildings:** Identify and confirm the office building occupancies for conducting the survey. It is expected that the survey will be conducted in at least three (more is preferred) different office buildings.
- **Task 2: Field Test Survey:** Implement the survey methodology developed in Phase I study to conduct field tests on office buildings identified in Task 1. Document and record all data collected via the survey.
- **Task 3: Statistical Analysis:** Perform a statistical analysis on the data collected from the field surveys and analyze existing and new data to investigate the sensitivity of fuel load density to assumptions such as material composition and calorific value of different furniture items.
- **Task 4: Final Report:** Develop a draft final report including the results of the field tests and statistical analysis. Review the draft report with panel and submit a final report after considering panel comments.

**How this information will be used:** Project deliverables will be useful for NFPA 557, Standard for Determination of Fire Loads for Use in Structural Fire Protection Design.