



SFPE STANDARDS-MAKING COMMITTEE ON CALCULATING FIRE EXPOSURES

Local Fire Exposures Working Group

Meeting Report – October 31, 2017

Present: Ulf Wickström (Working Group Leader), Sean Hunt, Brian Lattimer, Craig Beyler (Committee Chair) and Chris Jelenewicz (Staff).

The following was discussed:

- **Sub-Task 1 – Expressing boundary conditions**

Ulf drafted a paper “Technical comment - Ten statements on expressing thermal exposure as boundary conditions in fire safety engineering” (see attached) that can be submitted to a journal as a brief communication that discusses the 10 previously approved statements. The working group suggested that each individual statement be relocated next to its associated commentary. Also, it was suggested that a few paragraphs be added to the introduction that put things into context (explains why statements are important). Ulf asked each member to review the paper and provide additional comments before November 15.

Additionally, the update of the White paper or memo “On the discussion on how to express thermal exposure” (see attached) was briefly reviewed. Working group members were asked to provide comments before next meeting. This paper indicates views of Ulf’s and his suggestion to be the way forward of the task group in terms of how thermal exposure shall be expressed in the standards we are writing. Ulf is suggesting among other things that if in a standard the thermal exposure is given as ‘incident heat flux’ it shall be interpreted as an adiabatic surface temperature by prescribing the surface emissivity and the convection heat transfer coefficient. **Brian promised to suggest an alternative way.**

- **Sub-Task 2 – Local exposure fires – available formulas.**

Sean presented a template that would outline how the probability distributions for localized fire exposures boundary conditions could be analyzed. It was suggested that probability distributions can be generated on boundary condition parameters as a function of the fire size in the absence of a hot gas layer for:

- a. Flat wall configurations
- b. Corner configurations
- c. Flat wall-ceiling configurations
- d. Corner – ceiling configurations

e. Column-like objects

The distributions can be generated by FDS6 using a Monte Carlo approach on key parameters. These parameters are listed in the attached document.

Sean will check to ensure FDS is validated for this approach.

It was suggested that emissivity and the heat transfer coefficient be added to the list of parameters.

A second approach would estimate hot gas layer effects by using CFAST and incorporating into the FDS peak heat flux predictions via a blackbody radiation heat flux.

- **Sub-Task 3 – Façade fires – available formulas**

At the last meeting, the working group discussed a paper by Delicatsios et al., 2016) on estimating exposures to façades. This paper uses the compartment fire equivalence ratio to estimate heat release rate outside of compartment and the flame length out of the door. Brian completed some preliminary calculations that compared the flame extension for fires based on a compartment fire equivalence ratio approach versus a local flame extension case. These calculations focused on compartments with a noncombustible boundary. Based on these calculations, it was determined that the flame lengths are sensitive to the opening size, compartment equivalence ratio (defines total HRR and potential excess HRR), and the room height relative to the opening height. The largest deviations were in cases with lower ceiling heights and increased ventilation.

It was noted that adding interior finish to the calculation may make the situation more difficult to estimate.

As such, it was agreed that the Delicatsios, may not be the best approach.

The working group will try to track down possible data from researchers who developed façade tests.

The goal is to get a gas temperature and an incident radiant heat flux boundary condition estimation at the façade surface.

Brian will track down additional data that may be useful in estimating the flame length.

Additional data may be found in the proceedings from the International Seminar Façade Fires seminar. Sean will search the JH Library for this info.

- **Next meeting** – CJ will schedule via a Doodle Poll for mid-December.

End of Report