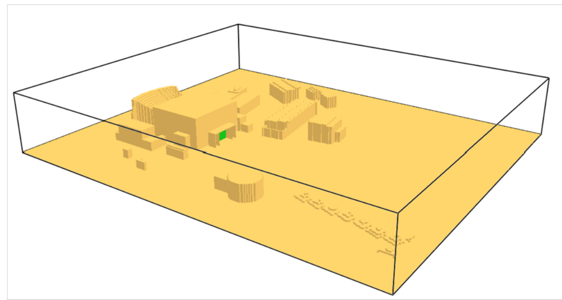
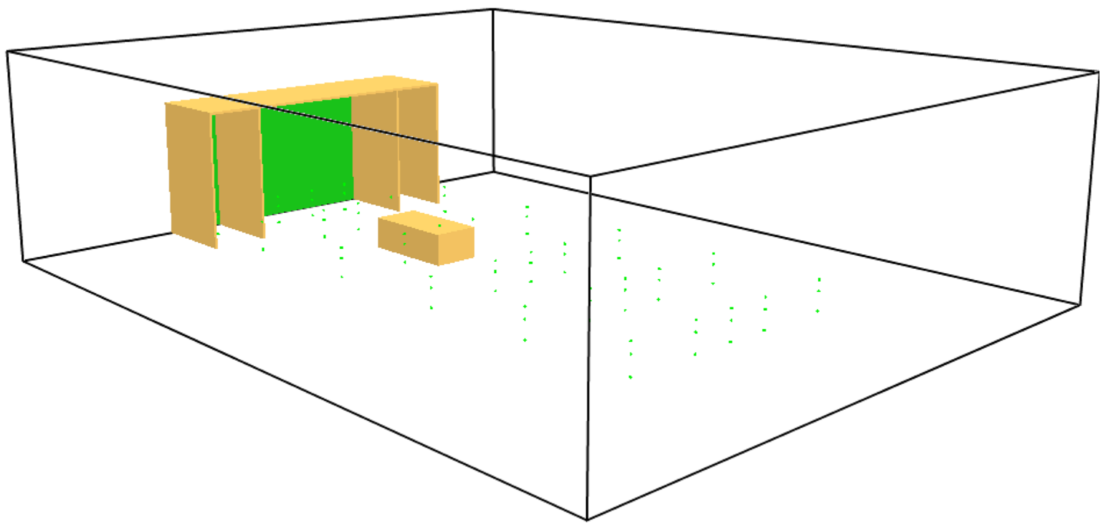
Model the cold flow experiments at IBHS

- Compare cold flow (wind only; no burning) experimental and simulated wind speed/direction results

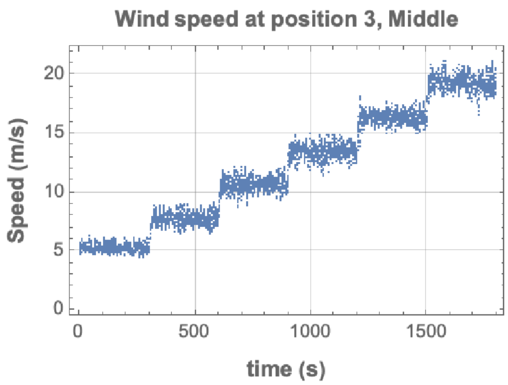


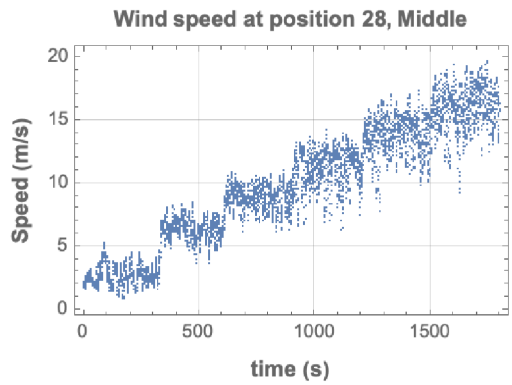
Experimental setup: Anemometer positions and wind tunnel speeds

FDS model configuration



NoBlockage measured wind speed at anemometers 3 and 28





Experiment: (●) NoBlockage ( ) Source90TargetNA

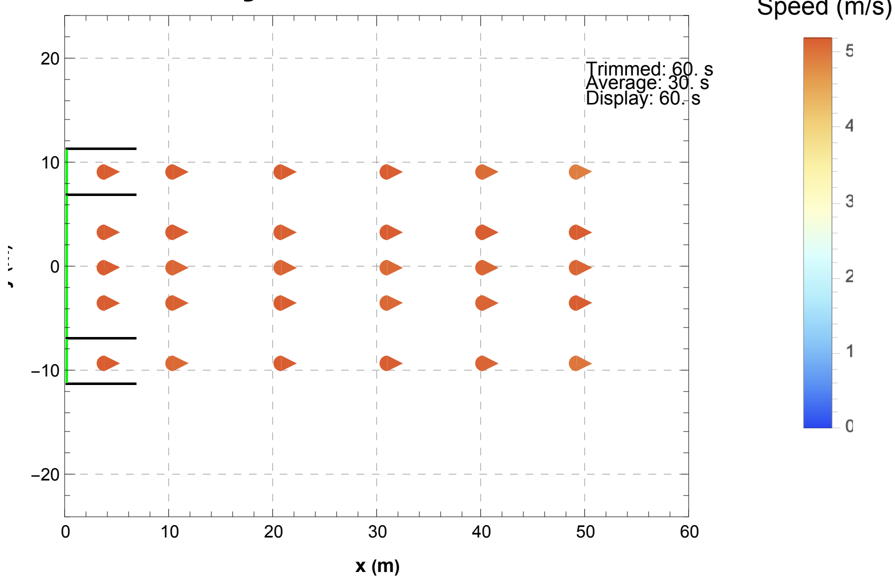
Time (s): 90

View data: ( ) Experimental (●) Simulated (FDS) ( ) Comparison

Tunnel output velocity (m/s): (●) 5.2 ( ) 7.9 ( ) 10.7 ( ) 13.5 ( ) 16.4 ( ) 19.5

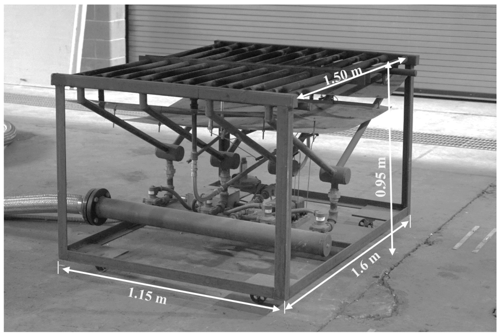
Anemometer height: ( ) Top (2.4m) (●) Middle (1.6m) ( ) Bottom (0.2m)

recorded by anemometers outside



Model the NIST 8MW gas burner

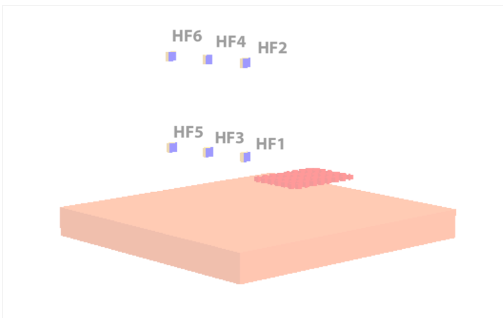
- Test the fidelity with which FDS can simulate the heat flux environment generated by a burner
- Evaluate if burners can be used to generate experimentally a computationally predictable heat flux environment for testing of structures



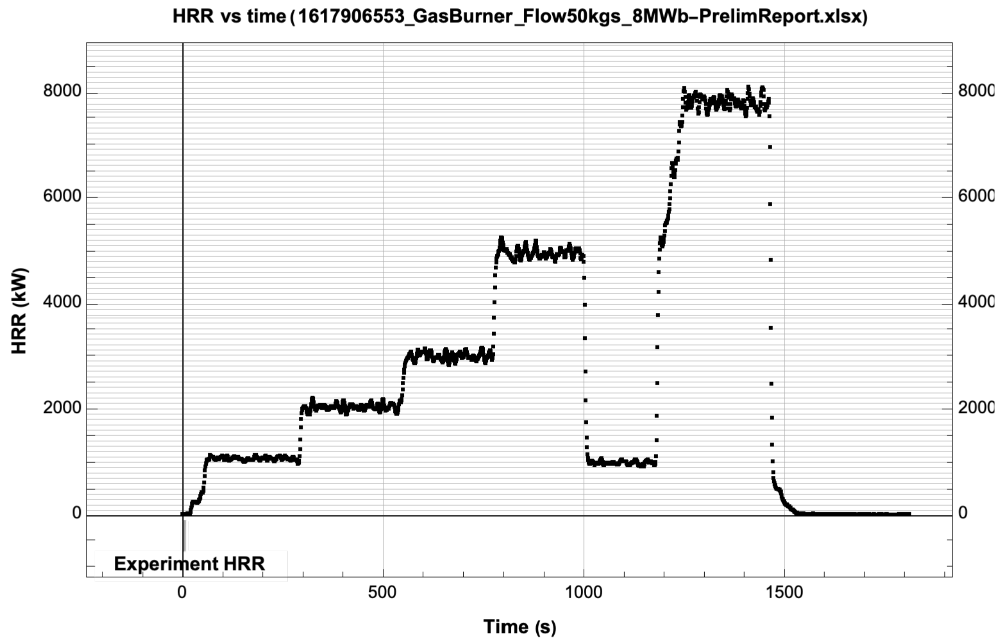
Configurations used in FDS to model the gas burner

Experiment performed to measure the heat flux (HF) generated by the gas burner

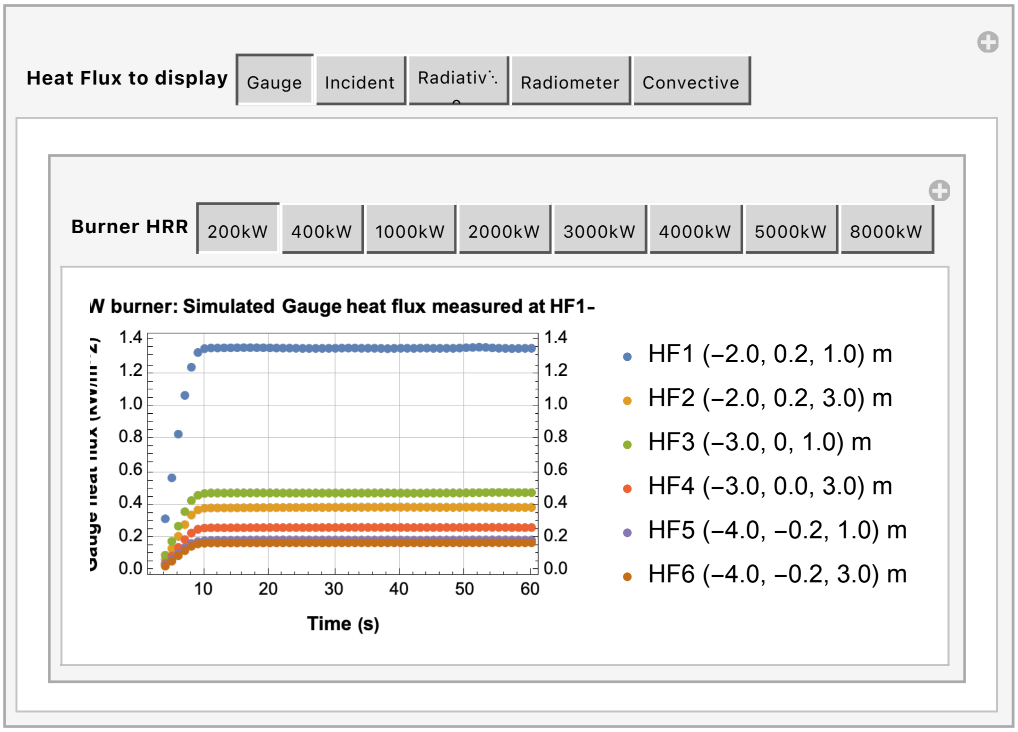
- HF1, HF3, HF5: 1 m high and 2, 3, 4 meters from the burner center
- HF2, HF4, HF6: 3 m high and 2, 3, 4 meters from the burner center



Experimental heat release rate (HRR)

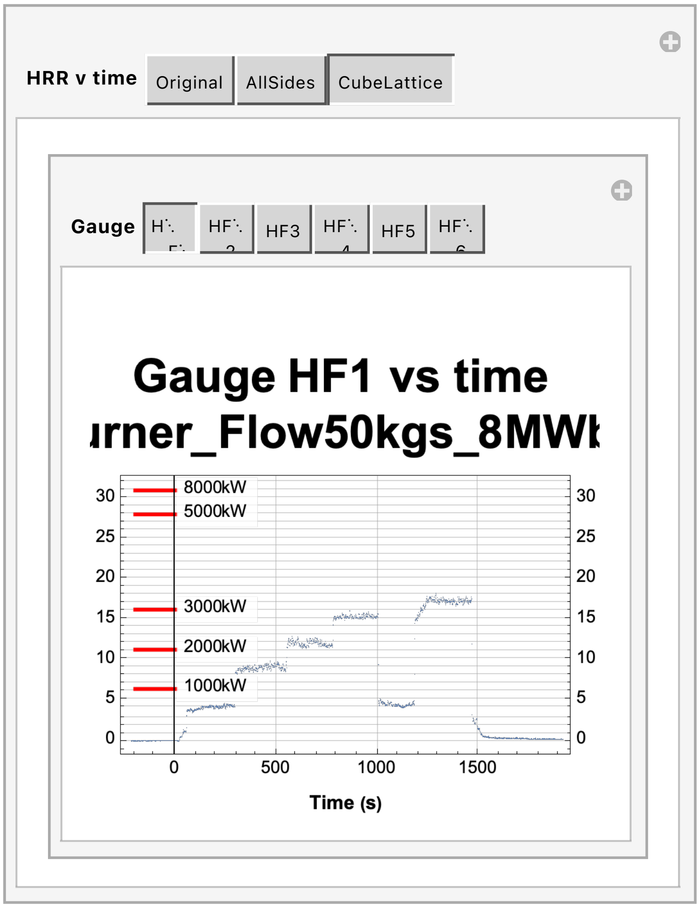


A steady-state heat flux is quickly established at each of the HF gauges in the simulations



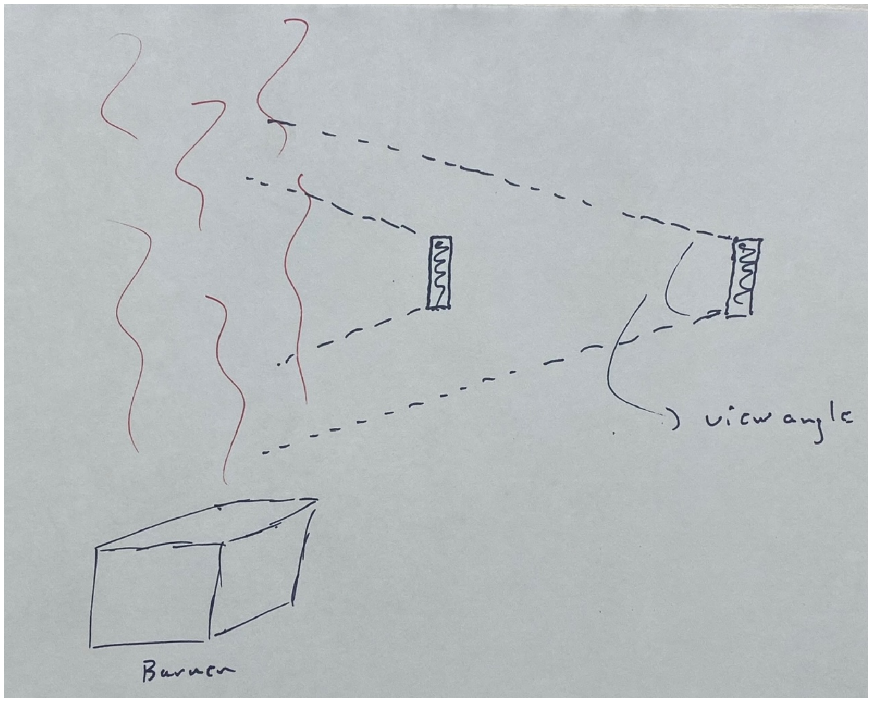
Compare the experimental and simulated heat fluxes

Experiment #3 HRR: 1000, 2000, 3000, 5000, 8000 (kW)



Conclusions

- None of the FDS models for the gas burner reproduced the experimental results particularly well
- The details of how natural gas is injected, how it is oxygenated and combusted, etc. determine the flame structure and the heat flux produced as a function of height
- The positioning of the heat flux gauges close to the flame make this a particularly demanding test


view angle
Burner