

FPE Group 2 - Residential Fire Protection

Kosher Compliance

Josh Binsol, Seungjun Jeong, Liam Orrison, Ryan Vacek



A. JAMES CLARK SCHOOL OF ENGINEERING

Problem Definition

Project Scope Definition

The purpose of this design is to conduct performance-based analysis of life safety limiting elements of the two-story opening and residential areas at UMD Hillel New Center for Jewish Life.

Project Goals

The goals of this project is to ensure life/building safety and mission continuity by protecting people during egress and rescue operations under the assumptions of worse case fire scenarios and practice of religious traditions.

Design Objectives

The objective of this project is to deliver a safe egress route by maintaining a tenable environment at fire origin and non-fire intimate areas during fire incidents by practicing industry standards.

Performance Criteria

Key Design Factors

- Open staircase connecting two floors
- Skylight directly above staircase
- Fully sprinklered and addressable fire alarm with mass notification system

Design Evaluation

- Calculate Available Safe Egress Time (ASET) to represent time before untenable fire conditions and Required Safe Egress Time (RSET) to represent evacuation time, verify $RSET > ASET$
- Determine smoke density and production for tenability
- Safety factor is incorporated to address outlying factors

Minimize fire related injuries and death

Limit COHb% to 12%

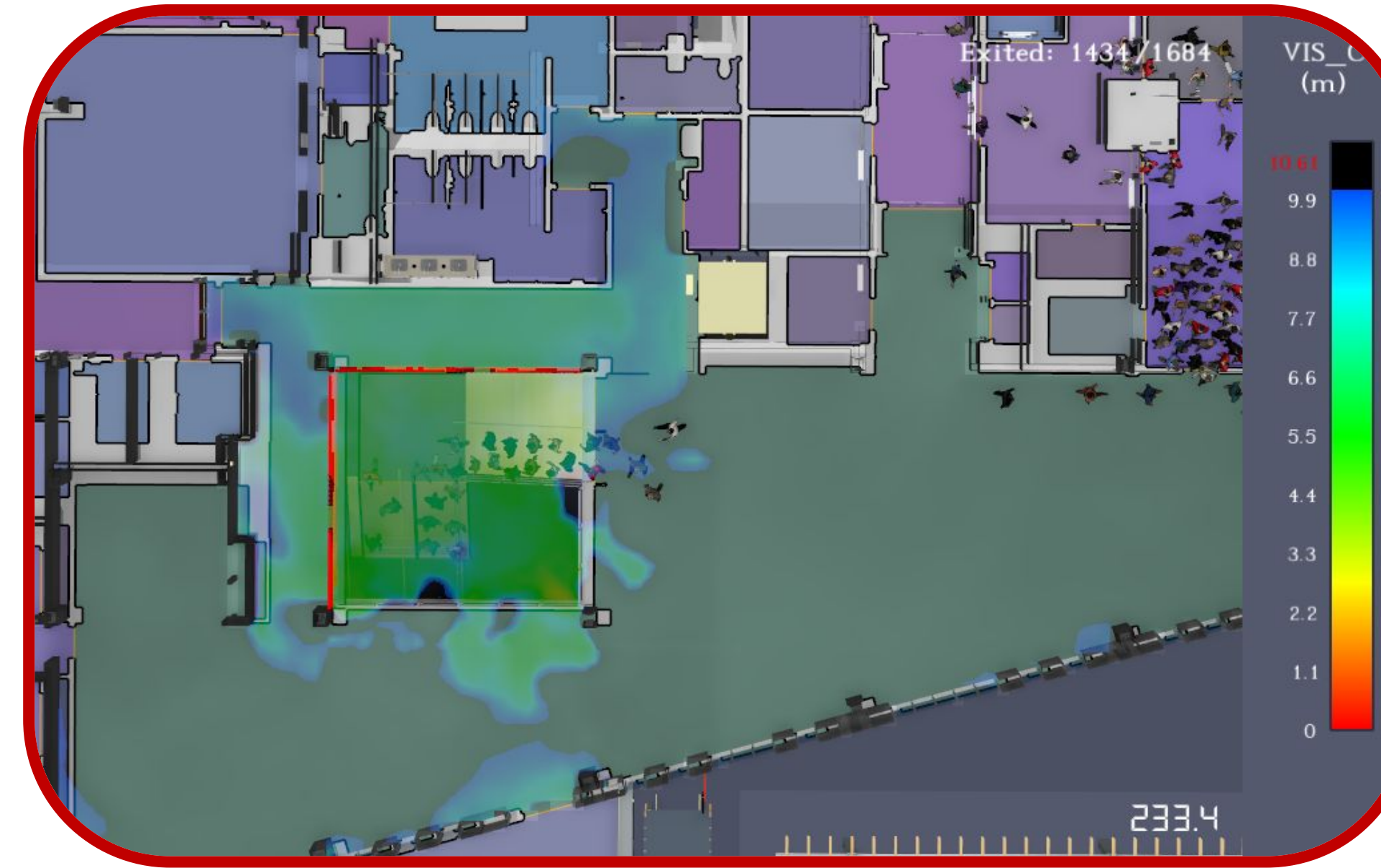
Visibility limit of 10 m

Maintain building integrity

Average maximum steel temperature 550°C

Highest window temperature 300°C

Fire and Egress Modeling Results



Visibility Slice at 10 m, 2nd Floor Communicating Space



Visibility Slice at 10 m, 1st Floor Communicating Space

- Visibility would fail first
- Smoke detector activation at 94 s
- Complete evacuation at 366 s, visibility only fails where occupants aren't present
- Pathfinder confirms $ASET > RSET$



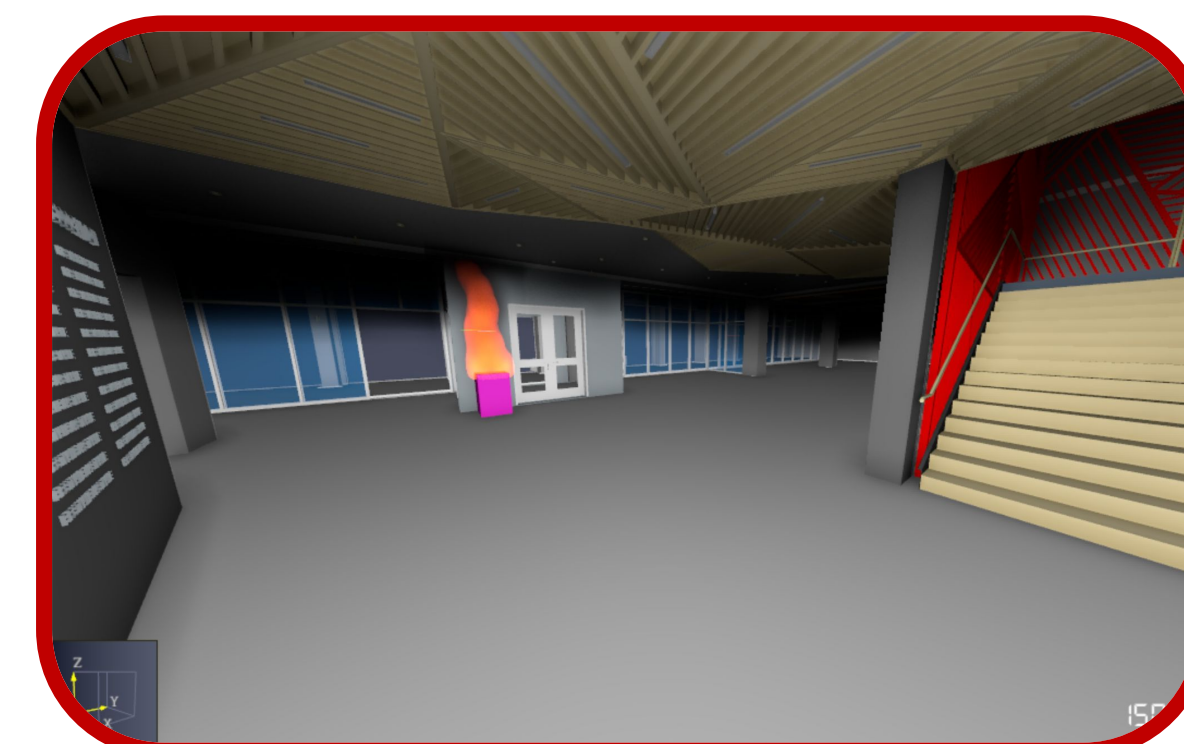
Last Occupants Egressing 2nd Floor Hallway



Visibility Slice at 10 m in 2nd Floor Hallway

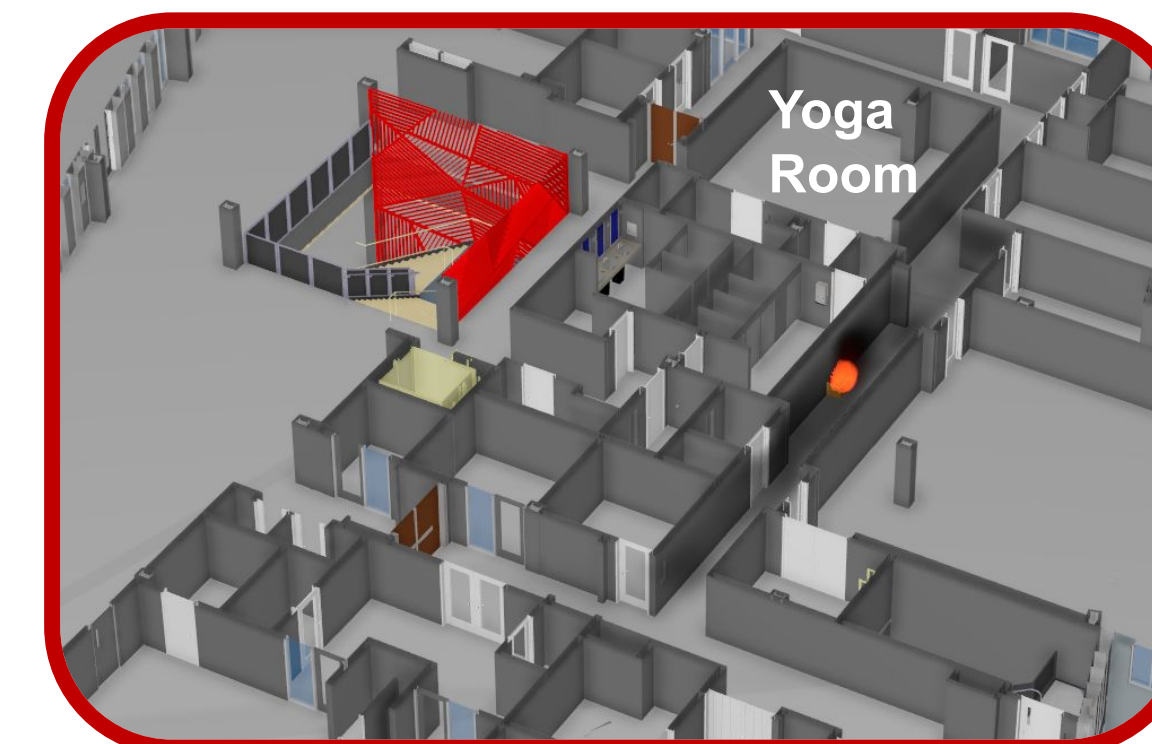
- Visibility would fail first
- Detector activated at 46 s
- Complete evacuation at 300 s
- HVAC maintains tenability until all occupants have evacuated hallway
- Pathfinder confirms that $ASET > RSET$

Fire Scenarios



Waste Basket Fire Shown in Communicating Space

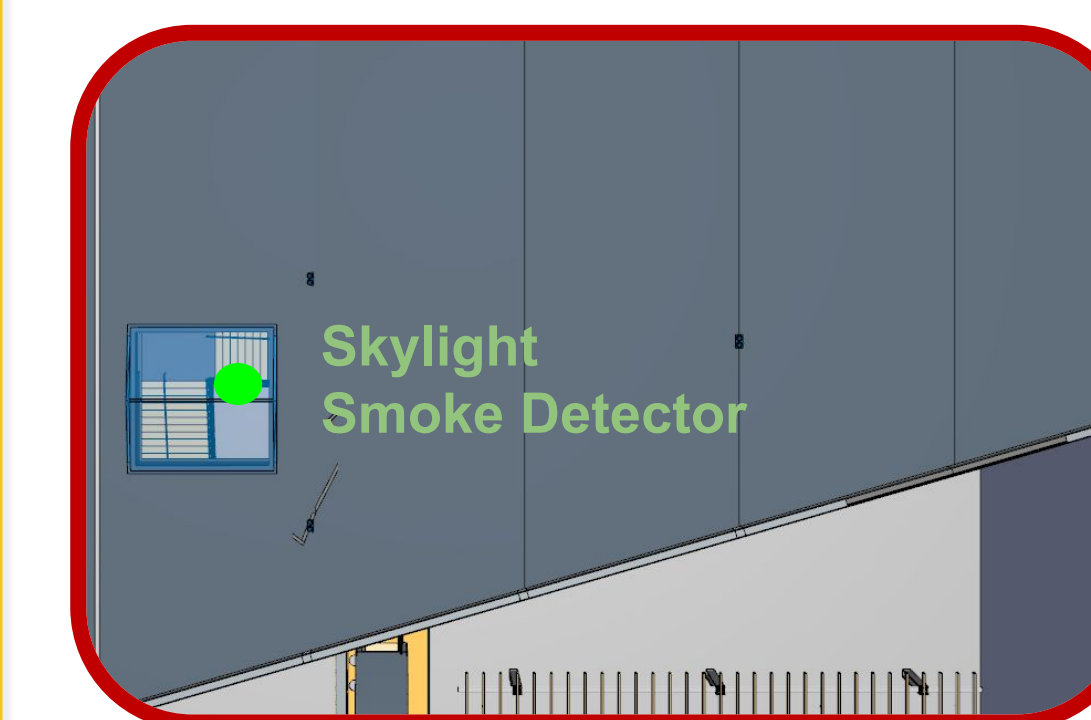
- Wastebasket Fire
- Peak Heat Release Rate of 800 kW at 120 seconds
- Prevents main entrance use due to excessive heat flux



Laptop Fire Burning in Mid Hall

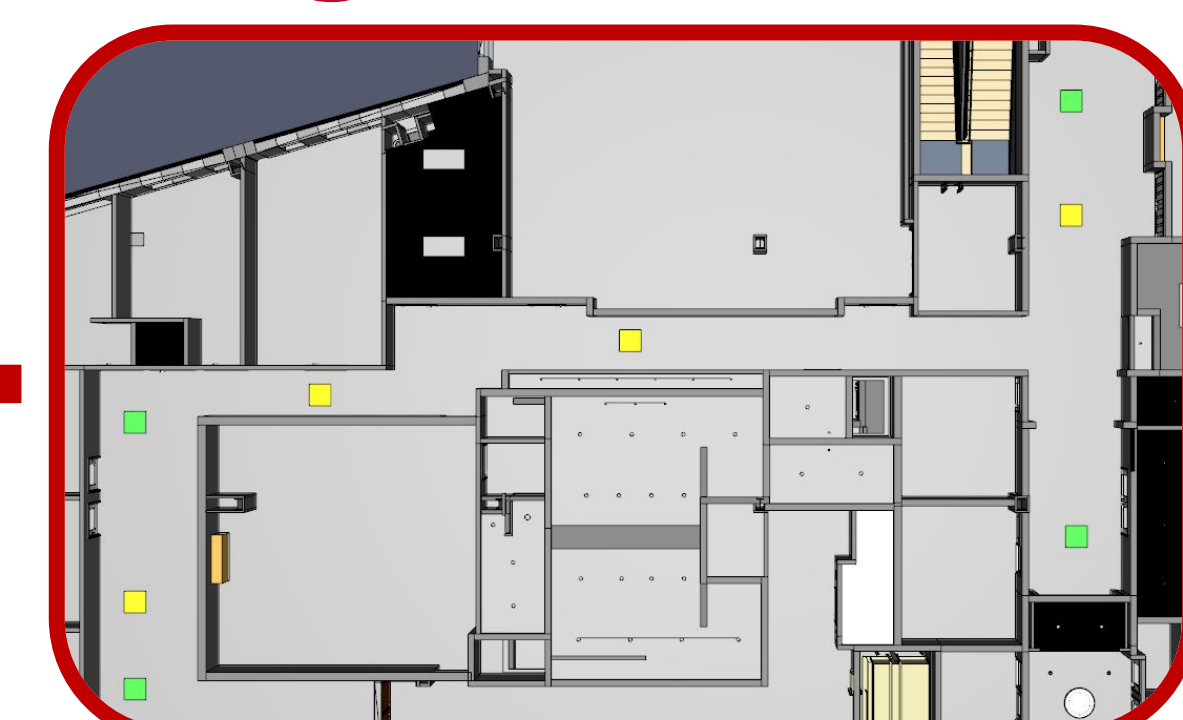
- Laptop Fire
- Peak Heat Release Rate of 390 kW at 200 seconds
- Impedes egress from yoga room and large prayer room

Final Design



Top Down Skylight Smoke Detector

- Single skylight smoke detector added in series with code-required detectors
- Improves coverage for fires under the skylight in the communicating space



Top Down HVAC Vent Placement

- Green represents supply vents, yellow represents return vents
- 4000 cubic feet per min per vent
- Detector activated at 46s with a steady 60s ramp up, full scale at 106s