

### **Problem Definition**

**Premise:** The new addition to BWI Airport adds connecting space between A & B concourses, as well as new gates, amenities, and an updated baggage handling system.



Interior view showing both PyroSim & Pathfinder Results

**A/B Connector** 

**Goal:** Create a performance-based design (PBD) to ensure safe egress of passengers in the event of a fire emergency. Ensure occupants can egress before conditions become untenable.

# **Design Calculations &** Analysis

Methodology: Use PyroSim, a CFD simulation program built around the FDS engine, to determine Available Safe Egress Time (ASET). In this case, ASET is the time for conditions to become untenable due to smoke inhalation, when the smoke layer has descended to head height.

Use egress modeling software (Pathfinder) to determine the Required Safe Egress Time (RSET). This is a measure of how quickly occupants can evacuate the space.

For our design to satisfy its requirements, ASET must exceed RSET, so that all occupants are able to escape safely before conditions become untenable.





Top view of occupants egressing at 100 seconds

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**Approach:** The final design approach for this project is to compartmentalize this area of BWI into four distinct zones. This compartmentalization strategy is achieved through smoke partitions and curtains. The goal of this strategy is that during a fire only the fire origin zone will need to evacuate to the landside.

**Design Choices:** The design seeks to achieve a balance between functionality and aesthetics while still maintaining a high level of safety for occupants. The smoke partitions will be made of smoke rated glass and the smoke curtain will be hidden within the ceiling during normal operations.



Isometric view of PyroSim results at 100 seconds

### **Results**:

- never reduces visibility below 30' at a
- failure
- failure
- RSET < ASET, so occupants can safely untenable

Isometric of occupants egressing at 100 seconds





# **Final Design**

**Cost Benefit Analysis:** The increased costs of this design approach is a key factor in its feasibility. The most significant benefit is that the airport can maintain a majority of mission critical operations during a fire. Additionally, the design at minimum provides a 48% reduction in revenue loss per hour during a fire.

## **Test Results**

- Due to sprinkler activation, the smoke layer height of 6' in areas of occupant egress - Thermocouples show there is no structural

- The available safe egress time is assumed to be at least 270 seconds since this is the end of the simulation with no causes of

- The required egress time is 249 seconds egress before conditions may become



Visibility slice of PyrosSim model at 206 seconds



