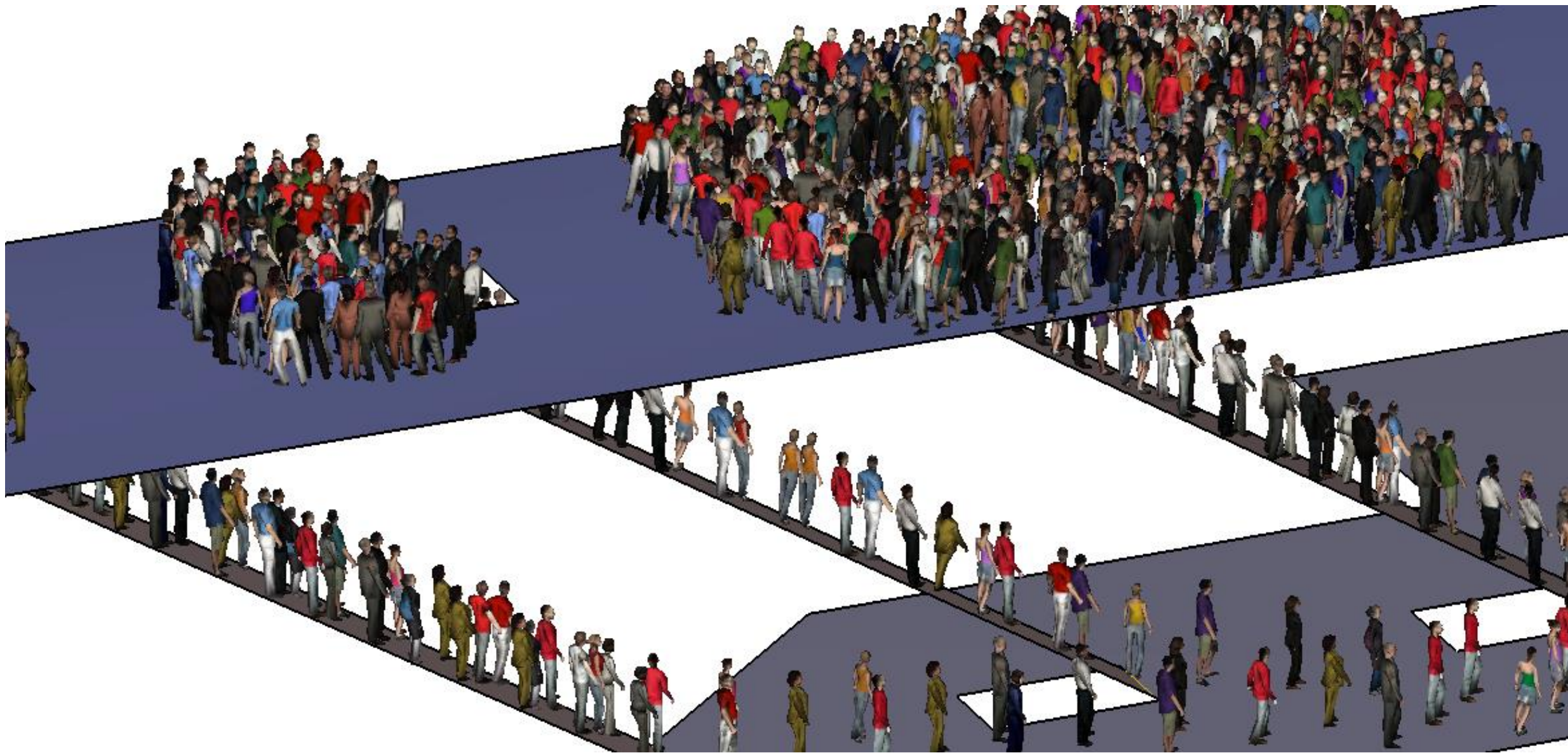


The Impact of Stairwell Queues on Egress Time From a Floor

Chris Campbell, PE
Senior Fire Engineer



Reddit.com – mealsharedotorg

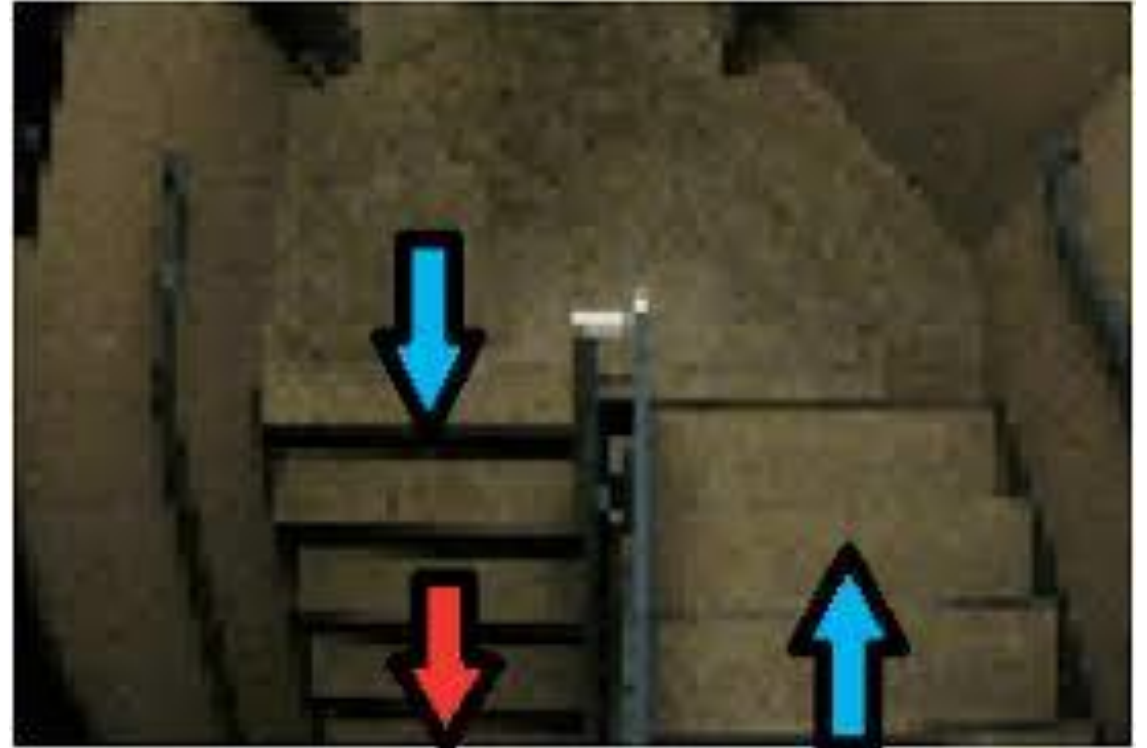


Thunderhead Engineering



Associated Press

- Estimates egress times using occupant velocities and flow rates through egress components
- Flow rates limited by a maximum specific flow
- In merging of flows, sum of flow rates in = flow rate out

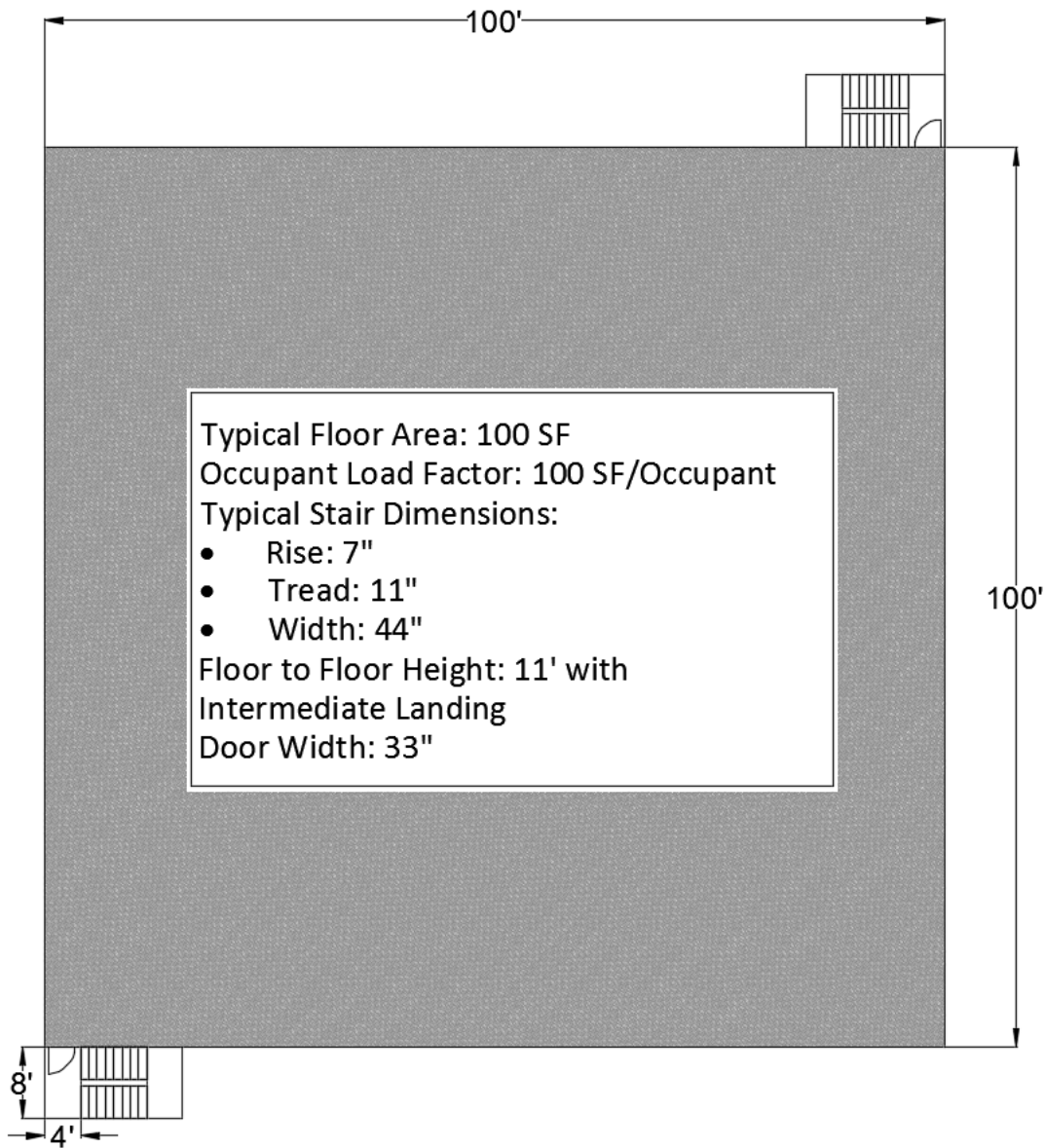


Driving Questions

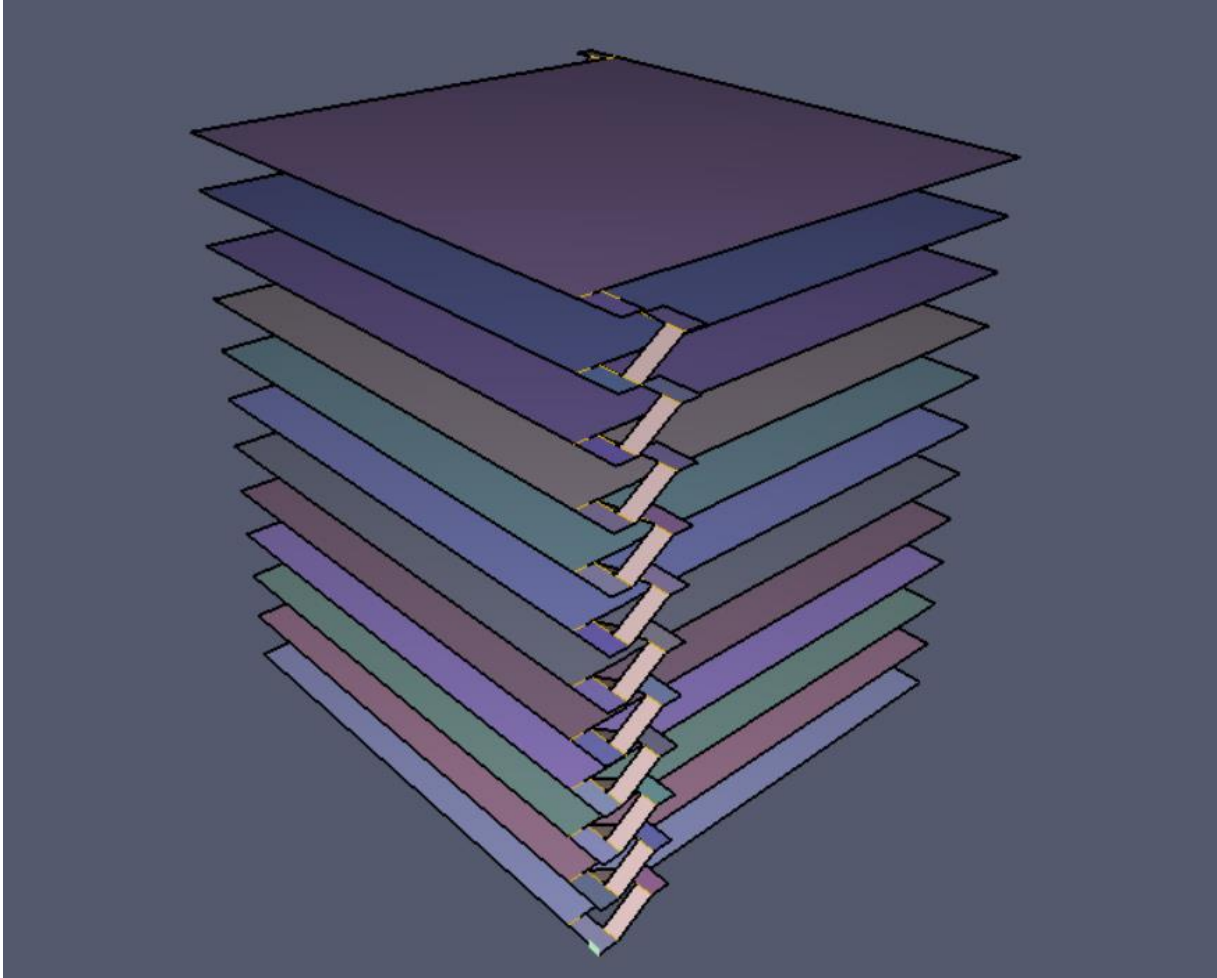
- If queuing at the stair/floor landing occurs faster than expected, will there be an impact to all floors above that point?
 - Taller the building, the greater the effect?
- Do model building codes account for this with any egress requirements based on number of stories/height?

Model Code Requirements in US

- IBC requires one additional exit for buildings taller than 420 feet
- NFPA 101 allows for a reduction in egress width factors for stairs wider than 44 inches
- NFPA 101 increases minimum stair width to 56” for stairs serving a cumulative occupant load of 2,000 persons or more

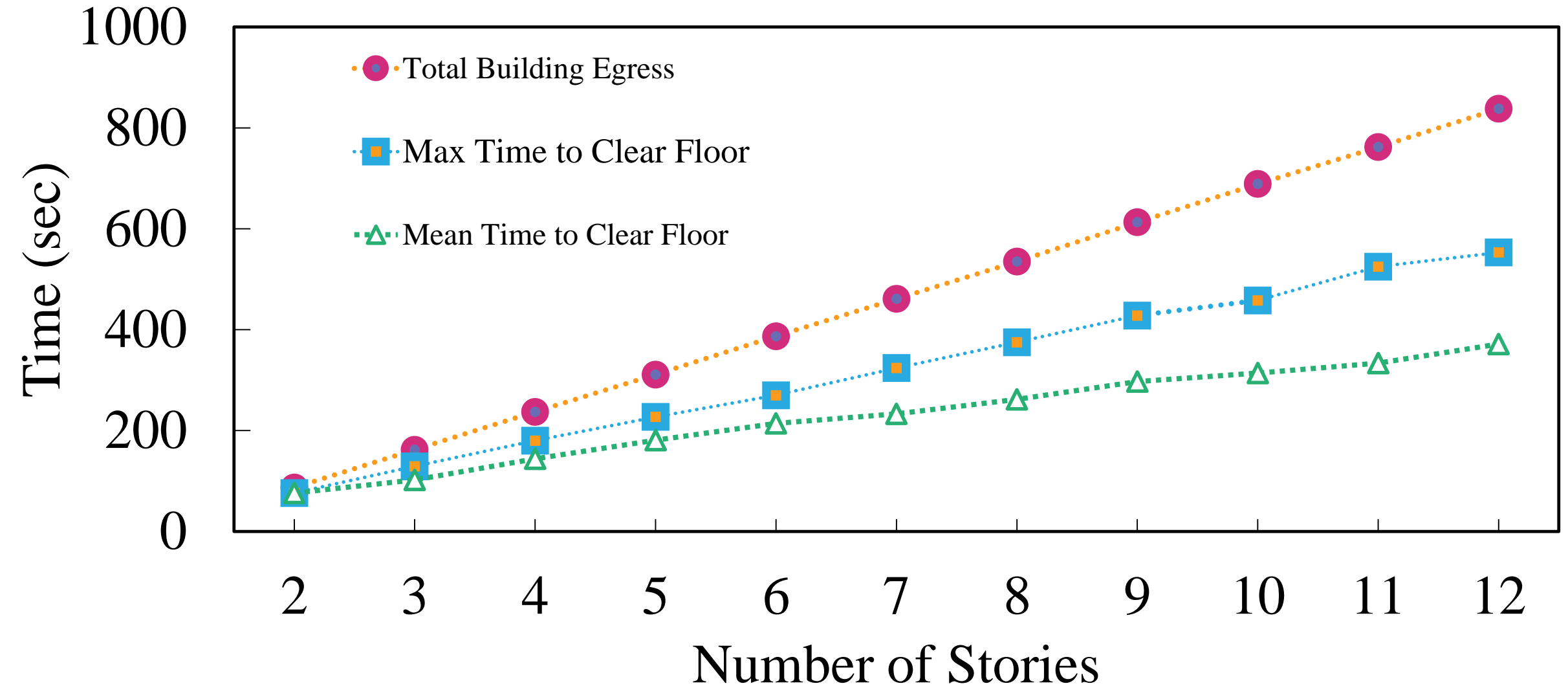


- 2 exit stairs available to all occupants
- All occupants begin evacuation simultaneously
- First floor occupants not considered

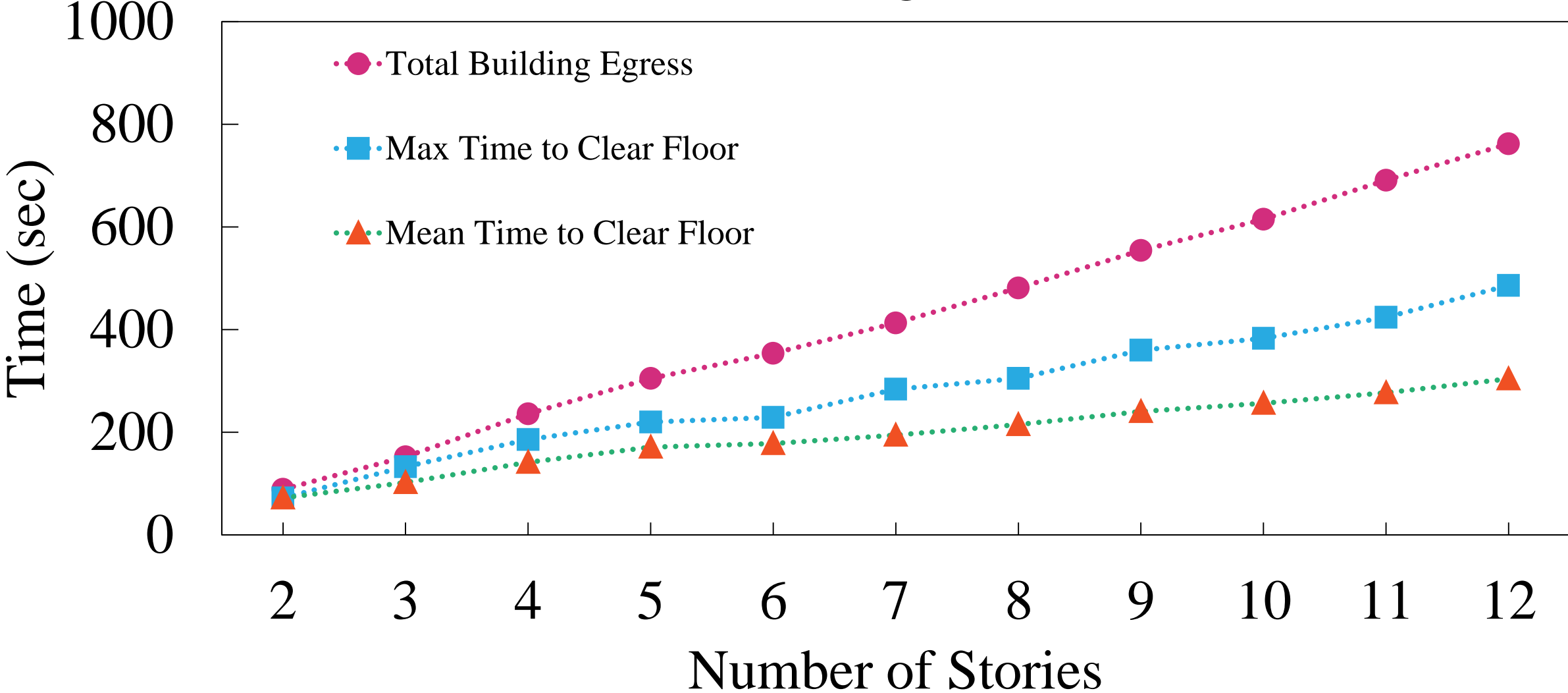


- Simulations ranging from 2-12 stories
- All simulations performed in both SFPE and Steering modes
- Exit discharge located at bottom of each stairwell

SFPE Mode



Steering Mode



Conclusions

- Total egress time is proportional to number of stories (as expected)
- Mean and maximum time to clear a floor also proportional to number of stories
- Potential solution – partial evacuation?

Future Study

- Expand scope of modelling analysis to taller buildings and more complex floor geometry
- Study real building evacuation data and determine if the same trend exists
- Code development community should consider these trends in future code cycles for requirements related to number of exits and egress width