

In testing ventilation methods for Meyerson Hall, I found that the relationship of placement of the roof opening is very important to the even distribute of comfort across zones. For instance, the Chimney which is located along one exposed side of the building yields the most even distribution of comfort across zones compared to the Central Atrium design which experiences more range in discomfort across more zones. However, the highest overall comfort average was achieved with the Central Atrium design. My speculation is that although it resulted in a wider range of values, this design was able to achieve a higher average because it also divides the space into a larger amount of zones (8 zones vs. 4 zones).

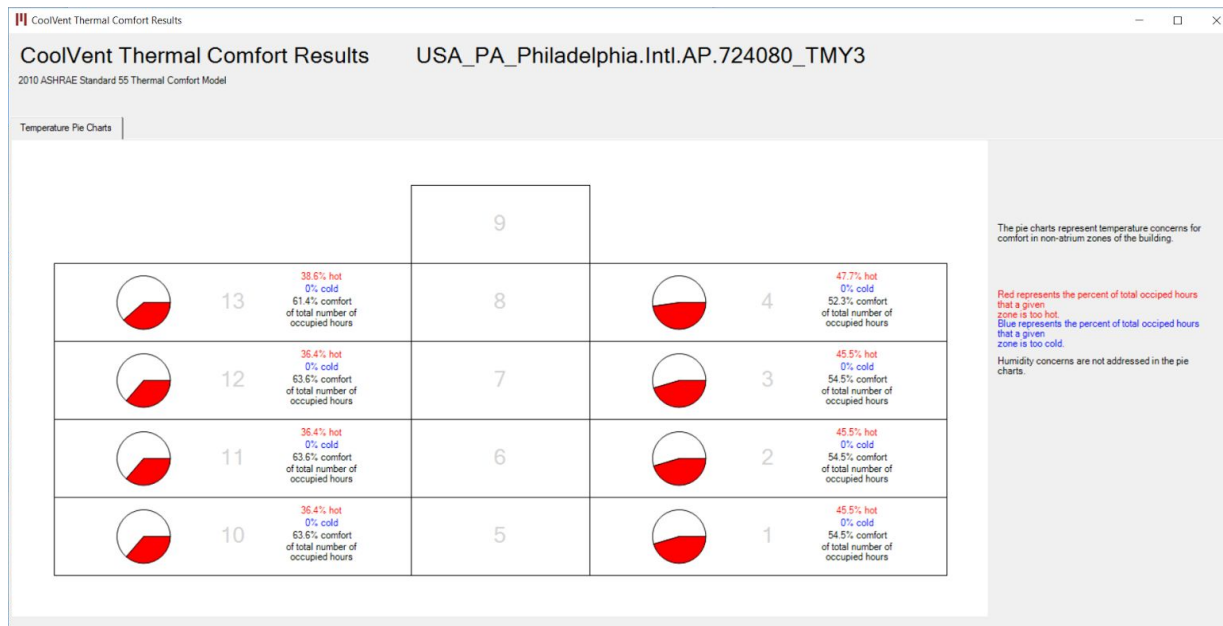
These are the dimensions set as a constant for the experiment:

The image shows the MIT CoolVent software interface. On the left, there is a 3D wireframe model of a building with a central atrium and a chimney. The main window is divided into several tabs: Start Here, Main Inputs, Transient Inputs, Building Dimensions, Windows and Openings, Ventilation Strategies, and Thermal Comfort Models. The 'Building Dimensions' tab is active, showing a list of dimensions with input fields: Number of floors (4), Floor length (40.5 m), Floor (bay) width (44 m), Floor-to-floor height (3.5 m), Floor-to-ceiling height (3 m), Shaft width (22.5 m), and Shaft height (5.5 m). To the right of these fields is a 'Help' button with a question mark. On the far right, there is a 'Scenario summary' panel for 'Meyerson Hall'. It lists: Simulation type: transient, Building type: central atrium, Building footprint: 4475.3 m<sup>2</sup>, Occupied area per floor: 3564.0 m<sup>2</sup>, Glazing-to-wall ratio per floor: 16.2 %, Opening-to-wall ratio per floor: 9.2 %, and Ratio of roof opening to roof area: 37.3 %. At the bottom of this panel are buttons for 'Calculate inputs / Save scenario' and 'Visualize results'.

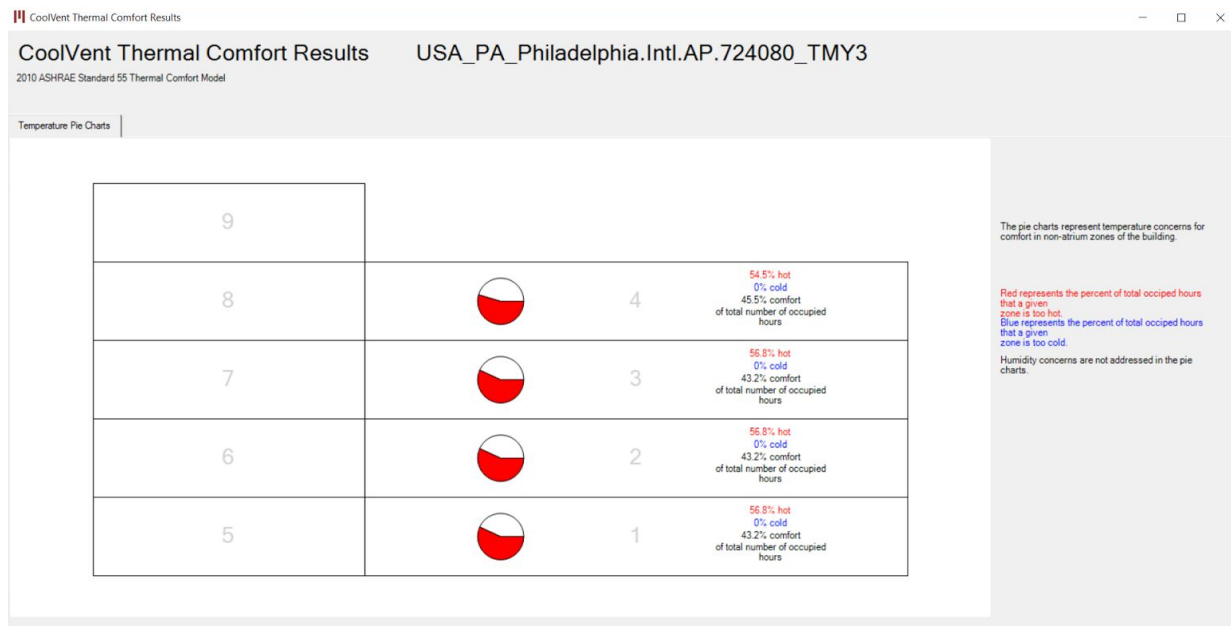
Building dimensions	Value
Number of floors:	4
Floor length:	40.5 m
Floor (bay) width:	44 m
Floor-to-floor height:	3.5 m
Floor-to-ceiling height:	3 m
Shaft width:	22.5 m
Shaft height:	5.5 m

**Scenario summary**  
Meyerson Hall  
Simulation type: transient  
Building type: central atrium  
Building footprint: 4475.3 m<sup>2</sup>  
Occupied area per floor: 3564.0 m<sup>2</sup>  
Glazing-to-wall ratio per floor: 16.2 %  
Opening-to-wall ratio per floor: 9.2 %  
Ratio of roof opening to roof area: 37.3 %

The results for a Central Atrium condition in September:



The results for a Chimney condition in September:



This condition attempts to incorporate 2 ventilation shafts which account for 170.5% of the roof area:

MIT CoolVent

Start Here Main Inputs Transient Inputs Building Dimensions Windows and Openings Ventilation Strategies Thermal Comfort Models File Units Help

Building dimensions

Number of floors: 4  
Floor length: 40.5 m  
Floor (bay) width: 44 m  
Floor-to-floor height: 3.5 m  
Floor-to-ceiling height: 3 m  
Shaft width: 10 m  
Shaft height: 10 m  
Shaft length: 10 m  
☒ Building has second ventilation shaft  
Second shaft width: 10 m  
Second shaft height: 10 m  
Second shaft length: 10 m

Meyerson Hall

Scenario summary

Simulation type: transient  
Building type: ventilation shaft

Building footprint: 2187.0 m<sup>2</sup>  
Occupied area per floor: 1782.0 m<sup>2</sup>  
Glazing-to-wall ratio per floor: 16.2 %  
Opening-to-wall ratio per floor: 9.2 %  
Ratio of roof opening to roof area: 170.5 %

Calculate inputs / Save scenario

Visualize results

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## ARCH-633\_Assignment 8



Perhaps that ratio of opening to roof area is too high?  
The next test will try for a lower percentage:

MIT CoolVent

Start Here Main Inputs Transient Inputs Building Dimensions Windows and Openings Ventilation Strategies Thermal Comfort Models

File Units Help

Meyerson Hall

Scenario summary

Simulation type: transient  
Building type: ventilation shaft

Building footprint: 2713.5 m<sup>2</sup>  
Occupied area per floor: 1782.0 m<sup>2</sup>  
Glazing-to-wall ratio per floor: 16.2 %  
Opening-to-wall ratio per floor: 9.2 %  
Ratio of roof opening to roof area: 49.4 %

Calculate inputs / Save scenario

Visualize results

Building dimensions

Number of floors: 4  
Floor length: 40.5 m  
Floor (bay) width: 44 m  
Floor-to-floor height: 3.5 m  
Floor-to-ceiling height: 3 m  
Shaft width: 23 m  
Shaft height: 3 m  
Shaft length: 15 m

☒ Building has second ventilation shaft

Second shaft width: 23 m  
Second shaft height: 3 m  
Second shaft length: 15 m



Conclusion: Comparative Chart

Strategy	Ratio of Opening to Roof Area	Comfort per Zone (%)	Overall Comfort Average (%)	Conclusion
Central Atrium	37.3%	54.5, 54.5, 54.5, 52.3, 63.6, 63.6, 63.6, 61.4	58.5	Highest variation in zones difference: 11.3
Chimney	37.3%	43.2, 43.2, 43.2, 45.5	43.8	Most even distribution of comfort across zones: 2.3
2 Vent Shafts	170.5%	50, 47.7, 45.5, 45.5	47.2	4.5
2 Vent Shafts	49.4%	47.4, 45.5, 45.5, 43.2	45.4	Reduction in opening ratio leads to minimal change in comfort level: 4.2