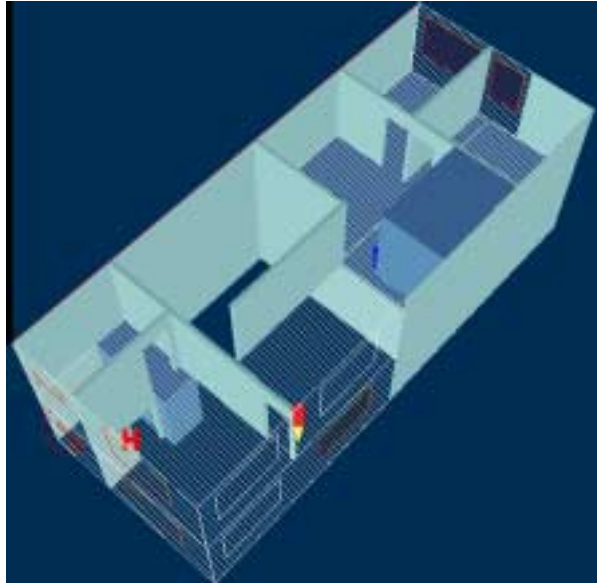
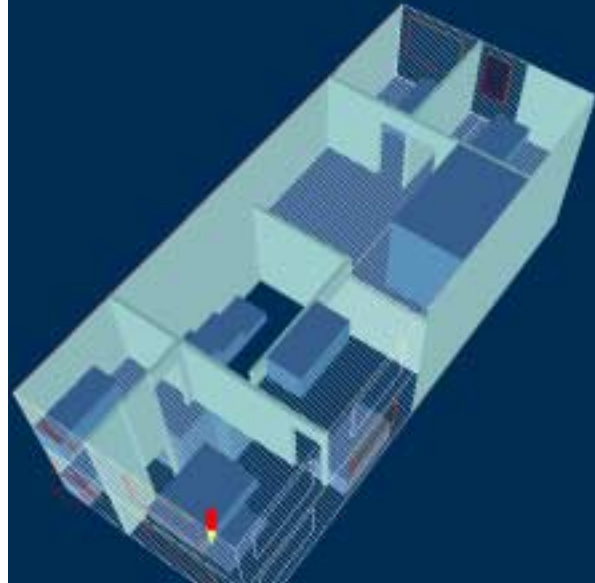


### Duplex Apartment Setup



Original Layout



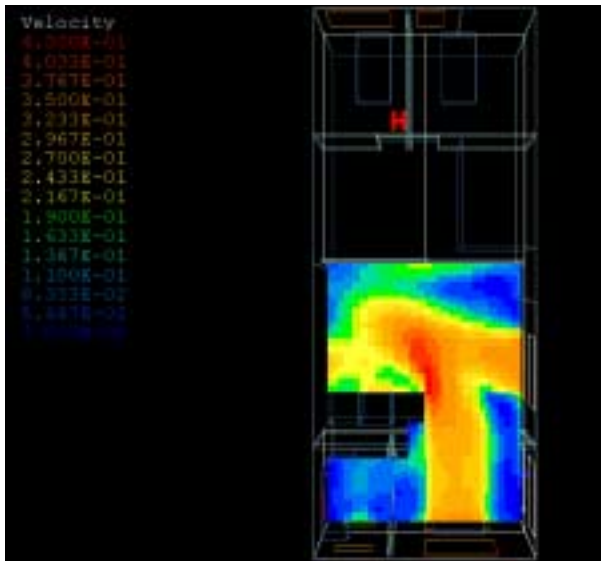
Modified Layout (Staircase, Railing, Furniture)

### Windows

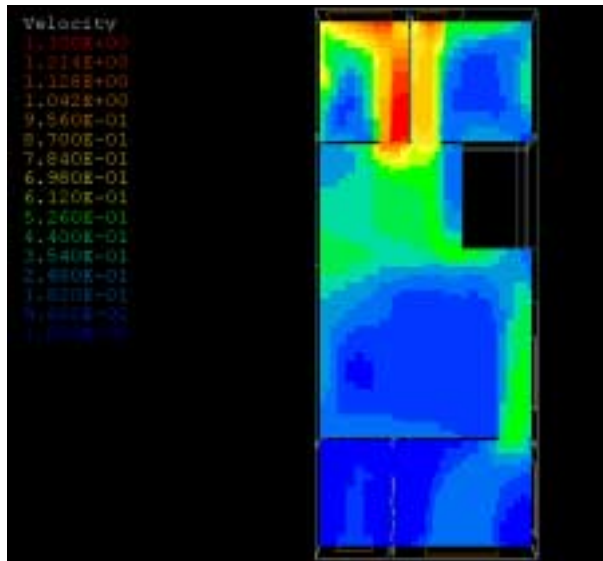
Duplex Level	Room	Orientation	Window Size (h x w)	Pressure (Pa)	Mean Air Velocity (m/s)
Lower Level	kitchen	south	1m x 0.5m	1.93	.241
	open area	south	2m x 1.5m	1.93	.321
	open area	east	2m x 1.5m	1.93	.336
Upper Level	bathroom	south	1m x 0.5m	1.93	.142
	master bedroom	south	2m x 1.5m	1.93	.236
	northwest bedroom	north	1m x 1.5m	-0.92	.915
	northeast bedroom	north	1m x 0.5m	-0.92	.977

### Velocity Patterns

Duplex Level	$V_{max}$	$V_{min}$
Lower Level (h=1.5 m)	0.43 m/s	0.03 m/s
Upper Level (h=4.3 m)	1.3 m/s	0.01 m/s



Velocity Contour at h=1.5m



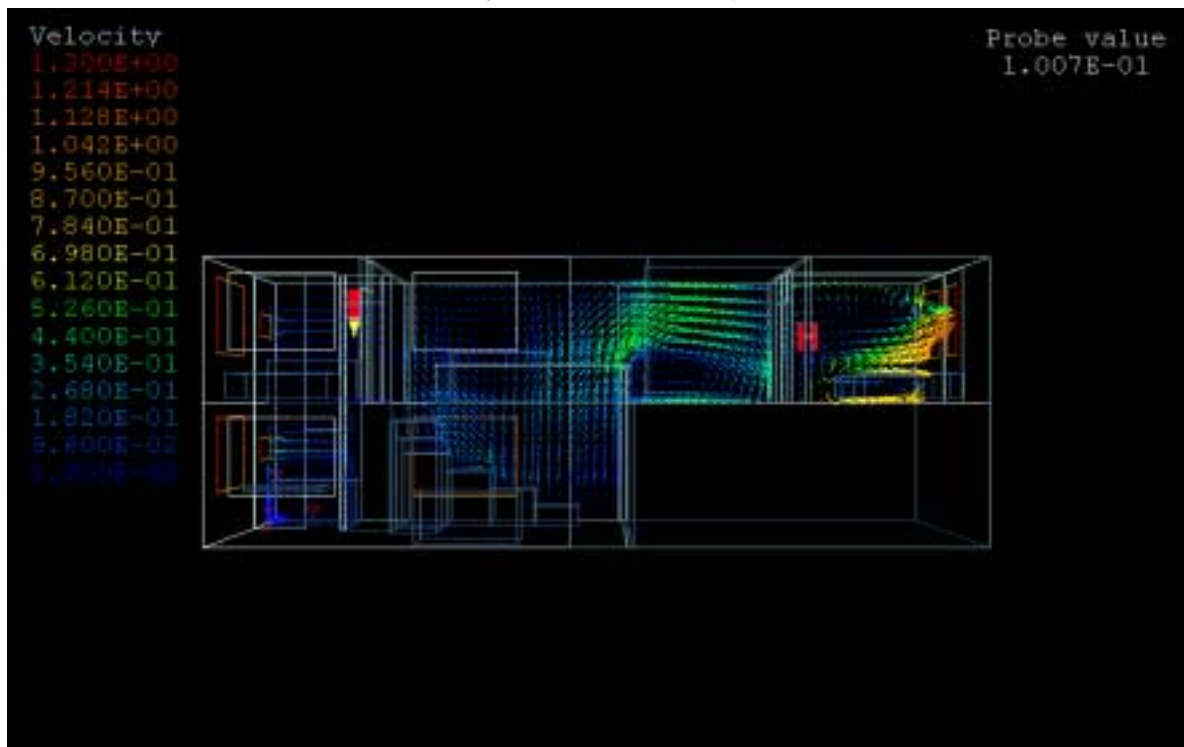
Velocity Contour at h=4.3m

(Note: Velocity ranges for each contour is different)

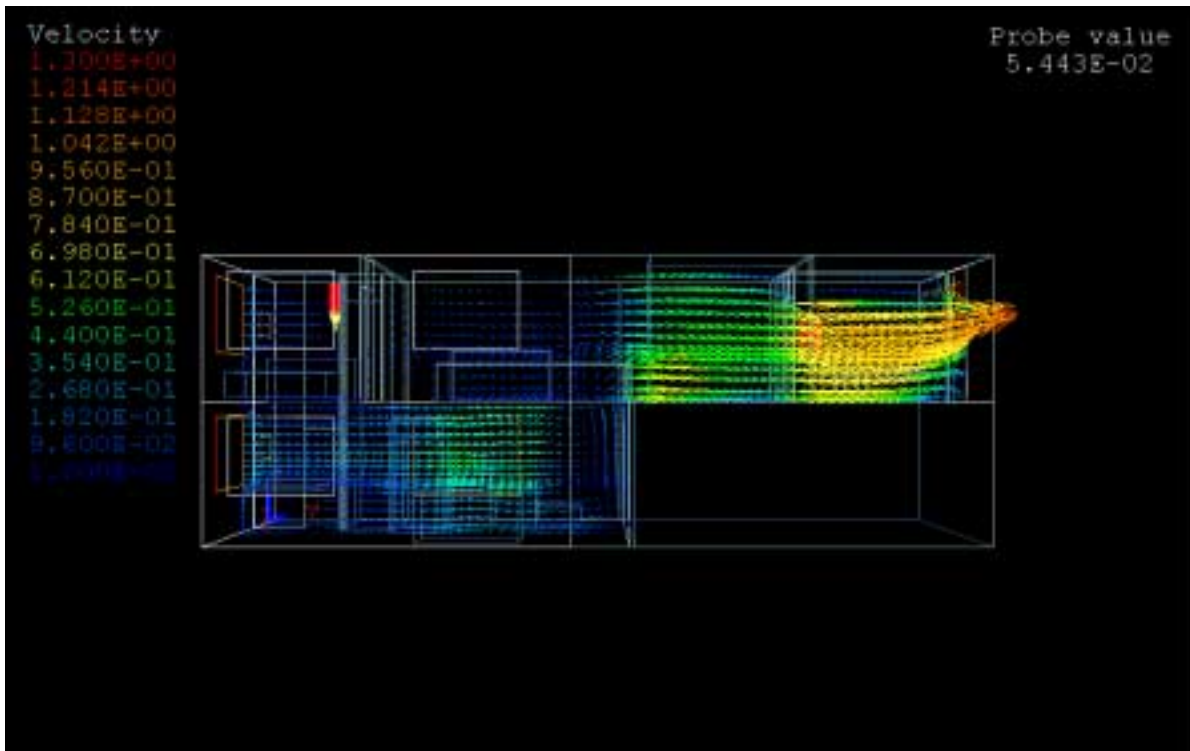
### Other Flow Patterns

(Note: Velocity ranges are the same in each figure for purposes of comparison)

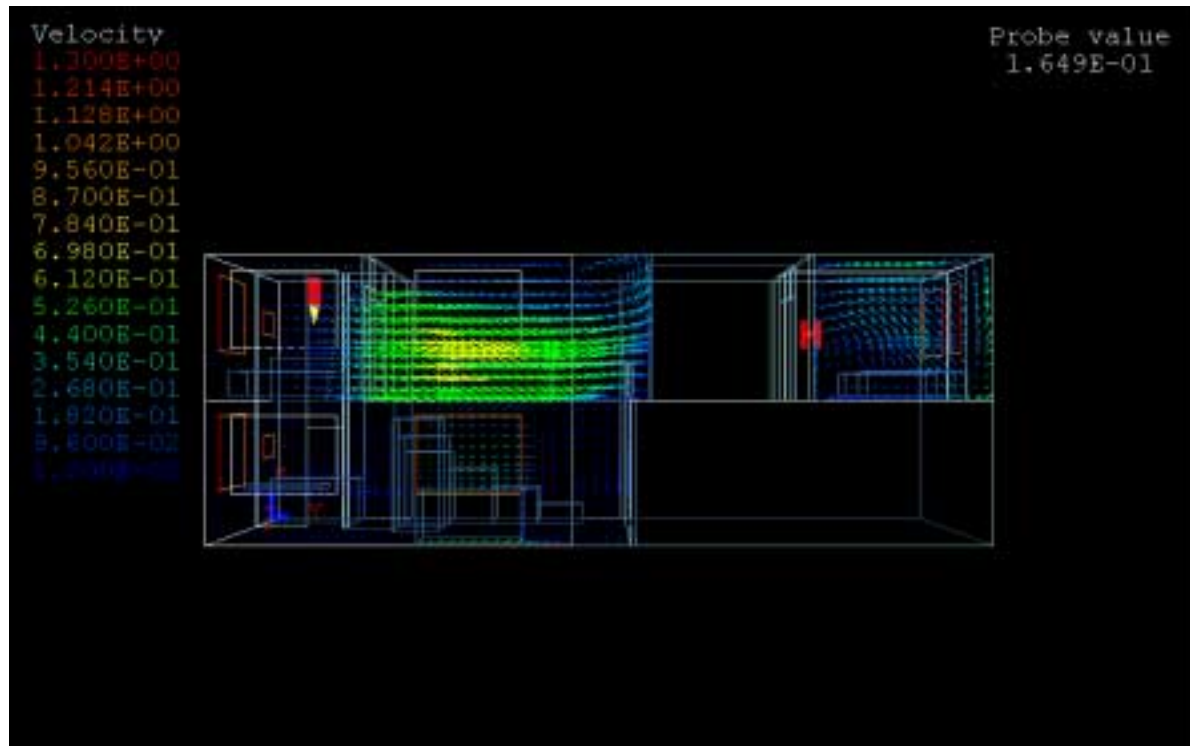
Velocity Vectors at x=1m plane



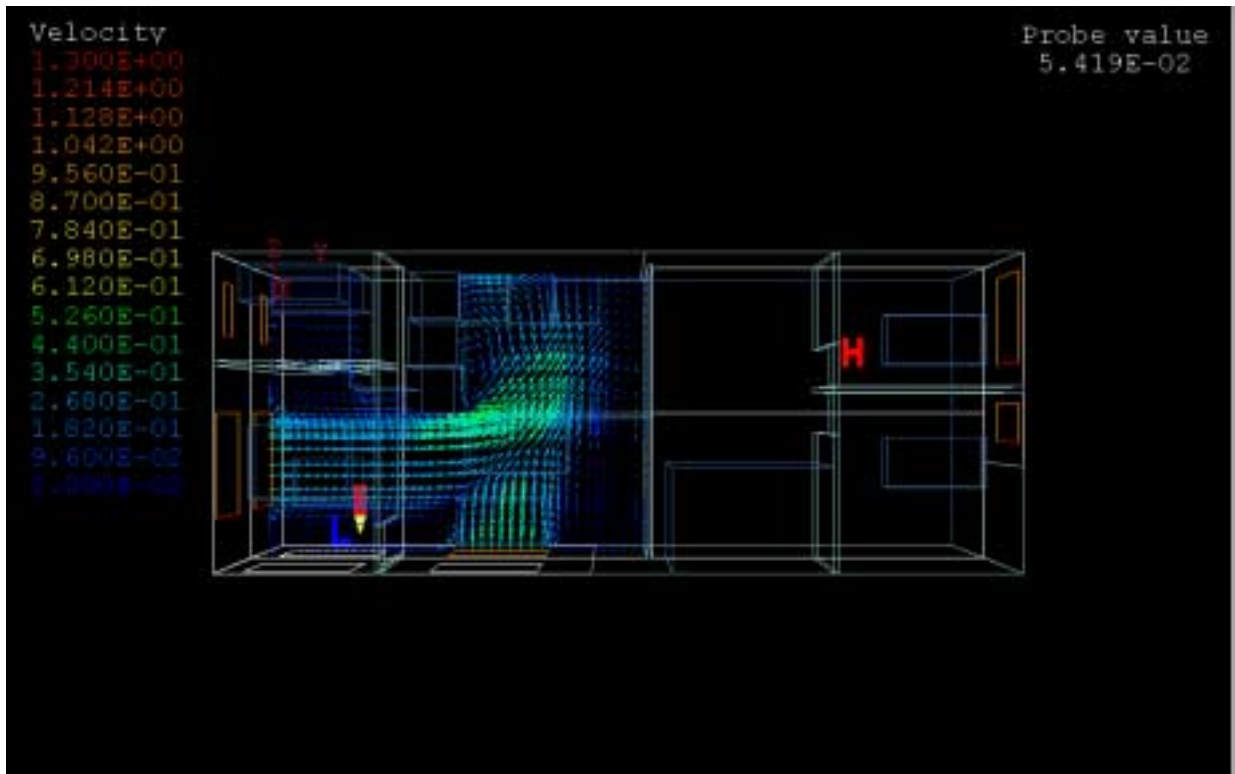
Velocity Vectors at x=3.2m plane



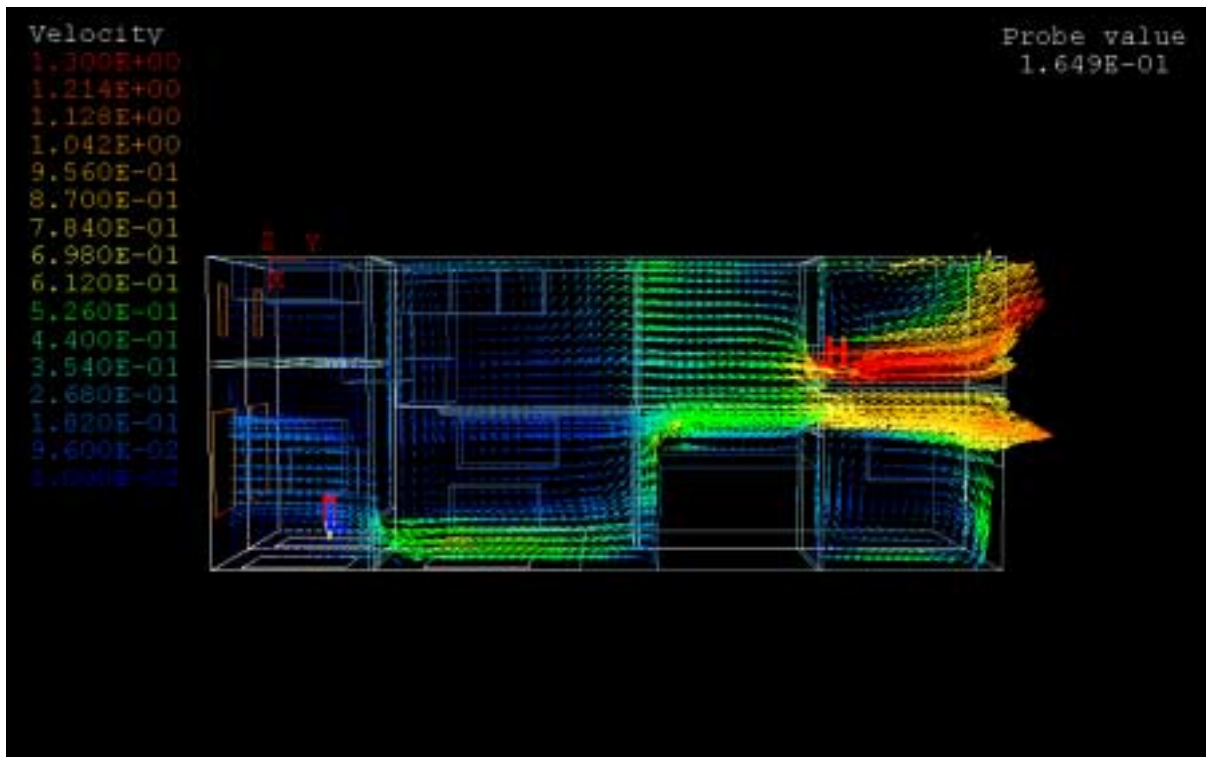
Velocity Vectors at x=5.6m plane



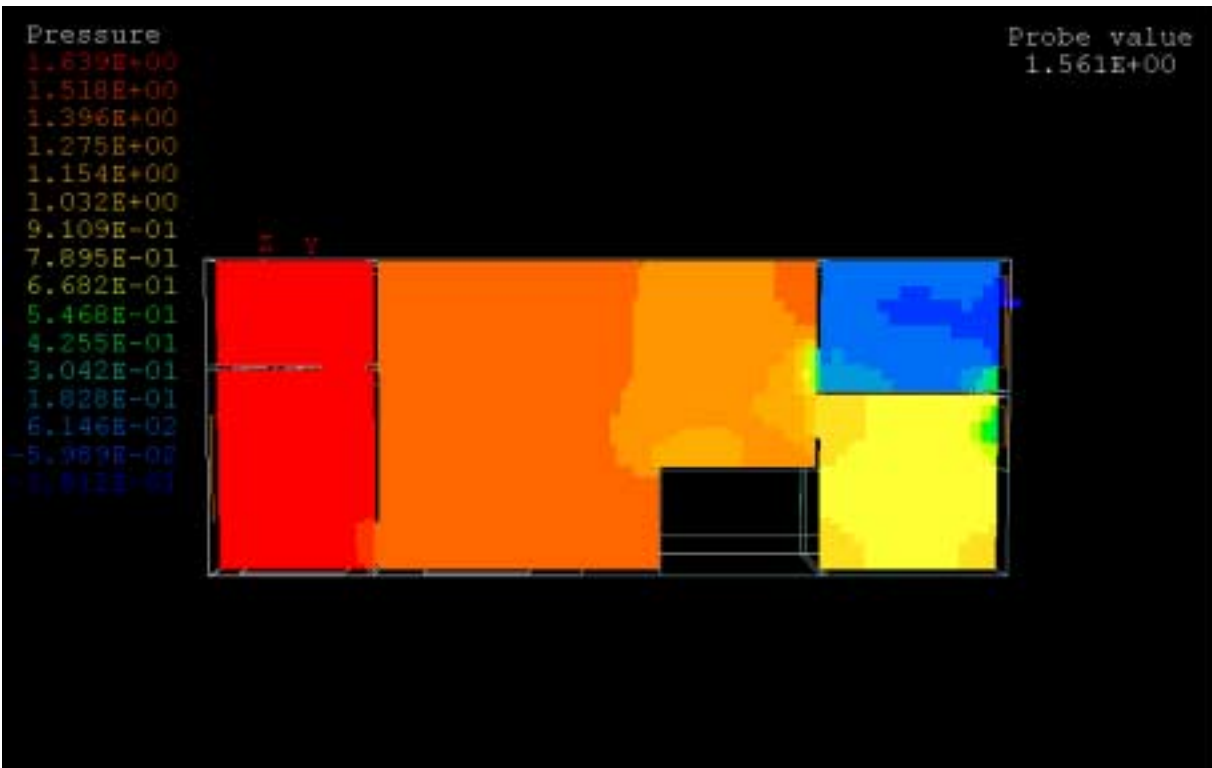
Velocity Vectors at z=1.5m plane



Velocity Vectors at z=4.3m plane



## Pressure Contour at z=4.8m plane



## Air change rate

(Original Calculation)

Volume=356.36 m<sup>3</sup>

$$\dot{V} = A_1V_1 + A_2V_2 + \dots + A_nV_n$$

$$\dot{V} = (0.5)(.146) + (0.5)(.22) + (3)(.288) + (3)(.236) + (3)(.281) = 2.598m^3 / s$$

$$ACH = \dot{V} \left( \frac{3600s}{1hr} \right) \left( \frac{1airchange}{365.26m^3} \right) = 25.606$$

$$ACH = 25.606$$

Suggestions...