Table 3 CFD Model Cases List

Case No.	Fire Place	Smoke layer height /m	Highest temperature/^{0}C	Wind speed/ m/s	Windows Open
1		1.10	70	2.0	Four windows open
2	First Floor	0.75	135	0.8	E、W and S
3		1.00	76	2.5	E、W and N
4		0.80	137	0.6	E、W
5		1.15	46	2.8	Four windows open
6	Thirteenth Floor	0.70	118	1.0	E、W and S
7		0.85	56	3.0	E、W and N
8		0.75	130	0.5	E、W
9		0.90	83	1.5	Four windows open
10	twenty-fourth floor	0.70	153	0.4	E、W and S
11		1.20	83	2.3	E、W and N
12		0.75	151	0.6	E、W

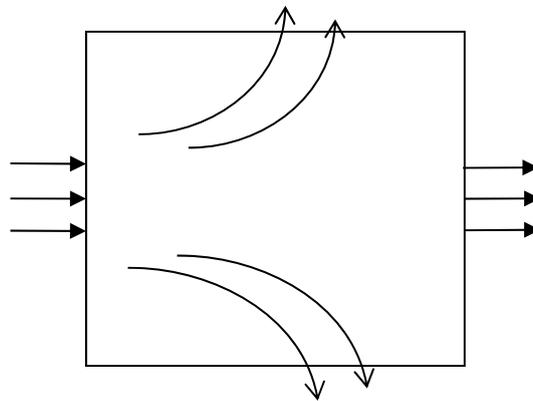*** N:**North; S:South; E:East; W:West

Fig.5 Flow pattern of upcoming wind

4. CONCLUSION

In this paper, an experimental facility was designed and placed in a wind tunnel. The wind effects on the indoor-air flow pattern were studied. The wind speed, distance between the barrier and other parameters were varied. CFD model was created and

some results were presented.

It can be concluded that upcoming wind speed would give effects on the vortex intensity. Higher wind speed would result a higher interface layer. Due to the drag force to upcoming wind, the cases for the four windows open and E、W and N windows open would give the higher smoke layer and lower smoke temperature. During the fire happens, the windows leeward must be closed.

ACKNOWLEDGEMENT

REFERENCES

Robert N.Meroney. (2011), "Wind effects on atria fires," Journal of Wind Engineering and Industrial Aerodynamics, 99, 443-7.

T. van Hooff, B. Blocken. (2010), "On the effect of wind direction and urban surroundings on natural ventilation of a large semi-enclosed stadium," Computers & Fluids, 39, 1146-55.

W.K. Chow. (2004), "Wind-induced indoor-air flow in a high-rise building adjacent to a vertical wall," Applied Energy, 77, 225-34.

Himoto K, Tsuchihashi T, Tanaka Y, Tanaka T. (2009), "Modeling thermal behaviors of window flame ejected from a fire compartment," Fire Safety Journal, 44(2), 230-40.

Klote,J.H. (1995), "Smoke control," SFPE Handbook of Fire Protection Engineering, NFPA SFPE 95, pp. 230-45.

Yang Y-C, Su C-H, Hsieh T-L, Chung K-C. (2005), "Wind effects on performance of smoke exhaust systems for tall buildings in Taiwan," Journal of Applied Fire Science, 14, 189-203.

Lu W, Lu WZ, Yuen KK, Lo SM, Fang Z. (2002), "Impact of floor planning on airflow patterns in designated refuge floor in high-rise building," Journal of Architectural Engineering, 8, 108-15.

Cheng CCK, Lam KM, Yuen RKK, Lo SM, Liang J. (2007), "A study of natural ventilation in a refuge floor," Building and Environment, 42(9), 3322-32.

Cheng C, Lam K, Demirbilek F. (2008), "Effects of building wall arrangements on wind induced ventilation through the refuge floor of a tall building," Journal of Wind Engineering and Industrial Aerodynamics 2008, 96(5), 656-64.

Chow WK, Li J. (2004), "Wind effects on performance of static smoke exhaust systems: horizontal ceiling vents," ASHRAE 2004 Annual Meeting,1-10.

Porch M, Trebukov S. (2000), "Wind effects on smoke motion in buildings," Fire Safety Journal, 35(3), 257-73.

Haixiang Chen, Naian Liu , Wanki Chow. (2009), "Wind effects on smoke motion and temperature of ventilation-controlled fire in a two-vent compartment," Building and Environment, 44, 2521-6.

Andersen KT. (2007), "Airflow rates by combined natural ventilation with opposing wind unambiguous solutions for practical use," Building and Environment , 42(2), 534-42.

Yuan J, Glicksman LR. (2007), "Transitions between the multiple steady states in a natural ventilation system with combined buoyancy and wind driven flows," Building and Environment, 42(10), 3500-16.

Hong Huang, Ryozo Ooka, Naian Liu, etc. (2009), Experimental study of fire growth in a reduced-scale compartment under different approaching external wind conditions. Fire Safety Journal, 44, 311-21.