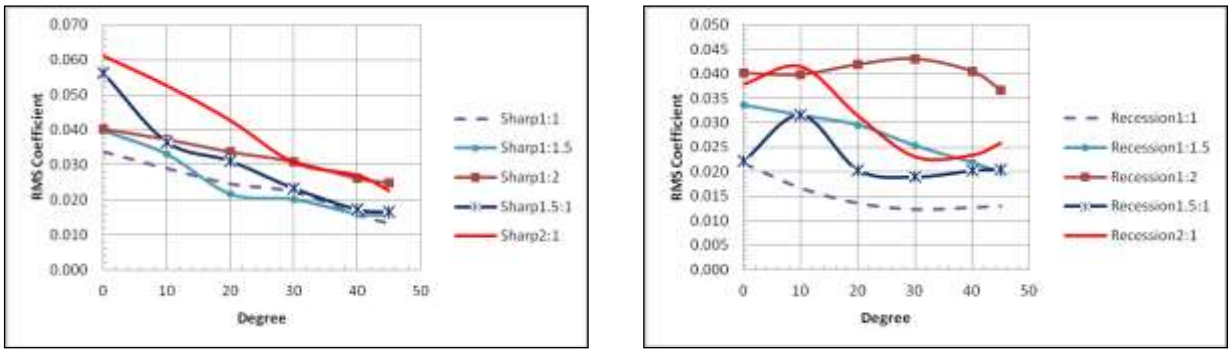


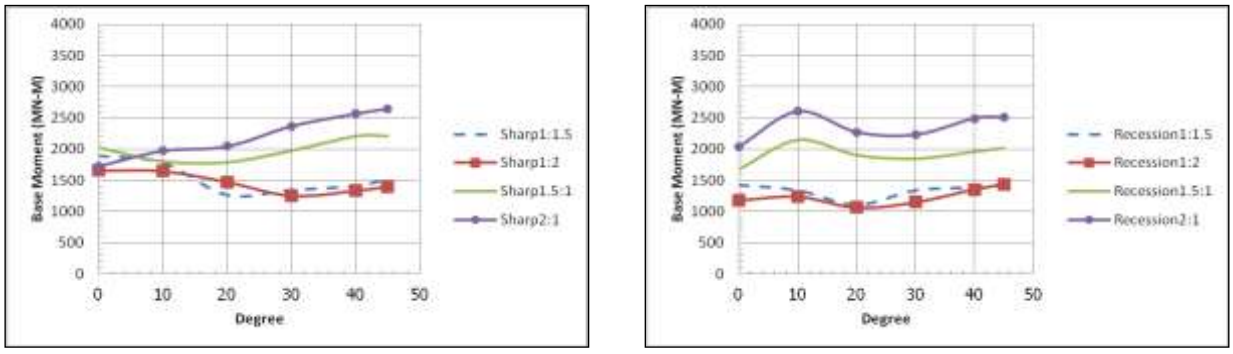

a) b)

Fig. 13 Standard deviation of fluctuating base torque for: a) sharp shape and b) recession corner

*4.2.3 Comparisons of based moments and torque*

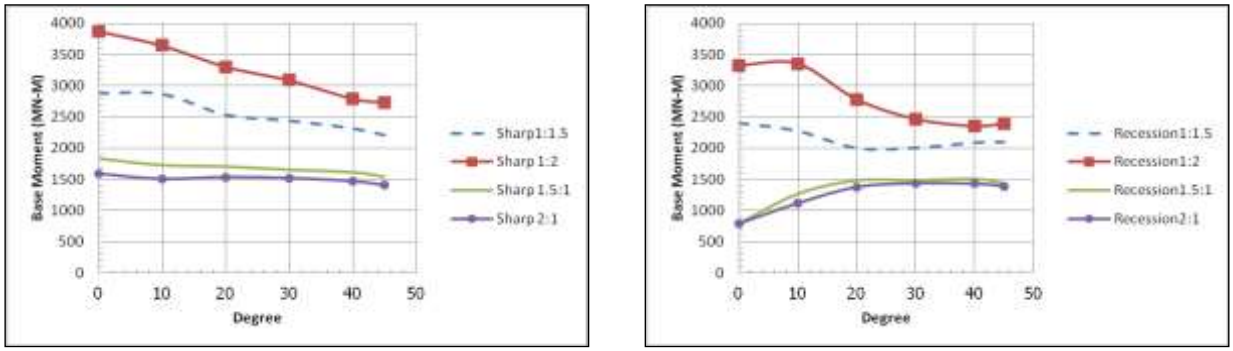
The building has the dimensions of depth : width : height = 40 : 40 : 240 m. in urban terrain. The natural frequencies in X and Y directions are 0.177 Hz and 0.177 Hz, and torsional frequency is 0.22 Hz. For strength consideration, 1-hour average wind speed in 50 year return period at 10 m in open terrain = 25 m/s corresponding to 33.43 m/s at building height, and damping ratio $\xi$ = 0.02.

The results of based moments and torque are shown in Figs. 14-16 for sharp shape and recession corner for aspect ratio of depth : width = 1:1, 1:1.5, 1:2, 1.5:1 and 2:1. The results show that the corner modifications result in significant reductions of along wind and across wind loads and response. For examples, the recession of the corner at 10 % of building face lead to reductions of base moment around x axis (0 degree wind direction) of 18, 25, 14, 3 and 2 percent for model depth to width aspect ratio (See Fig. 1) of 1:1, 1:1.5, 1:2, 1.5:1 and 2:1, respectively. Similarly, the recession of the corner at 10 % result in reductions of base moment around y axis of 13, 16, 14, 18 and 10 percent for the above models, respectively.



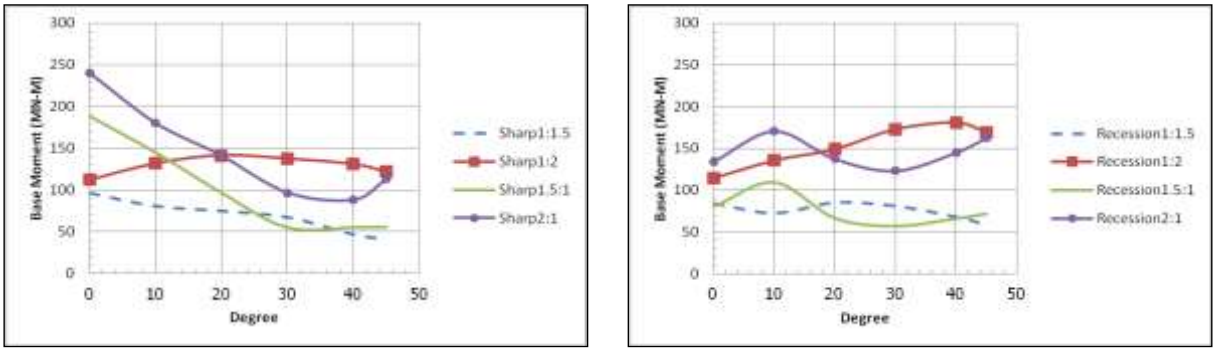

a) b)

Fig. 14 Comparisons of based moments about X axis for: a) sharp shape and b) recession corner




a) b)

Fig. 15 Comparisons of based moments about Y axis for: a) sharp shape and b) recession corner




a) b)

Fig. 16 Comparisons of based torque for: a) sharp shape and b) recession corner

## 5. CONCLUSIONS

Aerodynamic modifications of high-rise buildings for wind load and response reductions were studied. The high frequency force balance method in the wind tunnel based on base-bending-moment-based procedure was applied to test the sharp corner models and modification corner models by recession and chamfer. All results of mean wind force coefficients, spectra of aerodynamic base moments and torques, and standard deviation of fluctuating base moments and torques were compared for the wind directions of 10, 20, 30, 40, and 45 degrees. The results show that the corner modifications result in significant reductions of along wind and across wind loads and response. For examples, the recession of the corner at 10 % of building face lead to reductions of base moment around x axis (0 degree wind direction) of 18, 25, 14, 3 and 2 percent for model depth to width aspect ratio of 1:1, 1:1.5, 1:2, 1.5:1 and 2:1, respectively. Similarly, the recession of the corner at 10 % result in reductions of base

moment around y axis of 13, 16, 14, 18 and 10 percent for the above models, respectively.

## 6. ACKNOWLEDGMENTS

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