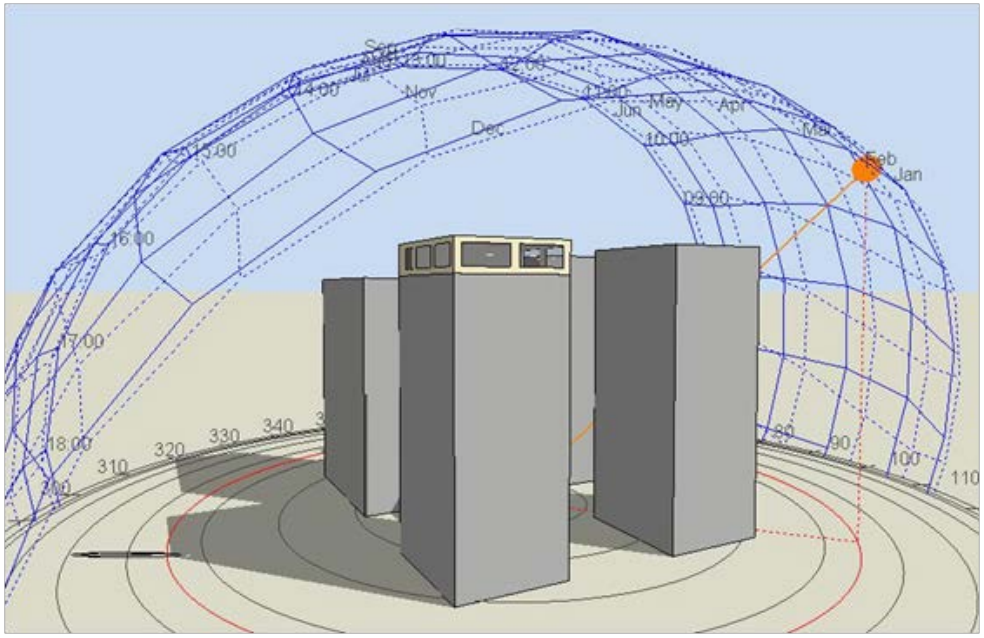
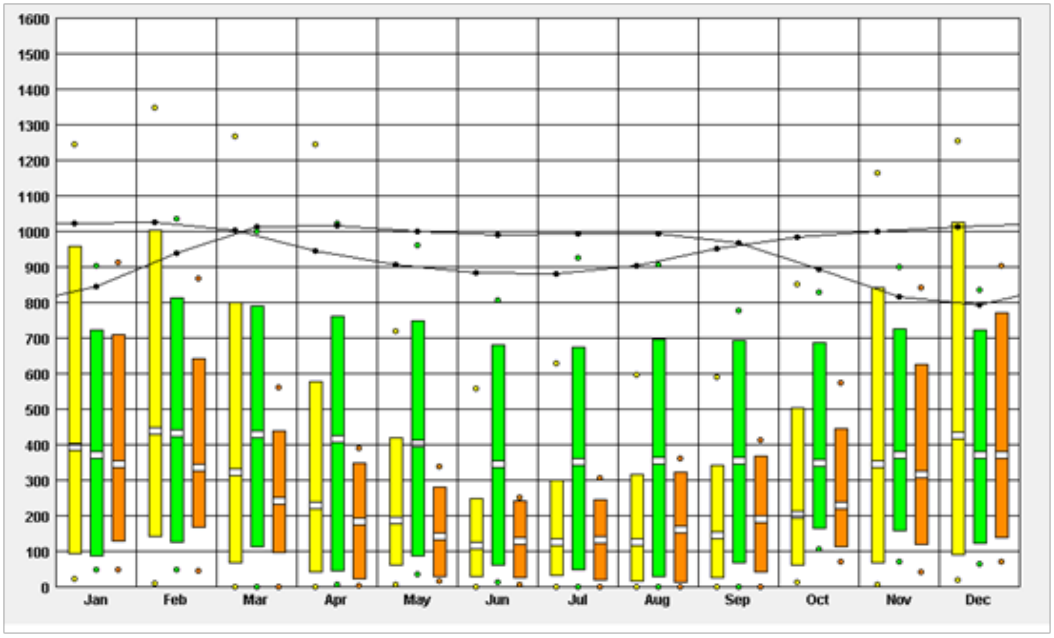
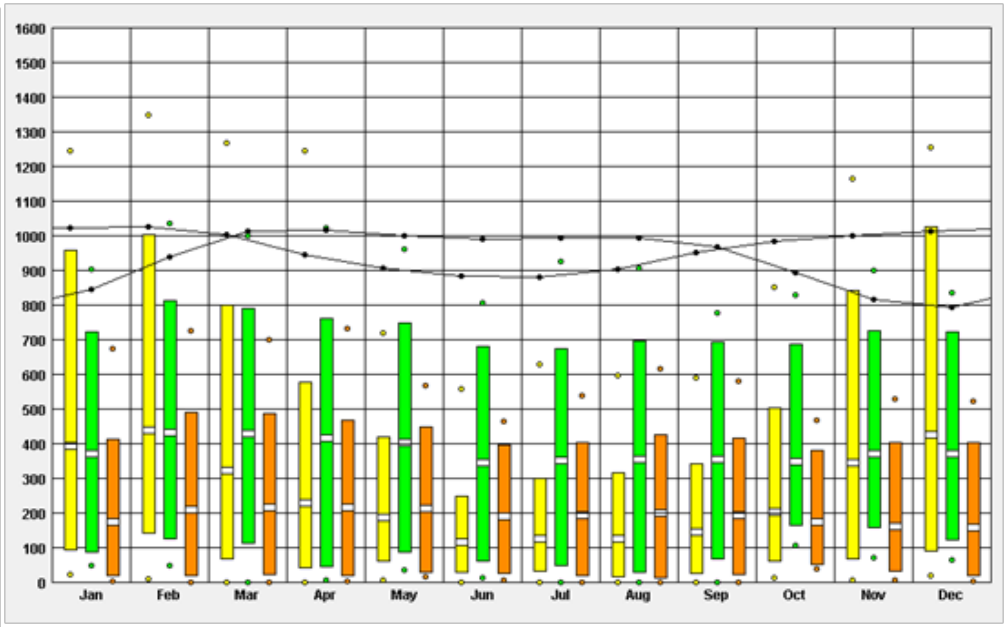
Investigation of fixed external shading devices to limit solar heat gain in office buildings in tropical monsoon climate of Mumbai

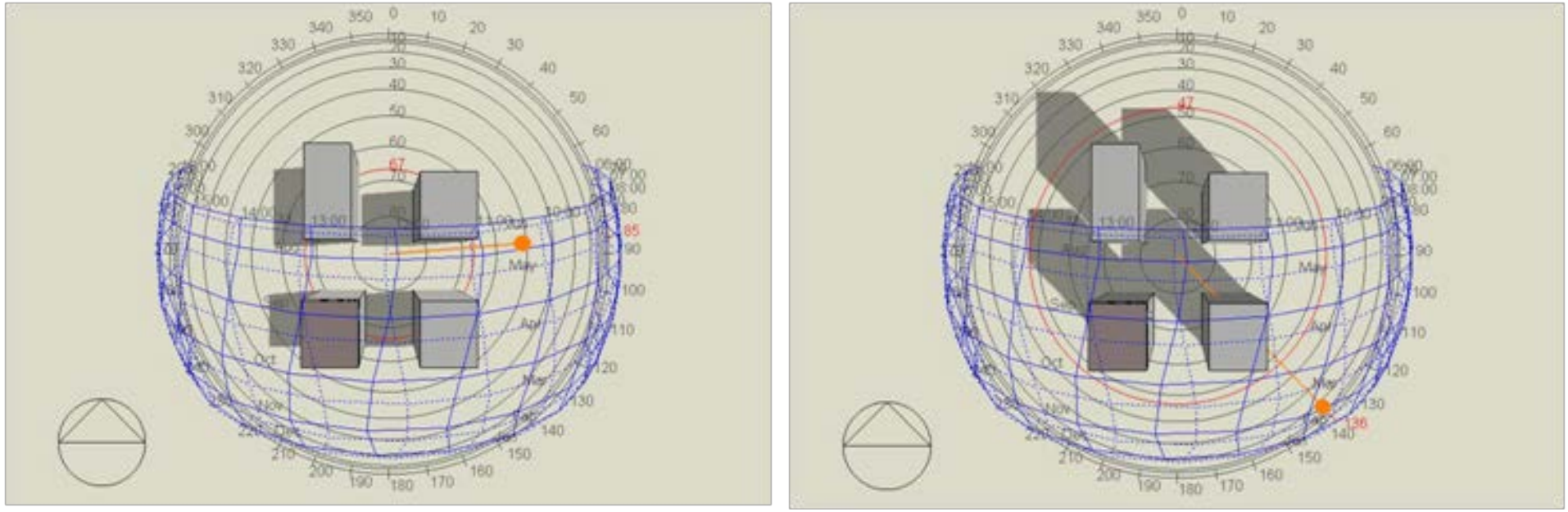


The top floor (10th) of a high rise office building in Mumbai , India is studied

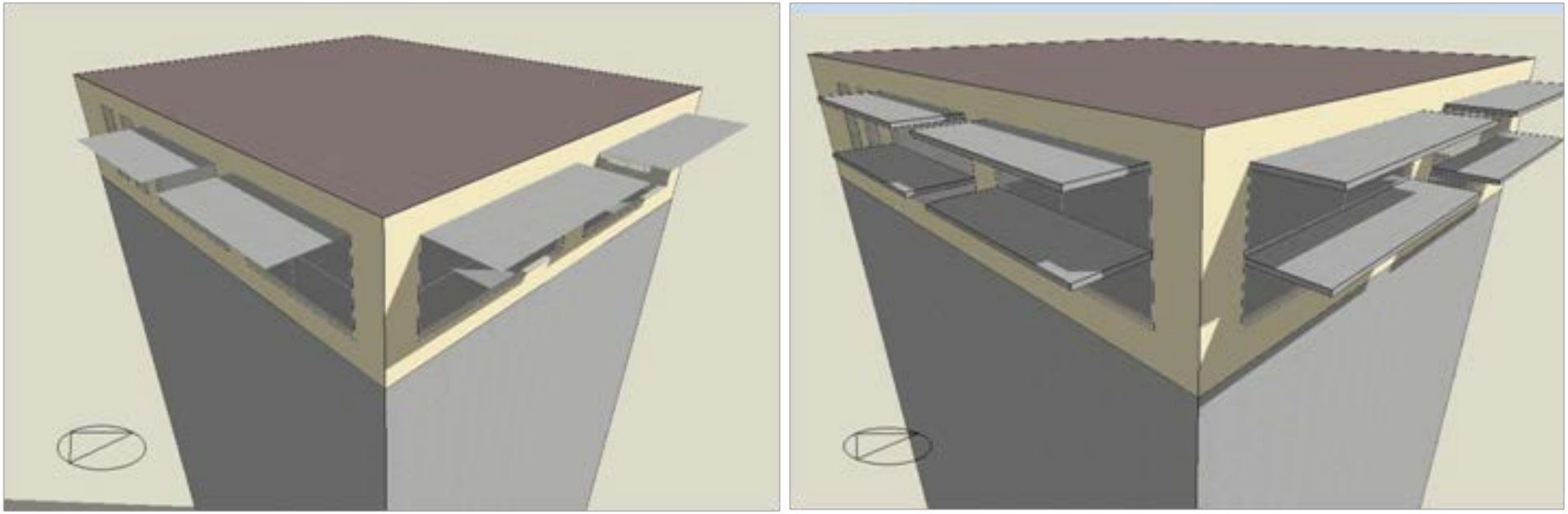




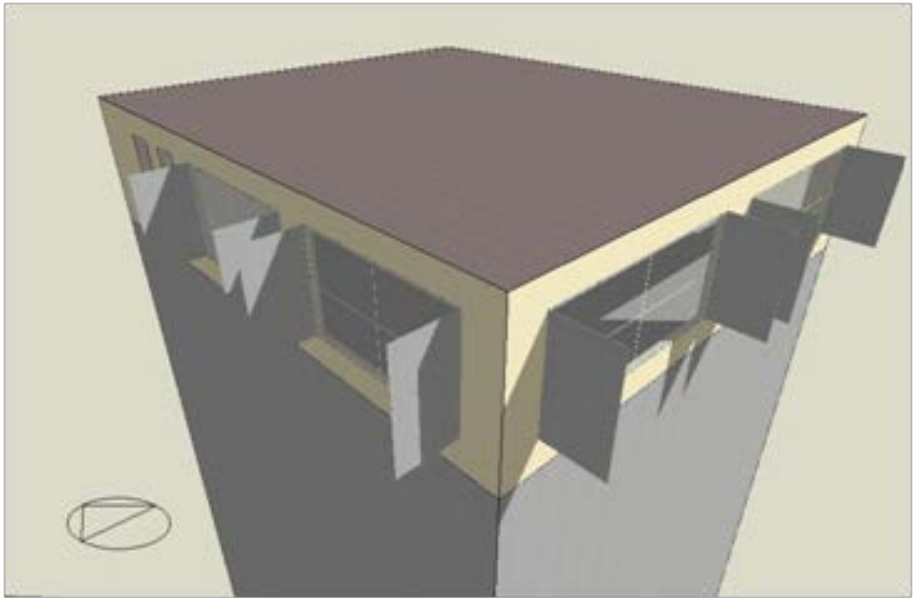
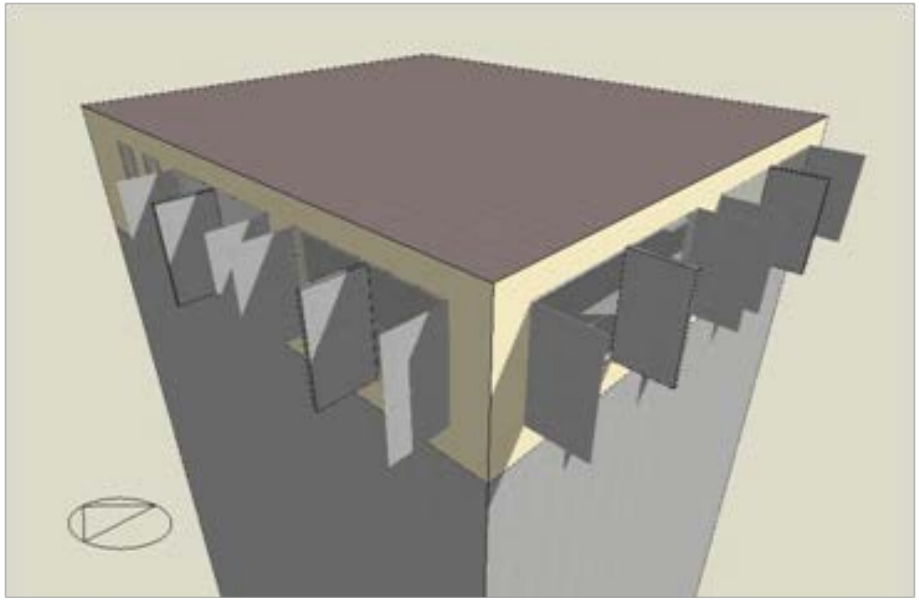
Total surface radiation received by the exposed sides of the building i.e on the South side (left) and West side (right)



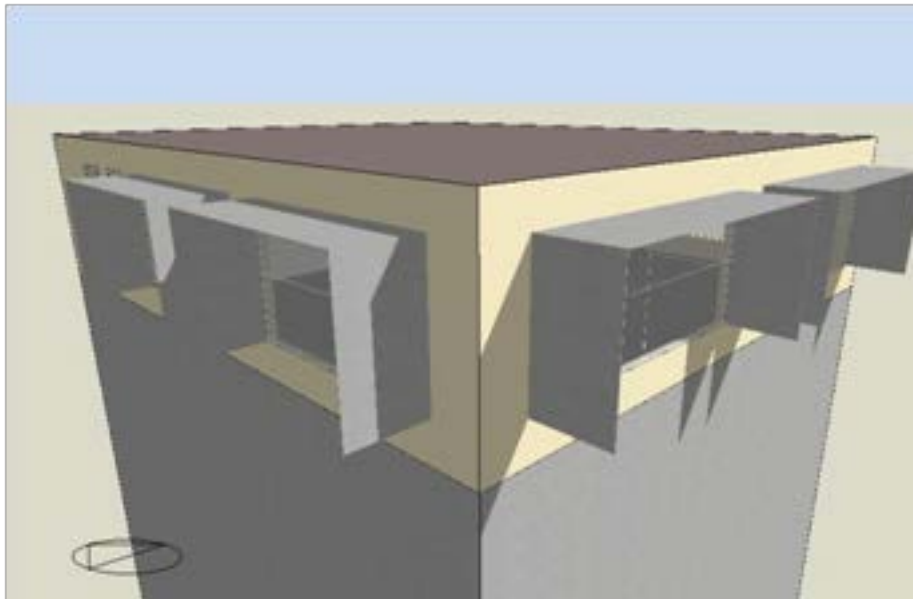
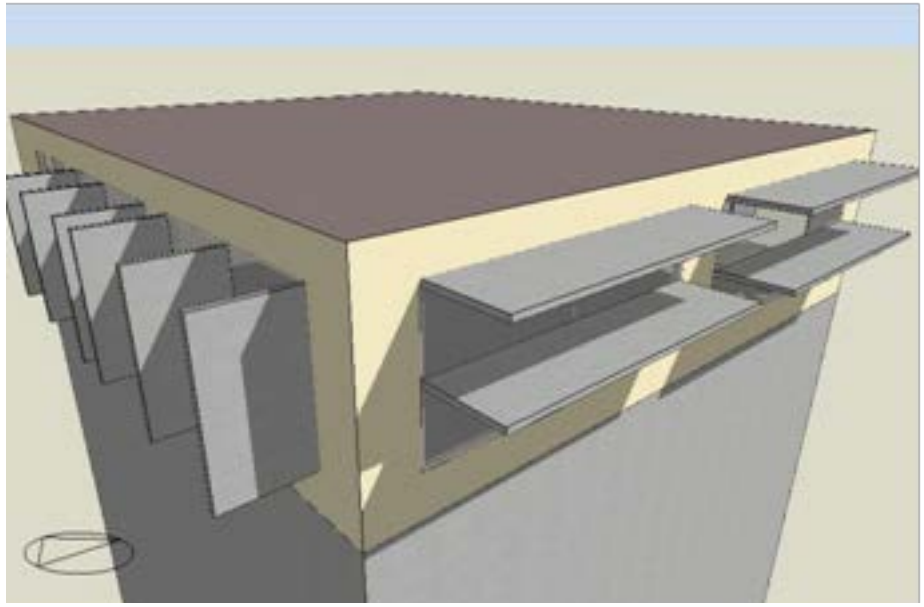
Sun path over the study building in summer design week (left) and winter design week (right)



Effectiveness of horizontal overhang (0.5, 1.0, 1.5, 2.0m) studied in Alt1-1.4 (left) and effectiveness of two overhangs studies in Alt 1.5 (right)

Effectiveness of vertical fins (0.5, 1.0, 1.5m) studied in Alt 2.1-2.3 (left) and effectiveness of three fins in Alt 2.4 (right)

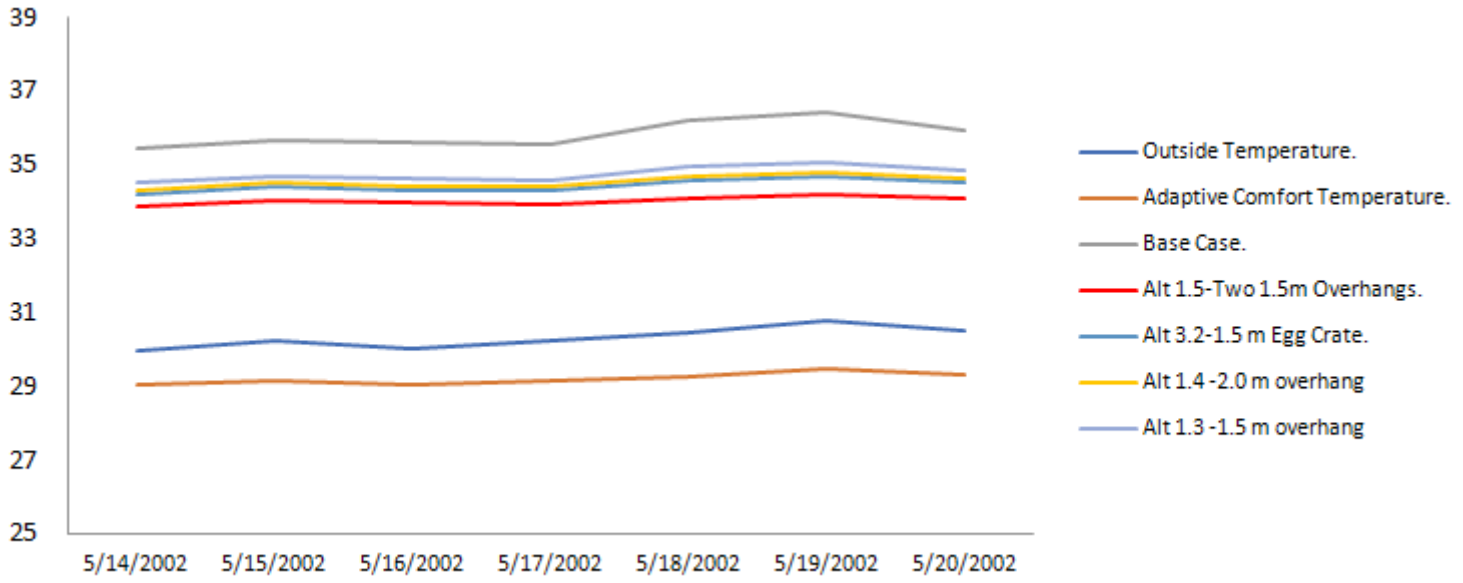
Effectiveness of egg crate (1.0, 1.5m) studied in Alt 3 (left) and effectiveness of mixed orientation wise strategies in in Alt 4(right)

RESULTS OF STEP 1

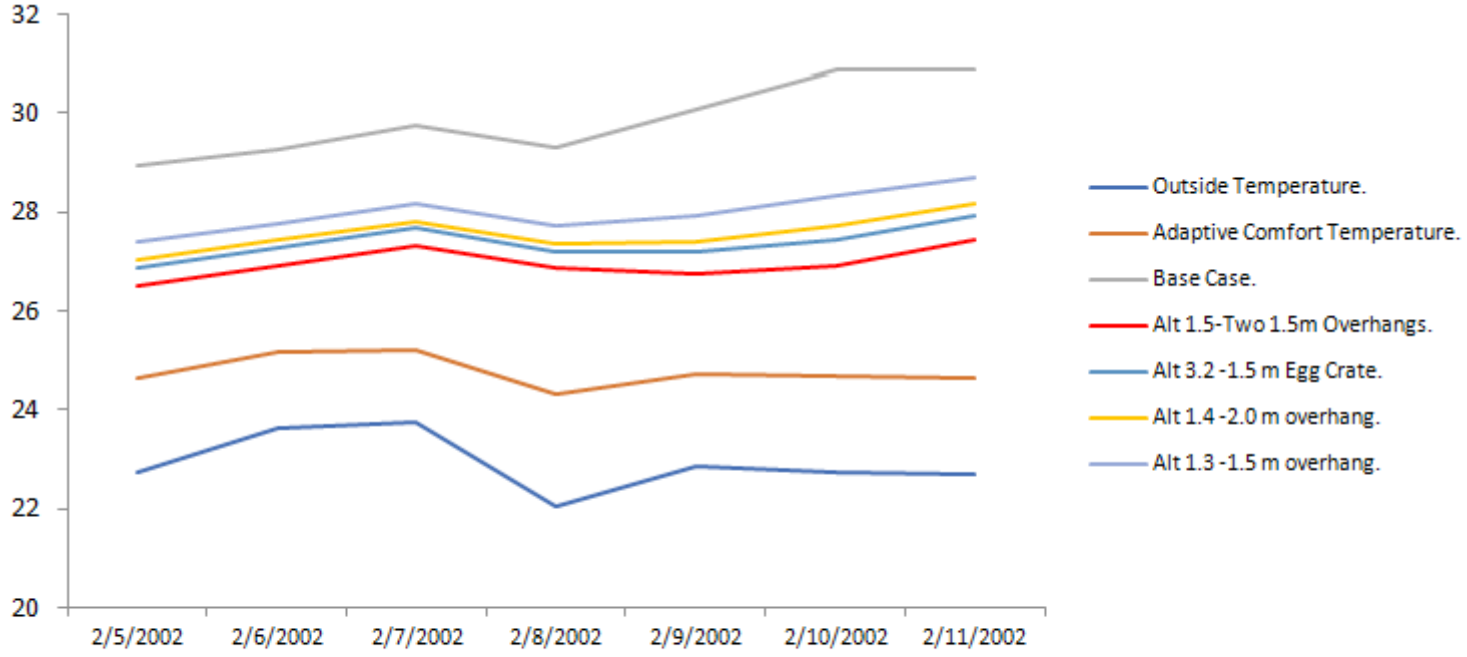
Alternative	Summer Design Week (Reduction %)	Winter Design Week (Reduction %)
Base Case	0	0
Alt 1 : Horizontal Overhang strategy		
1.1 : 0.5 m Overhang	12.63	15.1
1.2 : 1.0 m Overhang	23.75	29.26
1.3 : 1.5 m Overhang	**32.14**	**41.37**
1.4 : 2.0 m Overhang	**38.51**	**50.50**
1.5 : Two 1.5m overhangs	**53.3**	**63.6**
Alt 2 : Vertical Fins strategy		
2.1:0.5 m SideFins	3.49	5.53
2.2:1.0 m SideFins	5.80	9.2
2.3:1.5 m SideFins	7.7	11.8
2.4:Three 1.5m fins	19.0	27.2
Alt 3 : Egg crate strategy		
3.1:1.0 m Egg Crate	**31.0**	39.4
3.2:1.5m Egg crate	**42.3**	**55.1**
Alt 4 : Mixed strategy		
4 : Two overhangs on south and Three fins on East and West	29.3	**52.5**

Reduction in solat heat gain as compared to Base Case . Alt 1.3, 1.4 , 1.5 and 3.2 studied further in step 2

Alt 1.5 found to be the most effective shading strategy



Indoor Operative temperature in Summer Design Week



Indoor Operative temperature in Winter Design Week