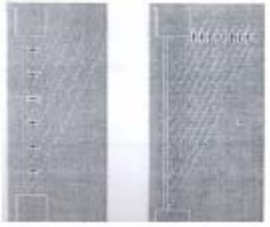
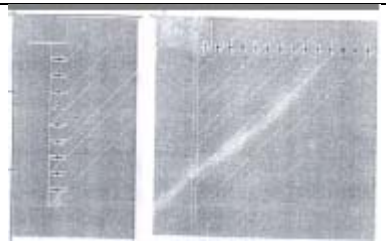
Broad Design GuideLines for energy efficient buildings in Haryana			
Architectural Design			
Design Parameters		**Recommendation**	**Remarks**
1	Orientation	Long Axis of the building along North south orientation.	
2	Wall to Wall Ratio	20-25% window to wall ratio on North & South orientation	To maximize glazing percentage on North and South orientation and minimize glazing percentage on East and West orientation. Glazing percentage recommended is enough to achieve recommended daylight level with minimum dissatisfied hours in a 6 m deep space away from the opening
		10% window to wall ratio recommended on East and West orientation	
3	External Shading		

Window Size	**Orientation**	**Shading Sizes**	**Recommended Glass**	**Design**	**Remarks**
For Window Ht-1200 mm					
Option 1	East/West	Horizontal Projection =2300 mm	Clear Glass	Horizontal Projection divided into louvers 	Most economical option. As per sun path analysis cuts direct radiation of critical hours specific to the orientation
	North	Horizontal Projection =235 mm	Clear Glass	Horizontal Projection or recess in the masonry.	
	South	Horizontal Projection =650 mm	Clear Glass	Horizontal projection divided into louvers 	

Window Size	**Orientation**	**Shading Sizes**	**Recommended Glass**	**Recommended SHGC by Energy Conservation Building Code**	Design	Remarks
Option 2	East/West	Horizontal Projection =1200 mm	Glass with SC=0.58	0.25		
	North	Horizontal Projection =1200 mm	Glass with SC=0.67	0.25		
	South	Horizontal Projection =1200 mm	Glass with SC=0.67	0.25		

Window Size	Orientation	Shading Sizes	Recommended Glass	Recommended SHGC by Energy Conservation Building Code	Design	Remarks
Option 3	East/West	Horizontal Projection =600	Glass with SC =0.45	0.25		It is recommended to select glass with suggested SC and highest light Transmission available.
	North	Horizontal Projection =600	Glass with SC =0.45	0.25		
	South	Horizontal Projection =600	Glass with SC =0.45	0.25		
Option 4	East/West	No external shading	Glass with SC =0.29	0.25		
	North	No external shading	Glass with SC =0.29	0.25		
	South	No external shading	Glass with SC =0.29	0.25		

Non Airconditioned Spaces				
Design Parameters		**Recommendation**	**Construction**	**Remarks**
Wall Alternatives				
	1	Double Brick Cavity Walls	Internal Plaster + Single Brick + air gap+ single brick+ external plaster	No insulation required between the cavity
Roof Alternative				
	1	Shaded + insulated roof with white china mosaic finish	Internal Plaster + Concrete slab + 3 " insulation & water proofing + tile finish	
	2	Non air conditioned spaces below air conditioned spaces.	Eg: Ground floor non air conditioned, comfort would be achieved through ceiling fans, while on the upper floors where roofs are exposed to direct solar radiation additional mechanical ventilation is required.	
Glazing Alternatives		Single glazing 100% shaded by external shading devices.		

Airconditioned Spaces				
Design Parameters	**Recommendation**	**Comnstruction**	**Remarks**	**Annual Energy Savings**
Wall Alternatives				
For both daytime and 24 hour occupied building		U factor : 0.062 Btu/hr ft2 F (U Factor: 0.352 W/m2 C)		
1	Brick Wall + 3" Extruded Polystyrene	Internal Plaster + single brick + insulation + External Plaster	Rs. 975/m2	3-10%
2	Brick Wall + 3.5" Rock Wol	Internal Plaster + insulation + single brick + External Plaster	Rs. 525/m2	
3	Brick Wall + 3.5" Expanded Polystyrene	Internal Plaster + insulation + single brick + External Plaster	Rs. 600/m2	
4	Brick Wall + 3" Polyurethane/ Polyisocyanurate spray	Brick Wall + 3" Polyurethane/ Polyisocyanurate spray	Rs. 1600/m2	

Airconditioned Spaces				
Design Parameters	**Recommendation**	**Comnstruction**	**Remarks**	**Annual Energy Savings**
Roof Alternatives				
For daytime (8 hour) occupied building		U factor : 0.072 Btu/hr ft2 F (U Factor: 0.409 W/m2 C)		
1	Roof Insulation +2.5" extruded polystyrene and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish	Rs. 1100/m2	3-10%
2	Roof Insulation +2" polyurethane spray and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish	Rs. 820/m2	
3	Roof Insulation +3.2" perlite and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish	Rs. 570/m2	
4	Roof Insulation +6" insuplast and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish	Rs. 608/m2	

Airconditioned Spaces				
Design Parameters	**Recommendation**	**Comnstruction**	**Remarks**	**Annual Energy Savings**
Roof Alternatives				
For 24 hour occupied building		U factor : 0.046 Btu/hr ft2 F (U Factor: 0.261 W/m2 C)		
1	Roof Insulation + 4" extruded polystyrene and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish		3-10%
2	Roof Insulation + 3.2" polyurethane spray and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish		
3	Roof Insulation +5.5" perlite and reflective external surface	Internal Plaster +concrete slab + water proofing + insulation + tile finish		
Glazing Alternatives				
1	U factor : 0.056 Btu/hr ft2 F (U Factor: 3.177 W/m2 C)	Solar heat gain coefficient: 0.25 Visible light transmittance: 50%		