

APPLICATION OF BUILDING INSULATION IN INDIA

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India Insulation Forum Seminar

"Basics of Thermal Insulation of building for Energy Efficiency"

EPI OF BEEP CHARRETTE PROJECTS: COMMERCIAL BUILDINGS, SUMMARY OF RESULTS

ESTIMATED ENERGY PERFORMANCE INDEXES OF CHARRETTE PROJECTS



ECBC COMPLIANCE ROUTES



POSSIBLE EFFECTS OF USING INSULATION IN ISOLATION



- Insulation applied on a tight building without proper shading and/or natural ventilation may lead to increased annual cooling demand
 - Cooling might be used throughought the year (even in winter)
 - Comparison



REDUCING HEAT GAINS



- Insulation is to be applied in conjunction with other building elements/systems
 - 1. Reduce solar gains
 - 1. Window to wall ratio
 - 2. Static shading
 - 3. External shading
 - 2. Use natural cooling
 - 1. Natural ventilation
 - 2. Free cooling
 - 3. Insulate



Examples of heat loads for a residential home with 3 faces exposed



Gains



- Building tightness (when closed)
- Insulated and low SHGC glazing
- Insulation on walls



Gains



- Increase of WWR to 50%
- Use of external movable shading





CASE STUDY: Aranya Bhawan, Jaipur

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Aranya Bhawan is the new office building of the Rajasthan Forest Department in Jaipur, inaugurated in March 2015.

ARANYA BHAWAN: BEEP DESIGN Charrette (December 2012)



BEEP Integrated Design Charrette was held in December 2012, adopting a collaborative working approach between the client, RSRDC & the architect.

- Client: Rajasthan Forest
 Department
- Executing Agency: Rajasthan State Road Development and Construction Corporation Ltd. (RSRDC)
- Architects: Mathur, Ugam and Associates



As at the time of charrette, the orientation and building massing was already finalized; the focus was more on envelope & HVAC measures

ARANYA BHAWAN: PASSIVE MEASURES





SANDWICH WALL INSULATION





THERMAL BRIDGES BY



- Slab to outside _____
- Pillars
- Relative surface of thermal bridging (35%):



Aranya Bhawan: Cooling System





REDUCTION IN COOLING SYSTEM SIZE





ARANYA BHAWAN: COST BENEFIT OF ENERGY EFFICIENCY MEASURES



			EPI: 77 kWh/m²/year
	Before Charrette	After Charrette	
Energy Performance Index (EPI)	77 kWh/m²/year	53 kWh/m²/year	32% energy savings
Cost of construction (not	Rs. 30 crores	Rs. 30.6 crores	2% cost
including the solar PV system)			increase

PAYBACK PERIOD: 3 YEARS



ELECTRICITY CONSUMPTION: SIMULATION & ACTUAL (EPI)



Monthly EPI Comparison: Simulated vs. Actual





INTEGRATED DESIGN CHARRETTE FOR D B PRIDE, INDORE

SUN PATH: SUMMER (21st June)



SUN PATH: MID-SEASON (21st March)





SUN PATH: WINTER (21st December)





CONCERNS: SUNSHINE IN SUMMER



- West facing units receive high direct sunshine at the hottest time of the day i.e. after 3 pm
- North and South facing units (B Block) receive less direct sunshine in summer
- End units of B Block will need special concerns as the west and east walls are exposed
- Open recreational spaces and the club house are well shaded in summer



<u>CONCERNS: WIND</u> VENTILATION FOR ALL BLOCKS





AREAS CONSIDERED FOR SIMULATION





SIMULATION RESULTS FOR ZONE 4 (TOP FLOOR) SHOWING THE EFFECT OF PASSIVE DESIGN MEASURE ON TEMPERATURE





SIMULATION RESULTS FOR ZONE 4 (TOP FLOOR) SHOWING THE EFFECT OF PASSIVE DESIGN MEASURE ON COOLING ENERGY





04.West.Win South.Exp. Present Design

04.West.Win South.Exp. with strategies



To know more about BEEP charrettes and to apply for a charrette, please visit www.beepindia.org

THANK YOU !!!