INDO - SWISS

BUILDING ENERGY EFFICIENCY PROJECT

BEEP
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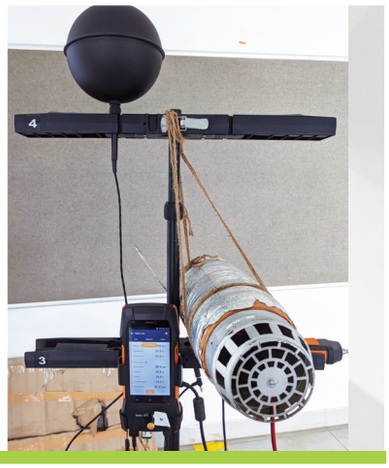
CASE STUDY ON ELA GREEN SCHOOL, CHENNAI



Ministry of
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ऊर्जा जीवन है, संरक्षण करें
BEE
Energy Is Life, Conserve it.

Schweizerische Eidgenossenschaft
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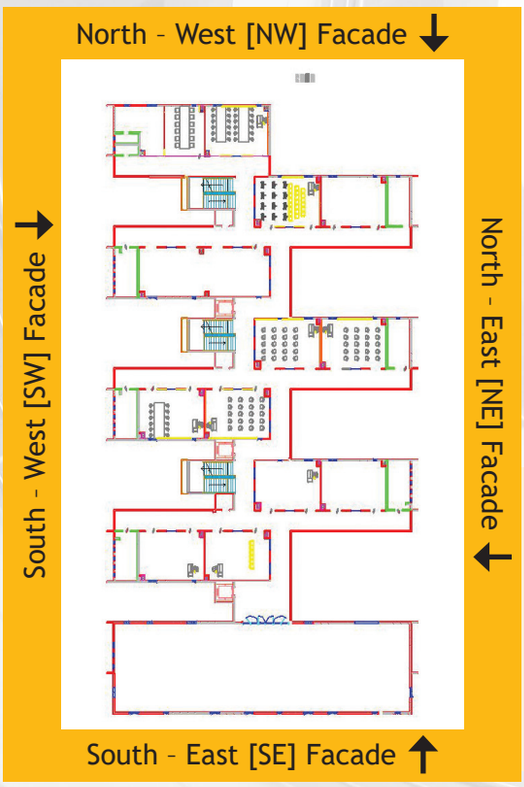
Swiss Agency for Development and Cooperation SDC

OVERVIEW

The Indo – Swiss Building Energy Efficiency Project (BEEP) provides technical assistance to builders and developers in designing energy efficient buildings. The technical assistance is provided by conducting a "design charrette" (a 3-4 day integrated design workshop) in the early design phase of the project. **Ela Green School, Chennai** was selected for the charrette which was held in July 2017.



- Ela Green School is in the outskirts of Chennai in Karambur village. It is a private, co-educational independent school with students from Play School to Class VIII and intended to increasing the classes progressively to 12th standard. It is a 4-storey building and will have key spaces as classrooms, labs, seminar rooms, halls, auditorium etc.
- Ela Green School has been conceived as a green school and aspires to imbibe concepts of sustainable living to its students. The project was executed by Ela Green School - BEEP Project Team.

- Site area: 29,848 m2
- Built-up area: 7,902 m2
- No. of storey: Ground + 3
  - 7 interconnected blocks/wings
  - 1 main administration block
- Occupancy period: 8:00 am – 3:00 pm

ACHIEVING THERMAL COMFORT IN THE CHENNAI CLIMATE

Chennai falls in the Warm – Humid Climate Zone with peak summer daytime temperature reaching 40-41°C; mild winters with day-time temperatures of 31°C. Also, the diurnal temperature variation is small (7 °C). High humidity with relative humidity exceeding 50% most of the time. Chennai has a good wind speed (Avg. wind speed 3 m/s) which can be utilized to achieve better thermal comfort. Given the climate of Chennai and for a mixed-mode building, the design objectives for energy efficiency and thermal comfort were:

(a) To increase the thermal comfort hours through passive measures and ventilation i.e. without the use of air-conditioning

(b) Improve daylight in the classrooms during occupancy hours

ENERGY EFFICIENCY MEASURES IMPLEMENTED IN ELA GREEN SCHOOL, CHENNAI

Reduce heat gains through building envelope

External Wall- exposed facade (pre fabricated sandwich panels of 60 mm Concrete + 40 mm Insulation + 150 mm Concrete)	U Value = 0.62 W/m^{2}k
Roof (Topping concrete 30mm+ EPS Insulation 50mm + Topping Concrete 60 mm + Hollow Core Slab 265 mm)	U Value = 0.55 W/m^{2}k
Window glazing (DGU)	SHGC = 0.26
Window-to-wall ratio	30%

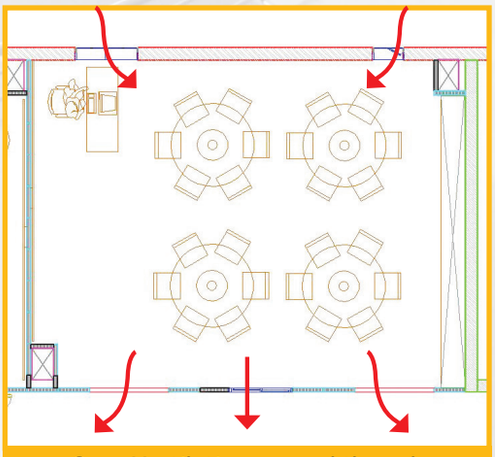
A Picture of pre fabricated sandwich panels

A picture of window opening

IMPROVING POTENTIAL OF VENTILATION FOR THERMAL COMFORT

- Each classroom has a window to floor area ratio (WFRop) of 14% . Windows are placed to allow good cross natural ventilation.
- A provision is made to further improve ventilation (~15 air change per hour) through assisted ventilation, by means of ventilation shafts with suction fans at the top of the shaft. When the fan is operated, a negative pressure is created in the shaft improving air change through classrooms. The fans can be operated during the day-time when the outside ambient is lower than the inside temperature or during the night for cooling the building through night ventilation. This ensures that improved ventilation can be provided even during low ambient wind velocity.

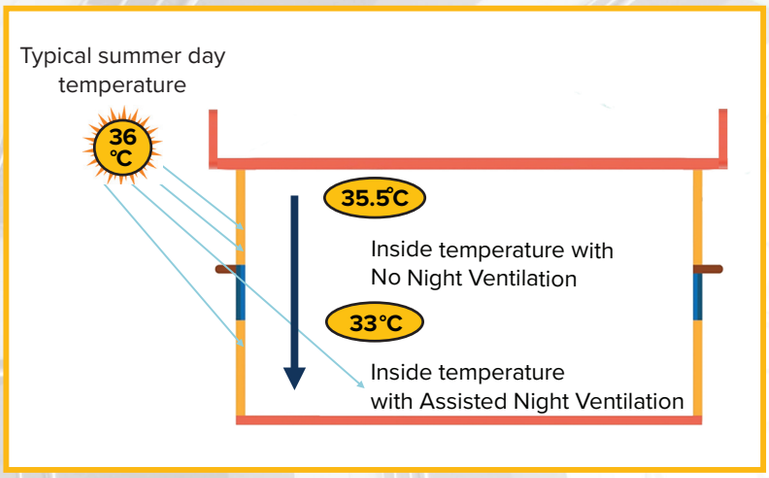
Assisted ventilation shaft in a classroom



Cross Ventilation ensured through placement of windows

The energy simulation carried at the time of charrette indicated that the number of thermally comfortable hours during the occupancy period are more than doubled through passive measures and assisted ventilation.

Measured impact of assisted night ventilation on thermal comfort



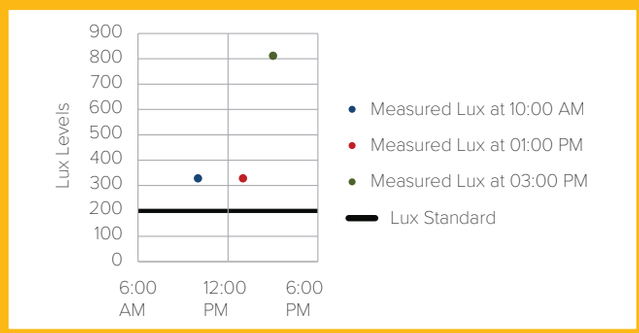
Measurements were taken for 3 days in June 2022,

- Up to 2.5°C reduction in air temperature during occupancy hours with assisted night ventilation.
- With no night ventilation, most of the time during occupancy **(22 out of 24 hours spread over 3 days or 92% of the time of the occupied hours)** are discomfort hours.
- With natural night ventilation (windows open during night), the discomfort hours are reduced to almost half **(13 out of 24 hours, 54%)**.
- With assisted night ventilation (Fan operated during the night), the discomfort hours are reduced to almost 1/4th **(6 out of 24 hours, 25%)**.

IMPROVING DAYLIGHTING

The classroom doors are fully glazed and are shaded by the corridor. This with, the DGU (clear glass) helps in increasing the Daylight Factor (DF) inside classrooms to adequate levels and distribute the light uniformly.

Measured daylight levels in a typical classroom



The Lux levels measured are well above standards[1] and therefore, indicates good daylighting in the classrooms.

[1] *National Building Code (Volume 2)*

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Project Management and Technical Unit (PMTU)

The Indo-Swiss Building Energy Efficiency Project (BEEP) is a bilateral cooperation project between the Ministry of Power (MoP), Government of India and the Federal Department of Foreign Affairs (FDFA) of the Swiss Confederation. The Bureau of Energy Efficiency (BEE) is the implementing agency on behalf of the MoP while the Swiss Agency for Development and Cooperation (SDC) is the agency in charge on behalf of the FDFA.

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