
India’s 1st


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Sustainable
Net Zero Energy
Showroom


PUMA

BUILDING ENVELOPE

- WALLS : - 200 mm Porotherm blocks with both sides cement plastered
  - U Value 0.1473 Btu/hr.ft^2.^{0}F

- SLABS : - Ready Mix Concrete with GGBS mix for structure
  - Recycled steel

- ROOF OVER
  DECK INSULATION : - Over deck extruded polystyrene insulation (XPS)

- GLAZING : - High performance facade
  - Reduced HVAC system load
  - U value 0.4984 Btu/hr.ft^2.^{0}F; SHGC 0.52; VLT 60 % (entrance)
  - U value 0.655 Btu/hr.ft^2.^{0}F; SHGC 0.24; VLT 22 % (others)


PUMA
SOCIAL

MATERIALS & INTERIORS

- CLADDING : - Pre fabricated concrete panels used for the front facade
- PAINTS : - Low VOC paints
- FALSE CEILING : - Recycled Bamboo
- FURNITURE : - All wood used is made from composite woods
- ADHESIVES & SEALANTS : - Low VOC content materials
- DOORS & WINDOWS : - Majorly UPVC and Aluminum; Minimum hardwoods

DAYLIGHTING

- More then 90% of interior spaces have direct views to natural daylight
- Use of artificial lighting is thus minimized
- 75% of interior spaces achieve daylight illuminance levels of 25 foot candles (fc) (270 lux) as minimum and 500 fc (5,400 lux) as maximum – sunny sky is 10,000 lux
- The same has been simulated and verified through Lighting Simulation.

NIGHT VIEW OF THE SHOWROOM

ARTIFICIAL LIGHTING

- Lighting Power Densities (LPD) of all areas – almost 30% to 40% less than standards (ASHRAE/ISENA. Std 90.1. 2004)

- Location values :
  - Retail space 0.463 W/sq.ft
  - Lobby 0.435 W/sq.ft
  - Passage 0.954 W/sq.ft
  - Toilet 0.713 W/sq.ft

- Occupancy sensing provides automatic on/off control

- Lighting Fixtures :
  - Energy Efficient Fixtures used which consume fewer watts for the same lumen output
  - LED’s used for façade lighting and retail display track lights

Showroom interiors with floor grilles

INNOVATIVE COOLING SYSTEMS

- Earth Air Tunnel (EAT) :

  - Used for free cooling and pre-cooling of fresh air

  - Outlet temperature of 25.5˚C when ambient is 36˚C (peak summers) and 24˚C when ambient is 10˚C to 13˚C

  - Centrifugal fan has a VFD drive with VAV boxes to vary air quantities based on room CO_2 levels (coupled with under floor air distribution)

  - VAV's modulate the zone pre cooled fresh air quantity based on CO_2 sensor signals

  - VFD drives modulate fan motor speeds based on demands of zones

  - The outside / fresh air considered is 35% more than comparable minimum fresh air requirements of ASHRAE 62.1.2004 (3500 CFM)

- Water Cooled VRV :

  - Replacing air cooled systems for higher efficiencies

  - Savings in energy, 2 kW at full load

  - At 60% part load, energy savings drop to 0.5 kW (cooling tower load is constant

  - COP is 4.4 (at full load) & 5.0 (at 60% part load)

  - Cost of additional cooling tower and pump piping (Rs. 2.2 Lakh)

  - Achieved Zero Discharge by using Water Cooled VRV

Natural draft FRP cooling tower

WATER CONSERVATION

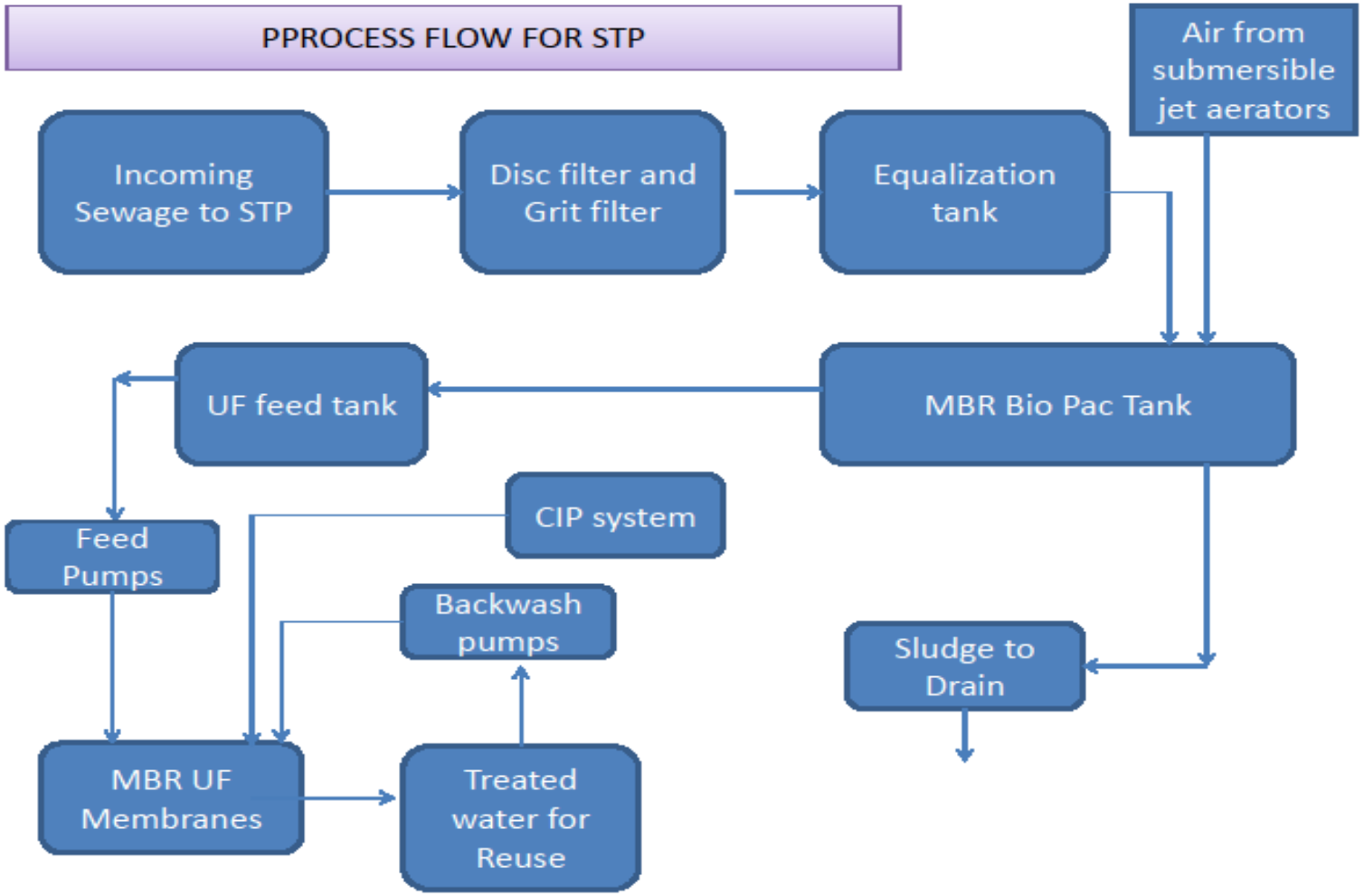
FRP COOLING TOWER

- Reuse of Water :
  - Water is treated and reused for flushing, landscaping and as make up water for cooling towers

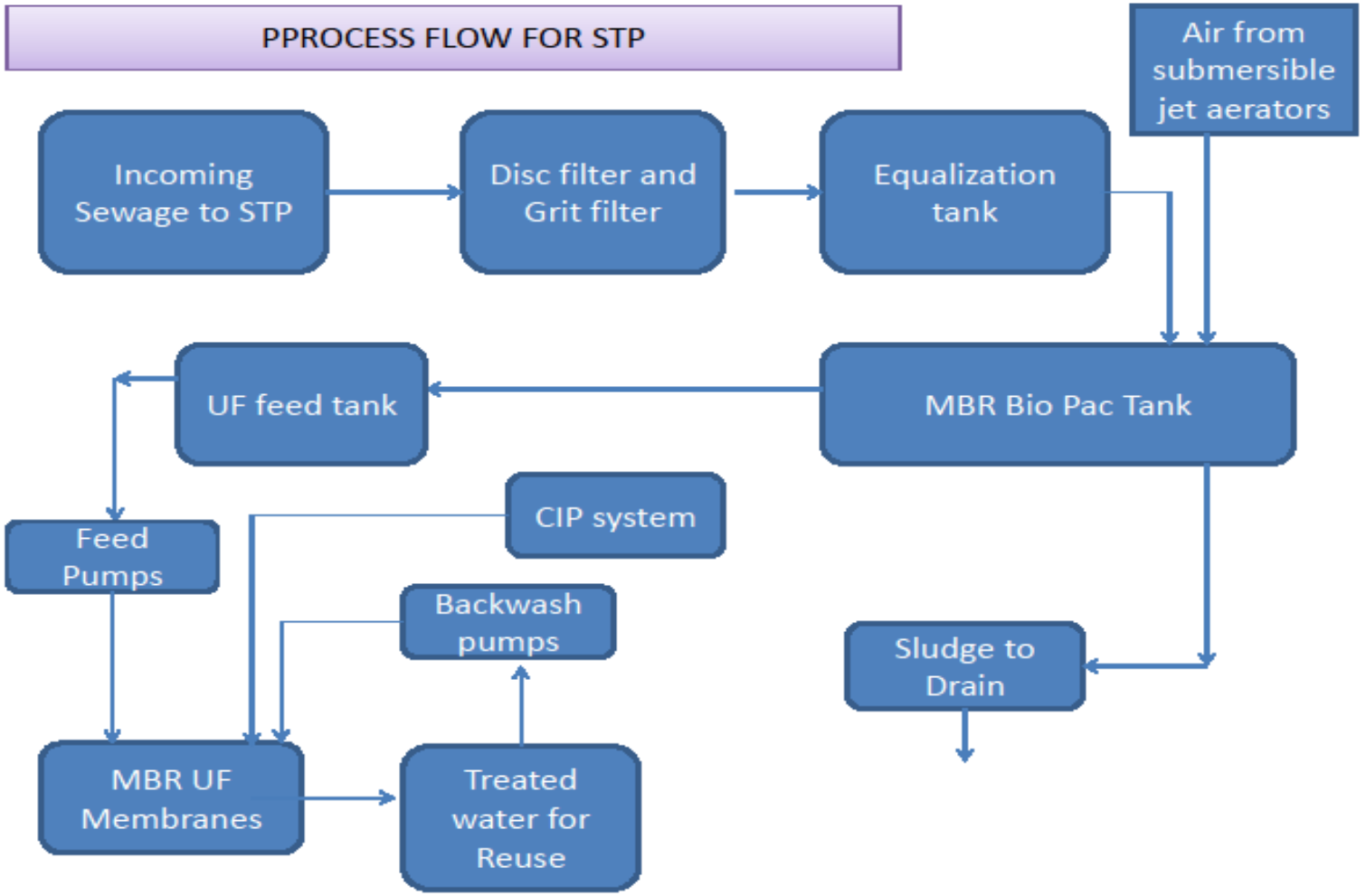
- Sewage Treatment Plant :
  - All water is being recycled and treated to tertiary standards for reuse

- Low Flow Plumbing Fixtures :
  - Low water consuming flushes for water closets and urinals
  - Dual flush in water closets specified

- Rain Water Harvesting :
  - Most of site run off water from ground and terrace is collected, treated and reused


PPROCESS FLOW FOR STP
Air from submersible jet aerators
Incoming Sewage to STP
Disc filter and Grit filter
Equalization tank
UF feed tank
MBR Bio Pac Tank
CIP system
Feed Pumps
Backwash pumps
Sludge to Drain
MBR UF Membranes
Treated water for Reuse

RECYCLING – WATER BALANCE

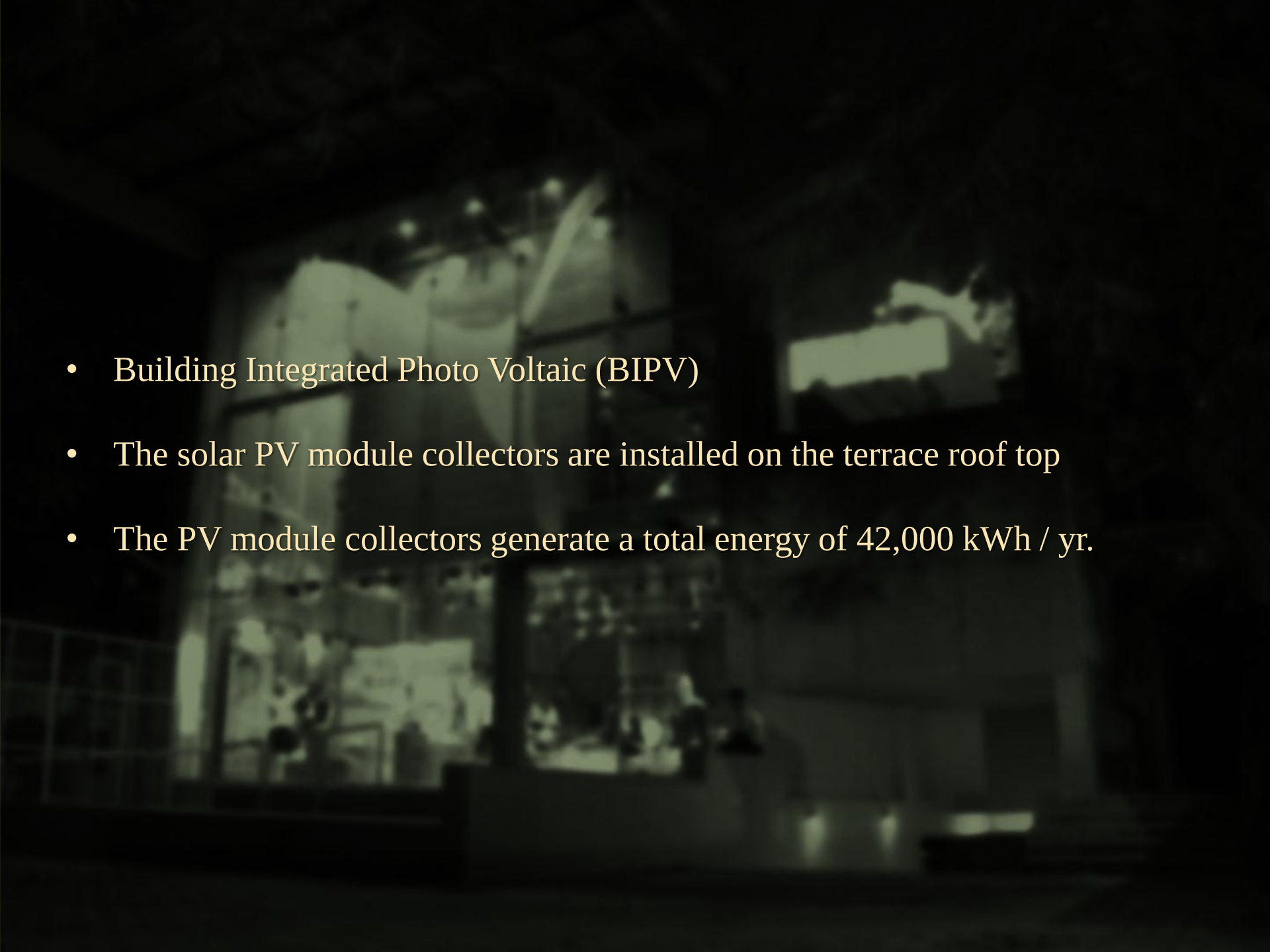


- MBR type STP at full load — 6 kLD
  - Discharge of treated water at full load — 4.9 to 5 kLD
  - Use for cooling tower makeup — 2 kLD
  - Toilet flushing at full load — 2.5 kLD
  - Gardening and landscaping — 0.4 kLD
  - Total consumption — 4.9 kLD
  - Monsoon and cloudy — 2 kLD

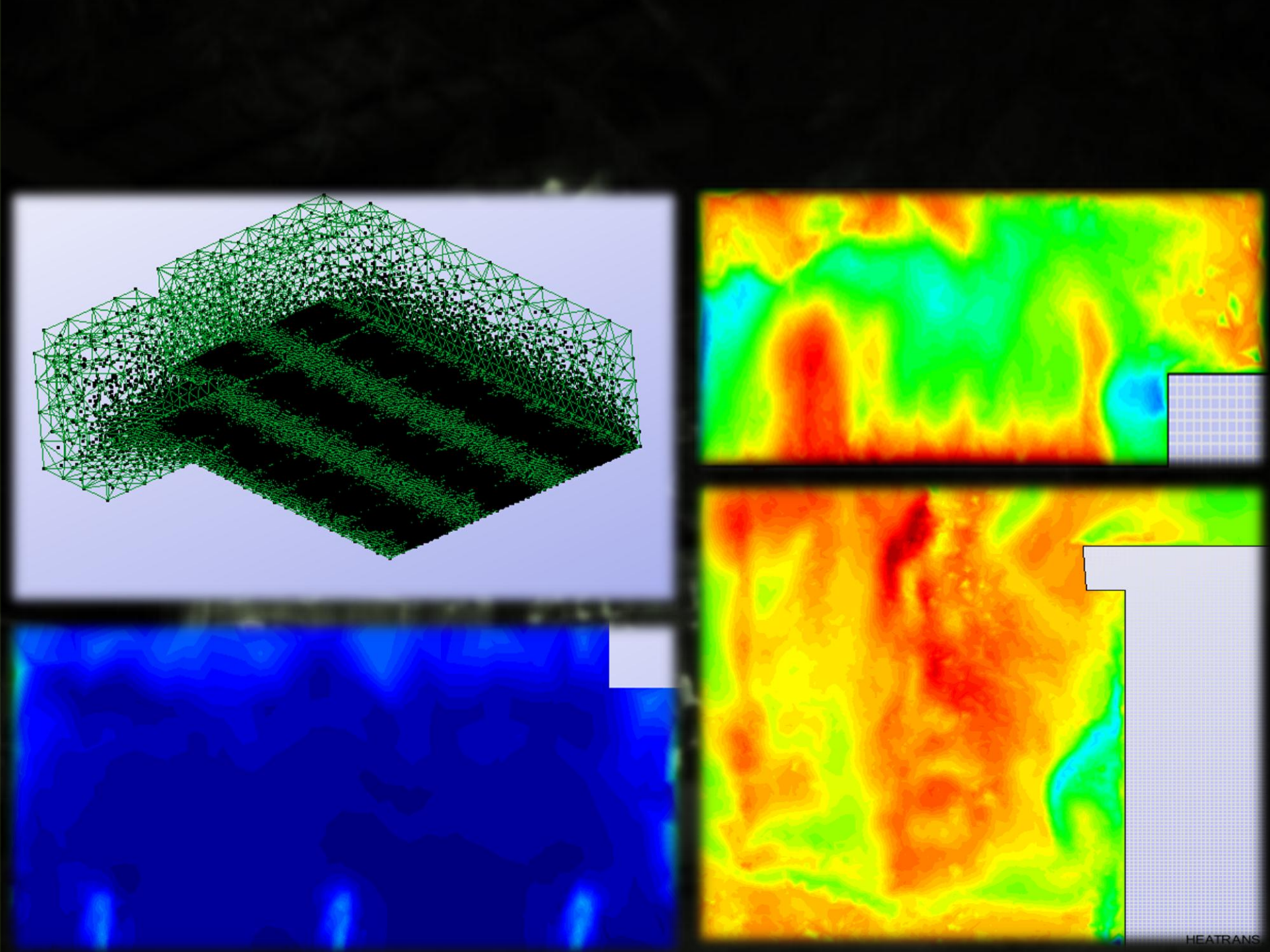
- Hence Zero Discharge at Full Load

PV panels on the building facade

BIPV

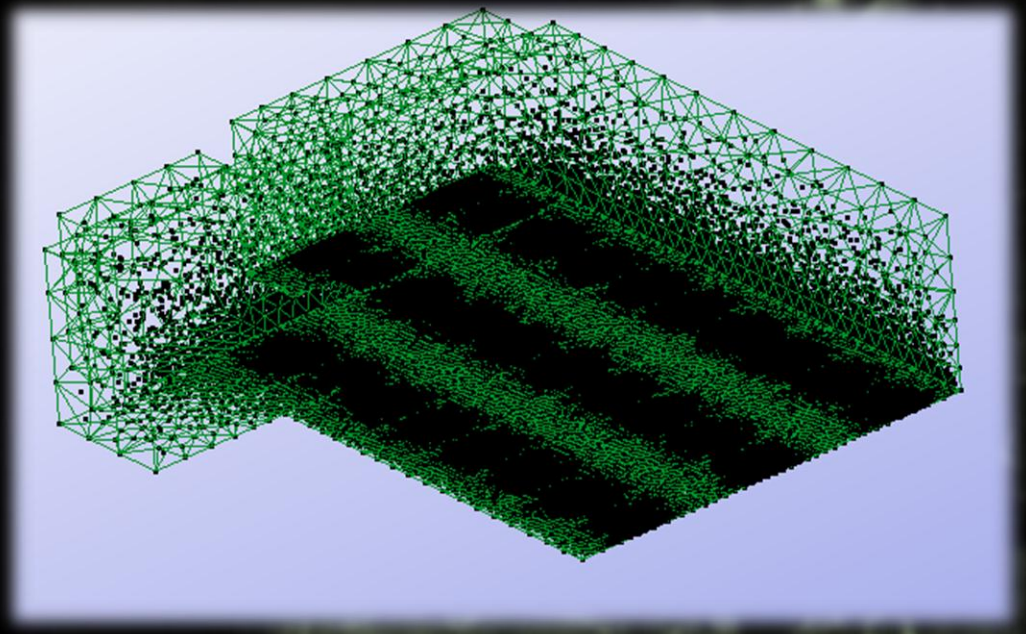


- Building Integrated Photo Voltaic (BIPV)
- The solar PV module collectors are installed on the terrace roof top
- The PV module collectors generate a total energy of 42,000 kWh / yr.

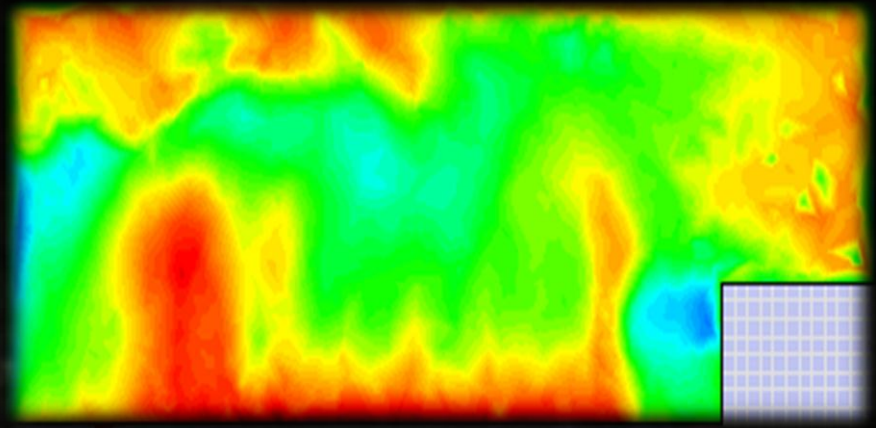

HEATRANS

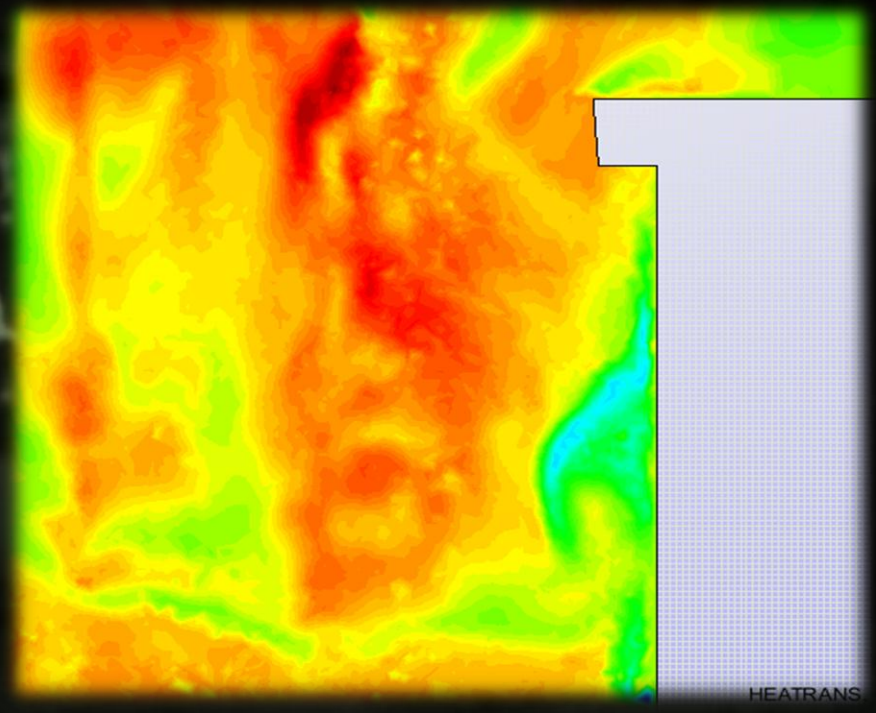
CFD

Meshing



Temperature Profiles





Velocity Profile

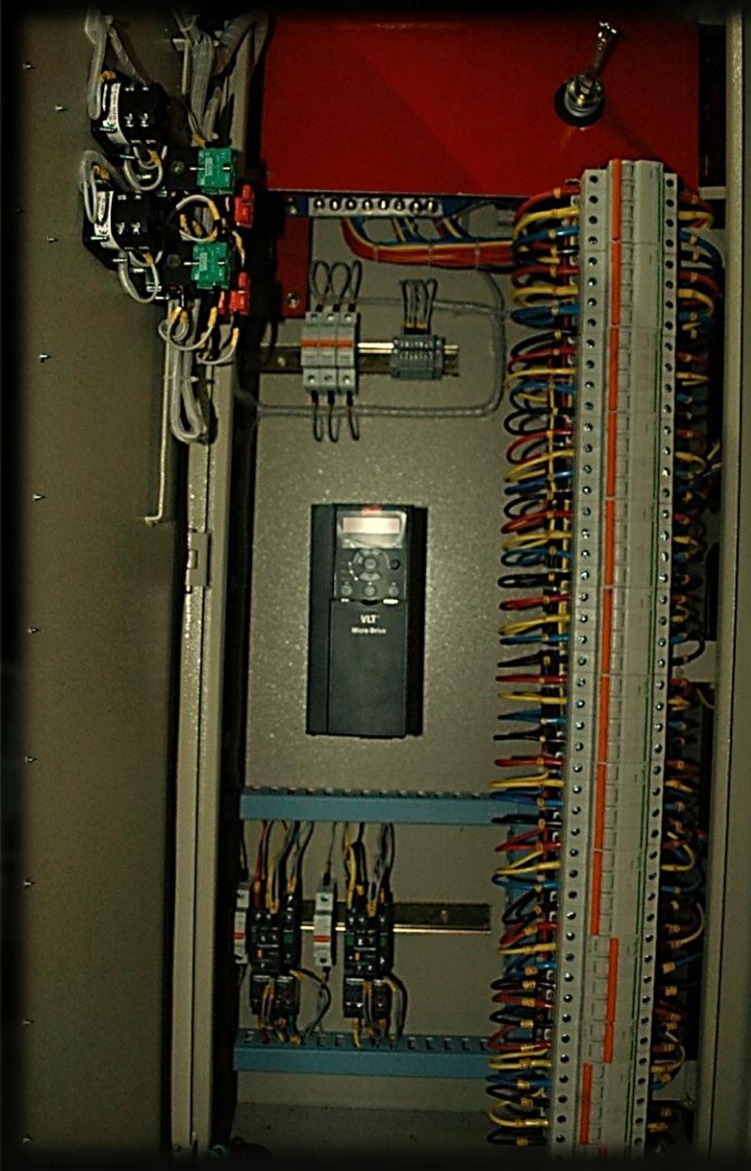
- Computational Fluid Dynamics analysis performed in the XY, YZ and XZ plane
- Velocity, Pressure and Temperature profiles measured
- The generated profiles used for diffuser positions and stack effect analysis
- Temperature and Velocity profiles confirm to ASHRAE 62.1, 2010 and ASHRAE 55, 2010 requirements
- Positive pressure validation done by CFD model (keep infiltration out)

VLT
Micro Drive

LG
MULTI V

OTHER INNOVATIONS

Room Control Panels



Atrium Exhaust Fan

Unit Piping

- Eco Friendly Refrigerant :
  - The refrigerant used minimizes or eliminates the emission of compounds that contribute to ozone depletion and global warming
  - Base buildings have only CFC & HCFC free refrigerants

- Free Cooling of Retail Areas :
  - Free cooling has been considered for retail spaces when the temperature goes below 20°C
  - 100% fresh air considered in the space volume which is exhausted through stack effect with extractors on the roof

- Under Floor Air Distribution system provides better and efficient comfort conditions at occupied zones
- Product focused LED lighting with occupancy sensors and lux controllers used instead of general lighting in turn reducing artificial lighting loads
- Natural draft FRP cooling towers reduce spillage & power consumption
- IBMS system ensures balance between working of indoor units and EAT based free cooling (control based on temperature, RH and IAQ)

ENERGY

- Retail Store (Ground, Mezzanine & First Floor) :
  - Base Energy consumption 46,741 kWh / yr
  - Energy consumption reduction due to EAT 4,846 kWh / yr
  - Final Energy consumption 41,895 kWh / yr

  - Misc. equipments such as all computers, printers, machines, plug loads etc. have been included
  - External equipment like lifts have been included
  - Area 11,970 ft^2
  - Energy Consumption Index 37.65 kWh / m^2.yr

- ZERO Energy Calculation :
  - Solar PV module rating 28 kW
  - 5 sunlight hours for energy generation through PV panels
  - Total number of sunny days in Bangalore is 300
  - Total Energy Generated : 28 X 5 X 300 42,000 kWh / yr

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