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**. ARCHITECTURE . INTERIORS . SUSTAINABILITY**

# A **SUSTAINABLE** APPROACH IN BUILDING DESIGN

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## CONVENTIONAL APPROACH

ASSESSMENT OF REQUIREMENT  
ASSESSMENT OF GUIDELINES  
INITIAL DESIGN  
FINAL DESIGN  
SANCTIONS  
DESIGN DEVELOPMENT  
WORKING DRAWINGS  
CONSTRUCTION SUPERVISION  
COMPLETION

## MODERN APPROACH WITH SUSTAINABLE METHODS

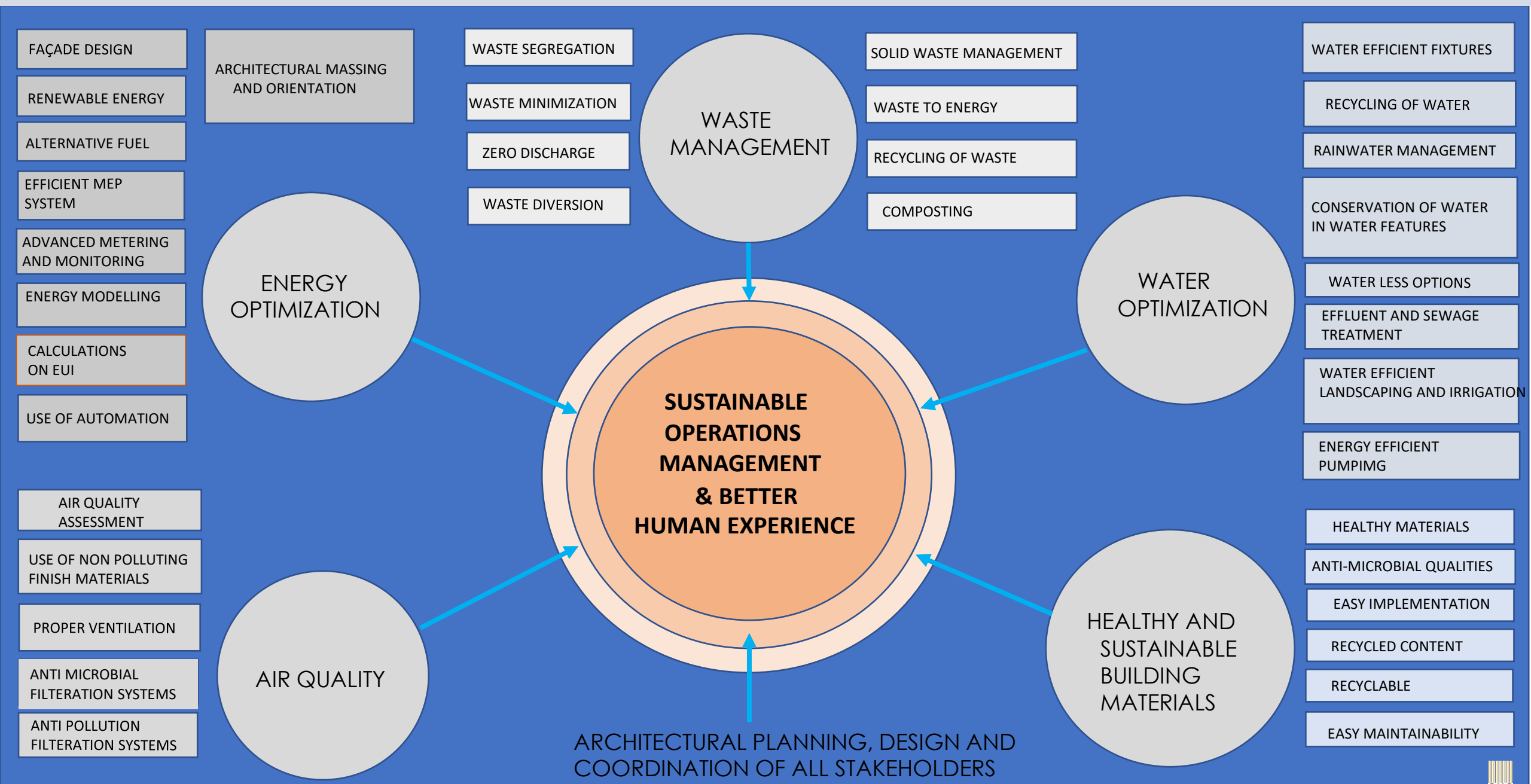
ASSESSMENT OF REQUIREMENT  
ASSESSMENT OF GUIDELINES

- PREPARATION AND VALIDATION OF INITIAL PROJECT REPORT
- PRE DESIGN STUDIES WITH SUSTAINABLE ASPECTS- SITE ANALYSIS, BOX MODELLING OF SUITABLE BUILDING SHAPE AND ORIENTATION AS PER SOLAR AND WIND DIRECTIONAL ANALYSIS.
- INTEGRATIVE PROCESS WITH ALL DISCIPLINES FOR SPATIAL AND QUALITATIVE INPUTS

FINAL DESIGN  
SANCTIONS  
DESIGN DEVELOPMENT(DD)  
INCLUSIONS OF ALL SUSTAINABILITY ASPECTS INTO DD WITH DETAILED STUDIES /ANALYSIS  
WORKING DRAWINGS  
INTEGRATION OF SPECIFICATIONS AND DETAILS IN ALIGNMENT WITH SUSTAINABLE GOALS  
CONSTRUCTION SUPERVISION  
SAMPLE AND SHOP DRAWING APPROVALS IN ALIGNMENT WITH DESIGN GOALS  
COMPLETION

- **PROJECT INTIATION** : UNDERSTANDING REQUIREMENTS CLEARLY AND IDENTIFYING PROJECT GOALS, PREPARATION OF OPR (OWNERS PROJECT REQUIREMENTS)
- **DESIGN PROCESS INTITATION (PRE DESIGN)** : INTEGRATION OF ALL FACTORS OF OPR IN INITIAL STUDIES TOWARDS SUSTAINABLE DEVELOPMENT WITH INTITAL SKETCHES, BOX MODELLING, AND FEASIBILITY STUDY OF FUNCTIONAL REQUIREMENTS
- **FINAL DESIGN** : FINAL DESIGN PROPOSAL BASED ON THE INITIAL STUDIES
- **DESIGN DEVELOPMENT** : DESIGN DEVELOPMENT FOR INTEGRATION OF VARIOUS DISCIPLINES LIKE STRUCTURE, MEP , LANDSCAPING , INTERIORS AND OTHER SPECIALIZED FIELDS. RESOLUTION OF ALL CLASHES BETWEEN VARIOUS TRADE ENTITIES VIA BUILDING MODELLING
- **WORKING DRAWINGS** : PREPARATION OF FINAL WORKING DRAWINGS BASED ON DESIGN DEVELOPMENT
- **EXECUTION SUPERVISION** : EXECUTION SUPERVISION TO ASSURE TRANSLATION OF ALL DESIGN AND DOCUMENTATION TO PHYSICAL CONSTRUCTION AT SITE. THE SAME SHALL INCLUDE SAMPLE AND SHOP DRAWINGS APPROVAL MADE BY VARIOUS VENDORS AND CONTRACTORS

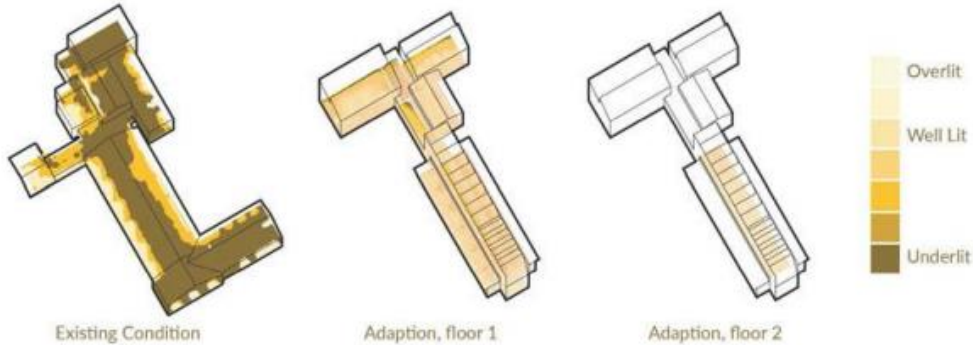
# SUSTAINABILITY AND INTEGRATION OF HEALTH ASPECTS IN OUR PROJECTS



# DESIGN PROCESS

## DATA DRIVEN DESIGN

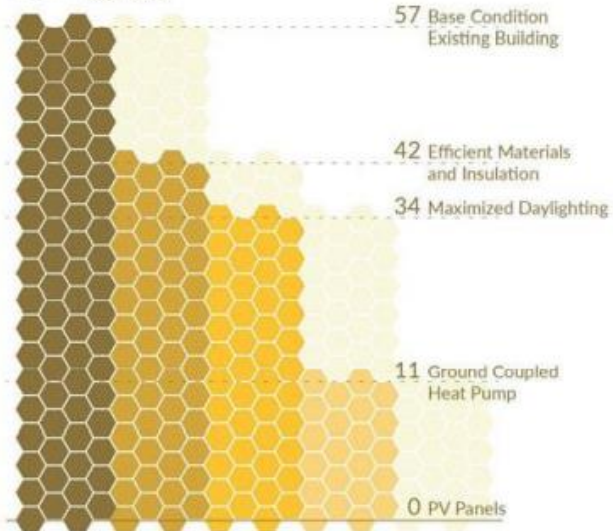
### Daylight Autonomy



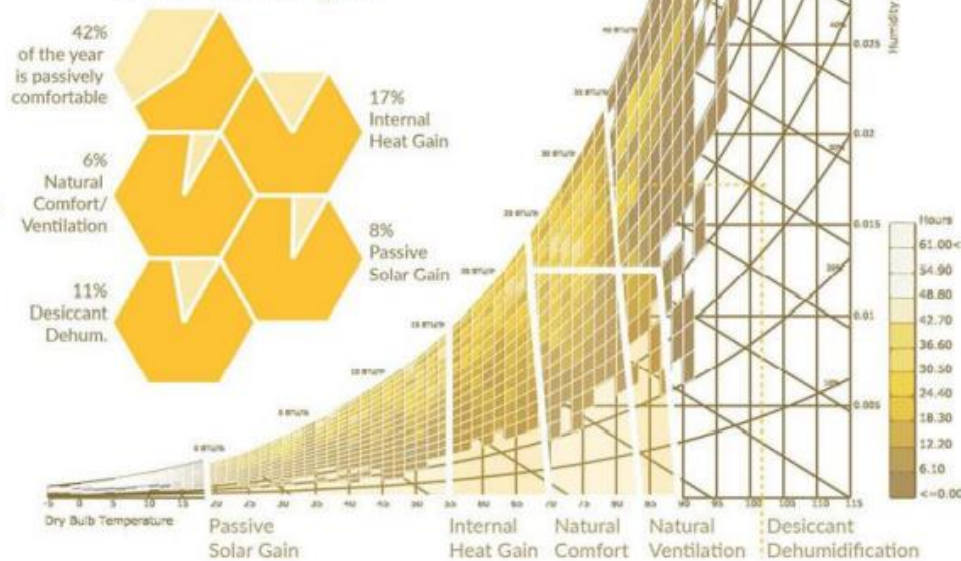
### Daylight



### EUI kBTU/ft<sup>2</sup>



### Passive Strategies



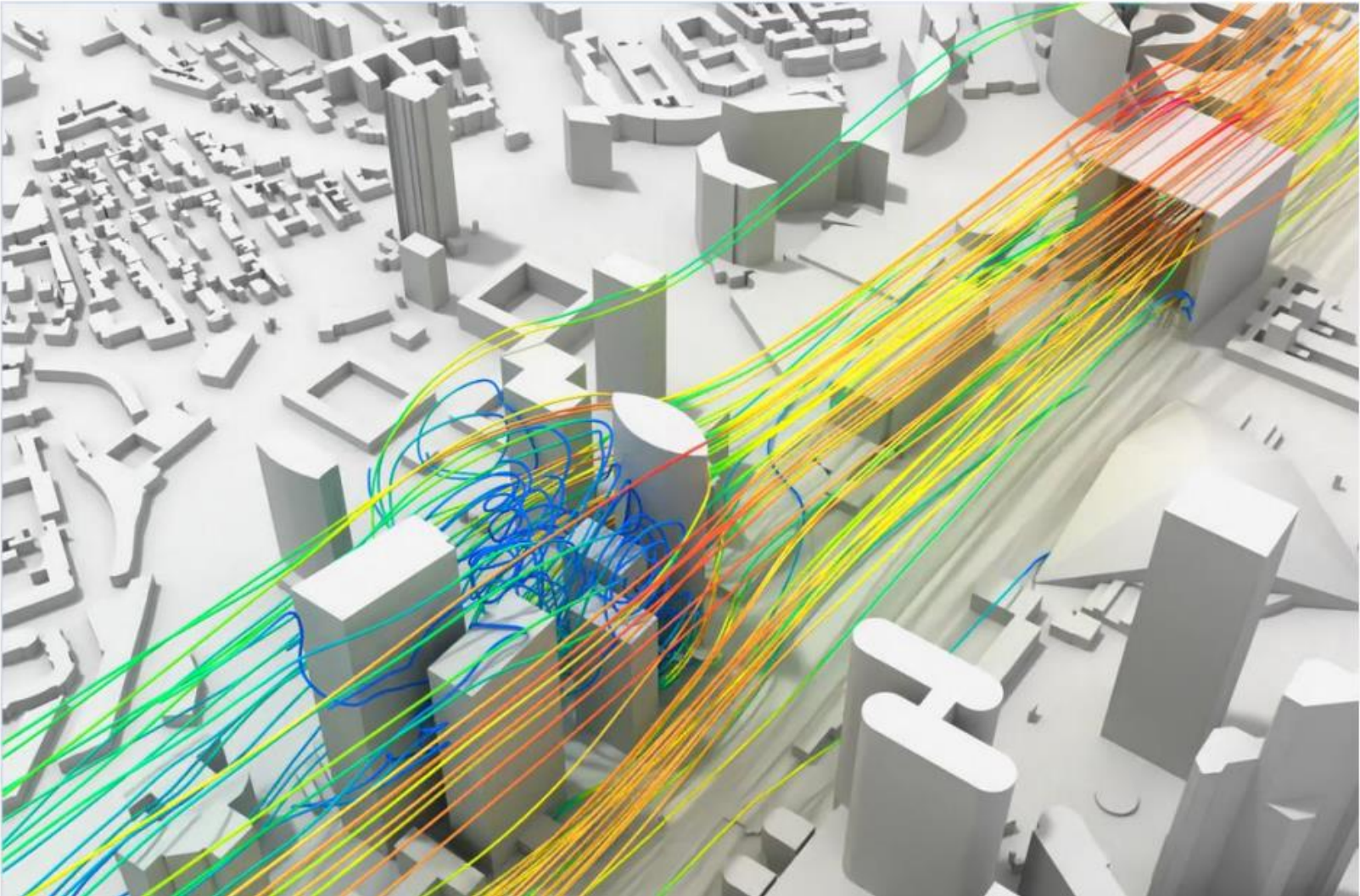
- MODERN DAY AUTHORIZING OF DESIGN STRATEGIES ENABLES US TO GO FAR DEEPER IN DESIGN PROCESS
- MODERN METHODOLOGIES AND TOOLS GIVE US UNPRECEDENT ACCESS TO VISUALIZE OUR BUILDING LIKE NEVER BEFORE.
- EVERY LITTLE ASPECT IMAGINABLE CAN NOW BE CONTROLLED OR PREDEFINED SUITING TO OUR NEEDS AND CONDITIONS





# CONCEPTUAL DESIGN

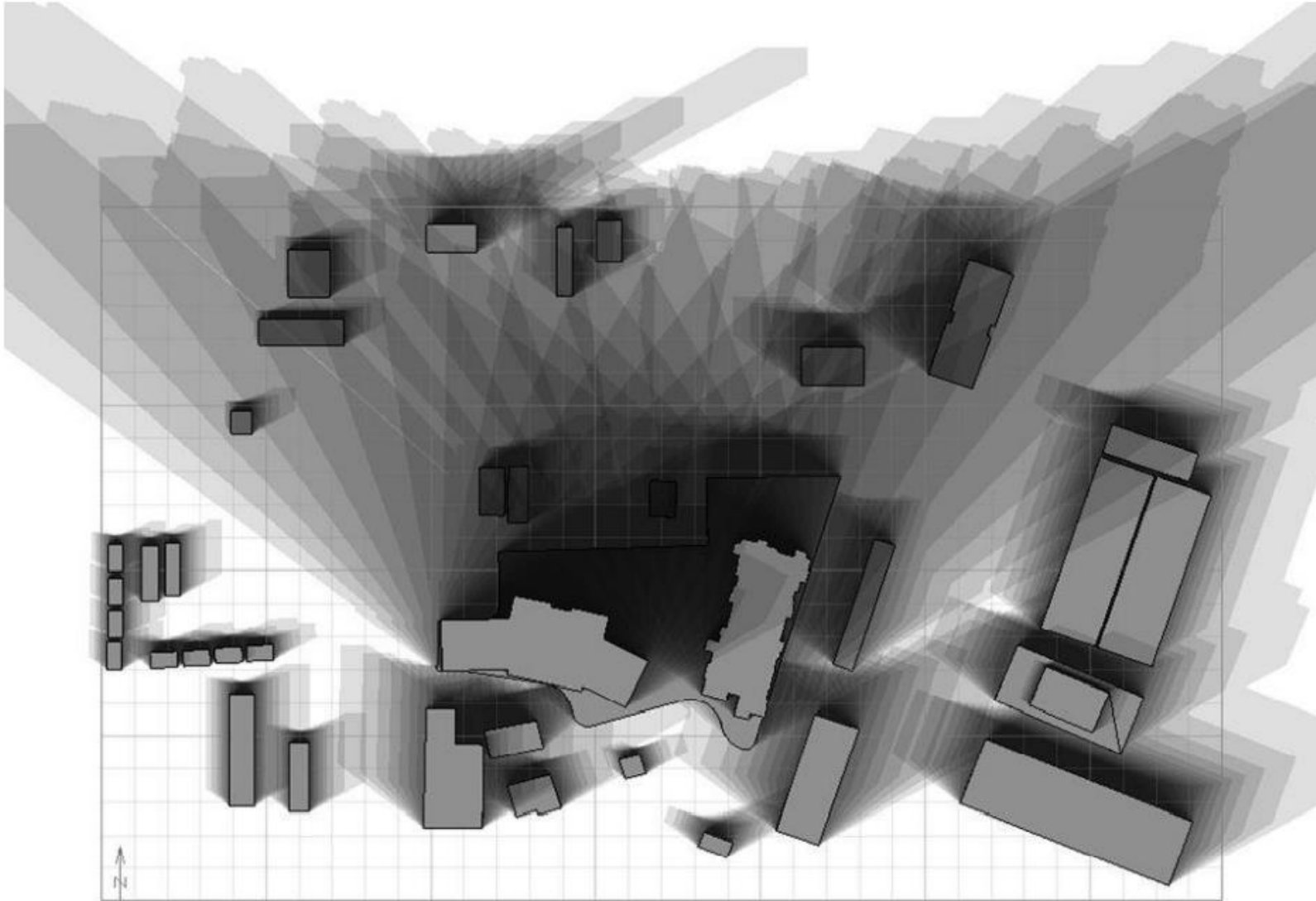
## WIND SIMULATION



- AUGMENTING AND SIMULATING WIND FLOW PATTERNS SURROUNDING THE BUILDING TO **ENHANCE BUILDING RESILIENCE** TOWARDS POSSIBLE WIND EFFECTS ON STRUCTURE AS WELL AS EXO-SCALATON, HIGHLIGHTING CHALLENGES AND OPPORTUNITIES IN PROPOSED DESIGN

## CONCEPTUAL DESIGN

### SUN-SHADING SIMULATION



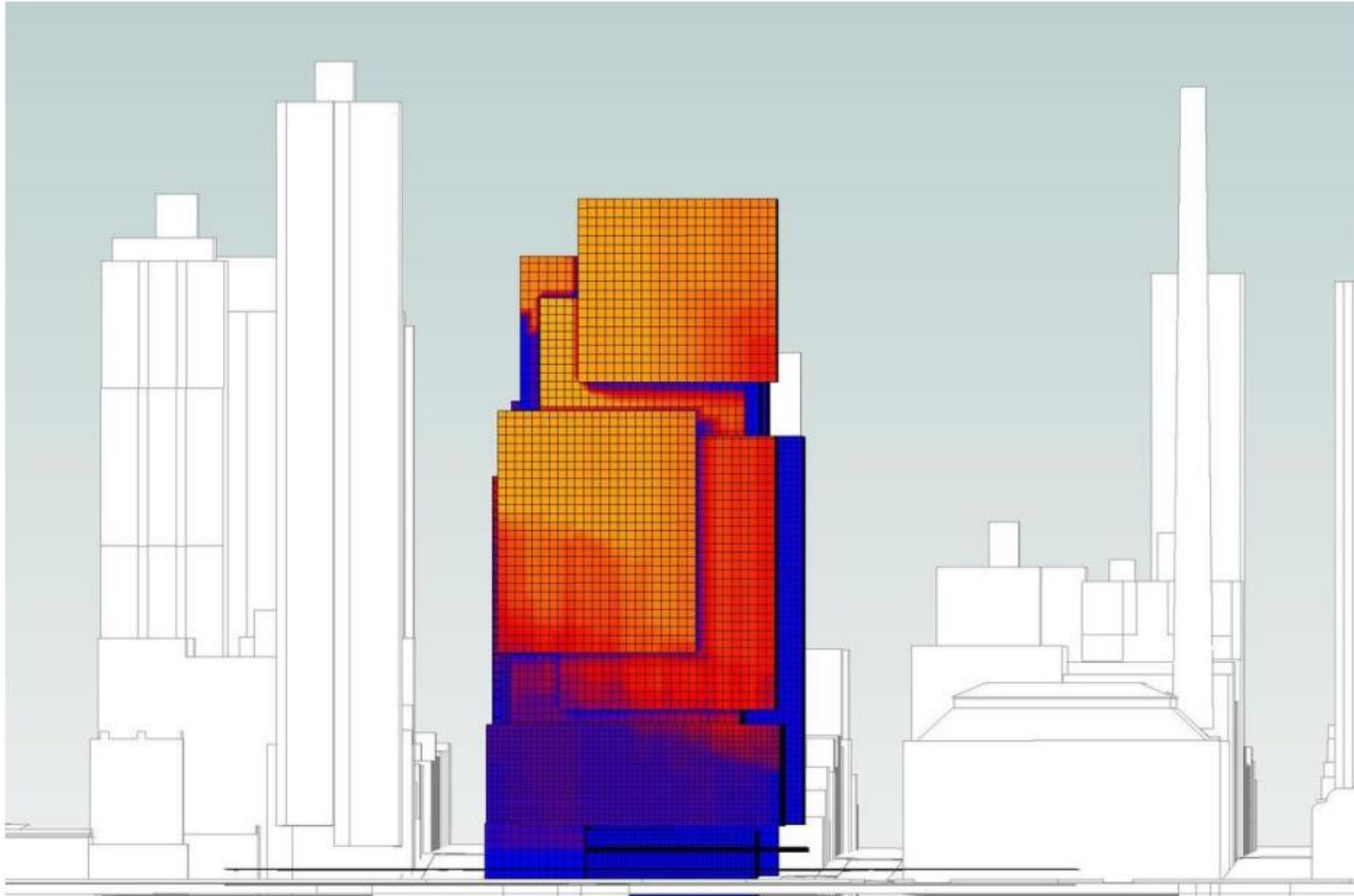
- VISUAL AND DATA ANALYTICS PROVIDES US WITH THE OPPORTUNITY TO VISUALIZE THE YEAR ROUND SHADOW ANALYSIS, THUS ENABLING US TO UTILIZE THE SITE TO ITS FULLEST POTENTIAL





## CONCEPTUAL DESIGN

### FAÇADE HEAT GAIN PERFORMANCE



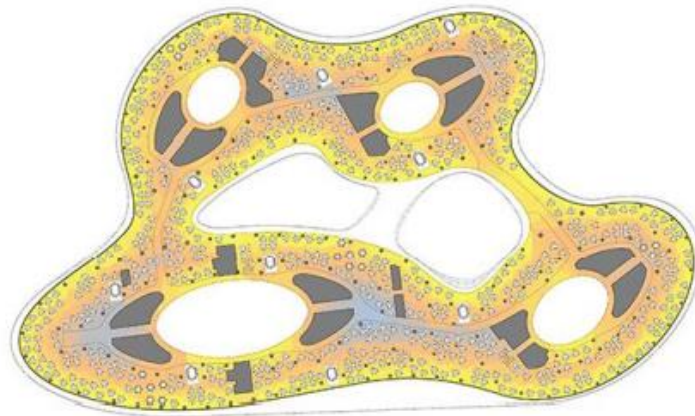
- BUILDING FAÇADE ARE RESPONSIBLE FOR MAXIMUM HEAT GAIN & WELL THOUGHT FAÇADE OPTIMIZATION & DESIGN STRATEGY CAN SAVE UPTO 50% OF BUILDING PASSIVE HEAT GAINS, THUS DRASTICALLY IMPROVING BUILDING ENERGY PERFORMANCE

# CONCEPTUAL DESIGN

## DAYLIGHT PENETRATION

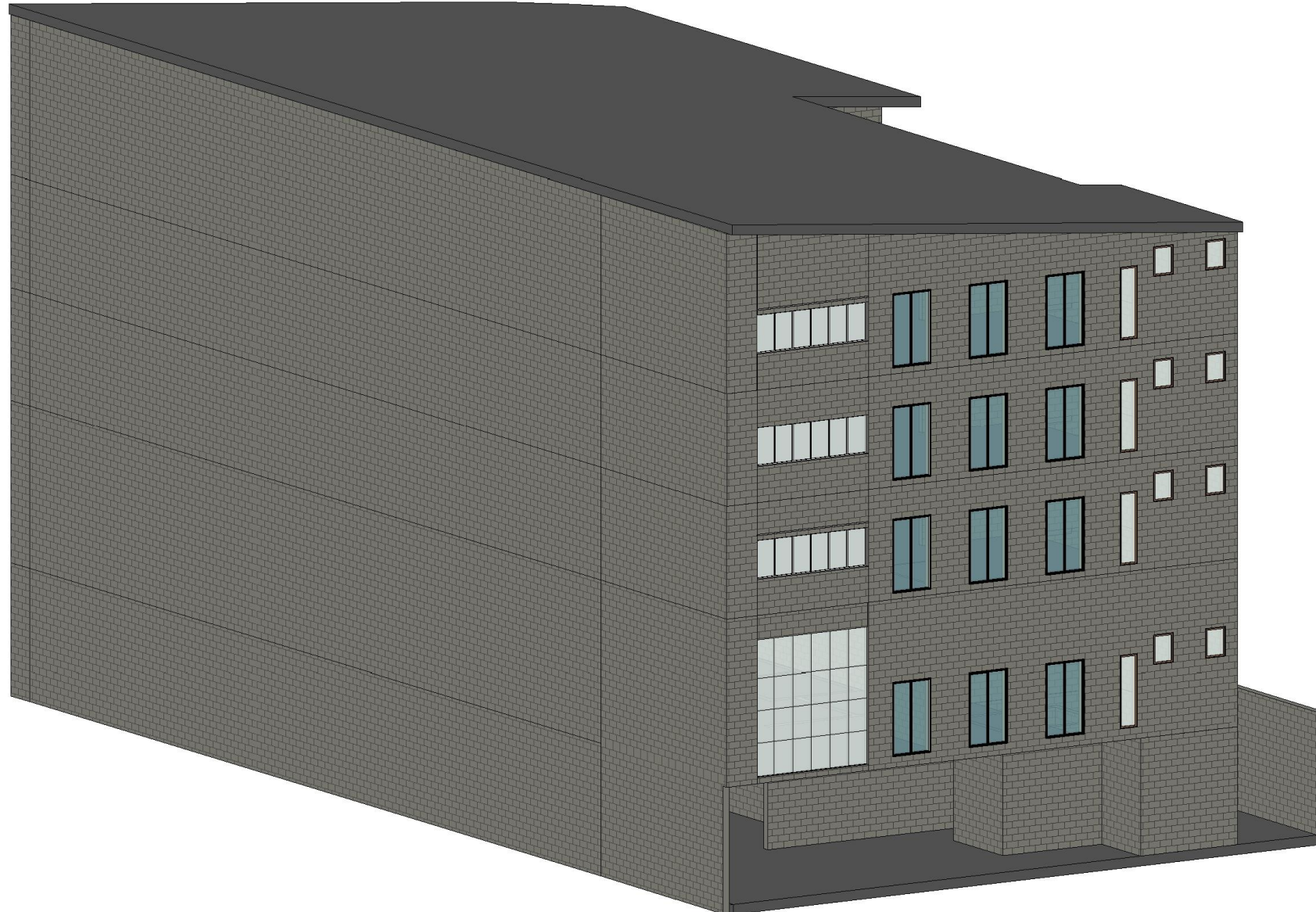


- OCCUPANT'S WELL BEING AND PRODUCTIVITY IS DIRECTLY AFFECTED BY THEIR EXPOSURE TO NATURAL LIGHTING AND OUTDOOR VIEW, HAVING A YEAR ROUND **DAYLIGHT PENETRATION** ANALYSIS AT OUR DISPOSAL, WE CAN PLAN MORE EFFICIENT LAYOUTS KEEPING OCCUPANT WELL BEING AT THE CORE OF IT

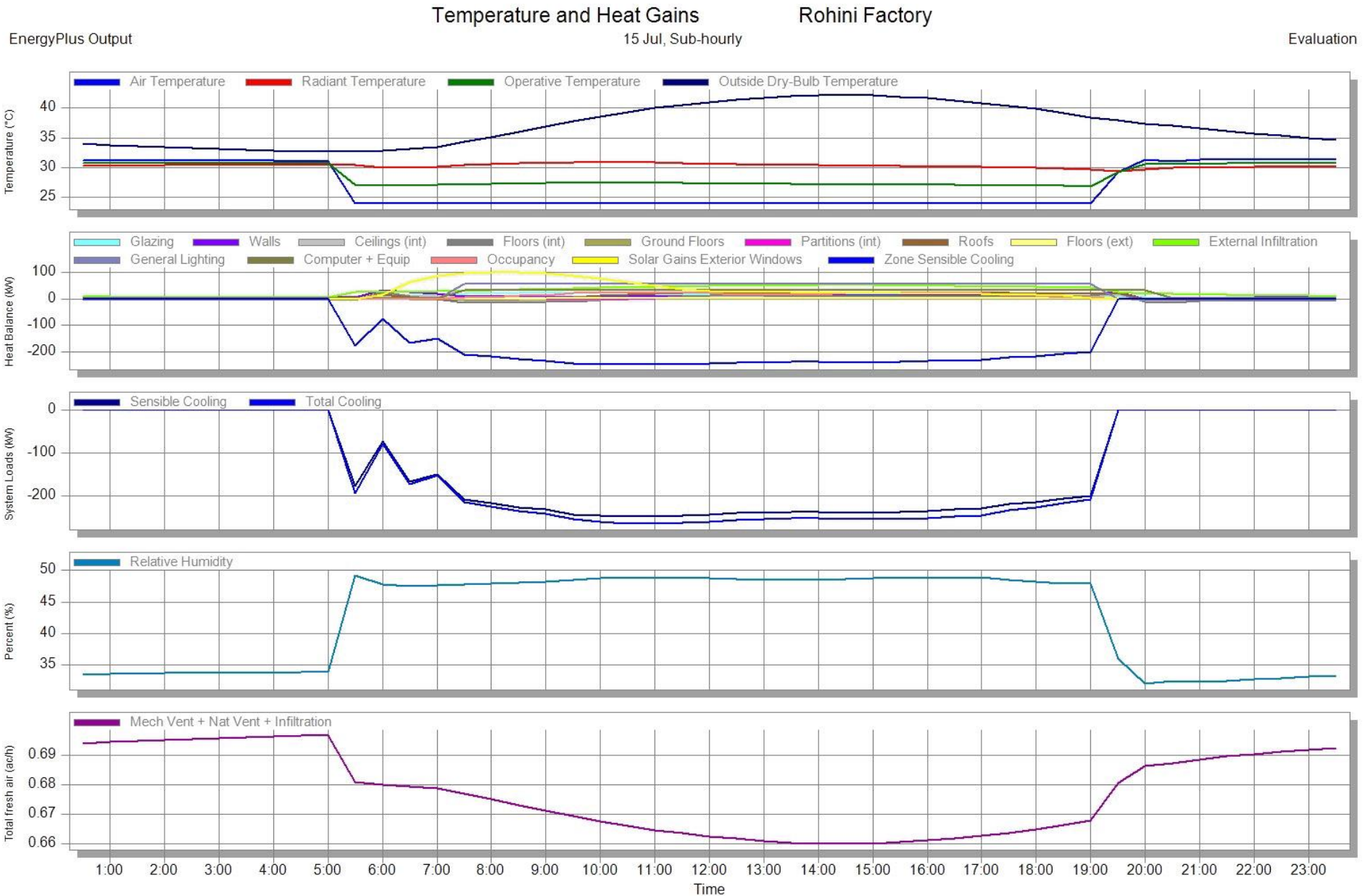


OPTION -01  
NO SHADING DEVICES

**CASE STUDY**  
FACTORY BUILDING  
AT ROHINI, DELHI



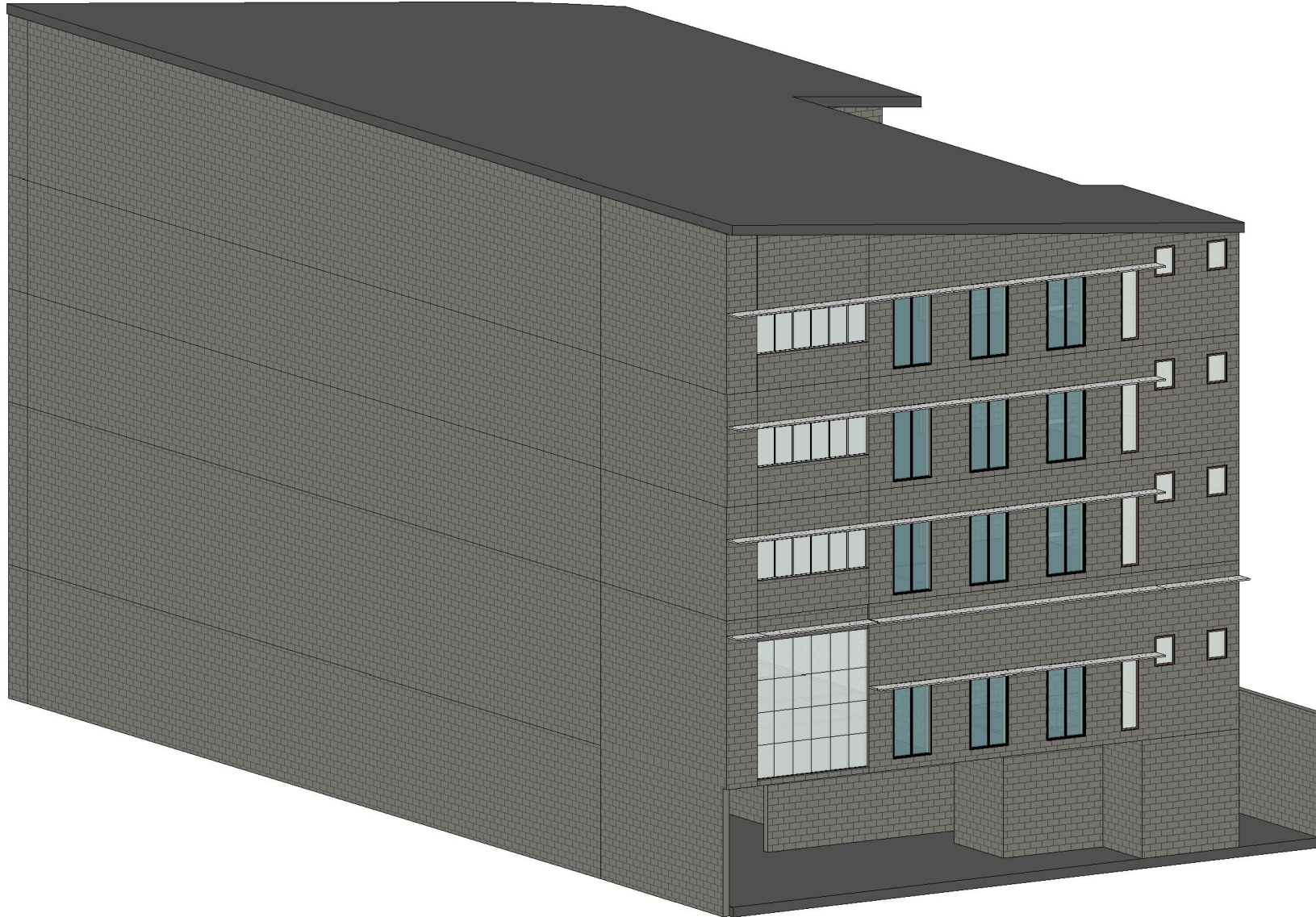


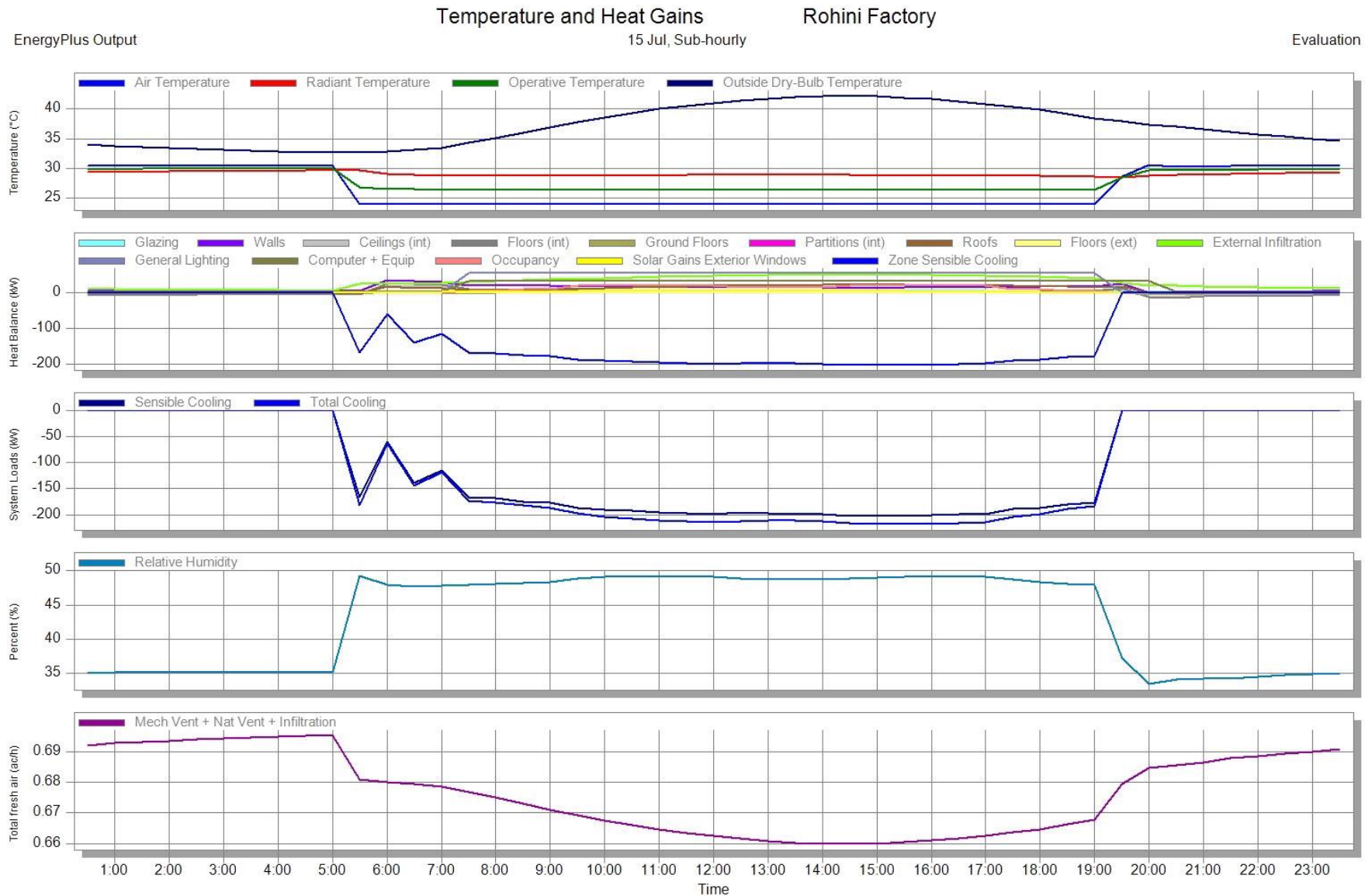




OPTION -02  
HORIZONTAL SUNSHADES

CASE STUDY  
FACTORY BUILDING  
AT ROHINI, DELHI



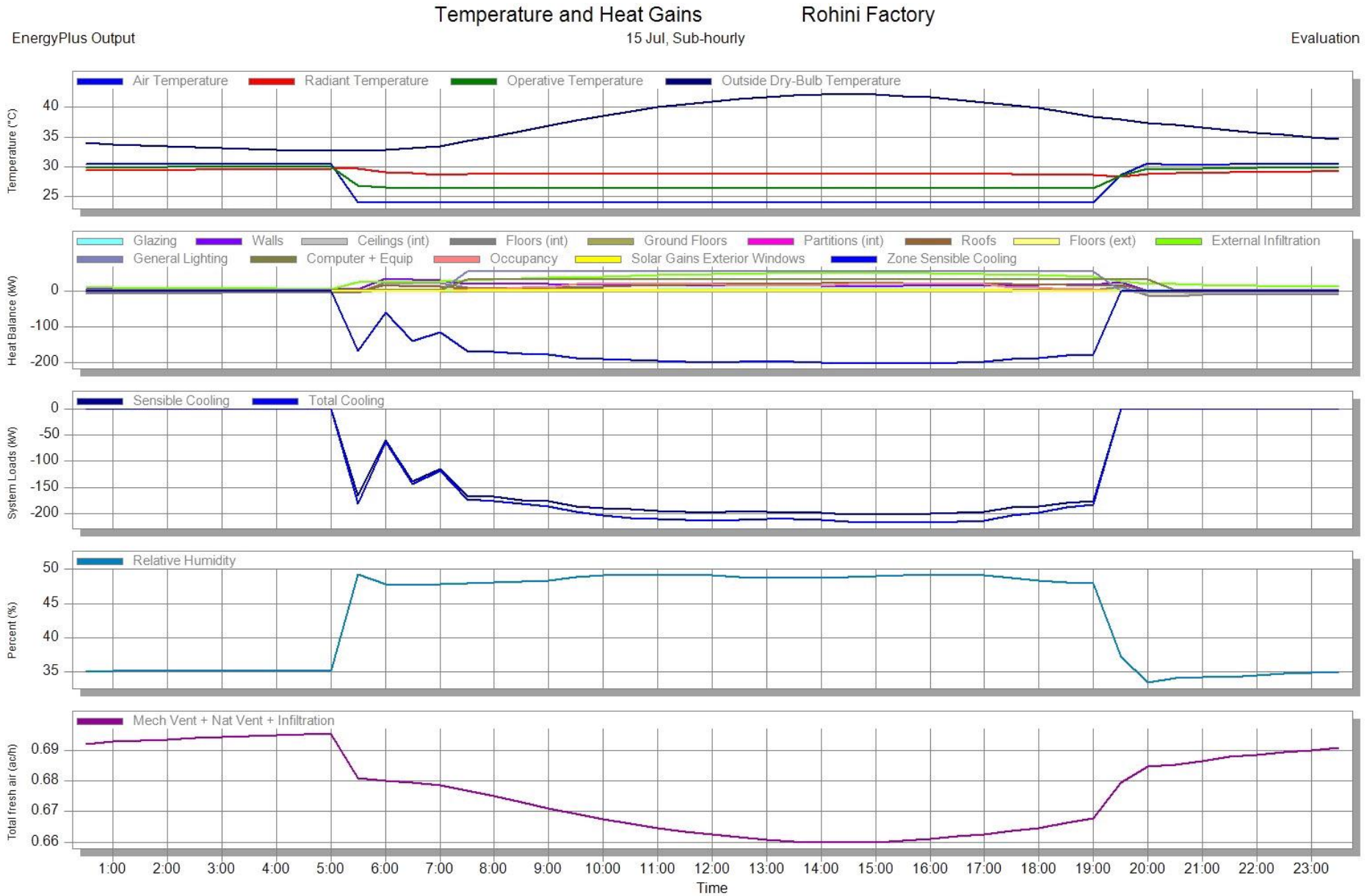




OPTION -03  
HORIZONTAL+ VERTICAL SUNSHADES

CASE STUDY  
FACTORY BUILDING  
AT ROHINI, DELHI



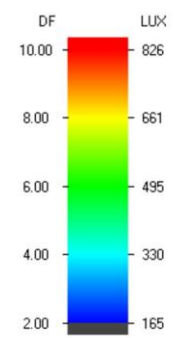
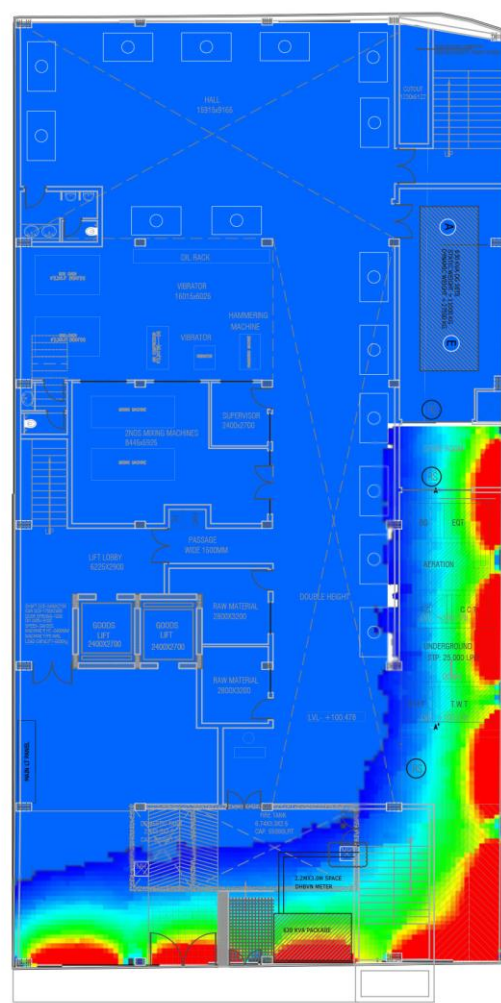




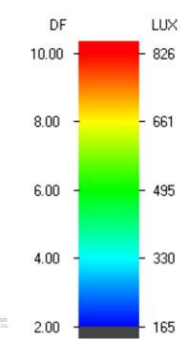
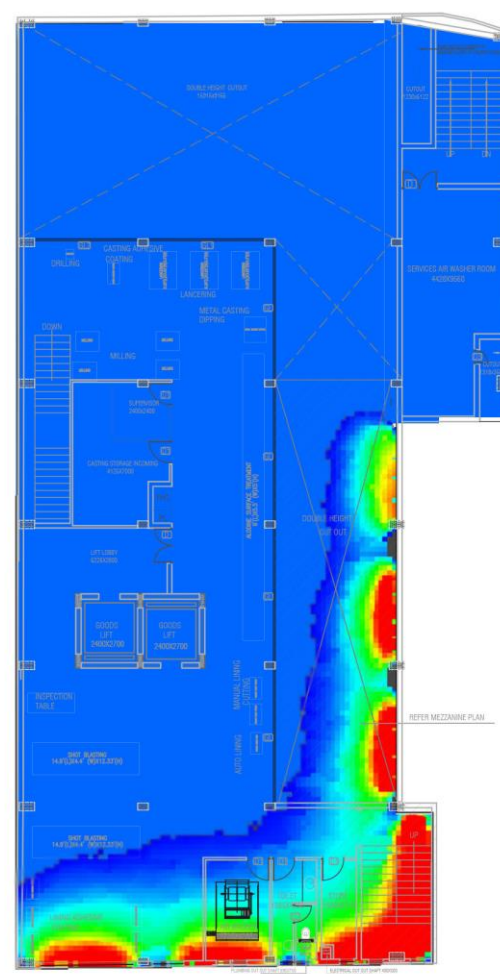
# CASE STUDY

FACTORY BUILDING  
AT ROHINI, DELHI

DAYLIGHTING  
ANALYSIS



GROUND FLOOR PLAN



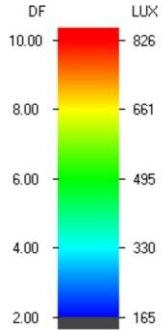
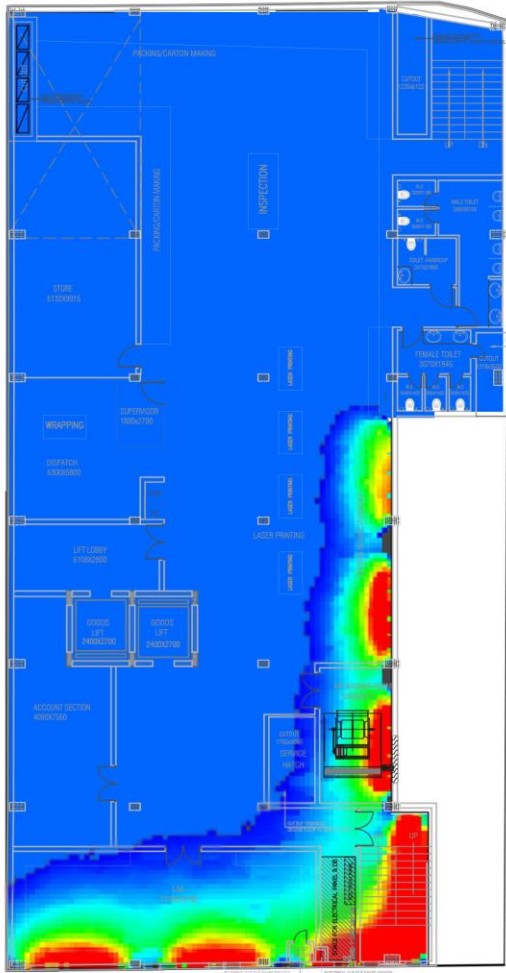
FIRST FLOOR PLAN



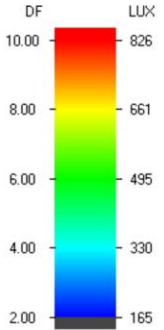
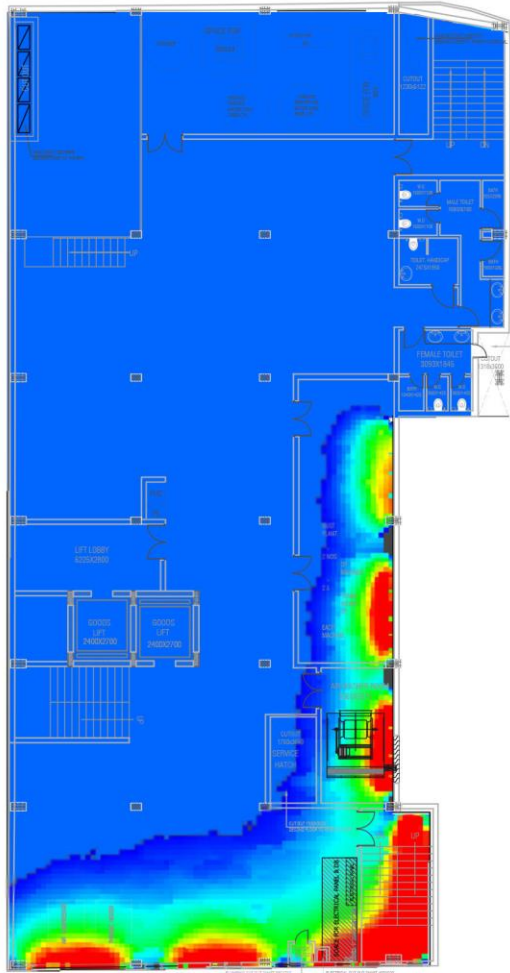
# CASE STUDY

FACTORY BUILDING  
AT ROHINI, DELHI

DAYLIGHTING  
ANALYSIS



THIRD FLOOR PLAN

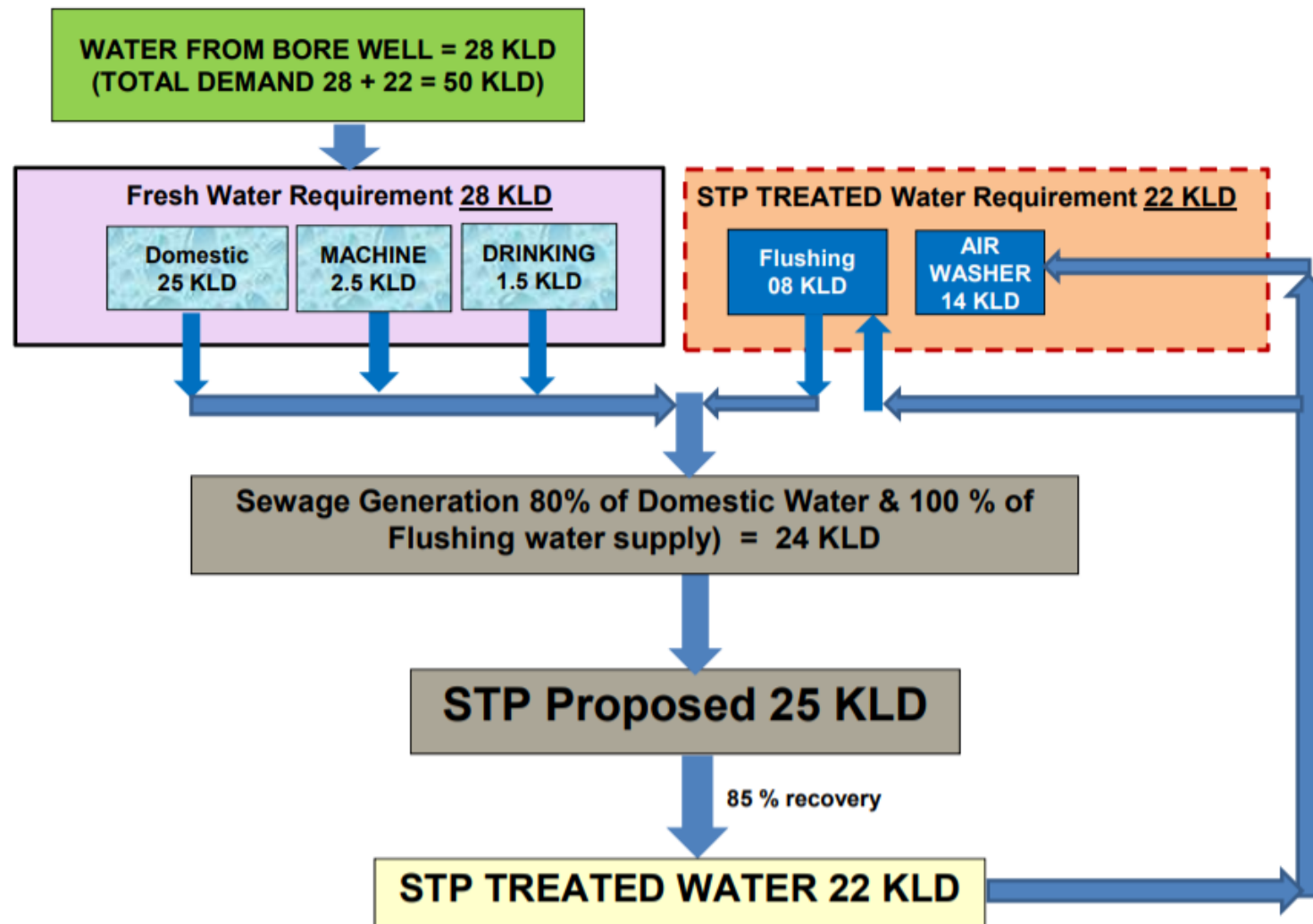


FOURTH FLOOR PLAN

## CASE STUDY

FACTORY BUILDING  
WATER BALANCE SHEET  
DESIGNED FOR ZERO  
DISCHARGE  
LOCATION : ROHINI,  
NEW DELHI

### WATER BALANCE DIAGRAM

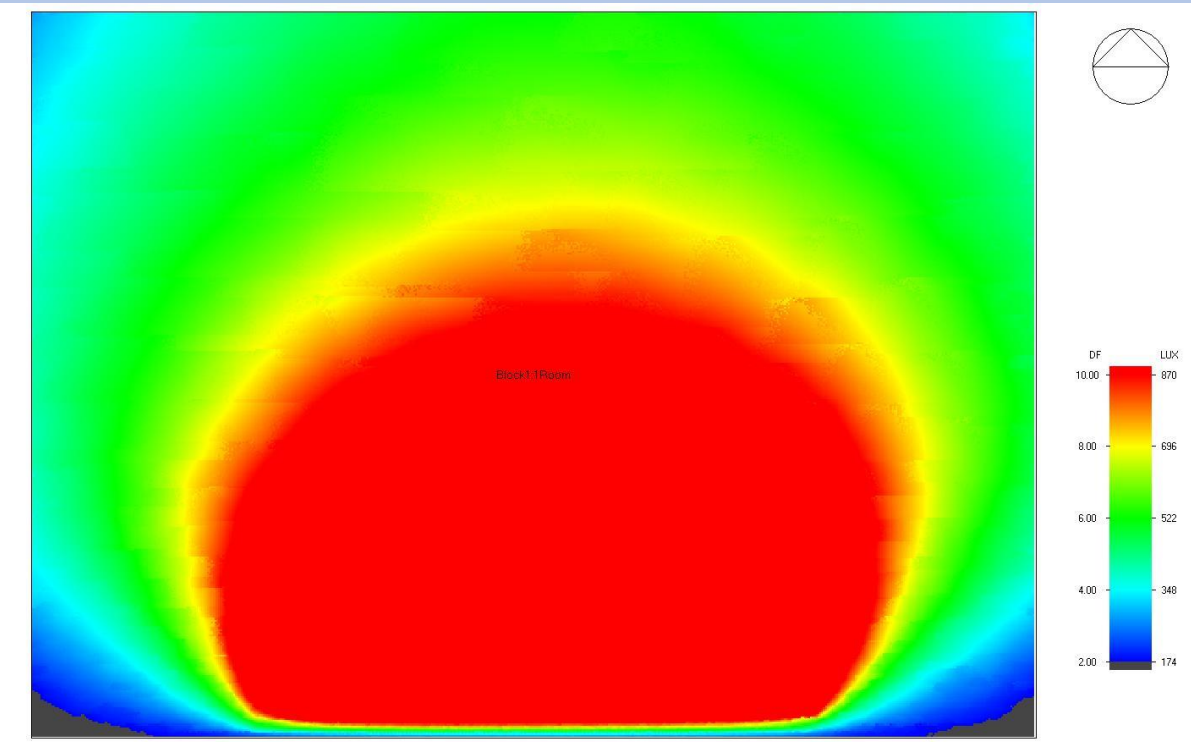




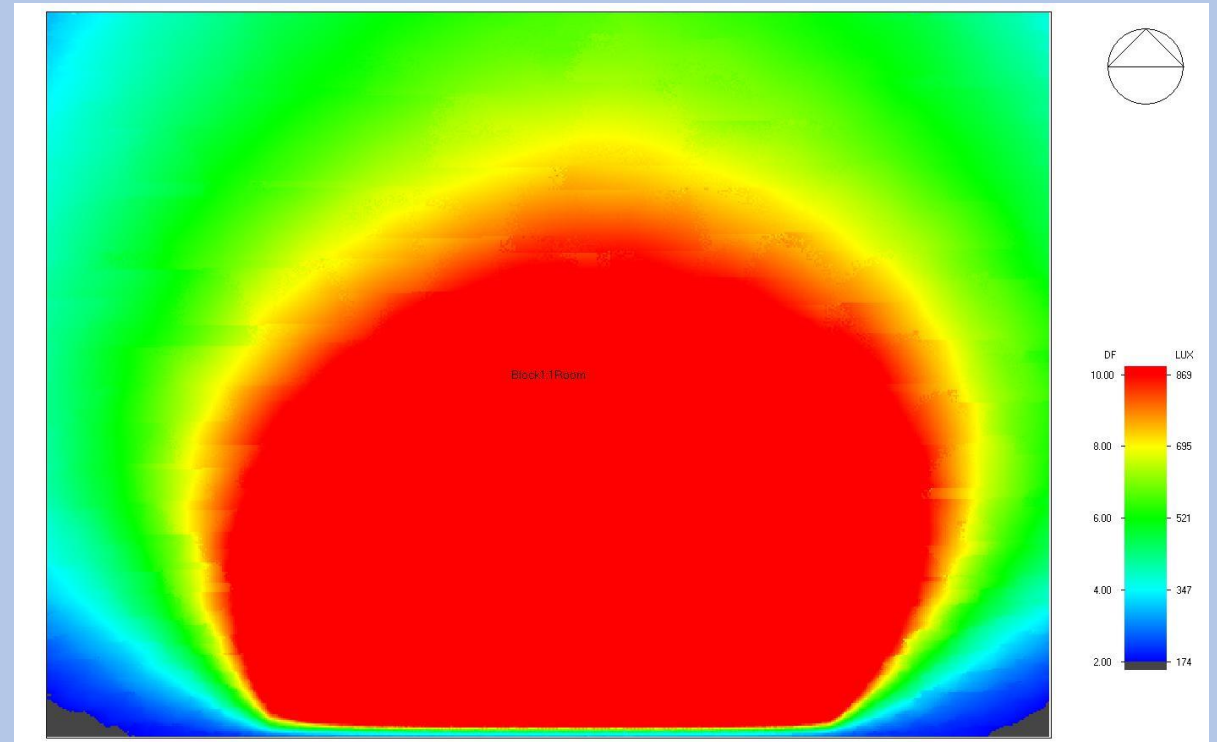
# SIMPLE MODEL- CASE STUDY FOR ITERATIONS IN DESIGN PROCESS



# DAYLIGHTING WITH AND WITHOUT SUNSHADE



DAYLIGHTING WITH SUNSHADE



DAYLIGHTING WITHOUT SUNSHADE

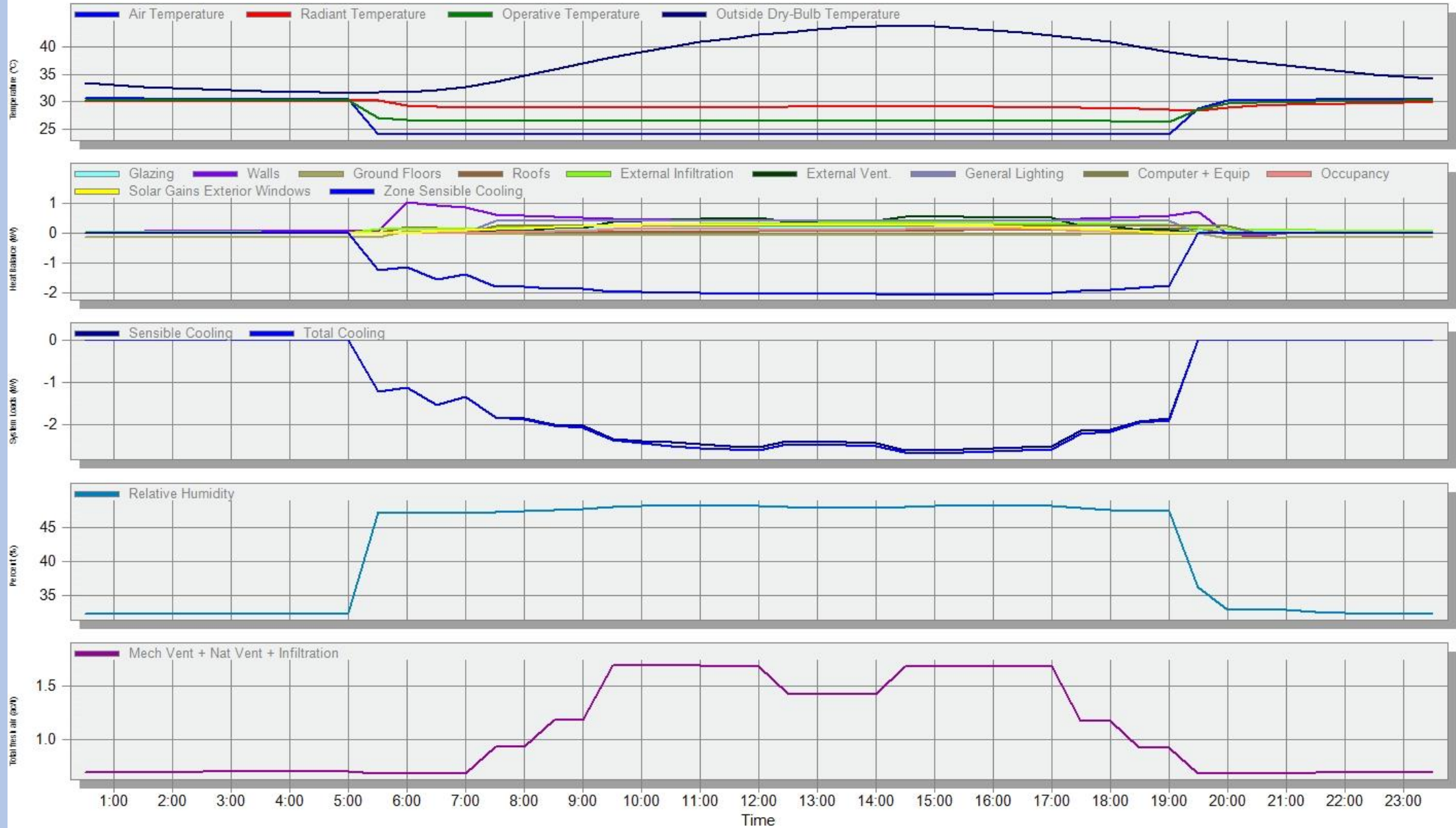
# OPTION – WITH CLEAR LOW-E GLASS DGU

## Temperature and Heat Gains - Project Shade try, Building 1

EnergyPlus Output

15 Jul, Sub-hourly

Evaluation



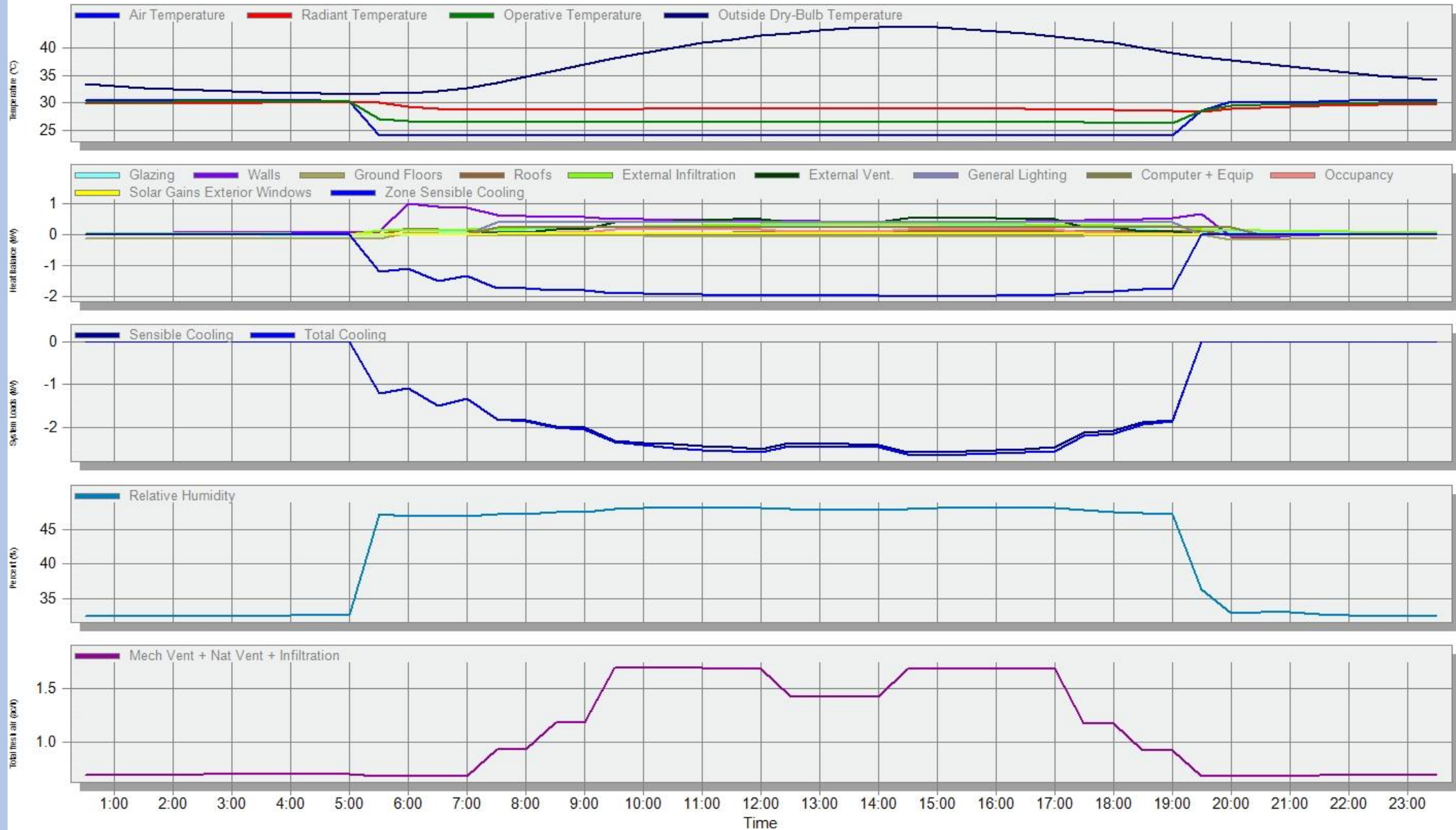
# OPTION – TINTED GLASS LOW-E DGU

## Temperature and Heat Gains - Project Shade try, Building 1

EnergyPlus Output

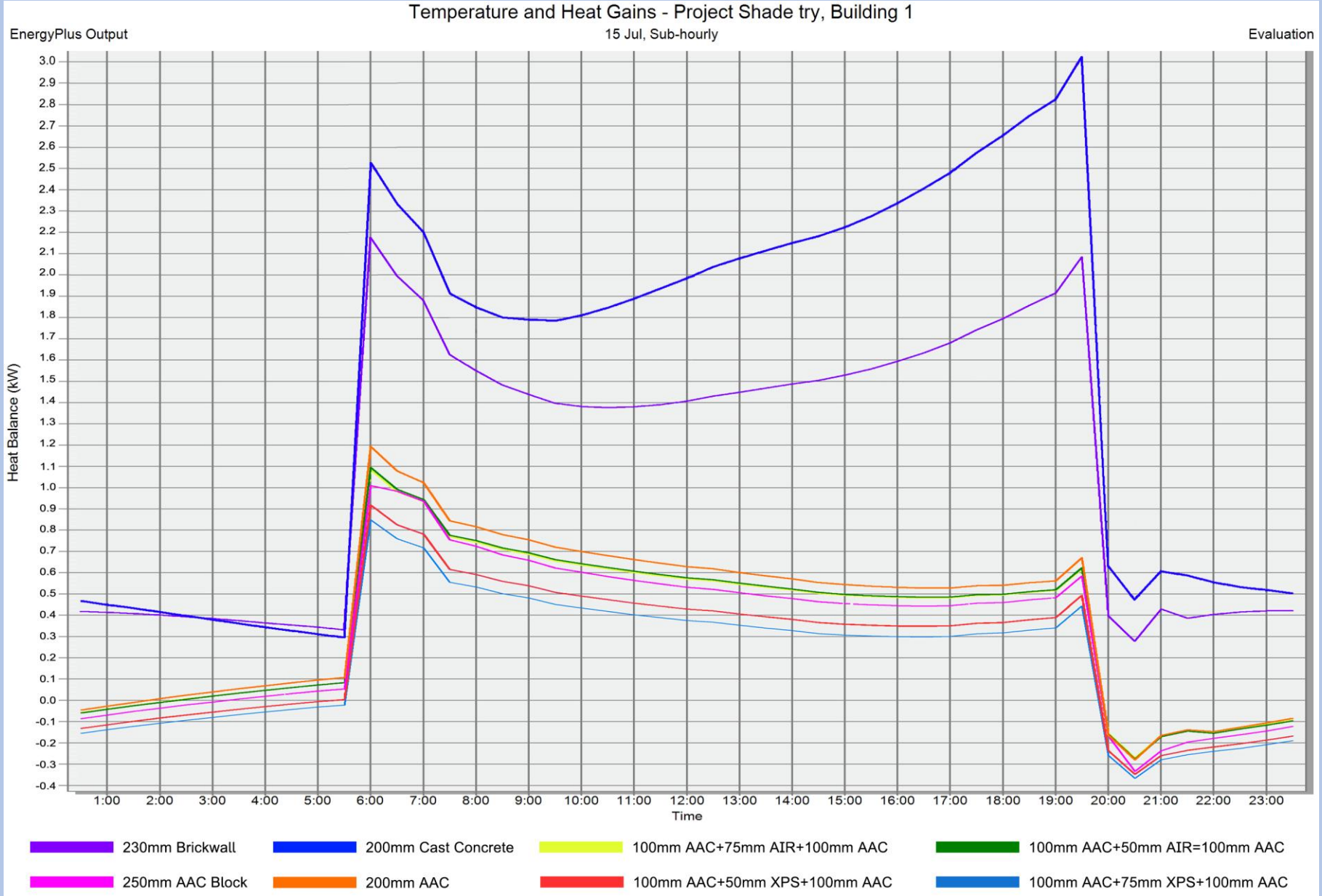
15 Jul, Sub-hourly

Evaluation





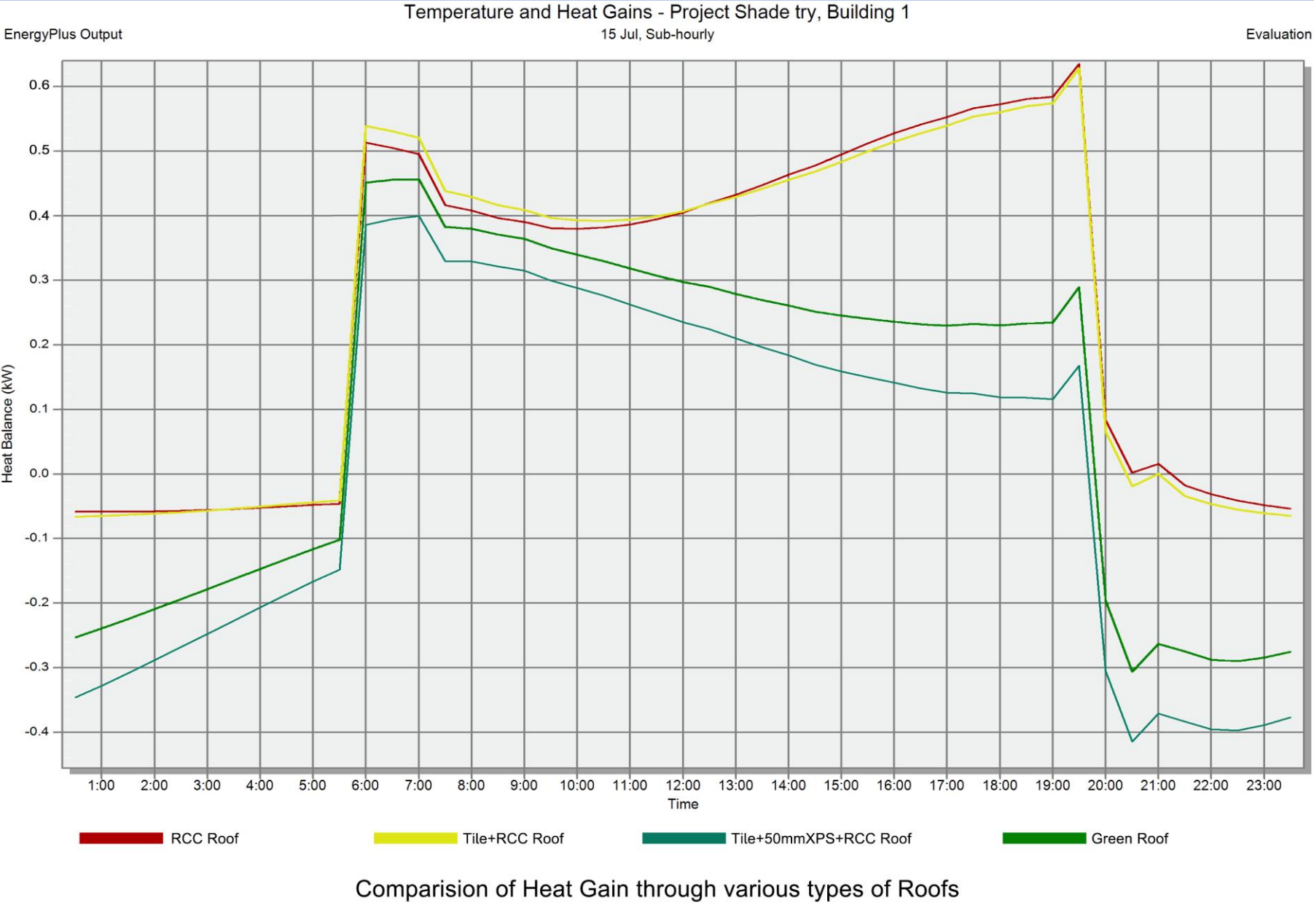
# COMPARISONS OF HEAT BALANCE WITH DIFFERENT TYPES OF WALLS



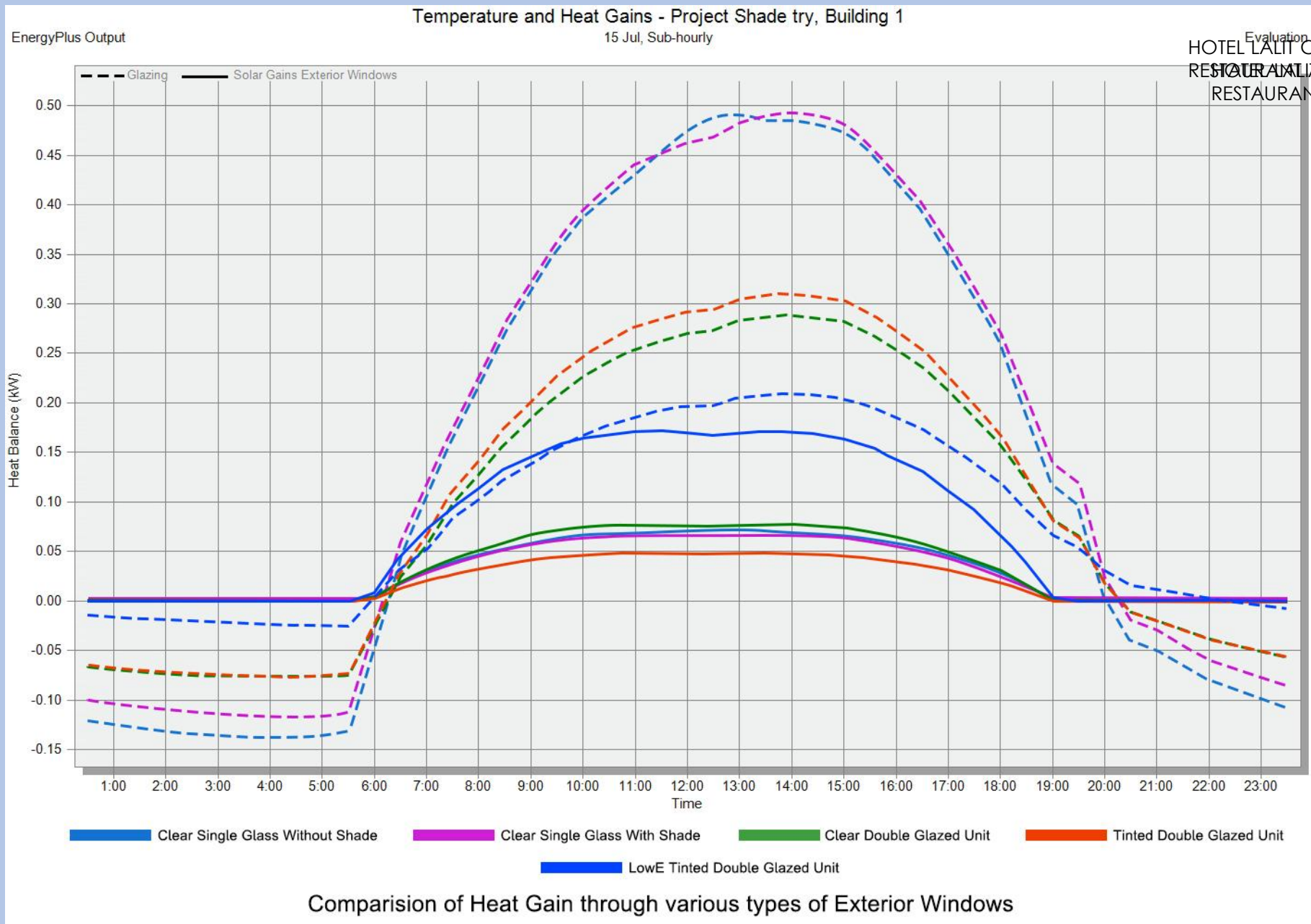
Comparison of Heat Gain through various types of Roofs



# COMPARISONS OF HEAT BALANCE WITH DIFFERENT TYPES OF ROOFS



# COMPARISONS OF HEAT BALANCE WITH DIFFERENT TYPES OF GLASS



Evaluation  
HOTEL LAIT CHANDIGARH:  
RESTAURANT AREAS TOWARDS THE FOREST  
RESTAURANT AREAS TOWARDS THE FOREST

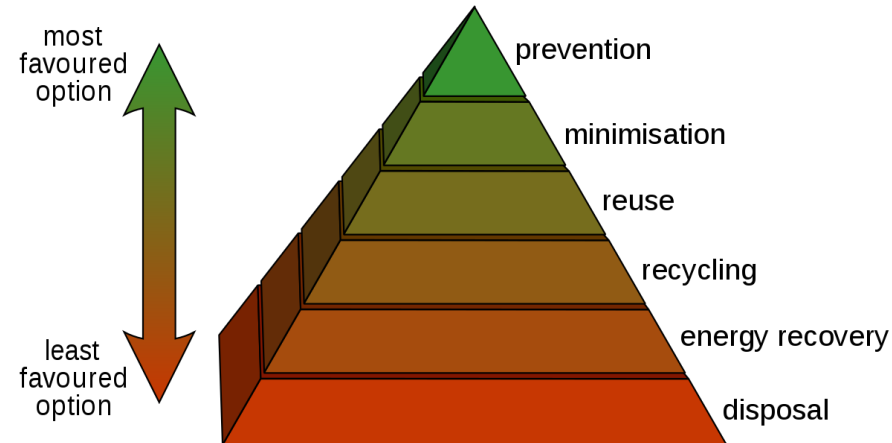
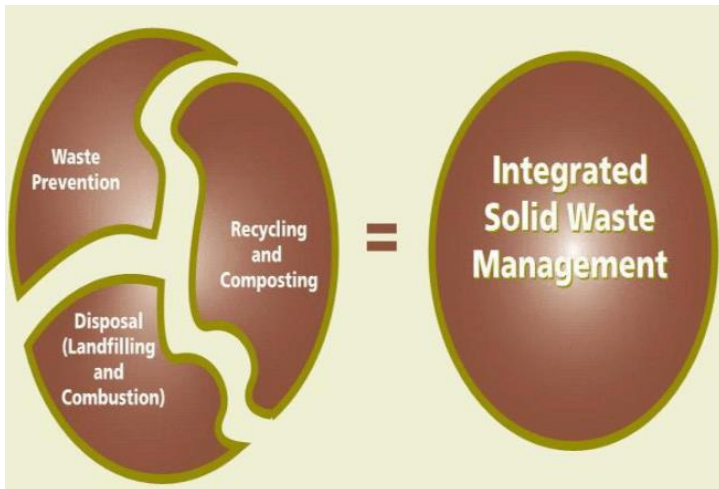


# INTEGRATED SOLID WASTE MANAGEMENT



# C & D WASTE MANAGEMENT

- Consider that the waste has been paid for as part a building material ; to be treated as redundant while the construction work happens at site
- Choice of construction materials can be made such that waste generated is minimum should be made in design process.
- Choice of Construction technology such that it is modular or factory made with least waste
- Sorting and channelizing waste to different streams of recycling, reusing or organized municipal waste management

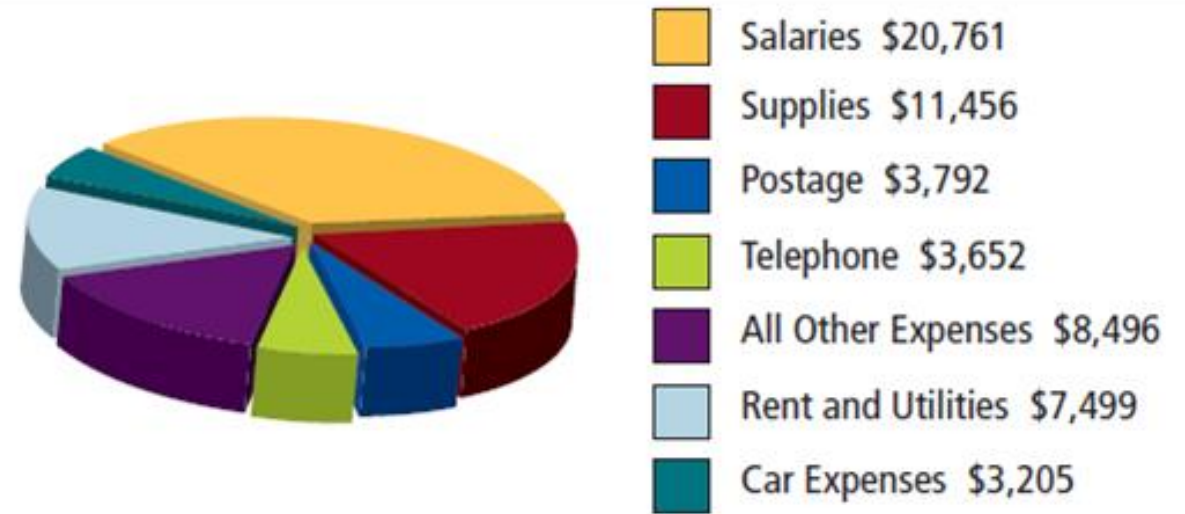




## DESIGN FOR A HEALTHY BUILDING



## EXAMPLE SHOWING THE COST TO A BUSINESS ( ECONOMIC BASIS TO A HEALTH BUILDING )



### GENERAL BASIS OF DESIGN FOR A HEALTHY BUILDING

- Design the building such that it has a healthy atmosphere.
- Choice of finishing materials should be such that those are good for health and also are durable/require less maintenance.
- Ventilation ,quality of air and its temperature plays a major role in a person's well being
- A balance of lighting- both natural and artificial should be looked at with maximizing daylighting during day hours



1. THE BUILDING DESIGN IS BEING DONE AS AN ITERATIVE PROCESS TO OPTIMIZE BUILDING ENERGY PERFORMANCE BY ORIENTATION, WALL-WINDOW RATIO, SHADING DEVICES AND MATERIAL SPECIFICATIONS.
2. THERE IS A SUBSTANTIAL SCOPE OF COST AND EFFICIENCY BENEFIT IN THE RELATED HVAC , ELECTRICAL AND PLUMBING/ WATER EFFICIENT DESIGN OF THE BUILDING
3. AS THE BUILDING ARCHITECTURAL DESIGN INFORMS SPECIFIC VALUES TO THE MEP AND STRUCTURE DESIGN, THE SAME HAS CONSIDERABLE IMPACT ON CAPEX COST ITSELF ( OTHER THAN BENEFITS IN YEARLY OPEX COSTS)
4. BUILDING ORIENTATION, ENVELOPE DESIGN, MEP DESIGN WITH DYNAMIC LOADS FOR VARIOUS LOCATIONS OF BUILDING, EXTERIOR WIND ANALYSIS , HEAT ISLAND EFFECT REDUCTION HAS MEASURABLE AND CONSIDERABLE IMPACT ON INITIAL CAPITAL COST WHILE DESIGNING AND BEFORE COMPLETION OF THE BUILDING AT SITE
5. THE TEAM USES SOFTWARE BASED ANALYSIS , APART FROM PRESCRIPTIVE APPROACH, HENCE ENABLING TO ARRIVE AT MORE ACCURATE INFORMED DECISIONS.
6. OTHER THAN ENERGY AND WATER, HEALTHY MATERIAL SELECTIONS, VENTILATION AND SPATIAL DESIGN CONDUCIVE FOR VARIOUS ACTIVITIES SHALL FORM AN INTRINSIC PART OF A HEALTHY BUILDING ATMOSPHERE FOR THE INHABITANTS.

**THANK YOU**

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