

COMPLIANCE REPORT TSECBC

PROPOSED CLUB HOUSE,
KANDLAKOI, MEDCHAL -
MALKAJGIRI DT., TELANGANA

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PROJECT DETAILS

INTRODUCTION

The objective of this report is to show compliance of the Proposed residential club house building bearing Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana.

The report contains a description of the project design shared by the design team, a summary of the analysis conducted on the roof, wall, glass, LPD, HVAC and other input parameters. The report is divided into five sections:

- Project details – providing a basic summary of the nature of the project
- Declaration letters
- ECBC Compliance forms – Filled in forms
- ECBC Mandatory Compliance – summary of the building and the parameters analysed
- Simulation Report – Reduction in energy consumption of proposed case over the base case

The project team has chosen simulation approach to show compliance and the team will ensure that all mandatory requirements are met as per TSECBC 2021.

PROJECT BACKGROUND

The proposed project is a proposed commercial building spread over an area of 16, 187 m², with a built-up area of 2297 m² of each block to be developed.

The project location falls under Composite climate zone and it focuses on sustainable development and self-sufficiency with highest levels of environmental concern, human comfort, and healthy quality living.

At this preliminary stage, broad analysis has been carried out on key building parameters. Following is the general information of the proposed project:

Location	- Kandlakoi, Medchal Malkajgiri District
Building type	- Commercial Space
BUA	- 2297 m ²
No of Blocks	- Commercial Building
No of Floors	- 2B + G + 4 Floors
WWR	- 25.3%

DECLARATION LETTER



VS INFRA PROJECTS

DECLARATION FORM

We do hereby declare that Construction of Residential Apartment Building project in Survey No. 139 Part, Kandlakol, Medchal - Malkajgiri District, Telangana State, under HMDA, belonging to M/s. VS Infra Projects, represented by Sri. P Venu Chander Reddy, Managing Partner of M/s. VS Infra Projects, will comply with the Energy Conservation Building Code requirements as mentioned in the Energy Conservation Building Code (ECBC) compliance report submitted by us to Third Party Assessor, **Samhita M**, bearing License No. **08/TPA-ECBC/GHMC/2017** for ECBC compliance check in reference to the GO. MS. 30 dated 28.01.2014. If any change in compliance approach or any changes in design specifications, it will be intimated to GHMC and permission will be sought from TPA I for ECBC compliance.

We understand that any failure in complying ECBC requirements on inspection by TPA-II, the post construction ECBC compliance certificate shall not be issued by him, which shall also withhold issuing Building Occupancy Certificate.

For: VS Infra Projects


Managing Partner.

Signature
(Owner)


HARISH P
CA/2005/36609

Signature
(Architect)



Signature
(MEP Consultant)



Signature
(ECBC Consultant)

Name: Sri. P Venu Chander Reddy
Organisation: M/s. VS Infra Projects
Date: 30-12-2024

COMPLIANCE FORMS

ENVELOPE SUMMARY

Envelope Summary						
Energy Conservation Building Code 2017 Compliance Forms						
Project Info	Project Address:				Date: 07-01-2025	
	Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana				For Building Department Use	
	Project Built-up Area (m²) : 2297					
	Project Above-grade Area (m²) : 2297					
	Project Conditioned Area (m²) : NA					
	Applicant Name:					
	Applicant Address:					
	Applicant Phone:					
Project Climatic Zone : Composite						
Building classification	Functional Hall					
Project Description: New building – Commercial Space having a total built-up area of 2297 m ² . Intends to comply through Whole Building Performance Approach						
Compliance sought for Energy Efficiency level	ECBC Compliant					
					EPI Ratio	0.98
Compliance Approach	Intends to comply through Whole Building Performance Approach					
Vertical Fenestration Area Calculation Note : Vertical Fenestration area cannot exceed 40% of the gross wall area for prescriptive option	Total Vertical Fenestration Area (rough opening)	Divided by	Gross Exterior Wall Area	Times 100 equals	% vertical Fenestration	
	(4176 ÷ 16506) x 100 = 25.3%					
Skylight Area Calculation Note : Vertical Fenestration area cannot exceed 40% of the gross wall area for prescriptive option	Total Vertical Fenestration Area (rough opening)	Divided by	Gross Exterior Wall Area	Times 100 equals	% Skylight	
	Not Applicable					

Other building type (daytime)

OPAQUE ASSEMBLY

150 mm R.C.C Roof + 25 mm EPS Insulation; U Value – 0.961 W/m² K

230 mm brick; U Value – 1.85 W/m² K

FENESTRATION

Vertical	SKN 144 II	Maximum U-factor	1.6 BTU/hr/ft ² /F
		Maximum SHGC (or SC)	0.27

Overhang (yes or no)

If yes, enter Projection Factor

No

Envelope CHECKLIST

Building Permit Plans Checklist						ENVELOPE Checklist	
Energy Conservation Building Code 2017 Compliance Forms							
Project Address: Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana						Date	07-01-2025
The following information is necessary to check a building permit application for compliance with the building envelope requirements in the TSECBC.							
Applicability (Yes, no, N.A.)	Code Section	Component	Information Required			Location on Plans	Building Department Notes
MANDATORY PROVISIONS (Section 4.2)							
Y		4.2.1	Fenestration Light to Solar Gain (L/S):	0.39/0.23 = 1.70			
Y		4.2.1.1	U-factor	ISO-15099			
Y		4.2.1.2	SHGC	ISO-15099			
Y		4.2.1.3	Visible light transmittance	ISO-15099			
Y		4.2.2	Opaque Construction	ISO-6946			
Y		4.2.2.1	U-Factors	ISO-6946			
Y		4.2.2.1	Solar Reflectance	ISO-6946			
Y		4.2.2.2	Emittance	ISO-6946			
Y		4.2.3	Daylight	Prescriptive approach			
Y		4.2.4	Bldg. env. Sealing	Indicate sealing, caulking, gasketing, and weather stripping			
PRESCRIPTIVE COMPLIANCE OPTION (Section 4.3)							
	NA	4.3.1	Roof	Specify implemented U factor			
	NA	4.3.3.1	Vegetative cool roof	Specify the solar reflectance, emittance and reference standards			
	NA	4.3.2	Opaque External Wall	Specify implemented U factor			
	NA	4.3.3	Vertical fenestration	(1) Indicate U-factors on fenestration schedule. Indicate if values are rated or default. If values are default, then specify frame type, glazing layers, Gap width, and low-e. (2) Indicate SHGC or SC on fenestration schedule. Indicate if values are rated or default. (4) Indicate VLT of fenestration schedule. Indicate if values are rated or default. (3) Indicate if overhangs or side fins or box frame projection are used for compliance purposes. If so, provide projection factor calculation and equivalent SHGC Calculation			

		NA	4.3.3 (a)	Fenestration U factor Exemption	Specify if applicable, specify unconditioned space percentage, and specify incorporated specifications		
		NA	4.3.4	Skylights	(1) Indicate U-factors on fenestration schedule. Indicate if values are rated or default. If values are default, then specify frame type, glazing layers, gap width, and low-e. (2) Indicate SHGC or SC on fenestration schedule. Indicate if values are rated or default.	NA	
Building Envelope Trade off Option (Section 4.3.4)							
		NA			Provide calculations		

COMFORT SYSTEM AND CONTROL SUMMARY

Mechanical Summary								
Energy Conservation Building Code 2017 Compliance Forms								
Project Info	Project Address:					Date 07-01-2025		
	Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana					For Building Department Use		
	Project Built-up Area (m²) : 2297							
	Project Above-grade Area (m²) : 2297							
	Project Conditioned Area (m²) : NA							
	Applicant Name:							
	Applicant Address:							
	Applicant Phone:							
Project Climatic Zone : Composite								
Project Description								
The project is a conditioned building, so the proposed case has been modeled same as base case of water cooled chiller systems of COP 4.9								
Compliance Option: Whole Building Performance								
Equipment Schedules		The following is the information is required to be incorporated with the mechanical equipment schedules on the plans. For Projects without plans, fill in the required information below						
Cooling Equipment Schedule								
Equip. ID	Brand Name	Model No.	Capacity kW	Total L/s	OSA CFM or Econo?	SEER or EER	IPLV	Location
						4.9 COP		
Heating Equipment Schedule								
Equip. ID	Brand Name	Model No.	Capacity kW	Total L/s	OSA CFM or Econo?	Input kW	Output kW	Efficiency
NA								
Fan Equipment Schedule								
Equip. ID	Brand Name	Model No.	Total L/s	SP	kW	Flow Control	Location of Service	

COMFORT SYSTEM & CONTROLS CHECKLIST

Energy Conservation Building Code 2017 Compliance Forms

Project Address: Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana

Date

07-01-2025

The following information is necessary to check a building permit application for compliance with the mechanical requirements in the TSECBC.

Applicability (yes, no, n.a.)	Code Section	Component	Information Required	Location on Plans	Building Department Notes
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COMFORT SYSTEM AND CONTROL

MANDATORY PROVISIONS (Section 5.2)

Y			5.2.1	Ventilation	Indicate all habitable spaces are ventilated with outdoor air		
Y			5.2.2	Minimum space conditioning equipment efficiencies	Provide equipment schedule with type, capacity, efficiency		ACs with water cooled chillers of COP 4.9
Y			5.2.3	Controls	Provide controls documentation		Team will ensure to provide necessary controls
Y			5.2.3.1	Timeclock	Indicate thermostat with night setback, 3 different day types per week, and 2-hour manual override, capable of retaining programming and time setting during loss of power for a period of at least 10 hours		
Y			5.2.3.2	Temperature Controls	Indicate temperature control with 3°C deadband minimum if the system provides both heating and cooling.		
					Indicate thermostats are interlocked to prevent simultaneous heating and cooling, where separate heating and cooling systems are there		
					Indicate separate thermostat control for space types		
Y			5.2.3.3	Occupancy Controls	Indicate occupancy controls for space types		
Y			5.2.3.4	Fan Controls	Indicate two-speed motor, pony motor, or variable speed drive to control the fans and controls shall be capable to reduce the fan speed to at least two third of installed fan power		
Y			5.2.3.5	Dampers	Indicate all air supply and exhaust equipment's having VFD		

					shall have dampers that automatically close upon the situations		
Y			5.2.4	Piping & ductwork	Provide sealing, caulking, gasketing and weatherstripping		
Y			5.2.4.1	Piping insulation	Provide R-value of insulation		
Y			5.2.4.2	Ductwork and Plenum insulation	Provide R-value of insulation		
Y			5.2.5	System Balancing	Specify system balancing		
Y			5.2.6	Condensers	Provide location and source of water used for condenser		
Y			5.2.7	Service Hot Water Heating			Since the project is a commercial building, there is no requirement of hot water in the building.
		NA	5.2.7.1	Solar water Heating	Indicate all Hotels and Commercials have water heating equipment installed for hot water design capacity		
		NA	5.2.7.2	Heating Equipment Efficiency	Indicate service water heating equipment performance and efficiency		
		NA	5.2.7.3	Other Water Heating System	Indicate supplementary heating system		
		NA	5.2.7.4	Piping insulation	Indicate piping insulation		
		NA	5.2.7.5	Heat traps	Indicate vertical pipe risers serving water heaters and storage tanks		
		NA	5.2.7.6	Swimming Pools	Indicate the heated pools are provided with a vapor retardant pool cover on the water surface and temperature control and minimum insulation value		
PRESCRIPTIVE COMPLIANCE OPTION (Section 5.3)							
		NA	5.3.1	Chillers	Indicate chiller type, capacity, COP & IPLV		
		NA	5.3.2	Pumps	Indicate pump type, its total installed capacity and efficiency		
		NA	5.3.3	Cooling towers	Indicate cooling tower type and installed type.		
		NA	5.3.4	Boilers	Indicate boiler type, capacity and efficiency		
		NA	5.3.5.1	Air Economizer (ECBC/TS***/T S****)	Indicate air economizer is capable of modulating outside-air and return air dampers to supply		

					50% of design air supply air quantity as outside air for respective building type.		
		NA	5.3.5.1	Water Economizer (ECBC/TS***/TS****)	Indicate water economizer is capable of providing 50% of the expected system cooling load at air temperatures of 10°C dry-bulb/ 7.2°C wet bulb and below, if the designed building is a respective building.		
		NA	5.3.5.2	Partial cooling	Indicate economizers shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the cooling load		
		NA	5.3.5.3	Economizer Controls	Indicate air economizers are equipped with controls		
		NA	5.3.5.4	Testing	Indicate air side economizers have been tested as per the requirement specified		
		NA	5.3.6	Variable Flow Hydronic Systems			
		NA	5.3.6.1	Variable fluid flow	Indicate design flow rate of HVAC pumping system		
		NA	5.3.6.2	Isolation Valves	Indicate water cooled air conditioning have two way automatic isolation valves and pump motors greater than or equal to 3.7 Kw is controlled by variable speed drives		
		NA	5.3.6.3	Variable speed drives	Indicate Chilled water or condenser water systems		
		NA	5.3.7	Unitary, Split, Packaged Air-Conditioners	Indicate the type of system, cooling capacity		
		NA	5.3.8	Controls for TS*** & TS**** Building			
		NA	5.3.8.1	Centralized Demand Shed Controls	Indicate the building has a Building Management System, with all Mechanical cooling and heating systems having PLC to the zone level shall have the control capabilities		
		NA	5.3.8.2	Supply Air temperature reset	Indicate multi zone mechanical cooling and heating systems shall have controls to automatically reset supply air temperature in response to building loads or outdoor air temperature by at least 25% of the difference between design		

					supply air temperature and the design room air temperature.		
		NA	5.3.8.3	Chilled Water Temperature	Indicate chilled water systems exceeding 350 kW shall have controls to automatically reset supply water temperatures by representative building loads or by outdoor air temperature		
		NA	5.3.9	Controls for TS**** Building	Indicate that the mechanical systems comply with § 5.2.4 and § 5.2.5		
		NA	5.3.9.1	Variable Air Volume Fan Control	Indicate Fans in VAV systems shall have controls or devices to limit fan motor demand		
		NA	5.3.10	Heating Recovery	Indicate for all Commerciality and Health recovery effectiveness and efficiency of oil and gas fired boilers.		
		NA	5.3.11	Service Water Heating	Indicate all Buildings, Hotels and Commercials have solar water heating equipment installed for hot water design capacity		
		NA	5.3.12	Total System Efficiency- Alternate Compliance approach	Attached		
		NA	5.3.13	Low Energy Comfort Systems	Indicate system type		

LIGHTING AND CONTROLS SUMMARY

Energy Conservation Building Code 2017 Compliance Forms				
Project Info	Project Address:			Date: 07-01-2025
	Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana			For Building Department Use
	Project Built-up Area (m²) : 2297			
	Project Above-grade Area (m²) : 2297			
	Project Conditioned Area (m²) :			
	Applicant Name:			
	Applicant Address:			
	Applicant Phone:			
	Project Climatic Zone : Composite			
Project Description	New	Addition	Alteration	Change of Use
Compliance Option: Whole Building Method				
Maximum Allowed Lighting Wattage (Interior, Section 6.3.2 or 6.3.3)				
Location (Floor/room no.)	Occupancy Description	Allowed Watts per m²**	Area in m²	Allowed x Area
1.2 W/sqft				
** Document all exceptions			Total Allowed Watts	
Proposed Lighting Wattage (Interior)				
Location (Floor/room no.)	Fixture Description	Number of Fixtures	Watts/ Fixture	Watts Proposed
Since the project is in design stage, lighting layout has not been finalised yet. But the team ensures to use LED luminaries with LPD of 0.84 W/ft² in all spaces.				
Total Proposed Watts may not exceed Total Allowed Wattage for Interior				
Total Allowed Watts				
Maximum Allowed Lighting Wattage (Exterior, Section 6.3.5)				
Location	Description	Allowed Watts per m² or per lm	Area in m² (or lm for perimeter)	Allowed watts x m² (or x lm)
Total Allowed Watts				
Proposed Lighting Wattage (Exterior)				
Location	Fixture Description	Number of Fixtures	Watts/ Fixture	Watts Proposed
Total Allowed Watts				

LIGHTING AND CONTROLS CHECKLIST

Lighting Permit Checklist					LIGHTING Checklist		
Energy Conservation Building Code 2017 Compliance Forms							
Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana					Date	07-01-2025	
The following information is necessary to check a building permit application for compliance with the lighting and controls requirements in the TSECBC.							
Applicability (yes, no, n.a.)	Code Section	Component	Information Required		Location on Plans	Building Department Notes	
LIGHTING (Section 6.2)							
MANDATORY PROVISIONS (Section 6.2)							
Y		6.2.1	Lighting Controls				
Y		6.2.1.1	Automatic shutoff	Indicate automatic shutoff locations or occupancy sensors			
Y		6.2.1.2	Space control	Provide schedule with type, indicate locations			
Y		6.2.1.3	Control in Daylight Areas	Provide manual or automatic control device schedule with type and features, indicate location			
Y		6.2.1.4	Exterior Lighting Controls	Indicate photosensor or astronomical time switch			
Y		6.2.1.5	Additional Controls	Provide schedule with type, indicate locations			
Y		6.2.2	Exit signs	Indicate wattage per face of Exit signs			
PRESCRIPTIVE INTERIOR LIGHTING POWER COMPLIANCE OPTION (Section 6.3)							
	NA	6.3	LPD Compliance	Indicate whether project is complying with the Building Area Method (6.3.2) or the Space Function Method (6.3.3)			
	NA	6.3.2	Building area method	Provide lighting schedule with wattage of lamp and ballast and number of fixtures. Document all exceptions.			
	NA	6.3.3	Space function method	Provide lighting schedule with wattage of lamp and ballast and number of fixtures. Document all exceptions.			
	NA	6.3.3	Luminaire wattage	Indicate on plans			

		NA	6.3.6	Controls_TS*** and TS***** Buildings	Provide centralized control system schedule with type and features, indicate locations		
PRESCRIPTIVE EXTERIOR LIGHTING POWER COMPLIANCE OPTION (Section 6.3.5)							
		NA	6.4	External light allowance	Provide lighting schedule with wattage of lamp and ballast and number of fixtures. Document all exceptions.		

ELECTRICAL AND RENEWABLE ENERGY SYSTEMS SUMMARY

Electrical and Renewable Energy Summary						
Energy Conservation Building Code 2017 Compliance Forms						
Project Info	Project Address:					Date: 07-01-2025
	Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana					For Building Department Use
	Project Built-up Area (m²) : 2297					
	Project Above-grade Area (m²) : 2297					
	Project Conditioned Area (m²) :					
	Applicant Name:					
	Applicant Address:					
	Applicant Phone:					
Project Climatic Zone : Composite						
Project Description:						
Compliance Approach		Intends to comply through Whole Building Performance Approach				
Transformers						
Type of Transformer		Dry Type Transformer				
Transformer Losses						
	kVA Rating of Transformer	/	Losses at 50% Loading in kW	/	Losses at 100% Loading in kW	X 100 =
Diesel Generator Sets						
Star Rating of DG set		Since the project is in design stage, the project team assured to procure BEE star-rated DG Sets.				
Uninterruptible Power Supply						
Efficiency at 100% Load						
Renewable Energy Systems						
Capacity and Type of Renewable Energy Installed						

ELECTRICAL AND RENEWABLE ENERGY SYSTEMS CHECKLIST

Energy Conservation Building Code 2017 Compliance Forms

Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana

Date

07-01-2025

The following information is necessary to check a building permit application for compliance with the electrical and renewable energy requirements in the TSECBC.

Applicability (yes, no, n.a.)	Code Section	Component	Information Required	Location on Plans	Building Department Notes
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ELECTRICAL AND RENEWABLE ENERGY SYSTEMS

MANDATORY PROVISIONS (Section 7.2)

			7.2.1	Transformers			
			7.2.1.1	Maximum Allowable Power Transformer Losses	Provide losses at 50% load and 100% load, capacity and efficiency		
			7.2.1.2	Measurement and Reporting of Transformer Losses	For less than 500 kVA transformer meters are calibrated of 0.5 class accuracy and digital meters		
					For above 500 kVA additional CT's and PT's are installed		
			7.2.1.3	Voltage Drop	Indicate the Voltage drop for feeders shall not exceed 2% at design load. Voltage drop for branch circuit shall not exceed 3% at design load.		
			7.2.2	Energy Efficient Motors	Indicate the motor class IE2/IE3/IE4		
					Indicate the motors capacity more than 0.375 kW have efficiency according to the latest version of IS 12615		
					Motor nameplate indicates nominal full-load motor efficiencies and full-load power factor.		
					Indicate the motor horsepower ratings does not exceed 20% of the calculated maximum load being served.		
			7.2.3	Diesel Generator Sets	Indicate the star rating of the Diesel Generator Set		
			7.2.4	Check Metering and Monitoring	Indicate the services exceeding 1000 kVA have permanently installed electrical metring to record kVA, kWh and total power factor. And provision for display of current in each phase, voltage between each phase and between each		

Since the project is in design stage, transformer losses are not available. However, the team will ensure to meet the requirements.

					phase and neutral and total harmonic distortion as a percentage of total current.		
					Indicate the services not exceeding 1000 kVA but over 65 kVA shall have permanently installed electric metering to record kW, kWh and power factor or kVARh on hourly basis.		
					Indicate the services not exceeding 65 kVA shall have permanently installed electric metering to record kWh on hourly basis		
					Indicate in case of tenant based building, for recording metering should be provided at a location from where each tenant could attach the services.		
			7.2.5	Power Factor Correction	Indicate that the power factor correction has been maintained at the point of connection		
			7.2.6	Power Distribution System	Indicate the power cable has been sized so that the distribution losses do not exceed the values mentioned in the code		
			7.2.7	Uninterruptable Power Supply	Indicate the UPS meets or exceed the energy efficiency requirements		
			7.2.8	Renewable Energy Systems	Indicate the buildings have provision for installation of renewable energy systems in the future on rooftop or the site		
			7.2.8.1	Renewable Energy Generating Zone (REGZ)	Indicate a dedicated REGZ equivalent to at least 25 % of roof area or area required for generation of energy equivalent to 1% of total peak demand or connected load of the building, whichever is less, shall be provided in all buildings.		
					Indicate the REGZ shall be free of any obstructions within its boundaries and from shadows cast by objects adjacent to the zone		
			7.2.8.2	Main Electrical Service Panel	Indicate the minimum rating is displayed on the main		

					electrical service panel. And space is reserved for the installation of double pole circuit breaker for future solar electric installation		
			7.2.8.3	Demarcation of Documents	Location for inverters and metering equipment, Pathway for routing of conduit from the REGZ to the point of interconnection with the electrical service, Routing of plumbing from the REGZ to the water-heating system and, Structural design loads for roof dead and live load.		

ECBC MANDATORY COMPLIANCE

ECBC COMPLIANCE – MANDATORY REQUIREMENTS

ENVELOPE

The building shall comply with all the mandatory requirements and will carry out simulation to evaluate the energy performance of the proposed case over base case.

Fenestration: Light to solar gain (L/S)

The project team will use DGU glass (SKN 144 II) in all floors and following are the specifications of the glass.

SPECIFICATIONS	DGU (SKN 144 II)
U value	1.6 W/m ² K
SHGC	0.27
VLT	0.39

Thus, the project has fenestration ratio of 1.70

Building Envelope Sealing

The project team will ensure that the following areas of the building envelope are sealed to minimise air leakage:

- Joists around fenestration and doorframes;
- Openings between walls and foundations and between walls and roof and wall panels;
- Openings at penetrations of utility services through, roofs, walls, and floors;
- Site-built fenestration and doors;
- Building assemblies used as ducts or plenums; and
- All other openings in the building envelope
- Exhaust fans shall be fitted with a sealing device as a self closing damper
- Operable fenestration should be constructed to eliminate air leakages from fenestration frame and shutter frame

Roof Surface

The project team will provide cool roof paints on roof to reflect the heat transfer in the building with an initial solar reflectance of atleast 0.7 and initial emittance of atleast 0.75.

HEATING, VENTILATION & AIR CONDITIONING

Load Calculations

The proposed project is a conditioned building of AHUs with COP 4.9

Natural Ventilation

The project team has designed the building with all the necessary provisions included in the design guidelines for natural ventilation in NBC 2016.

Minimum Equipment Efficiencies

The project shall meet all the minimum requirements for system efficiencies as prescribed in TSECBC 2021. The team will ensure the use of BEE 3 star rated fans.

The proposed project is a conditioned building and are modelled with water cooled chillers of COP 4.9

Controls

The project will provide all necessary controls required for heating and cooling equipment.

Zone Isolation

NA

Ventilation Fan controls

The proposed project is a conditioned building with water cooled chillers of COP 4.9

Enclosed parking garage ventilation

The project team shall automatically detect contaminant levels and stage fans or modulate fan airflow rates to 50% or less of design capacity, provided acceptable contaminant levels are maintained.

Piping & Duct work Insulation

NA

Duct work & plenum Insulation

The team will also ensure to provide insulation as listed below:

Duct Location	Supply ducts	Return ducts
Exterior	R -1.4	R -0.6
Unconditioned Space	R -0.6	None
Buried	R -0.6	None

System Balancing

All system balancing will be carried out, when the building is complete. Airside and hydronic system balancing shall be carried out to minimize throttling losses.

Fans with power greater than 0.75 kW, fan speed shall be adjusted to meet design flow conditions. Pump impellers shall be trimmed or pump shall be adjusted to meet design flow conditions.

Condensers

The proposed project is a conditioned building and the team shall ensure that all outdoor units are placed at well-ventilated space.

SERVICE HOT WATER & PUMPING

Since the project is a commercial building, there is no requirement of hot water in the building.

LIGHTING

Local control

Automatic Lighting Shutoff

90% of interior lighting fittings in the building or space of buildings larger than 300 square meter will be equipped with automatic control device.

Space Control

The team will provide atleast one control device to independently control the general lighting within the space.

Daylight Controls

Manual control device to shut off luminaries will be installed within in the building during potential daylit time of a day or automatic control device that:

- I. Has delay of minimum of 5 mins
- II. Can dim or step down to 50% of total power

Exterior Lighting Control

The team will provide photo sensors or astronomical time switch in all exterior areas that are capable of automatically turn off all the luminaries when daylighting is available.

Additional Control

The team will also provide controls for the following

- Display/ accent lighting
- Case lighting
- Task lights
- Hotel Guest Room Lighting
- Nonvisual Lighting
- Demonstration Lighting

ELECTRICAL POWER

Transformers

The project team shall provide transformers of the proper ratings and design with minimum efficiency of 50% and full load rating.

All measurements of losses shall be carried out by using digital meters of better accuracy certified by the manufacturer and the team will also ensure to provide additional metering class current transformers and potential transformers.

Energy Efficient motors

Motors that are better than IS 12615 shall be installed.

Power factor correction

The automatic power controller device shall be installed to maintain the power lag of 0.97.

Check metering and Monitoring

The team will install measurement devices to record and monitor the following

- Demand (kVA)
- Energy (kWh)
- Total power factor

Power distribution systems in buildings

Project will install cables of adequate size to limit the internal power distribution losses not to exceed 3.5% of the total power usage in ECBC building.

Uninterruptible Power Supply (UPS)

In buildings, UPS will meet or exceed the energy efficiency requirement as listed below:

<i>UPS Size</i>	<i>Energy Efficiency Requirements at 100% Load</i>
kVA < 20	90.2%
20 ≤ kVA ≤ 100	91.9%
kVA > 100	93.8%

Renewable Energy Systems

NA

ECBC COMPLIANCE – TESTING STANDARDS

The project team will also ensure to test the components as per the provisions given below

BUILDING ENVELOPE

Fenestration U Value	- ISO 15099
Cool roof reflectance	- ASTM E903
Cool roof emittance	- ASTM E40871
Measure the steady state heat transfer	- ISO 8301
U Value of roofs and slabs	- U factor calculation includes building material only and not air films

HVAC

Natural Ventilation	- NBC 2016 Part 8 Section 1
Water Cooled Chillers	- AHRI 551 AHRI 591
Duct Work and Piping Insulation	- ASTM C 518
Fan Efficiency	- AMCA 205
Duct Insulation R-value	- ASTM C518 at 24 C

ELECTRIC POWER

Dry type transformer	- IS 2026 Part 11 2007
Oil Filled transformer	- IS 1180

SIMULATION REPORT

ENERGY SIMULATION

INTRODUCTION

The purpose or goal of this analysis is to evaluate the energy performance of the Proposed commercial building situated at Sy.No. 139 part, situated at Kandlakoi, Medchal - Malkajgiri District, Telangana. An energy simulation was carried out to assess the performance of the building through which the energy consumption can be optimized in order to reduce the operational cost for the entire 8760 hours of a year.

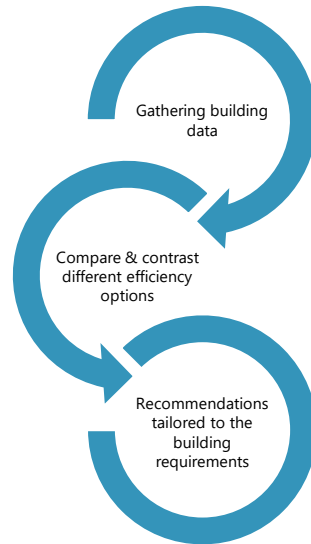


Figure 1 - Aspects of energy simulation report

An energy analysis report typically contains a description of the project design shared by the design team, a summary of the analysis conducted on the roof, wall, glass, LPD, HVAC and other input parameters.

ENERGY ANALYSIS

The detailed analysis was carried out in e-Quest software with different iterations. The analysis was done with some assumptions as indicated in the respective sections below.

Procedure

A base-case is built, and hypothetical cases wherein the building (proposed) is compared to understand the building energy consumption.

Base-case

Base-case can be defined as a hypothetically identical building like the one in study, performing in accordance with the TSECBC 2021 guidelines. It acts as a benchmark, above which the desired (proposed) building must ideally perform.

Proposed-case

The project team has ensured to use DGU glass in all floors to show compliance and proposed project is a conditioned building and hence the building has been modelled with base case systems of AHUs of COP 4.9

Following are the proposed and base case inputs to evaluate the energy performance of the building.

SIMULATION - INPUT PARAMETERS		
COMPONENTS	BASECASE (TSECBC 2021)	PROPOSED CASE
BUILDING ENVELOPE		
Roof U Value (W/m ² K)	0.33	0.961
Wall U Value (W/m ² K)	0.73	1.85
Glass U Value (W/m ² K)	2.84	1.6
Glass Shading Co-efficient	0.29	0.29
WWR	25.3	25.3
LIGHTING & EQUIPMENT		
LPD for interiors (W/ft ²)	1.2	0.84
EPD (W/ft ²)	0.75	0.75
AIR CONDITIONING SYSTEMS		
System Type	AHUs	AHUs
Fan Control	Constant Volume	Constant Volume
COP	4.9	4.9

WINDOW TO WALL RATIO

Based on the drawings provided, WWR of the building is estimated to be 25.3%.

Window Area	4176
Wall Area	16506
WWR	25.3

An excerpt from eQuest simulation output file showing the wall and window area is attached below

REPORT- LV-D Details of Exterior Surfaces				WEATHER FILE- EPW HYDERABAD, ANDHRA		
(CONTINUED)						
	AVERAGE U-VALUE/WINDOWS (BTU/HR-SQFT-F)	AVERAGE U-VALUE/WALLS (BTU/HR-SQFT-F)	AVERAGE U-VALUE WALLS+WINDOWS (BTU/HR-SQFT-F)	WINDOW AREA (SQFT)	WALL AREA (SQFT)	WINDOW+WALL AREA (SQFT)
NORTH	0.345	0.292	0.315	2400.00	3042.27	5442.27
EAST	0.345	0.292	0.302	528.00	2285.59	2813.59
SOUTH	0.345	0.292	0.300	816.00	4618.46	5434.46
WEST	0.345	0.292	0.300	432.00	2383.43	2815.42
FLOOR	0.000	0.083	0.083	0.00	9880.10	9880.10
ROOF	0.000	0.159	0.159	0.00	14822.30	14822.30
ALL WALLS	0.345	0.292	0.305	4176.00	12329.75	16505.74
WALLS+ROOFS	0.345	0.219	0.236	4176.00	27152.05	31328.04
UNDERGRND	0.000	0.058	0.058	0.00	12766.99	12766.99
BUILDING	0.345	0.151	0.166	4176.00	49799.12	53975.11
V S Infra WM_v2				DOE-2.2-50a	1/07/2025	0:58:02 BDL RUN

LPD - LIGHTING POWER DENSITY

Since the project is in design stage, lighting layout has not been finalised yet. But the team ensures to use LED luminaries with LPD of 0.84 W/ft² in all spaces.

SERVICE HOT WATER & PUMPING

Since the project is a commercial building, there is no requirement of hot water in the building.

EQUIPMENT POWER DENSITY

Equipment power density of 0.25 W/ft² in all spaces has been considered in the model to maintain equipment load of atleast 25% of the total energy consumed in the building.

AIR CONDITIONING SYSTEMS

A base-case is built as per TSECBC 2021 and wherein the building (proposed) is conditioned and are modelled same as basecase systems with water cooled chillers of COP 4.9.

SIMULATION RESULTS

BASE CASE

0° ROTATION

Electric Consumption (kWh x000)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	5.32	5.32	6.37	7.41	7.02	6.90	6.51	5.96	6.17	6.03	4.84	5.35	73.19
Heat Reject.	0.15	0.18	0.22	0.33	0.32	0.36	0.32	0.30	0.32	0.25	0.18	0.14	3.08
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.17	3.77	4.17	4.36	4.17	4.17	4.36	4.17	4.17	4.36	3.57	4.36	49.78
Pumps & Aux.	1.33	1.21	1.33	1.40	1.33	1.33	1.40	1.33	1.33	1.40	1.14	1.40	15.93
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	1.80	1.63	1.81	1.86	1.81	1.79	1.87	1.81	1.79	1.87	1.59	1.87	21.53
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	8.66	7.84	8.68	8.94	8.68	8.61	8.99	8.68	8.61	8.99	7.63	8.99	103.33
Total	21.43	19.95	22.58	24.31	23.33	23.16	23.46	22.25	22.39	22.91	18.96	22.12	266.85

90° ROTATION

Electric Consumption (kWh x000)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	5.68	5.74	6.84	7.84	7.29	7.08	6.66	6.15	6.51	6.39	5.15	5.72	77.03
Heat Reject.	0.17	0.20	0.24	0.35	0.33	0.37	0.33	0.31	0.33	0.27	0.19	0.16	3.27
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.36	3.94	4.36	4.56	4.36	4.36	4.56	4.36	4.36	4.56	3.73	4.56	52.08
Pumps & Aux.	1.35	1.22	1.35	1.42	1.35	1.35	1.42	1.35	1.35	1.42	1.16	1.42	16.16
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	1.80	1.63	1.81	1.86	1.81	1.79	1.87	1.81	1.79	1.87	1.59	1.87	21.53
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	8.66	7.84	8.68	8.94	8.68	8.61	8.99	8.68	8.61	8.99	7.63	8.99	103.33
Total	22.02	20.58	23.29	24.98	23.82	23.56	23.84	22.66	22.95	23.51	19.46	22.73	273.40

180° ROTATION

Electric Consumption (kWh x000)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	5.53	5.48	6.42	7.34	6.88	6.76	6.38	5.86	6.12	6.06	4.98	5.58	73.39
Heat Reject.	0.17	0.19	0.23	0.33	0.31	0.35	0.32	0.29	0.32	0.26	0.19	0.16	3.12
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.16	3.77	4.16	4.36	4.16	4.16	4.36	4.16	4.16	4.36	3.57	4.36	49.76
Pumps & Aux.	1.29	1.17	1.29	1.36	1.29	1.29	1.36	1.29	1.29	1.36	1.11	1.36	15.47
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	1.80	1.63	1.81	1.86	1.81	1.79	1.87	1.81	1.79	1.87	1.59	1.87	21.53
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	8.66	7.84	8.68	8.94	8.68	8.61	8.99	8.68	8.61	8.99	7.63	8.99	103.33
Total	21.62	20.09	22.60	24.20	23.14	22.97	23.28	22.10	22.29	22.90	19.07	22.32	266.59

270° ROTATION

Electric Consumption (kWh x000)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	5.32	5.42	6.54	7.60	7.15	6.98	6.55	6.03	6.29	6.12	4.87	5.35	74.22
Heat Reject.	0.16	0.19	0.23	0.34	0.32	0.36	0.33	0.30	0.32	0.26	0.18	0.14	3.14
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.24	3.84	4.24	4.44	4.24	4.24	4.44	4.24	4.24	4.44	3.63	4.44	50.67
Pumps & Aux.	1.31	1.19	1.31	1.37	1.31	1.31	1.37	1.31	1.31	1.37	1.12	1.37	15.67
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	1.80	1.63	1.81	1.86	1.81	1.79	1.87	1.81	1.79	1.87	1.59	1.87	21.53
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	8.66	7.84	8.68	8.94	8.68	8.61	8.99	8.68	8.61	8.99	7.63	8.99	103.33
Total	21.49	20.10	22.82	24.57	23.52	23.29	23.56	22.37	22.57	23.06	19.03	22.17	268.55

PROPOSED CASE

Electric Consumption (kWh x000)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	6.06	6.09	7.37	8.65	8.09	7.81	7.25	6.64	6.96	6.78	5.50	6.03	83.21
Heat Reject.	0.16	0.20	0.25	0.39	0.36	0.41	0.35	0.32	0.35	0.27	0.19	0.14	3.41
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	5.22	4.73	5.22	5.47	5.22	5.22	5.47	5.22	5.22	5.47	4.48	5.47	62.43
Pumps & Aux.	1.60	1.45	1.60	1.68	1.60	1.60	1.68	1.60	1.60	1.68	1.37	1.68	19.17
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	1.80	1.63	1.81	1.86	1.81	1.79	1.87	1.81	1.79	1.87	1.59	1.87	21.53
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	6.06	5.49	6.08	6.26	6.08	6.03	6.30	6.08	6.03	6.30	5.34	6.30	72.33
Total	20.91	19.59	22.34	24.31	23.17	22.87	22.92	21.68	21.96	22.37	18.48	21.50	262.08

SAVINGS

CASE	ENERGY CONSUMPTION
Base Case (MWh)	268.8
Proposed Case (MWh)	262.1
Built up area (m ²)	2297
Base Case EPI (kWh/m ² /yr)	117.0
Proposed Case EPI (kWh/m ² /yr)	114.1
EPI Ratio	0.98

CONCLUSION

Thus, the building tends to achieve EPI ratio of 0.98 as compared to base case and hence the project is applicable for TS* under TSECBC 2021.