



Green Audit Certificate

(Formerly Competent Inspectorate and Consultants LLP)

We take pleasure in Certifying that we have conducted Green Audit of <u>INSTITUTE OF AERONAUTICAL ENGINEERING</u> DUNDIGAL, HYDERABAD – 500043 <u>Covering Sustainability, Environment and Energy Management</u> In line with National Building Code 2016-Part 11 and as per directives of NAAC & NABCB During 23rd, 24th, 28th February and 15th March It indicates <u>92.23%</u> compliance as per our scoring method "Detailed report No. CIC/GAR/001 is attached"

Dr Ajaya Shankar Gupta Ainapur Principal Auditor Director (Training and Systems)



Dr Rama Dasu Pittal Managing Director

Certificate No: CIC/ GARC/0001 Dt-31/03/2023



	Green A	Audit Report		
Report Number:	CIC/GAR/001	Date of Issue	17 th March 2023	
Name of the University/ Institute		Institute of Aeronautical Engineering Dundigal, Hyderabad – 500043		
Areas Covered Buildings/ Facilities)	(Departments/	Dundigal Campus in 14 ac other infrastructure	cres with 7 buildings and	
Audit Period		23 rd , 24 th and 28 th Februa March	ary & Follow up on 15 th	
Name of Seni	or Auditor	Dr Ajaya Shankar Gupta		
		Dr. Rama Dasu Pittala (Da Dr. Ajaya Shankar Gupta (Ms Aparna Mamidi (Day1) Mr. N Bhaskar Reddy (Day	ay 1&2) and on 28th (Day 1&2)	
Names of A	uditors	Mr.C Venugopal (NABCB	Assessor) on Day 1	
Report Prep	ared by:	Reviewed and	Approved by	
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1. Executive Summary:

Institute of Aeronautical Engineering was audited during 23rd to 28th of February Covering Sustainability, Environment and Energy Management in line with National Building Code 2016-Part 11 and as per directives of NAAC & NABCB. The auditors are Dr. Rama Dasu Pittala (23rd, 24th and 28th Feb), Dr. Ajaya Shankar Gupta (23rd and 24th), Ms Aparna Mamidi (Day1), Mr. N Bhaskar Reddy (Day 2 only), Mr.C Venugopal (NABCB Assessor as observer) on 23rd.

The audit covered their total campus area spread over 14 acres and having 7 main buildings with a build-up area of around 36322 Sqm..

The criteria has 11 major clauses covering Sustainability, Environment and Energy Management as shown in the table1:

Table 1: NBC Part 11 Clauses Grouping into Broader Classification as Environmental and Energy Efficiency Categories	Sustainability,
NBC Part 11 Clause No	Major Focus
3 APPROACH TO SUSTAINABILITY	Sustainability
4 APPLICABILITY OF THIS PART	Sustainability
5 IMPLEMENTATION OF THIS PART	Sustainability
6 SITING, FORM AND DESIGN	Environmental
7 EXTERNAL DEVELOPMENT AND LANDSCAPE	Environmental
8 ENVELOPE OPTIMIZATION	Environmental
9 MATERIALS	Sustainability
10 WATER AND WASTE MANAGEMENT	Environmental
11 BUILDING SERVICES OPTIMIZATION	Energy Efficiency
12 CONSTRUCTIONAL PRACTICES	Sustainability
13 COMMISSIONING, OPERATION, MAINTENANCE AND BUILDING PERFORMANCE TRACKING	Energy Efficiency

Also the check points cover many of the requirements (around 31 Points) in NAAC's Self-Assessment Criteria as detailed in Annexure 1.

During audit the Checklist approved by NABCB has been used which has 136 check points and the auditors marked as NA if any clause is not applicable and then checked their Records/ practices/ documents etc against each check point. If the records/practice/ documents are meeting major requirement listed as Compliant, if not the observations are classified as below:

Major Nonconformity

a nonconformity that shows a NBC - 11 clause or other requirement has not been implemented at all, or has been implemented in such a way that the requirements are not met at all.

Minor Nonconformity



a single instance, or small set of single instances, that show a requirement has not been met. At the Lead Auditor's discretion, a large number of related Minor Nonconformities may instead be filed as a single Major Nonconformity.

OFI:

Opportunity for Improvement is Not a non-Conformity. It is a cause for a potential non conformity and or for further improvement

The summary of audit findings are as below:

Table 2: Summaro of Audit Findings

		ARC Aud	lit Sumn	nary				
S.No.	NBC Part11 Clause	Total Check Points	Not Appl Points	Net Appl Points	Compliant points	OFIs	Minor NCs	Major NCs
1	3 APPROACH TO SUSTAINABILITY	17	1	16	14	2	0	0
2	4 APPLICABILITY OF THIS PART	1	0	1	1	0	0	0
3	5 IMPLEMENTATION OF THIS PART	1	0	1	1	0	0	0
4	6 SITING, FORM AND DESIGN	11	0	11	11	0	0	0
5	7 EXTERNAL DEVELOPMENT AND LANDSCAPE	12	0	12	8	1	3	0
6	8 ENVELOPE OPTIMIZATION	3	0	3	2	0	1	0
7	9 MATERIALS	5	0	5	3	1	1	0
8	10 WATER AND WASTE MANAGEMENT	31	5	26	24	2	0	0
9	11 BUILDING SERVICES OPTIMIZATION	28	9	19	16	3	0	0
10	12 CONSTRUCTIONAL PRACTICES	16	1	15	13	1	1	0
11	13 COMMISSIONING, OPERATION, MAINTENANCE AND BUILDING PERFORMANCE TRACKING	11	1	10	3	6	1	0
	Total	136	17	119	96	16	7	0

By giving a weightage of 1 to compliant, 0.75 to OFI, 0.25 to Minor NC and 0 to Major NCs the total points against 119 applicable are 109.75 ie equal to 92.23%

Embodied Energy Calculated for Existing building as shown in Fig 9.5 shows that the average **EE Per Sqm is 2.955 GJ per Sq M** and the National average for Four-storey reinforced cement concrete (RCC) buildings is **4.3 to 3.1 GJ per SqM** (Fig. 9.4 reference Table 4 Embodied energy analysis of multi storied residential buildings in urban India S. Bardhan Dept. of Architecture, Jadavpur University, India), which indicates that the Old Buildings are also within the EE Standards.

Embodied GHG calculated is around **654 Kg CO2e per SqM** as shown in Figure 9.5, which is within benchmark given in a study published in the Journal of Cleaner Production, the embodied carbon of residential buildings in India ranges from approximately **250 to 750 Kg CO2e per SqM**.

The major strengths are:

- IARE has developed a Green Campus Policy indicating commitment and drive of Principal and Management.
- They prepared Guidelines to meet requirements of NBC Code 11 for future buildings
- The major effort taken by their Civil department to assess the Embodied Energy and GHG against old buildings



- EE Per Sqm is 2.955 GJ per Sq M and the National average for Four-storey reinforced cement concrete (RCC) buildings is 4.3 to 3.1 GJ per SqM (reference details given in report)
- They have prepared a list of materials with their Emboided Energy levels to assist in selection of materials for future construction
- They are using Flyash Bricks which is an eco-friendly approach
- Solar Panels used for Solar Power 160 KW capacity for campus lighting, ACs and fans.
- Rain water being recharged through rain water harvesting pits (24Nos) and 1 bore well connected to rainwater harvesting pit.
- Rainwater recharging pits and Use of STP Water for gardening.
- Interaction with local Pnchayat and villagers in 2002 was done. Established RO Plants, Provided Benches and Furniture to 10 Schools in and around the Institute.
- Students Participation in Street Cause and NSS is supported and encouraged by Management
- Environmental Risk Assessment and Control Plan covering Oil Leakage, Use of Energy, Dust Generation etc covered.
- Procedure for Emergency Response Plan (ERP) IARE/GA/ERP/01
- Existing Buildings are assessed for Building Orientation (Page 9 to 11), Material used (Page 7 to 9) and guidelines for new buildings addressed in IARE/GA/GAD/01
- 38 percent of the open spaces are maintained as softscapes (permeable surface on ground) as against norm of 30%
- Developed an SOP "Procedure for Waste Management IARE/GA/PWM/01"
- Plastic bottles Shredder, Canteen Waste Biogas Plant is there.
- MoU with Ramky Enviro for E Waste Management
- CFL lights replaced with LED 100% and All Ac's are now 5 star rated,
- Solar power is used and 35% energy reduced & and cost per KWH reduced by 35% (from 2019 to 2022).

Major areas for improvement are:

- All the Initiatives under Green Campus Policy to have Measurements / KPIs to assess/ monitor performance.
- Use of water conserving fixtures in Toilets, wash Rooms etc to be used
- Modification of Windows to further improve Day Lighting to be done
- Explore use of Auto dimming switches etc to conserve energy
- A site maintenance plan for Landscape is to be developed and precautions to avoid water logging in ground
- Construction agencies to perform soil monitoring, water quality monitoring, ambient air quality monitoring, noise monitoring etc with a view to having required controls
- Specific Water Consumption to be monitored regularly and to check water balance
- Explore Availability and use of Bio Diesel in Buses and Generators



• Monitoring Energy Consumption for different applications by having Sub-meters Training to all Housekeeping Staff and Electrical staff may be arranged

2. Introduction:

Competent Inspectorate and Consultants Pvt Ltd (CICPL) have been engaged by **Institute of Aeronautical Engineering (IARE)**, Hyderabad for conducting Green Audit of their campus as per NAAC advisory (Ref. No. -F. No. 14-29/2022 dated 26.05.2022) prescribing requirement of Green Audits/Certification of educational institutions by Inspection Bodies approved by NABCB as per ISO17020. As per Methodology prescribed by NABCBs policy Ref. No.: NABCB/P-001/09/2022/V.1 Green Audits to be conducted as per the National Building Code, 2016, Part-11 with clauses, as applicable therein. Accordingly CICPL had prepared checklist and conducted the audit, after obtaining approval for the checklist. This audit was Witnessed by NABCB nominated Auditor on first day.

About IARE:

Founded in the year 2000 by Maruthi Educational Society, Institute of Aeronautical Engineering (IARE) in Hyderabad has established itself as a leading Autonomous engineering college. With a mission to provide "Education for Liberation," the institute offers a wide range of B.Tech programs including Computer Science and Engineering, Information Technology, Electronics and Communication Engineering, Aeronautical Engineering, Mechanical Engineering, Civil Engineering, and more. IARE is also home to six M.Tech programs in engineering and an MBA program. Over the past 21 years, IARE has earned a prestigious reputation for excellence in education, with 100% admissions in the state of Telangana.

The Vision and Mission of the Institute are as below:

Vision

To bring forth professionally competent and socially progressive, capable of working across cultures meeting the global standards ethically.

Mission

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

About CICPL:

Competent Inspectorate and Consultants Pvt Ltd is formed in 2022 by converting Competent Inspectorate and Consultants LLP which was established in 2015 by merging Sun-Mann Engineers & Consultants (Serving Industry Since 2009) to provide highly competitive



specialized Third-Party Inspection and Field Services to support companies in building and managing their assets, ensure quality and compliance, improve reliability, performance and avoid the occurrence of incidents

CICPL performs third party inspections, which include the examination of materials, products, installations, plants, processes, work procedures or services, and the determination of their conformity with requirements and the subsequent reporting of results of these activities to the clients.

3. Audit Scope:

Audit is Covering Sustainability, Environment and Energy Management in line with National Building Code 2016-Part 11 and as per directives of NAAC & NABCB

The physical area covered 14 acres of campus area consisting 7 blocks covering Instructional, Laboratory and Administrative Infrastructure . The Layout plan is as below:



Figure 3-1: Campus Layout with details of Built-up area



4. References:

- NABCB Policy on Green Audit by Inspection Bodies
- NAAC's advisory ref No.F.No.14-29/2022 Dated 26.05.2022
- National Building Code of India 2016 Vol 2 Part 11 Approach to Sustainability
- ISO 17020 Manual and SOPs of CICPL
- National Lighting Code 2010 edition

5. List of Auditors:

- 1. Dr. Rama Dasu Pittala (Day 1&2) and 28th Feb
- 2. Dr. Ajaya Shankar Gupta (Day 1&2
- 3. Ms Aparna Mamidi (Day1)
- 4. Mr. N Bhaskar Reddy (Day 2 only)
- 5. Mr.C Venugopal (NABCB Assessor) on Day 1

6. List of Auditees:

- 1. Dr. L V Narasimha Prasad Principal and Professor of CSE
- 2. Dr Padmanabha Reddy, Head of IQAC
- 3. Dr Vemula Anand Reddy, HOD, Department of Civil Engineering,
- 4. Dr P Sreekanth Reddy, Asst Professor, Department of Civil Engineering
- 5. Mr Pavuluri Rajesh, Adminstration Officer, Admin Department
- 6. Dr. G Ranjith Kumar, HOD, Dept. Of EEE

7. Audit Plan, Opening and Closing Meetings:

Audit plan is attached as Annexure 1

Audit was performed during 23rd & 24th and some measurements were taken on 28th February.

Opening meeting and closing meeting photos are given below.





8. Areas Covered (Departments/ Buildings/ Facilities)

The physical area covered 14 acres of campus area consisting 7 blocks covering Instructional, Laboratory and Administrative Infrastructure.

 1. Block 1 - 1945 (Sqm) Per floor - 5 floors : 104679 Sft (9725 Sqm)

 2. Block 2 - 1275 (Sqm) Per Floor - 5 floors : 68620 Sft (6375 Sqm)

 3. Block 3 - 1945 (Sqm) Per floor - 5 floors - 104679 Sft (9725 Sqm)

 4. Block 4 - 4320 (Sqm)
 - 1 floors - 46500 Sft (4320Sqm)

 5. Block 5 - 1000 (Sqm)
 - 1 floors - 10764 Sft (1000 Sqm)

 6. Block 6 - 1167 (Sqm) per floor
 - 4 floors - 50246 Sft (4668 Sqm)

 7. Block 7 (Hub) - 509 (Sqm) - 1 floor
 - 5478 Sft (509Sqm)

Also the Solar Plant on rooftop, STP, Generator, Rainwater Harvesting Pits etc.



9. NBC Code Section 11 Clause wise Observations

3 APPROACH TO SUSTAINABILITY

The objective of this clause is to see overall commitment of management towards Sustainability and their approach /system of planning from concept, design, construction, commissioning, operation and maintenance, and also decommissioning and disposal at the



end of useful life of structure. Also focuses on Energy Efficient Design and Processes,



Reduced Embodied and Operational Energy, Integrated Water Management, Disaster Risk

Assessment and Mitigation, Corporate Governance etc.

IARE has a Green Campus Policy, signed by Principal is evidence of commitment towards Sustainability approach.

Guidelines Architect, to Civil designer and Contractors and Note on Existing Build addressed in Doc No. IARE/GA/GAD/01 dtd 01:10:2022. addresses their approach for Sustainability from Concept, designing to decommissioning and

disposal. The Contents page Figure 9-2: Contents of IARE/GA/GAD/01 Photo attached here.

INSTITUTE OF AERONAUTICAL ENGINEERING (Indemnia)	Guidelines to Architect, Designer and Civil Contractors and Note on Existing Buildings	IARE/GA/GAD/01 01:10:2022
9	Existing Dullungs	Issue:01, Rev: 00
Cuidalines to	Anchitest Desire	
Guidelines to	Architect, Desig	ner and Civil
Contractors a	nd Note on Exist	ing Buildings
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Thermal Massing		
External Development an	d Landscape Design:	12
Rainwater Harvesting		13
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Annexure 1: Table showing	CO2equalent emissions and Er	mbodied Energy of different

The construction activities comprised of different materials includes bricks, cement, aggregates, granites, etc. Among them the kind/grade of material has been used based on their green house gases and embodied energy for achieving the sustainability. To the possible

extent the material has been collected from the near localities to reduce the greenhouse gases emissions. The greenhouse gases and embodied energy of corresponding materials are listed

in Table 1 and 2 for better understanding IARE has conducted assessment of Embodied Energy in existing

4:	 Comparative embodied energy measures of different constructions. 						
0.	Countries	Building types	Embodied Energy (GJ/Sq m)	Area (Sq m)			
	India [10]	Eight storey conventional building	4.21	5120			
		Double storey conventional building with load bearing walls	2.92	149.5			
		Double storey building with soil- cement block and filler slab roof	1.61	160.5			
	New Delhi, India [12]	Adobe house	3.8	120			
	India [13]	Single storey Load-bearing structures	5 - 4.1	50-200			
		Double storey Load-bearing structures	4.2 - 3.7	50-200			
Ì		Four-storey reinforced cement concrete (RCC) buildings	4.3 - 3.1	50-200			

building as detailed in Table 2 of their document IARE/GA/GAD/01 shown in the figure below.

If we assess it's specific EE Embodied Energy Calculated for Existing building as shown in Fig 9.3 shows that the average **EE Per Sqm is 2.955 GJ per Sq M** and the National average for Four-storey reinforced cement concrete (RCC) buildings is **4.3 to 3.1 GJ per SqM** (Fig. 9.4 reference Table 4 Embodied energy analysis of multi storied residential buildings in urban India S. Bardhan



Dept. of Architecture, Jadavpur University, India), which indicates that the Old Buildings are also within the EE Standards







INSTITUTE OF AERONAUTICAL ENGINEERING (Admontocial)

Guidelines to Architect, Designer and Civil Contractors and Note on Existing Buildings

IARE/GA/GAD/01 01:10:2022

Issue:01, Rev: 00

		Green H	louse Gas (Calculation	
S.No.	Materials	Units	Qty	CO ₂ Emission/ unit	GHG
15	Tiles	m ²	500	18.33	9165
16	Plywood	kg	82400	0.61	50264
17	Plaster board	Sheet	4100	11.35	46535
18	Water	Liter	10200000	0.42	4284000
19	Welding rods	kg	245	20.5	5022.5
20	Gravel	kg	600000	0.00241	1446

Table 2 Emboided energy calculations of different materials used in the construction activity

	Er	nbodied	Energy Ca	lculation	
S.No.	Materials	Units	Qty	EE in MJ/unit	EE
1	Cement	kg	9708040	3.05	29609522
2	Concrete	m3	18869.12	0.21	3962.5152
3	Steel bars	kg	1941608	32.24	62597441.92
4	Granite	kg	1817650	0.105	190853.25
5	Tiles (Flooring)	m2	45111.74	10.63	479537.7962
6	Marbles	kg	1817650	1.53	2781004.5
7	Bricks	number	3883216	2.9	11261326.4
8	Glass	kg	30000	7.88	236400
9	Aluminum	kg	500	141.55	70775
10	Tiles	m2	500	18.9	9450
11	Plaster board	Sheet	4100	15.1	61910

 Table 3 Green house gas calculations of different materials used in the ongoing construction activity

	Green House Gas Calculation						
S.No.	Materials	Units	Qty	CO ₂ Emission/ Unit	GHG		
1	Cement	kg	96321.6	0.95	91505.52		
2	Concrete	m ³	240.83	0.159	38.29197		
3	Steel bars	kg	15000	5.457	81855		
4	Granite	kg	150000	0.04	6000		
5	Marble	kg	150000	0.436	65400		
6	Mosaic	kg	150000	0.238	35700		
7	Fly ash Bricks	number	17500	0.427	7472.5		
8	Glass	kg	5280	1.735	9160.8		

Figure 9-4: GHG & EE Calculations from Doc. No IARE/GA/GAD/01

8

COMPETENT INSPECTORATE	CIC R
AND CONSULIANTS FVI. LID.	COMPETENT INSPECTORATE AND CONSULTANTS PVT. LTD.

CIN:U74995TG2022PTC161136

		Gree	en House Gas Cal	culation		
				CO2 Emission/		
S.No.	Materials	Units	Qty	unit	GHG	
1	Cement	kg	97,08,040	0.9	95	9222638
2	Concrete	m3	18,869	0.1	59	3000.19008
3	Steel bars	kg	19,41,608	5.4	57	10595354.86
4	Granite	kg	18,17,650	0.0	04	72706
5	Tiles (Flooring)	m2	45,112	18.3	33	826898.1942
6	Marbles	kg	18,17,650	0.43	36	792495.4
7	Mosaic	kg	18,17,650	0.23	38	432600.7
8	Bricks	number	38,83,216	0.3	27	1269811.632
9	Glass	kg	30,000	1.73	35	52050
10	Plastic Pipes	m	2,50,450	0	.4	100180
11	Aluminum	kg	500	0.62	22	31:
12	Electricity	kWh	75,000	0.789	98	59235
13	Electric wires	kg	20,000	2.8	34	56800
14	Lighting fixture	Set	5,116	35.0	55	182385.4
15	Tiles	m2	500	18.3	33	916
16	Plywood	kg	82,400	0.0	51	50264
17	Plaster board	Sheet	4,100	11.3	35	46533
18	Welding rods	kg	245	20	.5	5022.5
19	Gravel	kg	6,00,000	0.0024	11	1446
						23778898.87
		Sum	mary			
		Total Sft	3,90,837			
		TotalSqM	36,309.93			
		Kg CO2e per Sft	60.84			
		CO2e per SqM	654.89			
Accord	ding to a study pub India ran	blished in the Journal Iges from approxima	Reference to Benchr I of Cleaner Producti tely 250 to 750 kgCO	nark: on, the embodied car 2e/m2 (square meter)	bon of resider of floor area.	ntial buildings in
			EE Calculation			
S.No.	Materials	Units	C	ty EE i	n MJ/unit	EE
	1 Cement	kg		9708040	3.05	29609522
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6	Marbles	kg	1817650	1.53	2781004.5
7	Bricks	number	3883216	2.9	11261326.4
8	Glass	kg	30000	7.88	236400
9	Aluminum	kg	500	141.55	70775
10	Tiles	m2	500	18.9	9450
11	Plaster board	Sheet	4100	15.1	61910
					107302183.4
		Summary			
		Total Sft	3,90,837		
		TotalSqM	36309.93		
		Mj per Sft	274.54		
		Mj per SqM	2955.2		
		Gj/SqM	2.955		

Embodied energy analysis of multi storied residential buildings in urban India

S. Bardhan, *Dept. of Architecture, Jadavpur University, India* https://www.witpress.com/Secure/elibrary/papers/ESUS11/ESUS11035FU1.pdf

Figure 9-5: GHG & EE Calculations for Existing Buildings at IARE



Solar Panels used for Solar Power 160 KW capacity for campus lighting, Acs and fans.

Daylight Factor (DF) is a measure of the amount of natural daylight that enters a room, and is defined as the ratio of the indoor illuminance at a point on a workplane to the outdoor illuminance under an overcast sky. DF is expressed as a percentage Daylighting factor measure Civil Expert indicates that day lighting factor is 4.78 as against minimum requirement of 2.

Calculate the total internal reflection (TIR) factor: TIR = (0.8 x ceiling reflectance) + (0.5 x wall reflectance) + (0.2 x floor)reflectance) + (0.1 x window reflectance) TIR = (0.8 x 0.7) + $(0.5 \times 0.45) + (0.2 \times 0.25) + (0.1 \times 0.1)$ TIR = 0.845 Calculate the DF: DF = (TIR x(windows+Door) area x 0.75) / room floor area x 90 100% Parameter Measurement Figure 9-7 STP constructed in 2018 of 30KLD 234.12 Door Area in Sq M Total Area of Widows in Sq M 500 Total Floor area in Sq M 9725 Ceiling 0.7 Walls 0.45 Floor 0.25 Reflectand Windows 0.1 Total Internal Reflection (TIR) 0.845 **Daylight Factor DF** 4.7840

Figure 9-6 Daylighting factor (ref Annexure 3 of Checklist)

Figure 9-8: Water Storage Tanks

Top Management Interaction with local Panchayat and villagers was done in 2002 before starting construction and continues to interact and support them. IARE has established RO Plants, provided Benches and Furniture to 10 Schools in and around Institute. Students also Participation in Street Cause and NSS is supported and encouraged by Management. Few report copies are shown below







To ensure association of different stakeholders Environmental Science Topic covered for all students. Training on Green Building and Energy Audit covered on 19th Oct 2022 to all staff and students of Civil and Electrical department covered. Awareness Session on Plastic Waste was conducted on 30-12-2022. Photos shown below:

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Figure 9-10 Training on Green Building	Figure 9-11 Awareness Campaign on Plastic

Environmental Risk Assessment and Control Plan covering Oil Leakage, Use of Energy, Dust Generation etc covered. Risk Assessment Sheet shown below.

Procedure for Emergency Response Plan IARE/GA/ERP/01 addresses Civil Unrest covering Preparedness for Medical Emergency, Fire, Snake Bite, Electrical shockSocio Economic and Political vulnerabilities etc. The location does not fall in River, Coastal, Cyclonic proximity and Climatic Zones. The Contents Page of ERP is shown below.





6 SITING, FORM AND DESIGN

The objective of this clause is to see if - passive design strategies for every building as a means to reducing overall energy demand before pursuing active and mechanical means in an effort to not only save energy but also to minimise the overall negative impact on the environment (energy conservation, water conservation and reduced greenhouse gas emissions.)

Existing Buildings are assessed for Building Orientation (Page 9 to 11) and guidelines for new buildings addressed in IARE/GA/GAD/01, Key points from that are:

- Block-1&6 are faced towards east, 3&4 is faced towards west.
- The ventilation and lighting system is provided on east and west facings of these four blocks.
- In addition, the windows provided for the ventilation are in the path of sun.
- Block-2&5 are faced towards north.
- Although block-2 and 5 are directed towards north direction, the surface area of wall including windows are open to the natural ventilation. The sunlight will have direct contact during sunny time period.



Figure 9-12: IARE Image from GoogleEarth

- Further the building's contact surface area with sun is comparatively larger and direct throughout the day, which declines the utility of electrical energy.
- Red clay bricks are used in the masonry component of a building. As per the standards, it possess it is an highly effective thermal massing material (refer to thermal massing).
- Also the buildings will provide sufficient natural shading when the sun is on opposite direction.
- The provision of windows on the direction of sun path achieving the desirable thermal and visual comfort to the occupants.
- All building envelopes are protected against thermal losses, drafts and degradation by natural elements such as wind, dust, sand, snow, rainwater, hail, etc.
- 25 percent of the regularly occupied areas of the building is achieving sufficient day lighting with a minimum day lighting factor of 2 percent.
- Solar passive techniques like Landscaping, optimum building orientation, surface to volume ratio etc in building to optimize building performance has been incorporated.



• As the institution is not falling in the area of climatic zone, no artificial heating systems are provided.

Site Assessment report by M/S Srinivasa Associates represented by Mr ASVS Srinivas Lic No. 105/Strl.Engineer/TP10/GHMC/2009 addressed in page 4 of IARE/GA/GAD/01. Key Points from site assessment were:

There is no forest area, no rivers or tributaries and/or streams It is not located in coastal regulation protected areas, public parks and recreation areas.

Natural contours/terrain demonstrate that no critical natural resource is impacted by the project

Near the construction there is a presence of floodplains, Dundigal lake within a distance of 250 m, defense areas within a distance of 6 km, agricultural land and wetlands in the surroundings.

Based on the observations made, the following steps were suggested by them:

- The soil in the site comprises of clay with medium to high compressibility, for which soil investigation needs to be performed for appropriate design of foundation.
- As there is a presence of water bodies nearer the construction site, suitable remedial measures to be adopted to avoid seepage or inflow into the site.
- After construction also, a barrier needs to be constructed around the site to prevent the flow of water during floods.
- Appropriate measures to be taken while disposing of liquid waste from institution to avoid contamination of nearby water bodies.
- The excavated soil in the construction should be reused as a fill material in appropriate heads.
- Also it is suggested to utilize the locally available materials to decline the effect on the environment based on their greenhouse gases emission and embodied energy for better sustainability.
- In case of any demolitions, the generated solid should be recycled and reused as a fill material or any other activities.
- Steel or any material obtained from recycling of construction waste needs to be handled properly. Improper disposal of these wastes in site may hinders the working activity and contaminates the nearer water bodies.

IARE/GA/GAD/01 page 11 addresses Existing Building data and Guidelines for New Building for Thermal Massing

Classrooms are constructed as per AICTE Norms, the height from False ceiling is measured as 8 Feet. It is the lowest possible height, hence Volume Optimisation is done.

Wind has SE Direction in the location . Old Building Windows orientation in E & W Direction in many rooms, hence helps in improving Thermal Comfort. Total Windows area was



measured by Civil Expert and found that only 13.25 % is open area Day Light Factor is only 4.78 as shown in Figure 9-6 above.

Annexure 1 of IARE/GA/GAD/01 addresses the materials and assemblies selection based on their carbon footprint (GHG emission potentials) of the product.

7 EXTERNAL DEVELOPMENT AND LANDSCAPE

This clause focusses on Landscape planning and design, because effective landscaping plays a vital role in preserving the natural capacity of a site for stormwater management, groundwater recharge, soil structure maintenance, and filtration, leading to the growth of soil organic matter and erosion prevention. Furthermore, it helps to regulate the microclimate by facilitating evaporation, transpiration, and the absorption and storage of carbon by trees and other vegetation.

IARE has landscape area around 34% as shown in Figure --- .





Since the location of IARE if far from Village, about 400M from ORR and the noise level was around 40db, noise reduction not identified as a need.

Considered shading pattern of the buildings on land scape. Visited and video graphed the land scape by Senior Auditor. <5% of area of landscape falls under shade of buildings as Referred: IARE/GA/GAD/01.

IARE has Paver blocks joints filled with sand to maximize perviousness seen in the parking area making it pervious. Pervious paving is an effective solution for managing stormwater by reducing the rate of stormwater flow, infiltrating it into the ground for reuse, and filtering it. Pervious paving not only helps with stormwater management but also aids in reducing the heat island effect. To achieve sustainable site planning, maximizing perviousness in the paved areas of the site is crucial. It not only benefits the environment but also adds to the aesthetic appeal of the site while maintaining its functionality.

O&M manual Reference: IARE/GA/O&M/01, page 11.

The content covered is for complaints redressal .

Visited Construction site where Acadamic Block is under construction . Found the topsoil stacked separately for backfilling later. Visited and found that Rain water being recharged to rain water harvesting pits (24Nos), 1 bore well connected to rainwater harvesting pit. How ever No data / records are available .



IARE has created Rainwater harvesting pits with sand bed directly on the ground. The following actions and precautions are taken to reduce contamination of rooftop rainwater:

- Rooftop is maintained and sanitized properly to avoid contamination of rainwater.
- No trees are growing on the roof, which in turn avoids leaves and bird droppings falling on the roof.



- The tanks are sealed properly to keep out sunlight (to prevent algae growth), mosquitoes, lizards, birds, etc.
- The tanks are disinfected properly once in a year with bleaching powder.

STP Water Used for Landscaping.

Referred IARE/GA/GAD/01, R00, Page Nos.12, Data reviewed, and found that pervious area is 38.06% against the requirement of 50%.

Light Illumination levels measured on 28th using calibrated Luxmeter on 28th and found OK.

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						Da	ate: 28-02-2023		
Instr	ument Deta	ils:					-		
Name		Make	Model	Serial No	Calibration Certificat	e No	Calibration due		
Digita	l Luxmeter	Lutron	LX-1010B	5288461	TSC/22-23/17192-1 Dated: 20-02-2023		20-02-2024		
S.	Location	Descriptio	on Floo	r/Block	Required illumination (Lux) Min*	Meas (Lux	sured illumination)		
1	Corridor		Ground	Block-3)	70	309			
2	Corridor		1 st floor	Block-3)	70	311			
3	Computer	Lab	1 st floor	Block-3)	300	1680			
4	Aeronautic	al Lab	1 st floor	Block-3)	300	480			
5	Staff room		1 st floor	Block-3)	150	653			
6	Lecture roo	om	1 st floor	Block-3)	300	1382			
7	Lecture roo	om	1 st floor	Block-3)	300	853			
8	Cafeteria				100	1031			
9	Library		1 st floor (Block-2)	300	670			
10	Reading roo	om	1 st floor (Block-2)	150 to 300	520			
11	Auditorium	(Hall)	4 th floor	(Block-2)	70	538			
12	Auditorium	(Stage)	4 th floor	(Block-2)	300	408			
13	Gymnasium	1	Ground (Block-6)	150	455			
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8 ENVELOPE OPTIMIZATION

The interface between indoor and external climatic conditions is maintained by the building envelope, which has the potential to regulate the building's climatic response. It is essential that the building envelope be designed to significantly conserve energy. An effectively designed building envelope optimizes daylight, provides access to natural ventilation for fresh air, offers views to the exterior, and enables modulation of solar heat gain while also controlling or reducing noise.

IARE building being 20 years analysis of the envelop optimization, is not done. In their Guidelines IARE/GA/GAD/01 they addressed it saying that in the near further such kind of analysis will be performed and will be employed for the newly constructed buildings.

Referred IARE/GA/GAD/01, R00, cl 5, Pages 9 to 11. Bricks used for imrovement of thermal performance, as per records

vo	ume ratio etc in building t	to optimize building performance	e has been incorporated.				
lig So	at passive techniques lil	lighting factor of 2 percent.	ding orientation, surface to				
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Al	Although block-2 and 5 are directed towards north direction, the surface area of wall						
In DL	In addition, the windows provided for the ventilation are in the path of sun.						
blo	blocks.						

Figure 9-17 Building Optimization reference



Renewable E nergy , ie. Solar Power Plant integrated in the envelope. Solar Plant installed on Block 1: 96.3KW, Block 2: 64.26KW, Total number of Panels : 510. Evidence verified by physical visit.





9 MATERIALS

The selection of building materials is crucial in sustainable design due to the far-reaching chain of events involved in producing a material, including extraction, processing, and transportation. Furthermore, these activities can have negative environmental impacts on the air, soil, and water, as well as harm natural habitats and deplete natural resources, not only during building construction but also in the long run.

IARE has prepared Guidelines for Material selection in Clause Material Selection and Annexure 1 addresses selection of material based on Embodied Energy, Local Availability, Carbon Footprint etc. Which helps in selection of materials. These guidelines in IARE/GA/GAD/01 says that

- Designer and Architect have to select the materials available in the local and the material having low Embodied Energy and Carbon Footprint. They can take help of the **Table 1** given in the Annexure 1 (snapshot Shown in Fig below).
- Try to encourage using building materials out of agricultural, industrial and bio-wastes, which have an enormous scope for regeneration.
- Also try to address possible reuse/recycle of materials/ components/structure or parts thereof from old/ dismantled buildings if any. Ideally close the loop (cradle to grave) with regards to resources originally used.

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A THE POST OF A			Existing Buildings		Issue:01, Rev: 00		Contraction of the second			Existi	ng Buildin	gs –	Issue:01, Re	:v: 00	
nnexure ifferent r	1: Tab nateria	le showing Is	J CO₂ equi	valent em	issions	and Embodied	l Energy of		S.No.	Materials		Unit	EE in MJ	// Unit	
	S.No.	Materials		Units	CO ₂ En	nission/ unit	1		1	Cement		kg		3.05	
	1	Cement		kg		0.95]		2	Concrete		m ³		0.21	
	2	Concrete		m ³		0.159			3	Steel hars		kσ		32.24	
	3	Steel bars		kg		5.457			4	Granite		ka		0.105	
	4	Granite		kg		0.04				V ata atama	(Deelsine)	1		0.105	
	5	Tiles (Floor	ring)	m^2		18.33				Kota stone	(Parking)	kg		0.24	
	6	Marbles		kg		0.436			6	Marble		kg		1.53	
	7	Mosaic		kg		0.238			7	Fly ash Bri	icks	Number	[0.85	
	8	Bricks		Number		0.327			8	Glass		kg		7.88	
	9	Glass		kg		1.735			9	Aluminum		kg		141.55	
	-								-			1.	1		
						Figure 9)-19: Mater	rial sele	ction						

Existing building service life plan:

As detailed in IARE/GA/GAD/01 the service life of the buildings has been calculated based on ISO 15686-1 and ISO 15686-2 standards. These standards deal with service life planning and address the service life of a building or a building component. Factorial approach, known as the 'factors method', is used to determine the potential service life of a building or component,



based on knowledge about materials and building technology. The service life of structure as well as the components present in it is listed below:

	S.No	Description	Service Life (Years)	
	1	Structure	75	
	2	Bricks	150	
	3	Tiles	20	
	4	Granite	100	
	5	Wood	50	
	6	Plywood	35	
	7	HVAC	12	
	8	Electrical	25	
Hence the Life of Bui	lding w	ill be 75 Years a	nd Components life is min	imum 12 years.
Figure 9-20 Service Lif	e of Str	uctures and dif	ferent components	
J				

Construction Phase Material Storage and Handling

Till date the construction material has been deployed effectively without necessity of large storage facility. On the ongoing construction they have provided the storage facility based on the requirement. All the register data related to the materials used is maintained.



10WATER AND WASTE MANAGEMENT

With the increasing population, industrial activity and pollution, surface and groundwater resources have been overexploited and severely polluted during the past few decades. As a result, the country is faced with immense water scarcity. Significant liquid and solid waste generation is witnessed and recorded in the urban areas of the country. Sustainable approach to water and waste management requires planning and design of building functions to integrate issues of water and waste management system at the early stages of design.

To achieve Zero anthropogenic waste design solution STP was designed taking input data of waste water generated and also thumb rule as given below:

		S	STP Los	ad Per Day	
S. No.	Blocks	Types of use	Nos	Usage of water (Litres)	Approx. total usage of water (Litres)
1	Block1	Wash rooms	12	500	6,000
2	Block2	Wash rooms	4	500	2,000
3	Block3	Wash rooms	8	500	4,000
4	4	Wash rooms	2	500	1,000
4	BIOCK4	Work shop	5	200	1,000
		Wash rooms	3	500	1,500
5	Canteen	Hand wash area	5	300	1,500
6	Work shops	Hand wash	1	500	500
	-	Total litr	·es		17,500
/laximi Design	um Number o ed Capacity	of Occupants in a 30KL is sufficient	day (60	00) X Usage Factor 0	.2 X 20 Ltrs = 24,000

Figure 9-21: STP Load calculation

A comprehensive waste management SOP "Procedure for Waste Management IARE/GA/PWM/01 dated 01.10.2022, Issue 01" is developed by IARE which addresses Solid Waste Management, Liquid Waste Management, E Waste, Plastics, construction and demolition waste management etc based on a study of various functional areas for identification of different wastes that may be generated during use, their characteristics and the disposal method. They provision of appropriate containers for wastes and waste generated in campus is cleared by housekeeping staff Daily 2 times.

Different wastes generated and their handling methods as detailed in SOP are shown below:





Procedure for Waste Management IARE/GA/PWM/01 01:10:2022

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Support Staff are responsible for:

- 1. Overseeing the day to day delivery of general waste and their recycling services.
- 2. Monitoring the performance of the institute contractor against the contact agreements.
- 3. Operational monitoring of waste management systems across the campus.

Heads of Departments responsible for:

- 1. Ensuring that non-hazardous waste is disposed of through the general or waste recycling streams.
- 2. Nominating a 'responsible person' within their department to coordinate waste disposal for any hazardous or laboratory wastes.

Staff will be responsible for:

Disposing of waste responsibly through the appropriate waste disposal system (segregation of waste), in accordance with institute policy and procedures.

Students will be responsible for:

Disposing of waste responsibly, through the appropriate waste disposal system, in accordance with institute policy and procedures.

5. Procedure

Below table describes different types of waste material generated in the campus premises and their associated method of disposal as per the regulatory requirements

S. No.	Type of waste	Description of waste	Disposal Method	Responsibility
1	Solid Waste Management	Dry waste- dry leaves, paper, cardboard glass, tin cans etc. Colour Code of Bins: Blue	 a) Collected in the waste segregation centre and handed over to Dundigal municipality b) The paper waste is handed over and recycled by the vendor M/s Ramky Environ Engineers Ltd on a monthly basis. 	Supervisor Housekeeping
		Wet waste- food waste generated in canteen and various food vendors inside the campus. Colour Code of Bins: Green	A biogas plant is installed to manage food waste from the canteen and the generated gas is used in the canteen. Surplus waste is handed over to Dundigal	



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Procedure for Waste Management

IARE/GA/PWM/01 01:10:2022

S. No.	Type of waste	Description of waste	Disposal Method	Responsibility
			municipality	
		Plastic waste - PET	Generated plastic is	1
		bottles plastic cups and	corrected and made into	
		alasses	fine plastic pieces by	
		grasses	mile plastic pieces by	
			using plastic shedder	
			available in the campus.	
			It will be handed over to	
			authorized recycler.	
2	Liquid Waste	Canteen and Toilets	Through pipeline, it is	In-charge Civil
	Management		brought to Sewage	Maintanance
			treatment plant (STP).	
			where the treated water is	
			reused for flushing and	
			gardening numera in the	
			gardening purpose in the	
			campus. (Sewage	
			treatment plant capacity	
			considered as 30 KLD)	
3	E-Waste	Comprise of Electronic	Segregated and stored in a	IT MS officer
	Management	devices, ranging from large	separate shed provided in	
		household devices such as	the campus.	
		refrigerators, electric	The same is dispatched	
		motors, voltage stabilizers,	through authorized	
		air conditioners, cell	vendors M/s Ramky	
		phones, television, LED's,	Environ Engineers Ltd on	
		Computer systems and	a monthly basis.	
		other consumer electronics		
		Lab instruments eizenits		
		Lao instruments, circuits,		
		desktops, laptops, printers,		
		charging and network		
		cables, W1-fi devices,		
		cartridges, sound systems,		
		UPS, biometric machines,		
		scientific instruments, etc.		
4	Bio-medical	The BMW generated from	Handed over to sister	Dean Events
	Waste	first aid room comprise of	concern hospital i.e.,	
	Management	Syringes, discarded	Arundhati Hospitals on	
	_	medicines, drugs.	monthly basis who in turn	
		bandages, plaster casts,	handles as per their	
		material contaminated with	guidelines.	
		blood COVID-19 marks		
		continuer hottles		
	Harardone	Used oil from Conorstorr	Handed ever to the corrier	Engineer
0	Waste	and Transformers	rianded over to the service	Elignmeer
	waste	and transformers	agency OEM	Liectrical
	Management			Maintenance
	-			



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Foucht	INSTITUTE OF AERONAUTICAL ENGINEERING (Material			Procedure fo Manager	Procedure for Waste Management			01:10:2022			
ON FO	IR LIVE.							Issue:U1, Rev: UU			
S. No.	Type o	f waste	D	escript	ion of waste	Dispos	al Metho	d	Responsibility		ity
						discharged neutralizati checking pl	into on pit and H levels.				
6	Constru Waste	iction	Gene demo the b	erated d olition a uilding	uring ind erection of s includes-	Steel is sup scrap vendo Aggregates	plied to lo ors , bricks, d	eal ust	In-cha Maint	rge Civ enance	ril
			Aggr dust,	egates, etc.	steel, bricks,	are used as in the camp will be tran	a fill mate ous and sur sferred to	erial Iplus			
7	Wood V	Waste	Gene modi the c	erated d fication	uring the 1 of furniture in	Supplied to	local sch	ards pols			
6. I	Records		, a				Issue	e:01, Rev	r: 00		
6. I	Records	aintained i	n the follo	owing table	e Waste Mananement System		lssue	e:01, Rev	r: 00	Form No:	IARE/GA/PWM/11
6. I	Records	aintained i	n the follo	wing table	e Waste Management System		Issue	::01, Rev	r: 00	Form No: Date	LARE/GA/PWM01
6. I	Records	aintained i Haa	n the follo	wing tabl	e Waste Management System te handling report:	Non Hazardous	Issue Waste	e:01, Rev	r: 00	Form No: Date Month/Ye	JARE/GA/PWM01
6. I Aonthly rep Descriptio	n/ Details	aintained i Hat E-Waste (Kgs)	n the follo zardous Was Sanitary and Bio- waste (Kgs)	wing tabl	e Waste Management System te handling report Plastic Waste (Kgs)	Non Hazardous Wet Waste (Kgs)	Ussue Waste Construction waste (Kgs)	Canteens and Toilets (STP output Litres)	r: 00 Metal Scrap (Kgs)	Form No: Date Month/Ye Remarks	IARE/GA/PWM/01 ar: Report Approved / Submitted by
6. I Aonthly rep Descriptio	n/ Details	aintained i Haa E-Waste (Kgs)	n the follo zardous Was Sanitary and Bio- waste (Kgs)	wing tabl IARE (Was te Used Oil (Litres)	e Waste Management System te handling report Plastic (Kgs) Uvaste (Kgs)	Non Hazardous Wet Waste (Kgs) Boxes (Kgs)	Vaste Construction waste (Kgs)	Canteens and Toilets (STP output Litres)	r: 00 Metal Scrap (Kgs)	Form No: Date Month/Ye Remarks	IARE/GA/PWM/01 ar: Report Approved / Submitted by
6. 1 Aonthly rep Descriptio	n/ Details	Aintained i Haa E-Waste (Kgs)	n the follo zardous Was Sanitary and Bio- waste (Kgs)	wing tabl	e Waste Management System te handling report Plastic (Kgs) Dry Waste (Kgs) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Non Hazardous Wet Waste (Kgs)	Waste Construction waste (Kgs)	Canteens and Toilets (STP output Litres)	r: 00 Metal Scrap (Kgs)	Form No: Date Month/Ye Remarks	IARE/GA/PWM/01 ar: Report Approved / Submitted by
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6. 1 Aonthly rep Descriptio	n/ Details ce al Qty Panchayat ar Hospital	E-Waste (Kgs)	n the follo zardous Was Sanitary and Bio- waste (Kgs)	wing tabl	e Waste Management System te handling report Plastic (Kgs) Vaste (Kgs)	Non Hazardous Wet Waste (Kgs)	Vaste Construction waste (Kgs)	Canteens and Toilets (STP output Litres)	r: 00 Metal Scrap (Kgs)	Form No: Date Month/Ye Remarks	IARE/GA/PWM/01 ar: Report Approved / Submitted by
6. I Anothly rep Descriptio Descriptio	In Details Ce Al Qty (Panchayat r Hospital N Vendor etc.) r above item	E-Waste (Kgs)	n the follo zardous Was Sanitary and Bio- waste (Kgs)	wing tabl	e Waste Management System te handling report Plastic (Kgs) Dry Waste (Kgs)	Non Hazardous Paper Vet Waste (Kgs) Paper Soxes (Kgs)	Vaste Construction waste (Kgs)	Canteens and Toilets (STP output Litres)	r: 00	Form No: Date Month/Ye Remarks	IARE/GA/PWM01 ar: Report Approved / Submitted by
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IARE has MoU with Ramky Enviro for E Waste Management dated 24th June 2021 valid for 3 years.

IARE analysed the water consumption in their SOP for Water Management IARE/GA/WMP/01 as Per capita/ Specific consumption including recycled water as 10.08. Detailed water consumption estimates and Water Balance details are given in the said SOP as detailed below.

		INSTITUTE OF AERONAUTICA ENGINEERING	Proce	dure for V	Vater	01.10.20	022
W FOR	LIBERT		Mana	lan	Issue:01, Rev		
			Table 7: Water dis	stribution syst	em		
S. No	. Bl	ocks	Types of use	No's	Usage of water (Litres)	usage of water (Litre	es)
			Wash rooms	12	500	6,0	000
L	Blo	ock1	Cooler	5	300	1,5	00
			Floor cleaning	5	100	5	00
		l	Wash rooms	4	500	2,0	000
	Blo	ock2	coolers	0	0		0
			Floor cleaning	4	100	4	00
		ļ	Wash rooms	8	500	4,0	000
6	Blo	ock3	Coolers	5	300	1,5	00
			Floor cleaning	5	100	5	00
			Wash rooms	2	500	1,0	000
Ļ	Blo	ock4	Work shop	5	200	1,0	000
			Floor cleaning	5	100	5	00
			Wash rooms	3	500	1,5	00
;	Ca	nteen	Coolers	2	500	1,0	000
			Hand wash area	5	300	1,5	500
			Floor cleaning	1	1000	1,0	000
	We	ork shops	Hand wash	1	500	5	00
	Co	nstruction	New construction	1	6000	6,0	000
3	RC) Plant	Drinking	4	1500	6,	000
			Total litres			36,4	00
			Table 8: Wate	er Balancing			
s	8. No.	Source /	Use		Quantity Sourced	Quantity Used	
1		Pumping	Ltrs		44,000		
2	2	Recycled	from STP		16,500		
3	3	Gardenin	g			22,950	
4	ł	Utilisatio in table 7	n in blocks, canteen e	tc as detailed		36,400	
5	5	Miscl Us	es			1000	
6)	Variation				150	
	Total				60500	<mark>60500</mark>	
					· ·		
D				1 1	1 1	100	<u> </u>
Pei	capita	a/ Specifi	c consumption in	icluding rec	ycled wate	er 10.0	8 N



IARE does not have any Large centralized hot water generation.

Recycled water from STP are used for Horticulture purpose and if any shortage is there it is made up with bore water. STP sludge is taken out by GHMC

Rain water being recharged to rain water harvesting pits (24Nos), 1 bore well connected to rainwater harvesting pit. Few Photos shown in Figure 9-15. Water storage facility, RO Plant and Water consumption for gardening etc are shown below:

drinking on to this	water to staff and st water coolers are also	9) plant in the co ions enabling sa udents. This wa provided to the	fe drinking water ter is provided to staff and students	th is weath, so LARE installed supply. It provides healthy and the classrooms, laboratory, in	3. Co Two uno campus	nstruction of tanks and derground tanks with the ca as a central system and over	bunds: apacity of 60,000 L chead tanks on build	itres and 60	,000 Litres was constructed in th our bund is created as the boundar
		Table 6: RO p	lant details		for all ra	in water Harvesting pits of	the college for the p	passage and 1	percolation of rain water.
io. L	ocation Qu	antity Capa	city Litres R	un. Hrs Total			10 - 10 - S - Mi - 10 S	BH 1008 - 1008	
Get	perators room	2 750	/Ш	2000			Table 4: Water ta	nk details	14
00	Icrators room	2 750	Ŭ	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	S. No.	Type of tank	Tank capacity (Litres)	Quantity	Uses
					1	Underground Tank	60,000	2	Bore well water store
	C bernel			The Provent of the second	2	Over Head Tank	5,000	1	
1000			2	89-10	3	Over Head Tank	3,000	1	Bore well water is distribution
1000		THE REAL PROPERTY IS	-	111222	4	Over Head Tank	3,000	1	
				Table	5	Over Head Tank	3,000	1	RO water distribution
		5	FI-		6	Recycle water (STP) underground tank	35,000	1	Water distribution for garden
					7	STP underground tank	35,000	1	Waste water storage
G	RO water plan	mara Pocham ORATORY, INSTITU Ingana 500043, Ind 17.600883° 37.84.16892° 13/22 03:13 PM at with the capac	Pally, Telangan re of AERONAUTICAL a ity of 1500 Litres	e Vois Map Camero a, India e Noneereno, Dundigal,					
G	RO water plan	mara Pocham IORATORY, INSTITU 1760083° 378.16982° 13/22 03:13 PM at with the capac of recycling/ f	Pally, Telangan re of Asponautical ity of 1500 Litres	C OF S Map Camers a, India eNGINEERINO, Dundigat, Per Hour Landscaping etc			THEFT A		
T S. No.	RO water plants a trees	mara Pocham coartow, NSTTU rzoobas g 78.16892 syz2 03:13 PM at with the capac of recycling/ f and Quantity	Pally, Telangan re of AERONAUTICAL a ity of 1500 Litres resh Water for . Use of water (litre)	A, India ervoneereno, Dundigat, Per Hour Landscaping etc No. of litres using per day					
T S. No. 1	able 5: Utilization Type of plants a Landscaping	of recycling/ f nd of recycling/ f p36.410992* p322 03:13 PM t with the capac	Pally, Telangan reop Assonauticat a ity of 1500 Litres resh Water for Use of water (litre) 0.2	Per Hour Landscaping etc No. of litres using per day 9,000			THE REPORT OF THE PARTY OF THE		
T S. No. 1 2	RO water plants a shrubs	indra Pocham ioRatory, INSTITU Ingans 50043, Ind. 9 78.410892- 9 78.410892- 9 78.410892- 9 78.410892- 19 78.4108- 19 78.4108- 10 78.4108- 10 78.4108- 10 78.4108- 10 78.4108-	Pally, Telangan re of AERONAUTICAL a ity of 1500 Litres resh Water for water (litre) 0.2 0.2	A, India e.NORNEERENO, Dundigat, Per Hour Landscaping etc No. of litres using per day 9,000 5,000			gal, Telangana	a, India	
T S. No. 1 2 3	RO water plants a shrubs Badam	of recycling/1 of recycling/1 of recycling/1 ond Quantity 45,000 od 25,000 45,000 od 45,000 od 25,000 400	Pally, Telangan re of ACRONAUTICAL a ity of 1500 Litres resh Water for water (litre) 0.2 0.2 10	A, India a, India ENGINEERRINO, Dundigat, Per Hour Landscaping etc No. of litres using per day 9,000 5,000 4,000		Dundi HCX8	gal, Telangana •VW4, Dundigal	a, India , Telangan	GPS Map Came a 500043, India
1 2 3 4	RO water plants a shrubs Badam Kadamba	organ Pocham 0:RATCRY, INSTITUTION 0:RATCRY, INSTITUTION	Pally, Telangari re of AERONAUTICAL a ity of 1500 Litres: resh Water for water (litre) 0.2 0.2 10 10	A, India a, India ENGINEERENO, Dundigat, Per Hour Landscaping etc No. of litres using per day 9,000 5,000 4,000 3,000		Creemetrys	gal, Telangana VW4, Dundigal, 599578°	a, India Telangan	GPS Map Came
T S. No. 1 2 3 4 5	RO water plants a shrubs Badam Kadamba Royal farms	of recycling/ f and Quantity of recycling/ f 45,000 and Quantity 45,000 400 add 25,000 400 300 150 150	Pally, Telangan re of AERONAUTICAT a ity of 1500 Litres resh Water for water (litre) 0.2 0.2 0.2 10 10 10	A, India e.NORNEERRINO, Dundigat, E.NORNEERRINO, Dundigat, Per Hour Landscaping etc No. of litres using per day 9,000 5,000 4,000 3,000 1,500		Greenmetro's Bhagyanagar	gal, Telangana VW4, Dundigal, 599578° 8.4175°	a, India , Telangan	Bos Map Carde
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G G G G G G G G G G G G G G G G G G G	RO water plants a shrubs Badam Kadamba Royal farms Mango Guava	of recycling/ f and Quantity 45,000 400 add 25,000 add 20 20 20	Pally, Telangan re of AERONAUTICAT a ity of 1500 Litres resh Water for 0.2 0.2 0.2 10 10 10 10 10 10	e Viels Mag Camero e, India e Nonesenno, Dundigat, Per Hour Landscaping etc No. of litres using per day 9,000 5,000 4,000 3,000 1,500 200 200		Greenmetro's Bragvanagar	gal, Telangana +VW4, Dundigal, 599578° 8.4175° 22 04:12 PM	a, India Telangan	Bosoda Suda Suda Suda Suda Suda Suda Suda Su
T S. No. 1 2 3 4 5 6 7 7 8	RO water plan able 5: Utilization Type of plants a shrubs Badam Kadamba Royal farms Mango Guava Date farms	of recycling/1 and Quantity of vertex 45,000 and Quantity addition 25,000 add 25,000 add 25,000 add 25,000 add 25,000 add 25,000 add 20 5 5	Pally, Telangan re of Acronauticat a ity of 1500 Litres resh Water for 0.2 0.2 0.2 10 10 10 10 10 10 10	A, India e.NORNEERRINO, Dundigat, Per Hour Landscaping etc No. of litres using per day 9,000 5,000 4,000 3,000 1,500 200 200 50		Greenmetro's Bragvanagar Signa Signa	gal, Telangana VW4, Dundigal, 599578° 8.4175° 22 04:12 PM	a, India , Telangan	GPS Map Carne a 500043, India
T S. No. 1 2 3 4 5 6 6 7 7 8	RO water plan able 5: Utilization Type of plants a Landscaping Flower plants a shrubs Badam Kadamba Royal farms Mango Guava Date farms	of recycling/f add 25,000 add 20 5 5	Pelly, Telangan re of Acronauticat a ity of 1500 Litres resh Water for 0.2 0.2 0.2 10 10 10 10 10 10	A India A, India A		Greenmetro's Bhagyanagar Si Alago Santa S Santa Santa	gal, Telangana •VW4, Dundigal 599578° •8:4175° 22 04:12 PM	a, India , Telangan	a 500043, India

Plastic bottles Shredder, Canteen Waste Biogas Plant is there. The biogas production is carried out in anaerobic digesters known as biogas plant. Flexi biogas plant is installed in IARE for kitchen waste from SP ECO Fuel Enterprises. Also a Plastic Bottles Shredder is installed. Photos are shown below:







11 BUILDING SERVICES OPTIMIZATION

The main objective of this clause is optimization of electro-mechanical services towards achieving a sustainable building. Reduction in heating, cooling, and lighting loads through climate-responsive designs and conservation practices can enhance the energy efficiency of a building.

At IARE CFL lights replaced with LED 100%,All Ac's are now 5 star rated, Solar power is used and 35% energy reduced & and cost per KWH reduced by 35% (from 2019 to 2022) .Electrical and AC power monitoring of all blocks evidenced and calculation of power savings evidenced(. No heaters being used. Now they set the targets of energy savings by 20% by 2025 through solar power, Specific power consumption-Kwh per person/year done -from 2018 to 2022, reduced by 50%.

They Incorporated solar passive techniques like Landscaping and optimum building orientation to optimize building performance. As shown in Figure 9-6 the Daylight Factor is above 2.

They have provided number of windows, but no assessment was done to check natural versus mechanical ventilation strategy to minimise the need for artificial cooling.

Low Energy Mechanical Cooling Techniques like 5 star ACs used. In ACs Refrigerants R 22 has been replaced which is R32 and R410 Zero OD. 88% of refrigerants are R 32 and low GWP and 12% of refrigerants are R410 which has high GWP.All 2 tonnes Acs are R410.

They have not used any auto dimming switches etc for optimal use of daylight to reduce the load of the electric lighting system when natural light provides ample illuminance .

Material used in Lifts are Recyclable Like Aluminium, Steel, etc

IARE made efforts to utilize in the building, the renewable energy available in various forms like Solar Energy, Biogas etc. as detailed above. The Solar energy generated, used and wheeling to grid etc are monitored daily. Sample data is shown below

date	2022-12-01	2022-12-02	2022-12-03	2022-12-04	2022-12-05	2022-12-06	2022-12-07	2022-12-08	2022-12-09
кwн	231879.7	232149.7	232510.2	232870.2	232951.8	233234.4	233469.7	233703.5	233903.7
КУАН	239823.6	240100.1	240486.7	240862.4	240947.2	241245.2	241490.1	241735.4	241947
Solar_Energy_Consumption	496	496	459.2	325.7	404.8	503.9	328.3	300.5	364.4
Exported_to_Grid_MR	21995	21996.8	21996.8	21996.8	22022.6	22023.1	22026.7	22030.7	22031.2
record_time	2022-12-02	2022-12-02	2022-12-03	2022-12-05	2022-12-05	2022-12-06	2022-12-07	2022-12-10	2022-12-10
KWH_diff	273.7	270	360.5	360	81.6	282.6	235.3	233.8	200.2
KVAH_diff	289.6	276.5	386.6	375.7	84.8	298	244.9	245.3	211.6
power_consumption	1158.4	1106	1546.4	1502.8	339.2	1192	979.6	981.2	846.4
total_energy	1654.4	1602	2005.6	1828.5	744	1695.9	1307.9	1281.7	1210.8
power_factor	0.945	0.976	0.932	0.958	0.962	0.948	0.961	0.953	0.946
solar_enery_generator	651858	652354	652813.2	653138.9	653543.7	654047.6	654375.9	654676.4	655040.8
solar_to_grid	18.4	7.2	0	0	103.2	2	14.4	16	2
Table 3: Solar energy ge	nerated	d, used	etc		-				

They may explore Availability and use of Bio Diesel in Buses and Generators as mentioned in OFI.



12 CONSTRUCTIONAL PRACTICES

The purpose of this clause is to ensure that sustainable construction is taken into account, which entails developing a design proposal that is not only functionally efficient but also includes meticulous planning to optimize the use of materials and construction technologies throughout the building process. To facilitate this, architectural design should be detailed in advance to enable planning of materials and technologies. Furthermore, feasibility reports

should incorporate the considerations necessary for sustainable construction. It is also recommended to use digital models to develop construction methodologies, allowing for simulations of physical developments under working conditions on-site.

IARE prepared General Terms and Guidelines to Contractors IARE/GA/T&G/01 which addresses the USE locally available materials to the possible extent for minimizing the environmental impact, The material section should be in such a way that it liberates low green house gases and possess minimum embodied energies. Etc as



shown in figure. But these guidelines needs to improve to cover all aspects of Construction Practices.

No evidence if they started the physical execution of works only after the construction methodology is established, and reviewed for its reliability under the risk environment as these are 20 yrs old buildings. However SOP is made for future constructions.

Procedure for Environmental risk assessment, IARE/GA/ERA/01 is developed by IARE as shown in Figure below.

		C0 ANI (Foi	MPET D CON merly Com		CIC TINS TAN spectors	SPE VTS ate and	R CTC PV7 Consu	DRAT	ГЕ D. Р)		
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and the second		Institute	of Ae	rona	autio	cal	Eng	gine	erir	ng	
		IDENTIFIC LETION AND	ENVIRON	MENTAL	RISK AS	SESSN	IENT				
	Construction ERA	IDENTIFICATION ANL	EVALUATION	OF ENVI	IRONMEN	TAL ASP	ECTS ar	Id IMPACT	ANALY	SIS	
	Aspect	Impact	Ту ДАЛА	pe N/A/E	(A)	(B)	(C).	(D)	(E)	Score	Additional/ Proposed Controls
	Oil leakage(from machinery)	Land Contamination	IA	А	1	2	4	1	1	8	 A) Shall be rectified Immediately on detection B) Tray shall be provided while
		Depletion of Natural resources	IA	А	1	2	3	1	1	6	C) Training shall be provided to all concern
	Use of energy (while using mixer vehicle)	Energy Consumption	IA	N	3	2	3	1	1	18	A) Idle running shall be avoided B) Overall efficiency would be monitored. C) Preventive Maintenance of
	Dust Generation during excavation	Air Pollution	IA	N	2	2	4	1	1	16	machineries
N	Noise Generation	Noise disturbance	IA	N	2	2	4	1	1	16	A) Barricading & cordoning off
131		Contraction of the second second			1000	1200	1.		1	10	the area

Procedure for waste management, IARE/GA/PWM/01 and Guidelines to Architect, designer and civil contractors IARE/GA/T&G/01 and note on existing buildings- IARE/GA/GAD/01 addresses construction methodology, impact on the suitability to achieve quality, control of

wastages, safety, resource optimization, energy conservation, water use, site contamination etc

Interacted with local panchayats, provided some support to schools etc to deal with social impacts during construction stage.

Construction agencies are not performing soil monitoring, water quality monitoring, ambient air quality monitoring, noise monitoring etc with a view to having required controls.

There are no Heritage buildings in close vicinity to the campus area.



Emergency Response planning, Doc no:IRE/GA/ERP/01 addresses Disaster Risk Mitigation during Construction also.



13 COMMISSIONING, OPERATION, MAINTENANCE AND BUILDING PERFORMANCE TRACKING

The objective of implementing a structured Commissioning and handover process for building services encompasses a range of elements including but not limited to natural ventilation, renewable energy systems, metering installation, plumbing, lifts, and HVAC systems commissioning. During the Commissioning phase, it is imperative to document the energy consumption of various systems, water usage etc. These records can be used to analyse and enhance the performance of these systems to optimize their efficiency. Furthermore, Operation and Maintenance (O&M) programs are designed to improve the energy efficiency of building systems without incurring significant capital investments.

IARE has developed a system for O&M, but There was no system in 2002 for commissioning and handover. Now building stability and annual inspection of the building are being planned.

MATTUTE OF AERONAUTICAL ENOMEENNO Manual	ICE IARE/GA/08.M/01 01.10.2022 Issue:01, Rev: 00		o Operation and Maintenance Manual	IARE/GA/0&M/01 01.10.2022 Issue:01, Rev: 00	
Contents Revision History 1. Objectives 2. Maintenance Services 3. Register of Buildings 4. Safety of Buildings 5. Monitoring of Maintainance 6. ANNUAL ACTION PLAN AND RATE CONTRACT SYSTEM Annual Building Survey and Program for Repairs Annual Repairs Register of periodical repairs Major Complaints Special Repair Register of special repairs A. ADDITIONS/ALTERATIONS AND UPGRADATION General Upgradation Works Energy Efficiency Measures 9. PREVENTIVE MAINTENANCE General Periodical Checks 10. HORTICULTURE MAINTENANCE	3 4 5 5 5 5 5 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 7 7 7 7 7 7 <td< th=""><td>shallbe approved by Charge quarterly bas activities can be made 7. DAY TO DAY AND / General All works of any by "wherever any exp repairs, special repair Day to day Repairs Day to day or routine such as removing ch to faulty switches, wa These are generally : agencies. Annual Repairs The works of periodi etc. are called Annua contracts. The periodicity is tw painting. In addition, work, replacement of replacement of sw Replacement Replant and trimming/pruning of routine type, can particular period of f under day to day repa Following guidelines. The total estimated cot the prescribed limits repairs. These may laboration</td><td>the Engineer in-charge. The Plan shall be re ed on funds availability and requirements. accordingly by the Engineer in-charge. INNUAL REPAIRS we shall be approved by the competent author enditure is involved. These include day to d s, upgradation works and additions and alteratic repairs are the works which are to be attended kage of drainage pipes, manholes, restoration tering of plants, lawn mowing ,hedge cutting, s ittended by institute workers or workers engo cal nature like White washing, colour washing Repair works and these are generally under hying finishing item for a building has been la to years for white washing and colour washing in orks such as patch repair to plaster, minor re of glass panes, replacement of wiring dam itches, sockets tiles, Gap filling of 1 ng of trees, shrubs, painting of tree guards, of plants etc., which are not emergent works be collected and attended to for a group o innaical year, depending upon the exigency. S ir also. The yard stick for annual repairs cover shall be followed for planning and execution o st of maintenance of a building / structure duri the suitably increased by the approved mainter the suitably increased by the approved mainter t</td><td>viewed by the Civil In- Addition or deletion of rity " Principal - IARE lay maintenance, annual ons. d on the day to day basis of water supply, repairs sweeping of leaf fallsetc. aged by the outsourcing g, distempering, painting taken through system of id down by the Institute. ing and three years for pairs to various items of iaged due to accident, hedges/perennial beds, and are considered to be f houses at a time and Such works can be done both theabove facilities. f Annual repair works. ng a year shall be within time to time, for Annual enance cost index in the</td><td>6</td></td<>	shallbe approved by Charge quarterly bas activities can be made 7. DAY TO DAY AND / General All works of any by "wherever any exp repairs, special repair Day to day Repairs Day to day or routine such as removing ch to faulty switches, wa These are generally : agencies. Annual Repairs The works of periodi etc. are called Annua contracts. The periodicity is tw painting. In addition, work, replacement of replacement of sw Replacement Replant and trimming/pruning of routine type, can particular period of f under day to day repa Following guidelines. The total estimated cot the prescribed limits repairs. These may laboration	the Engineer in-charge. The Plan shall be re ed on funds availability and requirements. accordingly by the Engineer in-charge. INNUAL REPAIRS we shall be approved by the competent author enditure is involved. These include day to d s, upgradation works and additions and alteratic repairs are the works which are to be attended kage of drainage pipes, manholes, restoration tering of plants, lawn mowing ,hedge cutting, s ittended by institute workers or workers engo cal nature like White washing, colour washing Repair works and these are generally under hying finishing item for a building has been la to years for white washing and colour washing in orks such as patch repair to plaster, minor re of glass panes, replacement of wiring dam itches, sockets tiles, Gap filling of 1 ng of trees, shrubs, painting of tree guards, of plants etc., which are not emergent works be collected and attended to for a group o innaical year, depending upon the exigency. S ir also. The yard stick for annual repairs cover shall be followed for planning and execution o st of maintenance of a building / structure duri the suitably increased by the approved mainter the suitably increased by the approved mainter t	viewed by the Civil In- Addition or deletion of rity " Principal - IARE lay maintenance, annual ons. d on the day to day basis of water supply, repairs sweeping of leaf fallsetc. aged by the outsourcing g, distempering, painting taken through system of id down by the Institute. ing and three years for pairs to various items of iaged due to accident, hedges/perennial beds, and are considered to be f houses at a time and Such works can be done both theabove facilities. f Annual repair works. ng a year shall be within time to time, for Annual enance cost index in the	6
F	igule 9-27 Samp	ie Content from C			

There is no participation of staff from operations, maintenance, engineering, training in O&M, it is identified as OFI. Also there is no monitoring of technical and energy performance during first three to



five years of occupancy for new Buildings which is given as OFI as they can follow it in future for new buildings.

As a part of measurement and verification (M&V) process, an ongoing monitoring of the energy and water systems is based on Water and Energy bills only. Energy meters are available for Lighting and solar power only. No system to measure Energy Consumption for different applications. It was given as Minor NC and IARE has committed that Energy meters will be installed for all major electrical energy consuming devices.

For Old Building occupant survey was not conducted. Structural stability is done once in every five years. It was given as an OFI and IARE has committed that the occupant survey will be conducted for new buildings in future.



10. Annexure 1: Linkage to 31 Points in NAAC's Self-Assessment Criteria as detailed below:

Green Audit covers these points

Metric	NAAC Requirement Metric	Weightage	Where addressed in NBC 11
No.			
Environ	nental Consciousness and Sustainability		
7.1.2 QnM	 Ine Institution has facilities for alternate sources of energy and energy conservation measures 1. Solar energy 2. Biogas plant 3. Wheeling to the Grid 	6	8.3 Renewable Energy Integration in Envelop 8.3.1 Integration of Solar Thermal Technologies 11.4 Passive Heating Techniques 11.10.1 Daylighting and Controls 11.16 Renewable Energy
	 4. Sensor-based energy conservation 5. Use of LED bulbs/ power efficient equipment 6. Wind mill or any other clean green energy Options: A. Any 4 or more of the above B. Any 3 of the above C. Any 2 of the above D. Any 1of the above E. None of the above 		Solar Energy Wind Energy Bio-fuels Waste heat utilization
Geo-tagg Bills for Permiss Apart fro Provide I	jed photographs of the facilities. the purchase of equipment's for the facilities created under this metric. sion document for connecting to the grid from the Government/ Electricity authority om the above: .inks for any other relevant document to support the claim (if any)		Refer Third party Audit Report by NABCB Approved Inspection Body CICPL page Nos



Metric No.	NAAC Requirement Metric	Weightage	Where addressed in NBC 11
Environ	mental Consciousness and Sustainability		
7.1.3 QIM	Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste (within 500 words) Solid waste management Liquid waste management Biomedical waste management e-Waste management Waste recycling system Hazardous chemicals and radioactive waste management Provide web link to Relevant documents like agreements/MoUs with Government and other approved agencies Geo-tagged photographs of the facilities Any other relevant information	6	 10 WATER AND WASTE MANAGEMENT 10.6 Planning and Design of Solid Waste Management System 10.6.1 Documentation of Nature of Waste and Quantification 10.6.5 Provisions for Waste(s) Requiring Special Management Biomedical waste e- Waste Management of radioactive waste 10.1.2 Liquid Waste Management 3.7 Integrated Water Management water conserving fixtures, landscaping, rainwater harvesting, aquifer recharging and waste water recycling
7.1.4 QnM	 Water conservation facilities available in the Institution: Rain water harvesting Borewell /Open well recharge Construction of tanks and bunds Waste water recycling Maintenance of water bodies and distribution system in the campus Options: Any 4 or more of the above Any 3 of the above Any 2 of the above Any 1 of the above None of the above 	5	 3.7 Integrated Water Management water conserving fixtures, landscaping, rainwater harvesting, aquifer recharging and waste water recycling 7.2 Rainwater Harvesting 7.3.2 Water Conservation and Irrigation Practices 10.0 zero anthropogenic waste design solution 10.2.1 Planning and Design of Water Supply System 10.2.4 Strategies for Water Efficiency 10.2.5 Strategies for Water Conservation 10.3 Planning and Design of Waste Water System



Metric	NAAC Requirement Metric	Weightage	Where addressed in NBC 11
NO.			
Environ	mental Consciousness and Sustainability		
	Upload the specific document as per description given below		
	I Geo-tagged photographs of the facilities.		
	Bills for the purchase of equipment's for the facilities created under this metric.		
	I Green audit reports on water conservation by recognised bodies		
Apart fr	om the above:		
Provide	Links for any other relevant document to support the claim (if any)		
7.1.5	Green campus initiatives include	4	7 EXTERNAL DEVELOPMENT AND LANDSCAPE
QIM	Describer the Green campus initiative of the institution including Restricted entry of automobiles,		7.4.3 Landscape planning and design
	Use of Bicycles/ Battery powered vehicles , Pedestrian Friendly pathways , Ban on use of Plastic,		7.4.3 Bicycle Lanes and Pedestrian Access
	landscaping with trees and plants etc in 500 words		9.2.1.6 Plastics
	Upload the specific document as per description given below		Use of plastics should be limited as far as possible or
	Policy document on the green campus/plastic free campus.		preference given to plastic products made with recycled
	Geo-tagged photographs/videos of the facilities.		content or renewable resources
	© Circulars and report of activities for the implementation of the initiatives document		11.2 Concept Development
			 solar passive techniques like Landscaping
	Apart from the above:		•
	Provide Links for any other relevant document to support the claim (if any)		



Metric	NAAC Requirement Metric	Weightage	Where addressed in NBC 11
Environ	International Consciousness and Sustainability		
7.1.6 QnM	Quality audits on environment and energy are regularly undertaken by the institution 7.1.6.1.The institutional environment and energy initiatives are confirmed through the following 1. Green audit / Environmental audit 2. Energy audit 3.Clean and green campus recognitions/awards 4. Beyond the campus environmental promotion and sustainability activities Options: A. All of the above B. Any 3 of the above C. Any 2 of the above D. Any 1of the above E. None of the above Institutional data in the prescribed format (data template) Policy document on environment and energy usage Certificate from the auditing agency. Certificates of the awards received from recognized agency (if any). Report on environmental promotion and sustainability activities conducted beyond the campus with geo-tagged photographs with	5	Total Green Audit addresses this 3 APPROACH TO SUSTAINABILITY: Sustainability 4 APPLICABILITY OF THIS PART : Sustainability 5 IMPLEMENTATION OF THIS PART: Sustainability 6 SITING, FORM AND DESIGN : Environmental 7 EXTERNAL DEVELOPMENT AND LANDSCAPE: Environmental 8 ENVELOPE OPTIMIZATION : Environmental 9 MATERIALS : Sustainability 10 WATER AND WASTE MANAGEMENT: Environmental 11 BUILDING SERVICES OPTIMIZATION : Energy Efficiency 12 CONSTRUCTIONAL PRACTICES : Sustainability 13 COMMISSIONING, OPERATION, MAINTENANCE AND BUILDING PERFORMANCE TRACKING: Energy Efficiency
caption a	and date. audit/environmental audit report from recognized bodies	1	Refer Third party Audit Report by NABCB Approved Inspection Body CICPL Audit Report
Apart fro Provide	om the above: Links for any other relevant document to support the claim (if any)		



Metric	NAAC Requirement Metric	Weightage	Where addressed in NBC 11
No.			
Environ	mental Consciousness and Sustainability		
7.1.7	The Institution has Differently-abled (Divyangjan) friendly, barrier free environment	5	
QIM	Write description covering the various components of barrier free environment in your		3.2 Elements of Sustainability
	institution in maximum of 500 words		
	I Ramps/lifts for easy access to classrooms		c) needs of persons with disabilities and of different age
	Divyangjan friendly washrooms		groups,
	I Signage including tactile path, lights, display boards and signposts		7.5.2 External Signage Design
	I Assistive technology and facilities for Divyangjan accessible website, screen-reading software,		1.3.2 External Signage Design
	mechanized equipment		
	I Provision for enquiry and information: Human assistance, reader, scribe, soft copies of reading		
	material, screen reading		
	File Description		
	Provide the link for additional information		
	Upload any additional information		



11. Annexure 2: NCR Form with Corrective action and Follow up comments

COMPETENT INSPECTORATE	Green Audit Summary with NCRs and Action Plan	CIC/GA/NCR/01 31:01:2023
(Formarily Competent Inspectrum) and Consultatio LLPs Deviation/Consumm() without		Issue 01, Rev: 00

Action Plan FOR Non-Conformities

S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Dept./ Site	Describe observations, documented information, Records, etc If required attach as Annexure	(Complia nt/ Maj NC/ Minor NC/ OFI)	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility	Timef rame	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No')
vvr	te the root Gause of No	inconformity under column 5 : A	OR D (Defic	ient resources) OR E (Defici	ent inputs/ser	vices)	erstanding, commitme	INDER C (La	ack of syst	em implementation)
1	7 EXTERNAL DEVELOPMENT AND LANDSCAPE 7.1.1 Landscape planning and design	Do they have the landscape planning and design ?	Civil Dept	Entire landscape area Shown in IARE/GA/GAD/01, Page No.5, Fig 1 . There is no separate landscape Planning and design Document.	Major NC		Satellite image through GoogleEarth is attached. Detailed landscape plan is in preparation stage and will be submitted within a month			Downgraded to Minor NC
2	7.1.2.3 Post- occupancy maintenance	A site maintenance plan for Landscape is developed or not?	Civil Dept / Admin	Veried O&M manual Reference: IARE/GA/O&M/01, page 11. The content covered is for complaints redressal only. Refer clause 7.1.2.2 of NBC Part 11. The post occupancy maintenance plan should address issues such as plant maintenance, integrated pest management, fertilizer use, rainwater harvesting, reducing freshwater	Major NC		The O&M manual is updated by addressing the post occupancy maintenance of Horticulture/ Landscape in Clause 10 as HORTICULTURE MAINTENANCE Revised O&M Plan attached			NC Closed



COMPETENT INSPECTORATE AND CONSULTANTS PVT LTD (Torney Considered Resolution and Consultates LLP) (Converted Consultation and Consultates LLP) (Converted Consultation and Consu Green Audit Summary with NCRs and Action Plan CIC/GA/NCR/01 31:01:2023

S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Dept./ Site	Describe observations, documented information, Records, etc If required attach as Annexure	(Complia nt/ Maj NC/ Minor NC/ OFI)	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility	Timef rame	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No')
* Wri	te the 'root Cause' of No	onconformity under column 5: A(Deficient pro OR D (Defic	cedures/instructions) OR B (L ient resources) OR E (Defici	ack of awarer. ent inputs/ser	ness, unde vices)	erstanding, commitme	ent) OR C(La	ack of syst	tem implementation)
				consumption, site safety, and irrigation allotment and schedule.						
3	7.3.1 Design and Post Occupancy Maintenance of Water Features	Does the site maintenance plan include appropriate maintenance activities for the water features taking care of the considerations as per cl 7.3.1 of NBC Part 11?	Civil Dept / Civil Maintenan ce	Not addressed in the maintenance manual IARE/GA/O&M/01.	Major NC		Addressed in Clause 9 as PREVENTIVE MAINTENANCE in revised O&M Manual. Attached O&M Manual			NC Closed
4	3.7 Integrated Water Management	What is per capita water consumption in last 3 Years?	Admin	No data for past 3 years. No monitoring of Per Capita water consumption is practiced	Minor NC		Approximate Estimate given after Table8 of Revised IARE/GA/WMP/01 is 10.08 Ltrs/ Person/ Day Attached Revised SOP It will be regularly monitored as KPI			Downgraded to OFI
5	3.7 Integrated Water Management	Is there any Integrated and sustainable water management focusing on least anthropogenic water discharge from human activities ?	Admin	STP constructed in 2018 for taking care of 4500 Occupants. Now around 6000 Occupants.	Minor NC		STP Input data given on separate sheet and Capacity is sufficient			NC Closed





 5.N b	Reference : Clause No of NBC Part 12 e the 'root Cause' of No	Requirement / Audit Check Point nconformity under column 5: A(Dept./ Site	Describe observations, documented information, Records, etc If required attach as Annexure edures/instructions) OR B (L	(Complia nt/ Maj NC/ Minor NC/ OFI) ack of awarer	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility nt) OR C (La	Timef rame ack of syst	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No') em implementation)
			OR D (Defic	ient resources) OR E (Defici	ent inputs/ser	vices)		1	1	
6	6.2.8 Optimal Daylighting	at least 25 percent of the regularly occupied areas of the building achieve sufficient day lighting with a minimum day lighting factor of 2 percent.	Civil	Total Windows area was measured by Civil Expert and found that only 13.25 % is open area Day Light Factor is only 1.5 Annexure 10	Minor NC		Reverified data and method of calculations and found that it is 4.784%. Hence meeting the norms. Revised Calculations sheet attached.			NC Closed
7	7.5 External Lighting Design	Is the External lighting, Signage in compliance to the requirements specified in cl 7.5 of NBC part 11? Verify the data / records and comment.	Electrical Maintenan ce	To verify the data	Minor NC		Measurements done with calibrated Luxmeter and the Illumination Levels are meeting the National Lighting Code standards. Sheet attached.			NC Closed
8	8.2 Envelope Optimization Methods for Energy Efficiency	8.2 what are the Envelop Optimization methods deployed for energy Efficiency? Verify records for objective evidence.	Civil Dept	Not deployed	Minor NC		We perform optimization for energy efficiency through ECBC compliance check. We will			NC Open



Green Audit Summary with NCRs and Action Plan CIC/GA/NCR/01 31:01:2023

S.N o	Reference : Clause No of NBC Part 12 e the 'root Cause' of No	Requirement / Audit Check Point nconformity under column 5 : A (Dept./ Site	Describe observations, documented information, Records, etc If required attach as Annexure ædures/instructions) OR B (I	(Complia nt/ Maj NC/ Minor NC/ OFI) .ack of awarer	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility ent) OR C (La	Timef rame	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No') tem implementation)
			OR D (Defic	ient resources) OR E (Defici	ent inputs/ser	vices)	5.	<i>·</i> · ·		
							finish the same			
9	9.2 Materials and Recommended Sustainable Alternatives	9.2 Is there evidence for use of different structural and surface finishing materials and with alternatives for helping in sustainable construction ? Verify records and comment.	Civil	Annexure 1 does not cover	Minor NC		We will initiate the same for buildings under construction.			NC Open
10	9.3 Construction Phase Material Storage and Handling	9.3 Does the facility have proper material handling and storage to provide a continuous flow of materials and components and ensure that materials are available when needed and to avoid wastage? . For storage and withdrawal of construction materials from storage places, does the facility follow first in first out policy? Verify the records and comment. Is the facility taking care in storing moisture sensitive construction phase materials? (Cement, Gypsum, Steel. Ply wood etc)	Civil	Not monitored	Minor NC		Till date the material has been deployed effectively without necessity of large storage facility. On the ongoing construction we are upto provide the storage facility based on the requirement. All the register data related to the materials used are available.			Downgraded to OFI
11	10 WATER AND WASTE MANAGEMENT	Have you considered zero anthropogenic waste design solution?	Admin	STP constructed in 2018 for taking care of 4500 Occupants. Now around 6000 Occupants.	Minor NC		STP Input data given on separate sheet and Capacity is			NC Closed



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S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Dept./ Site	Describe observations, documented information, Records, etc If required attach as Annexure	(Complia nt/ Maj NC/ Minor NC/ OFI)	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility	Timef rame	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No')
vviii	OR D (Deficient resources) OR E (Deficient inputs/services)									
							sufficient			
12	10.2.1 Planning and Design of Water Supply System	Do they have an overall water balance chart indicating all supply side resources, infusion of recycled water, and the actual consumption for potable and non- potable and other purposes	Admin	Procedure for Water Management IARE/GA/WMP/01 dated 01.10.2022, Issue 01 is not addressing water balance	Minor NC		Water Balance given in Table8 of Revised IARE/GA/WMP/01 Attached Revised SOP			NC Closed
13	11.2 Concept Development	In addition to achieving the optimum energy performance, the building should also provide the desirable thermal and visual comfort to its occupants. Have they Incorporated solar passive techniques like Landscaping, optimum building orientation, surface to volume ratio etc in building to optimize building performance	Electrical	Day lighting Factor Calculation done for Block 1 only.No of windows, area of windows considered while calculating. Day light factor for Block 1 is 1,325.	Minor NC		Reverified data and method of calculations and found that it is 4.784%. Hence meeting the norms. Revised Calculations sheet attached.			NC Closed
14	12.4 Planning, Monitoring and Control of Environmental Descriptors	Depending on the nature of project, construction agencies are performing soil monitoring, water quality monitoring, ambient air quality monitoring, noise monitoring, tree counting and traffic survey, with a view to having required controls thereon or not?	civil	not done	Minor NC		Air quality and noise monitoring stations will be installed. The same will be done within 6 months.			NC Open



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S.N o	Reference : Clause No of NBC Part 12 te the 'root Cause' of No	Requirement / Audit Check Point nconformity under column 5: A(Dept./ Site Deficient prod	Describe observations, documented information, Records, etc If required attach as Annexure ædures/instructions) OR B (L	(Complia nt/ Maj NC/ Minor NC/ OFI) ack of awarer	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility nt) OR C (La	Timef rame	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No') tem implementation)
	1		OR D (Defic	ient resources) OR E (Defici	ent inputs/ser	vices)	I	1	1	
15	13.4 Building Performance Tracking (Measurement and Verification)	Are there Energy metering provided for the following applications: • Lighting (interior and exterior); • Air conditioning (heating/cooling); • Hot water systems; • Renewable energy systems; • Energy meters for pumping of municipal water, grey water and irrigation water; and • Miscellaneous equipment such as elevators, computers escalators, etc.	Electrical	Energy meters are available for Lighting and solar power only. No system to measure Energy Consumption for different applications	Minor NC		Energy meters will be installed for all major electrical energy consuming devices.			NC Open
16	7.4 External Access design 7.4.1 Reduced Environmental Impacts from Parking Facilities	 More than 50 percent of the total paved area shall have pervious paving/open grid pavement/grass pavers, or A minimum 50 percent of the total paved area (including parking) shall have shading by vegetated roof/pergola with planters, or A minimum 50 percent of the total impervious paving area (including parking) shall be topped with finish having solar 	Civil Dept / Civil Maintenan ce	Referred IARE/GA/GAD/01, R00, Page Nos.12, Data reviewed, and found that pervious area is 38.06% against the requirement of 50%.	NC Minor		Some portion of the existing paved area will be converted into pervious area with interlocking tiles to meet the requirement within 6 months.			NC Open



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S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Dept./ Site	Describe observations, documented information, Records, etc If required attach as Annexure	(Complia nt/ Maj NC/ Minor NC/ OFI)	Root Cause * A/B/C/ D/E	Action Planned	Responsi bility	Timef rame	Follow up on 14 th March 2023: Is concerned Action completed and effective? (Write 'Yes' or 'No')
* Writ	Write the 'root Cause' of Nonconformity under column 5 : A (Deficient procedures/instructions) OR B (Lack of awareness, understanding, commitment) OR C (Lack of system implementation) OR D (Deficient resources) OR E (Deficient inputs/services)									
		reflectance of 0.5 or higher.								
17	7.2 Rainwater Harvesting	What are the approaches deployed at the facilities ?(Storing Rain water for direct use, and Recharging ground water aquifers). Review of Data /Records of Rain water harvesting.	Civil Dept / Civil Maintenan ce	Visited and found that Rain water being recharged to rain water harvesting pits (24Nos), 1 bore well connected to rainwater harvesting pit. How ever No data / records are available.	NC-Minor		Rainfall data and rain harvesting data will be captured in forthcoming rainy season onwards			NC Open

Action Plan FOR Non-Conformities and OFIs

S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Opportunity for Improvement	Action Planned	Responsi bility	Timef rame	Follow up Is concerned Action completed and effective? (Write 'Yes' or 'No')
1	3.3Life Cycle Sustenance	Do you have a system of planning from concept, design, construction, commissioning, operation and maintenance, and also decommissioning and disposal at the end of useful life of structure?	All the Initiatives of Green Campus Policy to have Measurements / KPIs to assess/ monitor performance.	KPI's identified . Regular data will be captured and monitored from financial year 2023- 24 onwards.			OFI Closed
2	3.7 Integrated Water Management	Do you have any water conserving fixtures, landscaping, rainwater harvesting, aquifer recharging and waste water recycling ?	Use of water conserving fixtures in Toilets, wash Rooms etc to be used	Will be done in Phased manner in next 6 months			OFI Open



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S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Opportunity for Improvement	Action Planned	Responsi bility	Timef rame	Follow up Is concerned Action completed and effective? (Write 'Yes' or 'No')
3	7.3.2 Water Conservation and Irrigation Practices	Have they planned for Reuse of gray-water, captured rainwater and/or condensate water for irrigation?	Explore use of Condensate Water, Captured Rainwater	Will be studied during next rainy season.			OFI Open
4	10.2.4Strategiesfor Water Efficiency	What are different strategies for water efficiency like Use of low flow fixtures Do they have approach to recycled water use with dual piping systems and waste water reuse systems.	Use of water conserving fixtures in Toilets, wash Rooms etc to be used	Will be done in Phased manner in next 6 months			OFI Open
5	10.6.5 Provisions for Waste(s) Requiring Special Management	What is your system for Management of inflammable and combustible wastes?	Segregation and Storage to be improved	It will be implemented within 3 months and regular maintenance will be taken care by Housekeeping department			OFI Open
6	11.3 Natural and Mechanical Ventilation Strategies	Have they done a thorough assessment of natural versus mechanical ventilation strategy to minimise the need for artificial cooling	Assess the level of Natural Cooling, Improve to optimum possible level by modifying windows.	It will be studied in next 6 months and improvements will be planned.			OFI Open
7	11.10 Lighting	Have they tried to design lighting to focus on providing high quality visual environment with an emphasis on energy efficiency?(by passive day lighting techniques)	Assess the level of Natural Lighting and Improve to optimum possible level by modifying windows.	Reverified data and method of calculations and found that it is 4.784%. Hence meeting the norms. Revised Calculations sheet attached.			OFI Closed
8	11.16 Renewable Energy	d) Bio-fuels — The term bio-diesel or bio-fuels is usually referred to liquid fuels that are not obtained from fossil based sources of energy such as crude oil, but are obtained from plant species.	Explore Availability and use of Bio Diesel in Buses and Generators	Will be reviewed with diesel suppliers and norms will be implemented within 6 months.			OFI Open
9	11.16 Renewable Energy	DG sets may use a blend of bio-diesel and diesel or may even operate on 100 percent bio-diesel.	Explore Availability and use of Bio Diesel in Buses and Generators	Will be reviewed with diesel suppliers and norms will be implemented within 6 months			OFI Open
10	12 CONSTRUCTIONAL	Does the framework for sustainable construction practices included the following issues:	Improve Contractor Guidelines to cover all aspects of Construction	Contractor Guidelines has been improved in compliance with			Not satisfactory. To be improved



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S.N o	Reference : Clause No of NBC Part 12	Requirement / Audit Check Point	Opportunity for Improvement	Action Planned	Responsi bility	Timef rame	Follow up Is concerned Action completed and effective? (Write 'Yes' or 'No')
	PRACTICES	 a) Pre-construction pre-requisites; b) Planning for sustainable construction; c) Preparation of sustainable construction management plan; d) Planning, monitoring and control of environmental descriptors; e) Sustainable work execution procedures; f) Effective use of water; g) Construction waste management ; h) Post-construction closeout; j) Construction methodology for heritage buildings; and k) Alternative use, de-construction, dismantling, demolition. 	Practices	sustainability. Refer::IARE/GA/T&GD/01			
11	13.3 Operation and Maintenance	Is there any participation of staff from operations, maintenance, engineering, training and administration in O&M?.	Involve O&M Staff in Operation and Maintenance planning	It will be practiced from next financial year after training of staff.			OFI Open
12	13.4 Building Performance Tracking (Measurement and Verification)	Have they performed a) Monitoring of technical and energy performance during first three to five years of occupancy Is there a system for regular monitoring of the performance which will provide information on whether the set environmental performance and targets have been met or not?	Monitoring of technical and energy performance during first three to five years of occupancy for new Buildings	Will be implemented for all new building under construction. One building which is less than 5 years monitoring will be done from next month.			OFI Open
13	13.4 Building Performance Tracking (Measurement and Verification)	As part of the measurement and verification (M&V) process, an ongoing monitoring of the energy and water systems is carried out or not?	Specific Water Consumption to be monitored	Suitable no of water meters will be installed and specific water consumption will be monitored with in 6 months.			OFI Open
14	13.4 Building Performance Tracking (Measurement and Verification)	Have you Conducted an occupant survey annually for the first three years of the building?	For new buildings Occupant Survey can be conducted	It will be done for new buildings			OFI Open



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	Performance Tracking (Measurement and Verification)	(M&V) process, an ongoing monitoring of the energy and water systems is carried out or not?	be monitored	installed and specific water consumption will be monitored with in 6 months	
14	13.4 Building Performance Tracking (Measurement and Verification)	Have you Conducted an occupant survey annually for the first three years of the building?	For new buildings Occupant Survey can be conducted	It will be done for now buildings	OFI Open
15	13.4 Building Performance Tracking (Measurement and Verification)	Are you using any energy management and control system (EMCS) for tracking the performance of the energy consumed by the different building systems?	Energy Consumption for different applications by having Sub- meters	Suitable no of sub meters will be installed for monitoring with in 6 months	OFI Open
16	13.5 Operator Skills and Training	Are you providing any training for Increasing the skill level of operators and maintenance personnel;	Training to all Housekeeping Staff and Electrical staff may be arranged	Training will be organised for concerned staff within 3 months	OFI Open

