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The Director, National Institute of Technology, Srinagar

No: MD/SECY(T)/Rtd./NIT/14

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Sub: Suggestions regarding Energy Efficient Measures to be considered during the construction of Mega Boys Hostel at NIT Campus at Hazratbal, Srinagar

Sir,

At the outset I would like to convey my thanks to the top management of NIT Srinagar for organizing Global Alumni Meet on 11<sup>th</sup> and 12<sup>th</sup> October, 2024. I also convey my sincere thanks for providing me an opportunity on 11<sup>th</sup> June, 2024 to deliver a lecture on need to develop Grid Interactive Solar Roof Top systems and Energy Efficient Building Design in J&K. It will be a major step towards development of green technologies and to conserve energy, which will eventually be a step towards preventing global warming. The lecture was delivered in the L-7 lecture hall under "Back to College" event.

I observed that a huge building namely, "Mega Boys Hostel" is under construction within the campus of the building and you are investing heavily under certain energy efficient measures like AAC Blocks, UPVC windows, wall cavities etc. However, I have certain suggestions which may kindly be considered if found feasible by your architects at this advanced stage of construction:

- 1. The roof of the building is yet to be constructed. It is suggested that it may be of **simple design** with optimum tilt angle so as to make it feasible for an installation of Solar Roof Top system. The gables on the roof may be avoided except for water storage tanks and heat pumps. The tilt angle may be decided carefully. Generally optimum angle lies between 28 degrees and 30 degrees for J&K. However exact tilt angle for college location may be decided in consultation with concerned faculty.
- 2. The roof may be oriented preferably in Southern Direction. The roofs oriented in this direction receive maximum solar irradiation round the year, followed by

Western and Eastern direction. However, roofs in Northern Direction receive minimum solar irradiation, so the solar roof tops on such roofs are not feasible. "By looking at the building layout, I observed that building length majorly runs from North to South so East & West facing roof will be the priority choice of architects probably. In this case also Solar roof top system can be designed for optimum generation.

- 3. Sufficient space may be provided on the roof for installation of Solar Water Heaters to meet the hot water requirement of the hostel. The water storage tanks may be installed in such a manner so as to provide sufficient gravity head to the Solar Water Heaters to be installed on roof. "Here again concerned faculty should be consulted to plan for simultaneous installation of Solar roof top system and solar geyser in the available space in order to avoid interference of one system with another for e.g. shadow effect etc.
- 4. To meet the additional hot water requirement during cloudy days especially during winter or on over consumption, Heat Pumps may be provided as a back up to solar geysers. The electrical geysers being highly energy inefficient, as compared to solar geysers and heat pumps, may be totally avoided.
- 5. The use of UPVC doors and windows is appreciated. However it may be ensured that all windows are double glazed and Argon filled type, otherwise these windows will behave like ordinary wooden single glazed windows causing huge heat loss during winter and huge heat gain during summer. Pertinent to mention that developed world uses triple glazed Argon filled windows to meet the stringent Passive House Energy Efficient design. The Double Glazed Argon Filled Windows are being manufactured locally in J&K as well and residential customers in J&K use Double Glazed Argon filled windows only. The thermal transmittance of a double glazed window is 5.8W/m<sup>2</sup>K as compared to 1.10 W/m<sup>2</sup>K for Argon Filled Double Glazed window. So single glazed window is 5 times more heat conducting as compared to single glazed window. With little additional investment on second glass, the returns will be huge by conservation of valuable energy and it will provide much needed thermal comfort to students during winters as well as during summers.
- 6. Since AAC blocks have been used for energy efficiency and light weight, it is not clear whether thermal bridges through RCC beams, columns and slabs have been avoided. In case these bridges are there, the insulation provided by AAC blocks will not be effective so thermal breaks may be provided by Insulation. "The U-Value of AAC Blocks is 0.184 W/mK against 1.58 W/mK for RCC. RCC is therefore 8 times more conducting than ACC Blocks. In case Beams, Columns and Slabs come in contact with exterior as well as interiors of the building, heat conduct/loss will take place through high conductivity RCC structures bypassing the AAC blocks". Best practices in this regard being implemented at AIIMS Awantipora may be followed and concerned faculty be consulted as well for further details and clarifications.

- 7. It is mandatory that the Energy Conservation Building Code-2017 (ECBC-2017) is followed strictly for thermal comfort of students and for energy conservation which prescribes maximum U-Values for various components of building envelope, maximum energy consumed per unit floor area, window to floor area ratio, the efficiency of electrical gadgets, illumination levels etc in various building areas.
- 8. The climatic condition of Kashmir being very cold during winter, it may be ensured that future buildings are oriented towards South and the windows on Southern side are kept very large to ensure maximum solar gain during winter. Under passive house design the South side window area is kept around 17% of the liveable floor area. However concerned NIT faculty may determine best window to floor area ratio for optimum solar gain during winters. The buildings may be constructed on the three principles to ensure optimum passive solar heating during winter; (i) To collect maximum solar irradiation through large South size windows during winter (ii) To trap this solar heat energy in thermal mass.
- **9.** It is also suggested to develop solar roof top on a large scale. The campus may be having potential of around 4 MW generation, which if harnessed can produce solar energy worth Rs. 28/- lac monthly.
- 10. Government of India, Ministry of Environment (MoEF & CC) has launched the National Clean Air Programme (NCAP) in January 2019 for prevention, control and abatement of air pollution levels in the Country at an urban and regional level. DG Sets are a major source of pollution contributing upto 18% of total air pollution (already operational DG Sets). To counter this, the National Clean Air Programme (NCAP) document provides following options: (a) Use of Retrofitted Emission Control Equipment / Devices (RECD) having a minimum specified Particulate Matter (PM) capturing efficiency of 70%, type approved by one of the five Central Pollution Control Board (CPCB) recognized labs. (b) Shifting to gasbased generators by employing new gas-based generators or retrofitting existing DG Sets for partial gas usage. Since DG sets are being used as a back up supply in case of grid failure and may be used for new building as well, these measures may be taken to ensure clean environment in the campus.
- 11. The senior students of all branches may be involved in the study and witnessing of implementation of energy conservation measures being taken at construction site of Mega Boys Hostel in the NIT campus.
- 12. The study of Energy Conservation Building Code 2017 and Eco Niwas Samhita-2018, i.e. Energy Conservation Building Code for residential buildings may be included in the syllabus of all engineering branches.
- 13. Guest Lecturers from industry be encouraged particularly for outgoing students in order to impart skill based/value addition courses before diving into the main industry.

14. NIT, Srinagar being the first prestigious engineering institute of J&K, may play a crucial torch bearer role in promoting Solar Roof Top and Energy Efficient Buildings in J&K.

With best regards.

Yours faithfully,

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Copy to the:

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