

RETROFIT DESIGN OF ENERGY EFFICIENT BUILDINGS USING LIFE CYCLE ASSESSMENT CASE STUDY ON RESEARCH INSTITUTE BUILDING

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Key Words: Life cycle assessment, Research institute building, Retrofit options, Space occupation regime.

Energy use in educational buildings constitutes a major proportion of the energy consumption and anthropogenic emissions. Such buildings account for 34% of total energy consumption in the Iran. To find the most beneficial retrofits in the educational buildings to satisfy energy demands increasing in recent years and decreasing the heavy environmental impacts, in this paper the multi-story educational building “Sharif Energy Research Institute” located in Tehran is chosen as a case study to assess its thermal loads in the first step and life cycle assessment in the second step.

The Sharif Energy Research Institute building’s base load is calculated based on weather data which is published by METOTEST. The heating and cooling demands are 160.7 and 360.8 MWH, respectively. In this paper, three scenarios are evaluated and compared by considering life cycle assessment. The first scenario considers the retrofit strategies which affect the building demand like space occupation regime managements, shading effects, and infiltration rates. The other scenarios consider the retrofit options of the supply building energy system to meet the energy demand, like elevating efficiency of equipment and also operational scheduling and planning of the HVAC systems and utilizing renewable energy for supplying part of building energy with regards to the working time of the building. Utilizing LCA for these scenarios provides better information about the impact of applied strategies through the whole supply chain of the system under study. This will facilitate the decision making process of retrofit project for the institute. It is notable to mention that all impact factor categories (global warming potential, Ozen depletion potential, nitrification potential and solid waste generation) correlate closely with primary energy demand in this work.