

Comparison of Traditional and Green Building Designs in Egypt: Energy Saving

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Abstract : This paper describes in details a commercial green building that has been designed and constructed in Marsa Matrouh, Egypt. The balance between homebuilding and the sustainable environment has been taken into consideration in the design and construction of this building. The building consists of one floor with 3 m height and 2810 m² area while the envelope area is 1400 m². The building construction fulfills the natural ventilation requirements. The glass curtain walls are about 50% of the building and the windows area is 300 m². 6 mm greenish gray tinted temper glass as outer board lite, 6 mm safety glass as inner board lite and 16 mm thick dehydrated air spaces are used in the building. Visible light with 50% transmission, 0.26 solar factor, 0.67 shading coefficient and 1.3 W/m².K thermal insulation U-value are implemented to realize the performance requirements. Optimum electrical distribution for lighting system, air conditions and other electrical loads has been carried out. Power and quantity of each type of the lighting system lamps and the energy consumption of the lighting system are investigated. The design of the air conditions system is based on summer and winter outdoor conditions. Ventilated, air conditioned spaces and fresh air rates are determined. Variable Refrigerant Flow (VRF) is the air conditioning system used in this building. The VRF outdoor units are located on the roof of the building and connected to indoor units through refrigerant piping. Indoor units are distributed in all building zones through ducts and air outlets to ensure efficient air distribution. The green building energy consumption is evaluated monthly all over one year and compared with the consumed energy in the non-green conditions using the Hourly Analysis Program (HAP) model. The comparison results show that the total energy consumed per year in the green building is about 1,103,221 kWh while the non-green energy consumption is about 1,692,057 kWh. In other words, the green building total annual energy cost is reduced from 136,581 \$ to 89,051 \$. This means that, the energy saving and consequently the money-saving of this green construction is about 35%. In addition, 13 points are awarded by applying one of the most popular worldwide green energy certification programs (Leadership in Energy and Environmental Design “LEED”) as a rating system for the green construction. It is concluded that this green building ensures sustainability, saves energy and offers an optimum energy performance with minimum cost.

Keywords : energy consumption, energy saving, green building, leadership in energy and environmental design, sustainability

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