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A Review Study on Energy Efficient Buildings

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ABSTRACT
Energy efficiency is a fundamental element in the progression towards a future low-carbon economy. Improvements in energy efficiency have played a key role in limiting global increases in energy consumption of resources and greenhouse gas emissions over the past three decades, while maintaining the quality of the energy service. As global energy demand continues to grow, actions to increase energy efficiency will be essential. To achieve this energy efficient methods are to be implied. Construction industry plays a major role in the use of large amount of energy resources and hence energy efficient buildings are been the optimal technique for energy saving against larger consumption of energy source. This article reviews about the energy efficient buildings to achieve the reduction in emission of green house gases and depletion of energy resources. This article reviews on the various research papers and case studies on energy efficient buildings as in residential, commercial as well as in business means.

Keywords
Energy efficiency, Emission of greenhouse gas.

1. INTRODUCTION
At the moment, most of the energy we use comes from fossil fuels such a soil, gas, coal and peat. Unfortunately there is a limited supply of fossil fuels in the world and we are using them up at a very fast rate. . As designers, developers, and owners we have to search for ways to minimize the operating costs and environmental impacts of buildings, while also increasing their functionality and appeal to occupants, "green" trends are becoming observable in the market place. Since traditional building practices often overlook the interrelations between a building, its components, its surroundings and its occupants. Buildings consume a lot more resources than necessary and negatively impact the environment locally and globally. Compared to conventional buildings, energy efficient buildings can achieve a customized reduction in energy consumption and create a healthy and comfortable environment for residents. Within the past few years building design and construction practices have improved, with the goal of achieving substantial reductions in energy and electricity consumption. Many buildings being completed or built today consume 30 percent to 50 percent less energy annually than most of the dwellings and structures representative of the existing building stock. Such energy saving scan often be achieved at an additional cost which is 1 percent to 3 percent greater than that of conventionally constructed building.

2. METHODS:
2.1 Insulation
Levels of insulation higher than those required in the Building Regulations are in many cases economically justified. Insulation should be well distributed around the building shell. It is better to have a good overall level of insulation than, for example, a highly insulated floor with no roof insulation. Attention should be given to the avoidance of therma bridges. These are "short circuits" across insulation, which are commonly found at lintels, jambs and sills of doors and windows, and at junctions where floors and ceilings meet external walls. They give rise to increased heat loss and possible condensation problems.

2.2 Ventilation
Adequate ventilation is essential to provide fresh air and to remove moisture, odours and pollutants. However, excessive ventilation during the heating season results in energy wastage and can also cause discomfort due to draughts. Controlled vents should be installed in every room; trickle or slot vents incorporated in window frames can ensure a reasonable amount of continuous fresh air and can be opened up or closed down to a minimum as required.

2.3 Passive Solar Features
If the house is exposed to the low-altitude winter sun, glazing should be concentrated on the south facade. Window area on the north facade should be minimized to limit heat loss. Thermal mass within south-facing rooms, e.g. masonry walls or concrete floors, can absorb and store solar energy during the day and release it gradually during the evening. The heating system should have a fast response time and good controls to maximize the usefulness of solar gains. Over heating protection in south-facing rooms in summer can be provided by overhanging eaves, blinds, natural ventilation, thermal mass or other means. In general, it is not wise to increase south-facing glazed areas too dramatically. Otherwise additional measures will be required to avoid overheating in summer and excessive heat loss at night and on overcast days in winter. Windows should have a high resistance to heat loss. 'Low emissivity' double glazing, which has a special coating to reduce heat loss, is required. Well-fitting curtains can help to retain heat at night. If a radiator is mounted below the window, the curtains should not cover it when closed, but should rest lightly on a window-board or shelf above the radiator. This arrangement will direct warm air from the radiator into the room rather than up behind the curtain. A well-designed sunspace or conservatory on

the south side of a building can reduce the heating needs of a house by acting as a buffer against heat loss and collecting solar energy on fine days.

2.4 Building Materials

The embodied energy of a product is the energy used to produce it, and includes energy used in extracting raw materials, processing and transport, e.g. Irish-grown timber will incur lower transport energy use than timber imported from overseas. The embodied energy of a house is typically over five times its annual energy consumption and therefore equates to approximately 5-10% of the total energy consumption during the life of the house.

2.5 Boilers

The heating system should be efficient, not only at full load, but also at lower loads. If looking at oil or gas boilers, we should ensure that the boiler complies with the EU boiler efficiency directive. In the case of gas boilers, we should consider condensing boilers, which cost a bit more but are highly energy-efficient. If selecting individual room heaters, we should consider room sealed, balanced flue units. Room heaters should be correctly sized for the room they are to heat and should be thermostatically controlled.

2.6 Hot Water Systems

It is generally more energy-efficient to heat water using an efficient boiler or other fuel-burning appliance than with an electric immersion heater. The hot water cylinder should be well-insulated; factory applied insulation is generally more effective and durable than a lagging jacket. As well as providing space heating, combination ‘combi’ boilers supply hot water directly to the taps, thus avoiding the losses associated with storage in a hot water cylinder.

2.7 Location/Configuration

By locating the heating and hot water systems, including pipe work, entirely within the insulated building shell, heat losses can become heat gains. Ensure good ventilation to the boiler and take account of fire regulations. Attention should be given to minimizing the lengths of pipe runs and associated heat losses.

2.8 Omatic Controls

Heating system controls should be installed to ensure that heat is provided only when and where it is needed. The Building Regulations require thermo static radiator valves that allow control of temperatures in individual rooms. Separate time and temperature control in two or more zones is necessary where floor area is greater than $100m^2$.

2.9 Open Fires

Open fires, whether of the solid fuel or gas type, are wasteful of energy, and even when they are not in use, the chimney gives rise to uncontrolled ventilation heat loss. If a fireplace must be installed, an ‘under floor draught’ air supply (a small duct or pipe installed within the floor and connecting the outside air directly to the fire place) can help to reduce the amount of warm internal air escaping through the chimney. A closed stove is preferable to an open fire in terms of controlled efficient heat.

2.10 Solar

Active solar heating systems, including a solar collector on a south-facing roof, can contribute to heating needs. A solar water heating system can provide about 60% of a family’s annual hot water requirement, with back-up heating coming from the conventional system. A solar space heating system can contribute to heating needs, particularly in spring and autumn. Though the economics of such systems may be marginal at present low fuel prices, they use a clean, sustainable energy source.

3. RESULTS

Green-labeled buildings have a higher sale value proportional to net operating income (lower cap rate) than non-certified buildings. A national 2011 study of 209 LEED buildings and 1,719 ENERGY STAR buildings found a $1 saving in energy costs associated with average increase in transaction price of $13/ft2 – a capitalization rate of about 8%

Higher Rental Rates – LEED buildings display a 15.2-17.3% premium and ENERGY STAR buildings display an 7.3-8.6% premium over similar non-rated buildings.

Higher Occupancy Rates – LEED buildings have 16-18% higher occupancy than non-rated buildings, while ENERGY STAR buildings have 10-11% higher occupancy.

Lower Utility Costs – Electricity and gas expenses in ENERGY STAR buildings are more than 13% lower compared to similar non-rated buildings.

Increased Sales Prices –LEED buildings exhibit a 10-31% premium and ENERGY STAR buildings exhibit an 6-10% premium over non-rated buildings.

Low Construction Cost Premiums – Construction costs for LEED buildings are typically equal to or only slightly greater than the costs for non-rated buildings, primarily due to the costs of certification (approximately 2%)

- Excellent Flexibility, High Compressive Strength, Good Dimension Stability, Planed surface with good bonding performance.
- Reduce crack and damage in exterior walls caused by huge temperature change, extend the usage life of the building.
- Excellent moisture resistant and protects membrane against weathering, physical abuse and damage.

4. CONCLUSIONS

An energy efficient approach influences the design and layout of a building through for instance orientation or limited window area, material use, and construction. It is commonly acknowledged that a building’s appearance mediates information about its purpose and use, and that architectural aspects can have a significant influence on user satisfaction. Therefore it should be of interest whether the premises of energy efficient building results in specific architectural expressions, and how the aesthetics of energy efficient buildings are perceived and influence user satisfaction. It is of importance to make the operation of buildings understandable to the users to increase control over work or home environment, as well as to ensure the buildings optimum performance. There is a lack of research on detailed evaluations of operation systems, and how information and training on use and operation should be given. How should energy operating panels be designed? Should there be differences according to resident groups and system operators? In what ways should information on use and operation be provided? How much information is needed, and should there be feedback on operation of energy efficient buildings over time? Buildings and their users change over time. Longitudinal studies focusing on operation and maintenance over years are significant for planning better and more usable energy efficient buildings. Future evaluations should be longitudinal, and focus on operation and maintenance overtime. User evaluation must include a detailed focus on different types of user friendly operating systems. They should include a detailed focus on different ways of providing information and training for the users and system operators in energy efficient buildings.

Validated technology components and processes are integrated into the value chain for full demonstrations, thus creating progressively new market conditions where building owners are ready to invest into an affordable built environment having lower energy demand and lower GHG emission footprints over their whole life cycle.
New technology building blocks and construction processes are validated to reinforce the above integration waves through other innovative integration processes: such integration processes must indeed become even more user centric (building users lean on "fool proof" user interfaces that prevent the misuse of buildings, while improving optimal indoor air-quality and comfort), but also construction worker centric (construction workers must work more collectively, while being able to monitor the quality of their tasks through self-inspection commitments that guarantee intermediate performances, and therefore faster commissioning of more and more complex construction projects)
Expected business benefits from sustainability adoption is represented in the below graph.

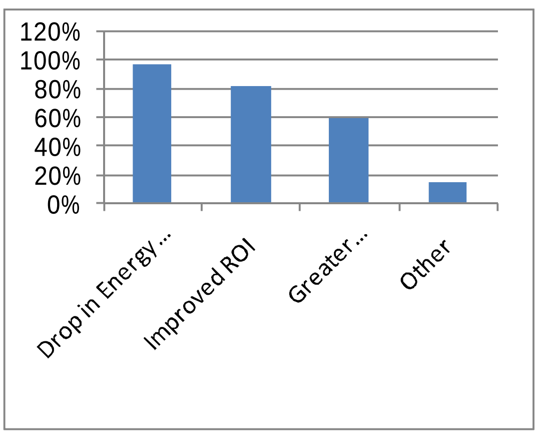

Fig 1 Business benefits from sustainability adoption.

Current Energy-Efficient Retrofit and Renovation Projects Use Internal Resources, Not Outside Funds 85% of the energy efficiency projects were fundedthrough capital budgets and company profits. Only 16% were financed from performance contracting and 6% from bank loans. Relying on capital budgets and company profits is ultimately a limiting factor for the efficiency market, and financing needs to be made more available and moreattractive to help the market grow.

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