# Free report on sustainable building

Education, Sustainability

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# Introduction

Natural resources such as fossil fuels have limited reserves on earth. These are precious sources of energy that have multifarious uses and applications. Due to this fact their demand and usage has been growing recklessly. However, fossil fuels are the greatest emitters of carbon. This has become a serious cause of concern since large amounts of carbon emissions have resulted in the unpredictable change in climate. This in turn gives rise to several environmental concerns such as pollution, global warming, rise in sea level etc. It also poses threat to the wildlife since the animals will face extreme difficulty in adapting to such fast changes in the climate and may thus get endangered or even extinct. Therefore, it has become imperative for us to adopt alternative sources of energy. It is essential to device ways to maintain the existing lifestyle without causing any further harm to the

environment. Sustainability offers solution to the problem by introducing new and innovate technologies, techniques and patterns of thinking.

## Purpose

The objective is to establish the role of engineers in designing and implementing the sustainability measures. Engineers have the ability and the necessary skills to generate and monitor the suggestive techniques for a more sustainable society. However, they face certain obstructions in their path such as out-dated system for measurement of sustainability framed by the regulatory bodies and the need to strictly comply to them, limited scope, faulty framing of the sustainability problems, contextual issues and conventional education failing to incorporate all the spheres of sustainability. It is indispensible to sort out these issues if sustainability is to be achieved. The threats posed to the sustainability of such processes that address the critical needs of the society must be identified, framed and a long-term plan must be formed to resolve them.

## Building construction for sustainability

Building construction is a necessary requirement of man, apart from being one of the important determinants of development and progress. It involves a complex network of activities and in turn exercises tremendous demands on energy usage. Therefore, it is essential to incorporate environment-friendly and resource-efficient measures. Sustainable buildings are built with a view to reduce the adverse environmental impacts while ensuring greater durability and increased life-span. The construction industry is faced with several challenges such as global warming and the changing climate forces.

One of the most effective ways of reducing energy consumption is by means improving and enhancing efficiency of the various systems within the structure. These systems may include heating, cooling, lighting etc. Every effort must be made to reduce the exploitation of natural resources at every stage of building design, implementation, construction, maintenance and use. There are several important techniques that are useful in minimizing energy usage.

## Recycling of scrap metals such as steel and aluminum

Steel is a widely used construction materials that has multifarious uses and applications in building construction. Latest innovations such as the Siemens-Martin or open hearth furnace have enabled successful and high quality recycling of the scrap metals. This was an improved technique that was developed from the Bessemer process and allowed greater control of the chemical compositions of the metal. Some of the most popular modern day methods of recycling steel include the use of a Basic Oxygen Furnace (BOF) and the Electric Arc Furnace (EAF). Depending upon the composition of Carbon and other elements steels can be classified into three types, namely Low, Mild and High carbon steels, Stainless Steels and Alloy Steels of Manganese, Silicon and Nickel. Steel has multifarious applications in several areas. For example, it can be used for drawing sheets, wires, pipes, rail tracks, surgical instruments, car accessories etc. It can also be used for making permanent magnets (Cantu, 2011).

## Diagrid.

Diagrid or diagonal grid is a structural steel structure comprising of a series of triangles that combine and lateral supports as one unit. This in turn brings stiffness and efficiency and makes the building lighter than a traditional high-rise building. The triangular criss-crossing steel members are connected at specially jointed nodes which act as mutual reinforcement. “ They create an integral network across a building surface that braces against the floors, the wind, and the members above. With this exoskeleton in place, the designer can cut down on internal supports, saving on space and building materials, allowing naturally broad apertures, and providing greater flexibility for systems installation” (Portmantaeu). Some notable examples where the diagrid system has been implemented include the Swiss Re Building, Lotte Super Tower, Skidmore, Owings & Merrill, Hearst Tower and so on. Diagrids can be made using either steel or concrete. Durability of the concrete that is used for building construction can be achieved through a well proportionate mix of cement-water ratio, careful design of cement matrix and its microstructure which would also lead to the development of strength. Durable concrete with strengths in the range of 30-80 M Pa is appropriate for practical applications. This would ensure that the structures are durable, long-lived and eco-friendly (Swamy, 2008). High strength concrete comprising of higher cement and reduced water content develops strength at a rapid rate. However, these are unsuitable for structures materials since they develop cracks easily. It has been observed that there is a certain critical threshold level of water. On falling below this level, it becomes necessary to use high range water reducing agents (HRWR) which

is an undesirable effect since it decreases the durability of the concrete (Swamy, 2008). The synergistic interaction between Portland cement, slag and chemical admixtures formed by a careful mixing of slag fineness, water-adhesive ratio, cement level and a high range water reducing agent promote the development of durability in cement concrete. This concrete gives rise to a homogeneous, dense and crack-free microstructure (Swamy, 2008). Furthermore, it results in reduced heat of hydration, extremely less bleeding rate and nominal changes to setting time compared to the ordinary Portland cement. Also, it has been proved that such concretes can be designed to posses highly refined pore structure containing very low diffusivity and very high resistance to water and chloride ion penetration (Swamy, 2008).

## Conclusion

In the recent years several attempts have been made to develop and evolve ways to control the indiscriminate usage of the conventional and exhaustible natural resources. However, in spite of the fact that numerous sustainability technologies have been developed in the recent past, the absence of effective implementation hinder any possible success. It is extremely important to give adequate amount of freedom and power to the engineers to enable them to actively take sustainability measures. Education should be kept abreast with the recent developments and advancements in technology such as improved building forms, techniques and materials like concrete as well as recycling of scrap metals. Also, technology that makes sole usage of the renewable energy resources must be stressed upon. Thus, it is a necessary requirement to take into consideration every feasible sustainability solutions and to successfully take them to completion.

Buildings that are environmentally sensitive and function with minimum usage of energy are the key elements to sustainable living.

## Bibliography

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