2.3.3. Environmental analysis

ENVIRONMENTAL MANAGEMENT

Construction is the single largest industry in the developed world, with arguably the greatest environmental impact. Buildings and construction contribute directly and indirectly to most of our environmental problems. Buildings are tremendous consumers of resources and generators of waste, and the industrial processes used to manufacture materials and equipment contribute to waste and pollution as well.

According to the World Watch Institute, buildings in the developed countries use 17 % of the total freshwater flows and 25 % of harvested wood; they are responsible for 50 % of CFC (chlorofluorocarbons) production, use 40 % of the total energy flows, generate 33% of CO2 emissions, and generate 40 % of landfill material as a result of construction waste.

The aim of a building project is to complete the development as economically as possible. There are certain rules and regulations which must be observed in the industry, but to win a contract and then to complete it profitably, the only consideration is economic. This is not an unreasonable situation as the criteria for each business is to make a profit. However the situation is causing considerable problems for the wider environment so much so that it is beginning to threaten our quality of life.

Construction cannot be viewed in isolation from its surroundings, and from its industrial and service base. The construction industry is central to how we shape our future. The industry impacts on almost every aspect of the realization of human settlements and the creation of infrastructure that supports development.

An inefficient building will put thousand of tons of pollutants into the air, a site that doesn't manage its storm water effectively will cause off-site problems, and communities that do not offer transportation alternatives will continue to suffer from automobile congestion and pollution. However it is rarely possible to do everything we would like to reduce the environmental impact of building projects. Therefore it makes sense to figure out where our efforts will do the most good and where should we focus most of our attention in designing and building structures that will have minimum impact on the environment.

There are however many ways to improve our work. Sustainable designing is one of them. Sustainability is no longer a buzz word-it is a business reality. Sustainability is the issue of our time. In addition to the environmental and social benefits, the business benefits of operating sustainably are increasingly apparent. Sustainable development involves meeting

the needs of the present without compromising the ability of future generations to meet their own needs. It is not merely the development that can be sustained, but rather the kind of development we need to pursue in order to achieve the state of sustainability. It is not the goal, but the process of maintaining a dynamic balance between the demands of people for equity, prosperity and quality of life and what is ecologically possible. Development is also not just seen in its narrow meaning.

of growth, expansion and acquiring of knowledge, but as a progress through improvement and evolution.

Sustainable Construction aims to apply this principle to the construction industry by providing ways of constructing buildings that use less virgin material and less energy, cause less pollution and less waste but still provide the benefits that construction projects have brought us throughout history.

Sustainable construction is moving forward steadily, and several companies are taking a pro-active stance. Some companies use their sustainability credentials as a differentiator in winning work and can demonstrate tangible benefits. Further benefits of a sustainable approach include enhanced reputation and public image, reduced risk of disruption to projects and establishing good community relationship.

Careful selection of environmental sustainable building materials is the easiest way to begin incorporating sustainable design principles in buildings. A cradle-to-grave analysis of building products, from the gathering to their ultimate disposal, provides a better understanding of the long term costs of materials which are paid not only by the client, but also by the owner, the occupants, and the environment.

According to Jong-Jin Kim, Assistant Professor of Architecture in the college of Architecture and Urban Planning, University of Michigan a material’s life cycle can be organized into three phases. These phases relate to the flow of materials through the life of a building.

Pre-Building Phase

The pre-Building Phase describes the production and delivery process of a material, which also includes discovering raw materials in nature as well as extracting, manufacturing, packaging, and transporting it to a building site. This phase has the most potential for causing environmental damage as the raw material procurement methods, the manufacturing process, and the distance from the manufacturing location to the building site all have environmental consequences.

The extraction and gathering of the natural resources and their conversion into building materials causes loss of habitat erosion, water and air pollution.

Building Phase

This phase refers to a building material's useful life. This phase begins at the point of assembly of the materials into the structure and also includes the maintenance and repair of the material, and extends throughout the life of the material.

The waste materials generated on a construction site can be considerable. Thus the selection of a building material plays a very important role in this phase of the building life cycle.

Post-Building Phase

This phase refers to the building materials when their usefulness in a building has expired. At this stage the material can be re-used entirely, have its components recycled back into other products, or be discarded. The demolition of the building and the disposal of the waste may have a high environmental cost.

The adaptive reuse of an existing structure conserves the energy that went into its materials and construction. The energy embodied in the construction of the building and the production of these materials will be wasted if these resources are not properly utilized.

In order to balance the economic equation of sustainability and affordability at a practical level, a framework and a set of goals are needed. Those are as follows.

USE OF ENVIRONMENTALLY PREFERABLE BUILDING MATERIALS

The materials used in the structure should be given careful consideration; some materials require more energy to produce than others, and some exhaust natural resources.

The biggest culprits in terms of climate change are the materials that form the basis of modern construction – concrete and steel. Twice as much concrete is used in construction around the world than the total of all other building materials – including wood, steel, plastic and aluminium. Cement kilns have been identified as a stationary source of nitrogen oxides. Steel is one of the most energy intensive materials. The manufacturing of this material can also be very water intensive.

The productions of iron, steel and non-ferrous metals as well as production of the construction materials such as cement, glass, lime and bricks are responsible for 20% of annual dioxin and furan emissions.

The moral of the material selection process is that it should be done talking into consideration the sustainable qualities of the different materials and also tap the wide range of environmental issues such as waste reduction, pollution prevention, recycled materials, embodied energy reduction, energy efficiency, natural materials, non toxic, longer life, reusability, etc.

SELECTION AND DEVELOPMENT OF SITES

Impacts to the wildlife and to the watershed should be considered when selecting sites for construction. A careful site evaluation of soils, vegetation, water resources etc, should guide the design.

Consider the need for a new build. Give preference to options that redevelop existing sites and structures, and those which make use of existing infrastructure. Assessing the case for re-use or a new build should be based on an objective technical appraisal which would evaluate the long-term potential of an existing asset against the decision to build a new one. Provide parks, recreational areas, and conservation easements to protect the open space.

Mixed-use development, in which residential and commercial uses are intermingled, can reduce automobile use. The buildings should be located so as to provide access to public transportation, bicycle paths, and walking access to basic services.

MINIMIZE ENERGY IN CONSTRUCTION AND IN USE

Buildings consume large quantities of energy in the production phase as well as during the life spans. Energy is used to manufacture and transport building materials and products, to create the building or any element of the infrastructure and to operate the building through its lifetime. The production of energy used in the heating, cooling, ventilation and lighting of buildings account for emissions of carbon dioxide, an important green house gas.

Technological solutions are available and proven in the form of energy efficient buildings. They are as follows:

- Use of hybrid passive and mechanical ventilation, heating and cooling.
- Use of electricity derived from non fossil fuel sources.
- Optimizing natural ventilation and natural lighting.

- Solar shading can be designed to block solar heat gain and low-emissive double gazing allows selective transmission of the visible radiation while preventing or reducing the transmission of infrared radiation.
- Use of solar thermal systems, which use the heat of the sun to provide a facility with hot water for domestic uses (such as showers or kitchen use), for low-temperature industrial processes, or even for heating swimming pool.
- Use energy efficient lighting.

ISO 14000 & ISO 9000

ISO 14000 provides guidelines on the elements of an environmental management system and set a framework for continuous improvement. The International Environmental Management standards are intended to provide organizations with the elements of an effective environmental management system (EMS), which can be integrated with other management requirements and where appropriate, applied within an ISO 9000 Quality System. The main thrust for its development came as a result of the Rio Summit on the Environment held in 1992.

The advantages of using an ISO 14000 are as follows:

- Reduced cost of waste management
- Savings in consumption of energy and materials
- Lower distribution costs
- Improved corporate image among regulators, customers and the public
- Framework for continuous improvement of organization’s environmental performance

The ISO 9000 and ISO 14000 families are among ISO's most widely known standards ever. ISO 9000 and ISO 14000 standards are implemented by some 610,000 organizations in 160 countries. ISO 9000 has become an international reference for quality management requirements in business-to-business dealings, and ISO 14000 is well on the way to achieving as much, if not more, in enabling organizations to meet their environmental challenges.

The ISO 9000 family is primarily concerned with "quality management". This means what the organization does to fulfill:

- the customer's quality requirements, and

– applicable regulatory requirements, while aiming to

– enhance customer satisfaction, and

– achieve continual improvement of its performance in pursuit of these objectives.

The ISO 14000 family is primarily concerned with "environmental management". This means what the organization does to:

– minimize harmful effects on the environment caused by its activities, and to

– achieve continual improvement of its environmental performance.

The vast majority of ISO standards are highly specific to a particular product, material, or process. However, the standards that have earned the ISO 9000 and ISO 14000 families a worldwide reputation are known as "generic management system standards".

"Generic" means that the same standards can be applied to any organization, large or small, whether its "product" is actually a service, in any sector of activity, and whether it is a business enterprise, a public administration, or a government department. It also signifies that no matter what the organization's scope of activity, if it wants to establish a quality management system or an environmental management system, then such a system has a number of essential features for which the relevant standards of the ISO 9000 or ISO 14000 families provide the requirements.