

The Features of Sustainable Buildings

Guangyi Chai

Jilin Construction Engineering Institute

Abstract: Being concerned about the present definitions of sustainable building and many popular understandings of it, this thesis attempts to expound on the features of sustainable buildings and the feasible designs of them.

Keywords: Sustainable building, feature

With our entering the 21st century, the concept of sustainable development has been become widely known. Our country has listed sustainable development as one of its crucial strategies, and planned to build a balanced society with economic consumption of natural resources and energy. The construction of buildings itself consumes energy and natural resources, and directly or indirectly affects the balance in the ecological system. Therefore, sustainable buildings that are featured by energy saving and land saving are the goal in the trend of the development of buildings. Whenever sustainable building is mentioned, people tend to think about how to raise the efficiency in the utilization of traditional energies, the development of new energies, the balance of ecological system, and environmentally friendly buildings and the means to realize those; this is definitely right, but the studies that are concerned with the feasible design of the sustainable buildings are few. Therefore the many articles published in various journals on ecological building, sustainable building, and environmentally friendly building can not avoid being hollow. The "ecological" building and "sustainable building" that have been built have little value as models for the future development of building and are hard to be popularized. This thesis aims to present some ideas concerning the features of sustainable building and some feasible concepts in the design of this kind of building, so as to explore the feasible development of sustainable buildings.

1. SUSTAINABLE BUILDING IS THE BUILDING WITH STRONG DURABILITY.

Extremely strong durability is the material base for a sustainable building. The present durability of buildings that is determined by their main body is obviously too weak (for normal buildings it is from 50 to 100 years); it should be strengthened to last 200-300 years. At the same time durability requirement (the requirement can be 50-100 years) should also be imposed upon the external and internal furnishing, the equipment within the building, the piping system, etc. The process of the construction of the buildings is itself a process of damaging the natural environment; therefore the durability of buildings should be prolonged to as long

as possible, so as to reduce the needs to build more and save natural resources and energy. Only when this requirement is reached, can the buildings have the base for a sustainable building. It will also reduce the construction waste produced in dismantling a dilapidated building.

2. THE MATERIAL FOR THE CONSTRUCTION OF A SUSTAINABLE BUILDING MUST BE MOSTLY RECYCLABLE.

Wood, steel, plastics, paper boards, glass, rubber, non-ferrous metals, and soil etc. are the preferred materials for a sustainable building, because these materials can be recycled. Regarding bricks, concrete, pottery, lime, more research should be done to transform them into recyclable materials; on the other hand, before that can be done, the durability of those materials should be raised to reduce the construction waste produced in replacing dilapidated buildings.

3. THE STRUCTURE OF A SUSTAINABLE BUILDING SHOULD BE RATIONAL AND THE DESIGN OF IT SHOULD BE OF DISTINCT CONCEPT.

Since a sustainable building should first of all a durable building; the structure of it must be rational and must avoid unreasonable allocation of stress. In the design of a sustainable building, this aspect must be given enough attention. For example, the center of the building should be as near the center of gravity as possible; the floor should be even and try to avoid overlapping parts; unnecessary suspensions and slants, the irrational breakthrough between floors that are done to cater to the customers, and the unreasonable space left between supports are all to be avoided,

4. THE ENERGY CONSUMED BY A SUSTAINABLE BUILDING SHOULD BE ENVIRONMENTALLY FRIENDLY AND THE BUILDING SHOULD BE A BUILDING THAT HAS LOW ENERGY CONSUMPTION

The environmentally friendly energies such as the solar energy, biogas, and wind energy should replace the traditional energies like coal, natural gas, and petroleum as the major forms of energy consumed by a sustainable building. It is to be gradually realized that the air conditioning, the cooking, the hot water supply, the domestic electrical appliances, and the maintenance of the green areas in a building group, can all be powered by environmentally friendly energies.

The key technology for a building with low energy consumption is the heat insulation property (or energy saving property) of the enclosing structure of the building; at the same time other measures like the utilization of solar energy and the reutilization of leftover heat can also be applied. The research on the energy saving in the heating system should be enhanced, and the present energy saving system that is stimulated or forced by the government should be changed into an energy saving system in which the users of building actively save the energy; in this way the energy consumed by buildings can be fundamentally reduced, and the governmental subsidy on energy and the citizens' expenditure on energy can be reduced.

5. A SUSTAINABLE BUILDING SHOULD BE DESIGNED RATIONALLY TO MEET THE LONG TERM REQUIREMENT OF THE PARTICULAR REGION WHERE IT IS LOCATED.

The rational design that takes future development into consideration is a prerequisite for a sustainable building. The design of a building should never be a cause for its future dismantlement, and for a sustainable building, the design of it should also meet the requirement for sustainability. In the planning period in the design of a building, the requirements on the building's facing direction, avoidance from redundant sunshine, and natural ventilation must be met according to the features of particular regions where this building is located. For instance, in cold regions, the residential building's facing direction and the distance between buildings to allow enough sunshine must be given more attention; in hot regions, more emphasis should be laid upon the avoidance from unwanted sunshine and the natural ventilation system of a building.

6. THE INTERNAL STRUCTURE OF A SUSTAINABLE BUILDING SHOULD BE MORE ADJUSTABLE AND EASY TO BE ALTERED.

The adjustability of the internal structure is a fundamental prerequisite for the durability of a building. A single-functional internal structure of a building is more fixed and difficult to be altered, so this kind of buildings is more likely to be dismantled for its outdated design in the future. The structure of a building that has an external framework, a shearing wall system, and an internal adjustable framework can

meet more of the requirements on the alterability of the internal structure of a building. The buildings with more internal supporting walls have to prolong their durability. The buildings with a more adjustable internal structure are more likely to be still used in the far future, so their durability in this respect is longer.

7. A SUSTAINABLE BUILDING SHOULD BE MORE ABLE TO STAND DISASTERS.

The purpose of a building is to provide a safe and comfortable shelter for mankind against harassment from nature. However, in the building itself there lurks a great danger. Since buildings came into existence in human society, they have been playing an important role in the disasters of human being. It is more so with modern buildings. The disasters that can damage a building are earthquake, tsunami, fire, and terrorist attacks. The design of a sustainable building should take these things into consideration. To enhance the building's resistance to earthquake, whether it is better to raise the firmness of the building or to raise the flexibility of it is still something under discussion; but the requirement for a building to be able to stand serious earthquakes is imperative to be met. In regard to the building's resistance to fire, the design of a building should try to raise its fire-resistance level, try as much as possible to use non-combustible materials or fire-resistant materials for construction and external and internal furnishing, and the steel structure of a building should be protected to resist fire under more extreme conditions. The materials that emit noxious smell when heated or burnt are to be avoided. The ventilation system (the natural ventilation is mostly concerned) is also an important part in a building's resistance to disasters. The attack of "untypical pneumonia" and some terrorist attacks gave us some warning on this aspect.

8. A SUSTAINABLE BUILDING SHOULD BEAR FEATURES THAT ARE SUITABLE FOR THE PARTICULAR CLIMATE OF THE REGION WHERE THE BUILDING IS LOCATED.

There are different requirements for a sustainable building for different climate. In cold areas, a sustainable building should be able to have more heat insulation property in its enclosing structure, more able to receive sunshine and more able to allow internal flow of air. In hot regions, a sustainable building should be able to reduce its consumption of energy in air conditioning, more rational in the natural ventilation system, and more able to avoid unwanted sunshine. The buildings in an area that is both cold in winter and hot in summer should take all the above points into consideration, and should be given more attention on the rational design for buildings in cold areas. Therefore the sustainable buildings are various with particular regions.

9. THE CONSTRUCTION OF A SUSTAINABLE BUILDING SHOULD HAVE AS LITTLE

NEGATIVE EFFECTS ON THE ENVIRONMENT AS POSSIBLE.

The construction of a building is bound to produce noise, dust, vibration, waste, and also possible to damage the plants and roads of a city. Therefore it is damage to the city's sound environment and appearance. Building a sustainable construction should take those problems into concern. For example, the concrete mixed on site can be replaced by commercial concrete; the prefabricated stakes and the stakes made with a embedded pipe can be replaced by the stakes made with a drilled a hole or the stakes made by squeezing with static stress, etc.; the base made from bricks, stone bars, and concrete can be replaced by the base made of stakes (by drilling, digging, and static pressing). In addition, the construction of the main body of the building should be done in a completely enclosed space.

10. A SUSTAINABLE BUILDING SHOULD BE AN ECONOMICAL BUILDING

The initial investment for a sustainable building is probably higher than that for a traditional building; nevertheless, with the long durability and low energy consumption of the sustainable building, when the economical calculation is done on a long term, the sustainable building is considered better in economical efficiency. In addition, the positive effects brought by sustainable buildings on the society and on the ecological environment are beyond monetary calculation.

11. A SUSTAINABLE BUILDING SHOULD BE A HEALTHY AND SAFE BUILDING

In healthy and safe building, the construction materials should be environmentally friendly, and anything that is radioactive or may emit noxious gases shall be avoided in a sustainable building; otherwise the building itself would be a great resource of pollution, then how can the residents in it be healthy and safe? Without this prerequisite, nothing sustainable can be guaranteed.

12. SUSTAINABLE BUILDINGS SHOULD BE BUILT IN A SOCIETY WITH COMPLETE LEGAL AND JUDICIAL SYSTEMS, THE

CONSTRUCTION OF THEM SHOULD BE DONE IN COMPLETE ABIDANCE WITH THE LAW, AND THE BUILDINGS SHOULD BE PROTECTED BY THE LAW.

A large scale development of sustainable building must be done in a society with complete legal and judicial systems. Firstly, since the quality of a building is most crucial, so the quality of the people engaged in construction and real estate must be guaranteed. If the designers, constructors and the users of sustainable buildings were not in accordance with the requirements on their quality, then however complete the material conditions are met, a large scale development of sustainable buildings could never be realized. (According to the statistics offered by the National Construction Department by the end of the 20th century, at that time every 4 days there would be a building that collapse; every year the lost caused by the low quality of construction is over RMB 100 billion; the so called "trash" construction is not a rare phenomenon.) Moreover, to guarantee a sustainable development, laws should be made that forbid unreasonable dismantling of buildings that have not reached their expiration dates; heavy cost for the disposal of the construction waste that is not recyclable should be charged; the internal and external furnishing or modification should be limited; all those procedures are to be taken to reduce the generation of construction waste.

The definition of ecological building and sustainable building is still something under discussion, but I firmly believe that a sustainable building is not a building that is simply designed in imitation of some creature. We, as designers of sustainable buildings, must study widely upon their nature and features, and should never blindly follow a certain theory or fashion. The above ideas on the feature of sustainable buildings are just some conclusions made from limited knowledge, so I hope other specialist in this industry can make some corrections on my ideas and give some more insightful ideas.

REFERENCE

Xia Yun and others (ed.). *Ecology and Sustainable Building*. China's Construction Industry Press.