

The Sustainable Strategy of Existing Building Renovation

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Abstract: Existing building renovation is an old topic, but how to do it is always a new one, especially when today, sustainable development is widely accepted.. This essay takes current building reform as the title, and focuses on the architectural thought brought by the sustainable development to analyze the relationship among the use of resources, sustainable building with ecological environment and current building reform, in order to bring up the sustainable principle of current building reform, ecological technique strategy as well as the industrial significance of current building reform under the new situation. The purpose is to make use of the opportunity of current building reform, and moderate the relation between current building and environment resources, in order to push and promote the sustainable development of building.

Keywords: existing building renovation, sustainable development, ecological technique strategy

1. INTRODUCTION

No shadow of a doubt, sustainable development thought is an important constitution of scientific development viewpoint. That is because it can bring a new way of development, which "is leading to the future and can support the improvement of the whole humanity". The sustainable development thought as well as its strategic cultivation are very abundant, and the principle of intercommunity emphasized by them not only includes the world common, but also includes all mankind common, all society common, even" when everybody considers and arranges his own activity, he should consider the influence to others (including their descendants) and ecosystem environment that caused by this activity and honestly use intercommunity principle to handle affairs, so there will be a mutual benefit relationship among human as well as between human and nature, and only in this way, the goal of sustainable development can be fulfilled." Building has environmental, social as well as economic attributes, so that when facing the challenge brought by sustainable development thought, we should consider our activities from the perspective of these attributes.

The existing building renovation is already not a new topic. Renovating the existing buildings in order to make suit to people's demand can and should happen together with the emergence of building. But how to renovate it, especially which guiding theory and technology to be adopted, for which purpose to reform are new topics. This essay is just from the angle of sustainable development to talk about some problems in existing building renovation.

2. CONSIDERATION BROUGHT BY SUSTAINABLE DEVELOPMENT

Sustainable development thought and its strategy provide us with much consideration in all

directions. We have to completely and accurately comprehend it, in order to use it as the guidance of our practice. Just from the perspective of building, especially existing building renovation, there are three kinds of thoughts to be emphasized:

2.1 The important marks of sustainable development are the everlasting exploitation of resources and the good condition of ecosystem environment

Sustainable development is "a development that not only meets the needs of contemporary people, but also causes no harm to the ability for descendants to meet their needs". Its major principles are: the principle of fairness, principle of sustainability and principle of intercommunity; its basic characters are: everlasting ecosystem, everlasting economy and everlasting society. The thought and modes of sustainable development are entirely different from the traditional ones. The main differentiation consists in: first, the sustainable development is not the simple kind of development but a sustainable one which emphasizes the generation sustainability, fairness among different areas and the reasonable allocation of limited resources; second, sustainable development not only pursues the economic growth, but also focuses on everlasting ecosystem, everlasting economy and everlasting society, especially on the fact that everlasting ecosystem is the basis of everlasting economy and everlasting society; third, sustainable development can't depend on individual activities but the effort of the whole world, human and society, especially the effort of human, society and professions together. So in all, sustainable development mode is not simply to exploit natural resources in order to meet people's needs now, but to maintain the potential of natural resources while exploiting them in order to meet the needs of future; the mode is not focusing on development only without the consideration of environment, but trying the best to harmonize

development with environment in order to keep the ecosystem which is a necessity for life in the good condition. From the above, we can point out that the important marks of sustainable development are the everlasting exploitation of resources and the good condition of ecosystem environment.

Natural resources and ecosystem environment not only directly affect the existence and development environment of human, but also directly influence the existence and everlasting maintenance of all the other living resources. Meanwhile, whether the living resources can be everlasting also directly affects human's existence and development. This ecological chain between environment and human as well as among environment, living creatures and human forms the sustainable development system of human society and economy.

2.2 The important mark of sustainable building is the ecological character of building

2.2.1 The sustainable development of building.

Influenced by the sustainable development thought and strategy, sustainable development of building and sustainable building already become the hot topic in architecture. Experts and scholars are all actively exploring and have already formed some theory and practical results, which is surely a pleasing situation. Obviously, the concept, principle, character as well as cultivation of the sustainable development of building are not yet agreed upon. However, no matter how we set the concept for the sustainable development of building, it should contain the basic principle and character of sustainable development. Those are respecting nature, making clear the relationship among building, resources and ecosystem environment, and the fact that the development of building should be accompanied by everlasting ecosystem, economy as well as society.

2.2.2 Sustainable building Sustainable development on architecture can't get away from sustainable building.

If we set the concept of sustainable building from the angle of sustainable development on architecture, it should be the visualization of the thought of sustainable development on architecture. In fact, all of the concrete buildings are formed by visualizing something. The differentiation between buildings is not lying on themselves, but on the things that are visualized. The buildings are constituted by three factors, which are function, material and appearance, so the thing that is visualized in building should also be shown on these three factors. If we try to understand sustainable building from this perspective, then the thought of sustainable development on architecture that states building should respect nature and harmonize with resources as well as ecosystem environment should be shown on these three factors. The building that can show those is really sustainable building. If the thought of sustainable development on architecture is only shown on one factor, it is not the sustainable building according to the whole concept.

2.2.3 The ecological character of the building

To get a better understanding of the ecological character of building, we need to understand ecosystem first, and make clear several relative concepts including environment, natural resources,

ecological balance as well as ecological sustainability. The ecosystem is a concept in the biology. Its original meaning is the physical characters and living habits of the living creatures. The living creatures include the animals, plants, and microorganism, that is, all the living things. Therefore biology is also called the life science. The word of ecosystem is seldom used alone, because ecosystem is meaningless without environment. Ecosystem environment means the combination of living creatures and their various kinds of natural factors as well as conditions. The various kinds of natural factors in ecosystem environment mainly refer to natural resources here. The natural resources in scientific area can be divided to: 1 climate resources; 2 water resources; 3 living creatures resources (the existence of one living creature should depend on the existence of others); 4 land resources; 5 mineral resources. These natural resources must exist in a certain way and with a certain relationship, that is, resources must exist in the environment, environment must contain resources. The dependent relationship between resources and environment forms the concepts of resources environment and environment resources. The ecological balance means the relative stable condition that is reached by controlling, changing, compensating and exchanging each opposite factor in the development process of some animals, plants and ecosystem. This stability is usually referred to two aspects: one is that the constitution and quantity ratio of the living creature category are relatively stable; the other refers to non-living creature environment, which means the stability between resources environment and environment resources. From this respect, the ecological character in fact means ecological balance, good condition of resources environment and ecological sustainability. The ecological character of building is the good condition of the relation between the building itself and resources environment. The important marks of sustainable development are the everlasting exploitation of resources and the good condition of ecosystem environment. Sustainable development on architecture surely should make clear the relationship between building and resources environment, visualize the thought to the building and show it through the ecological character of building, which is also sustainable building. Conversely speaking, the important mark of sustainable building is the ecological character of building. So ecological building can be undoubtedly called sustainable building.

2.3 Ecological character and sustainability should also become the basic attributes of existing building.

Strictly speaking, the ecological character of building is contained in its sustainability. Sustainable development on architecture gives birth to sustainable building, and the sustainability should be shown on the three constitutions of building that are function, material and appearance. The ecological character of the relationship between building and nature is mainly shown on the materials. Here we bring up ecological sustainability from total sustainability, just in order to emphasize the ecological problem of existing building again.

The ecological character of existing building also affects sustainable development on architecture. Obviously, sustainable development on architecture theoretically refers to that all the buildings can have the sustainable development, including all kinds of buildings on space basis and the future buildings as well as existing buildings on time basis. Only if all the buildings keep good relation with resources environment and become ecologically sustainable buildings, can architecture be pushed to sustainable development. It should be pointed out that, existing building takes a great portion in all the existing buildings, and in their lasting architectural lifespan, they still have some relation with resources environment and affect ecological sustainability. The effect in the using process of this kind of building is even much greater than that of the constructing process. Therefore, standing from the perspective of sustainable development on architecture and sustainable building, we should pay much attention to the ecological problem of the continuing life of existing building, which is also the problem of sustainability.

High energy consumption and high pollution are the major problems that affect the ecological character of building. During the past twenty years, our economy has grown up year by year; architectural area has also experienced fast development and its contribution to the economy and society has also risen a lot. There is great improvement in the quantity and quality of building. Ideas renewal, material development and technique improvement greatly promote the smooth development of building and resources environment. The building with the ecological character of energy saving, green and intelligence already becomes the development tendency, which is really pleasing. However, seen from the angle of ecological sustainability, our architectural industry is still the one with high material consumption, high energy consumption and high pollution. What's worse, the earlier the buildings are, the more serious the "three highs" problem is. High material consumption is mainly referred to the material consumption in the construction process of the building, which is already a past for existing buildings, and cannot be changed. But high energy consumption and high pollution still exist in the lasting lifespan of the building, which not only do harm to the resources and environment, but also go against sustainable development as well as ecological sustainability.

The only way to solve the problem of high energy waste and high pollution of existing building depends on existing building renovation. Although there are so many reasons for existing building renovation, the renovation can be divided to function renovation, appearance renovation and material renovation, seen from the three factors of building. From the angle of sustainable development on architecture, existing building renovation should do some contributions to promoting the ecological character of building. The ecological character and sustainability should also become the basic attributes of existing building. Existing building renovation should be changed to be ecological character and sustainability renovation.

3. THE SUSTAINABLE PRINCIPLE OF EXIST BUILDING REFORM

From the angle of sustainable development and ecological sustainability, existing building renovation should adopt the following principles:

3.1 The principle of respecting nature.

The nature we talk about here is referred to the nature that is constituted by ecological environment. This is not only the principle of existing building renovation, but also that of the creature of the new building. In our past creature and renovation of building, we didn't completely overlook nature or environment. But the key point is we should pay more attention to the environment instead of focusing on ecological problems. Attaching importance to and making use of the nature should first take building as the constitution of ecological environment and put it into the global ecosystem, so that we can see the interaction among architectural system, natural resources and ecosystem; second, if we take building as the living thing, we should use its whole life circle, such as: renovating, using, maintaining, pulling down and reusing, to consider their relation with the use of resources and ecological environment; third, we should regard the ecological character which can respect nature and make use of the nature as a principle, so that we can visualize it to the existing building. In the creature and reform of building in the past, we focused more on " safety, convenience, economy and artistry", but didn't bring up the relationship between building and nature, which is really the lack of building designing principle. As a part of the global ecosystem, building, which is interacting with resources environment all the time in its lifespan, if can't be coordinated with natural resources and ecological environment, then "convenience, economy, artistry " will also be discounted. Current building reform can be regarded as the second time creation of building. If we take this chance to revise the mistake of the original one, then it would be a contribution both to architecturally sustainability and to ecological sustainability.

3.2 The principle of properly using the resources

Building is the product of resources and labor. Resources are not only the basis of the economic sustainability, but also the basis of architectural sustainability. There are two problems of existing building renovation that are related with resources: one is the relation between the process of reform and resources; the other is the relation between the building after renovation and resources. The proper use of resources also mainly refers to these two points. The proper use of resources in existing building renovation is: first, we should possibly avoid making use of the resources that are scarce or not recyclable, such as land, coal, oil, and some other petrochemical resources, metal mineral and non metal mineral resources; second, we should promote the use of recyclable resources, such as solar energy, wind energy, water energy, subterranean heat energy, bioenergy, etc; third, we should improve the efficiency of using resources by reforming the equipment and

developing the technique, that is, we should “waste less and use more”; fourth, we should make good use of local and natural resources on a economical basis, so that we can both lower the cost and reduce the energy waste and pollution that are caused by processing the materials; fifth, we should also make good use of the ways such as ventilating naturally, shading and afforesting to reform the function of buildings, in order to reduce the dependence of building on the resources.

3.3 The principle of reducing and dealing with pollution to the environment

Reducing environmental pollution means trying to reduce the pollution to environment in the process of reforming building, using the building and pulling down the building. Dealing with environmental pollution means taking the chance of renovating existing building renovation to renovate the pollution that is caused by the original building. For example, we can use clean resources, deal with the pollution that is produced by coal, purify polluted water to make it to reach the standard and so on.

3.4 The principle of using recyclable material

Various materials can be used in existing building renovation. The development of building also provides enough choices for architects. To reach the purpose of improving the ecological character of building, we should promote recyclable materials as long as they can meet the demands. For example, steel, plastic, glass, block and board materials made from industrial wastes are either recyclable or able to be processed and used again after first time using, which all show the superiority in saving resources and reducing pollution.

3.5 The principle of improving safety and endurance of the building

Even though the reason for current building reform is not lying on safety, the principle of safety and endurance should be adopted in the reform. Only seen from ecological angle, the safety and endurance of the building could extend its lifespan, which is undoubtedly a benefit for protecting resources and environment. Also, the ecological character of the building are dependent on the building itself, and the value of the ecological character should be realized by the safety and endurance of the building, especially the one that are reformed for the purpose of improving ecological character. Therefore, no matter what is the purpose of existing building renovation, safety and endurance cannot be reduced. Otherwise, the reform is totally meaningless.

3.6 The principle of synthesizing the economic performance

No matter existing building renovation is for the purpose of ecological consideration or the other ones that are combined with ecological consideration, cost is unavoidable. All the principles we talk about above pay the cost. Whether existing building renovation is economical or not should be considered synthetically, and we should compare the cost on the basis of the whole lifespan of the building. Generally speaking,

existing building renovation has its superiority in the economic aspect. For instance, original land cost, accessory cost, earlier stage cost and so on already happened. Because of the ecological character and sustainability of the reformed building, the relation between building and nature can be smoother and the function is more suitable to the new demands. So the economic performance of existing building renovation can be reflected.

4. SUSTAINABLE TECHNIQUE OF CURRENT BUILDING REFORM

The ecological consciousness of existing building renovation should finally depend on visualizing the ecological technique to existing building, in order to improve the ecological characters and promote the sustainable development of existing building. From the relationship between building and ecosystem, the ecological techniques we talk about here are referred to the ones that can reflect and show the good relation among building, everlasting resources and environment. Among those techniques, some are already mature and should be adopted in promoting current buildings.

4.1 The technique of energy saving in building

Existing building renovation should attach great importance to energy saving problem. **Technical Specification for Energy Conservation of existing Heating Residential Building** announced by our country in 2001 demands that the renovation of heating residential building should improve the performance of energy conservation, and the renovation of other buildings can also follow the above regulation of the Code to practice the measures of energy conservation to every link:

4.1.1 Improve heat preservation performance of building envelope, such as walls, roofs, doors and windows. Improve sealing property of doors as well as windows, reasonably control the ventilation of the buildings, and reduce the permeation of cold air from holes. The application of thermal insulation techniques with new type materials we have adopted now is pretty mature, and the old doors and windows of existing buildings should be replaced by new type energy conservation plastic and steel products, which has an excellent performance of energy saving.

4.1.2 Improve the heating system and heating efficiency. Usually, the function of old boilers are bad with high maintaining cost and low heating efficiency and are major sources of air pollution; also, the heating lost of outdoor heating network should not be overlooked, so new materials are needed to strengthen the heat preservation in existing building renovation; relative charging system should also be reformed in accordance, that is, inside heating system should be charged respectively each door in order to charge the fee according to their real heat consumption so that the activity of residence to save energy can be motivated. Urban heating system should be promoted in different areas as many as possible, so that the heating by regional or small scaled boilers can be reduced, air pollution can be

reduced and heating energy consumption can be saved.

4.2 The technique of using recyclable energy

4.2.1 The solar energy is used widely worldwide as a clean and free natural energy. In Germany and some other developed countries, the solar generating devices installed by private residence can provide the electricity not only enough for their own use, but also for selling to national electricity system. In our country, the use of the solar energy is still confined to solar hot water system of building roof. The solar ventilation system for building heating that is produced by our Shandong province and Canada together in 2004 should be widely used due to its low cost, long lifespan and convenient installment, and it is suitable for current building reform.

4.2.2 Wind generating techniques is widely used in European countries and the US, and is already mature. In the past, we didn't pay enough attention to Wind energy generation in our country, but the Wind generating system constructed in Xinjiang area by using the technique of Netherlands is already put into use this year. This kind of Wind generating system is best suitable for vast areas. It can not only provide electricity for the areas themselves, but also save a lot of cost on constructing long distance power supply units and repairing it for the country.

4.3 Green building material and technique

Current building reform should first adopt green building technique and materials, such as steel structure, wooden structure, plastic, glass, straw products and so on. Compared with concrete and clay brick, those materials are recyclable and their final construction rubbish as well as the pollution to environment are both little. Besides, they also have some other ecological character:

4.3.1 Adobe structure, which is still widely used on the countryside for new or reformed buildings. Its advantages are that it can be made by people without other help; the cost is low; the clay resource is free; people only need to make mud brick without baking, so it saves energy. When it passes the lifespan for use, clay goes back to the nature, which is pretty good for protecting the environment. Adobe structure is easy for construction, and the function is simple. Its thermal stability is good, which can keep cool in summer as well as warm in winter, so it is usually used in one story houses.

4.3.2 Steel structure. Its advantages are: light, high bearing ability, good earthquake-resistant ability; it is recyclable and good for green environment; it is convenient for construction, favourable to realize industrialization, standardization and production in batches, and is not influenced a lot by the climate. Correspondingly the envelope of buildings could be made up with high efficiency materials of thermal insulation.

4.3.3 straw board, which appeared many years ago but is not widely used for several reasons. However, now because the cold areas already seriously follow **Energy conservation design standard for new heating residential buildings (JGJ26-95)** and our country forbids the use of clay brick in the construction

of new buildings after the end of 2005, exploiting new type walls such as straw board and reasonably solving the problems of heat conservation, saving energy, greening as well as protecting the environment already become the necessary tendency. The full use of straws can also avoid the burning pollution and the danger of fire on the countryside. So it changes the useless thing to be the precious one and saves the materials, which create more value for farmers. And that has the great realistic significance to green building and sustainable development.

4.4 The technique of intelligence building

The technique of intelligence building can use the computer to control the system of inside temperature, humidity, sunshine, ventilation and outside shading. The old technique of controlling them manually always caused the problem of surfeit, lack of timing and unnecessary waste. The technique of intelligence building can economically and properly solve this problem and provide a comfortable and healthy inside environment for the residence.

5. THE FUTURE OF CURRENT BUILDING REFORM INDUSTRY

Nowadays in China, there are still a lot of current buildings that are not in use or not used completely due to quality problems in every area, which is a great waste of the resources. We should reform the buildings to let them take effect in economic construction.

Our country has achieved a lot in current building reform. For example, the project of building roof renovation from flat to sloping could overcome the rain leakage problem of flat roof effectively, which has been a chronic and stubborn disease for many years in wide areas of China. At the same time, sloping roof buildings also changes the boring appearance of that of flat roof, and freshes the cities; the energy conservation renovation of the heating residential buildings not only saves energy consumption but also makes the residence feel the great improvement of inside environment, which already receives the affirmation from the society. But the reform is still confined to limited scope, so we should promote it more in the future.

The relative policy and regulation of our country is the basis for the development of current building reform industry. **Chinese Sustainable Development Action Essentials in the 21st Century and Long-term Special Programme of Energy Conservation** announced by **State Development and Planning Commission** this year set the new goal again, and this brings both the rare opportunity of development for current building reform industry and the higher requirement, that is, we should take the requirements of ecological balance and sustainable development as our guidance for current building reform.

Due to the galloping development of society and economy, the consciousness of rights and law of common people is enhanced. The issue of energy saving and environment protection of building attracts more and more attention and understanding from the

whole society, which is the result of continuing efforts of the society. The formation and development of current building reform as a new industry also call for the agreement and support from the whole society. As long as government and scientific study department cooperate to improve the technique and regulation, with the promotion of media which can make the thought of ecological and sustainable development accepted by people, the current building reform industry must face a bright future.

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