

Energy-saving Renovation Technology Studies of Existing Residential Building in the Hot Summer and Cold Winter Summer Zone

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Abstract: The hot summer and cold winter zones are some of the key national construction energy conservation zones. In this paper, we analyzed the outside environment in the hot summer and cold winter zones and its influence on heat loss in an existing residential building. We further explored and analyzed major elements of residential outdoor environmental design, including water and vegetation. Through mathematical calculations, graphic analysis and logical reasoning, this article gives suggestions for residential energy-efficient outdoor environment-transforming technologies and methods.

Keywords: Existing Residential Building, Outside Environment, Energy-saving Renovation

1. OUTSIDE HOT ENVIRONMENT OF HOT SUMMER AND COLD WINTER ZONE AND ITS INFLUENCE CONDITION TO HEAT LOSS OF EXISTING RESIDENTIAL BUILDING

The Hot Summer and Cold Winter Zone is over a very large territory, and the characteristic climate of this area is that the winter is cloudy and cold and the summer is hot and damp as well as the high temperature always following rainfall. The summer in this area makes people feel sultriness to be hard to take, because of high temperature, big difference in temperature day and night, big air humidity, the

high relative humidity. Cold air common attacks this area in spring the fall, the winter three seasons, above all else, the temperature always falls fiercely in the whole area in the winter following gale and

serac. Sunlight percent rate in the winter is also low. The entire winter is raw and moist.

Because of inside and outside room hot environment close relation as well as thermal transmission rule, Outside hot environment affects inside hot environment affect greatly, meanwhile, Relations between outside hot environment and the design are also very big. For example, the temperature that there is virescence outside room is low 3 than there are not, added to this, the warming speed is also low than it. In addition, an effect reducing the heat which transpiration of face of blade close to building brings can make the temperature of wall lower 1.6^[1] than the temperature outside. Compared with these, the temperature of walls having no virescence outside is higher 7.2^[1] than the temperature outside; there are 8.8 between the two, which makes cool loss of building in summer low greatly. Some data indicate that comparing residential area having virescence with residential area having no virescence, air relative humidity of the former be higher 10 to 20 percent in winter and 20 to 30 percent in summer. In the meantime, the reasonable distribution of virescence cannot only carry excrement hot air inside off to lead natural airiness inside in summer, but also shelter buildings from bise to reduce heat loss of existing residential building. On the other hand, reflection quantum sun radiation hot which place reflects is great and almost twice than heat shining upon walls and windows directly, which affects inside hot environment seriously and aggravates cold burden of air condition system.

Therefore, while carrying on energy-saving renovation to the existing residential buildings, the improvement of outdoors tiny environment is one of the valid paths to meliorate residential building hot

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environment. Existing residential buildings can't carry on an unitary programming extensively but should begin from the following concrete aspects:

2.RENOVATION OF WATER ENVIRONMENT

2.1The Function Which Water Lowers Environment Temperature and Stores Calories

Water is the important factor to stable air temperature, the reason of this is the specific heat capacity is big, ascending and descending all not easy. The water surface has obvious function on many aspects such as improving the temperature, air humidity and forming small scope local wind.

Under the high temperature of summer, the evaporation of water will absorb a great deal of heat, increasing air humidity; on the other hand, because of the big hot capacity of water ($0.0039KJ/(m^3 \cdot k)$)^[1], about $0.036 (w/(m^2 \cdot k))$ ^[1] accumulation of heat capability and $0.09 (w/(m \cdot k))$ thermal conductivity, the weight is lighter and heat storing is also more when compared with unit volume materials as bricks. At the same time, the hot effect difference of land-and-water causes land-and-water surface being heated streakily, results in part hot presses to form day and night alternative Land-and-water wind which wind blows from water to land in daytime but from land to water at night.

2.2 Problems That Exist In Traditional Water Environment Design

There are several universal problems as follows existing in a great deal of existing residential buildings: in the first, most of existing residential buildings lack water environment design, even few which has water environment design subsists deficiency such as inconspicuous functions because of smaller water surface. The second, traditional residential areas usually adopt to take water as center to program to get close to water, designs of water environment, Vegetation environment and Shop hard to environmental all encircling water design put up; The third, existing residential areas water environment design only pays attention to sight impact unilaterally, actually, design skills of these

water environment are all disadvantageous in the formation of Land-and-water wind.

2.3Artificial Renovation Technique

First we take figure 1 for example to discuss several factors affected on formation of Land-and-water wind: Water surface (SI) is a static state, land material is stone material or concrete, the air current of land-and-water is free from a bar. There is formation of wind form water

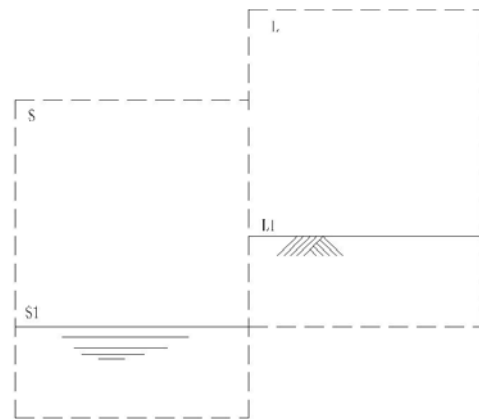


Fig.1. [2] Hot and physical model of land-and-water wind

to land in daytime and nighttime, because of difference of accumulation of heat, capability thermal conductivity between water and land; (2) Water surface (SI) is a dynamic state, land material is still stone material or concrete, friction between water and air at SI critical level will promote convection so that wind intensity from water to land will be aggrandized to static water. Water surface (SI) is a dynamic state, land is covered by virescence. The warming speed of virescence is bigger than water surface, heat absorption capacity and thermal storage capacity are all smaller than water surface, so that wind in daytime is from S space to L space but in nighttime in other way round; If surface between water SI and land is close, no matter what instances above-mentioned, the result all will be that wind intensity from water to land is weakened or not formed.

On the whole, we should promote format to be advantageous to land-and-water wind while carrying on a renovation to existing residential buildings water environment. The ways as follows are feasible: we

should make surface of water and land close to water almost near by digging water space, meanwhile, cause the water flow and get land close to water be virescence.

3.RENOVATION OF VEGETATION ENVIRONMENT

3.1 Influence And Principle Plants Carry On Environment Temperature

Plants influence environment temperature mainly by transpiration and photosynthesis. During the course of plants growth, the process that moisture dissipates by vapor state from part above ground to below ground of plants is called transpiration. Plants improve the residential tiny weather by transpiration to lose moisture toward environment, absorb the sun radiation heat and lower air temperature to increase air humidity. This kind of phenomenon that plants absorb sunlight as motive, make carbon dioxide and water synthesize organic matter storing energy called photosynthesis. Reasonable collocation of vegetation environment can not only shelter buildings from sunlight and radiation, but also obstruct buildings from gale.

3.2Problems That Exist In Traditional Vegetation Environment Design

There are several universal limitations as follows existing in vegetation environment design of existing residential buildings: a great deal of existing residential buildings outside, vegetation environment was not designed, but only Shop hard to environmental quality; on the other hand, there are just lawn but no attention to arranging in pairs or groups in existing residential buildings having vegetation environment design; traditional vegetation environment keep to programming pattern which public greenbelt, building greenbelt and path greenbelt three parts fit together.

3.3Park And Green Mechanisms That Can Renovate Tiny Environment

While renovating we should reduce road and space having no virescence possibly so that we can

ensure virescence rate of certainly construct area; Study data indicate that lawn surface temperature is about 20 to 24.5 when temperature outside buildings is 27.5 , which is lower 6 to7 than exposed land and8 to 20.5 than a blacktop driveway. It is clear that virescence has an obvious function to reduce temperature. Secondly, we should pay great attention to things sheltering land and plants installs. The concrete modus operandi are as follows: we should make evergreen and hardwood, fast-growing tree and slow-growing tree as well as arbor, shrub, lawn and so on arrange in pairs or groups. we should get plants and water arrange in pairs or groups in order to form land-and-water wind; furthermore, vegetation programming pattern which public greenbelt, building greenbelt and path greenbelt three parts fit together should be changed into multi-space vegetation programming pattern including rooftop, balcony and vertical plane of residential buildings.

4.RENOVATION OF SHOP HARD TO ENVIRONMENT QUALITY

4.1 Influence Floor Carry On Tiny Environment

At the sweltering summer, the ground receives a great deal of heat from suns radiation and it's almost twice than east and west walls. Because of function of ground's glint to sunlight, a great deal of heat is reflected to walls and windows of residential buildings, which cause hot environment indoors is more bad in summer.

4.2Problems That Exist In Floor Between Buildings

The traditional floor pattern always are as follows: floor+ residential buildings+floor+lawn; floor+ residential buildings+floor; lawn+ residential buildings+ lawn+floor. Meanwhile, the distance between lawn and residential buildings is unbending. Under ground's reflection on heat from suns radiation, the negative effect will be prodigious if we adopt to these kinds of design pattern.

4.3 Reformation Methods

Hot Summer and Cold Winter Zone locates northern latitudes about 25° to 34°, sun altitude of

northern latitudes 25° in the summer solstice day at 14:00 that time is the highest in a day is 62.87° , in the winter solstice day at 14:00 is 33.5° . the data of northern latitudes 34° is 61.78° in the summer solstice day at 14:00, and 25.86° in the winter solstice day at 14:00. we can discuss instance ground glint to heat from suns radiation and function change of sun altitude carry on ground's reflection from figure 2 to 5. We can see clearly

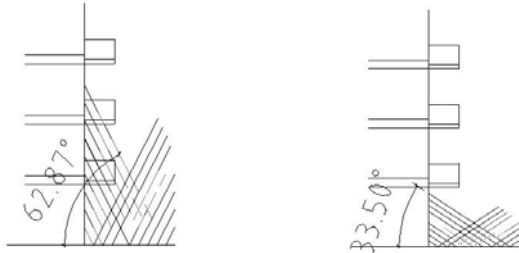


Fig.2.Floor between buildings
Fig.3.Floor between buildings
glint to heat from to sun buildings glint to heat
radiation in northern from sun radiation
latitudes 25° in the summer solstice day at
14:00 **25° in the winter solstice day at 14:00**



Fig.4.Floor between buildings
Fig.5.Floor between buildings
glint to heat from to sun buildings glint to heat
radiation in northern from sun radiation
latitudes 34° in the summer solstice day at
14:00 **34° in the winter solstice day at 14:00**

from charts that the influence ground glint to heat from suns radiation following change of sun altitude is obvious, and the influence in the day summer solstice is especially remarkable. Meanwhile, the height of residential building is one of factors, but for existing residential building, this factor can be neglected.

In one word, renovation of floor environment in Hot Summer and Cold Winter Zone, firstly, we should calculate or look up sun altitude of at 14:00 in the summer solstice, unite height of existing

residential buildings, calculate the width of land which glint to heat from sun radiation to vertical plane of residential buildings by managing trigonometric function. We renovate the land that makes the negative effect on residential buildings inside hot environment into Vegetation based on this, so that heat from sun radiation can be scattered according to this to make sure reasonable position of soft floor and Shop hard.

End language: Studies and exertion of energy-saving renovation technology and methods of existing residential building manage ways improving residential buildings outdoors comfortable moderation in order to attain the purpose of promoting indoors comfortable moderation and reducing heat loss of existing residential building. It not only scooped out potential of energy-saving renovation of existing residential building but also reduced technology and economy pressures only by energy-saving renovation of existing residential building. Furthermore, it matches thoughts of sustainable development and give people a living environment with pleasant comfort while reducing heat loss.

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