Burglar Mesh +—Discussion on the Urban Residential Maintenance Strategies Based on Stimulating the Comprehensive Environmental Efficiency of Indoor Greening

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Abstract. The problem of residential repair is a major proposition always accompanied by human development. This paper intends to integrate an economically applicable, operable and environmentally beneficial residential maintenance strategy from the generally scattered window disposal measures taken by households spontaneously at present, and make further discussion and interpretation about this strategy from multiple aspects in combination with the greening practice in daily life and other cases.

Housing Maintenance is Related to the Healthy and Stable Development of Urban Housing

After 40 years of reform and opening up, China has made remarkable achievements in economic and social development, and attracted worldwide attention. Nevertheless, we should always keep a cool head, because crises often go hand in hand with development. For instance, in terms of urban housing development, according to the data released on the website of State Statistics Bureau, China’s urbanization rate reached 58.52% in 2017, and the permanent urban residents reached 813.47 million. In addition, the per capita residential area in urban areas increased to 36.6M²/person in 2016. In this regard, it can be calculated that the total amount of urban housing in China had reached more than 30 billion M². It’s hard not to be shocked. However, it is not difficult to imagine the significant effect of such a large number of residential buildings and the corresponding population distribution and aggregation in cities and towns, as well as the degree of its construction on the economy, society, resources and environment. Crucially, the process is far from over! Even leaving aside the keen demand of additional population resulted from urbanization and natural population growth for new housing, regardless of the housing increment for the increasing residential area per capita, as well as the significant loss of existing housing due to natural and man-made disasters and the elimination ahead of time for outdated function, only for the renewal and reconstruction of more than 30 billion m² existing housing according to the fixed service years of 70, the annual construction volume should be more than 450 million M². Meanwhile, the maintenance and renewal of elements outside its main structure is the premise to ensure the safety of housing to reach the service life, and the scale is doubled in this. It is enough to see the importance of housing maintenance to the healthy and stable development of urban housing.

“Burglar mesh +” Strategy and Characteristics Based on Stimulating Residents’ Initiative

In general, the exterior interface elements, such as house façade, roof and etc., should not only resist the invasion of harsh and changeable external environmental conditions for a long time, but also guarantee the quality of interior space and the safety of main structure; moreover, they are also the main body of residential appearance. Therefore, the exterior interface of housing is the priority among priorities of house maintenance. And among them, window, balcony are the important elements next only to wall body on the façade in terms of scale. At the same time, for bearing the important function of regulating indoor physical and landscape environment, they become the most active elements on the facade that all residents pay most attention to.
“Burglar mesh +” Strategy

After the rational review of the spontaneous transformation behaviors of residents around window and balcony, the “burglar mesh +” residential maintenance strategy is put forward.

The spontaneous transformation behavior of residents around their own windows mainly include: add burglar mesh, rain and sun shed, flower pot frame, air conditioning rack and hangers, etc. For a long time, due to the lack of effective management and organizational guidance of such behaviors, the image of many old residential areas has become more disorderly and dilapidated. Especially the burglar mesh, which is not only widely criticized by the people due to its large coverage, rough workmanship, messy layout, rusting appearance, but also gives people the negative association of banditry everywhere and social insecurity. What’s more, there are also implicit worries about the impact on external rescue efforts. In view of this, some communities with better property management in the developed areas have simply banned such spontaneous behavior. However, in my opinion, these spontaneous behaviors, to some extent, reflect the reasonable demands of the residents, and contain huge energy that can be positively guided and stimulated.

As we know, the core motivation for human beings to create dwellings lies in protection against the bad weather, predators, poisonous insects and even the invasion of other nations of the same kind. For a long time, due to economic, technical, land resources and other reasons, human housing generally takes the form of low-rise, which also enables people to make full use of topography, landform, vegetation and other natural elements, so as to create a safe livable environment for housing and community. The ancient Chinese attached great importance to this and accumulated rich wisdom. [1] Considering the current urban housing and community, due to population and land pressure, it is rare to see new multi-storey housing in large and medium-sized cities. High-rise buildings are standing everywhere, face to face, and natural conditions are difficult to take advantage of. Nevertheless, the need for protection remains at the heart of housing. For modern urban residents, doors and windows are the focus of their protection. Among them, the protection of windows is much more complex. The windows are designed for lighting, ventilation, sunshine and outdoor scenes, but they are also the openings for the invasion of excessive sunshine, wind and rain, noise, haze, external sight and even thieves, as well as the soft rib of indoor energy loss. To this, what a lot of contemporary houses solve is not quite in place. Thus, some initiative behaviors of residents are inevitability, which can also have certain positive effect really. It is better to follow the trend than to forbid it outright. The “burglar mesh +” strategy advocated in this paper is to integrate burglar mesh, flower rack, air conditioning rack, rain-sun shed and other elements together, and promote it as an effective residential maintenance method based on stimulating the inner motivation of residents. It is to build a rich and easy-to-operate window greening platform for all residents, so as to encourage them to actively participate in the residential facade greening activities, and actively transform the greening of windows, balconies, rooms and other places inside the house into an effective means to improve the quality of indoor space; furthermore, it makes the whole house naturally evolve into a super greening device with remarkable environmental functions.

Technical Composition of This Strategy

This strategy consists of five parts, specific as follows:

Weather-proof Light Steel Beam-column Frame. Take the residential floor and room width as the benchmark, add weather-resistant light steel beam-column frame 0.5-0.6m from the outer wall, set up supporting linkages corresponding to the beam-column joints of the outer wall, and build the support frame of “burglar mesh” composite unit of each window.

Composite Unit of “Burglar Mesh”. The complex is composed of “burglar mesh”, upper stainless steel rain-sun shed, lower stainless steel floor and so on. The depth is corresponding to the wall distance of light steel frame, the height and width is based on each window, and expanding by 0.35M at each side. At the same time, a beam needs to be added at the lower edge of support frame in the outer side of “burglar mesh”. The inner side of “burglar mesh” complex is fixed on the wall with expansion bolts, and the gap between the rain-sun shed and the wall is sealed with waterproof
material; the outer part is welded to the support frame. With the improvement of environmental security conditions, the anti-theft function of “burglar mesh” has been gradually weakened, and naturally changed to the facade elements focusing on beauty, greening support, and climbing. Hence, the burglar mesh is particularly effective in preventing large objects, such as flower pots, and trees from being blown down by the wind. In terms of form and installation time, the combination can be handled flexibly by integrating facade modeling and residents’ wishes. (Fig. 1)

**Normalized FRP Flowerpot.** The diameter of flower pot can be set as square, and the size can be divided into two types, which is matched with the depth of “burglar mesh”. The large pot is 0.45-0.55M square, with the height of 0.5-0.6M. The small basin is 0.2-0.25m square, with the height of 0.3-0.4m. The pot is filled with planting soil. Of course, the residents can choose the pots in other forms and materials, and make personalized decoration according to personal preference.

**Plants.** The window greening of this strategy is mainly functional greening, without the pursuit of exquisite and noble varieties of single plant and single pot greening, and special requirements for plant species. The selection scope covers from herbs and shrubs to small trees and even twining vines. Dominated by those easy to live, beautiful, and evergreen, there are also some deciduous flowering plants. Of course, poisonous and prickly plants should be avoided for safety reasons.

**Waste Water Discharge and Automatic Irrigation System.** Add drainage riser, and make all wastewater collected by the bottom plate of “burglar mesh” complex connected to the riser, and discharged to the ground greening or sewer pipe, ditch. Households can choose a suitable automatic watering system at their discretion. But artificial irrigation is given priority to in daily life. So that it can not only collect the life wastewater in kitchen and bath that does not harm to the plant in time, but also close the relationship between residents and plants, so as to be helpful for the cultivation of residents’ natural feelings and good life habits.

**Features and Application Scope of This Technical Strategy**

**This Strategy is Provided with High Economy, Reliability and Feasibility.** Based on the integration and upgrading of current behaviors and skills that are scattered and unorganized, this strategy is an integrated technology to remove impurities and retain essence, and avoid harm and gain benefits. Although these behaviors do cause a certain sense of chaos and security risks to the current residential environment, the fact that it exists widely also indicates that it must have good efficacy, high economy and feasibility. This provides a basis for the necessity and feasibility of the integrated technology.

**It Has a Significant Effect on Improving the Physical, Visual and Psychological Environment Quality of Residential Interior Space.** Above all, the functional greening potential of windows is very large, which can form the greening barrier with considerable scale. It not only has a good effect on suntan prevention, noise reduction, haze filtering, external vision blocking and etc., but also provides rich greener landscape indoors that can change with the season; continuous participation in the daily maintenance of window greening is a good way of life to maintain close relationship with nature, which is greatly beneficial to people’s physical and mental health. Secondly, the effect of rain-sun shed on blocking high-angle sunlight in summer is obvious. Moreover, its good function of rain shielding can greatly increase the chance of opening window for ventilation in rainy days.

**It Is the Best Breakthrough of Three-dimensional Greening of Residential Buildings.** In a word, the three-dimensional greening of residential building includes flat roof, wall space, window and other main parts. Among them: besides the vine planted along the foot of wall, the traditional perpendicular greening way that allows its to climb freely on wall face is realized more easily, it is not feasible to popularize the high-end technology, and high-maintenance wall face greening method in common residence at present; its frequent maintenance activities are also prone to interfere with the home life of residents. And flat housetop has bigger greening potential originally. However, due to the lack of public funds for its public properties, residents are prone to build spontaneously and illegally. In addition, the influence of significant increase of roof greening load on building structure should be professionally evaluated; accordingly, the opportunity of
popularizing housetop greening still is not mature. In comparison, window greening has a good basis for promotion. The convenient and safe greening platform provided by this strategy will greatly mobilize the enthusiasm of residents and enable window greening to become the first breakthrough of three-dimensional greening of residential buildings.

**It Plays a Significant Role in Maintaining the Outer Wall of Residential Buildings.** Rain-sun shed and window greening can make almost all wall space around windows protected basically from insolation, rain drench, and reduce the deformation of exterior wall space, thus playing a protective role; meanwhile, it can also obviously keep wall space dry and clean, so as to prevent winter rainwater infiltrating and freezing, thereby causing the wall space cracked.

**It Can Effectively Improve the Appearance Image of Old Residential Buildings.** First of all, the integrated metal support frame and “burglar mesh” complex can significantly weaken the dilapidated sense old wall space. Secondly, the window greening with a high proportion of facade will gradually forms a scale, so that residential buildings and even residential areas will naturally present a vibrant green image.

**It Is of Great Significance to the Improvement of the Overall Urban Environment.** Residential buildings naturally evolve into huge three-dimensional greening devices based on window greening, and the urban residential area one by one will jointly form a super greening device to improve the quality of urban environment.

**This Strategy Has Extremely Extensive Applicability.** It is suitable not only for residential buildings, but also for other types of buildings with better manual or automatic maintenance conditions. [2] In terms of residential buildings, the lower the height, the smaller the spacing among buildings, and the more serious the problems of visual interference, noise, haze and guard against theft; while the plant growth conditions are relatively stable. As building height increases, and building space increases, the problems above abate gradually, but the increase in wind force can greatly increase the difficulty of opening windows to maintain plants. Therefore, the optimal height section of this strategy is proposed to be residential buildings within 50M, which can be extended to the height range below 50-100M as appropriate.

**Interpretation about the Application of This Strategy**

The effectiveness of improving the quality of indoor space is the driving force of this strategy. Through the mutual positive influence among residents, the residents will independently extend window greening to the whole building, the whole community and even the whole city, which is the promotion and development logic of this strategy. The following is a rough explanation of the application of this strategy by taking the daily indoor greening practice of the author’s personal house as well as the “burglar mesh+” strategy transformation idea of an urban residential building as an example.

**Indoor Greening Practice of the Author’S Personal Housing**

The author’s personal housing is a multi-storey apartment of about 130M², which has been occupied for nearly 20 years since 1999. All the time, perhaps because of the author’s profession, this house seems to serve as a microlaboratory for maintaining indoor environment and reflecting his sustainable life concept as a matter of course. According to the ultra-slow pace of daily life, continuous discussions have been made on the themes of the significance of integrating green and humanistic concepts into life [3], the concept of organic growth of interior space [4], the efficacy of ink painting in the repair of old walls and the improvement of interior space quality [5], and so on, and much has been gained consciously. Among them, the effectiveness of indoor greening is particularly prominent. The main manifestation is that, with the passage of time, all artifacts are gradually aging, but greening is gradually obvious. The greening effect inside the house is summarized as follows:

**Green Curtain on Windows.** As the elapse of time, the green plants in pots grow up gradually, and each window is covered with a multicolor green curtain changing with season together with the
drooping cane wood that climbs along the burglar mesh. It is not only beautiful, but also plays a better visual, environmental protection role. (Figure 2, 3)

**Figure 1. Basic composition of window unit assembly.**

**Figure 2. Appearance of window top flower rattan.**

**Figure 3. Green curtain of each window.**

**Figure 4. Balcony courtyard of sitting room.**

**Creation of Characteristic Space.** Create the closed balcony of sitting room to be an ecological courtyard that surrounds the small pool, build a hall-courtyard integrating sitting room space, thus presenting the spatial effect of 3/4 sitting room and 1/4 courtyard. (Figure 4)

Kitchen is a space with windows at both east and north sides, so the insolation in summer and the uncomfortable sight line due to the opposite building is obvious. The beautiful window greening can not only greatly alleviate the problem, but also make the kitchen a landscape kitchen to a certain extent. (Figure 5)

**Figure 5. Green view of kitchen window.**

**Figure 6. One corner of semi-wild bird cage.**

Construction of semi-wild bird cage. It is the nature of modern city children to keep pets. But pets are bound to cause a lot of pollution indoors. Accordingly, closing the burglar mesh outside the bedroom enclosed balcony with steel wire net will form a big birdbage that a bird can fly inside together with the rain-sun shed and bottom board. The birdbath for planting flowers and plants and raising turtle on the bottom board can achieve the purpose of not separating people and animals and plants. (Figure 6)

**Rich Harvest of Natural Taste.** Window greening can provide rich landscape, such as flowers, leaves, fruits and branches, and the growth process itself can give people more experience; in addition, it often attracts wild birds to forage, make nests, and bees and butterflies to fly and dance.

**Cultivation of Healthy and Green Lifestyle and Its Environmental Significance.** Continuous
plant maintenance behavior will gradually evolve into good living habits. There is no doubt that it will do great good to people’s physical and mental health. Moreover, it is possible to further explore the environmental functions of greening inside houses. For example, I have always been trying to make windowsill greening have a significant effect on the degradation of domestic wastewater and kitchen organic waste. Of course, this requires proper organization to prevent mosquitoes and exhaust fumes in the degradation process. In practice, when there is a lot of garbage, it can be compacted, covered with soil and watered to promote the fermentation of organic matter and infiltration into soil layer as soon as possible. Keeping the right amount of organics in the pot will greatly accelerate the degradation process. After long-term observation, insects rarely scramble or bite dead plants.

**Conception of “Burglar Mesh +” Strategy Transformation of Residential Buildings in a City**

After an easy-to-operate window greening platform for residential building is built, and the inherent power of greening inside the house is stimulated, the scene of a vibrant residential building is worth looking forward to after some time. In this case, an ordinary tower high-rise residential building about 50M high is selected as an example, so as to present the residential maintenance effect of this strategy in a relatively intuitive manner.

The building is located near a city’s T-junction, and it is about 20 years old. Years of wind-rain erosion has made it show an old state, and not adaptive to the surrounding environment; at the same time, with the successive completion of surrounding high-rise buildings, its unique environmental advantage at the beginning of its construction has already disappeared, and the visual environmental pressure of the windows of residents naturally comes into being. Therefore, in terms of the renewal of the exterior image and the improvement of internal environment, it is actually necessary to maintain the building. This case attempts to make conceptual maintenance according to “burglar mesh +” strategy. The residential building after transformation will not only make the participating residents benefit directly, but also obtain organic renewal of the appearance of residential building, full of green. (Figure 7)

**Figure 7. Conceptual drawing of renovation of a residential building.**

Therefore, it can be expected that after the promotion of this strategy, urban residential areas will naturally evolve into a series of super greening devices, which will play a huge role in the improvement and maintenance of urban environment and landscape.

**Conclusion**

In the present situation, for the purpose of improving the quality of indoor environment, residents often spontaneously carry out some practical transformation on their windows. Although these behaviors and measures are practical and effective, there is a hidden danger of more serious
environmental problems due to the lack of effective organizational guidance. This strategy is an integrated technology based on effective and scattered practical measures and practices presented in this universal phenomenon. The purpose is to stimulate the greening potential of residents’ houses by building practical and easy-to-operate window greening assembly device. Furthermore, this strategy has been achieved successively in improving the ability of indoor environmental protection and spatial quality, and in maintaining and improving the urban environment of residential buildings. The case of this paper provides some evidence for the feasibility of this strategy. The technical composition of this strategy is not complicated, but the guidance and cultivation of people’s environmental concepts and the organization and management of projects may play an equally critical role in the smooth progress of this strategy.

References


