

Effects and Approaches of Green Design for Communal Spaces in Housing Designs

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ABSTRACT: This article presents a study on effects and approaches of green design for communal space in housing designs. First, it examines various types of communal areas in apartment housing where the notion of green design is applicable. Then, it conducts case studies with regard to green design possibilities within apartment housing. Finally it attempts to find some strategies and methodologies that will be applicable for the apartment housing in Korea.

Keywords: Green design, communal space, transitional, façade, housing

1. INTRODUCTION

With rapid urbanization and dramatic growth of population in urban areas, excessive energy consumption, the concept of sustainable and green development has become a new paradigm in architectural pedagogy for the 21st century: Integrating eco-environmental issues into architectural practices.

Green design does not simply mean designing with green elements. It involves many other environmental, economical and social issues. A significant part of green design includes operating buildings in a sustainable way. Accordingly, a green building design must address many factors, including air quality, energy efficiency, and the application of green materials. Basically, it should consider conserving energy, working with climate, minimizing new

resources, minimizing new resources and respect for users.

By doing so, it allows sustaining an eco-friendly environment and healthier communities. This notion has referred to as many other terms, such as 'green design', 'eco-design', 'green architecture', 'sustainable architecture', etc. In particular, the notion of green design has led a significant influence on green housing. Recently, there are a considerable number of attempts and research to develop innovative green housing solutions and design methodologies. In fact, green housing from ecologically-friendly homes to eco-neighbourhoods, is booming worldwide.

Nevertheless, highrise apartment housing that energy efficient and green features are applied into the design is rare in Korea. Perhaps, green design in an apartment development in Korea means little more than an interior-design or partial design option. Perhaps, it is due to the lack of any

strategy of innovative green design, the lack of understanding of what green design can do in Korea, the lack of green design research and available community resources, or severe weather conditions.

Therefore, this article attempts to examine various types of communal areas in apartment housing where the notion of green design is applicable, to conduct case studies with regard to green design possibilities within apartment housing, and finally to find some strategies and methodologies that will be applicable for the apartment housing in Korea. Hence, based on the preliminary research, a basic ground will be provided to develop different types and levels of green design possibilities in highrise housing in Korea.

In general, a communal area is any shared area within a block of apartments or sheltered housing complex. Thus, it excludes individual dwelling units. These areas are typically divided into three areas in large: Communal use areas, semi-public transitional space, and the facade.

2. TYPES OF COMMUNAL AREAS IN APARTMENT HOUSING

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2.1 Communal Use Areas

Communal use areas mean interior or exterior rooms or spaces of a building that are made available to the residents. Communal use may be provided at a building that is publicly owned. The areas are divided into two: semi-public communal area and semi-private communal area. Semi-public communal area includes areas where every residents of the housing block can come and approach. Semi-private communal

area is the initial point where the semi-public communal space and individual dwelling units are connected.

Table 1: A range of communal areas

Communal Use Areas	Semi-public communal area	hallway, stairwell, service core including elevator, lobby and hall
	Semi-private communal area	entrance hall to a dwelling unit

These communal areas are mainly used for the purpose of entering and passing. Until 1980s, minimum space for the communal use areas has been secured due to the tendency to give importance toward the exclusive use area of dwelling residents in apartment housing in Korea. Lately, the high-rise apartment building has been the typical Korean home. And Korean attempt to improve their dwelling units. Accordingly, many experimental efforts directed at developing an eco-friendly and sustainable housing complex by focusing on building community and ecological living with the dwelling tenants. In addition, communal green space in apartment housing has been increasingly significant for the success and identity of the community. At times, some parts of the landscaped communal space are open to the public.

Apartment housing in Korea recently calls for communal open space for quality of life and community integrity. In Singapore, there has been a significant influence on the promotion of green housing. Singapore even invests about 3 percent to 5 percent of construction costs in designing and building innovative eco-features. The Newton Suites residential project in Singapore is one of the latest examples where a good example of such a green communal space is offered.

WOHA Architects designed the Newton Suites residential project, which features sun-shading over the entire building, cantilevered sky gardens and green walls over the whole 36-storey structure. It is modern highrise development located in the heart of the coveted District 11 in Singapore. The apartment is based on the four-bay housing where each dwelling unit is connected to the vertical communal atrium.

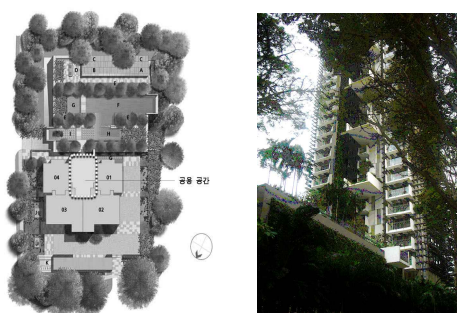


Figure 1: Newton Suites Plan, Singapore. Left. Floor Plan; Right. South Facade

Extensive landscaping covers the service core area and stairs concentrated in the central communal space in order to absorb sunlight, create oxygen, and enhance the building's appearance. In particular, creeper vines cover the south-facing exposed stair and the blank walls on the facade. In addition, there is a sheltered skygarden with overhanging trees at every 4 levels on the southeast facade. In the apartment, extensive use of shading screens and protruding balconies adapt the tower to the tropical climate and minimize energy demand. The meshes of the shading screens are angled to keep views to the ground open while blocking sunlight from the windows. Shading screens moderated energy flow within individual housing units. Swimming pool on the south of the housing is practically located on top of the parking garage. It allows the summer natural air current to move the cool air through the vertical communal core.

2.2 Transitional Space

A transitional space is an area in between the urban exterior environment and the inviting dwellings within. Roof area, sky court, entry garden court, atrium, public terrace area belong to this space. For example, the interior courtyard affords some privacy for tenants as they enter and exit the building but also encourages interaction among them in what is a transitional space between public and private.

Green design is more applicable for the transitional space than communal use areas. Thus, there is a far greater opportunity for achieving green benefits by promoting the areas for the roof garden, sky garden and communal green terrace in apartment housing, because the transitional space connects to the open air. By introducing the cycle of the nature and utilizing sustainable design concepts and principles in such spaces, apartment housing can optimize energy efficiency and promotes occupant productivity and health, and so on, thus upgrading the sustainability of the housing.

In addition, the green approach not only addresses the physical as well as the social and economic needs of the people. The social benefits of sustainable design are related to improvements in the quality of life, health, and well-being. The residents' benefits of sustainable design have centred on health, comfort, and satisfaction. The social benefits of sustainable design include knowledge transfer, improved environmental quality, neighbourhood restoration, etc. Interest is growing in the community benefits of sustainable design. The notion of a communal green space is to create a focal point that helps give the community an identity as well. Creating and maintaining a strong sense of community is vital to the success of the community and the prosperity of the people.

The establishment of the transitional space in urban contemporary housing in Korea lacks. Thus it resulted in the lack of communal life and extreme individual life-style. However, the recent housing

development in Korea is facing new and diverse demands for the public space. In particular, such a space has been popularly applied into a variety of housing designs, particularly in Singapore, Malaysia, Germany, Japan, and so on.

The work of Ken Yeang is a good example of such an approach. Unlike the traditional building type such as the stacked concrete container box, he provides terrace, sky garden and atrium that connect to the open air even in highrise buildings.

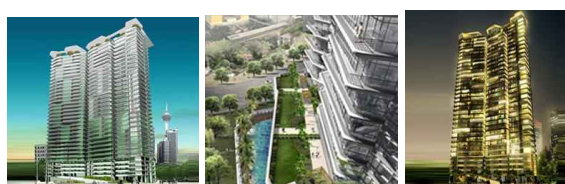


Figure 2: Left. Idaman Residence: Center. Landscaped terraces at level 6: Right. Night View

This residential tower was built in the central business district of Kuala Lumpur. Skycourts and terraces like on the 6 floor are introduced within the tower which provides an internal to external buffer zone and generates the microclimate at the building's periphery. The space between the two separate 'L' form of the towers provides a large central atrium and with vertical separation at the corners enables a free air flow within the building to provide all units with natural ventilation. And roof garden is to reduce run off and to enhance biodiversity.

To be applicable such design features in Korea, many other factors must be considered due to severe winter weather conditions. For example, the enclosed atrium is an exceptional showcase of the building's integrated green design principles, providing natural daylighting and a heat stack effect that draws natural ventilation up through the building. However, it is necessary to consider sustaining the enclosed atrium during the winter.

2.3 Façade Elements

Facade elements that influence on green facade in apartment housing include planted skycourt, green wall panel system, and shading devices.

First of all, vertical landscape is essentially a living cladding system with many of the benefits of a green roof. With these gardens, plants grow on, up or against a building's façade. Suitable plants include a wide variety of perennial and annual vines as well as espaliered trees. Vertical greening has more potential impact, with greening of a building's façade often encompassing four times the area of the roof and even more for a highrise building. Green roofs and vertical gardens are a well-established feature in south-east Asian countries, like Singapore, with policy makers having put in place various measures to support the application of these technologies.



Figure 3: EDITT Tower



Figure 4: Santa Fe Tower

Ken Yeang has applied a variety of green design elements. In particular, he incorporates terrace and skycourt

considering natural ventilation and sunlight to core. His design features focus on the bioclimatic studies carried out using simulation processes within a virtual environment. In terms of the apartments, Ken Yeang evaluates thermal stratification and comfort, temperature, wind penetration, to understand sunlight penetration, solar gain and surface temperature rise. It determines sun angles on the façade. In particular, based on the analysis of sun path, Ken Yeang places a vertical circulation and core design on the facade where solar heat is strong. Otherwise, he places interstitial spaces like skycourts, atria, wind-scoops or sun-shading devices combined with deeply inset sky courts. His design approach is based on the study that proposes an optimized design according to specific orientations of the highrise housing as the best solar orientation. It would be interesting if the ecological basis for architectural design like Ken Yeang's design is experimented in highrise housing in Korea.

Secondly, green wall using climbing plants as a cladding system should be used. Such system can dramatically reduce the maximum temperatures of a building by shading walls from the sun. Together with the insulation effect, temperature fluctuations at the wall surface can be reduced dramatically. The use of climbers to reduce solar heating is most effective if they are used on the wall that faces the sun, together with the west wall, which experiences afternoon heating. Green wall system can help protect the surface of the building from damage from very heavy rainfall and hail, and possibly can play some role in intercepting and temporarily holding water during rainstorms, in the way that green roofs do.

Thirdly, shading devices offer the opportunity of differentiating one building facade from another. Shading can be provided by natural landscaping or by building elements such as awnings, overhangs, trellises, louver-controlled systems, balcony and canopy structure, and

so on. The design of windows and louver-controlled systems influences the effectiveness of daylight utilization significantly. In particular, the exterior louver system tracks the sun's movement throughout the year, taking full advantage of the building's southern exposure. Daylight may be introduced into a building using a variety of design concepts or strategies. The use of sun control and shading devices is an important aspect of many energy-efficient building design strategies. In particular, buildings that employ passive solar heating or daylighting often depend on well-designed sun control and shading devices.



Figure 5: Zorlu Ecocity¹

Figure 6 illustrates Ken Yeang's shading devices used in Menara Boustead according to different building orientation and building surface materials. Shading devices can have a dramatic impact on building appearance. This impact can be for the better or for the worse. In recent years, there has been a dramatic increase in the variety of shading devices and glazing available for use in buildings.

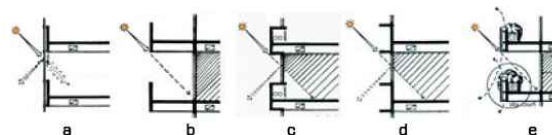


Figure 6: Shading devices: a. curtain wall blind device; b. deep balcony; c. deep window; d. horizontal louver device; e. balcony green plants

¹ Zorlu Ecocity is a Llewelyn Davies Yeang project located in Istanbul, Turkey. It will have 588,850sm of accommodation, which includes office towers, residential towers, two hotels, apartments, and resort-style elderly units above a three story retail complex.

5. SUMMARY

To sum up, green design or sustainable design should be integrated into a project from the very beginning of the housing planning and design. Based on the research, the following three points should be considered when designing efficient multi-story green housing in Korea.

First of all, green design can be seen as a pure aesthetical element in architecture. Green design contributes, to some extent, to a better microclimate through evaporation filtering of dust from the air and a decrease in temperatures, give residents personal control over temperature, ventilation, and lighting to enhance their comfort and productivity, and to supply residents access to daylight, windows, and contact with nature to provide significant physical and psychological benefits. Therefore, it must be considered as a significant factor when designing apartments. Many issues must be considered. Among others, research on regional plants and trees and how to maintain with regard to different weather conditions should be a fundamental factor to be considered. How to retain water in sky gardens and roof gardens while allowing excess water to the drainage system is another significant point.

Secondly, green design should become a part of everyday life for the community. Hence, a collaborative process leading to a green community is a significant issue. Multi-purpose and flexible roof gardens, sky courts, and communal use green areas should be developed on different levels of the housing so that a group of people interacts and enhances the sense of community.



Figure 7: Next21 Photo and building greenery

Finally, green design with diverse economic and technical elements should be considered. For example, NEX21 is an experimental 18-unit housing project that involve not only the notion of substantial natural greenery and open flexibility, but also other notions including: treating everyday waste and drainage onsite within the building, minimizing the building's compound burden on the environment, using energy efficiently by means including fuel cells, creating a variety of residential units to accommodate varying households, etc.

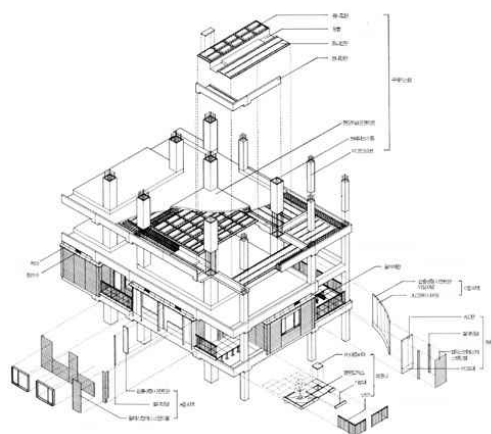


Figure 8: Next21. Open Building concept diagram

In addition, shading devices, solar photovoltaic panels, green wall panel system, recycling water and supply system (Black Water System), etc must be considered seriously for the purpose of energy efficiency. They can be part of design elements of green architecture.