

A Study on the Environment-Friendliness of Indoor Common Space in Multiple Dwelling Housing

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ABSTRACT: This study supports that indoor common space in multiple dwelling housing is more than a mere corridor, and grants its own significance as a communal space among residences. We developed a tool that can evaluate environment-friendliness of indoor common space. This tool will provide the design guidelines to designers who are planning environment-friendly multiple dwelling housing.

Keywords: indoor common space, environment- friendliness, evaluation tool

1. INTRODUCTION

1.1 Background of Study

All indoor common space of multiple dwelling housing is the intervening area that connects individual dwelling unit with outdoor common space. This space allows sense of community to be created through meetings and exchanges among residents, and supports environments for friendly human relationship. Since the creation of community among residents and the desire to protect individual privacy contradict each other, the design technique that can appropriately maintain balance between them is required. However, current indoor common space acts chiefly as a simple

passage, compared to its various necessary functions and importance. Therefore, a study for the establishment of independent significance as a space of common life for residents and a specific planning technique is necessary.

In case of Environmentally Symbiotic Housing of Japan, improvement of correlation between indoor and outdoor space, support of common life of residents, and realization of resourceful residential characteristics are the planning requirements. It is a regulation for the interim area which is not covered in the Green Building Certification of Korea, and has significance in that it is a policy that considers the intrinsic role of indoor common space. The

environment-friendliness in the study of planning indoor common space is the factor that should be considered from the points of view of friendliness with surrounding natural environments and support of residents for the health and amenity as well as sustainable development from the desirable macro viewpoint of the earth.

1.2 Purposes and Methods of Study

There are two purposes of this study and they can be identified stepwise. The purposes and methods of study for each step are as follows. First, develop a tool that can evaluate environment-friendliness of indoor common space. To find out how to design indoor common space to have environment-friendliness, excerpt relevant items as indexes for indoor common space from the requirements for the Green Building Certification of Korea and the Accreditation Requirements for Environmentally Symbiotic Housing of Japan. Second, clarify design technique of environment-friendly indoor common space. By evaluating cases

through application of the indexes excerpted as above, verify the applicability of the indexes and a practical design technique for environment-friendly indoor common space.

2. DEVELOPMENT OF TOOL FOR EVALUATION

2.1 Evaluation of the Requirement for the Green Building Certification of Korea

The review points for multiple dwelling housing in the Green Building Certification System are shown on the following table. Evaluations are comprised of 9 sectors and lots of problems are suggested since details of evaluation are not specific and the evaluation structure is vaguely composed. As the result of applying review points to items appropriate for evaluation of indoor common space, there were relationship with material, resources and indoor environment. However, there is difficulty in the application to design of actual indoor common space.

Table 1: Requirement for the Green Building Certification of Korea

Sector	Category	Details	Relevancy
Use of Land	Ecological Value	Ecological value of existing land Preservation rate of existing nature resources	
	Use of Land	Floor space index Establishment of systematic hierarchy	
	Effect on Surroundings	Means to prevent disturbing rights to sunshine	
	Construction of Residential Environment	Plan on community center and facilities Pedestrian walk within complex Network of pedestrian walk	○
Transportation	Reduction of Traffic Load	Ready access to mass transportation Bicycle stand and bicycle road within complex Network of driveway	○
Energy	Energy Consumption	Energy consumption amount	
	Energy Conservation	Energy conservation	○
Material and Resources	Resources Conservation	Consideration of change in life cycle Environment-friendly engineering and technology	○
	Application of New Technology	Restraint of use of furniture made of natural resources	
	Separate Collection Household Garbage	Separate collection of recycling household garbage Reduction of food waste	○
	Recycling Resources	Use of green certification products Reuse of existing building	○

Water Resources	Setup of Water Recycling System	Reduction in loss of rain water	
	Conservation of Water Resources	Conservation of household use of faucet water Use of rain Installation of system for water of intermediate quality	
Environmental Contamination	Prevention of Greenhouse Effect	Reduction of CO ₂ emission	○
Maintenance	Systematic On-site Management	On-site management plan considering environment	
	Efficient Building Management	Documents and guideline for operation and maintenance	○
	Efficient Household Management	Provision of user manual	
Ecological Environment	Construction of Green Tract	Axis of linked green tract Rate of green tract Application of artificial environment afforestation technology, considering ecological environment	○
	Formation of space for living creatures	Formation of biotope for aquatic living creatures Formation of biotope for living creatures on land	○
	Use of Natural Resources	Rate recycling of topsoil	
Indoor Environment	Environment of Air	Use of material containing little amount of various harmful elements Ventilation design	○
	Air-conditioning	Automatic air-conditioning for individual rooms	
	Sound Environment	Insulation of stamped sound between floors Insulation of sound between households Sound environment of complex	○
	Light Environment	Rate of sunshining area in household	○
	Consideration for Handicapped Citizen	Appropriateness of consideration of senior citizen and disabled people	○

2.2 The Accreditation Requirements for Environmentally Symbiotic Housing and Planning Methods

The Environmentally Symbiotic Housing has three basic requirements for the definition, which are Low Impact on environments, High Contact with its surroundings and the Health and Amenity residential environment. Planning methods for multiple dwelling housing to satisfy these basic requirements were studied by the Association for Environmentally Symbiotic Housing and the Accreditation Requirements for Environmentally Symbiotic Housing was established based on the study. The accrediting system of Environmentally Symbiotic Housing is

composed of mandatory provisions and higher provisions.

2.2.1 Accrediting Requirements for Environmentally Symbiotic Housing

There are four types for the Environmentally Symbiotic Housing: which are 1) energy conservation type, 2) efficient use of resource type, 3) locality-adaptive and environment-friendly type 4) healthy and safe type, and there are 7 applications for each type. Applications used for the accrediting requirements are shown on the following Table 2. Applications are organized so that they can be applied for indoor or outdoor separately and applications related with indoor common space are indicated in the table shown below. Among the applications, there are things to

be considered especially for indoor common space and they are for the purpose of improving correlation between indoor and outdoor and for healthy and amenity indoor environment. Each item can be categorized, but the evaluation method is vague in the

aspect of specific architectural plan. Therefore, it is necessary to review the table along with the specific planning method drawn up by the Association of Environmentally Symbiotic Housing.

Table 2: Accrediting Requirements for Environmentally Symbiotic Housing

Category	Application	Relevancy
Energy Conservation Type	Efficient Reduction of Heat Loss	○
	Efficient Control of Sun Light	○
	Passive Use of Sun Energy	○
	Active Use of Sun Energy	○
	Active Use of Unused Energy	○
	Use of Highly Efficient Equipment	
	Others	
Efficient Use of Resource Type	High Durability	○
	Use of Change-Responsive Engineering	○
	Reduction of Wastes	○
	Active Use of Recycled Materials	○
	Highly Efficient Use of Water Resources	
	Architectural Support of Separate Collection of Garbage	◎
	Others	
Locality-Adaptive and Environment-Friendly Type	Friendliness with Surrounding Ecological Environments	○
	Consideration of Water Circulation in Surrounding Area	
	Active Consideration for Afforestation of Surrounding Area	○
	Creation of Resourceful Intervening Area between Indoor and Outdoor Spaces	◎
	Consideration for Local Landscape	○
	Reflection of Local Culture and Industry	○
	Others	
Healthy and Safe Type	Appropriate Barrier-Free Design between Indoor and Outdoor Space	◎
	Equipment of Enough Ventilating Capacity	○
	Use of Material in Consideration of Health and Environment	○
	Efficient Reduction and Proof of Sound	○
	Maintenance Service	
	Provision of Information on Performance of House	
	Others	

2.2.2 Planning Methods for Environmentally Symbiotic Housing

The planning methods for Environmentally Symbiotic Housing are comprised of 3 basic requirements which are again comprised of 4 sub-requirements. In the sub-requirements, there are specific

requirements that can evaluate environment-friendliness quantitatively. This was organized into an evaluation sheet, and used in comparative evaluation in each case during the study of Environmentally Symbiotic Housing. It provides specific methods that can be applied in the aspect of planning.

Table 3: Planning Methods for Environmentally Symbiotic Housing

Requirements	Sub-requirements	Relevancy
Low Impact on Environments	Conservation of energy and efficient use	○
	Efficient use of unused natural energy	○
	Improvement of durability and efficient use of resources	○
	Reduction of environmental load and wastes	○
High Contact with Surrounding Environment	Ecological abundance and circulation	○
	Harmony with climate and locality	○
	Improvement of correlation between indoor and outdoor of building	◎
	Support of common life of residents	○
The Health and Amenity Residential Environment	Relish and feel the change of nature	○
	Healthy and amenity indoor environments	◎
	Environments allowing safe residence	○
	Realization of resourceful residential characteristics	○

2.3 Colligation of Evaluation Tool

In preparation of tool for the environment-friendly indoor common space, specific application of design can be readily carried out if evaluation items are determined based on the steps of planning method of designer. This study considered design process and overall shape of resident building and specific space plan was

separately considered. The specific plan classifies indoor common space into entrance to resident building, indoor passage of resident building and front of entrance to individual dwelling unit, and contains planning considerations for each classification. This can be used as a guideline for evaluation of environment-friendliness in the aspect of the form of resident building and specific space plan.

Table 4: Planning Colligation of Evaluation Tool

Sector	Classification	Details
Form of Resident Building	Composition of Plan	Small building that has relatively less circumference per unit area of ground-shape with few concavo-convex profile
		Layout and shape that allows easy ventilation during Summer
		Introduce outdoor space into indoor in the shape of courtyard and light well
		Installation of spacious terrace, rooftop garden and balcony
		Common facility for meeting and leisure activity
	Plan and Elevation	Construction of green tract - on the rooftop and wall
		Construction of place for living creatures
	Design of Elevation	High air-tightness of entire building
		Efficient control of sunshine
		Active solar system – Sunlight collector
		Passive solar system – glass on the south, heat-condensing wall
Specific Space Plan	Plan on Entrance to Resident Building	Architectural support of separate collection of garbage
		Systematic network of passage
		Continuity and openness through pilotis and footpath
		Barrier-free design in and out of building
	Plan on Passage of	Design allowing convenient self-management

	Resident Building	Design that allows installation of plant box under common maintenance
		Spacious stairways and hallways
		Providing enough ventilation
		Consideration of handicapped citizens – such as guardrail
	Front and Passage of Individual Dwelling Unit	Providing enough sunlight
Fabricating Method and Material	Front of Individual Dwelling Unit	Barrier-free design between separate spaces
		Entrance that provides privacy in an one-way hallway
		Fabricating method allowing convenient replacement of material in and out of building
		Use of material and parts that use less energy
		Use of green certification products and existing building
		Use of material considering health and environment
		Efficient reducing of noise and sound proofing

3. EVALUATION OF ENVIRONMENT-FRIENDLINESS

3.1 Profile of Object of Evaluation

As samples for evaluation of environment-friendliness, apartments of Korea and Environmentally Symbiotic Housing of Japan are selected. As the sample of Korea, the Unnam district in Kwangju was surveyed. As samples of Environmentally Symbiotic Housing, the Hukasawa Environmentally Symbiotic Housing, the house of Osaka Municipal Kawachinagano Kido, the experimental house of Next21 in Osaka and U-court of Kyoto were selected. There are significant differences in the number of households and stories between samples of Korea and Japan. When considering environment-friendly multiple dwelling housing, the size of land and resident building is required to be as modest as human scale.

3.2 Evaluation of Composition of Indoor Common Space

3.2.1 Study of Form of Resident Building

The multiple dwelling housing of Korea and Japan was evaluated by the environment-friendliness evaluation table that was drawn up in 2.3. For the apartments of Unnam Housing Complex, arrangement of households are classified into stairway

type, core type and corridor type and theses were regarded as the representative types since Unnam Housing Complex has the similar structure for methods of dwelling unit arrangement.

Table 5: Resident Building Plan

	Resident building Plan
Unnam Stairway Style	
Unnam Core Style	
Unnam Corridor Style	
Hukasawa	
Kido	
NEXT 21	
U-court	

Evaluation of each item is indicated in 4 levels and as shown below. Unnam Housing Complex is apparently contrasted with the Environmentally Symbiotic Housing. It is no wonder because the Environmentally Symbiotic Housing is multiple dwelling housing while the apartments of Unnam Housing Complex are just ordinary multiple dwelling housing. However, through this evaluation we can find which aspects shows apparent differences specifically. Differentiation was apparent in the aspects of active solar system, consideration of passive solar system and provision of space for living creatures. To design environment-

friendly, these aspects should be considered when designing resident building. The differences among arrangements of dwelling units are not apparent except for ventilation during summer, but it is found that arrangement along corridors is most efficient in ventilation among ordinary multiple dwelling housings. However, even among the same arrangement of dwelling units, one can be designed more environment-friendly and U-court was efficient in ventilation and had a good evaluation for the item of balcony even though it is a kind of arrangement along stairways.

Table 6: Evaluation of Form of Resident Building

Evaluation Item	Unnam Stairway Style	Unnam Core Style	Unnam Corridor Style	Hukasawa	Kido	NEXT 21	U -court
Circumference per Unit Ground Area	0.62	1.33	0.93	0.67	0.67	0.96	1.08
Ventilation in Summer	x	△	○	◎	○	◎	◎
Courtyard and Light well	x	x	x	○	△	○	x
Terrace, Balcony	△	△	△	○	△	○	◎
Meeting Place	x	x	x	△	○	○	○
Green Tract	x	x	x	○	○	◎	○
Space for Living Creatures	x	x	x	○	△	○	△
Efficient Control of Sunlight	△	△	△	△	△	△	△
Active Solar System	x	x	x	○	○	○	x
Passive Solar System	x	x	x	○	x	○	x

(◎:Affirmative Yes ○: Yes △: So So X: No)

3.2.2 Study of Specific Space Plan

The evaluation item in which contrast between the multiple dwelling housing and the Environmentally Symbiotic Housing is apparent in the composition of passage space. Common room, warehouse, space for plant box and guardrail need to be installed and more space should be provided for

various activities of residents. Corridor and courtyard type is more superior in environment- friendly composition of passage, and appropriately correlated indoor space with outdoor environments even though it is rather inefficient in the rate of circumference to unit ground area.

Table 7: Evaluation of Specific Space Plan

Evaluation Item		Unnam Stairway Style	Unnam Core Style	Unnam Corridor Style	Huka sawa	Kido	NEXT 21	U- court
Entrance to Resident Building	Support of Separate Collection of Garbage	○	○	○	x	x	x	x
	Footpath	△	△	△	○	○	○	x

	Barrier-free of in and out of Building	○	○	○	○	○	○	○
Passage Space	Common room, Warehouse	x	x	x	x	○	x	x
	Space for Plant Box	x	x	x	○	○	○	○
	Extra Space	x	x	x	○	○	○	○
	Ventilation	△	△	○	○	○	○	○
	Guardrail	x	x	x	△	△	△	△
Front of Dwelling Unit	Sunlight	△	○	○	○	○	○	○
	Space for Privacy	x	x	x	○	○	○	○

(◎:Affirmative Yes ○: Yes △: So So X: No)

4. CONCLUSION

This study related to the planning of environment- friendly indoor common space, and developed the table for evaluating an environment-friendliness of indoor common space. Through application of the evaluation table, it is clarified the specific design method of environment-friendly indoor common space. Even though more study of planning table for environment-friendly and relevant cases are necessary, significant results of this study are as follows.

In planning or evaluating environment-friendly multiple dwelling housing, it is appropriate to apply the table for the evaluation of indoor common space in stepwise according to the process of planning. These evaluation tables can also be used in planning environment-friendly multiple dwelling housing, and therefore more specific approach, in addition to the fundamental approach, is necessary.

Environment compatibility of indoor common space can be evaluated in the sector of shape of residential building, specific space plan, and adjoining method and material. For the sector of residential building, outdoor space needs to be an introduced indoor, and a meeting space as well as a green tract needs to be furnished. For specific space plan, it is important that common warehouse, plant box and guardrail are furnished and leisurely space is provided.

ACKNOWLEDGEMENT

"This work was supported by the Korea Research Foundation Grant funded by the Korean Government (MOEHRD)" (The Regional Research Universities Program/Biohousing Research Institute)

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