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The Design Criteria for the Model Development of the New-hanok Type Public buildings - *Focused on Expert Opinion Surveys* -

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ABSTRACT

Purpose: According to the characteristic of hanok public building, Planning criterion of structure, technology, efficiency, design is needed which can includes various type of new-hanok type public buildings. In this paper, we collect expert opinions to be used as a basis for developing models of New-hanok type Public Buildings. **Method:** This study was conducted in Research Study and expert surveys. The Part of reviewing Study looked at conception of new-hanok type public buildings model development and overview planning criterion set briefly. Expert surveys were targeted to professors and architects who are related in new-hanok type public buildings model development research. **Result:** In this study, we suggest improvement direction about planning criterion of new-hanok type public buildings model development surveys. In conclusion, first, In concept and legal status, it is necessary to adjust clearly than the term and legal status of new-hanok type. Second, various applicability is needed by using new materials and new construction method at the part of planning elements. Third, 'composed structure-juxtaposed type' should be clearly classified or combined at the part of Setting of type. Forth, improvement on heat insulation, soundproof, waterproof efficiency is demanded to roof, wall, window systems. Fifth, arranging revitalization plan is important.

1. Introduction

1.1. Purpose

As Ministry of Culture, Sports and Tourism announced 'The Second Stage of the Government Administration, Direction to Cultural Prosperity and Promotion Plan'(August 18th, 2015), it set 'Re-discovery of Traditional Culture and Creation of New Values' as core policy and declared that it would re-discover the scientific characteristics and healthiness of Hanok and promote its modernization as part of the implementation plans. Since 2000, the government has implemented Distribution and Expansion of Hanok and Hanok Research and Development Project¹) as part of Hanok Cultural Prosperity Project²). Of the implementation plans of Hanok Research and Development, the introduction and support of

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Hanok-typed public building has been active and important in making the excellence of Hanok known widely and enhance the integrity and value of Korean public buildings. Such effort has been paid off. Because a public building is used by many users, Hanok-typed public building needs to be built, reflecting public convenience and various functions to maximize the popularization and image enhancement of Hanok.

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Unfortunately, the concept of, suitable subject and criteria for Hanok public building are not clearly defined and developed though various forms of Hanok public buildings are being provided at the level of the government, so that the government faces obvious barriers to systematic support and management. Therefore, it is urgent to set practical design criteria for Hanok public building so as to manage comprehensive aspects of it such as structure, technique and technology, material, performance, and design while succeeding to the tradition of traditional Hanok.

In this respect, the present study conducted an expert opinion survey to verify and derive the key considerations of design criteria and will use them as the basic data for developing new-Hanok type public building model.

1.2. Method

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It is the project supported by Ministry of Land, Infrastructure and Transport and Korea Agency for Infrastructure Technology Advancement. High-performance and low-cost Hanok technique and technology has already been realized in the first phase (2009–2013) and the project is now in the second phase (2013 ~2016) of empirical study to apply the technology to Hanok.

²⁾ Hanok Public Architecture Support Business Project (2008) that Ministry of Land, Infrastructure and Transport supports local governments with, 'New Hanok Plan for Advancement of National Status' implemented at the government level to promote Hanok on May the 3rd, 2010, and ^THanok, Etc, Architectural Assets Promotion Act₄ (Act No. 12739, legislated on June 3rd, 2014) etc.

This study mainly consists of literature review³) for model development and expert opinion survey. In reviewing precedent studies, focus was placed on concept development and design criteria of new-Hanok type public building. A questionnaire-based expert opinion survey was carried out with professors, researchers and model developers that have done a research related to model development of new-Hanok type public building or worked with such model before.



Fig. 1. Expert Opinion Survey Process

2. Literature Review Related to the Development of New-Hanok Type Public Building Model

In this section, the summary is given of key researches regarding 'the development of new-Hanok type public building model', which was given to help the experts understand the questions in the survey. This study looked into the concept and common design factors of new-Hanok type public building in an effort to understand the direction to setting design criteria for the development of new-Hanok type public building model; to test the applicability of the DNAs of Korea traditional architecture derived for architectural design elements, and configuration technologies (tentative)⁴) and system (tentative)⁵); and find improvements.



Fig. 2. Research Content Progress Pictures

2.1. Design Concept of New-Hanok Type Architecture⁶⁾

Based on the structure, functions, esthetic beauty of traditional Hanok, the design concept of 'new-Hanok type architecture' is to modify, reconstruct and create the design elements derived from each of 'DNAs' of Korean traditional architecture, 'research outcome'of Hanok Research and Development (1 phase), and future-oriented 'modern architecture' under new architectural environments.

This concept is to form an aggregate of the structure, functions, traditional beauty of Hanok as basic orientation, various spaces to be created through variable spatial design, and internal/external domains including transitional space. Therefore, the design concept of new-Hanok type architecture should have potential value and significance as a tool to popularize Hanok and make Korean architectural technique and architectural culture known to the world, based on the structure, functions, esthetic beauty of traditional Hanok.



Fig. 3. The configuration concept of New-hanok type building(proposal)

³⁾ The review mainly focused on the 1st phase and 2-1 phase of the research project "The Development and Construction of New-Hanok Type Public Building Model (LH)" of "Part 3 Project of Phase 2 Hanok Technology Development(2013-2016).

⁴⁾ The configuration technologies (tentative) are those to connect between traditional architecture and modern architecture based on 6 types of structure set in this study.

⁵⁾ The configuration system (tentative), which is R&D for Hanok functions and performance to actively embrace modern convenience and efficiency, includes, roof, wall, window, storage, facility and other systems.

⁶⁾ Park, Joon-Young et al., "The Design Elements for the Model Development of New-Hanok Type Service Facilities in Apartment Housing -Focused on the Genetic factors of Korean Traditional Architecture-", KIEAE Journal, Vol. 15, No. 3, Jun. 2015, p.30

2.2. Design Concept of New-Hanok Type Public Building(plan)⁷⁾

'New-Hanok type public building' conceptually designed on the basis of the current legal system and precedent studies consists of wooden structure type (column, beam and key structure sections); composite structure -convergence type (ferroconcrete structure, steel structure) with modern structure to create various spaces through flexible spatial plans; building and its annexes, and Korean-style open buildings, architectural structures, and outdoor pace that reflect traditional elements and futuristic design elements that succeed to, develop and creatively reinterpret the characteristics of traditional Hanok.

Especially, 'new-Hanok type public building' should hold value and play a role as public facility to enhance local residents ' welfare, cultural benefits, communication and exchange because it is space closely related to their daily lives.

2.3. Setting Legal Status of New-Hanok Type Public Building(tentative)⁸⁾

To establish the legal status of 'new-Hanok type public building', 「Hanok, Etc, Architectural Assets Promotion Act」⁹⁾ was reviewed. According to the Act, 'Hanok' is categorized as 'building' in architectural asset while 'Hanok architectural style' includes both 'building' and 'spatial environment'. They are defined too broadly and ambiguous.

When 'Hanok architectural style', which is present in this society in various forms, is categorized, it can mainly be classified into 4 main formats: new-Hanok type public building¹⁰), new Hanok ¹¹), modern Hanok ¹²), and ferroconcrete building built in the style of wooden Hanok¹³). The legal status of new-Hanok type public building set in this study is different from 'new Hanok', included in 'Hanok architecture style' defined in 'Hanok, Etc, Architectural Assets Promotion Act', excluding ferroconcrete building built in the style of wooden Hanok.

2.4. Basic Direction to the Development of New-Hanok Type Public Building Model¹⁴⁾

The basic direction to the development of New-Hanok type public building model is to succeed to the merits of traditional Hanok architecture and improve them to modern architectural environment. Therefore, new-Hanok type public building proposed in this study seeks to be a building of high potentiality and value, being organically flexible to sustainable dwelling environment of past, present and future, actively respond to the various needs of users for living, and create new demands.

2.5. Extraction of Design Elements for New-Hanok Type Public Building(tentative)

The design elements for 'new-Hanok type public building' were derived separatedly for the DNAs of traditional architecture and modern architectural technique.

Based on the original principles of Korean architecture, the DNAs of traditional architecture were divided into structure, functions, and esthetic beauty¹⁵) through vertical(form) and horizontal (space) analysis frame. The elements of modern architectural techniques to introduce to new-Hanok type public building were divided into structure, functions, and esthetic beauty for design elements through the survey on Hanok completed after 2000.

Particularly, for the applicability of the design elements that were derived from the DNAs of traditional architecture and modern architectural techniques to 'new-Hanok type public building', they were reviewed for 'tradition+modern' in structural aspect, 'tradition< modern' in functional aspect, and 'tradition>modern' in esthetic aspect¹⁶).

2.6. Typology of New-Hanok Type Public Building by Structure (tentative)

'New-Hanok type public building' can be divided into 3 categories by structure: 'wooden structure type', 'composite structure-convergence type' and 'composite structure-juxtaposed type' and each of these 3 types can be sub-divided into 2 types: ① traditional Korean wooden structure type ②composite wooden structure type'¹⁷) commonly maintaining traditional Hanok

⁷⁾ Park, Joon-Young et al., "The Type setting and Application of the New-Hanok type Public Buildings -Focused on Cases were completed after 2000-", KIEAE Journal, Vol. 15, No. 5, Oct. 2015, p.48

⁸⁾ Foregoing paper (Oct. 2015), pp.48~49

⁹⁾ According to Clause 2 of 'Hanok, Etc, Architectural Assets Promotion Act' (Hereinafter Architectural Assets Act)_ , which was enacted from June 4th, 2015, 'Hanok '' and ''Hanok architectural style'' are both defined as ''architectural asset''

¹⁰⁾ It is differentiated from and a broader concept than 'New Hanok' which is visibly emerging. This concept is established to extend 'New Hanok', which is aimed to secure dwelling to various types of buildings including public building.

¹¹⁾ The main structure sections are architecture built in Korean traditional 'wooden structure type' and mean the buildings and annexes constructed by modern techniques and with modern materials to improve architectural performance. Ministry of Land, Infrastructure and Transport, 2008

¹²⁾ They are Hanok buildings built during modern times. They include Hanok of which size was reduced by the division of plot in the process of past urbanization plan (urban Hanok) and Hanok that changed from traditional Hanok (improved Hanok)

¹³⁾ They are modern buildings only of which appearance are designed in traditional architecture.

¹⁴⁾ Foregoing paper (Jun. 2015), p.32

¹⁵⁾ The division of Korean traditional architecture DNAs into 3 factors of architecture (structure, functions, and esthetic beauty) is an effort to give new-Hanok type public building value and meaning to the basic planning of the project for sustainable utilization of Hanok both in present and future. Therefore, the classification in 'Table 5.' is not fixed but flexible and variable depending on value of use and purpose.

¹⁶⁾ The part of the applicability is not based on quantitative analysis, but has been conducted on the comprehensive perspectives that this research team have had so far on the research outcome of Hanok Research and Development (1 phase and 2-1 phase), the publications in footnote 3) and 4, and domestic experts' opinions. Therefore, there is limitation.

¹⁷⁾ The division of new-Hanok type public building into 3 types and each type into 2 sub-types is an effort to use it as basic tool for the design criteria of the development of new-Hanok type public building model (see the publications in 'footnote4)'. Therefore, the typology in this paper is this paper-specific and other classifications are possible.

appearance and structure.

Category			Genetic I Korean Traditio	Modern Architecture Introduced Elements	Applic ability			
		Layout	River (地, s ↔ he	South) ↔ b eaven (天, N	uilding (人) North)	Basement, more than		
Struct	A	rchitecture	Wooden pos Stylobate(地) チ	st-and-lintel → column(ノ	construction: <) ↔ Roof(天)	two layers, the core structure,	tion +	
ure		Space	Exterior space ↔ I	(地) ↔ tran nterior space	sfer space(人) e(天)	RC·SRC, etc. construction	Mod ern	
			Entry area(地) ↔	Central area	(天)↔Subarea(人)	methods		
	pe	erformance	Natural heating (or roads), Variable storage	ondol), Natu wall(Variably space(closet,	ral cooling (wind y open the door), alcove)	Built-in thermal insulation, sound		
T		Dwelling	Daemungan, th haengrangc	Daemungan, the main house, Sarangc haengrangchae, byeoldang, shrine			Tradi	
unction	u	Palaces	Political Affairs	Life	Garden	gardens, such as new materials	∧ Mod ern	
	se	Temples	Chanting	Life	e Education	and new technology, environment		
		Sowon	Ganghak	Jehyang	Attached	ally-friendly energy utilization		
		NT / 1	Buildings, fenc					
	n	Natural naterials	Roof: Korean t					
			Yard: Clay,	Lighting				
Beauty	Colors		Color of Korea is not flashy, simple and neat, and should be careful not to violate than being the prominent for full harmonization, White worship, dancheong			electricity, communicati ons, fire, air conditioning	Tradi	
	Line		Roof: Flexible c and ridg	and heating facilities	uon ∨ Mod			
	P	roportion	No specific r	all buildings	and how	ern		
	Ceiling		Well Suspended ceiling, ceiling lanterns, canopies, bogae, etc			futuristic design		
	I v	Doors & vindows	Patterns of C jeongjasa	orrugated, P I, comb, kko	anjang, ttisal, otsal, etc.	elements		
	Humorous		Humorous ele (wickets, f	ment in the fences, chim	hiding places neys, etc.)			

Table 1.	Design	Elements	of	New-Hanok	type	public	building(proposal)	
10000 1.	20018.1	Биенненно	~	11011 11011011	<i>spc</i>	priorie	oundaning(proposed)	

New Hanok-type public building in 'Composite structureconvergence type' is a building mainly constructed in wooden structure and modern structure is introduced to supplement the sections that can't be built only in wooden structure. It is divided into '①traditional Korean wooden structure + modern architectural structure와 @composite wooden structure + modern architectural structure'.

New Hanok-type public building in 'composite structurejuxtaposed type' is a building where the elements of Hanok is minimized in application while giving an overall image of traditional Hanok to the building. It can break down into '①traditional Korean wooden structure + modern architectural structure type and ② composite wooden structure + modern architectural structure'.

Category	Conceptual diagram	Characteristic
Wooden Structure type		 Columns, beams, Dori, etc, the basic structure of wooden structures The difficulty of planning of multi-story building and construction for space Jipseongmok, trusses advantage, etc, tried to Modern improve Expand in size by increasing the number of building
Composite Structure- Convergence type		 The fusion of modern architectural structure with wooden structures Ease of Disabled-accessible space and composition of a large-scale space Effective planning of a multi-layer and basement structure Technology is required for the efficient integration of structure
Composite Structure- Juxtaposed type		 Physical juxtaposition of the wooden structure with a modern architectural structure Processes separation and spatial compartment Easy effective of Ease emphasis of the traditional beauty and modern architecture Natural Joint development needs of the structure

Table 2. Structural type settings of New-Hanok type public building (proposal)

2.7. Initiative System (tentative) of New-Hanok Type Public Building

Of the DNAs of Korea traditional architecture, 5 key functions (natural lighting system, natural convection system, flexible wall system, storage system, natural air-conditioning system) were selected from functional (performance) perspective in setting the scope of configuration system including roof, wall, window, storage, facility (including others) system so as to work suitably for ever-changing architectural environment¹⁸).

In the configuration system of new-Hanok type public building, roof, wall, window, storage, facility and others, which were independent from each other before, can organically converge for spatial, functional and/or structural purpose, and play creative roles.

¹⁸⁾ The selection of 5 functions as configuration system for new-Hanok type public building has significance in that they were chosen to set the scope and subjects as the design criteria to use practically for developing and realizing new-Hanok type public building model in later plan. Therefore, configuration system not suggested in '2.6' can also be added and used in following development of new-Hanok type public building model and in setting the design criteria for it.

Category	Initiative system (example)						
	Skylights for natural light	Roof lightweight Utilizing trusses	Eaves fleeting, ephemeral roof				
Root Systems		For G A MEN TAKe 44.5					
	Storage utilizing In-bangJae	Utilizing sliding doors	Sliding walls form				
Walls system	6/5 AV 4		30 FE 4 WE 1 3 5 FE 4 WE 2				
W. dam	Variably open the door	Apply gasket	Smart Windows application				
Systems	44 88 24 45 86	CE CH4 AC 4-2-2 H 725 AC8 A-2					
0	Well Banja utilization ceiling storage	The outer wall of storage space utilization	Closet space utilization				
systems		2554 SEF4					
Equipment,	Outdoor installation with Dead Space	Integration of wooden structures and equipment	Install LED lights				
and other systems							

Table 3. Initiative Systems of New-Hanok type public building (proposal)

3. Expert Opinion Survey With Respect To the Development of New-Hanok Type Public Building Model

3.1. Summary of Expert Opinion Survey

This expert opinion survey was conducted to collect experts opinions from various fields with respect to setting the design criteria for the development of new-Hanok type public building model. The questionaries of the 1st expert opinion survey were distributed on July the 6th, 2015 and collected until July the 28th. The questionaries of the 2nd expert opinion survey were distributed on July the 30th, 2015 and collected until August the 13th. And the those of the 3rd expert opinion survey were distributed on September the 14th, 2015 and collected until October the 7th.

For the subjects for survey, 30 experts who well understand and experience research, theory and/or actual use in the development of new-Hanok type public building model were selected. The 1st survey consists of 8 theorists and 2 actual users and the 2nd survey consists of 5 theorists and 4 actual users. And the 3rd survey consists of 3 theorists and 8 actual users.

This study adopted qualitative method for opinion survey to obtain accurate and professional responses with open questionaries. The questionnaire was designed in self-administered style and distributed and collected via e-mail.

Table 4	able 4. Expert Opinion Survey Overview								
Category		Contents							
Period	Primary	2015. 07. 06 ~ 2015. 07. 28(Theory 8 people, working 2 people)							
and	secondary	2015. 07. 30 ~ 2015. 08. 13(Theory 5 people, working 4 people)							
surveyed	tertiary	2015. 09. 16 ~ 2015. 10. 07(Theory 3 people, working 8 people)							
Way	Using	g an open questionnaire via e-mail reply, qualitative analysis							

The results are of both data description and data analysis. Before the respondents answered to self-administered questionnaire questionnaires of open questions, the summary of the research was provided to them in an effort to help them understand the questions and secure more accurate responses as follows: A. the basic concept of new-Hanok type building (tentative); B. basic configuration of new-Hanok type public building (tentative); C. design elements extracted for new-Hanok type public building (tentative); and various structure types of new-Hanok type public building (examples). The questionnaire used for the expert opinion survey is outlined in Table 5.

Table 5. Open questionnaire

Category	Item number	Survey information
Concept and legal status	1	Please indicate your opinion about the concept and the legal status New-Hanok type public buildings set in the present study.
Design Elements	2	Please indicate the measures applied after you have selected modern architecture introduced elements with traditional architectural genes to think most important about the plan elements for the development of new-Hanok type public building model.
Type setting (proposal)	3-1	Please write down your opinion about the classification system of New-Hanok type public buildings, model development time, please select the type only one who thought you had best.
	3-2	Please indicate your opinion on each type when applying, considerations.
Initiative system (proposal)	4	Please write your opinion about what should be considered the most important by initiative system of New-Hanok type public buildings.
Etc	5	Please write freely your other comment in addition to above.

3.2. Data Analysis of Expert Opinion Survey

(1) Concept and Legal Status

The experts were surveyed upon the concept and legal status of new-Hanok type public building set in this study and each export was asked to express his/her opinion on 3 categories: 'positive', 'positive but it needs improving', or 'negative'. Their responses are summarized in Table 6.

Most of the theorists and practitioners were positive with the need of establishing the concept and legal status of new-Hanok type public building. However, they commonly pointed out the urgency of legal system rearrangement with respect to vague use of such terms as 'Hanok', 'New Hanok' and 'new-Hanok type'.

Some of the respondents also pointed out that 'space' element needs adding to the design elements for new-Hanok type public building, along with structure, functions, and esthetic beauty, which had been derived from the DNAs of Korean traditional architecture and modern architectural techniques. And they thought that the division of the elements into structure, functions, and esthetic beauty are proper considering that this division is not fixed but flexible and variable depending on value of use and purpose, as explained in footnote 11.

Although they responded that it is necessary to consider expanding the application of wooden structure beyond the key structure sections, this opinion can be left for future review because this study set the scope of the application, aiming to develop the model of new-Hanok type public building, which is even new concept now, and the design criteria used to realize the model in current environment.

Especially, some experts expressed theoretical opinion that it is necessary to improve the current legal system to develop the model of new-Hanok type public building and commercialize it.

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Category	Summary comments	Number of people	Ratio(%)
Affirmative	- Attention needs to avoid a biased approach outward side	16	53
	- Incentives need for New-Hanok type Public Buildings		
Positive modification needed	 Adjust needed clearly the definition and legal status of New-Hanok type, ensuring differentiation with Han-style Structure, function, in addition to beauty, the 'space' concept necessary to add Apply the needs of a variety of other traditional wood frame structure Need to include a modern re-interpretation techniques of Hanok 	11	37
Negative	 Distinction of the Shinhan & sinHanok-hyeong is not clear Not differ from the requirements of the current Building Code even public buildings 	3	10
Total		30	100

(2) Design elements

In the survey, both experts theoretical and practical opinions were asked on the design elements of 'the DNAs of traditional architecture' and 'modern architectural techniques to introduce' to developing new-Hanok type public building model. Table 7 shows the summary of the design elements that the expert selected by structure, functions, and esthetic beauty.

Among the DNAs of traditional architecture, post-and-lintel construction was most chosen as design element for structure to use. In functional aspect, natural ventilation and spatial variability were most mentioned and traditional details and transitional space were most selected for the esthetic beauty of new-Hanok type public building.

The experts answered that steel/RC/SRC structure, new materials, and new engineering techniques should be borrowed from 'modern architectural techniques' in structural aspect. In functional aspect, the elements related to performance and energy saving of 'modern architectural techniques need to introduce to

new-Hanok type public building. Traditional details of flexible space and lighting, and new materials were most recommended as design elements for esthetic beauty.

Table 7. Opinion Analysis of the Design Elements

Category		Kinds	Mentioned number ¹⁹⁾	Ratio(%)
		Post-and-lintel construction	18	60
		Self-assembly	4	13
	Structure	Roofs and Eaves, Kong-po	2	7
		A sense of volume of the main structure	1	3
		Natural ventilation	8	27
		Spatial variability	7	23
		Ondol	6	20
Genetic	Function	Eco-friendly materials and planning	4	13
Factors of Korean		Connection Relationship building and yard	3	10
Traditional Architecture		Lighting, fences and gates, floors (hall)	1	3
		Traditionally details	7	23
		Transition space	6	20
		Line shape	5	17
	Beauty	proportion	4	13
		Eaves	3	10
		Arrangement of rafters, Stylobate	2	7
		Structural exposure, encircle of the -type space, simplicity, natural beauty, windows and doors design	1	3
		Steel / RC / SRC structure	12	40
		Modern materials (interior finishing work etc)	6	20
	Structure	Large buildings, E/V	4	13
		Underground	2	7
		Easy assembly, bonding moment, long-span structures	1	3
N 1		Confidential, improved thermal performance	9	30
Architecture		Facilities Room	4	13
Introduced	Function	Low energy consumption	3	10
Elements	r unotion	Deep eaves, modern flat type, floor heating technology	2	7
		Maintenance, ventilation, lighting simulation, rooftop	1	3
		Variable space	4	13
		Light	3	10
	Beauty	Traditionally detail using modern materials, facade design	2	7
		Preform partially introduced, transparency	1	3

(3) Typology Setting (tentative)

The experts were asked to opinion on the typology of new-Hanok type public building set in this study.

Table 8 is the summary of their opinions on 3 types (wooden structure type', 'composite structure-convergence type', 'composite structure-juxtaposed type') of new-Hanok type public building defined in this study and considerations necessary in developing the model of new-Hanok type public building.

¹⁹⁾ There is difference between the total number of the respondents and the number mentioned because the latter includes overlapping and no responses. The numbers mentioned in Table 9 and Table 10 are counted in the same manner as Table 7. (no more footnote description for this from here)

57% of the theorists and practitioners selected 'composite structure-convergence type' as the most suitable type for new-Hanok type public building while 30% recommended 'composite structure-juxtaposed type'. Regarding the reasons for their selection, they explained that 'composite structure-convergence type' allows easy fusion of traditional and modern materials and creative interpretation of traditional Hanok. In addition, they mentioned that 'composite structure-juxtaposed type' has that merit of actively introducing modern architectural techniques as well as expressing Hanok symbolically. There are some respondents pointing out ambiguous distinction between 'composite structure- convergence type' and 'composite structure-juxtaposed type'²⁰), but they did not suggest a specific solution to it.

Table	8.	Opinion	Analysis	of	the	Type	Settings
			~	~		~ 1	<u> </u>

	Category	Choice (1)	Ratio (%)	Summary comments (2)
	Wooden Structure type	1	3	- Wood and steel, concrete is difficult to use a mixture of different properties
Composite Structure- Convergence type 17 57 - This free as and conterring - It must sol - Directing contraditional of traditional of the second secon			57	 This free access is possible in the fusion of traditional and contemporary materials It must solve the structural problems of the joints Directing creative contemporary space that reflects the traditional design
	Composite Structure- Juxtaposed type	9	30	 In a symbolic show of Hanok The proposed legal basis is required for the proper juxtaposition The overall harmony of part of the Traditionally, modern part is required (Problem resolution is required, which can be seen as a separate building)
	Not choosing	3	10	-
	Total	30	100	_

(4) Initiative System (tentative)

In the expert opinion survey, they were asked to express most important elements for the configuration system of new-Hanok type public building. Their opinions were made on 6 facility systems and other systems were separated from 5 configuration systems set in '2.6' (roof, wall, window, storage, facility (including others)) in an attempt to collect broader opinions (see Table 9).

For 'roof system', the experts said it needs 'maintaining roof shape', 'lightweight roof and roof drying', and 'modern functions under roof (e.g. solar collector panel)'. They emphasized performance aspects for 'wall system' such as 'thermal insulation and sound insulation' and opinions the need to use modern technology-based finishing materials and to apply variable modular wall. For 'window system', they recommended to develop system window with high performance in durability, water-resisting qualities and water tightness unlike traditional window system, and adopt traditional window design, modularization and standardization of windows. In addition, they suggested active use of interior spaces such as ceiling and walls to create attic and closet for 'storage'. They also stressed the need to build storage system of modern functions. For 'facility system', they emphasized it is necessary to apply high-tech systems such as flush mounting-typed facility, various lightings, air-conditioning and ventilation. Especially, thermal insulation, sound proofing and water-resistance performance are commonly asked to apply to both 'roof system', 'wall system' and 'window system'. In 'other systems', the geological elevation gap, proper yard arrangement, environment-friendly materials and no barrier space for characterizing Hanok.

Table	9.	Opinion	Analysis	of the	Initiative	Systems

Category	Things to consider	Mentione d number	Ratio (%)
Roof Systems	Roof Type	14	47
	Lightweight roofing materials, dry way	8	27
	Roof lower rafters, elaborate Kong-po forms, modern features introduced(Solar panels, etc.)	5	17
	Roof integrated systems structure (shortening the construction period, plant production)	4	13
	Features of the eaves	3	10
	Durability, thermal insulation, waterproofing of roof, diversification of roof shell material	1	3
	Thermal insulation, sound insulation performance increase	14	47
Walls	Modern process interior finishing work	7	23
system	Modular Wall (factory production), Variable wall	5	17
	Using environmentally friendly materials	3	10
Window Systems	System Window (durability, water resistance, thermal insulation)	17	57
	Reflect traditional Windows design	15	50
	Variable window system, off-the-shelf production (mass production, and maintenance)	4	13
	Sunshine regulation introduced	2	7
	Locking Device Development	1	3
	Storage using the Ceiling, wall (Attic, closet)	12	40
Storage	Modern storage systems introduced	5	17
systems	Conditioning of the internal space as a decoration	3	10
	Cellar	1	3
	Equipment flush mounting type	9	30
	Utilizing a variety of lighting	6	20
	Air-conditioning	5	17
Equipment	Lighting, ventilation systems	3	10
systems	Confidential, improved thermal performance	2	7
	Water supply and drainage facilities, wireless equipment, safety equipment on fire, equipment drawing standardization	1	3
	Natural Energy	6	20
	Use the terrain height difference	4	13
Other	Yard layout and leveraging	3	10
systems	Eco-friendly materials, barrier-free space	2	7
	Disaster prevention systems, smart space, hierarchies inherited traditional space	1	3

(5) Other opinion

In the expert opinion survey, the experts were asked to express their opinion on other matters related to the design criteria necessary for developing new-Hanok type public building model.

²⁰⁾ As already explained in '2.3. Setting Legal Status of New-Hanok Type Public Building(tentative)', the ambiguity between 'composite structure-convergence type' and 'composite structure-juxtaposed type' in the typology of new-Hanok type public building set in this study is attributed to categorizing new-Hanok type public building in 'Hanok architecture style (type)' stipulated in 'Hanok, Etc, Architectural Assets Promotion Act'. Based on this, it is expected that legal system will be re-arranged for more accurate and applicable scope of new-Hanok type public building.

Table 10 summarize them.

Their opinions can be categorized mainly into 'model development plan' and 'activation plan'. In the number of times, 8 opinions were collected on 'model development plan' while 10 ones were mentioned on 'activation plan'. of them, the opinions mentioned more than 2 times include 'For engineering, modern architecture should be used but finish work should be done with wood', 'It is necessary to establish a plan for maintenance and repair, and for preventing disasters', 'The government should recommend and promote the construction of new-Hanok type public building and provide incentive for the construction', and 'The government needs to expand demonstration project and support budge for it.'

Therefore, it was found in the survey that new-Hanok type public building does not only need model development, but also implementation and activation plan to distribute and expand it.

Table	10.	Opinion	Analysis	of the	Etc

Other comments	Mentioned number	Note		
New-Hanok type is follows the modern construction methods, finishes should be wood	2			
Pre-fabrication application	1	Model		
Smart space, passive design application	1			
Modern workspace application	1	Development		
Indirect (metaphorical) expression rather than direct imitation of Hanok	8 times)			
By region (urban, suburban, rural) New-Hanok type design method diversification	1			
It requires an in-depth review of the process of forming the meaning of Hanok form	1			
Enlarge promote pilot projects and budget support, competition enforcement needed	3			
Maintenance and prevention system construction needs	2			
New-Hanok type public buildings built upon, incentives and strong recommendations needed	3			
Guidelines maintenance necessary of the New-Hanok type public buildings design, construction, equipment	1	Activation (mentioned 12 times)		
Need to establish an integrated database of New-Hanok type public buildings	1			
A Comparative Study on the need for the modernization practices of abroad traditional construction				
The need for the proposed recycling scheme for existing traditional architecture	1			

4. Conclusion

This study was aimed to collect the experts opinions to find the considerations necessary in establishing design criteria for new-Hanok type public building model. In this respect, the present study conducted an expert opinion survey to verify and derive the key considerations of design criteria and carried out data description and qualitative analysis with the collected data. The findings are as follows. First, there was consensus among the experts on the need of defining the concept and legal status of new-Hanok type public building. However, they made principle-level opinions on the arrangement of related laws, which is necessary to remove the ambiguity in terminology such as 'Hanok', 'new Hanok' and 'new-Hanok type', and to support the commercialization of new-Hanok type public building. Therefore, it is necessary to improve the limitations of the current legal system (e.g. Hanok, Etc. Architectural Asset Promotion Act, Building Act, and such) in order to develop new-Hanok type public building model and commercialize it. In addition, it is needed to provide institutional support to the parties in interest by entity (e.g. material production, facility, constriction, repair and maintenance) with incentives.

Second, as far as the design elements are concerned, the experts said that it is necessary to introduce the 'post-lintel construction', 'natural ventilation and flexibility', and 'traditional details and transitional space' of the DNAs of traditional architecture to new-Hanok type public building. For the elements from 'modern architectural techniques', they said that steel/RC/ SRC structure, new materials, and new construction engineering, energy saving architecture, spatial variability, and traditional details using modern lighting and modern materials are needed. Therefore, when new-Hanok type public building model is developed in future, the common design elements (e.g. spatial variability) considered necessary to apply to all the key dimensions (structure, functions, and esthetic beauty) should be first considered. And then, the design elements that need adopting from traditional architecture or modern architectural techniques should be used considering the purpose, composition, and system requirement of target public building in separate or integrated way.

Third, the respondents said about the typology (tentative) of new-Hanok type public building that 'composite structureconvergence type' and 'composite structure-Juxtaposed type' are the most suitable for new-Hanok type public building. However, some of them mentioned that the typology is vague. Their preference for suitable types turned to be 'composite structure- convergence type', 'composite structure-juxtaposed' and 'wooden structure type' in the order. However, when it is placed in consideration that new-Hanok type public building model has not yet been developed and implemented, different opinions among the experts are understandable. Since the typology is not fixed or permanent, it is worth considering it as an tentative idea helpful in developing the model of new-Hanok type public building, which is new concept, and in setting the design criteria. The details of the typology need to be made along with the systematic re-arrangement of related legal system.

Fourth, the configuration system (tentative) of new-Hanok type public building can be an important factor in preparing the design criteria for the model development. The expert opinion survey showed the emphasis on utilizing the merits of traditional architecture and supplementing its shortcomings with modern architectural techniques, performance and modern system. In particular, the experts share the common need for improving the performance of thermal insulation, soundproofing, and waterresistance for roof, wall, and window system. They also expressed the need for modularization and standardization of window, and application of modern architectural technique to storage and facility system. When these considerations are put all together, it indicates that automation-based mass production system should be established to overcome the weak performance and small quality production based on manual industry of tradition architecture so as to popularize new-Hanok type public building and design user-oriented various Hanok space. Therefore, these are important design elements to be considered in developing to new-Hanok type public building model in future.

Fifth, among opinions on other matters related to new-Hanok type public building, those on 'model development' can be summarized in considerations of maximizing the strengths of traditional architecture as base with modern architectural techniques (e.g. wooden finishes using modern architectural engineering, indirection expression of Hanok, and process review of Hanok style). The opinions on 'activation plan' includes expansion of demonstration projects, budget support, opinion convergence through public design contest, plan for repair and maintenance, and disaster prevention system after building, providing various incentives, building integrated DB, benchmarking the overseas cases of modernization of traditional architecture, recycle of traditional architecture. However, they are too broad in dimension so it is difficult to categorize into certain types. However, these opinions on other matters are worthwhile to pay attention to in developing and activating new-Hanok type public building model in future.

Only with expert opinion survey, this study has limitations to analyzing data, verifying direction to the design elements for model development, and proposing considerations and implications. However, considering the current situation in which there is no clear definition and direction to the design criteria for new-Hanok type public building, so there is little ground on which government support is provided to new-Hanok type building, this study finds itself significance in that it proposed podder to verifying the direction to design criteria for the model development. In a following research, qualitative survey as well as qualitative one needs employing to collect broader range of experts. In addition, more research and studies with overseas cases will also be necessary to compare the modernization and popularization of traditional architecture in Korea and foreign countries. It will help establish a institutional system for new-Hanok type public building.

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