

*The Architectural Characteristics of Usage through Case Analysis of New Han-Ok Style Public Buildings*

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ABSTRACT

Purpose: A comprehensive review of Han-Ok and New Han-Ok Style architecture for various purposes nationwide. In the future, we will extract the design and construction element applicable to the social welfare field of Han-Ok Style, and utilize it as useful data applicable to the actual design and construction stage. **Method:** Reconstruct the scope of the case study of the New Han-Ok Style public building. We will analyze the case in connection with the 2nd stage case study of the existing Han-Ok technology development. Six representative cases are extracted according to the application that best matches the elements and concepts of New Han-Ok Style Public Buildings. We want to analyze the advantages and disadvantages of the application due to the use of Han-ok and modern buildings. **Result:** We will carry out further case studies on Han-Ok-style buildings other than public buildings, which are continuously being developed and constructed, and public buildings to be constructed additionally. The features and disadvantages of the structure, function, and aesthetic elements of each application should be subdivided. It is hoped that this study will be activated as a basic research applying the standard and evaluation factors for the construction of the New Han-Ok Style public building.

KEYWORD

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1. Introduction**1.1. Background and purpose of research**

Since the 2000s, key words about health such as eco-friendliness and well-being have become social trends and the demand for Han-Ok has increased and it has been expanded to the whole building business. And as the public buildings have begun to attract attention as a means to promote and spread the traditional beauty of the Han-Ok, the support, encouragement and research of the Han-Ok have been activated under the government initiative. The government and local governments are also actively engaged in activities about Han-Ok such as the establishment of laws and regulations related with Han-Ok, the establishment of Han-Ok village, and the restoration of traditional Han-Ok village.

Currently under the supervision of the Ministry of Land, Infrastructure, and Transport, there is a 3rd stage research on the development of Han-Ok technology and the research¹⁾[1] is proceeding in parallel with the demonstration construction. This

is a study to build and verify a new type of public building suitable for today's needs by solving the problems of Han-Ok which is not suitable for modern life and high construction cost by modern building technology and main the merit of Han-Ok. This contributes to the propagation and spread of Han-Ok public buildings in the future. In the previous second phase of the research, small and medium sized New Han-Ok style small-scale public buildings such as day care center, exhibition facilities and town hall have already been established. We have developed various construction technologies and reduced costs and verified the possibility of combining traditional Han-Ok and modern architecture. In the third stage, research is underway to establish various spaces, auditoriums, and libraries for the social welfare facilities that are needed. Through this, we plan to develop hi technical and design technologies to realize the construction of large-scale public buildings that can meet various social demands in the future. To do this, a case study on Han-Ok - style social welfare facilities and existing Han-Ok and New Han Ok buildings directly related to the third stage research is needed. Through this, it is necessary to review the matters and applicable technologies to be considered in the design and construction stage of the new Han-Ok style social welfare facilities in the future. Therefore, this study comprehensively reviews the various Han-Ok and New Han-Ok buildings that have already been

verified nationwide. Based on this, we will extract the design and construction technology applicable to the New Han-Ok style social welfare facilities and utilize it as useful data applicable to the actual design and construction stage.

1.2. Method and scope of research

This study reviews the related literature and preliminary studies of New Han-Ok style public buildings²⁾ [2] and reviews the direction of current research progress. Then, we conduct a case study analysis of the New Han-Ok style public buildings. After classifying the use and characteristics of each case, representative cases were extracted and analyzed in detail. We analyze the advantages and disadvantages of representative cases of New Han-Ok style public buildings by use and through this, we propose the continuous and applicable way of future research.

After reconstructing the scope of the case study of the New Han-Ok style public building, we will analyze the case in connection with the case study of the second stage of Han-Ok technology development project³⁾ [1]. We analyze the merits and disadvantages of the case of merging Han-Ok and modern buildings after extracting six representative examples that most closely match the elements and concepts of New Han-Ok style public buildings. And we want to analyze the commonness and difference of structure, function and beauty of six cases.

1.3. Review of advanced research

At AURI, the research was divided into cultural properties, authentic Han-Ok and new Han-Ok, and Han-Ok style architecture and progressed[3]. Since 2014, research on Han-Ok has been actively conducted mainly in residential areas. The research on New Han-Ok style public buildings has been activated since it was conducted as part of the second stage of the Han-Ok technology development project in 2014.

Park Min-young (2014) applied the trends extracted from the architectural elements of traditional and contemporary architecture to the cases, and suggested the design elements after analyzing them. Park, Joon-young (2014) set the complex planning standard for the wooden structure and modern structure of New Han-Ok style public building after extracting genetic factors of Han-Ok. Kim, Young-hoon (2015) analyzed

Table 1. New Han-Ok Style public building related research

Subject	Definition
Park, Min-Young, Lee, Hyun-soo, Lim, Sooyoung (2014)	In the past 10 years, we have investigated the New Han-Ok style public building case to refine the structure, function and beauty of traditional and modern architecture, Classify the extracted design trend by region, Suggest design element
Park, Joon-Young, Kwon, Hyuck-Sam, Cheong, so-yi, Jung, kyung Yoon, Son, Ji-Ho (2014)	Extracting the inherent characteristics of Han-Ok as genetic factors and setting criteria such as design, architecture, layout, spacem, New Han-Ok style public building is classified into Wooden structure type, juxtaposed type, and fusion type, and housing complex planning standard is set
Jung, Kyung-Yoon, Kwon, Hyuck-Sam, Cheong, So-Yi, Park, Joon-Young (2015)	for vitalization of New Han-Ok style public building New Han-Ok style public building, Applying system based on green building certification system, Suggests future improvement direction
Kim Young-Hoon, Peck Yoo-Jung (2016)	Han-Ok style Depending on the purpose of the building constructed as public day care center architectural characteristics and modern construction method, Han-Ok an analysis of how to use unique elements
Park, Joon-Young, Kwon, Hyuck-Sam, Cheong, So-Yi (2016)	For the activation of the New Han-Ok Style public building analysis of legal system such as improvement plan classification system, material resource, human resource, Problems and future directions presented after evaluation through expert consciousness survey
Park, Joon-Young, Jun, Myong-Hoon, Kwon, Hyuck-Sam, Cheong, so-yi (2017)	New Han-Ok style constitutes the basis grundrsatz of design of public building, It is composed of the joint planning standard and the specialization plan standard and suggests the concrete phase
Seo, Jung-Seung, Kim, Young-Hoon, Kwak, Dong-Yeob (2017)	Analysis of process management and work progress of New Han-Ok style public building, Suggesting future research plans by improving the problems of process management
Kim, Young-Hoon, Peck Yoo-Jung, Park, Joon-Young (2015)	The analysis of R & D application factors about Sunchang daycare center, Suggestions for improvement of technology and structure development of public buildings in the future through limitations of technology application
Park, Joon-Young, Bae, Kang-Won, Kim, So Young, Jung, Kyung-Yoon (2016)	A questionnaire survey was conducted on the development of the New Han-Ok style public building model, and based on the questionnaire, the model development plan was suggested and the directions for improvement were suggested.
Kim, Young-Hoon, Peck Yoo-Jung, Park, Joon-Young (2017)	Based on three cases of New Han-Ok style public, we reviewed the technologies reflected in the field of construction by each case. Suggest application techniques other than traditional method in demonstration construction

the case analysis of New Han-Ok style public buildings only in the day care center. Park, Joon-young (2016) suggested problems and future directions through the investigation of experts' opinions after the analysis of related laws and systems to revitalize New Han-Ok style public buildings. Park, Joon-young (2017) extracted the necessary performance of traditional architecture, modern architecture, and public architecture and proposes a complex type plan standard. Seo, Jung-seung (2017) proposed problems, improvement and research methods for the overall process management for three New Han-Ok style public buildings which have been proven by Han-Ok technology development research. Kim, Young-hoon (2015) analyzed the R

2) concept of the public architecture of the New Han-Ok style is a composite structure that uses wood for the main structures such as pillars, beams, and tori, and uses modern structures such as reinforced concrete structure, steel frame, and structure as the substructure.

The ideals and characteristics of Han-Ok and modern architecture as a fusion public architecture was categorized and extracted as structure, function, and beauty.

3) 2014 Urban Planning Project In the second stage of the Han-Ok Technology Development, the research and development of the new model of the New Han-Ok style Public Buildings was carried out simultaneously with the model building, prototype, case study etc

& D application factors, focusing on the Sunchang daycare center, reviewed the limitations of technology application, and suggested ways to improve the technology and structure development of public buildings in the future. Park, Joon-young (2015) conducted a questionnaire survey of experts on the development of the New Han-Ok style public building model, presented the model development and planning standards based on the survey, and suggested future directions for improvement. Kim, Young-Hoon (2017) examined the technologies presented in the existing research and the applied technology in the field of three New Han-Ok public buildings that were constructed.

In this paper, we propose an effective construction technique other than the traditional method in demonstration of field application technology. Advanced studies related to New Han-Ok style public buildings have been active since 2014, but they are focused on planning standards and basic research based on laws and case studies and research on characterization of space and appearance according to the use of each case has not progressed sufficiently

2. New Han-Ok style public building case classification

2.1. Scope of the case survey of New Han-Ok style public buildings

In order to classify the case studies of New Han-Ok style public buildings, we applied the method [4] applied to case studies in existing researches. New Han-Ok style public buildings have great features such as reduction of construction cost, securing of structural performance, and succession of genetic inheritance of Han-Ok. Therefore, there was a need to add harmony with modern structures other than the introduction of traditional elements such as Korean tableware and traditional wooden structures to the case study. New Han-Ok style public buildings are frequently used by citizens and are frequently exposed, therefore, it is important for citizens to recognize the image of Han-Ok.

The shape of the exterior included the reproduction of the roof structure using concrete, steel, etc. instead of the roof structure using the existing wood of the traditional Han-Ok. In addition to the roof structure using traditional tile tiles, all tile shapes including modified tiles, plastic tiles, and bronze tiles were included. In addition to the architectural form using the traditional wooden structure, it includes all forms using the reinforced concrete structure and the steel structure. In the existing Han-Ok, the range is limited to the Noble Han-Ok form because it is familiar with the Noble Han-Ok type, not

normal traditional house, including thatched house and low cost house. As a public building, it was examined whether the building was operated under the control of the government or the local government, maintenance and repair were carried out, and whether free access to citizens such as communication and exchange with the citizen was being carried out. The case study included not only the Han-Ok form from the planning to the construction of the existing building but also the building which continued use through the extension and renovation of the traditional and modern structure. <Table2 contents>

Table 2. Additional categories for case study of New Han-Ok Style public building

Subject	Definition
Roof structural material	Including concrete roof structure instead of wooden roof structure, Improved roof tile, plastic roof tile, copperplate roof tile, earthenware roof tile etc Use to form a roof structure
Han-Ok style structure	In addition to the traditional wooden structure using wood, it makes the hanok structure similar by utilizing R.C and steel frame.
yangbans house	In the form of Hanok, Reproduces the shape of the yangbans house where yangbans lived
Government management	Maintain and maintain under the management of government, local government
Free opening	Public buildings where liberty is open to citizens

Adapt the contents of , An Analysis on Regional Case for New Han-Ok Style Public building Demonstration, Kang, Moon-Chul

2.2. New Han-Ok style public building case

A total of 36 cases of New Han-Ok style public buildings were classified into 38 cases due to the fact that the characteristics of the buildings include two or more uses. New Han-Ok style public architecture has the advantage that the size and shape of the building can be designed more widely than traditional Han-Ok because of the combination of modern structure and wooden structure. As a result, the need to adopt the form of Han-Ok that appears due to the climate of the region has been reduced, and the characteristics of the buildings in each region have become very similar. Due to the characteristics of the public building, the appearance of the building, the structure of the room, and the main features are different according to the changes of the main users. Therefore, a case study was conducted focusing on the application. <Contents of Table3>

Table 3. New Hanok Style Public building classification by use

New Han-Ok Style Public building Type and feature by Facility					
New Han-Ok Style Public Building	division	Case type by consumption using		Features by consumption using	total case
	New Han-Ok Style Public Building	· Elderly and Children's Facilities	Total 3	Seoul Special City 2 cases	· There are many daycare centers among Elderly and Children's facilities · Combination of underground modern architecture and ground traditional wood structure · Utilizing main use space of traditional wood structure · Using R.C assistant space
Gyeonggi-do Province 1 cases					
· Culture and assembly facilities		Total 12	Seoul Special City 6 cases	· Large-scale culture and gathering space formation through the use of modern materials such as R.C structure · Attempts to apply and harmonize traditional wooden exterior engineering and modern materials for securing large-scale space and structural safety · Utilization of R.C structure assistance use space · Conducting modern analysis of tradition through traditional wooden structure + modern materials · Some traditional materials such as traditional tree structure and an earthen tile	Seoul K-medi Center, Seoul Donhwamun Traditional Theater, SejongMaeul Sangchonjae, The Lee sang House, Space42, Donuimun Museum Village, Daejeon Intangible Cultural Heritage center, Gangnam Museum of Calligraphy, gwonbun Culture and Arts Center, gungnamjl - Lotus Gallery, Ojuk Hanok Village, Heo Gyun Heo Nanseolheon Memorial
			Daejeon Metropolitan City 1 cases		
			Jeolla-do 2 cases		
			Chungcheong-do 1 cases		
			Gangwon-do Province 2 cases		
· Business facility		Total 9	Seoul Special City 1 cases	· Use of modern materials such as R.C structures to form a large workspace · Formation of free inner space by using R.C structure · the Visual Han-kok Formation through the construction Form of Hanok · Visual Han-kok through the Use of Roof Times of tradition an earthen tile and copper tile	Hanok Support Center, Haenggung-dong Community Center, Korean electric power corporation, Gyeongju, Gyeongju City Hall, Gyeongsangbuk-do provincial government building, Yeosu City Hall, Yeosu Community Health Center, Yeosu City Transportation Information Center, Buyeo County Office
			yeonggi-do Province 1 cases		
			Gyeongsang Provinces 3 cases		
			Jeolla-do 3 cases		
			Chungcheong-do 1 cases		
· The first class -Neighborhood convenience facilities		Total 6	Seoul Special City 2 cases	· modern structure Above Traditional design succession through traditional material finishing · Enlargement of modern structure according to characteristics of use · Modern Finish Plastering Finish, Try of traditional through traditional an earthen tile	Cheongun Munhak Library, Seoul K-medi Center, Daejeon Intangible Cultural Heritage center, Bomun 119 Safety Center, Bomun Post Office, Bodeok-dong Community Service Center
	Daejeon Metropolitan City 1 cases				
	Gyeongsang Provinces 3 cases				
· The second class -Neighborhood convenience facilities	Total 2	Seoul Special City 1 cases	· Various attempts of hanok using visual Hanok, traditional Hanok, wooden structure and modern structure	Seoul K-medi Center, Daejeon Intangible Cultural Heritage center, So Dae Hun, Ho Yeon Jaean old house	
		Daejeon Metropolitan City 1 cases			
· Facilities related to cemetery	Total 1	Gyeonggi-do Province 1 cases	· Formation of large-scale space using modern structure to expand funeral and graveyard facilities · Attempt to inherit the beauty of Hanok through harmony of modern structure and traditional an earthen tile	Icheon National Cemetery	
· Training and research facilities	Total 1	Chungcheong-do 1 cases	· Traditional neck structure adoption · Increased use of the building through interior modern finish · Contemporary and traditional harmony using modern materials for exterior windows	Institute of Gongju Studies	
· Accommodations	Total 2	Gyeonggi-do Province 1 cases	· Succession of traditional wooden structure for beauty of hanok of internal facilities · Maintains the beauty of traditional structure structure unique proportions · Increase user convenience by connecting toilet and kitchen in the room	Hanok in Cornus fruit Sarangchae, Gongju Hanok Village	
		Chungcheong-do 1 cases			
· Facilities for tourism and resort	Total 1	Daejeon Metropolitan City 1 cases	· Harmony of traditional cultural assets and modern structure + Traditional materials building · Secure space for cultural property protection and publicity in modern buildings	Uam Private Park	
· Detached house	Total 1	Daejeon Metropolitan City 1 cases	· Formation of experience space through maintenance and repair of traditional Hanok · Constant use of buildings through cultural property management	So Dae Hun, Ho Yeon Jaean old house	

The characteristics of each application are a comprehensive analysis of the average data of the cases and not all cases.

2.3. Classification of New Han-Ok style Public Buildings by Use

There are a total of 27 architectural uses, of which 10 are examples of New Han-Ok style public buildings. Due to the various functions and elements of each building, cases of overlapping use were included for each use. There were a lot of day care center in the young and old facilities, and modern architecture and traditional wooden structure were combined. These utilize the traditional wooden structure as the main space and the reinforced concrete as the auxiliary space.

Cultural and assembly facilities use reinforced concrete structure and tried to apply and harmonize engineering wood and modern materials in addition to traditional wood for securing large space and structural safety. Reinforced concrete structure was used as an auxiliary space and modern analysis to tradition was carried out through traditional wood structure + modern materials. Traditional wooden structures, traditional pottery and other traditional materials were used for the building.

The work facility formed a large work space through the use of modern materials such as reinforced concrete structure, and formed a free internal room space using the reinforced concrete structure. It attempted to visualize the Han-Ok through the construction of Han-Ok form outside and tried to visualize the Han-Ok through the use of soil tiles, bonze tiles, and tiles of various materials.

The first kind of neighborhood living facilities inherited the traditional design through the traditional material finishing on the modern structure, and made the modern structure large according to the characteristics of the use and tried traditional culture through modern painting and soil tile.

The second kind of neighborhood living facilities utilized various visuals of Han-Ok, traditional Han-Ok, wooden structure and modern structure and tried various Han-Ok.

The cemetery related facilities formed a large-scale space utilizing modern structures to expand funeral and graveyard facilities, and attempted to inherit the Beauty of Han-Ok through harmony of modern structure and soil tile.

The educational research facility has a traditional wooden structure, and the interior has a modern finishing material that enhances the ease of use of the building. It attempted to harmonize contemporary and traditional with contemporary materials for exterior windows.

The accommodation structure maintains the specific structure ratio of the traditional wooden structure, and the user convenience is increased through the connection of the indoor toilet and the kitchen. The tourism and rest facilities harmonize traditional cultural assets with modern structures and traditional

materials, and secured space for cultural property protection and publicity through the formation of modern buildings. The single-family house formed an experience space through maintenance and repair of traditional Han-Ok and promoted the continuous use of the building through cultural property management.

3. Representative case analysis

3.1. Selection of representative example of New Han-Ok style public buildings by use

In-depth analysis was conducted on representative examples of New Han-Ok style public buildings by use and the evaluation criteria were reconstructed by referring to the contents and standards of public buildings, which were conducted in the second stage of Han-Ok technology development research. The analysis standard was set up by introducing the concept of extracting the traditional factor inheriting the structure, function and beauty of the traditional Han-Ok which is the basic concept of New Han-Ok.

Table 4. Establish analytical criteria for case studies

New Han-Ok Style public building Representative case reference element			
Division	Structure	Function	Beauty
New Han-Ok Style public building	<ul style="list-style-type: none"> · Tradition+Modern Han-Ok+Modern architectural structure = Combination of various structures · Increase economy, workability, stability 	<ul style="list-style-type: none"> · tradition+Now+Future = Users by age, usage, and future outlook Needs Hire · Modern architecture, Convergence with smart technology, Han-Ok Unique variable, ecological space utilization 	<ul style="list-style-type: none"> · Traditional beauty + Modern beauty + Future beauty = New Han-Ok Style · Traditional(Space, proportional, design, facade composition) succession, Contemporary design elements reflected, Try new design

hanok Technology Development Phase 3 Phase 1 Annual Report new hanok style Demonstration of Social Welfare Facilities and Suggestions, 2017 Quoting and reorganizing content

As for the structure, the main evaluation factor was whether the combination of traditional, New Han-Ok, and modern architectural structure increased economy, construction and safety. As for the function, main evaluation factor was whether it meets the user's performance according to the mix of the tradition, the modern and the future, the age, the use and the future outlook and fusion with modern architecture, smart technology, and the Han-Ok's unique variable and ecological space was utilized. As for the beauty, the main evaluation factor was whether New Han-Ok combined traditional, modern and futuristic beauty, succeeding tradition by space, proportional, exterior and facade composition and attempt new design

reflecting modern design elements. The acquisition of drawings through the internet, company, administrative and management departments also served as an evaluation factor for the selection of representative cases. <Table 4 Contents>

Table 5. New Han-Ok Style public building related research

Evaluation element				
Name	structure	Function	Beauty	note
Surak Hanok daycare center (1)	◎	◎	◎	
Seoul K-medi Center (2)	◎	◎	◎	
Heungcheon daycare center (3)	◎	◎	◎	
Seoul Donhwamun Traditional Theater (4)	◎	◎	◎	
SejongMaeul Sangchonjae (5)	△	△	△	
Donuimun Museum Village (6)	△	△	△	
Hanok Support Center (7)	△	△	△	
The Lee sang House (8)	◎	◎	◎	remodeling
Cheongun Munhak Library (9)	◎	◎	◎	
Space42 (10)	◎	◎	◎	
Daejeon Intangible Cultural Heritage center (11)	○	○	○	
So Dae Hun, Ho Yeon Jaean old house (12)	△	△	△	repair
Haenggyung-dong Community Center (13)	○	○	△	
Haenggyungahae Dream Nuri (14)	◎	◎	◎	
HwaheungMun Tourist Information Center (15)	○	○	○	
Hanok in Cornus fruit Sarangchae (16)	◎	◎	○	
Icheon National Cemetery (17)	○	○	○	
Bodeok-dong Community Service Center (18)	○	○	○	Extension of building
Bomun 119 Safety Center (19)	○	○	○	
Bomun Post Office (20)	○	○	○	Extension of building
Bomun police substation (21)	○	○	△	
Korean electric power corporation, Gyeongju (22)	○	○	○	
Gyeongju City Hall (23)	△	△	X	partly roof tile
Gyeongsangbuk-do provincial government building (24)	○	○	○	
Gangam Museum of Calligraphy (25)	○	○	○	
Gwonbun Culture and Arts Center (26)	△	△	△	
Yeosu City Hall (27)	○	○	△	
Yeosu Community Health Center (28)	○	○	◎	
Yeosu City Transportation Information Center (29)	○	○	△	
Institute of Gongju Studies (30)	◎	◎	◎	
Gongju Hanok Village (31)	△	○	○	

Buyeo County Office (32)	○	○	○	
GungnamJI - Lotus Gallery (33)	○	○	○	
Danyang Hanok lodging village (34)	○	△	○	free design
Ojuk Hanok Village (35)	◎	◎	◎	
Heo Gyun Heo Nanseolheon Memorial (36)	○	○	△	

Associated with case study number in Table 4
◎ - Very good ○ - good △ - average X - bad

According to the criteria of Table 4, the case evaluation was classified into Very good, good, average and bad according to the analysis standard. According to the evaluation factors, 6 representative cases were selected as Surak Hanok daycare center (1), Heungcheon daycare center (3), Seoul Donhwamun Traditional Theater (4), The Lee sang House(8), Cheongun Munhak Library (9), Institute of Gongju Studies (30).

Surak Hanok daycare center is located at 131, Suraksan-ro, Nowon-gu, Seoul and has been commissioned to the Sejong Center and completed in March 2016.

Heungcheon daycare center is located at 29, Heungcheonsa-gil, Seongbuk-gu, Seoul. It is managed by Seongbuk-gu Office and completed in February 2015.

Seoul Donhwamun Traditional Theater is located in 102, Yulgok-ro, Jongno-gu, Seoul, and is managed by Seoul Metropolitan Government and completed in March 2016.

The Lee sang House is located at 18, Jahamun-ro 7-gil, Jongno-gu, Seoul and has been remodeled and enlarged in February 2014 under the supervision of the Arumjigi Foundation.

Cheongun Munhak Library is located at 40, Jahamun-ro 36-gil, Jongno-gu, Seoul, and is managed by Jongno-gu Office and completed in November 2014.

Institute of Gongju Studies is located at 56, Gongjudaehak-ro, Gongju-si, Chungcheongnam-do. It was managed by Gongju City Hall and Kongju University and completed in February 2015. The detailed summary is shown in <Table 6>.

3.2. Analysis of Representative Case

A detailed analysis of the architectural outline and reference elements of each building was conducted in the representative cases of the New Han-Ok style public buildings evaluated in <Table5> and the advantages and disadvantages of the examples of characteristics and synthesis is analyzed. <Table 6> shows the detailed analysis of each building element.

As a representative example of the young and old facility, the structural element of the Surak Hanok daycare center is a combination of modern elements such as reinforced concrete and other steel structures and Korean traditional wooden structure. The 1st floor and 1st floor of the ground were stable using

Table 6. New Han-Ok Style public building representative case research

	Surak Hanok daycare center (1)	Heungcheon daycare center (3)	Seoul Donhwamun Traditional Theater (4)	The Lee sang House (8)	Cheongun Munhak Library (9)	Institute of Gongju Studies (30)
a blueprint						
Picture						
Site	Suraksanno 131-accessible Hanok daycare center	Heungcheonsa Temple, Heungcheonsa-gil 29, Seongbuk-gu	102, Yulgok-ro, Jongno-gu, Seoul	Jahamunno 7-gil, Jongno-gu, Seoul	Cheongun Munhak Library, Jahamunno 36-gil, Jongno-gu, Seoul	Gongju Yeonghoenae Apt., Daehak-ro 56, Gongju-si, Chungcheongnam-do
Owner	Seoul Metropolitan Government (Department of Culture and Arts)	eongbuk-gu Office	Seoul Metropolitan Government (Department of Culture and Arts)	a foundation arumjigi	Jongno-gu Office	Gongju City Hall, Kongju National University
management	a foundation Sejong Center for the Performing Arts contracting-out	eongbuk-gu Office	Seoul Metropolitan Government (Department of Culture and Arts)	a foundation arumjigi	Jongno-gu Office	Gongju City Hall, Kongju National University
Completion	Match, 2016	February, 2015	Match, 2016	February, 2014 (Extend a building)	November, 2014	February, 2015
plottage /total floor area	843.8 m2 / 1,773.64 m2	2,734.00 m2 / 591.86 m2	843.8 m2 / 1,773.64 m2	Existing hanok - 32.02m2/ Lee sang House - 10.99m2	1,238.50 m2 / 744.82 m2	1,455 m2 / 705.96 m2
Building to land ratio/Floor area ratio	27.45% / 27.45%	11.74% / 13.72%	27.45% / 27.45%	Existing hanok - 42.52% / Lee sang House - 12.47% / Existing hanok - 42.52% / Lee sang House - 14.60%	12.75% / 16.30%	14.68 % / 48.86%
Floor area (m2)	First floors above ground 229.19 First-third underground 529.98 ,492.56, 521.91	First floors above ground 229.19 First underground 529.98	First-second floors above ground 229.19, 529.98 First-second underground 492.56, 521.91	Existing hanok (First floors above ground) 32.02 / Lee sang House(First-second underground) 8.30 /10.99	First-second floors above ground 157.87 First underground 586.95	First floors 406.98 Second floors 298.98
Use	Culture and assembly facilities	Elderly and Ahildren's Facilities	Culture and assembly facilities	Culture and assembly facilities	first-class Neighborhood units building	Training and research facilities
Roof	GableRoofed, the gambrel roof	GableRoofed, the gambrel roof	GableRoofed, the gambrel roof	GableRoofed, the gambrel roof	GableRoofed, the gambrel roof	a gable roof, GableRoofed
Structural components	· R.C (modern), Korean-style wooden structure (traditional) and other steel structures combined · Ground, underground 1 layer using R.C structure, Ensure structural stability · Utilizing entrance space through formation of other steel structures	· R.C (modern), Korean- style wooden structure (traditional) and other steel structures combined · Utilization of ramps through the use of underground R.C structures · Formation of ground and underground yard through underground R.C structure	· R.C (modern), Korean- style wooden structure (traditional) and other steel structures combined · R.C is buried in the basement to emphasize the structure of the Han-Ok on the ground · Formation of sunken and underground gardens through the formation of basement	· R.C (modern), Korean- style wooden structure (traditional) and other steel structures combined · Maintaining and repairing Korean wooden structure and connection with modern structure · Remodeling without damaging existing structure	· R.C (modern), Korean- style wooden structure (traditional) and other steel structures combined · Utilization of R.C underground, Ensure structural stability · Utilization of underground concrete as foundation foundation of Han-Ok	· Formation of a second Floor structure through traditional wood structure construction method · Stabilization of building structure through concrete foundation of modern construction method
Functional elements	· Korean style window + system window + window · The harmony between modern space and traditional space · Formation of play space using slope way · Building maintenance function Modern space arranged · Formation of inner yard using slope way	· Korean style window + system window + window · Preparing building space by forming large space of R.C structure · Obtain internal privacy through fence formation on the first floor slab	· a modern style equipment · Korean style window + system window · Separate basement floors by function · Build large space inside exhibition hall · Inner yard center sunken formation	· Composed of general windows only · Modern space, traditional space division · After Existing window frame and lintel removed, the whole Window formation resulting in building use effect climb · Formation of the courtyard through building extension	· Korean style window + window · Formation of yard and sunken using slope way R.C structure · Separation of space area through Han-Ok and modern buildings	· Korean style window + system window + window · Build large space inside the building · a modern style retoolable · Second floor space Roof shelter formation
Aesthetic elements	· By using the traditional wooden structure, guests can feel the traditional beauty. · Increased traditional beauty not only by concrete but also by brickwork, granite and fence finishes. · We introduced a traditional element by forming a pilotty courtyard in the basement.	· By using the traditional wooden structure, guests can feel the traditional beauty. · Increased traditional beauty not only by concrete but also by brickwork, granite and fence finishes. · The ground slabs, fences, and underground fences formed a yard.	· Using traditional Korean tile · Reflects the characteristics of Korean Han-ok through the wall · Uses traditional finishing materials · Creation of floors inside the building through the formation of a fountain and a dam · Establishment of indoor courtyard through '□' style building arrangement	· Using traditional Korean tile · Whole window, harmony with traditional hanok such as concrete · Maintains the traditional interior plaster elements · Formation of the courtyard through the expansion of the concrete structure.	· Using traditional Korean tile · Traditional beauty inheritance through the plaster of wayeon and jeon brick of R.C structure · Traditional beauty inherited through foundation the stylobate and cornerstone · Create a small terrace through a simple type fence in the basement	· Traditional Korean roof tile and use · Uses interior traditional material finish · Traditional beauty inherited through foundation the stylobate and cornerstone · Emphasis on beauty of tradition through the use of Han-Ok traditional law, jeonbrick, and a lintel

Source

<https://kras.go.kr:444>

reinforced concrete structure and exposed and other steel structures were used to form a storage space and windshield space at the entrance. Functional elements are composed of Korean style, system, and general window, and modern space and traditional space are harmonious and there is a play space using a slope way. The facility and the necessary space are designed to be made through the formation of the space in the reinforced concrete, and under the piloti structure is used as the inner yard. The beauty elements have been utilized in traditional wood structures, allowing the guests to share the traditional beauty of the area, and have increased traditional beauty through the use of broken roof tile, granite and fence finishing materials.. Under the Piloti, a yard which was one of the traditional elements of Han-Ok was formed. However, due to the characteristics of the Han-Ok, there was a shortage of storage space and a disadvantage that the risk of injury to users was increased due to the use of traditional structures.

As a representative example of an old-age facility, the structural element of the Heungcheon daycare center is a combination of modern element, reinforced concrete, and Korean traditional wooden structure. Through the use of the underground reinforced concrete structure, the hill was used as a slope way and the yard space was formed. Functional elements are composed of Korean style, system, and general window and the space required for the building was secured through the large space of the reinforced concrete structure and internal privacy was secured through the fence on the slab on the first floor. The use of traditional wood structure has increased the main user's usability of traditional beauty and increased the traditional beauty of the whole building through concrete, broken roof tile, granite and fence finishing material. The ground slab, fence, and underground fence formed the yard. However, there was a disadvantage that the view of the outside was cut off in the yard through the creation of the fence and the risk of injury of the users due to the use of the traditional structure was increased.

As a representative example of culture and assembly facilities, the structural element of the Seoul Donhwamun Traditional Theater is a combination of reinforced concrete, which is a modern element of construction, and Korean traditional wooden structure, which is a traditional element. Through the underground floor reinforced concrete structure, the ground Han-Ok structure was highlighted and the ground and underground gardens were formed through the formation of the underground floor. Functional elements consist of modern machinery, Korean style, and system windows and functional rooms are separately constructed in the underground floor, and the exhibition room and the performance hall are formed through the internal space, and the central sunken is formed in the inner

yard to increase the ventilation and skylight rate. The beauty element reflects the characteristics of the Han-Ok through traditional tableware and the use of a wall. It uses traditional finishing materials and forms a floor inside the building through the formation of a broken roof tile fence and upper floor and forms a traditional type inner courtyard through the arrangement of a □-shaped building. However, there is a disconnection between the yard and the outside using the □ - shaped building type. Not only the users also main users: program management personnel in the building and management personnel have a disadvantage in living in a modern structure.

As a representative example of culture and assembly facilities, the structural element of the Lee sang house combines the modern element of reinforced concrete with the traditional element of Korean wooden structure. After maintaining and repairing existing Han-Ok, we connected with modern structure and remodeled without damaging existing structure. The functional elements are composed of only general windows and divided the area of modern space and traditional space. After removing the existing window frame and lintel, the whole glass window was formed to increase the effect on the use of the building and to build a small courtyard by building expansion. The beauty element was harmonized with traditional Korean house such as whole glass window and concrete using soil tile. Maintaining the existing beauty elements and forming the courtyard through concrete expansion. However, enlargement through preservation of existing Han-Ok has a disadvantage that the actual space used is narrow and the heterogeneity of the connection with Han-Ok is maximized due to the modern construction.

As a representative example of the first kind of neighborhood living facilities, the structural element of the Cheongun Munhak Library combines the modern element of reinforced concrete with the traditional element of Korean - style wooden structure. Reinforced concrete was used in the underground floor to ensure structural stability and underground concrete was used as the foundation of Han-Ok. Functional elements are mixed use of Korean style window and general window, and the reinforced concrete structure of the slope is used to form the yard and sunken, and the space area of the Han-Ok and the modern building is separated. Beauty element uses traditional Korean style tile. It uses the broken roof tile of reinforced concrete, whole brick flooring, base, foundation and cornerstone to inherit traditional beauty and form a terrace through a simple fence in the underground. However, due to the inclined structure of reinforced concrete, and there is a lack of connectivity to the space of Han-Ok and modern architecture.

As a representative example of educational research facilities, Institute of Gongju Studies has formed a two - story structure

through the traditional wooden structure mixing method and stabilized the building structure through the concrete foundation. Functional elements are mixed use of Korean style window system and general windows, large space is built in the building, modern machinery is installed, and a roof rest space is formed in the second floor space. Beauty elements are used with traditional Korean tableware, traditional materials are used for interior finishing materials, and traditional Han-Ok elements such as base, foundation and cornerstone are inherited. Han-Ok's traditional techniques and traditional whole brick, lintel are used to highlight traditional beauty. However, there is a disadvantage in that it does not use a modern structure except for the foundation and lacks of space expansion and implementation according to the use purpose compared to a modern building. Table 7 summarizes the advantages and disadvantages of each representative case.

Table 7. Pros and Cons of Representative cases

New Han-Ok Style public building Representative cases pros and cons		
	Pros	Cons
Surak Hanok daycare center	<ul style="list-style-type: none"> · Design and construction tailored to main users · Realization of traditional beauty through modern structure and traditional materials 	<ul style="list-style-type: none"> · lack of hanok unique storage space · User injury by using traditional structure
Heungcheon daycare center	<ul style="list-style-type: none"> · Maintenance and use of slope through the use of modern structure, formation of hanok spatial element · Design and construction tailored to main users 	<ul style="list-style-type: none"> · Disconnecting the view with the outside in the yard through the creation of a fence · User injury by using traditional structure
Seoul Donhwamun Traditional Theater	<ul style="list-style-type: none"> · Applying Traditional Elements, Traditional Elements · Creation of space required by use of R.C 	<ul style="list-style-type: none"> · Disconnection between the yard and the outside through the use of '□' building form · Using the modern structure of main users
The Lee sang House	<ul style="list-style-type: none"> · Formation of hanok spatial elements through extend a building · Reinterpretation of existing Han-Ok through remodeling 	<ul style="list-style-type: none"> · Narrow space through maintenance of existing Han-Ok · high degree of heterogeneity in the connection between Han-Ok and modern structure.
Cheongun Munhak Library	<ul style="list-style-type: none"> · Use slope through R.C · Traditional analysis of concrete through fences, bricks, and bricks 	<ul style="list-style-type: none"> · Decrease in building comfort due to inclined land filling of R.C structure · Lack of connectivity between Hanok and modern architecture
Institute of Gongju Studies	<ul style="list-style-type: none"> · Outside traditional beauty · Multilayer implementation 	<ul style="list-style-type: none"> · Modern structure unused · Lack of space extension and implementation

Table 6 shows the structure, function, and beauty elements in six representative cases, and common points and differences were extracted. In common, the structural element is the combination of reinforced concrete and Korean wooden structure and the use of concrete foundation of modern construction. The functional elements are the use of Korean style windows and system

windows, the use of modern mechanical equipment, the formation of yard or rest area to maintain the traditional relaxation function, and the necessary room for each use of the building is constructed as a wooden structure. the beauty element is that it uses a traditional wooden structure, uses a traditional Korean tile, and inherits the appearance using the foundation and the cornerstone.

The difference is that the structural element is to utilize other steel structures or to form a space with concrete layer when used in a slope way and remodeling the existing Han-Ok and than the characteristics of each building is rising. Functional elements are the use of general windows, Korean style windows and system windows in harmony, the formation of large spaces according to the needs of the building, the formation of the inner courtyard, and the formation of resting spaces and leisure spaces in various forms such as inner and outer courts. The Beauty element transforms the design of a building by constructing each part of the building with a traditional or modern finishing material and it is expressed differently depending on the use of the fence and the size of the fence.

Table 8. Common and Differences of Representative cases

New Han-Ok Style public building Representative cases common and differences			
	Structure	Function	Beauty
Common	<ul style="list-style-type: none"> · Combined R.C, Korean-style wooden structure · Modern Construction method concrete foundation use 	<ul style="list-style-type: none"> · Using Korean style window + system window · a modern style equipment · Formation of yard and rest area · Necessary thread composition according to purpose 	<ul style="list-style-type: none"> · Using Korean-style wooden structure · Using Korean-style tile · Use of Gi-Dan and Cornerstone
Differences	<ul style="list-style-type: none"> · Use of other steel structures · Concrete layer reclamation using slope · Remodeling of existing Han-Ok 	<ul style="list-style-type: none"> · Free use of Korean style window, system window, window · Large space formation · Use of inner and outer courtyards and Courtyard 	<ul style="list-style-type: none"> · Selection of traditional and modern finishing marterials · Whether or not fences are used

Table 9 summarizes the analysis of the structural elements, functions, and beauty elements extracted from the detailed case analysis. The structure can be variously configured according to the type classification of New Han-Ok style public buildings. In addition to the traditional building technology, the basic and major structural parts should utilize modern building technology. The function should utilize a natural system such as floor heating system, wind road, etc., and use a lifting window to use variable wall system, and use a storage system such as closet, hook, loft, and modern machinery to improve performance. The rooms of the traditional Han-Ok can be planned for modern or traditional

use, and the exterior space design such as the traditional garden or fence should be applied. In order to create a large-scale space as a public building, each private room should be planned so that the space can be varied in future. Beauty uses trees, dirt, and stones to make buildings and fences. When building roofs, it uses Korean trowel, thatched roof, shingle, etc. and uses modern building materials according to size and usage. It should be used positively without regulation.

applied. And it is necessary to borrow traditional methods such as checkered ceiling and lotus lantern ceiling, and plan ceilings that mix modern and traditional methods. In order to secure modern livability, it is necessary to plan the window by mixing system, Korean style, and general windows as well as traditional Korean style windows.

Table 9. Applicable Elements derived from Case study Analysis

Division		Applicable Elements	
Structure	Building structure	It can be variously configured according to new hanok Style public building classification	
		main Structural part	Use of modern construction technology
Function	performance	natural heating system : Korean floor heating system	a modern style machine equipment : Utilizing boiler, air conditioner, system window, etc.
		natural air-conditioning system : Wind Road	
		variable Wall System : a lifting door	
		collection system : a closet, a loft over a kitchen, a closet	
Usage	It is possible to plan the space needed for each application such as the main gate, ancha, sarang chae, hanbangchae, etc. in a modern and traditional way		
	Application of exterior space design such as traditional garden and fence		
	The private rooms of New Han-Ok style public building perform their roles and plan to make space variable.		
material	Buildings, fences : trees, dirt, stones, etc.	Utilizes modern building materials(Concrete, iron, plastic, copper, etc.) according to size and usage	
	Roof : Korean-style earthenware, thatch, a shingle etc		
color	It is not gorgeous, but it is simple and pure, and it maintains the same hue as a whole, and utilizes natural color including white		
Beauty	line	Roof : The beauty of the curve of a roof line and the eaves line.	Wall : Low on human scale, conform to topography
	proportion	atypical Proportional beauty : Constant norms have been created, but there are no rules that encompass all buildings	
		Human scale : Designed according to body scale and movement according to body proportions	
	ceiling	Utilizing traditional methods such as a checkered ceiling, lotus lantern ceiling etc	Plan ceiling as needed (Modern finish)
fittings	Mixed use of system windows, Korean style windows and general windows to secure modern livability, including traditional Korean style window patterns		

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Using natural materials, it is necessary to maintain the line so that it is low in human scale with flexible curves such as ridge line and eaves, and conforms to the surrounding terrain. It has a certain frame, but it should be designed to fit the Human Scale with irregular proportions, no rules set, and body proportions

4. Results

In this study, 36 New Han-Ok style public building case studies were conducted in connection with the second stage case study of Han-Ok technology development. Surak Hanok daycare center shows structural elements such as reinforced concrete, Korean wooden structure, and other steel structures. In addition, functional elements such as the use of various windows, formation of inner yard using slope are appeared, and the use of beauty element through the pilotty yard, finishing of broken roof tile of exterior concrete, granite etc. However, there are disadvantages such as the lack of storage space and the rising risk of injury of main users due to the wooden structure.

In Heungcheon daycare center, the structural elements such as reinforced concrete and Korean wooden structure appear, and functional elements such as use of various windows, acquisition of internal privacy through formation of a façade on the slab on the first floor, beauty elements through the formation of the ground through slabs and fences and underground fences appear. However, there was a disadvantage that the view of the outside was cut off in the yard through the creation of the fence and the risk of injury of the users due to the use of the traditional structure was increased.

Seoul Donhwamun Traditional Theater shows structural elements such as reinforced concrete and Korean wooden structure, functional elements such as Korean style + system window and interior space of exhibition room, and the beauty elements such as formation of the inner floor of the building and the formation of the inner yard through the arrangement of the building. However, disconnection from the outside occurred due to the formation of the courtyard, and there was a disadvantage that the frequency of use of the main structure of the main user was low.

The Lee sang House shows the structural elements of connection with the modern structure of the existing Korean wooden structure. And functional elements of the formation of courtyard through division and extension of contemporary space and traditional space appear, and it maintains the traditional interior finishing, and beauty elements such as ceiling, concrete and Han-Ok are harmonized. However, there is a disadvantage that the space for actual use is narrow and the heterogeneity of

Han-Ok and modern space junction is maximized

The Cheongun Munhak Library shows structural elements such as reinforced concrete and Korean wooden structure. And the functional elements such as separation of space area through Han-Ok and modern buildings and yard and sunken formation using reinforced concrete appear. Traditional elements based on basic, foundation, and cornerstone, and beauty elements through formation of small terraces through the fence between underground also appear. However, there are disadvantages such as lack of comfort in underground buildings and lack of connectivity between traditional and modern spaces.

The Gongju Institute of Chemical Technology shows structural elements of connection type between basic part modern structure and Korean wooden structure and functional elements such as the implementation of space inside the building, modern mechanical equipment and the formation of a two-floor space shelter and beauty elements through the preservation of materials and methods such as Han-Ok construction method, whole brick, and lintel. However, there is a disadvantage that the use of partial modern structure and lack of expansion and implementation of space in modern buildings.

The structure, function, and beauty elements in six representative cases, and common points and differences were extracted. In common, the structural element is the combination of reinforced concrete and Korean wooden structure and the use of concrete foundation of modern construction. The functional elements are the use of Korean style windows and system windows, the use of modern mechanical equipment, the formation of yard or rest area. The beauty element is that it uses a traditional wooden structure, traditional Korean tableware, foundation and the cornerstone. The difference is that the structural element is to utilize other steel structures and remodeling and than the difference of each building for usage is rising. Functional elements are the use of general windows, Korean style windows and system windows in harmony, the formation of large spaces according to the needs of the building, the formation of the inner courtyard, and the formation of resting spaces and leisure spaces in various forms such as inner and outer courts. The Beauty element selects traditional finishing material for each part and confirms the autonomy about use of fence.

However, in this study, the subdivision of structure, function, and beauty factor proceed simultaneously, and it is not enough to apply the commonness and difference. In future research, it is necessary to establish consistency and systematical analysis of New Han-Ok style public architecture analysis by reviewing <Table9> applied factors

In each representative case analysis, usage functions such as the architectural structure of modern architecture and wood

structure, natural air-conditioning system of Hanok, variable wall system, performance of modern mechanical equipments, modern reinterpretation of Han-Ok's distinctive purpose, introduction of garden and fence landscaping design were derived.

Beauty elements such as window elements using various kinds such as segmentation of expressions of natural materials and modern building materials, Han-Ok's natural color, The color inherited from nature, The distinctive line of Han-Ok's roof and fence, Maintaining Human Scale of Han-Ok, Proportional elements of non-standardization that separately measure the proportions of the buildings while maintaining the constant norms of Han-Ok, traditional methods such as checkered ceiling and lotus lantern ceiling, ceiling elements that form modern finishes in special spaces such as toilets, restaurants, system window, Korean style window, general window have been derived.

New Han-Ok style Public building examples have reduced the need to adopt regional characteristics to combine modern and wood structures to form buildings. Due to the nature of public buildings, main users are changing, and according to the facilities in use, there are characteristics of usage. Han-Ok style buildings other than the public buildings that are continuously being developed and constructed, and public buildings to be additionally constructed are subjected to further case studies. The characteristics, advantages, and disadvantages of structures, functions, and beauty elements for each use should be classified. It is expected that basic research applying this study based on criteria and evaluation factors will be activated in the construction of New Han-Ok style public buildings.

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