

An Overview of Korean wooden architecture¹

Plenary speech by Architect CHO, In-Souk

I. Opening remarks

One of the challenges we face today in architectural design is to find a globally sustainable design approach. Yet another challenge, when considering the complexity of the rich heritage of Asia and its local wisdom, would be how to differentiate it from other places on earth. The topic of today's sub-theme is how these two challenges are incorporated or not in the architecture of the region.

Besides globalization in general, urbanization and curbing climate change seem to be the two global megatrends that will have the greatest impact on our future. Both will also play an extremely important role in architectural design.

The principal function of a house was protection against the weather. The earlier forms of human habitats were crude structures without significant distinguishing characteristics. As human lifestyles diversified and the functions of shelters expanded to accommodate individual and social needs and activities, houses began to assume national, regional and individual characteristics. The natural environment, along with such cultural elements as people's lifestyles and customs, also played an important role in the evolution of architectural styles. Korean houses, as domestic architecture does in all cultures, showcased people's everyday activities as well as their history and culture.

This presentation will focus on the Korean Perspective regarding the dimensions of a sustainable design approach, examining the Korean traditional house of wooden structure:² *hanok*.

II. Understanding *hanok* (Grammar of *Hanok*)

Common considerations incorporated into the design works to be elaborated on later are as follows: careful survey of site condition and location; proper adoption of hierarchy of buildings and courtyards;

¹ This is a part of the presentation to "the 15th Asian Congress of Architects" introducing my own design works under the title <Designing *Hanok*, the Korean Organic House: contemporary Challenges> in Bali, Indonesia October 29, 2012.

² I revised this part "a look at the Korean wooden structure, Lotus Lantern, summer 2006" for the presentation document at the 15th HMS Colloquium on "Korean Architecture: Past and Present", November 3, 2007, George Washington University, Washington, DC, and revised it again for the keynote speech at the World School International Forum, October 19, 2010, Seoul, Korea.
<http://www.gwu.edu/~eall/special/hms2007b1021.htm>
<http://www.gwu.edu/~eall/special/cho.html>

realization of the traditional application of the *hanok* concept, architectural hierarchy, and use of standard site-specific measurements. Furthermore, unitization of materials enables affordability; for instance, unit modules are applied to several buildings on one site in the rational design of roof structure; the construction period was shortened with economic use of repeated configurations of basic rafters, fan-shape rafters and base eaves hip-rafters (rafters at the four-corners of the roof structure). In addition, extensive efforts were made in the design process to carry development of an idea from design concept to detailed design.

When asked to describe the grammar of *hanok*:

Hanok is the indigenous house for Koreans, and continues to be built in Korea to this day with proper **materials** - earth, wood, and the stones from the very nature we are living in; with **techniques** handed down to us through generations; and based on a sound **structure** of column and beam with mortise and tenon joints that create aesthetic beauty. As a result of sound and rational structure, a beautiful eave-line is created.

In other words, the site location, the natural environment, its local materials and traditional techniques are the basic elements for a *hanok*, the organic house of Korean wooden structure. The inherent grammar of sustainable *hanok* involves the following: firstly, the characteristics of **spatial compositions** of building–courtyards–enclosed wall, warm heated floor room “Ondol-bang,” cool wooden floor hall “Dae-cheong (maru)” and raised floor “Nu (maru)” are enclosed by the front and rear courtyards which are again enclosed by the wall; secondly the **scientific characteristics** which is comparable to green growth and environmental theory of present days. During hot summer, cool breeze blows through the wooden floor hall circulating the cold air of the backyard and hot air of the front yard, on the other hand, during the cold winter, warm and cool air convection in the warm heated room “Ondol-bang”; thirdly and lastly the inherent **authenticity** of the house which is accordant of materials, techniques, structures, and concepts.

In the facade there are three components of 1) raised platform, 2) columns, door and windows and walls and 3) roof on the wooden structure.

To support this statement, we will examine basic information on the Korean environment, natural and social environment, along with some essential points in an “Overview of Korean Wooden Architecture”.

Environment

Natural environment

70% of the land in Korea is mountainous. However, most of the land is relatively low, as typically seen in aged terrain. With these geographical characteristics, villages and individual dwellings formed with mountains to the back and rivers to the front. The mountains not only protected houses from the wind but also supplied firewood. The river provided drinking water and agricultural irrigation.

The climate in Korea is moderate. The southeasterly wind blows on summer while the dominant wind

in wintertime is the northwesterly. The South Korea climate in winter is normally long, cold and dry and in summer is humid, hot, and short. Due to this duality in the climate of Korea, two contrasting floor structures of heated floor room and wooden-floor hall in a house appeared.

Social and cultural environment

Throughout the history of Korea, theories of Yin-Yang-and-five-elements School, *Pungsu* (*Fengshui* in Chinese), Buddhism, Confucianism, Taoism and other philosophies left a lasting imprint on the process of housing evolution.

The principles of Confucianism have dictated family and social lives in Korea. Confucian theories spawned a strong patriarchal family system in Korea and out of this came the tribal village formed of patriarchal blood relations. Ancestor worship and hospitality is the core of sacred obligation in a family. People erect separate family shrines in their homes and provide a guest room in the men's quarter. Since Confucianism called for the separation of the genders, the women's quarters were detached from the men's.

As the house protects humans from severe weather and provides a resting place, *hanok* is the most appropriate architecture considering the geographical and climatic features of Korea.

III. An Overview of Korean wooden architecture

Site selection and Orientation

An area with mountains surrounding it and protecting it from the winds, with four godly animal protectors on guard in all directions, (cradled by a turtle-shaped mountain to the back, a bird shape to the front, a dragon to the left and a tiger to the right) was considered the ideal location.

The topographical location of mountains and rivers is directly related to the fortune of human beings and Confucian concept.

The pursuit of constant contact with nature, an appropriate view of "mountains and water", was based not only on aesthetics, but also on geomantic principles.

A structure was positioned to face a stream with a mountainous area at its back side.

Ideally, the mountain had to have "wings" at both ends so that it could embrace the structure and had to have a stream flowing in front.

Efforts were made to avoid man-made construction that disrupted the natural contour of the terrain.

After a site for a house was selected, decisions were made on the exact location of the foundations and the orientation of the house, the direction seen from the back of the house toward the front. The orientation the house faced was believed to determine the destiny of the head of the household.

Materials and techniques

1) Materials

The soil, the wood and the stones are the basic materials for building *hanok*.

The most popular wood for the creating Korean buildings is pine. It is a solid but not too rigid wood and sometimes untreated pine, in its natural form, can be used for special effects in buildings. Because of these characteristics, pine is the most popular wood chosen for palaces and temples. In particular, Korean Red Pine is much valued. After the Korean War, the planting and subsequent harvesting of the trees lessened and so it is extremely difficult to obtain good quality Red Pine today.

Due to the shortage of red pine wood, the Korean Cultural Heritage Administration limits the use of local pine wherever and whenever they can both for restoration and reconstruction work on cultural heritage buildings.

High quality stones such as granite, gneiss, andesite, limestone and sandstone were used as building materials. People used granite especially for corner stones, foundations, and walls.

2) Inherited techniques

Until the early 1960's, the term identifying architects did not exist in Korea. A craftsman who had been apprenticed to a great master or to a Buddhist monk was able to create the building according to the degree of skill acquired.

In the past, monks carried out their own work on the temples, having trained under a specialist.

Even today, some carpenters as well as stone masons are so highly skilled that they are designated and protected as Intangible Cultural Assets and so became the depository of traditional techniques which they can then hand down to their apprentices.

Spatial arrangement and floor plan

The typical layout of the living spaces in Korean houses has evolved through significant changes.

The traditional homes of upper class consisted of several quarters:

A central part of the house or "*Anchae* (women's quarter)" and "*Sarangchae* (men's quarter)", which were the space of high level which serves to the master and his family;

The *Sadang* (family shrine), where ancestral tablets were properly housed, was built behind the main part of the house;

Byeoldang (annex) belonged to the *anchae*, if the lady of the house used it, if used by the man of the house it belonged to the *sarangchae*;

Haengrang (servants' quarters) was the space of the lower level which served to the servants;

Daemunghan (the front gate) and *Jungmungang* (middle gate).

Banbitgan (the kitchen), a food preparation and storage space, was separated but a part of the *anchae*.

Each space reflects the occupant's status and place in the hierarchy.

A central part of the house is surrounded by the courtyard and again the courtyard enclosed by the wall or series of servants' wings.

That is the basic arrangement of the traditional space.

They are uniquely combined to more than one such spaces and it has a certain hierarchy.

The majority of the remaining ancient wooden structures are rectangular or square in shape.

In the plan, the primarily L-shape, I-shape or its reversed shape are combined each other and these

made various courtyards in between.

Since Confucianism called for the separation of the genders, the master and his consort of an upper-class house lived in separate quarters.

The master resided in the ‘*Sarangchae*’ and the consort of the master ‘*Anchae*,’ respectively. A low wall separated the ‘*sarangchae*’ and ‘*anchae*,’ but the two structures stood side by side, occupying the central part of the house.

Based on the aforementioned grammar of *hanok*, the basic spatial compositions are of *Bangs* (individual enclosed rooms), *Cheong* or *Daecheong* (wooden-floored main hall) and *Ru* (raised wooden floor hall). Two basic forms of flooring are warm heated floor “*Ondol*” and cool wooden floor “*Maru*.”

Structural organization and elevation

The Korean wooden architecture can be summarized as comprising a raised stone platform, a wooden post and lintel structure, and a tiled roof with distinctively upturned eaves.

The façade always appears in a uniform pattern: above the stone-finished platform there are the wooden lattice windows or doors and mud walls, and finally the clay roof tiles.

1) The Podium or Platform and Column Bases

The wooden columns stand on natural or polished base-stones. The platform is built with some layers of well-dressed quarry stone or solid granite stone with a bush-hammered finish.

Choi Sang-Hun in his *Interior Space and furniture of Joseon Upper-class Houses* describes as stone base: Upper-class houses were built on stone bases to bring sunlight into the house and prevent humidity coming up from the ground. The base was a symbolic element representing the master’s social standing. Contrary to the earthen base used in lower-class houses, granite was used in upper-class houses. Likewise, the material, height, and facing of the surface all indicated to which class the master belonged. (Citation end)³

2) The Columns and the Walls

The wooden columns are placed on the base-stones without any connecting mortar. There are two types of columns; square and round. Round columns used for relatively important buildings. Square columns generally used for the residential purpose or less important buildings.

There are three technical characteristics of Korean wooden structures. They are: *Guisoseum*, *Anssolim* and *Baeheulim* in Korean. These terms refer to the arrangement or size of the columns of the building in question. Often the height of the columns varies considerably in the same row.

A *Guisoseum* technique is gradually increasing in height columns from the central bay towards the

³ Choi Sang-Hun, *Interior Space and furniture of Joseon Upper-class Houses*, Seoul, Ewha Womans University Press, pp.40-41

corners of the building.

An *Anssolim* technique is slightly inwardly inclining in the upper part of column.

In a *Baeheulim* technique, the largest diameter is one third of the height of column from the bottom to prevent the torsion of the column.

Baeheulim appears only in the wooden structure and seldom applied for the residential architecture.

Apart from aesthetic considerations, these aspects of the architecture are fundamentally important for the stability of the building because they distribute the weight evenly.

Horizontal lintels connect the columns to keep the building stable and there are woodblocks placed at the tops of the columns.

The walls do not bear the roof load.

The walls consist of wooden doors and windows.

Plastered mud wall stands on the lattice base or the wooden panels and makes up the rest of the wall.

Wood-panelled dry wall construction was commonly used in the 19th century.

3) The roof with roof structure

- Rafters and extended rafters

The cantilevered rafters and extended rafters bear and distribute the roof load and shift the load downwards to the columns.

With this load-bearing system the whole building is stable under the large, heavy roof structure.

- Roof Structure and Roof Tiles

On top of the columns, there are transverse beams and purlins above the small horizontal lintel-blocks and above which lie the round-shaped rafters.

The length and height of the elements are determined by the size of the whole roof structure and the cantilevered eaves.

The main transverse beams connect the building and carry the whole roof load.

To fulfil this purpose, the strongest and hardest woods are used for the main beams. The short supporting columns stand on the transverse beams to hold the roof structure.

The wooden panels and the woodblocks cover the rafters and on the top filled with clay.

Roof tiles used to be produced in-situ. They are called 'Amkiwa' (female, yin) and 'Sukiwa' (male, yang).

The Ceilings

The ceilings consist of either exposed rafters or of the same square shaped well pattern. The exposed-rafter ceiling exposes girders, beams and all the rafters. The spaces between the rafters are filled with white plaster. The square shaped well pattern ceiling is filled with boards. To conserve heat, the

ceilings are often covered with paper special rice or mulberry paper for the ‘Ondol’ (hypocaust-heating) rooms.

The Heated Floor and the Wooden Floor

‘Ondol’ (similar to the roman hypocaust heated floor) was a system in which heat produced at the fireplace in the kitchen travelled through the sub-floor flue and warmed the stone underneath the floor. The thick, tough oiled paper covering the floor is not only beautiful but also provided some insulation.

‘Cheong or Maru’ (the wooden floor) refers to the floors made of carefully laid wooden boards in the special square shaped well pattern. The wind passed through the open space.

The measurement unit – *kan*

In Korea, a building is described by ‘*Dori-kan*’ (the purlin direction) and ‘*Bo-kan*’ (the transverse beam direction) rather than the frontage and depth, terms widely used in the Western World.

The proportions of the building are determined not only by the height of the columns, but also by the number of columnar bays and by the distance between the columns.

The term, ‘*Kan*’ is generally used to name the bay of the two columns and in Japan it is used for inner space between two columns.

(In this way a building can be described as 5-*kan* in the purlin direction and 4-*kan* in the transverse beam direction.)

Unlike the main buildings of the palaces or the temples, this measurement unit *kan* in a residential house refers to the square space created by four posts.

So a house of 60-*kan* meant that it had 60 such spaces.

The size of the ‘*Kan*’ varies according to the size of the building and the dimensions of the wood. The *kan* was not only a unit of measurement, but also was a basic building module.

Examples of 19th Century Palatial residences

“**Yeongyeongdang**” in Changduggung represents an upper-class house of the Joseon period. The buildings were arranged according to the theory of Pungsu.

The walls surrounding each courtyard followed along the lines of ‘sarangchae’ and Seonhyangjae.

Therefore we can point out two axes defining the courtyard of ‘Yeongyeongdang.’

Each courtyard has a slightly elevated area adjusted to each building and this area forms a rectangular shape.

Conclusively, the courtyard and architecture of Yeongyeongdang have an intimate relationship that is defined by structural composition.

“**Nakseonjae** (Retreat of Joy and Goodness)” in Changdeokgung stands out for its exquisite architecture and views. It was in the style of an upper-class house with men’s quarters and women’s quarters. The buildings of ‘Nakseonjae’, ‘Seokbokheon’, and ‘Sugangjae’ are arranged from west to east and a long servants' quarter acts as a wall, collectively forming the ‘Nakseonjae’ area.

Seokbokheon was situated between King Heonjong (r.1834-1849)'s bedchamber, Nakseonjae, and the King's grandmother's bedchamber, 'Sugangjae', so that the King's concubine could wait on the king with his grandmother at a close distance so as to fulfil her duty well.

“**Unhyeongung**” is where King Gojong (r.1863-1907) lived as a child before coming to the throne. Unhyeongung's main buildings are Norakdang, Noandang, and Irodang. Norakdang was used for gatherings, celebrations, and other major events for the royal family. Noandang is the guest quarter used by Daewon-gun (the King's father).

“**Geoncheonggung**” in Gyeongbokgung was built in 1873 (the 10th year of King Gojong), five years after Gyeongbokgung was rebuilt. Located in a secluded place in the northernmost part of the palace, it was built for the king and the queen to enjoy peace and quiet. A large pond called Hyangwonji was created nearby, with a pavilion at the centre of the round island. The residence followed the architecture of a typical scholar's residence, except for a few ornate decorations. Jangandang Hall for the king, Gonnyeonghap Hall for the queen and Gwanmungak Library behind Jangandang are laid out to copy the men's quarters, women's quarters and the library of the typical literati's residence. The surrounding brick walls are decorated with beautiful flower patterns.

Aesthetics and symbols

A design of grapes and bats is apparent in 'Nakseonjae.' Grapes symbolize fertility and bats represent good fortune, reflecting the fact that the house was built in hopes of producing a royal heir.

60 On the hill behind Nakseonjae is a garden with attractively designed pavilions. The decorative walls and pavilions in this garden demonstrate the flair and refinement of Joseon architectural aesthetics.

The round island in the square lotus pond symbolizes heaven and earth.

Like the Chinese, Koreans have traditionally believed that the soul separates from the body at the time of death. According to the Chinese, just as the Cosmos consists of and comes about through the interaction and interchange of Yin and Yang, in a similar way, the human personality consists of and comes about through two principles or "soul (靈)", a Yin soul and a Yang soul, which are welded together during life, but separate at death. Their separation means the end of the personality as such, even though the Yin and Yang principles survive.

Korean traditional architecture is a good method to show the notions of understanding the relationship between nature and human beings. There is a poem written by a 16th Century scholar poet.

After the poet Song Sun retired from his long-term position as a government officer, he built a humble three room pavilion on a hill above his home village. He took such a long time to finish the construction. Such a long time described as "ten years" in the poem. He shared the pavilion together with fresh wind and warmish moonlight. The three-room hut was too small to let the mountains and streams in. He shall leave them around the hut and appreciate it as it is.

- ten years -

It took ten years to build
my little thatched hut.
One part is for me, the moon fills the second,
the third is reserved for the clear wind.
Rivers and mountains: There is no room to invite you in!
Stay where you are, I'll gaze at you surrounding me.⁴

Song Sun (1493-1583) / Translated by Professor Dr. Young-Key Kim-Renaud

IV. Concluding remarks

Once the basis of *hanok* is mistreated, then it is no longer *hanok*. *Hanok* is *hanok*.
“Modernisation or Evolution of *hanok*” is due to the unpleasant past during which *hanok* was considered to be old or worn. That concept arrived here as 'the Korean is that worthless thing' together with 19th century Western civilization and it is still, even in this moment, longing for the other culture. Proper restoration of *hanok* is needed not for improvement of the original or return to the original state, but for acceptance of changes over time.

The higher the basis of culture achieves, the greater the interest in the authenticity and the identity of one's own culture. Until recently, activities in daily life such as: coffee, quality wine and western classical performances indicate a certain quality level of cultivated life.

⁴ This translation was originally prepared by me in 2007 for the presentation at the 15th HMS colloquium. There was a slight revision on the last line by Dr. Young-Key Kim -Renaud. I found it was not bad and I decided to put her name as a translator because I felt it more reliable than the name of architect as a poetry translator though the poem was about the nature and architecture. There was a big debate in August 2012 through the Korea Web.ws between Frank Hoffmann and Dr. Kim regarding the translation. Frank Hoffmann introduced different version, which Frank Hoffmann admired very much. It was done by late Richard Rutt CBE.

At the end of ten years' work
I have a hut with a straw roof.
The clear wind lives in one half,
and the bright moon in the other.
There's no space to invite the hills—
they will have to stay outside.

Song Sun (1493-1583) / translated by Richard Rutt (1925-2011)

I also introduced it in German language when I was invited to speak about Korean Pavilion on the occasion of the “Wiesbadener Kunstsommer 20.6-22.8.2010 Wiesbaden, Germany. The title of the lecture was “Lobrede auf den Pavillon - Entwurf einer koreanischen Ästhetik inmitten der Natur” August 10, 2010. It was edited by my German friends Renate & Georg Wagner based on my original English version and revised one as well.

-Zehn Jahre-
Zehn Jahre dauerte es,
um meine kleine, strohgedeckte Hütte zu bauen.
Ein Raum für mich; der Mond füllt den zweiten
und durch den dritten weht ein frischer Wind.
Ihr Flüsse und Berge: Für euch ist kein Platz!
Bleibt, wo ihr seid; ihr umgibt mich und ich kann euch bewundern!
Song Sun (1493–1583)

A new measure of cultural standard involves the experience of **authentic cultural activities** like traditional music in the palace or the traditional way of life in a *hanok*, etc.

But it is still not easy to understand what *hanok* is. It is obvious too difficult for art historians to understand the timber structure, so that their main concern is only on the aesthetical elements not on the structure, material or techniques. But even architects do not know exactly about *hanok* and they are still glorifying the beauty of lines such as decorative elements in understanding the construction of the Korean houses. Mechanical and electrical facilities and auxiliary materials should be renewed in accordance with the change of lifestyle. But *hanok* must maintain its organic outstanding value.

The following few essential points shall be emphasized:

A sustainably built environment is a major competitive advantage for cities and countries, and this will be increasingly important in the coming years. Sustainable housing in a country must take its own economic, environmental and social aspects into account. Each dimension is necessary: the equation is only as strong as its weakest link. The goal of a good housing policy is to provide decent housing for all with its own **identity**. The entire environment needs to be sustainable and well-designed with **proper intervention**. Sustainable housing is authentic housing. **Authentic housing** means an authentic society. And being an authentic society is just authentic. Let us build more authentic *hanok* in Korea! (doreem July 2. 2013)