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This is the final peer-reviewed author’s accepted manuscript (postprint) of the following publication:

Published Version:

Cristiana Bartolomei, A.F. (2021). The “Japanese Landscape Inside”: The Transition of Architectural Spaces. Cham : Springer [10.1007/978-3-030-59743-6_25].

Availability:

This version is available at: <https://hdl.handle.net/11585/819907> since: 2021-05-06

Published:

DOI: http://doi.org/10.1007/978-3-030-59743-6_25

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This is the accepted manuscript of:

Bartolomei, Cristiana, Anastasia Fotopoulou, Caterina Morganti, Giorgia Predari.
“The “Japanese Landscape Inside”: The Transition of Architectural Spaces” In:
***Digital Draw Connections: Representing Complexity and Contradiction in Landscape*, edited by Fabio Bianconi and Marco Filippucci. Cham: Springer, 2021.**
<https://dx.doi.org/10.1007/978-3-030-59743-6> 25

The final publication is available at

<https://link.springer.com/book/10.1007/978-3-030-59743-6>

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The “Japanese landscape inside”: the transition of architectural spaces.

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Abstract: Japanese traditional architecture from its origins is harmonized with the natural environment. The relation with the landscape has its roots to the Heian period, where the connection between the interior and the exterior space was important. The landscape is inserted to the interior, rather than excluded, due to a variety of means such as shoji, bamboo screens, balconies, entrances and verandas or open corridors (EN). The physical and symbolic use of the Japanese landscape finds its maximum expression in the architectural space of the traditional buildings, in all its forms; the outer space and the inside are deeply interconnected and at the same time separated through a gradual transition process, which has as its main principle the connection between the man and the landscape, where the building, as a construction and physical model and as a social expression becomes the medium. The fusion between exterior and interior, thus forms a spatial continuity, typical of the dedicated places as for example the tea ceremony room (茶道). So Japanese architecture recalls some of the concepts exposed by Robert Venturi in his "Complexity and Contradiction in Architecture", such as the equilibrium generated between opposites, which in this case are inside and outside, which live in perfect continuity.

This paper aims to comprehend the traditional Japanese architecture related to the landscape while investigating the design, the constructive choices and the adopted technologies, achieving awareness thanks to the fundamental instrument of representation.

Keywords: “Japanese Traditional Architecture, Timber Construction, Tea Ceremony Room, Pattern, Construction History”

1. Introduction

Historically in Japan, the architectural practice has always been related to the idea of working and living in harmony with the natural environment. Since the Heian period¹ the building model was the shinden-zukuri 寝殿造, a term that identifies the style of residential architecture of the palaces and aristocratic buildings built mainly in Japan in the 10th century. The main characteristics of the shinden-zukuri style were a precise symmetry of the group of buildings of the complex and the space enclosed by them. The main building, the shinden, was placed on the central north-south axis and faced south towards an open courtyard. Two additional buildings were built by the two sides, right and left of the shinden, both oriented in an east-west direction, and were connected to it by two corridors, in which were found some intermediate entrances giving access to the courtyard, a place where many ceremonies were celebrated (Fig.1). The corridors were extended versus the south and ended perimetrically in small pavilions shaping a courtyard in a U-shape. This model was adopted since the Middle Ages until the post-war period, maintaining over time the concept that the space of a traditional Japanese house is interpreted as a space in which the limits between exterior and interior are not well defined. This close relation to nature is in fact the ultimate goal of the Japanese

¹ The Heian period (平安時代 heian jidai) is an era of the Japanese history between the VIII and XII (794-1185) centuries and has taken its name from the capital of that period, Heian-Kyo, the current Kyoto.

architecture. Consequently, the design of a Japanese house can be seen as composed of three parts: the exterior, the intermediate space and the interior (Fuccello, 1996). The exterior is naturally expressed by the garden and the interior is the place where the inhabitants spend most of their daily time. The intermediate area is an important area considered as a filter area among the other two spaces, allowing nature to penetrate the house while guaranteeing protection and safety at the same time (Kalland, Asquith, 1997). Therefore there is no clear division between the exterior and the interior, but due to a series of screening elements, such as the veranda (engawa), door (mon), wall (hei), hedge (ikegaki), canopy (hisashi), the natural landscape is well blended with the anthropic one. Indeed, the traditional Japanese architecture reflects the basic dichotomy of the Japanese thought, known as Uchi and Soto (in and out), Uchi literally means house, while Soto (外) refers to the outside.

Paraphrasing what Robert Venturi says about Shodhan House, it can be argued that even Japanese architecture is closed and yet open. The concept "yet" is therefore valid: "Contradictory levels of meaning and use in architecture involve the paradoxical contrast implied by the conjunctive "yet" (...). This series of conjunctive "yets" describes an architecture of contradiction at varying levels of program and structure. None of these ordered contradictions represents a search for beauty, but neither as paradoxes, are they caprice" (Venturi, 1980). It is therefore an architecture based on contradictions, finely resolved through the concept of equilibrium, since equilibrium must be created out of opposites.

This clear distinction between inside / outside, internal / external, presented in many aspects of the Japanese culture, is also reflected in the organization of the living space as seen in the traditional Japanese residences. Great attention is given to the idea of the space that exists between things, such as the very space of transition between inside and outside, which in the Japanese tradition is known as the "knowledge" of the MA (間), and also on how to arrange the spaces to achieve harmony, not only in the geometric aspect but mainly in the idea of being/living. This duality between internal and external finds its natural fusion in the passage between the garden and the house but also internally, in the transitional spaces of the traditional Japanese house, which are those that connect the landscape with the space of life such as the entrance vestibule (genkan), the area that is found once you enter the main door (Katsuhiko, Kōjirō Y, 1987). The landscape intended as nature, is found in the house through a variety of materials and means with a certain degree of transparency and permeability such as bamboo curtains (sudarè), sliding walls in paper (shoji or fusuma) the tatami, the wooden gratings (koshi) etc (Kuroda, 2010). These devices were born during the Heian period and were developed according the Shinden style allowing nature to enter physically and visually in the internal rooms (Fig. 2, Fig. 3). For the Japanese of the Heian period, the natural elements such as rocks, streams, trees were endowed with energy and the proximity and interaction with them was necessary for the well-being of the inhabitants. Therefore, built and natural environment never stop to invade one to the other: the construction of the house always follows the course of the land in which it is located; the interior, which follows and is adapted to the changing seasons, leaves nature enter through the shoji² that move accordingly, allowing you to appreciate the maples in autumn, the cherry trees and azaleas in spring and the snow during winter time. In the most important room of the house, the tokonoma, a painting with a floral composition is often placed to reinforce the idea of how important the natural landscape is. Furthermore there is always a composition of flowers in pots (chabana), which changes shape and layout according to the seasons and the climate, but it is never positioned at the center of the alcove, thus reaffirming that nature is asymmetrical and so is life and the existence of beings. The flower, which is taken from nature and brought into the reality of architecture, becomes architecture itself and as architecture is made by man there is therefore a very close relationship that never stops to be brought to light. The close contact of the Japanese people with the landscape is also documented by the immense importance that is attributed to the external space of the garden. In Japan there are three types of gardens: those that are mainly naturalistic and that have been influenced by the typical gardens of the villas of the court of the nobles or the shogun family; those influenced by the rock gardens, which often can be seen in Zen temples and finally those called roji 露地, or "tea gardens", which are inspired by the philosophy and traditions of chanoyu 茶の湯, "Japanese tea ceremony" (Mizuno, Yoshida, 1987). Each one of them though is designed having thought each detail; in fact, Japanese culture approaches nature in a highly aesthetic

² The shoji are very light sliding panels, consisting of a simple skeleton of thin strips of wood arranged to create rectangular meshes and framed by larger strips, on which the paper is usually glued, whose texture is rather coarse, allowing the diffusion of the natural light, creating a generally light atmosphere. As the light conditions change throughout the day, so does the quality of light. The wooden slats are notched into one another to strengthen the frame. The lower part of the shoji is often opaque, consisting of a wooden panel. Usually the paper is placed to the external part of the shoji allowing the wooden trellis to be visible from the inside. In order to have it visible from both sides more elaborated manual work is needed, since a double frame should be constructed.

way. In ancient Japan the word "nature" did not exist (Liotta, 2012). The words that were used - ame-tsuchi 天土 (heaven and earth), yama-kawa 山川 (mountains and rivers), ue-sue 末 (above the end) - refer to separate entities extracted from nature (Fujita, 2012). When the Japanese try to imitate nature, they extract some essential elements from the whole, limiting themselves to a few carefully chosen species following the "less is more" principle and tend to miniaturize everything. Furthermore, Japanese architecture is an architecture in which right angles and rectangular shapes are used to create "paintings" in which architecture itself defines the landscape. With this artificial boundary, the so-called "domesticated" nature (construction) is separated from the external "raw" nature (the landscape) (Filippucci, Bianconi, Verducci, 2006).

2. The concept of the natural landscape

Numerous definitions have been given to the term "landscape". The European Landscape Convention (Council of Europe 2000) defines it as "a specific part of territory, as it is perceived by the people, whose character derives from the action of natural and / or human factors and their interrelations". The Convention recognizes as worthy of interest both the landscapes that can be considered exceptional, the landscapes referring to daily life, and the degraded landscapes as well, considering the landscape, as an essential component of the context of life, expression of the diversity of the common cultural and natural heritage of people and the foundation of their identity. The landscapes are therefore spatially delimited portions of the real world that appear as environmental mosaics diversified by the different interactions between man activities and natural processes, through space and long periods of time (Farina, 2001). The traditional Japanese architecture fits perfectly into this scenario, and in particular the residential one, which comes from an ancient millenary tradition that already in its first housing models established four fundamental elements that still now days accompany many of the residential expressions: an independent supporting structure from vertical closures, the sloping roof as upper closure, the rising floor over the ground and the use of light vestments of natural fibers or wooden lattices as internal divisions (Fig. 4). The natural scenery is therefore part of the overall design of the construction of a traditional house. Worth mentioning is that the Japanese landscape law defines the term landscape as "a form combined by nature, history, culture, means of livelihood and economic activity". The architectural space is the result, in fact, of a complex of history, cultural, religion, linguistic and aesthetic traditions. Japanese philosophy is based on the concept that everything is nature, even architecture itself (Fig. 5). Therefore the building must be conceived as an extension of the nature that surrounds it and not as a simple insertion into it. Shizen¹ which represents the harmony with nature, is a fundamental aspect of the traditional Japanese spatial organization. The same attention of the space integrated with nature is found in the use of materials, strictly natural: wood for the structure, floor and walls and cypress bark for the roof. In fact, the use of natural materials in the construction is favored due to their ability to age slowly. In the walls made of wood, in the paper surface of the sliding doors, in the straw of roofs and floors one can identify the profound harmony that is found in the natural environment. A traditional Japanese house is formed parallel to its garden and with it is being completed. This relation is translated by framed views of windows and meditative verandas that offer direct views of the garden. In every space, in fact, great attention is given to the positioning of the openings that are placed so as to capture views and frame them like a painting on the wall. The internal and external space is seen as a unicum, an ambiguous space created with no clear and strict borders.

In this sense, Japanese architecture is in total opposition to one of the principal statements of the Twentieth century, as reported by Robert Venturi: "Contrast between the inside and the outside can be a major manifestation of contradiction in architecture. However, one of the powerful twentieth century orthodoxies has been the necessity for continuity between them: the inside should be expressed on the outside" (Venturi, 1980). In Japanese culture, and consequently in its transposition into architecture, the opposite concept is exactly true: there must be perfect continuity between inside and outside.

The house is transformed and changes character as previously mentioned according to the different seasons in order to allow the greatest possible connection with nature: in winter shoji sliding doors are joined by sheets of paper that make light less intense and protect from the cold; instead during summer period the doors give directly access to the garden. There is never a separation between nature and built environment, which is amplified by the contrast between the two parts: on the one hand the building that is being developed in extremely made by geometric architectural forms with very high level of symmetry, with prevalence of forms based on parallel and perpendicular lines, which produce a total perspective homogeneity within the space even after the rotation of the observation point, while on the other hand there

¹ Shizen began to mean "nature" according to the Western conception only from the eighteenth century, and precisely it was appeared in a Dutch - Japanese dictionary of 1796 where was used to translate the Dutch word "natuur". Before then, the conception of nature as considered in the West was significantly absent in Japan.

is the natural landscape where geometry and symmetry seem to be totally absent. Therefore, if symmetry and order reign inside, outside order is broken (Venturi, 1980).

In reality, a careful analysis reveals that nature, if not hindered by anything, would have a strong tendency to symmetry: trees, flowers, plants in fact tend to grow according to symmetrical and repetitive models and in order to study these models we use as a reference the fractal geometry, a geometry much more extensive than the Euclidean one, where in addition to the spatial symmetry, the scalar symmetry is also added. Yet environmental conditions, such as the different exposure of light or wind, produce an ordered asymmetry in the landscape thanks to which the balance between left and right is altered to create a dynamic beauty, which makes the Japanese natural landscape a place of contemplation: the Japanese take care of every millimeter detail in designing it. They gather the elements of nature present in the surrounding landscape, organize them in such a way as to maintain each one's own specificity and recompose them so as to form a miniature image of the landscape itself and the house is precisely designed to be also inserted asymmetrically into the landscape. The garden is not just a simple view that can be admired from inside a building, as in the case of Western architecture: the Japanese house is conceived as an integral part of the landscape itself. Climate variability certainly influences considerably the way in which the living space is constructed, determining various interconnected and consequential factors between them: the type of domestic environment, the exploitation of landscape resources, the variety of crops, the festivities that mark the seasons and the agricultural year. For this reason should be avoided falling into the idea that the "traditional" Japanese house is a single invariable and isolated from any other influence.

3. The organization of the Japanese house

The Japanese building tradition is based on the organic integration between man and nature, giving attention to the use of natural materials, to the fluidity of the interior spaces, to the simplification of forms through the elimination of superfluous elements, to the continuity between the inside and the outside and as a whole to the harmony between the environment and the construction. The traditional Japanese house is designed from the inside out: the outside of the house evolves from the design of the internal distribution rather than being designed to adapt to a rigid pattern or to pre-established geometric shapes. There are four elements that allow the occurrence of this: the particular protruding roofing system, a very flexible system of interior spaces, the detachment of the floor from the soil of about half a meter, the external walls built in wood, bamboo and clay bricks. Originally, according to the traditional model that is known as shinden, traditional Japanese buildings were developed around a large central space: the moya, which represented the main room that was characterized by four large cylindrical wooden elements. On either of the sides of this space were found the hisashi (whose etymology derives from "hi [ga] sasu", "where the sun shines"), two porticos that over time would extend to embrace the central body forming a sort of gallery and a further external gallery (magohisashi) was added to this structure, functioning as a permeable screen to the external landscape. This allowed the internal space of the house to remain "open" towards the garden, allowing the Heian aristocrats to modify and expand considerably the space of their homes without changing the fundamental main structure. The core of the building (moya) is 3x3 ken wide¹ and is surrounded on four sides by a 1 ken hisashi, bringing the external dimensions of the building to a total of 5x5 ken. Therefore the total area of the galleries surrounding the building is larger than the surface of the moya. The space of the house was therefore composed of open spaces that in fact were neither really considered as internal ones nor truly external but they guaranteed a constant desirable connection between the surrounding garden and the house. The Heian culture, which also strongly influenced later periods, was the symbol of an architectural model that places the man in the heart of the garden and the surrounding natural environment. Even when the old galleries were replaced by verandas and corridors which connected various rooms together, it always remained as a fixed reference that the garden had to remain connected to the house (Fig. 6, Fig. 7). After the earthquake of 1467, which devastated Tokyo, a method of construction was developed, known as the "Shoin style"² which normalized, according to a system of typical dimensions, the construction of the dwelling starting from the foundations, from the beams, from the deforming of the roof and from the floor to the dimensions of the living spaces and other elements of the traditional Japanese house. The large cylindrical

¹ Ken (間) is a traditional Japanese unit of length, equal to six Japanese feet (shaku). The exact value has varied over time and place, but generally has been a little less than 2 meters. Nowadays it is standardized as 1/9 of a meter.

² A term initially used in the context of Zen to indicate the cell of a monk. Later was used to express the style of homes of the samurai class, a style that still constitutes the basic form of typical Japanese architecture. The shoin style was born from the shinden style of the aristocratic residence of the Heian period. After a long evolution and several variations, around the middle of the fifteenth century the main shape was established, characterized by rooms with tatami, divided by fusuma sliding doors.

columns of the moya were replaced from the square-shaped supports of the hisashi, thus obtaining a structural homogeneity that maintains the desired fluidity in the spatial organization. The internal divisions, which were initially fixed, are replaced by light and sliding elements. The doors, originally being heavy and massive, leave now place for a wooden framework, the shoji, on which a pad of rice paper is mounted making the element light and translucent. Tatami was used for the floor finishes. The structure of traditional Japanese houses therefore, according to the Shoin style, is characterized by columns or wooden pillars that rise from the foundations directly fixed to the pressed ground or to a stone. The space of the Japanese house is therefore not defined by walls and rigid separations. It is the columns or pillars that establish the shape of the space and as a result in the structure that forms the framework of the house there are two or more sides without fixed walls. To limit the effects of soil moisture and to minimize the damaged of the frequent earthquakes, the floor is raised by tens of centimeters and is made of bundles of horizontal wooden boards. This lack of contact precisely between floor and ground is one of the aspects that marks the connection between the domestic space and the outside, which amplifies the passage from inside to outside, allowing the level of the house to offer a higher "observation point" than that of the garden, so that it is possible to have different views and shots of the landscape from the inside than from the level of the garden. In ancient times, the walls of the houses were made of dried bamboo and stucco with soil on both sides. Nowadays, different types of materials are used, including plywood. Until the middle of the 19th century, the columns were partly seen in the external part of the house while from the Meiji era (1868-1912) onwards, these columns were progressively placed inside the outer walls to reduce the risk of fire. The roofs were thatched, but nowadays many roofs are covered with tiles called kawara. However, the principle of all these models remains that the landscape should be free, natural and completely interconnected with the built environment. To reinforce this idea, in parallel with the shoin style, is developed in Japan the style called sukiya, which explored the design of a solitary, contemplative and isolated building in the middle of a refined garden, thus ensuring a close contact with nature and elevating to a high level of dialogue, a much more delicate and introspective style than the shoin and shinden models. In this model it is gained a maximum integration between inside and outside, natural materials show original colors and textures, everything is oriented towards those who live in the space and towards the natural frame of the landscape. Japanese buildings have been developed over the years by combining traditional forms with modern technology, improving their resistance to fire, but in any case the tendency has remained to investigate the inspiring principles of traditional constructions also for the development of new solutions. Even today the design of the house does not aim only at functionalism, but rather at the continuity between private space and public space that is manifested in the relationship of vertical walls to the ceiling or to the roof of the house. All Japanese architecture remains so faithful to the landscape and nature, as for example, that when there are no constraints imposed by an urban context, the houses are oriented to an east-west direction so that the top of the roof points to the east, thus ensuring the best orientation during the summer and winter months. It can therefore be concluded that the design of the space of the Japanese house, regardless of the style used, integrates the house in the garden and in the recreating landscape.

4. The traditional Japanese way of building

As in all cultures of the world, Japan's traditional way of building is strongly influenced by the environmental context; on the one hand, as regards the choice of the materials used it is mainly wood, since the country is rich in forests from which it is possible to derive high quality construction elements. On the other hand, as far as inherent in the way of using them; in addition to the four seasons traditionally intended, in fact, in Japan, at the beginning of summer, there is a brief rainy season and typhoons in early autumn, so as to create a cycle of six seasons. In spring and autumn the climate is pleasant, in winter it is naturally cold. The three remaining seasons, namely the rainy season, the summer and the typhoon season - are hot and humid, and it is to these three that Japanese architecture is mainly oriented. The traditional Japanese construction system consists of simple skeleton structures of wooden beams and pillars, without diagonal stiffening elements, both in the vertical plane and in the roof slopes. As reported by Engel: "Because the structure is a simple post and beam framework without any braces or struts, the wall panels in between those structural members support only themselves and do not require foundations. Only at places of actual structural supports, i.e., at the columns, is the ground sill provided with a simple foundation of natural or hewn stone that raises the whole wooden framework above the damp ground" (Engel, 1985)). From this derives the possibility of large open spaces for the insertion of windows and doors, light external walls and movable partition walls (Jinnai, 1995). On the base of the pillars can be found simple stone foundations that have the function of lifting the entire wooden frame above the damp ground, allowing the raised floor to be placed several tens of centimeters on a horizontal beam framework in wood¹. The vertical uprights, hashira, are

¹ Studies on traditional Japanese construction have shown three types of column foundations: hottate-basira (wooden columns are inserted directly into the ground, without stones, but are very likely to decay), ishiba-

erected above the frame of the plane, positioned at regular distances and connected to each other by means of horizontal connection elements. At the same time, the floor beam, ashigatame, is placed on top and the entire upper part is supported by the perimeter beams, thus completing the frame above. The constructive simplicity is even more evident in the roof. Heavy logs are simply warped from the eaves to the ridge beam, simply resting on each other. Wooden uprights are erected over the transverse beams to facilitate the arrangement of purlins and rafters. The Japanese way of building appears therefore very different from the western construction schemes, which mainly use stone and bricks, that is massive constructions based on the long duration of the building thanks to the use of heavy materials, to the organization for different environments characterized spatially in a different way and aligned in succession, to the absence of direct relationship between inside and outside, to the search for beauty and perfection through order, symmetry and proportions. The free articulation of the interior space, the independence between the supporting structure and the closures, the relationship of continuity between indoor and outdoor spaces discovered, the relationship between architecture and landscape, the point structure, the light materials, the normalization and prefabrication of the elements the characteristics of Japanese architecture are constructive. The choice of wood as the main material of these buildings, as well as other natural materials such as thatch and bamboo, therefore highly delicate, follows the principle of renewing the architectural form, thanks to which the construction technique is handed down. Great emphasis was given to the roof, the most important structural element of the whole building, as it was what provided shelter. The geometry of the roof is a pavilion or two-pitched shape; the cover is made with shingles, thatch or tiles². In any case, the complete roof structure is extraordinarily heavy: the tiles are very large and held by a thick layer of mud. The thatch, although not particularly heavy, becomes so after a heavy rain. Therefore the roof frame must bear a very big weight. The structural simplicity of the constructions conceived could be surprising, where the construction method, based on lightness, contrasts with the need to withstand heavy roofs for protection against strong winds and hurricanes, but which constitute a factor of great seismic vulnerability given that their masses induce high forces of inactivity at the top of the buildings, which can cause collapsing. Furthermore, the various specific elements are assembled without any type of rigid connection or riveting, since each component is connected by means of tenon and mortise joints, and no controversies of any kind are foreseen, creating a compatible system to withstand vertical connections but totally devoid of a mechanism capable of withstanding horizontal actions. In fact, the traditional Japanese method of building construction is mainly based on a structure of wood joinery, in which each structural element is joined without the application of other fastening elements and bracing not based on wood. In traditional Japanese architecture, the intricate components of the stirrups have been carefully carved into the wood, using pre-industrial hand tools for working with wood, and assembled together and held in position solely by the force of gravity and by the force in the connections of the joints themselves (Fig.7, Fig. 8). Not even the foundation offers any rigidity to the entire structure, but the weak connection between the foundation stone and the frame appears very appropriate in the event of an earthquake; studies carried out over the last century (Tanabashi, 1960) have made it possible to understand how the construction technique alone could be sufficient, for the purposes of seismic protection, in the context of traditional buildings, when modern materials were still not available. In fact, the more a structure is rigid, the more the seismic action on it increases; for flexible structures with long natural periods of vibration, however, the seismic action is weaker. The Japanese wooden structure is substantially anti-seismic since it is ductile and elastoplastic due to the material and the way the structural elements are composed. The inclusion of diagonal bracings, recently integrated on a western derivation in the traditional construction technique, has ensured further stability and durability of the construction. Japanese houses have been developed over the years by combining traditional forms with modern technologies to improve their fire resistance. In today's wooden constructions the construction technique remains the same as in the past; the supporting structures are still mainly made of wood, but the coatings are of stucco or synthetic materials, fixtures and doors and windows are made of light metals, the paper surfaces are replaced by glass. Reinforcements and metal joints have been inserted,

date (with a base made of stone material of small size and the column is grafted on top on a stone) and dodai-date (similar to the previous one, but with the column set on a wooden sleeper)

² In the common shingle roof, a wooden plank is first nailed onto the slanted joists and the shingles are applied to this with bamboo connecting elements. In the case of use of tiles, instead, shingles are first distributed on the roof boards, then a thick layer of mud is spread on this surface, on which the tiles are immersed, one row after the other. The thatched roof is by far the most widespread in the countryside of Japan. To spread the straw, the roof does not need to be specially prepared, but it is necessary that the inclined beams are close enough to each other to be able to support it. The straw is placed by hand, combed with fingers or adjusted so that the stems are all in the same direction. Then the groups of stems are fixed to the slanted rafters and pressed onto the roof with bamboo, which will then be eliminated. While the straw remains pressed, it is elaborated with a particularly shaped wooden mallet, so it is shaped with a pair of shears with a long handle. Once the work is completed, the roof looks incredibly neat and symmetrical.

especially for the foundation, which has now become continuous, with the construction constrained to it by anchor bolts. In the main frame, wall bracing is used to withstand earthquakes and wind pressure.

5. Natural materials in Japanese homes

According to Feng Shui¹, for Japanese culture every manifestation that takes place in the Universe is characterized by the five elements: Wood, Fire, Earth, Metal and Water. The materials used within traditional Japanese homes are intimately related to these five elements of which nature is composed. Each of them is characterized by its own characteristics. The main materials found in Japanese homes are bamboo, wood, clay, stone and paper. With these materials nature is present in the house. All the parts of the building are unified and interconnected: the dimensions of the individual parts in an environment take the form of the side of the square of the wall, whose width is in turn in function of the size of the given environment, which is measured in relation to the modular dimensions of the tatami. In fact, the design of a traditional house identifies only the quantity of tatami in the room and indications on the space between columns or pillars. The tatami mats, which have always served as a module to size the house, are mats formed by the intertwining of rice thatch and rushes, of rectangular shape and standard size (3x6 shaku²), with perfectly squared corners edged on the long side from a black linen ribbon, with a footprint of about 90 by 180 cm and a thickness of two inches. Oriented to cover the floor, they serve as a soft surface for walking, sitting and stretching the futon to sleep, making the floor fresher because the tatami allows air to circulate on the ground. For the Japanese the tatami represents the grass, and therefore covering the tatami floor emphasizes the bond with nature. Bamboo is a material widely used in traditional Japanese homes due to its strength, durability and flexibility. In fact, it provides a high stability with a minimum weight and moreover it is not particularly affected by humidity. In addition being used as a building material to make roofs and beams, it also has a high aesthetic value, due to the beauty of the knots and the brilliant surfaces that evoke the sound of bamboo forests. The traditional Japanese house uses a lot of wood, used naturally and without being painted. It is a light material that responds well to earthquakes, and which embodies in itself the concept of transient, so important to the Japanese people. Primarily species of cypresses (Hinoki and Asunaro) are used, species of pines, both red (Akamatsu) and black (Kuromatsu), species of spruce (Tsuga) and Japanese cedar (Sugi) and also species of maple (Momiji) and mulberry (Kuwa). Clay is also used both for the construction of the roofing layers and for making of the external walls (Komai-Kabe). Several layers of clay, sometimes up to fifty, are used and spread on a bamboo frame, thus producing different varieties for structure, grain and color. Stone is a material that is used mainly in the exterior, to mark the paths in the gardens, as well as to support the foundations. This material is associated with the earth element, which symbolizes the place to life, which allows the seeds to grow. However, it is not normally used for construction, although the country is rich in stones that can be used as good building material. Finally the use of paper with which the shoji are made. Shoji are the mobile separating walls that are used as a division elements of the interior, but above all to mark the boundary between the inside and the outside. The paper, translucent and coarse-grained, usually glued on a wooden frame, on both sides (fusuma-gami) or on one side (shoji-gami) has the characteristic of allowing the passage of light but not drafts, although allowing ventilation (Fig. 10, Fig. 11, Fig.12). There is a strong attention in the use of the choice of materials and their colors (always neutral colors such as white, yellow, beige, gray or light brown or alternatively with pictorial patterns present in nature or with calligraphic decorations) and the accent always on the unfinished detail, as if to reaffirm the irregularities of nature. The choice of these materials is linked to the classical Japanese vision, where reality is temporarily, a flow in continuous transformation. The traditional constructions, conforming to an idea of naturalness, harmony and organic unity with the surrounding landscape, are conceived as not lasting but temporary constructions. This idea is still current, even when Japanese architects use materials and Western architectural techniques: Japanese cities are in fact the subject of a continuous transformation where the quality of the materials is always of absolute priority. The much appreciated Japanese order in fact, is based precisely on the nature and expressiveness of the material, made evident by the wise techniques of elaboration used.

¹ The Feng-Shui [literally "Wind and Water"] is an ancient Chinese discipline that deals with the energy interrelation between the man and the environment and in particular with the correct configuration of a space (living but also working) to assimilate the best fortune and maximum well-being; Feng Shui is based on the knowledge of the energies and rhythms of Nature, on the bio-psychic influences of the four directions connected to the five elements of Chinese Medicine, on the correct furnishing and layout of the premises and of the external environments. It finds correspondences in the Indian science of Vaastu Shasta, in the Japanese Ka-So and, in the West, in the ancient discipline of Geomancy and in today's Geobiology and Bio-architecture.

² It is the Japanese unit of measure, called the Japanese foot completely identical to the British foot. It is a traditional measurement system, imported from China.

6. Space and the "natural" components of transition spaces between exterior and interior

The interior space of the traditional Japanese home is composed of a mix of lines and textures and the effects created by light. Their beauty lies in the effects of the shadows produced by the light on the walls: both define the interior space and recall the exterior through windows that frame the views. The interior space of Japanese homes is a neutral frame that comes to life only when activated by the presence of man. The hierarchy of spaces does not follow functional criteria, but changes in relation to situations. The spaces are open and permeable to allow nature to become part of the architecture; the rooms are simple, the dimensions vary, the internal panels (fusuma) allow to join or divide neighboring rooms, while the shoji give the possibility to visually prolong the horizon by combining more rooms. The shoji, the mobile panels that form the internal and external walls, are removed in the summer to let the breeze in and enjoy the view of the garden, making the house a place closely related to nature and the seasons. These are the main elements that define the relationship of space within the home (Paolucci, 2001). The minimalism of the rooms gives strength to the landscape that becomes the predominant element of the house. Both the floor and the ceiling have no role in the partition of the interior space. Everything that is built appears as an extension of the natural environment, which dialogues and merges with it. The Japanese space is thought to be seen and appreciated by the level of the seated man, in a meditation position. Only in this way is the perfect point of view to look outside and the rooms, which otherwise can appear small, cold, unbalanced, become instead gently welcoming, made on a human scale. From this point of view, the landscape enters the house, as Fosco Maraini explains very well in the book "Ore giapponesi": "the fusion between outside and inside is perfect; every tree, every stone, every wave of the pond are designed according to how they will appear from the inside; and vice versa the house is designed so that from any side you look at it, from the outside, it completes a foreshortening" (Maraini, 1962). The construction of a space, in Japan more than ever, needs an interior, an exterior, boundaries and a place of passage that unites and / or divides these elements. The set of material and symbolic practices, typical of Japan, such as the practice of bowing or taking off the shoes and overcoming various levels of heights different from the outside inside the house, do not aim to create a net distinction between outside and inside, but they constitute a path, a transition. In the relationship between exterior and interior it is interesting to note how the entrance into the domestic space of the Japanese house takes place gradually, overcoming various steps and with a precise logical sequence. Usually from the outside a path of stones starts, of which the latter is known as Kutsunugiishi 沓脱石, literally, "stone take off shoes", on which the shoes are removed before entering the house. The stone does not only mark the act of removing the shoes for hygienic reasons, but above all it states the physical and symbolic boundary between the exterior and interior, between the public and private spheres. In addition to a gradual ascent from the ground to the raised floors with the use of stone and steps, there is a real change in the material, from the street (outside) to a concrete or stone area (transition space) wood and tatami (interior). The transition between natural space and anthropic space takes place through three main elements: the veranda (engawa), the entrance vestibule (genkan) and the shielding elements (noren, sudarè, yoshizu). All made with natural materials almost as if they were bringing nature always with them. The first element is the veranda, it is the filter area between the garden and the house. It is that space that lies below the eaves of the roof structure. The veranda can be maintained at ground level becoming an essential part of the garden and can be made of stone or gravel to physically separate it from the garden or be an arboreal continuum with the garden, as if to bring the natural landscape inside the house. The veranda space, at times, is physically shielded from the outside with the use of shoji or fusuma and also the veranda, standing under eaves, is covered by a low roof that does not allow to see the sky (Fig.13). In Japanese culture in fact the sky is never seen directly but only by reflexion¹. To signal the transition between exterior and interior the Japanese use to place in front of the veranda a large stone of particular shape that serves as a visual clue and is the place where the shoes are removed (Morse, 1972). Engawa filters the natural light inside the house while protecting it from the rain: during the summer it becomes a part of the garden, in winter it can be closed so as to form an extension of the interior space. The second element is the entrance pre-hall (genkan). The genkan is the architectural expression of the transition, the spatial translation of the connection with the external landscape. It is the atrium at ground level where the shoes are still worn and which modulates the passage inside the house an intermediate space that constitutes a filter area with the function of reducing the contrast between inside and outside. The third element is the protecting devices that allow to provide ventilation, light and privacy at the same time, thus guaranteeing natural elements such as light and air to pass freely through the house. Among the most widely used forms of protection is the noren, non-continuous curtains in fabric or hemp that allow the "living" of the wind, producing a sensation of

¹ It is thought the attention that is placed in the design and orientation of the water mirrors within the gardens. The water mirrors are placed in fact so that from the observation point from the veranda of the house through the mirrors of water we can see the sky "beyond" the garden through the reflection in the water.

freshness even in the hot summer months and the sudarè or Yoshizu, sliding bamboo curtains vertical the first one and horizontal scrolling the second, much less soft than noren, but they have the advantage of not being opaque, thus allowing to always see the natural landscape from the inside. They are usually found attached to the lower edge of the attics and allow shelter from the glare of the sun, without however losing the perception of the external natural landscape: moss, stones and shrubs present in the garden can be appreciated from the privileged angle when viewed from a low angle. Therefore, it is clear that direct sunlight becomes a constant factor in the interior space. During each season the sunlight will reach the deepest areas of the space. Also during the evening hours, sunlight can cover half of the floor with direct light. Although the screen functions as a shading device, does not provide complete shade, but filters sunlight into a more diluted light. The screen also works best when combined with other shading layers, such as paper screens, to provide a second layer of shade. Through the shoji the rooms of the house are found, where the room in traditional Japanese architecture is nothing but a mobile interval within the space of the house, a temporary space determined by the opening and closing of movable walls that can form a bigger space (Fig. 14).

7. The space of the Tea Ceremony

The space that best celebrates the intense relationship with the landscape is the tea house, very important in Japanese culture, especially since the shoin period (XVII-XIX century). In the shoin period, a standard was established that prevented any creative architectural development, since the dimensions of the rooms were fixed, as well as the shape and materials to be used, so that any possibility of personal expression was practically prevented. The cult of tea, already present from the sixteenth century, then forcibly introduced its sukiya style from the seventeenth century, which allowed the expression of the personal taste of the owner of the house in the realization of the tea space. The tea house was designed to offer a port of nature and peace and to provide a break from the hustle and bustle of everyday life. Even today it is an attempt to create a natural environment in the midst of the chaos of city life. Thus an architectural environment was born where space was shared within a main room, through mobile panels, called kakoi (fence). The name kakoi, later, designated those tea rooms that were integrated or physically annexed to the main house. The simplest style, referred to as souan, was an area organized by four and a half mats, which formed a square surface of about 7.29 m², with a sloping ceiling much lower than in the other rooms, made of bamboo weaving or from strips of braided wood (Larsen, 1992). The space was equipped with a skylight to allow the lighting of the space in function of the rising or setting of the sun, to place the accent on the strong emotional connection with nature. The significant character of this architecture is its apparent poverty: the walls are bare, the only element added is a smooth white plaster. The woods are never painted, so that they can show signs of aging and the effect of bad weather conditions. Apart from the plaster (and sometimes the tiles), all the materials used are of vegetable. In the tea house often beams, joists and other visible structural elements are made of bamboo. Set aside the recognition of constructive elements such as walls, foundations, roofs, doors and windows, the Japanese architecture of the tea house is very difficult to understand, except through a meaning that transcends the architecture itself (Larsen, 1994). The space intended for the ceremony evolves from an enclosed environment within the home to a smaller, simpler and more bare space, immersed in the landscape and destined for the sole use of this practice. These buildings are called chashitsu, and are isolated buildings inspired by the architecture of rural villages (Tollini, 2014). The building is in unity with the garden and this is in relation with nature. This commonality with the garden not only brings nature and the universe closer, but establishes a precise relationship between life and the universe by demonstrating that nature is a part of life and life is a part of nature. This is so apparent that this space is considered as an environment in which it is possible to experience sensations so intense as to cause a change in the consciousness of those who celebrate it. The individual identifies himself so strongly with nature and thanks to the neutral scenario of the tea room, devoid of furniture and dominated by soft colors, he is able to free thoughts and anxieties from his mind. This liberating path begins even before entering the tea room, it originates already while walking through the garden, as Bruno Taut describes very well in this passage, when he describes the imperial villa of Katsura, which he visited in 1933: "The path that through the woods and leading to the teahouse (Shokatei) is a philosophical preparation (Berque, 2014). First of all there is a quiet pastoral, a murmuring stream and a small waterfall - from this point a clear transformation begins, with big stones as you could find on windswept beaches or on the tip of a promontory (...) The stones at the south seem to invite the visitor to meditation. A rough stone bridge leads to the teahouse. The tea ceremony is held without pomp or regard for differences in social status. However, once the group moves for lunch in the largest room, the sounds of the waterfall can be heard again and for the first time the sunlight is reflected in the water of the moving waterfall. A turtle enjoying the sun on a rock in the middle of the pond plunges into the water with a spray. The fishes jump on the surface of the water showing their scales while the cicadas sing delicious songs in

the shade (...). The world is really beautiful (...) "(Taut, 1933). In these gardens one walks only along the prescribed paths. To access from the garden (roji) to the space of the tea ceremony there is a very gradual passage through a path of large irregular stones. The path is made of unified stones that are carefully arranged at specific distances. You must place your feet on these stones and on them only. In this way the pace of the passage is determined in the same way as the points of view proposed to it. Man and landscape merge once again. This path is also part of the ritual to immerse oneself in a state of inner concentration and catharsis in order to be prepared for the ritual of the ceremony which finds its roots in Japan's Shinto animistic-naturalistic religious sense. Shintoism, survived the introduction of Buddhism and merged with it finding a particular affinity in the Zen spirit, especially in the concept of shizen which in Japanese translates the western term "nature". The preferential way to cultivate and restore this original state of mind and things is thus translated into the search for a profound harmony and unity between man and the natural world. In the buildings designed for the tea ceremony, all the principles that guided the design of Japanese living spaces are realized: the complex relationship between interior and exterior and between buildings and garden, the absence of perspective centrality and the classic symmetry axes of classicism western, the modular and scaled conception of space.

8. Conservation of the traditional architecture

In Japan over the last 60 years the issue of conservation is strongly addressed, especially intense as a tendency to preserve the boundary lines of roads, land, following numerous reconstructions. It should be said in fact that in Japan the design is cyclical, in the sense that the Japanese people have the habit of periodically reconstructing the structures thanks also to the ability of the workers to reproduce original models with the same techniques (Miller, 2013). The path to conservation, which began with the protection of the first minka¹ as individual assets, then moved to the protection of the whole, defined in Japanese as machinami, which includes both the built and the surrounding environment, and it is finally extended to the protection of the natural and cultivated environment of groups of traditional buildings (denken). The latest conservation developments have extended the subject of protection even more to cover the issues of both the cultural landscape and the environment (Gutschow, 1998). Following the rapid economic growth in the 1960s, which led to disorderly development, depopulation of rural areas and the consequent destruction of the landscape and traditional buildings, it was necessary to think about the issue of conservation. In 1965, triggered by the construction of houses in the courtyard of the famous Santuario of Tsurugaoka Hachimangu in Kamakura, a movement was born for the protection of historical landscapes that led to the enactment of the law for the conservation of ancient capitals (LPAC) in 1966. For the cities not covered by LPAC, in 1968 Kanazawa was the first city to issue guidelines to preserve traditional environments, followed by other cities. This convinced the national government to rethink the LPAC in 1975. The "Denken" protection system that protects villages, historic urban landscape and groups of traditional buildings dates back to this period. In particular, this system guarantees the protection of sites where traditional buildings are one with the surrounding environment (Nitschke, 1966). In Japan today, thanks to this protection system, there are 86 protected areas distributed in 38 prefectures and 74 municipalities, ranging from mountain villages to samurai residences, from industrial cities to mining towns, from cities born around Buddhist times or Shintoists, from fishing villages to trading districts. The Japanese government, then within these protected areas, chooses those of great value, called "Jūdenken" areas, based on one of these criteria: groups of traditional buildings that have an excellent architectural design as a whole, which have preserved the original appearance and finally showing significant regional characteristics. In 2004 the law on the landscape was spread to guarantee the protection and preservation of cultural landscape sites. This is to reiterate the fundamental importance of the close relationship that exists in Japan between landscape and construction.

9. Conclusion

If Robert Venturi loved complexity and contradiction in architecture based on the richness and ambiguity of modern experience, Japanese architecture clearly transmits both of them, but often with different meanings from those proposed by him.

An analysis of the Japanese space revealed an essential relationship between nature and construction. Traditional Japanese houses have always guaranteed free access to the elements of the nature, becoming precious building allies. Channeling nature and natural energy into a building is ultimately one of the goals of

¹ The Minka are rural houses of spontaneous architecture built in any of the different traditional Japanese styles. During the last part of the Heian period there are the first documented examples of houses of this type: they are characterized by the use of local materials and the extensive use of labor, being mainly built in wood, with small ground floors and thatched roofs.

today's design around the world. Although in contemporary cities the applications of other materials such as concrete, steel, laminated wood and wooden constructions have been developed around the classical traditional configuration, they are still about a third of the new constructions made in Japan, even if their use is more limited than in the past due to the restrictions imposed by the building code which prohibits wooden constructions for buildings higher than two floors. Technological development and the conception of the timber supply system for this type of construction was promoted after World War II in order to try to solve the housing problem. The government has studied and proposed standardized solutions for wooden buildings and in 1994 began to promote and spread the use of these solutions for residential construction. In recent years, innovations have also materialized in terms of materials and construction techniques, improving the efficiency of construction in terms of labor costs, construction times, preparation of manuals and documents, design and construction - thanks to computerized CAD systems. However, unlike the prefabricated houses, which are built by large-scale construction companies, the construction of these traditional buildings with cutting-edge features is entrusted on a small scale to local builders who demonstrate competence and historical knowledge, and who promote the constructive and cultural tradition of the country.

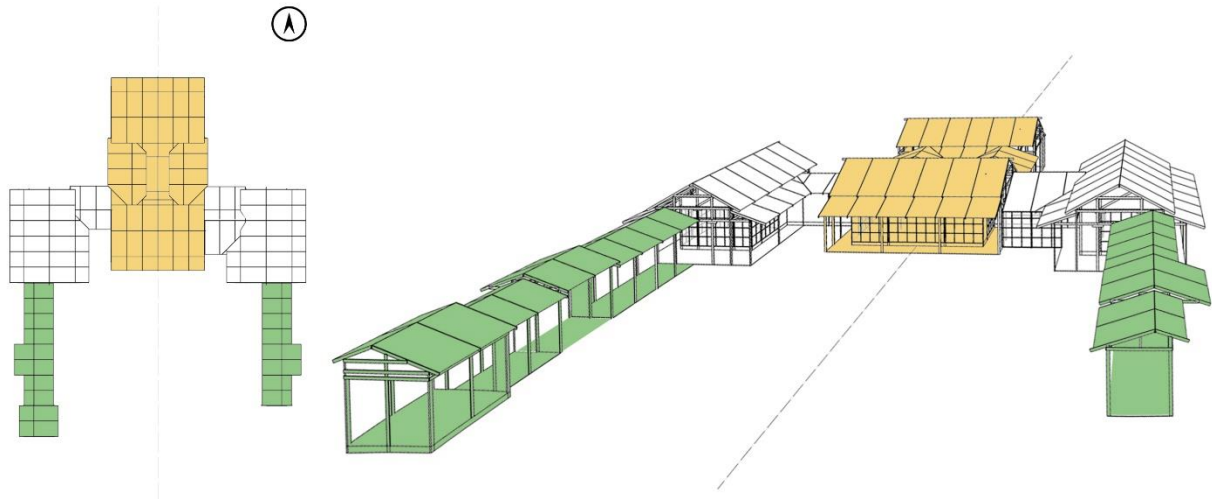
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CAPTION

- Fig. 1 Characteristics of the shinden-zukuri. – Drawing by Caterina Morganti*
- Fig. 2 Connection between interior space and nature.- Picture by Caterina Morganti*
- Fig. 3 Connection between interior space and nature. Picture by Caterina Morganti*
- Fig. 4 Interior space of a traditional Japanese architecture. Picture and drawing by Caterina Morganti*
- Fig. 5 Fusion between nature and architecture. Picture by Caterina Morganti*
- Fig. 6 Veranda as an element of connection with nature. Picture and drawing by Caterina Morganti*
- Fig.7 Veranda as an element of connection with nature. Picture by Caterina Morganti*
- Fig. 8 Japanese wooden structure. Picture and drawing by Caterina Morganti*
- Fig. 9 Japanese wooden structure. Picture and elaboration by Caterina Morganti*
- Fig. 10 Shoji with horizontal-moving section. Drawing by Caterina Morganti*
- Fig. 11 Ordinary shoji. Drawing by Caterina Morganti*
- Fig. 12 Shoji with vertical-moving section. Drawing by Caterina Morganti*
- Fig. 13 Different types of veranda. Drawing by Caterina Morganti*
- Fig. 14 Reflection of light in Tea Room. Drawing by Caterina Morganti*



- SHINDEN
- ACCESS CORRIDOR

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

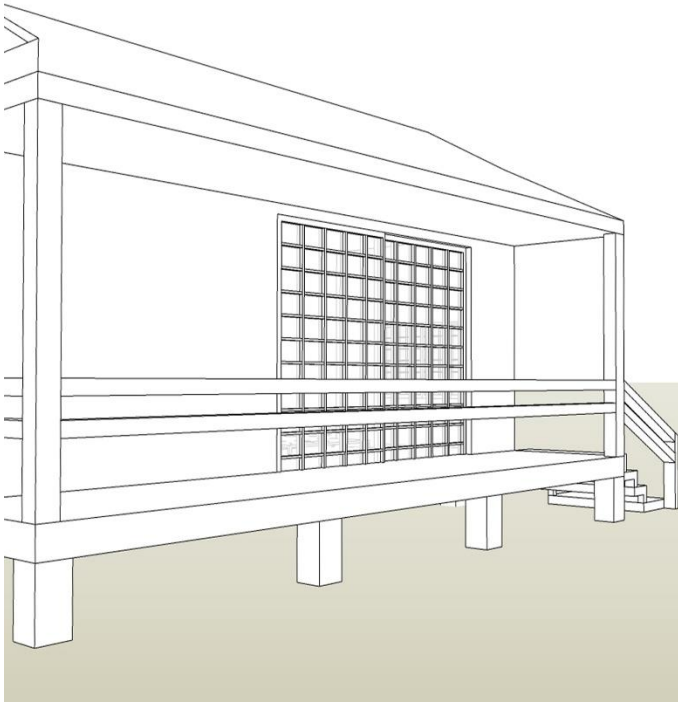


Fig. 6



Fig. 7



Fig. 8



Fig. 9

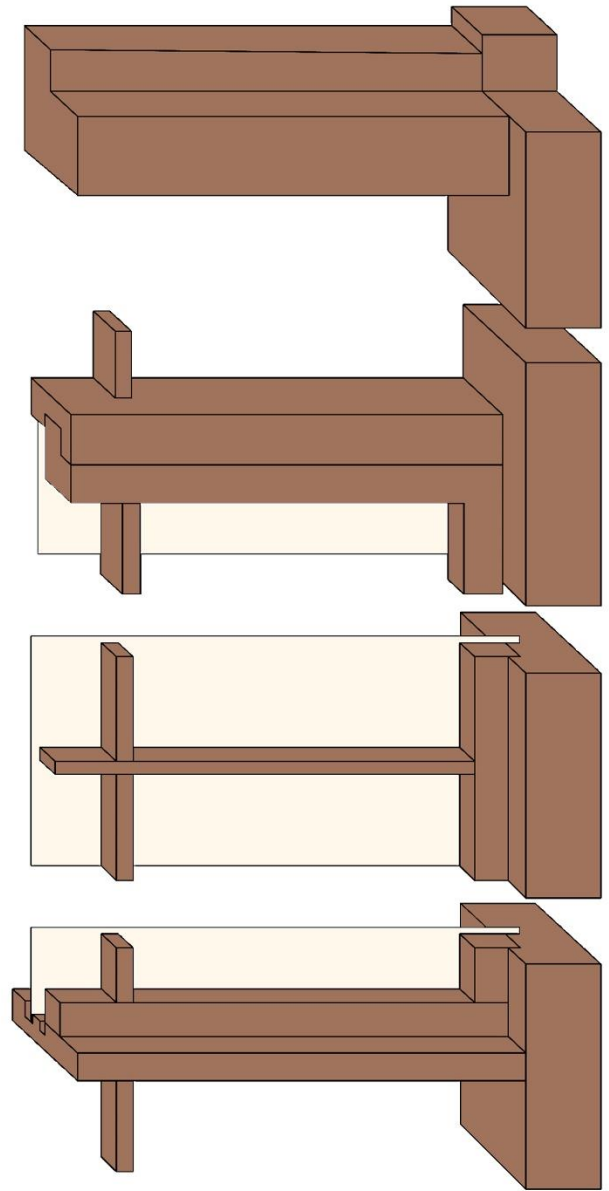
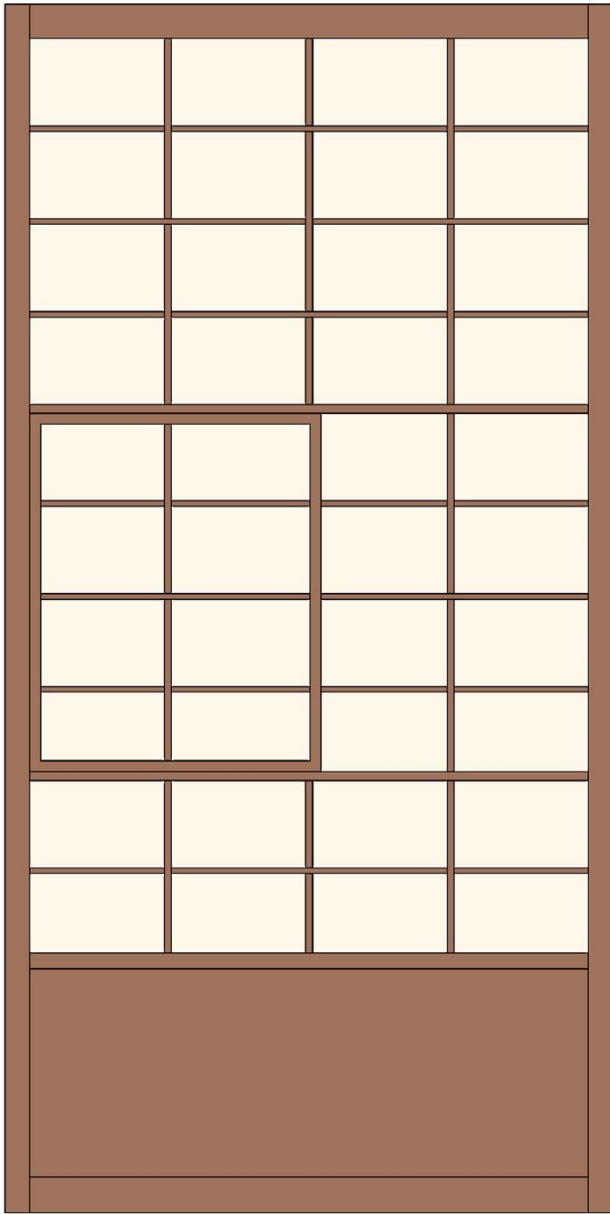


Fig. 10

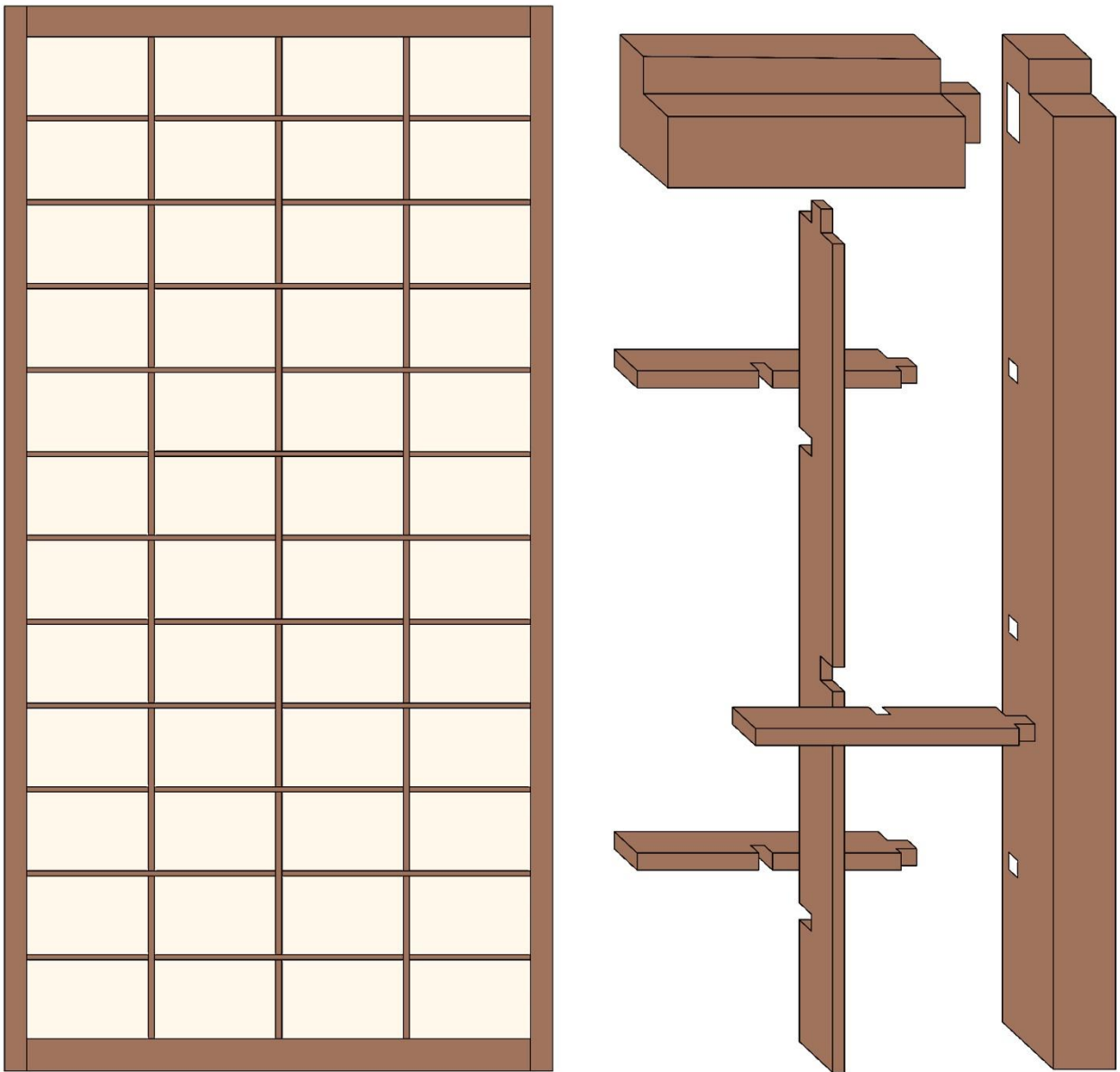


Fig. 11

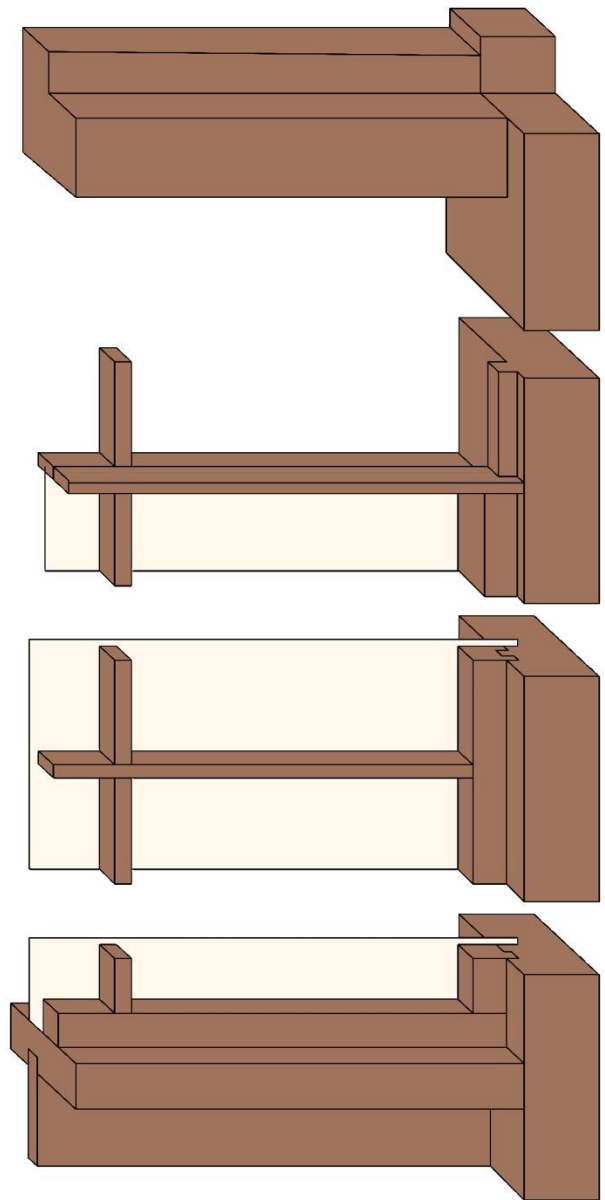
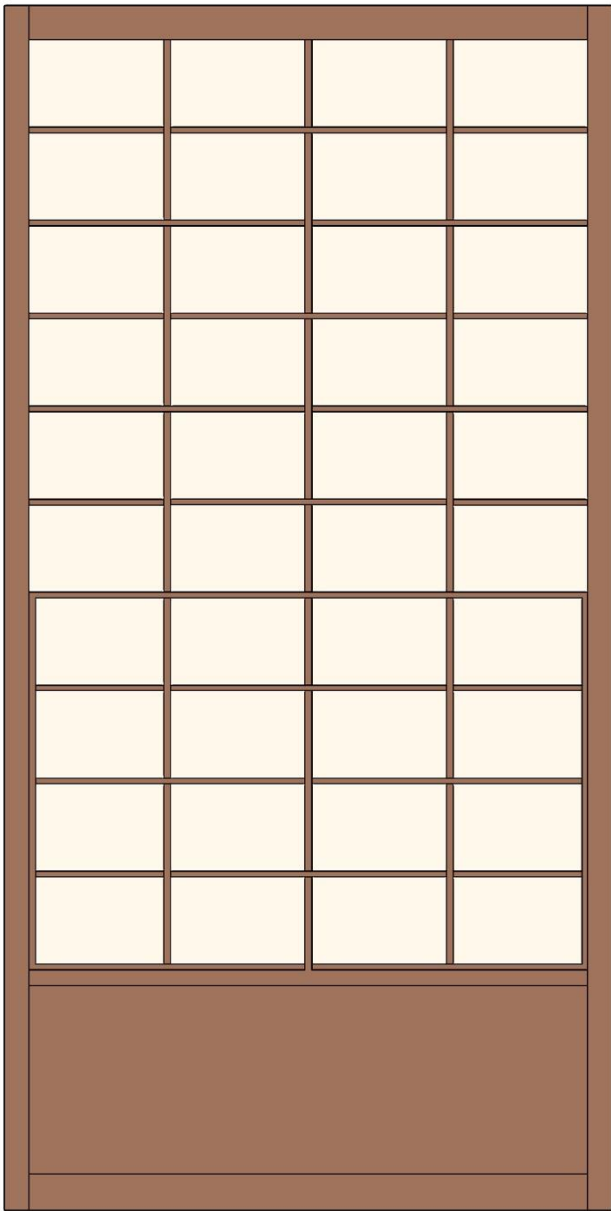
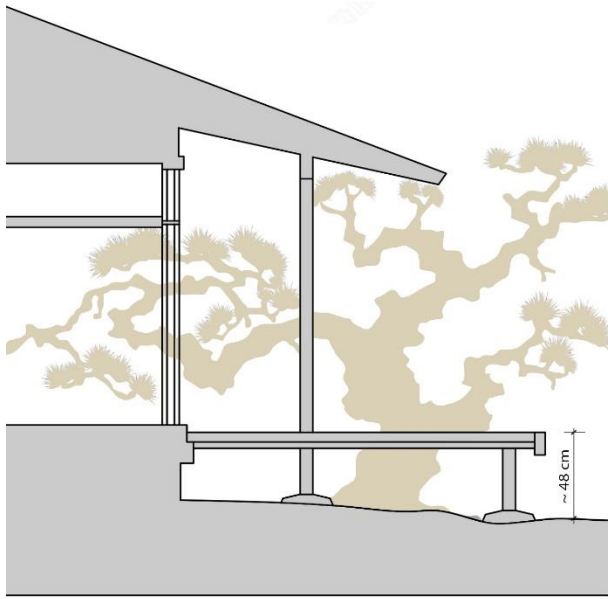
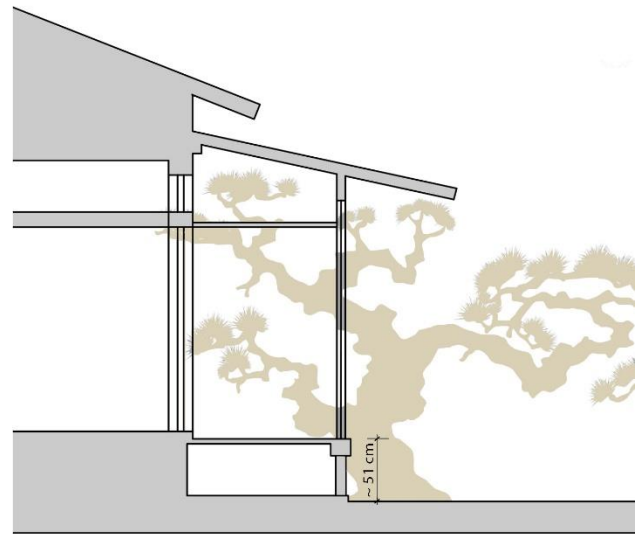


Fig. 12



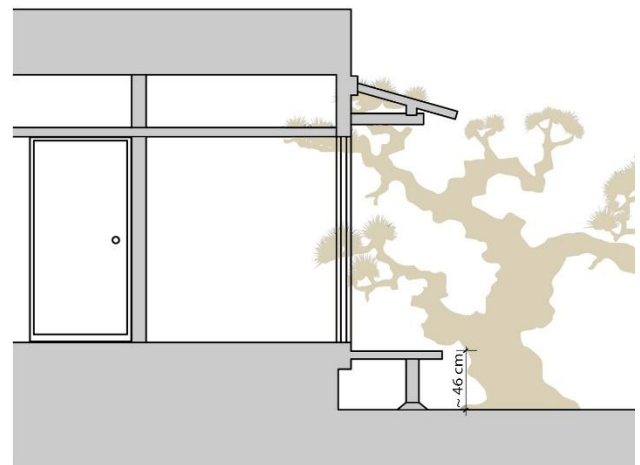
VERANDA - TYPE 1



VERANDA - TYPE 2



VERANDA - TYPE 3



VERANDA - TYPE 4

Fig. 13

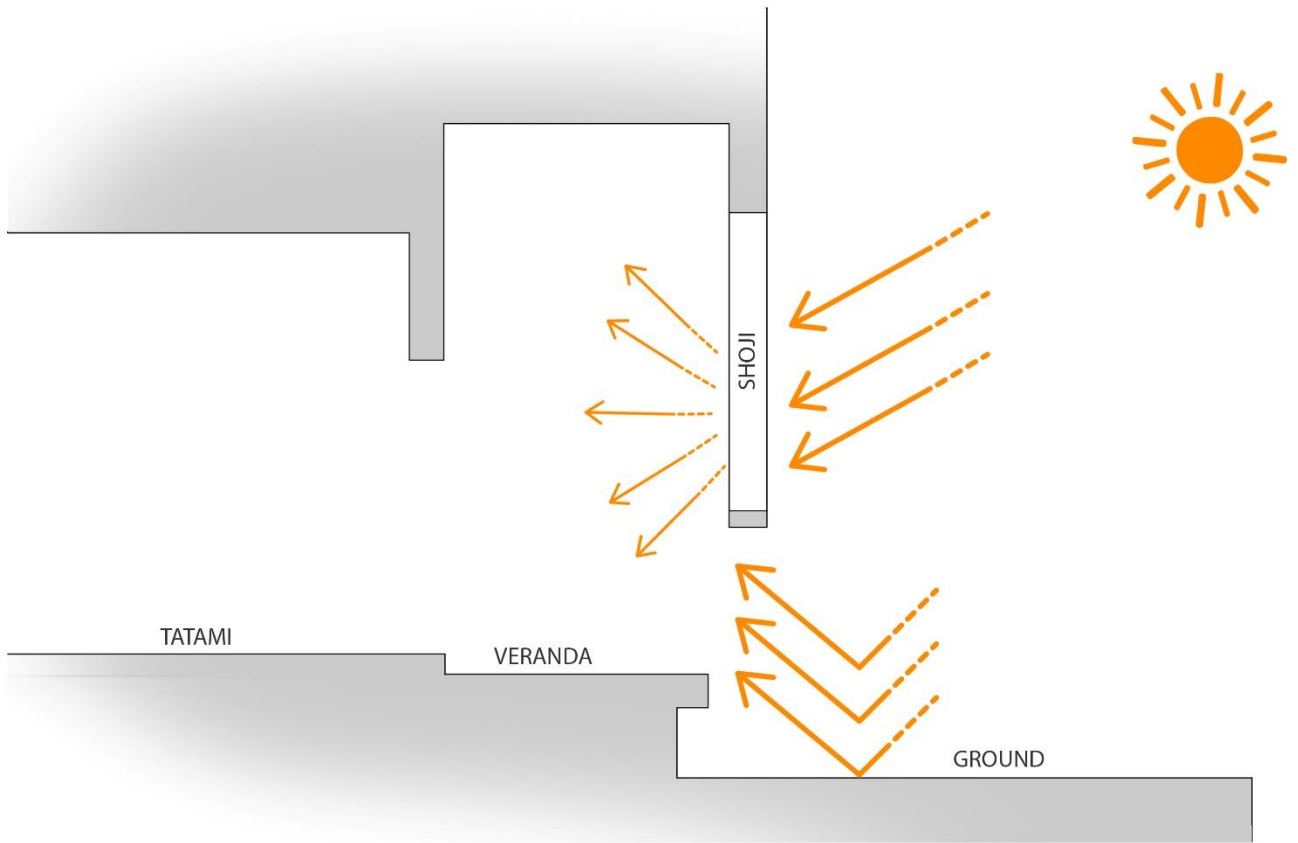


Fig. 14