Minka Reuse

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Abstract

This paper, related to a design exercise given in the second term for second year students under the direction of the author, is an attempt to effectively educate students on the Open Building concept. The content of the assignment is to select one of two specified traditional wooden folk houses, and to remodel the house to accommodate a modern-day family.
The folk houses of Japan represent a residential prototype that has been successively inhabited for hundreds of years with a deep connection to the climate and trade of various regions of the country. Collections of these houses forming a village are regarded as the spiritual home of the Japanese. While one of the specified folk houses is spatially closed to the outside and the other is opened, they both are beautiful wooden post-and-beam thatched roof structures with approximately the same floor area.
While the present era is completely different in every aspect -- lifestyle, materials, M/E equipment, etc. -- from the age in which these folk houses were built, the purpose of the assignment is to identify what is to be left inside these buildings as skeleton and to design an infill suitable for modern living. Through this exercise, while learning how to clearly distinguish between that which should remain and that which has been changed, the students will also learn how to integrate these two factors into a single residential structure. This paper reports on the instruction of such skills and the assignment results.

Keywords

Traditional Japanese folk houses, open building, residential architecture, wooden structures

Introduction

Housing design ranging from small residences to collective housing is the focus of a course taught by the key author of this paper for the Depart
ment of Architecture and Architectural Engineering at the College of Industrial Technology of Nihon University. As one of the design exercises in the first term, third year students are assigned a project on the reuse of *minka*, or traditional folk houses of rural Japan, for which the Open Building concept is introduced.

Since architectural design at Japanese universities is centered on the design of new buildings, such assignments involving the repair and reuse of existing structures are unusual. This paper describes the details of the course assignment, instruction methods, features of the resulting student works, and the educational effect of this project.

The assignment is to select one *minka* from a choice of two—the Kitamura Residence or the Hirose Residence—built approximately 300 years ago during the Edo Period (1615 to 1868) and renovate it as a residence suitable for contemporary life while maintaining its structural and spatial integrity.

Characteristics of *Minka*

Traditional *minka* in Japan are common dwellings that had been inhabited successively since hundreds of years ago up until the 1960s, with some dating as far back as the 17th century. deeply connected to the climate, natural features, industry and collective grouping of buildings of

the region in which they are found, their forms vary with respect to their location. Despite these regional differences, all *minka* built within a given area adhere to the same design regulations since they have been built using similar materials and common structural methods, creating a uniform townscape (Fig.1).

Figure 1 An old streetscape of Japan

In contrast to the folk houses of Europe in which apertures perforate the main wall structure of stacked bricks or stone, those of Japan are wooden post and beam structures, distinct in that their inter-columnar openings formed are fitted with windows, doorways and walls.

Due to improvements in carpentry and the widespread use of the modules of *sun*, *shaku* and *ma*[1] in the Edo period, construction materials that circulated in the marketplace also became standardized. Pillars were raised at intervals of 909mm, and unit dimensions of 1818mm by 909mm became the standard for *tatami* straw mat flooring and the inter-columnar elements of *fusuma* (opaque sliding doors) and *shoji* (translucent paper sliding doors). This is comparable to the construction methods used in industrialized housing today.

Although most Japanese people today have inhabited such spaces, with its extensive history, the space of the *minka* that had been intimately related to the daily habits and lifestyle of common people still inspires a sense of familiarity and comfort. Likewise, the appearance of a village formed by a group of *minka* represents the native scenery of Japan. Yet, many *minka* have been demolished and replaced because they are not suitable for modern lifestyles and are costly to maintain.

The two *minka* chosen as the objects for design, the Hirose Residence and the Kitamura Residence, are important cultural properties—the former is an important cultural property of Kanagawa Prefecture and the latter, a national important cultural property—and have been dismantled and reconstructed at the Japan Open Air Folk House Museum. Both houses have approximately the same floor area and are single-story wooden structures.

With a gabled roof enclosing an attic that was used to cultivate silkworms, the Hirose Residence has low eaves and a slightly closed feeling due to its abundance of walls (Fig. 2). The side elevations have a visually appealing Mondrian-like composition.

The Kitamura Residence is a hipped-roof *minka* and has a high degree of livability with its ceiling finish that covers all but the *doma*, or compacted earthen floor area (Fig. 3). The veranda along the central hall with bamboo flooring creates an open spaciousness that connects to the exterior.

[1] Units of measure used in traditional Japanese architecture based on the span of a bay (*ken*), in which 1 *sun*=30.3 mm, 1 *shaku*=303 mm, and 1 *ken*= 1.818m.

Figure 2 Hirose Residence

Figure 3 Kitamura Residence

Process of the Design Course

In the first phase of the project, the students go to the museum and examine the two houses in situ to understand the traditional Japanese space of the *minka*. Ample time is allocated to experience the spaces through various actions, such as standing and sitting inside and outside the buildings. It is also important for the students to appreciate intangible aspects of the *minka*, such as the smells, temperature, wind flow, and sounds, and to become familiar with the uniqueness of the spaces. Following this investigation, the students then document the buildings by measuring details and points of interest, while verifying the actual space against the building plans.

In the second phase, students construct models of the structural framework as the skeleton of the *minka* (Figs. 4 and 5).

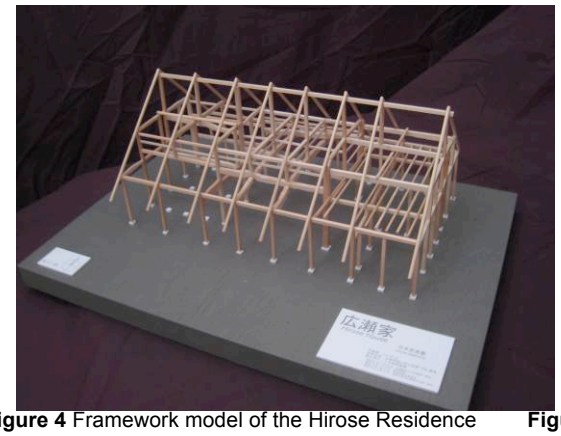

Figure 4 Framework model of the Hirose Residence

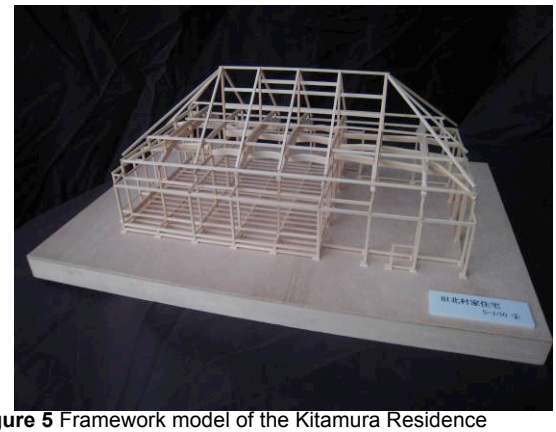

Figure 5 Framework model of the Kitamura Residence

In the third phase, the students establish their concepts of *minka* reuse while considering aspects they found unique and those they would like to keep intact. They then make conceptual models and sketches based on those concepts.

In phase four, students present their individual concepts and sketches during class and receive advice from the instructors. Students then develop their concepts based on that advice.

During the fifth phase, each student gives a final presentation. In addition to their regular course instructors, architects invited as guest lecturers also attend these presentations, while students of other grade levels are also welcome to listen (Fig. 6).

From the project assignment to the final presentation, this seven-week program is broken down into the following timetable: one week is allotted for the first and second phases, five for the third and fourth phases, and one for the fifth phase.

Figure 6 Classroom presentation

Tendencies and Intentions of Student Works

The general tendencies of resulting student works vary slightly from year to year, such as interest in large-scale alterations of the existing *minka* by inserting new spaces, or focus on HVAC and other mechanical and electrical facilities suitable to modern lifestyles. The theme of the assignments also varies from year to year. For example, in some years there is an interest in the relationship between location and usage, or in others, the program calls for mixed-use housing that includes some other function in addition to residential use. However, alterations that retain the inherent features of the *minka* remain consistent every year.

The students make comparative studies between the *minka* and contemporary housing, and formulate their designs for *minka* reuse in consideration of the attributes they would like to keep of the former or those they should incorporate of the latter. They then divide the means of spatial usage in their actual designs into three categories: wall insertions, spatial insertions, and spatial divisions, as shown in Table 1

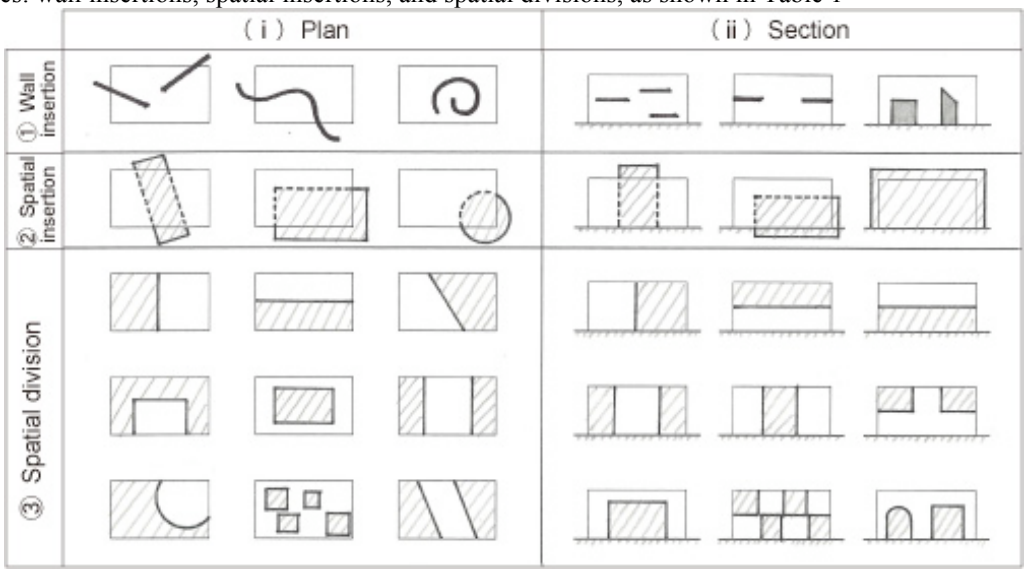

Table 1 Spatial usage

Table 2(i) shows what the students consider to be characteristic of the *minka*. For example, they possess "dark spaces as a result of their large roofs, or flexible spaces that can be divided by movable *fusuma* and *shoji* partitions. Among those items, the most distinctive features of the *minka* are listed as being their large spaces greater than 100m^2 in floor area with over 5m ceilings, and their post and beam structures with large, organic-

shaped cross sections. The characteristics of present-day housing are shown in Table 2(ii), in which they are described as possessing bright spaces with natural and artificial lighting, or comfortable indoor livability with air conditioning systems.

		(ⅰ) Characteristics of *minka*	(ⅱ) Characteristics of contemporary housing
Shell	①	**Post and beam structure**	
	②	Natural materials (clay walls , tiled roofing , wood board/bamboo/earthen flooring)	Modern materials (steel , glass , concrete, etc.)
	③	Beautiful proportions	
	④	Utilities (firewood , river water)	Utilities (electricity , gas , plumbing)
Furnishings	⑤	**Large interior space**	
	⑥	Dark interior with large roof	Bright spaces from natural and artificial lighting
	⑦	Flexible space afforded by movable partitions (*fusuma* , *shoji*)	Spaces with individual functions (master bedroom , nursery room, etc.)
	⑧	Japanese-style floor-based space for daily living (*tatami* mats , *futon*)	Western-style space for daily living (chairs , beds)
	⑨	Function as a place of production (ex. Silkworm cultivation)	Function other than residential use (SOHO, etc.)
	⑩	Intermediary spaces between exterior and interior (*engawa* , or veranda , space under	
	⑪		Indoor residential performance (M/E kitchen equipment , A/C, privacy)

Table 2 Features of *minka* and contemporary housing

Examples of Student Works

A number of the students' *minka* reuse projects have been selected from among the results and are introduced as follows.

Figure 7 shows a project in which skylights are created through perforations in the roof to bring sunlight down into the space, turning the dark *minka* space formed from the large roof into a bright, modern space. Conversely, the project shown in Figure 8 optimized the dark space of the *minka*, locating the AV room for movie viewing in the center of the house, while placing other rooms around the perimeter walls, providing natural lighting.

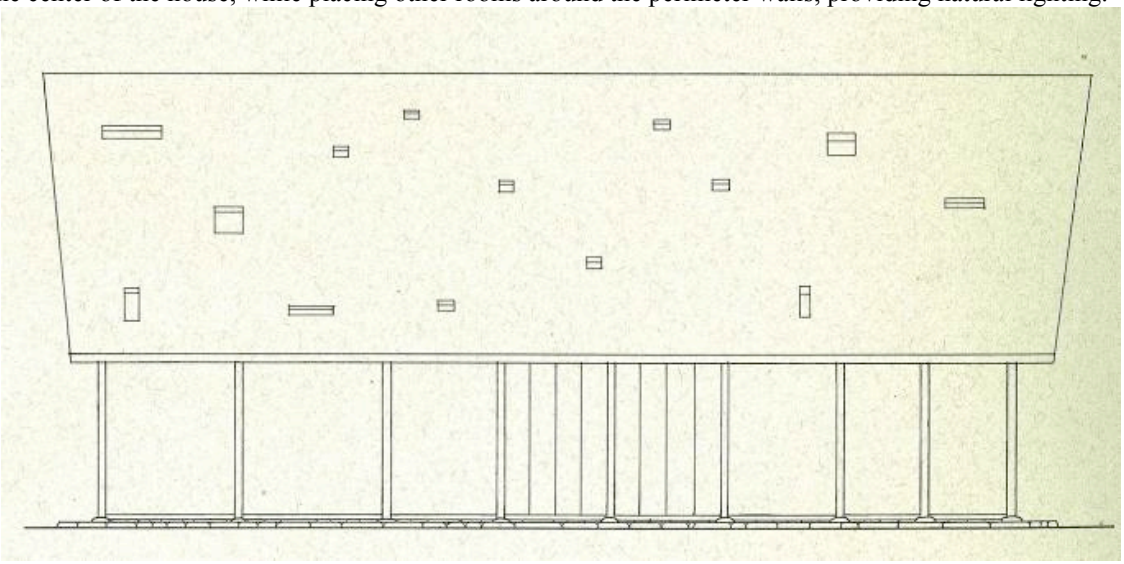

Figure 7 Transformation of interior from dark to light

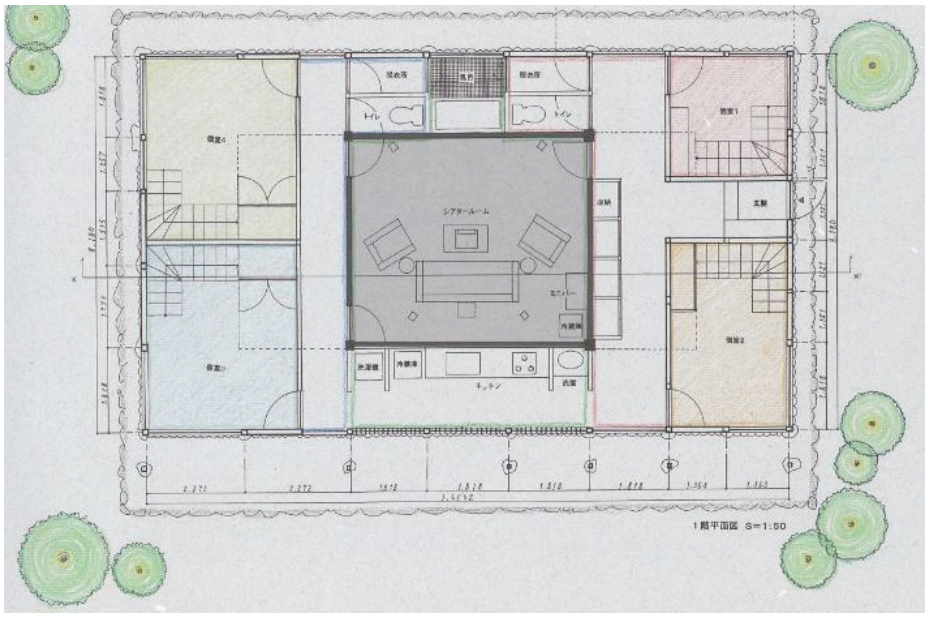

Figure 8 Optimization of the dark interior

While the arrangement of rooms in *minka* is flexible due to the use of partitions, in the scheme shown in Figure 9, a large multi-use space that functions as a living room, dining room and kitchen was situated in the center of the main space, with a layout of separate individual rooms, such as bedrooms for each member of a family of four and bath/toilet/laundry rooms. The mechanical and electrical equipment was enhanced in each room, providing comfortable indoor livability.

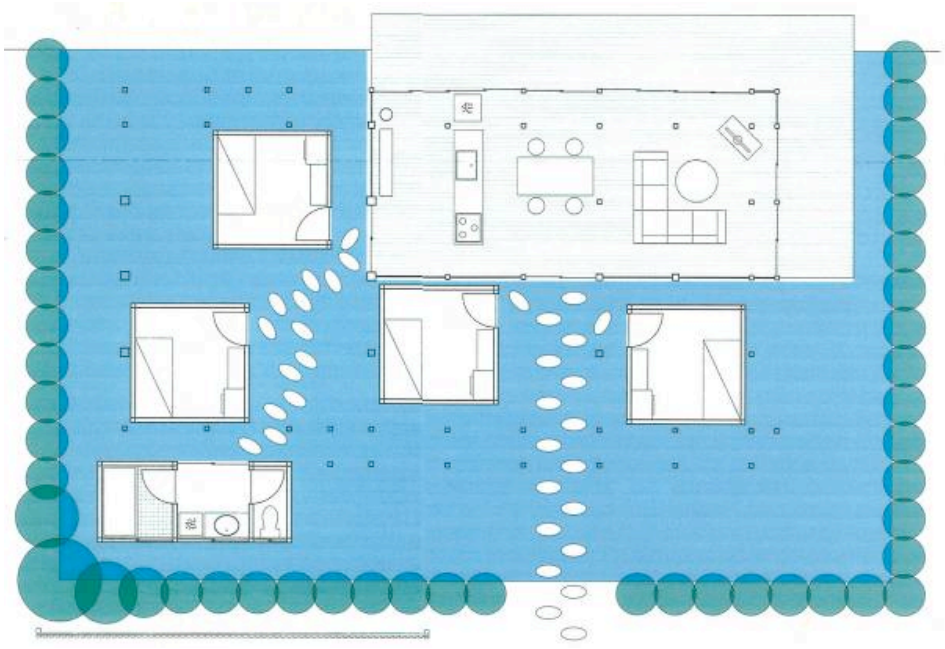

Figure 9 Layout of rooms

The scheme shown in Figure 10 focused on the interest of materiality over the improvement of residential performance. Concrete, glass, and aluminum walls were introduced as a method of spatial division in contrast to the natural materials of the *minka*, such as clay walls and wooden columns.

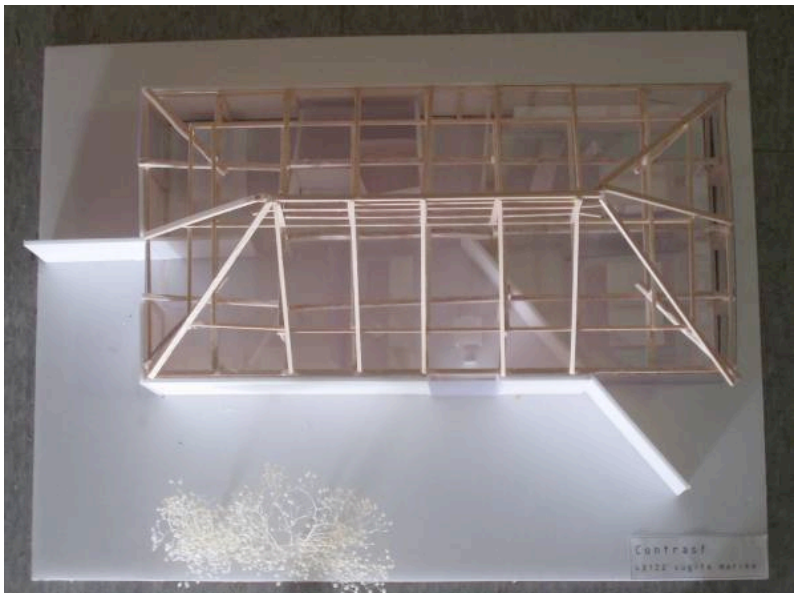

Figure 10 Wall insertion

In the scheme shown in Figure 11, in order to improve the residential livability of the *minka* to suit a contemporary lifestyle, a section of the roof was removed and a box-like space with a second story was inserted; but aspects characteristic to *minka,* such as the flexible layout afforded by movable partitions and the Japanese-style living room, were kept intact. By contrast, the scheme in Figure 12 located the minimal amount of water-based utilities necessary for modern living inside an oval space, while the rest of the house incorporated elements of traditional *minka*, such as the use of an *irori*, or sunken hearth, for heat.

Figure 11 Spatial insertion

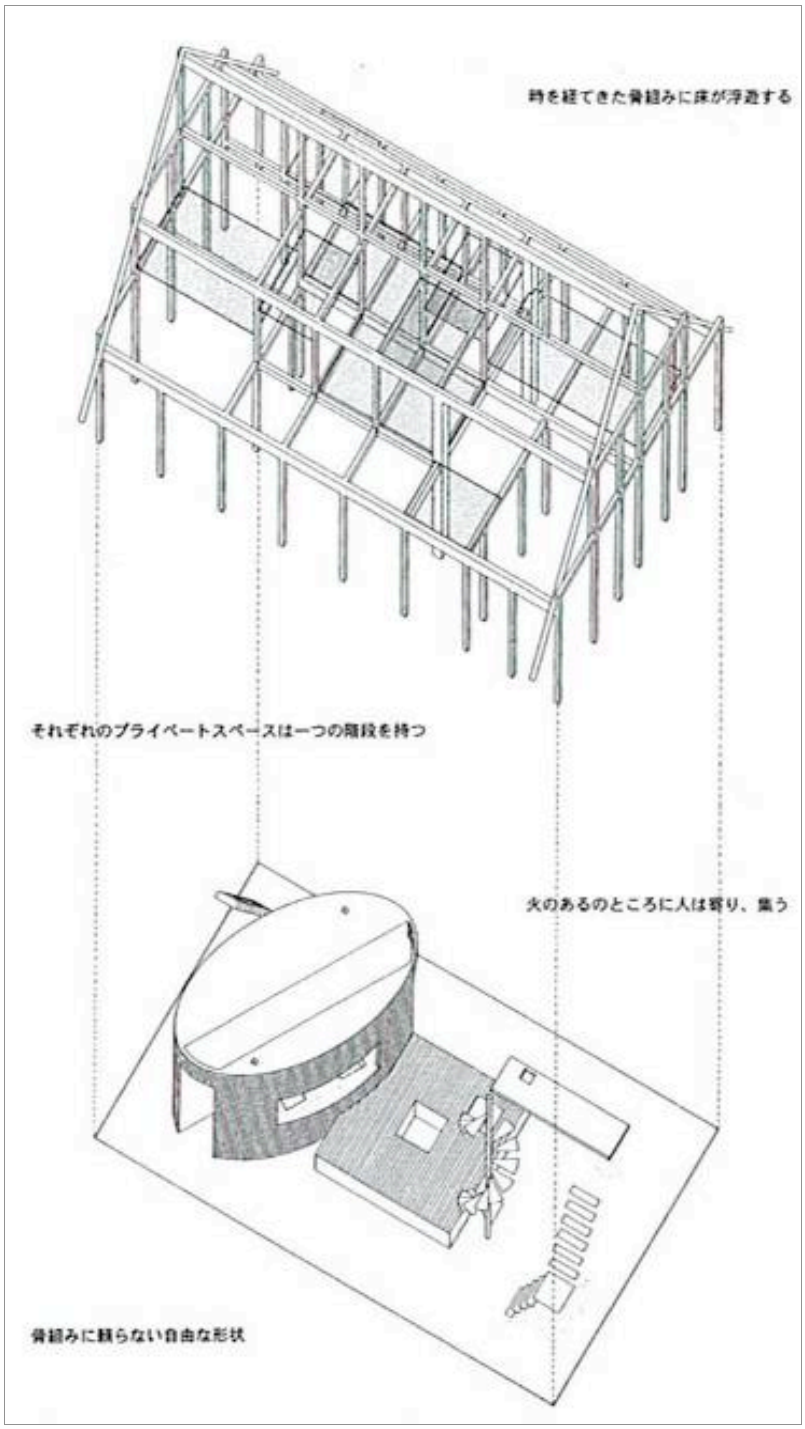

Figure 12 Compact integration of modern-day M/E facilities

Typically, when a second level is created in a *minka*, there are limitations on the use of the space due to the organic form of the wood beams of the upper structure. For this reason, the amount of small beams is generally reduced when installing a second floor level. However, in the scheme shown in Figure 13, all beams were kept intact and floors were inserted at various heights, where low-height spaces between the floors and beams that are hard to access by adults became interesting spaces for children. The project shown in Figure 14 is a unique scheme for a mixed-use dry cleaning shop-cum-residence, where the clothing moves on rails hung among the beams to call attention to the distinctive forms of the beams.

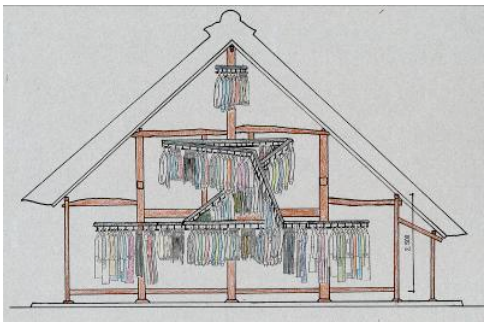

Figure 13 Daycare center with various scaled spaces

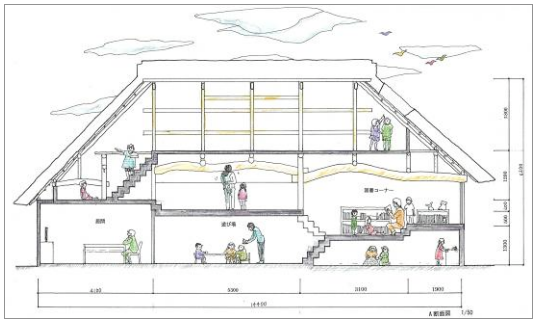

Figure 14 Dry cleaning shop using space between beams

Significance of the Project Assignment

While valuable as a means for the students to acquire an understanding of traditional Japanese space, the assignment of *minka* reuse is also an effective means of learning about the Open Building concept. In considering the usage of the large space of the *minka* unsuitable to modern living, students determine which columns and beams are structurally required and optimize them in their designs. The Open Building concept can be learned through this process.

The results of their investigations can be seen in the skeleton/infill housing (SI housing) projects that follow the *minka* reuse assignment. Designs for SI housing are conducted in groups of five or six, with each group proposing a concept for the skeleton of a collective housing project. Each student then develops their own infill design for these skeleton designs. The students who succeed in their assignments for *minka* reuse propose skeletons that have rich originality—not simple rigid frame structures that are the norm in SI housing design—and in the process, they produce many interesting infill solutions that optimize those skeletons. In closing, we introduce two of the students' SI housing schemes.

The scheme in Figure 15 shows an equilaterally triangular structural cross section as a continuous skeleton through applying an incline to a simple rigid-frame structure. From such a skeleton emerges an infill with rich spatial variety. The scheme in Figure 16 shows a rectangular tower skeleton with a regular octagonal core, where partitions radiate from the core and protrude from the tower, creating an infill of glass boxes. Although both of these projects present simple skeletons, they are flexible and allow numerous infill possibilities.

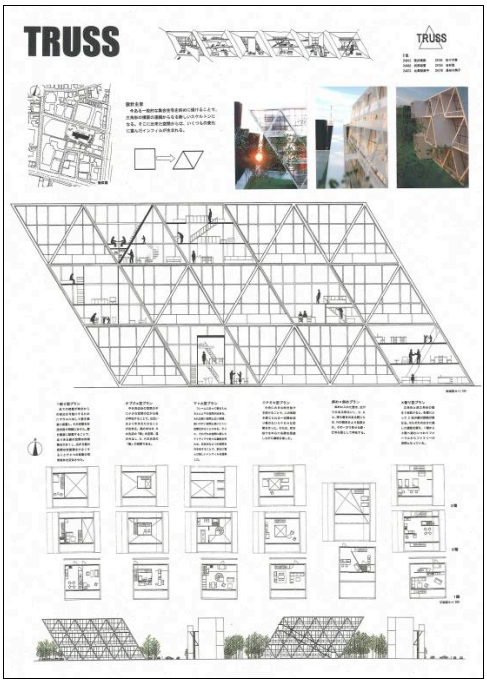

Figure 15 Truss-like skeleton

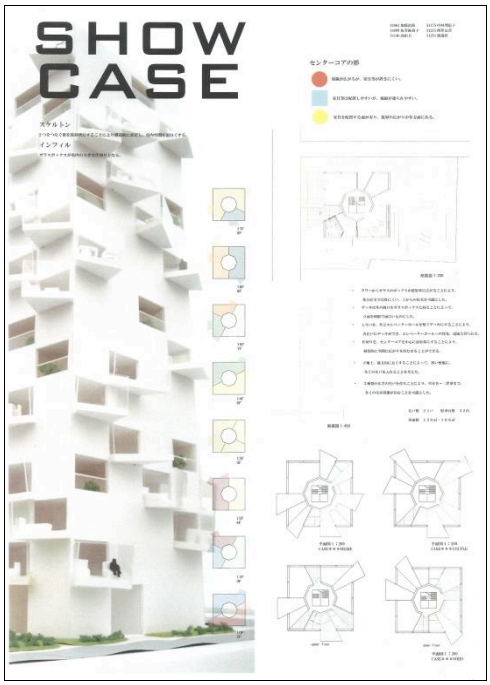

Figure 16 Showcase-like infill