

A Study on Model Method of Japanese School Buildings Renewal and Conversion through The Actual Proposal Projects

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Abstract

Post-war Japan witnessed the construction of many school buildings with standard designs; however, today, these school buildings pose certain serious problems. First, school buildings made of reinforced concrete have become decrepit, and they require reinforcement to withstand earthquakes. Second, there has been an increase in the number of vacant classrooms and closed school buildings because of the declining birthrate.

Through this study, we describe certain school-building renovation and conversion models that have been comprehensively examined from the perspectives of architectural planning, structural engineering, building production, and architectural environment. We believe that these renovation and conversion models that have been comprehensively examined will be useful and effective against the stock management society.

We have proposed several models for school renovations and conversions. In this report, I will propose some of these models based on the following two patterns: (A) renovations of old, traditional school buildings to change them into contemporary and functional schools and (B) a complete conversion of vacant school buildings to other public facilities for the local community.

Through these project models, we show that the renovations and conversions of school buildings based on comprehensive consideration are effective with regard to cost, energy, and provision of amenities.

1. Introduction

1.1 Background

In post-war Japan, construction of many reinforced concrete school buildings with standard designs rapidly spread. Among elementary and secondary schools alone, the number of such public school buildings amounts to 55,000. Moreover, it is regarded that school buildings over 20-years-old constitute more than 70% of all public elementary and secondary school buildings. In addition, it is an established fact that a large proportion of this 70% of school buildings was built before 1981 when the new quake-resistance standards were set. Currently, in Japan, earthquake retrofit is being progressively performed on such school buildings as part of a national project. The completion of this project had been targeted by the end of 2006; however, the poor financial state of the national and local governments has delayed the process. In addition, most of the school buildings are not only decrepit but also suffer from a functional shortage that incapacitates them

to meet the requirements of the present education system with its curriculums and learning activities. On the other hand, a declining birthrate in Japan has resulted in an increasing number of vacant classrooms and closed schools. The effective utilization of these spaces is an important issue faced by every school and local government. It is difficult to sell these public school buildings and renovate them to suit other uses because national funds have been invested in the maintenance of these buildings by local governments. The easing of existing regulations has allowed the conversion of public school buildings to other public facilities; however, encumbered by the difficulties of maintaining relationships with different jurisdictions and by the complication of project finance distribution, many local governments are still unable to find a feasible solution to the problem of effective utilization of school buildings.

Therefore, renovation and conversion projects of many school buildings have not been comprehensively considered. There are few model projects that have been renovated or converted comprehensively, for example, Kohoku elementary school (Yokohama City) and Kyuhaku elementary school (Ohta City). However, these model projects are nothing more than “the model”; most projects are still being worked in each independent purpose.

1.2 Purpose of this project

The aims of our project were as follows:

- 1) To comprehensively propose more realistic renovation or conversion models for closed school buildings and vacant classrooms based on several aspects: architectural planning, structural engineering, building production, and architectural environment
- 2) To frame realistic models that consider each “object” school building’s background and characteristics by observing certain specific target school buildings
- 3) To formulate a general and versatile renovation and conversion method that proposes plans with the consideration of each school’s surroundings and background
- 4) To arrive at a finding that ensures the future utilization of school buildings and to indicate its effectiveness with respect to cost, energy, and provision of amenities through a comprehensive consideration of the planning models.

2 Brief of this project

Our projects were implemented under the local governments of two cities: Y City and T City. These cities were faced with different situations. Y City is one of the biggest cities in Japan and has more than 500 public schools. While the number of students was decreasing in some districts, in others, it was increasing. Y City also had many old, traditional school buildings that needed to be repaired, reformed, and reinforced. On the other hand, T City is located in a big residential district, which was developed as a new town in the 1970s. Just prior to the implementation of our project, T City had been facing a serious population problem in that an increase in the number of elderly people had been concomitant with a rapid decrease in the number of children. Therefore, the city had six vacant school buildings that were temporarily being used as public facilities without any reform or repair.

We had proposed some models for the renovation and conversion of existing schools in these two cities. In this report, I propose four models categorized under two patterns. These patterns are as follows: 1) renovation of old, traditional school buildings to contemporary and functional schools and 2) complete conversion of vacant school buildings to other facilities for the local community.

3 Renovation of old school buildings to contemporary and functional schools

3.1 KAM Project

This project aimed to remodel a secondary school building into a school with a new curriculum, which provided education primary through early secondary levels. Our remodel target school was

N secondary school located in the KAM area in the southern tip of Y City. N secondary school had several vacant classrooms because of a decrease in the number of students in this area. Moreover, in K elementary school that is situated adjacent to N secondary school, the number of pupils was also decreasing. Consequently, teachers of these two schools had tried to introduce informal and flexible learning by providing adequate staff and utilizing spaces in these schools. In addition, they had introduced a departmentalized classroom system and a new curriculum for students across nine academic grades from elementary to early secondary school. We proposed to convert N secondary school into a new nine-grade school through the implementation of a new concept [Fig.1].

The objectives of our plan were as follows:

- 1) To design a small nine-grade school by putting to use the intimate and calm atmosphere of these schools
- 2) To find a new method of schooling that sets the foundation for future schooling styles across Y City
- 3) To propose a new curriculum with renovation models
- 4) To divide the nine-grade school to lower school, middle school, and upper school
- 5) To change the existing school library, computer room, and audiovisual room to well-developed learning centers and set them in the center of the school
- 6) To change the barrier-free design
- 7) To take advantage of the structure by removing a part of the floor slab or by constructing rooms on some part

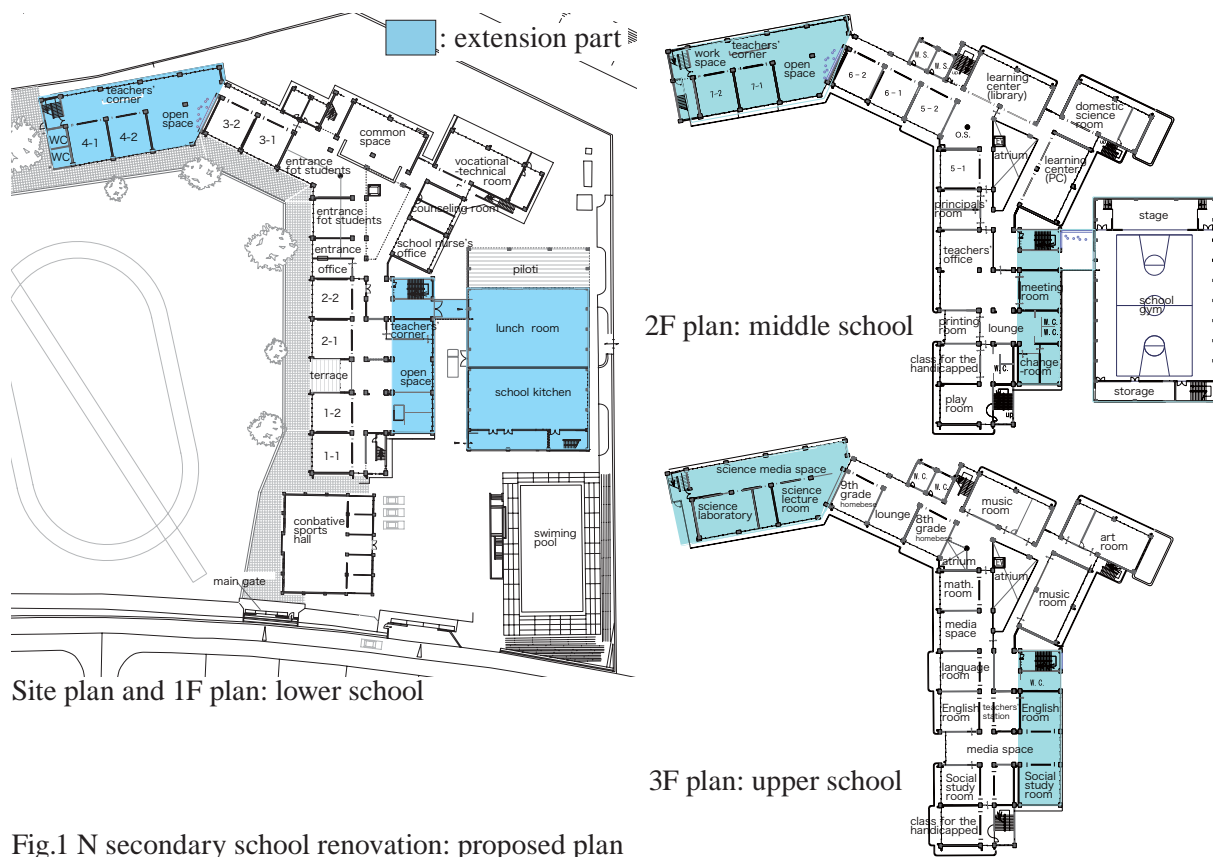


Fig.1 N secondary school renovation: proposed plan

3.2 SAK Project

S school, the target school in this project, consisted of an old school building that was constructed in a traditional style [Fig.2]. It is located near the center of Y City. The building of S school has been extended on four occasions and the oldest part had been constructed in 1959. The school building was

decrepit, and it needed not only a seismic retrofit but also reform or repair. Although the school had been successfully experimenting with a small-group teaching system, it encountered problems the preceding year due to a shortage in classrooms that was brought about by an increase in the number of students. We aimed to perform the following tasks in order to comprehensively renovate the school, while considering economy and effectiveness.

1) Change it to a high-speck school building by effectively appending structures to the school building—to transform spacial composition to suit an informal learning environment and to implement a barrier-free design style for normalization as a community facility

2) Create a comfortable learning and living environment—to introduce energy-saving designs and ensure psychological comfort

3) Improve school safety—to protect students from intruders and reinforce and repair the building by incorporating functional changes

Finally, the performance of the abovementioned tasks would produce an effective renovation model in an ecological and economical way.

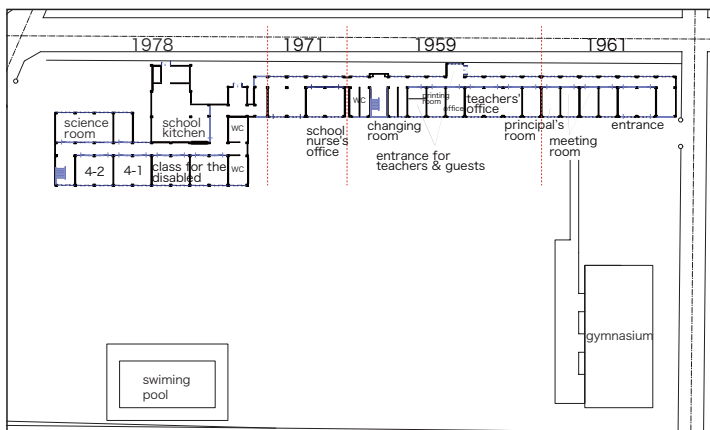


Fig.2 existing SAK elementary school:siteplan

detail design point

- A) Practical learning area that can be used as a one room
- B) Put an elevator near the class for the disabled children and community zone
- C) Outdoor learning space—wood deck and grass lighten up heat accumulation of ground
- D) Adding new stairs for ensuring escape route and ensuring learning unit of each grade
- E) Connecting library and PC room as a media center
- F) After school care children can use the media center
- G) In newer building part, to change room uses and adding environment improvement without exist construction change.
- H) In older part, adding some spaces and reinforce exist construction with these added spaces
- I) minimum extension because of school premise narrowness
- J) Adding aseismic capacity to exist wall
- K) Adding airtightness, sound absorbency and aseismic capacity to classroom partition of corridor side
- L) Adding aseismic capacity to exist building with extension
- M) Music room for instrument
- N) Setting a vertical louver against west sun
- O) Covering all building with exterior thermal insulation
- P) Music room for chorus and dancing
- Q) Adding new window sash for improvement insulation efficiency
- R) Slit for draft and daylight
- S) To paint the wall bright color, it lighten up classroom by reflecting daylight
- T) To put appentice to south windows for direct light mitigation

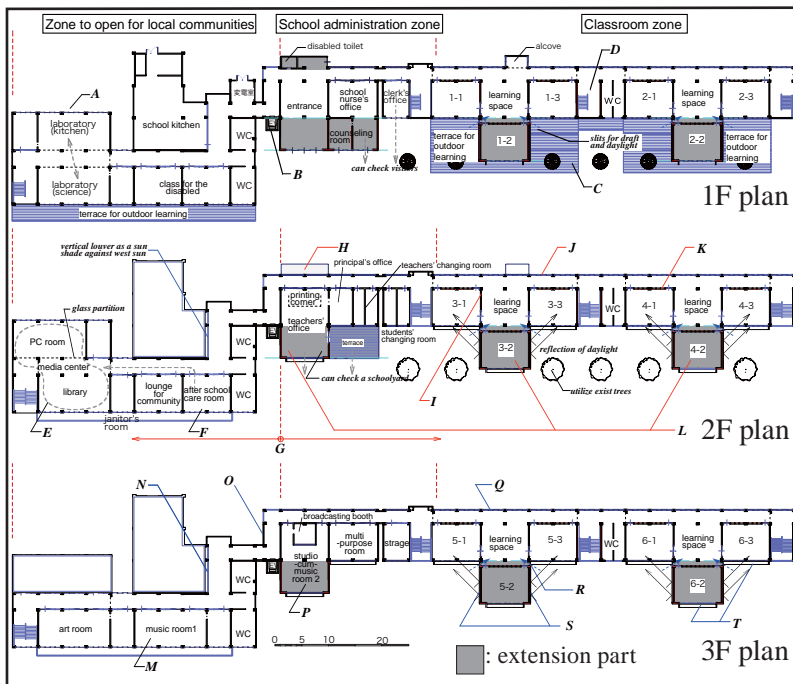


Fig.3 SAK elementary school renovation: proposed plan

4 Full conversions of vacant school buildings to other public facilities

4.1 KIR project

The KIR area, situated in the northwest part of Y City, is a residential area that is not well connected. This led to an annual decrease in the number of young families residing in this area; consequently, the number of students also decreased in the three elementary schools in this area. Subsequently, the local government put the students of the three elementary schools into one of the schools, while another school building was converted into a public facility for the community. The government was undecided on the how to use the third building, which was the oldest one. We surveyed the conditions in the three buildings, the public facilities and service network in this area, and the need of the local people for public service. We then proposed a plan on how to utilize these school buildings and also demonstrated through a conversion model how one of these buildings could be changed into a lifelong learning facility for the local people belonging to different generations [Fig.4]. We designed the conversion model as follows:

1. By changing to a more functional design, we promoted effective communication among users belonging to different generations.
2. By removing some floor slabs or parts of the building, we strengthened the base of the building, and maximized the utilization of its large capacity.
3. By removing some floor slabs or parts of the building, we constructed an atrium using glass to allow natural light, and we built a rooftop garden to serve an ecological purpose.
4. By developing the schoolyard, we converted it into a multipurpose park for people living nearby.

On the presentation of this conversion model, the local and city governments directed that the different functions (day-care center, recreation and relaxation center for the aged, child support center, and community center functions) needed to be separated according to the jurisdictions of the local government.

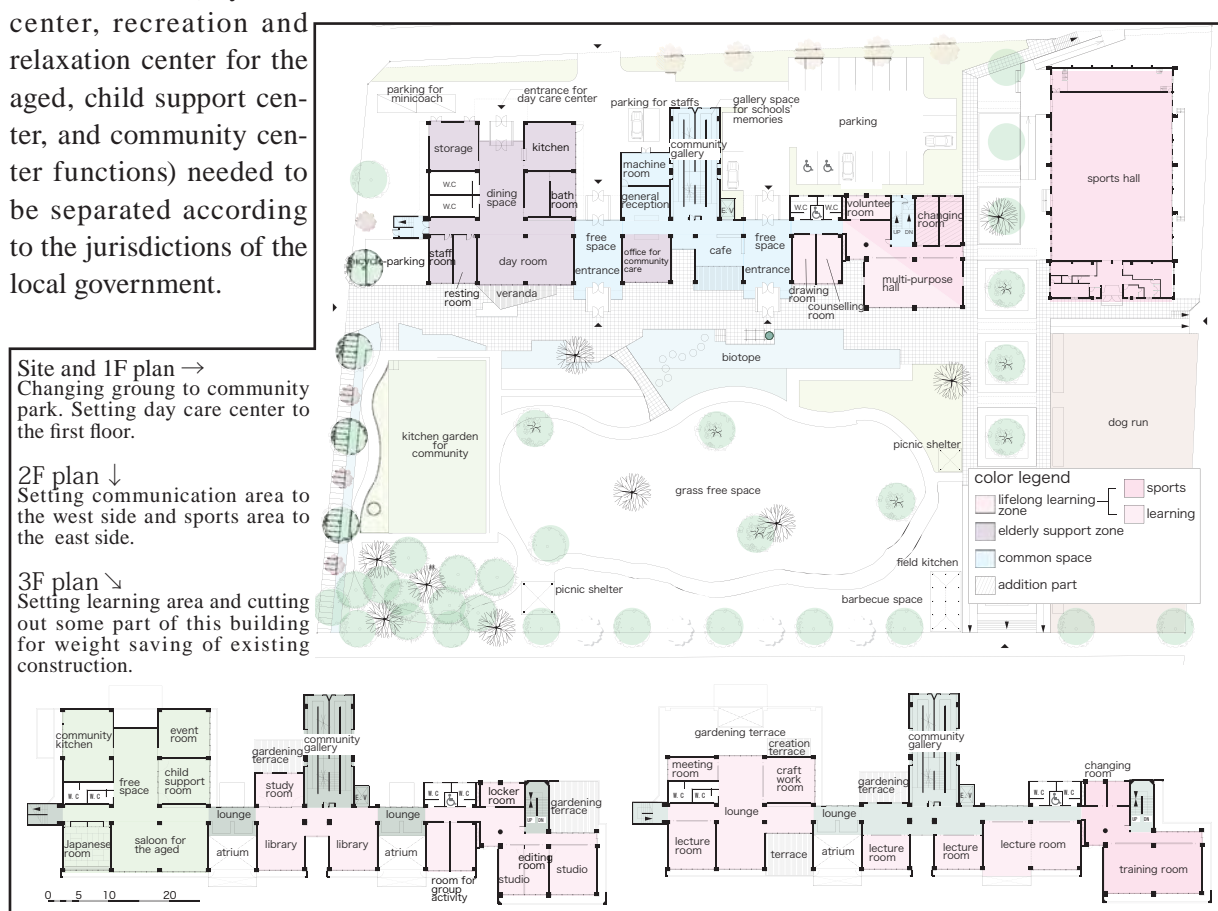


Fig.4 KIR project conversion of vacant school to a lifelong learning facility for the local people

4.2 HGN Project

HGN elementary school had closed down in 1995, and its building was being used as a provisional public facility [Fig.5]. This school building was located next to the main pedestrian street and also near a railway station. As a result, local people visited this public space on a daily basis. However, the building had not been repaired or remodeled for public use, and it stood as a typical, traditional school building. We believed that a conversion model based on this building could act as a general model for many traditionally designed school buildings in Japan.

Subsequently, our team proposed two conversion models (pattern A and pattern B).

Pattern A: We suggested changing the school building into a complex facility that included a community center and office spaces for lease. The neighboring area did not house a community center, notwithstanding the systematic improvement in community facilities in T City. We also surveyed the actual state of the existing community centers in T City. Therefore, we converted the HGN school building into a community facility for different generations, i.e., a day-care center for the elderly, an after-school care center for children, and a lifelong learning center for the local people. In addition, since the location of the building was convenient for business, we converted the upper floors into a welfare office and an office space for Soho [Fig.6].

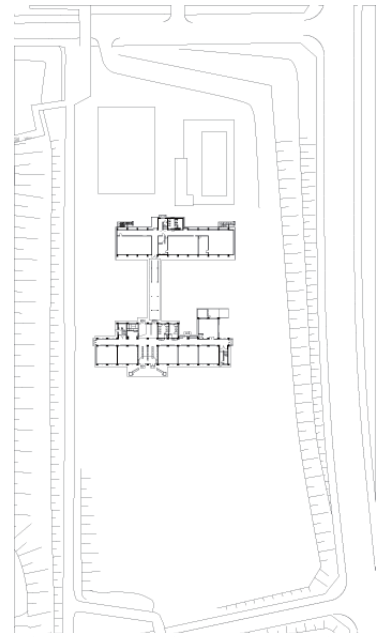


Fig.5 HGN elementary school existing site plan (1:3000)

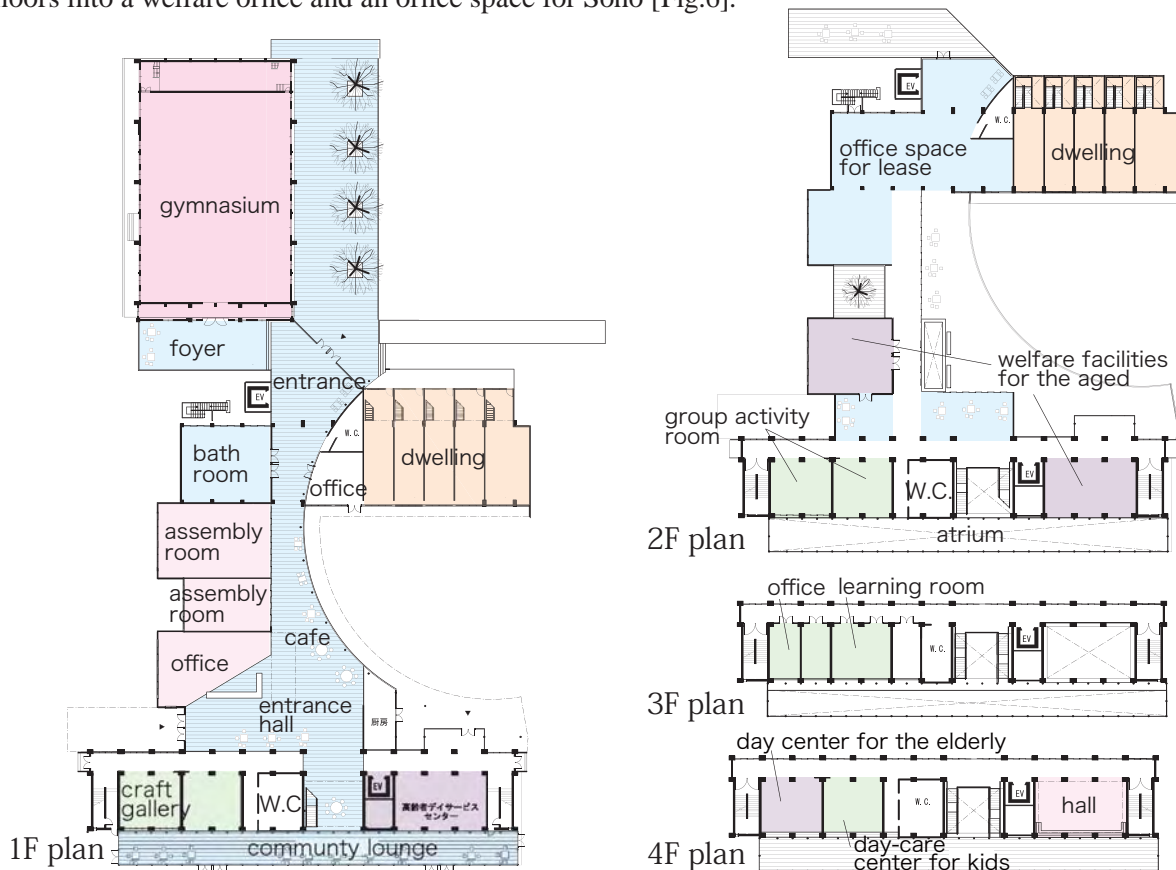


Fig.6 HGN project: conversion of vacant school to a complex facility (S=1:1000)

Pattern B: We attempted the entire conversion of the traditional school building into a dwelling facility for the aged. In Japan, traditional school buildings have approximately the same span, module, and floor height. A classroom could be changed into a traditional Japanese dwelling space (2 rooms, comprising the dining room and kitchen). In addition, half the space of a classroom could be changed into a bed-sitting-room for singles. We proposed care houses for the aged who required nursing care and housings for healthy aged people [Fig7,8,9].

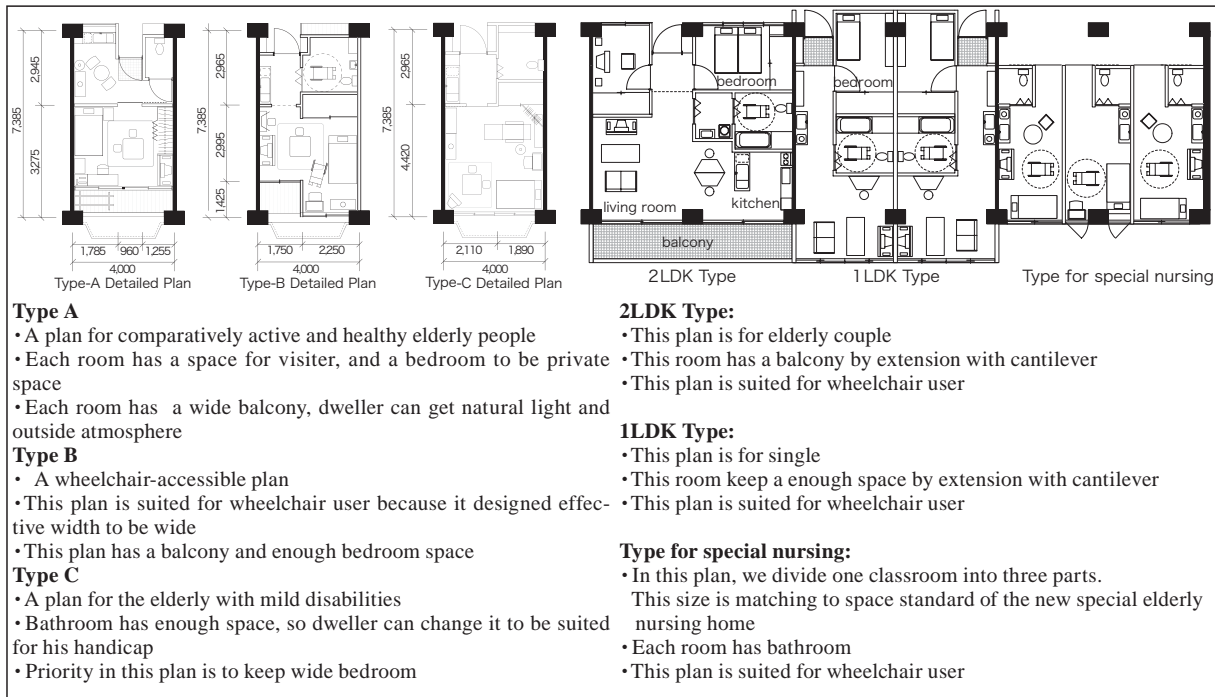


Fig.7 HGN project detail plan: changing classroom unit to dwelling unit

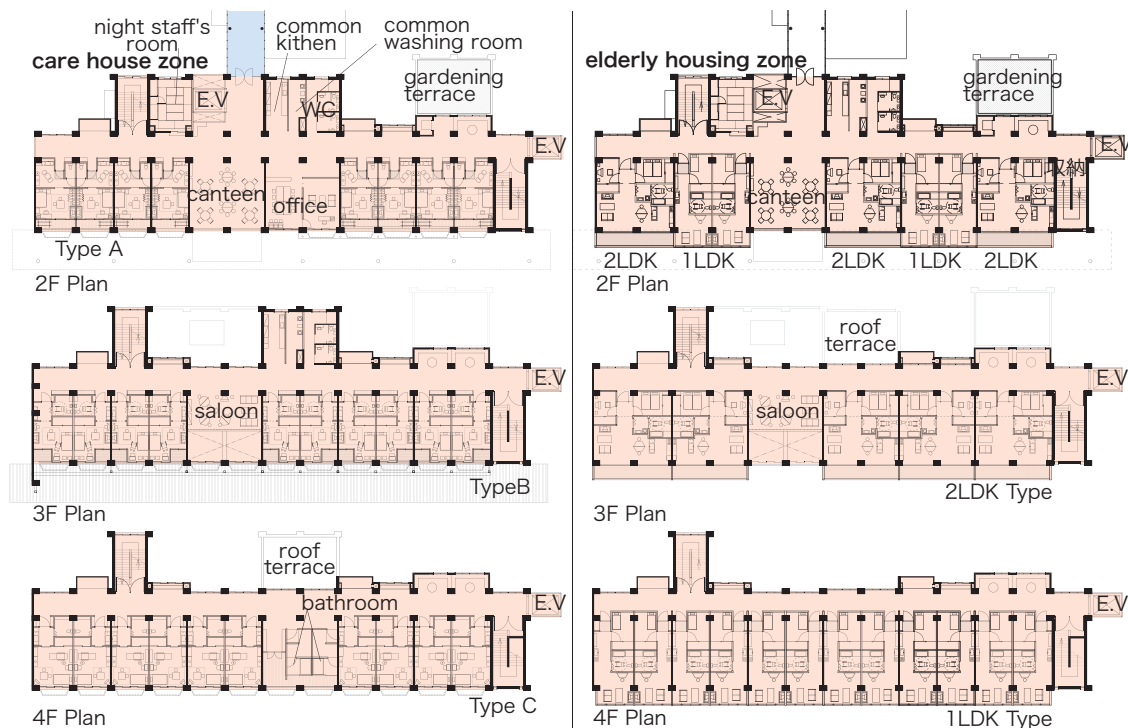


Fig.8 HGN project: conversion of vacant school to a dwelling facility for the elderly (S=1:800)

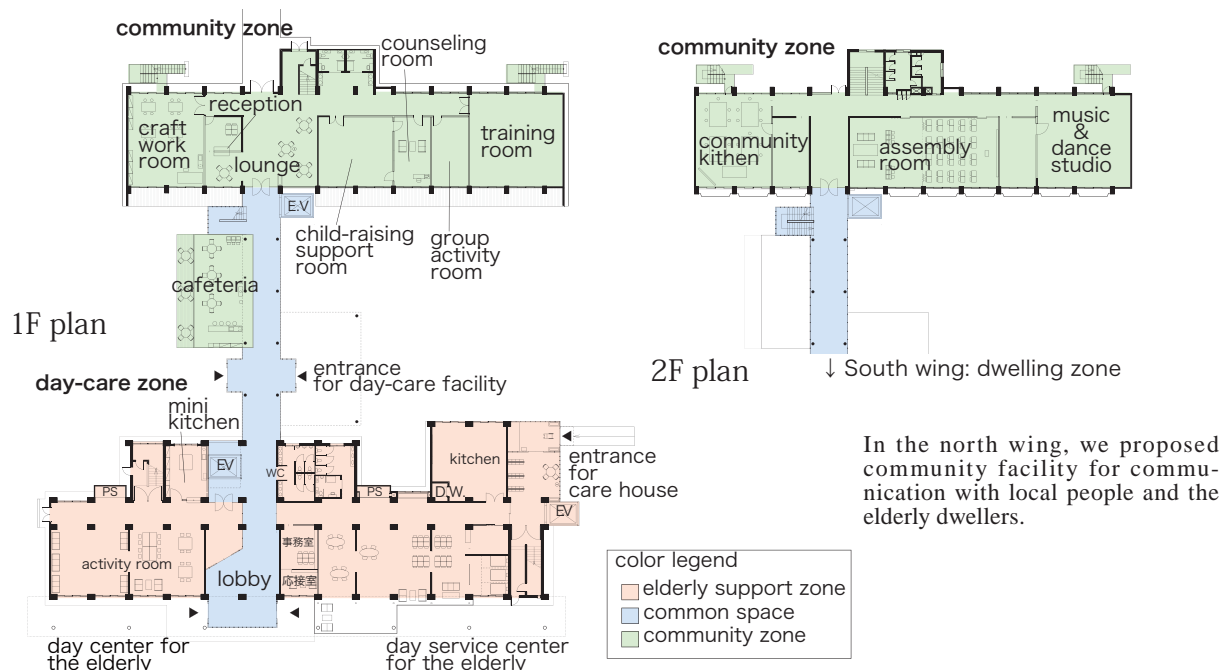


Fig.9 HGN project pattern B: first and second floor plan

5 Conclusion and future tasks

In this report, I explain the main concepts and functional proposals pertaining to each project; however, as each plan indicates, these proposed models are based on comprehensive consideration. From the viewpoint of facility or cost management, it is certainly disadvantageous to continue using school buildings by carrying out repeated renovations that are funded in a segmentalized manner, similar to the process many local governments adopt. Thus, with the implementation of this project, the following will be brought into effect: (1) it will be required to adaptable change in software in public works, and it should be planned comprehensively from united or city government level. (2) an adaptable and effective financial system in place of a rigid system, and (3) a review of the compartmentalized public administration system.

On the subject of the conversion and renovation of school buildings, it is important to ask the following questions with regard to long-term planning.

1. For how many years will this building be used?
2. Which is the most important point involved in this task (renovation or conversion)?
3. How high spec do we need in each renovation or conversion task?
4. Is there a need for convert or renovate this building based on people's future needs?

A consideration of all the abovementioned aspects is required to provide effective cost management on every conversion and renovation work that is undertaken. Moreover, we will try to do a trial calculation on each proposal model plan that we designed, and try to indicate relationship between these proposal models and cost-benefit.

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