

**NEXT 21:  
A Prototype Multi-Family Housing Complex**

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## **1 Introduction**

NEXT 21 located in Osaka, Japan is an experimental multi-family housing project demonstrating new concepts of multi-family housing units that incorporates sustainable design methods and advanced technologies expected to be used in the near future. The design of this building was conceived with a hypothesis that the highly individualized lifestyle is expected in the new century, and addresses issues relating to high-density urban housing and resource conservation in building. In contrast to conventional cookie-cutter design, NEXT 21 experiments a new collective housing that accommodate the preferences and lifestyle of individual occupants. At the same time, it aims at showcasing an environmentally friendly building incorporating various energy and resource conserving design strategies and building systems. As a way of achieving these goals, the concept of two-stage housing was adopted, and design and construction of building infrastructure and individual housing units were carried out in two stages.

The project was sponsored by the Osaka Gas Company and completed in October 1993. The building consists of 18 individual housing units, which were designed by 13 different architects. The building has six floors above ground and one basement. The construction period lasted from May 1992 to September 1993, and the design of the units continued until December 1993. Following a period of six months in which the building was open to the public, the five-year experiment in occupancy began in April 1994. Employees of the Osaka Gas Company and their families became the occupants of the building, participating in the project by beginning the five-year process of compiling data related to their living experience.

## **2 The Site**

The site of NEXT 21 is a residential area in central Osaka about one kilometer south of the historic Osaka Castle. The area surrounding the site contains a number of residential buildings and schools. The site is approximately 1,500 square meters in area, and is bordered on three (north, south, and west) sides by streets that slope gently from west to east. The main approach to the site is from the northwestern corner (See Figure 1).

**Figure 1. View from Main Access Road**



### **3 Design Concepts**

The NEXT 21 project incorporates two principal concepts in its design: the systems building and the two-stage building. Together, these two concepts provide a framework from which specific design strategies emanated.

#### **3.1 Systems Building**

Systems building refers to one that is an integration system assembled from a series of multiple independent subsystems. This decomposition of the building subsystems allows for a building that is technologically-flexible, in which components such as mechanical equipment can be easily replaced, and the adaptive reuse of individual units in response to changes in the lifestyle and occupancy pattern is built in its design. Consequently, one of the key design tasks was to synthesize a number of building subsystems and their component parts into one integrated building. With the systems building approach, building products produced from independent production processes could easily be incorporated without disrupting the integrity of other subsystems. Prefabricated products made in factories and/or customized parts made on site are used in building construction. These two categories of building components differ in their workmanship and precision. Thus the rules of integration to make them compatible with each other must be established and shared among relevant players.

Systems building contributes to reducing initial construction and lifecycle costs in various ways. By using prefabricated building components, the job site waste during construction can be avoided. During a building's occupancy and use, independent subsystems make it easy and economical to replace component parts. After a building's life, the disassembly of its component part is convenient, and useful parts could be easily recycled or reused. For these reasons, systems building could be regarded as a strategy for design for disassembly and sustainable design. This will be the case particularly for buildings whose intended life is short.

The four main subsystems in NEXT 21 are structure, cladding, infill, and plumbing. In order for these subsystems to be compatible and to harmoniously produce a well integrated building, three types of coordination are required:

- 1) Geometric coordination in terms of the size and shape of the building components.
- 2) Performance coordination of building equipment.
- 3) Job coordination in the process of construction

Because of these requirements of coordination and standardization, systems buildings are often considered a hindrance to design creativity. NEXT 21 challenges this popular belief, and incorporates non-standardized building components such as one-of-a-kind products and hand-made parts to experiment how they can be integrated into a systems building.

### **3.2 Two Stage Building**

Two-stage housing forms the other conceptual foundations of the NEXT 21 project. Thus this project experiments new approaches to design, construction, occupation and adaptive reuse in collective housing. As such, this building was designed to meet not just the need and lifestyle of initial occupants but also those of the future adaptively. It is also intended to flexibly accommodate future building technologies as they continue to innovate.

In NEXT 21, building systems are classified into two groups: the infrastructure and the infill. This classification provides the principal guideline for implementing the two-stage system. The Infrastructure is regarded as a shared property and the infill as personal property of the individual owners. The infrastructure is designed to be permanent, where as the Infill, which has a shorter life and is designed to be easily replaceable. The Infrastructure consists of the structure, the cladding, the public doors and windows, and the plumbing and mechanical equipment installed outside individual units. The infill includes the unit partitions, fittings, interior finishes, the doors and windows of the individual units, and the mechanical equipment within the individual units.

### 3.3 Design Process and Criteria

The design of collective housing is typically proceed based on assumed user preference. However, in Next 21, user participation in design was integral part of design decision-making processes. During the early stage of the project, project organizers and designers conducted interviews with prospective occupants to identify their needs and wants in living in a collective housing. The responses of prospective occupants obtained from the interviews were diverse:

- 1) a home that accommodate individual lifestyle
- 2) high-tech, comfortable home
- 3) suitability for the elderly
- 4) tranquil indoors
- 5) home that allows for social gatherings and interaction and communal living
- 6) capable of accommodating three-generations
- 7) home office, workshop, studio, fitness room
- 8) home for a young family
- 9) house that grows

Next, designers collectively established general design objectives for the experimental housing project:

- 1) A flexible building that allows for the provision of diverse housing units and that responds to changes in the lifestyles of occupants within individual units.
- 2) A building that conserves energy and utilizes natural resources efficiently.
- 3) A building that minimizes the deleterious environmental impact.
- 4) A building that is flexible in adapting innovation in building technology.
- 5) A building that provide spaces in contact with nature.

In order to achieve these objectives, a series of specific design strategies were developed:

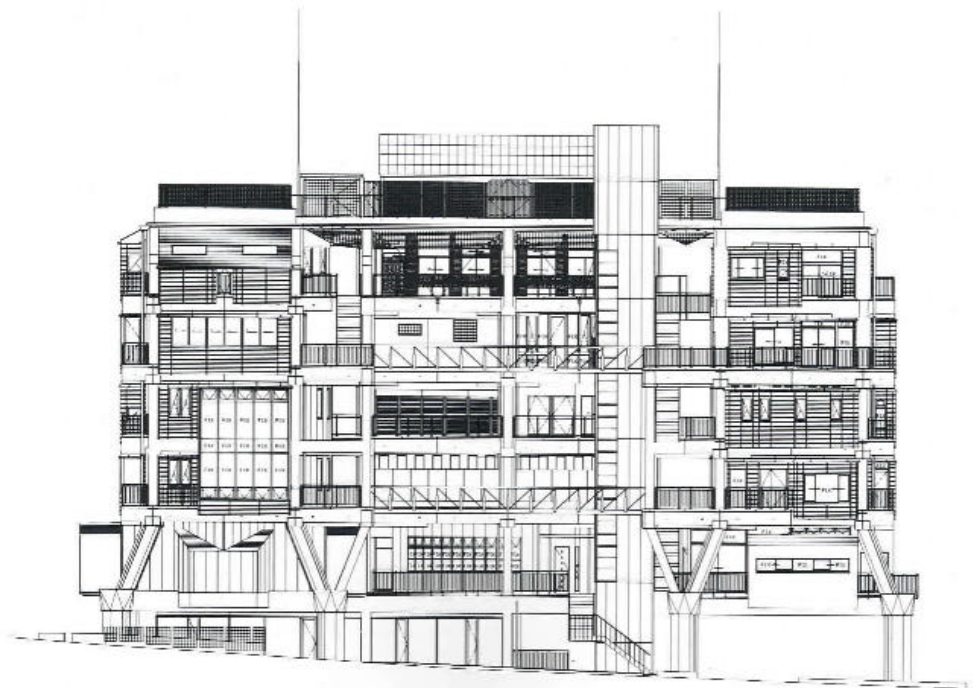
- 1) A structural system that provides flexibility in locating exterior walls and interior layouts, and that is organized in module so that various individual units can be harmonized to form an integrated building. Both standard and nonstandard building components are to be incorporated to enhance the diversity of the individual units. To test the ability of the building system to accommodate diverse residential units, each unit should be designed by different architect.
- 2) A building energy system that is based on natural gas as the primary resource. This system is intended to save energy by using fuel cells as the primary source of electricity and solar cells as secondary source.

- 3) Waste treatment systems and methods that encourage the reuse and recycling of resources produced from the building including solid wastes and gray water. In addition, a construction method that avoids or reduces the use of wooden forms.
- 4) A building assembly method that delineates building systems into distinct subsystems. This creates a building that has the flexibility to adapt to future technological changes by providing for the easy replacement of subsystems as they become outdated. In addition, this uses resources more effectively by allowing for only necessary components are replaced as their life expires.
- 5) The creation of a green inner city oasis for human occupants as well as for wild birds and insects.
- 6) The creation of an open, three-dimensional street. It further enhances the green effect by enabling occupants to experience nature as they move through the building. People will feel livelier in such three-dimensional spaces. The space under the streets is used as conduits for the supply and discharge of resources such as energy and water.

## **7. The Design Process**

Two groups of architects participated in the project on two different capacities. One group was responsible for designing the building infrastructure, and the other was assigned only to design the individual housing units within the infrastructure. This two-level organization of the design teams rendered a unique architectural design. For instance, the facades of the building are a combination of that of individual units designed by different designers, and thus resulted in a distinctively unconventional design. The facades of NEXT 21 are symbolic of its challenge to conventional notion of collective housing.

**Figure 2. Façade Details**





**Figure 3. Exterior and Interior Façade Details**



## **8. The Architectural Organization**

The NEXT 21 project is organized around three zone types, each based on a 90-centimeter grid: the house zones, the street zones, and the public zones. The house zones include three different sizes of modules. The main modules consist of units 7.2 meters x 7.2 meters, and the sub-modules come in two units 7.2 meters x 3.6 meters or 7.2 meters x 1.8 meters. The street zones include stairs, corridors, and voids and are 3.6 meters wide. The public zones consist of 10.8 meters x 10.8 meters or 10.8 meters x 9.6 meters.

The house zones and street zones have floor-to-floor are higher than the heights typically found in collective housing buildings heights anticipating future expansions of building mechanical, electrical or plumbing systems in floor and ceiling plenums.

### House Zones

The house zone defines the organization of the building framework. These zones are organized into six layers, with six units on each floor. In each unit, the main modules face north or south and the sub-modules face east or west. The columns, including the cladding, are 60 centimeters square in plan. The columns are spaced 6.6 meters apart, surface-to-surface, or 7.2 meters apart, center-to-center. Spaces for ducts and pipes are provided in both the floor and ceiling plenums so that rooms, including wet areas, can be freely located.

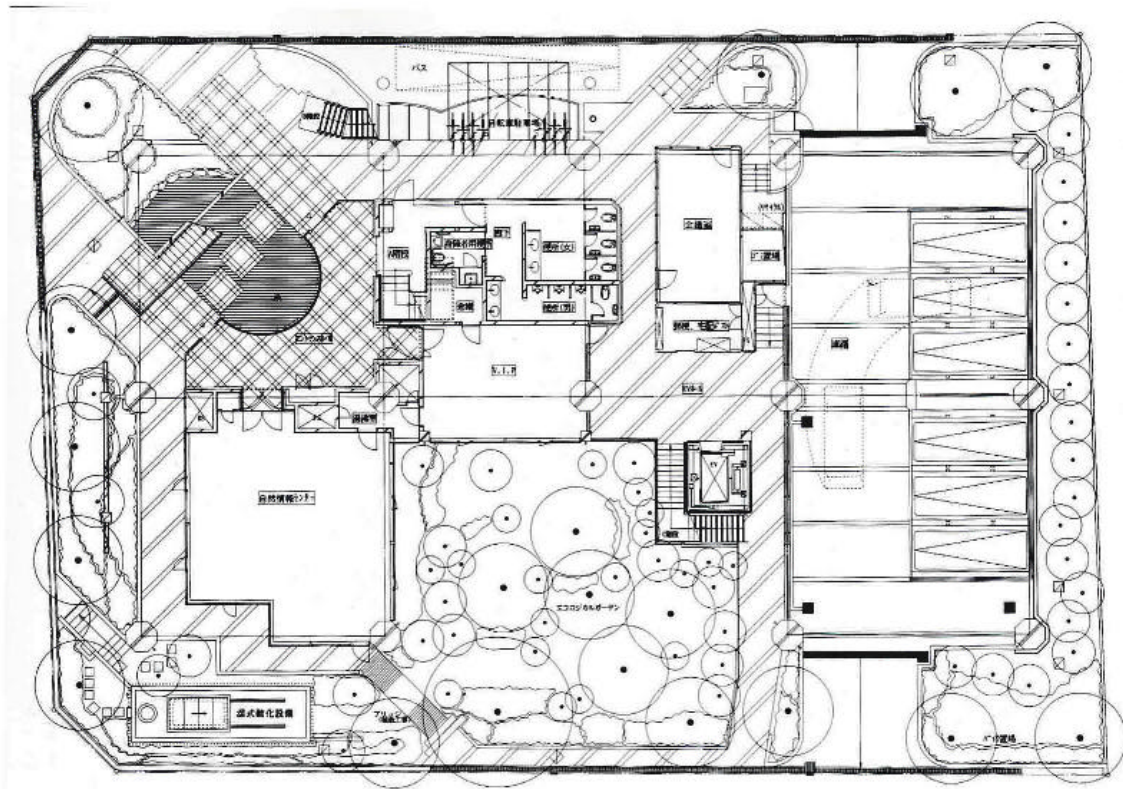
## Street Zones

The street zones are formed by the spaces between the house zones and are 3.6 meters wide, from surface-to-surface. Similar to the house zones, the floor and ceiling have plenums to accommodate the shared ducts and pipes for the building. Unlike spaces in the house zones, however, these spaces are deeper and can accommodate more pipes. The floor panels are removable to provide access for maintenance or system replacement.

## Public Zones

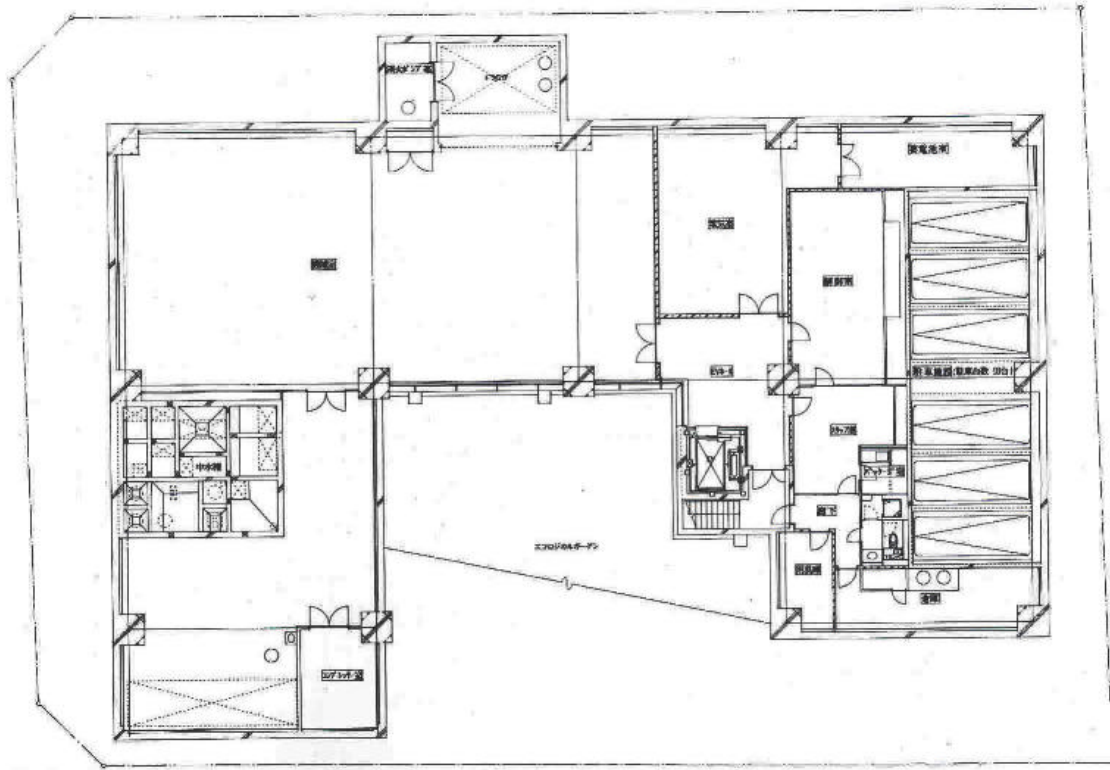
Large spaces were required on the lower levels of the building in order to accommodate public facilities such as a conference room, parking, and a mechanical room (See Figure 4). Consequently, a larger bay size was necessary. This was accomplished by consolidating every four columns on the upper floors into one column on the lower floors (See Figure 5).

**Figure 4. Lower Level Plans**





**Figure 4. Lower Level Plans, continued**



**Figure 5. Branching of Support Columns**



## 9. The Structural Design

The infrastructural of NEXT 21 consists of four subsystems: structure, cladding, infill and mechanical systems. This division is based on the different life spans and production methods of the subsystem components. The decomposition of the building into a collection of subsystems allows for a building system which enables easy disassembly of each part as its life expires. In addition, this division increases the flexibility for technological and occupant lifestyle churns.

### Structure

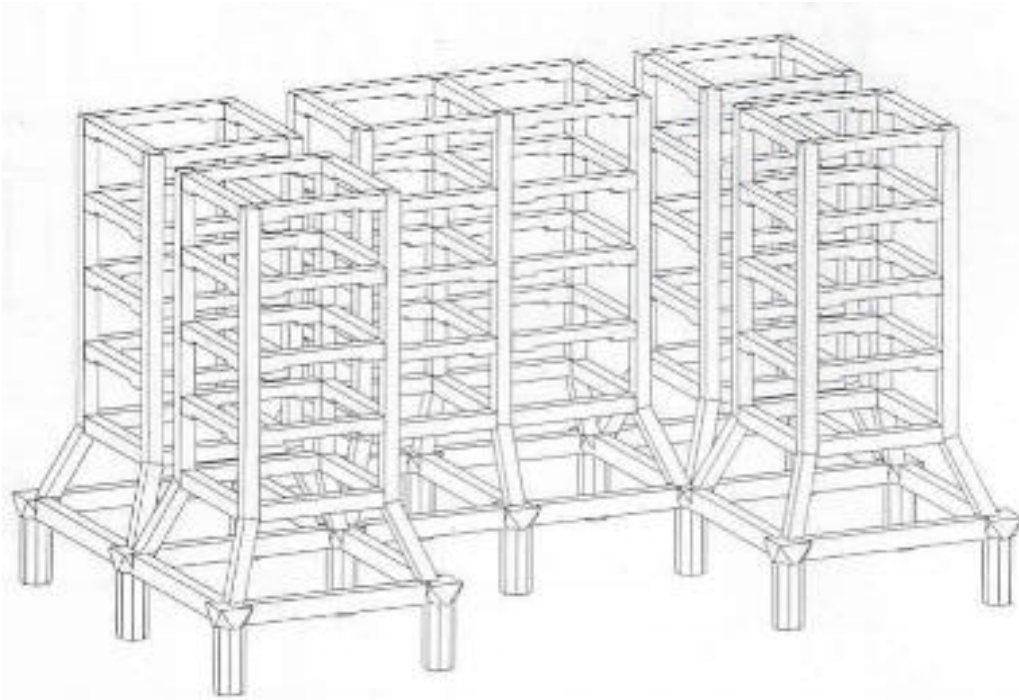
The structure is the only part of the building that is fixated permanently. Consequently, it must have a longer life span than the other subsystems. It was agreed that the life span of NEXT 21 should be at least 60 years. To achieve this, the concrete structure was clad to protect from rain, wind, and other corrosive elements.

The building frame consists of columns and beams of cast-in-place concrete. Cast-in-place concrete is widely used in Japan and the forms are typically made of plywood. Since the use of wood material has become a reason for deforestation, efforts were made to reduce the amount of wood used for formwork. Therefore, in the construction of the frame, thin, factory-produced precast concrete panels and boxes were used as forms. The columns were built by the Precolumn method and the beams by the Oroform method. Both methods are very durable and do not require the wasteful use of temporary materials. The floors were also constructed using thin precast concrete panels as forms.

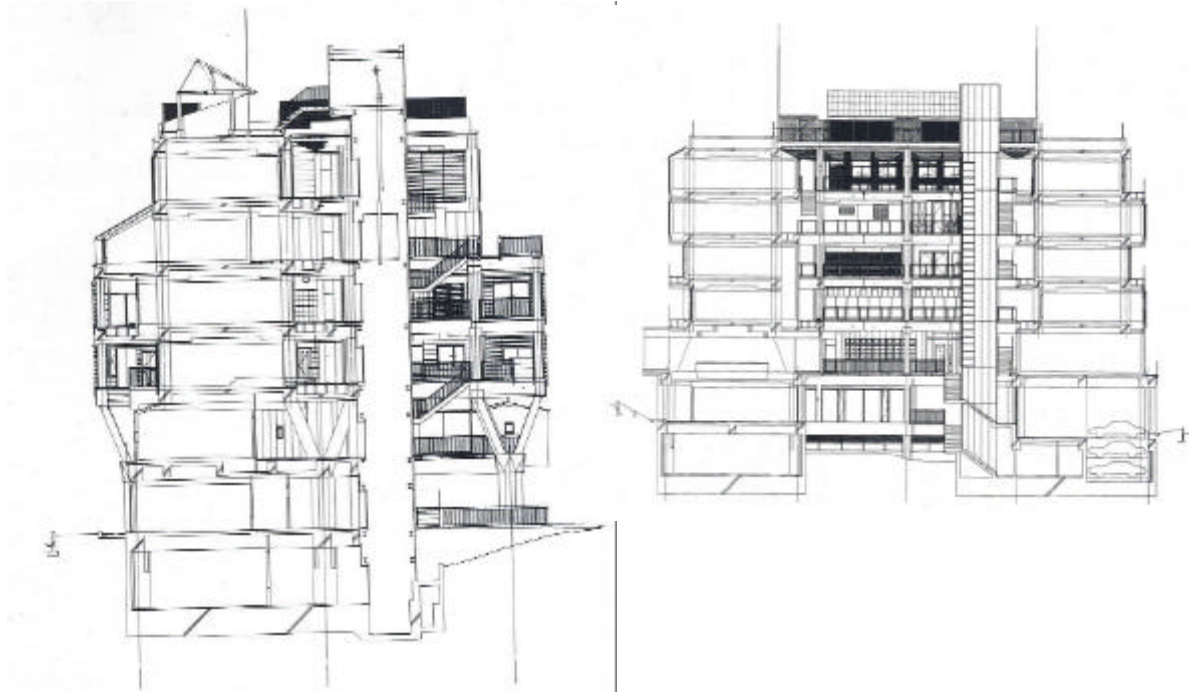
From the third floor up, there are six independent structures which are single-span towers of columns and beams, each 7.2 meters square in span (See Figure 6). Between these structures are zones 3.6 meters wide which are provided with low slabs. As a result, there are parts of the floor in each upper level that are lower than the other areas (See Figure 7).

These areas are the common corridor spaces (the three-dimensional street), and the extra space provided allows for pipes and wiring underneath the finished floor. The floor-to-floor height of the upper levels is 3.6 meters.

**Figure 6. Frame**



**Figure 7. Building Sections**



As previously mentioned, every four columns on the upper floors are consolidated into one column on the lower floors. This creates larger bays (10.8 meters x 10.8 meters and 10.8 meters x 9.6 meters) on the lower floors in order to accommodate the public

facilities. The result is a tree-shape structure in which the columns branch off from a trunk below. The floor-to-floor height of the lower level is 4.2 meters.

### The Exterior Walls (Cladding)

In the cladding system of NEXT 21, the exterior walls are located at the tip of a cantilever. This allows for the changing of the panels to be accomplished from the inside, without the need for scaffolding. The perimeter walls fit into a 150 millimeter wide band, and heat insulation material and a stainless exterior finish are affixed to the outside of the walls. By making them easily replaceable, the designers of NEXT 21 treat the exterior walls as an independent system on the infill level. The geometric variation of individual unit facades was coordinated through the incorporation of design rules for the exterior walls and the modular arrangement of the windows. The stainless finish of the exterior walls was arranged in coordination with the window components to give the building a unified appearance from the street (See Figure 1). Several cladding materials were incorporated (See Figure 8).

**Figure 1. View from Main Access Road**





**Figure 8. Various Cladding Materials**



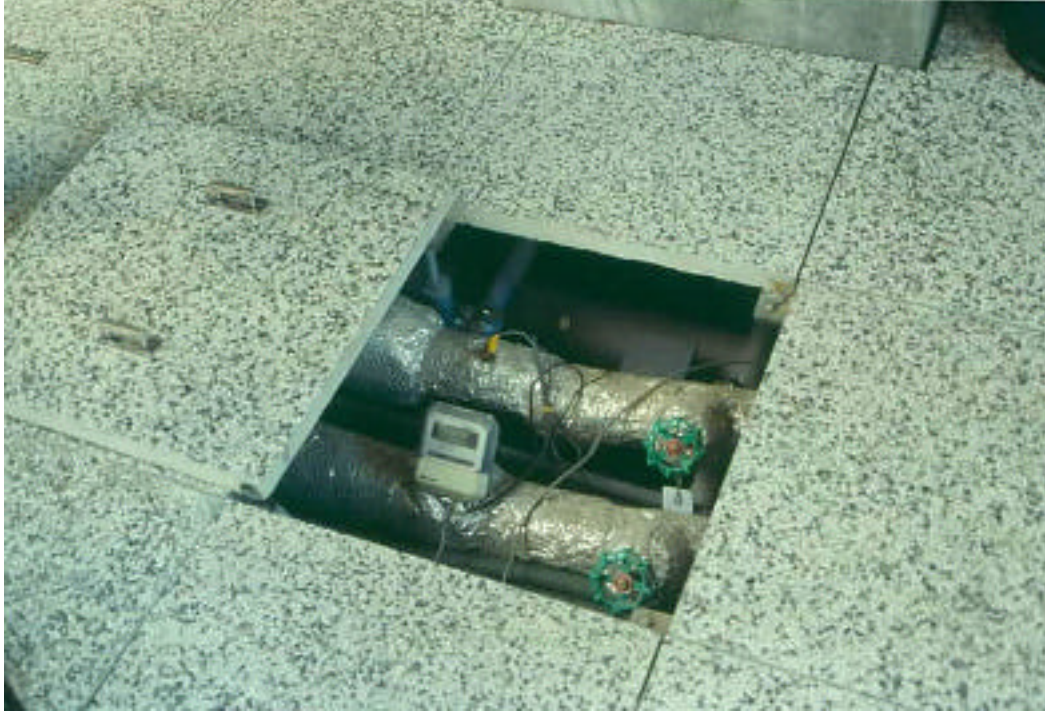
### Infill

The infill of NEXT 21 consists of partitions, fittings, and the interior finishes of the floors, ceilings, and walls. The ceilings and the floors in each unit have hung ceilings and raised floors respectively. Even with these plenum spaces, a sufficient floor-to-ceiling height was provided through the building.

The floor is constructed by a method that improves sound insulation. The architects were allowed to choose the floor finishes of individual units, and many chose wood flooring. A standard floor level is set at 240 millimeters above the slab of the building frame (See Figure 9). The plenum space under the floor accommodates wiring and plumbing. The accessibility of this space allows for the easy replacement of components. The structural plan and the plan of the mechanical systems are coordinated so that pipes and ducts do not need to pass through the walls, floors, and beams of the building frame. Each unit is equipped with hung ceilings that provide a space for air conditioning ducts and equipment. Large beams have stepped shapes cut out of the middle so that, at the exterior wall, for supply and exhaust ducts have easy access to the outdoors. The incorporation of these features of the infill subsystem allows for flexibility in the location of interior partitions and facilitates easy maintenance and renovation of mechanical components.



**Figure 9. Raised Floor in a Unit**



### The Mechanical Systems

Building mechanical systems have shorter lives than the building frame. Therefore, the aging of the pipes and duct components of mechanical systems has a major impact on the life span of the building. The advancement of automated electric home appliances has increased the demand for flexible wiring infrastructure in housing units. Because of these attributes, the spaces and pathways that accommodate mechanical systems were designed to be easily accessible. And the components of mechanical systems were assembled in modular elements arranged in grids. These interrelated grids occur on several levels and organize the design of all building subsystems. The ducts, pipes, and wiring of mechanical systems are housed in floor or ceiling plenum spaces, which allows for flexibility for the location of kitchens and bathrooms.

Another design feature of NEXT 21 which helps to organize the cables and conduits is the clear separation of the mechanical systems and the building frame. This is accomplished by the concentration of the vertical shafts for the mechanical systems, as opposed to the typical method in which vertical shafts are located inside the individual units. The latter approach makes the repair of old pipes difficult and increases the amount of debris that must be disposed of after repair work. In NEXT 21, large vertical shafts are located in two places in the building. Pipes and wiring are led from these shafts, underneath the common corridors (the street zones) to each unit. This concentration of the vertical shafts in easily accessible locations facilitates the maintenance of pipes and wiring.

## 10. The Design of the Units

The 18 units of NEXT 21 were designed by 13 different architects. As a two-stage housing, the design of the units began after the design of the building frame and continued while the building frame was being constructed. The participation of the occupants was instrumental throughout all design decision-making processes. As a result, a variety of housing units were emanated (See Figure 10). For example, growing bonsai is a hobby of one of the predetermined occupants, and for his unit, a broad verandah corresponding to the garden in a single-family house was provided along with a shelf for the bonsai. The design process employed in NEXT 21 is an important part of the project experiment.

**Figure 10. Floor Plans**

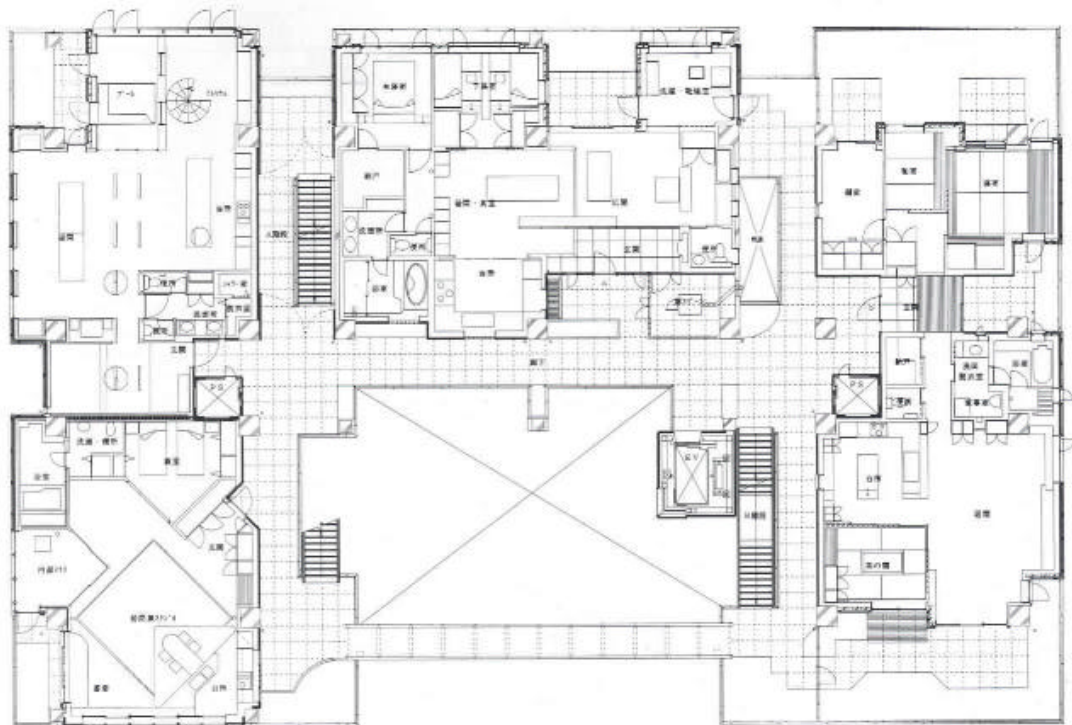
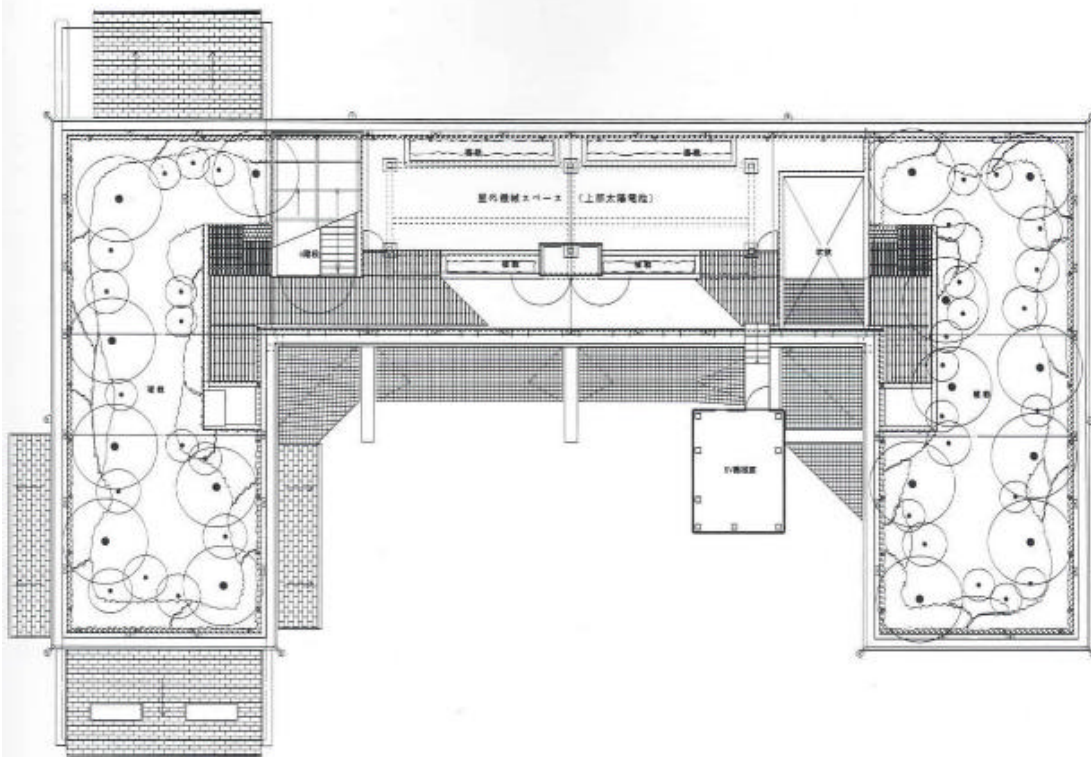
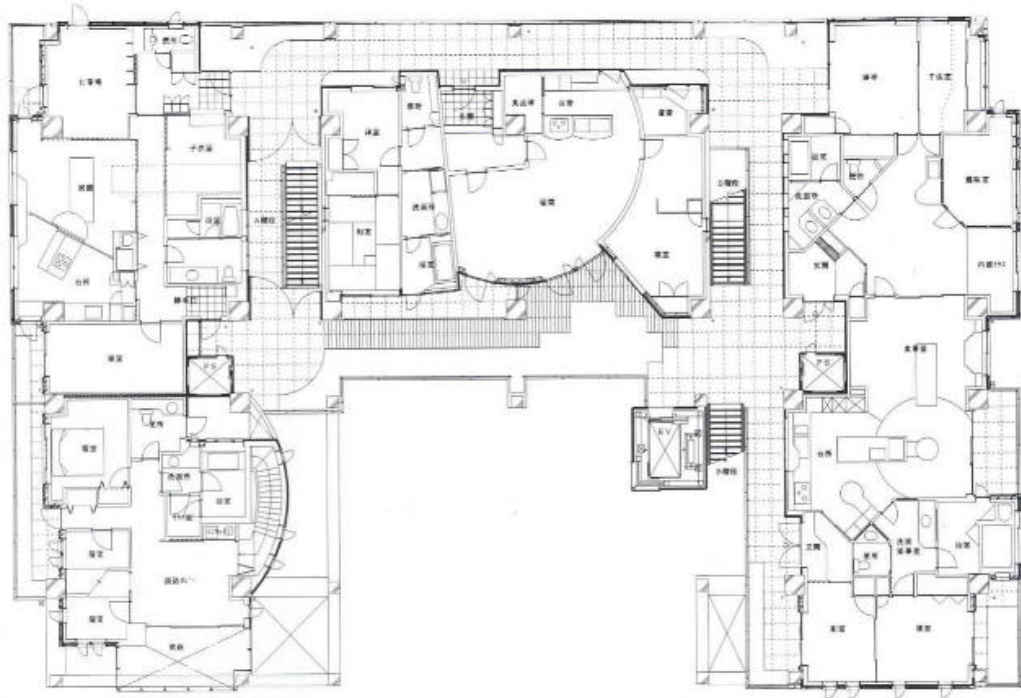


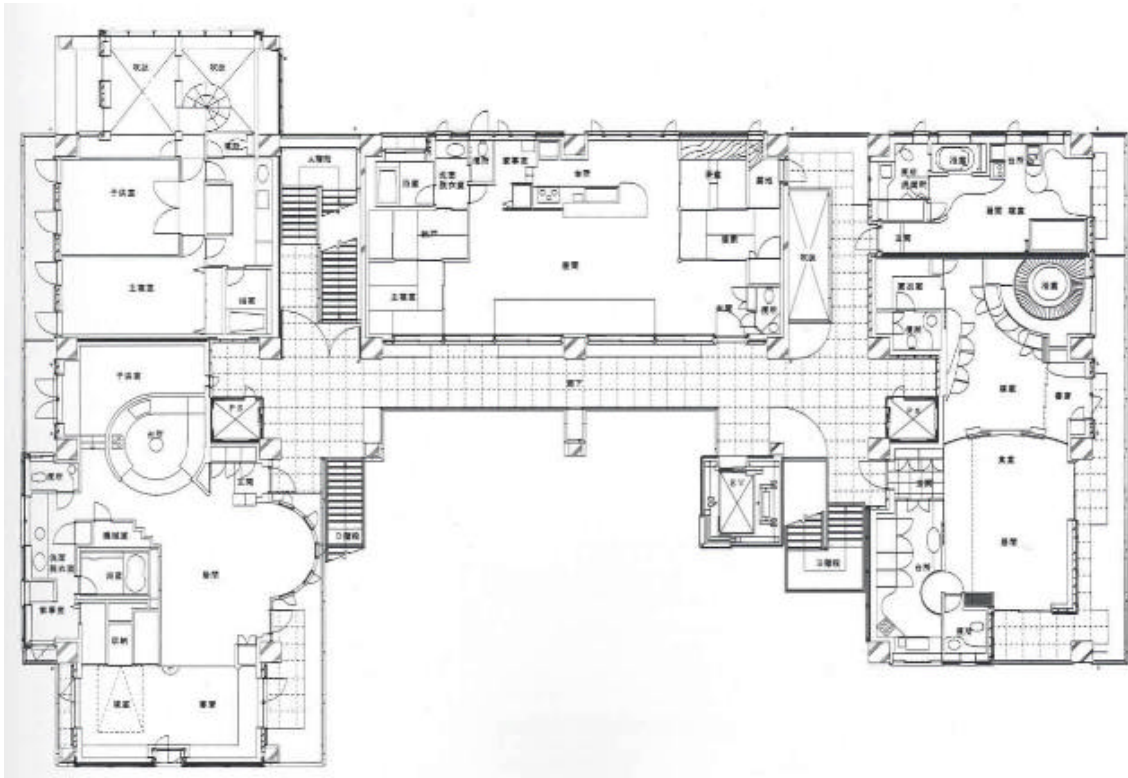
Figure 10. Floor Plans, continued



星形平面図



**Figure 10. Floor Plans, continued**



The diversity in the units of NEXT 21 is an epitome of its ability to adapt to various lifestyle, family composition and occupancy patterns expected to occur during the course of its occupancy after construction. Each unit was allowed to be independently designed within a building frame that consists of reinforced concrete columns, beams, and slabs. Walls are excluded from the building frame, which provide the architects with flexibility in locating the exterior walls and organizing the layout of each unit. There have been many collective housing projects where the interior of the units was freely designed. However, few projects have permitted the exterior walls to be freely located as in NEXT 21. In the past, this was a difficult problem because a balance had to be found between giving architects freedom to design exterior walls and producing a unified image for the building as a whole.

**Figure 11. Interior of Various Units**



### Design Rules

In order to ensure cohesiveness between the individual units, independent coordinators are employed to arbitrate between the design of each unit and the design of the building as a whole based on the design rules. Most of this coordination is in the form of interpreting these design rules. The application of these rules in the design of the units ensures that the building projects a unified formal composition and promotes rationality in construction.

A main feature the design rules is the arrangement of the perimeter walls in the individual units. The perimeter walls are confined to a 30 centimeter thickness. They can be arranged with their outer lines on a grid created by lines that are spaced alternately 1200 millimeters and 600 millimeters apart. In other words, it is a 90 centimeter grid that incorporates a double grid of walls that are 30 centimeter thick. When the arrangement of the perimeter walls for the units has been determined, the enclosed spaces become the house zones and the exterior spaces become the street zones. When the position of a perimeter wall differs from the already established boundary between the street zone and the house zone, the rule for the mutual extension of the house zone and the street zone was applied. This rule was established to allow the greatest latitude in the design of the relationship between units and the streets. According to this rule, it was possible for a part of the street zone to extend into a house or part of the house zone to protrude into the street. However, excessive use of this rule would result in a disorderly streetscape, and thus, was discouraged.

### Perimeter Wall Types

The three wall types make up the individual units: Types, B and C walls.

Type A walls are a part of the perimeter wall of the building and therefore, directly face the street. They are designed as elements of the infrastructure in order to ensure an orderly exterior facade. Consequently, the architects of the individual units do not have



any choice with respect to the finish of Type A walls. However, they have freedom with respect to the position and size of the windows as long as they conform to conditions of modular coordination. The locations of the exterior walls were determined by the architects of the individual units, taking into account the preferences of the prospective occupants.

Type B walls are exterior walls located where a cantilever is used as a balcony for the exclusive use of single units. They are walls that have a balcony between them and the street. The design requirements for Type B walls are basically the same as those for Type A walls.

Type C walls are perimeter walls that face the street zone and the interior courtyard, and therefore, great latitude was allowed in their design. The architects of the individual units were free of restrictions in designing Type C walls as long as conditions of modular coordination were met. This allows the character of each unit to be reflected on the interior facade of the building.

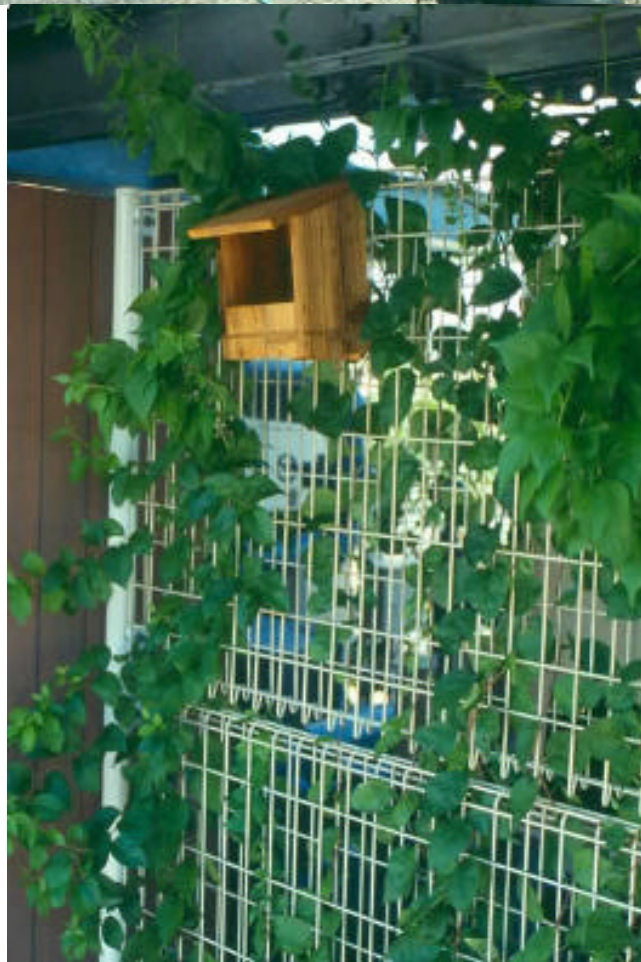
### Modular Coordination

A 30 centimeter grid is laid throughout each unit enclosed by are 30 centimeters thick perimeter walls. This grid is the basis for modular coordination throughout the project. The partitions, floors, ceilings, windows, and components such as prefabricated units, fittings, and electric home appliances must all adhere to this module.

## **11. Green Features**

One of the objectives of the project was the incorporation of nature in the design of collective housing. A theme of the project was the creation of an inner-city oasis. Grass and trees were planted on the roof, and small atria were created in the balconies. In addition, a courtyard, called an ecological garden, is located on the ground level and is stocked with plants that attract wild birds and insects (See Figure 12). This courtyard is also provided with flowing water. The designers of NEXT 21 also intended to make the corridors and balconies of the building hospitable to birds and insects. Also, an office for the Japan Wild Birds Society is housed in the building. This infusion of nature in the building made the occupants become more conscious of seasonal changes in an urban setting.

**Figure 12. Incorporation of Greenery**



## Streets

Another concept which is intended to create a more natural environment was the theme of a three-dimensional neighborhood with a three-dimensional network of streets. Within this network, people approach the units not by enclosed stairways, as in typical collective housing buildings, but by open streets. This network of streets allows one to come from the urban street and walk a public path through the entire structure, from floor to floor, crossing the bridge halfway over the common garden below, until one ends up at the roof garden (See Figure 13). In this journey, one experiences all the elements of a true Japanese neighborhood: the public path, the houses with private gardens, and a small public park. As in a typical neighborhood, one can walk through the three-dimensional neighborhood of NEXT 21 in a number of different ways. This three-dimensional organization enhances the integration between the building and nature, a characteristic of traditional Japanese dwellings, while providing several approaches to individual housing units.

**Figure 13. Three-Dimensional Network of Streets**





The floor slabs of the streets are lowered to provide not only common zones for pipes and wiring, but also zones for plants. In most buildings that attempt to accommodate spaces for plants in their corridors, raised plant boxes are incorporated. However, the method used in this building creates a space for plants where the soil is on the same level as the floor, resulting in a more natural setting (See Figure 14).

**Figure 14. Floor Level Plants**



## **12. Recycling and Reuse**

The recycling of resources and the treatment of household wastes and gray-water within the building were another green feature of NEXT 21. Waste from the kitchens is ground in a disposer and sent by a special pipe to waste treatment equipment in the basement machine room. This device works through the catalytic wet oxidation process in which the waste is slowly oxidized in a long tube, changed into clean exhaust gas, and reclaimed as water. The heat generated during this process is used as a heat source for the heating system and the recycled water is reused for flushing toilets and watering plants. In addition, organic matter in the drainage from such sources as baths is treated by the contact aerating treatment system. Recycling and the centralized treatment of waste within the building increase building's environmental responsibility. The recycling of natural resources are more economical and feasible in collective living than single family dwelling, another environmental benefit of collective housing in high-density urban areas.

## **13. Energy Efficiency**

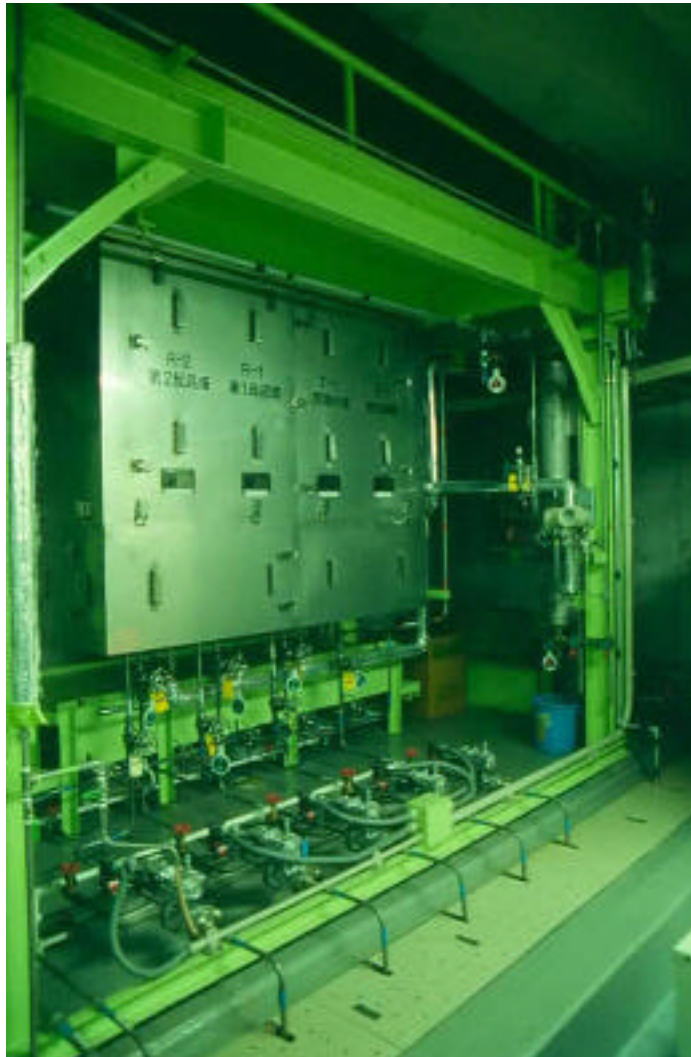
Energy efficient housing is one of the key features of the NEXT 21 project. In addition to conserving energy consumption, the concept of an “energy-producing” building was applied. Technologies for on-site electricity generation by means of solar and fuel cells were incorporated. In addition, the project features a cogeneration system that uses wasted heat produced from water heating and air conditioning.

### Fuel Cells

Next 21 are all gas systems. The only fossil fuel source for Next 21 is natural gas, and no electricity is supplied to the building. It is the first collective housing that use fuel cells as the principal source of energy. The fuel cells used in this building generate a maximum of 100 kilowatts of electricity, which is sufficient for the needs of the entire building (See Figure 15). Direct current is used for lighting the common corridors and running the elevator, but an inverter is installed in each unit so that general household electrical appliances can be installed. The heat generated by the fuel cells is used to produce cool and hot water by an absorption chiller-heater, and pipes carry the cool and hot water to each unit. In addition, storage batteries are installed in the machine room and solar cells are mounted on the roof as auxiliary sources of energy (See Figure 16).



**Figure 15. Fuel Cells**



**Figure 16. Solar Cells**



Walls, Windows and Ventilation

Although Osaka has a relatively mild climate, exterior walls and windows have high insulation values and are airtight. In addition, it has a small window area compared with typical Japanese homes, which further increases the heat insulation and air-tightness of the building. Energy efficient ventilation and air-conditioning systems run 24-hour a day.

To recover heat contained in exhausted air, heat recovery ventilators were incorporated in the ventilation systems.

## 14. Conclusions

NEXT 21 is one of the most comprehensive buildings that demonstrates and experiments sustainable design methods in the process of design, construction, and operation and maintenance. A variety of energy and resource conserving design methods and technologies could be found in this project. A two-stage building delivery process experimented in this project could be adapted in future collective housing and office buildings. The methods and techniques for the “design for disassembly” and the “design for life cycle” have a broad implication to how buildings should be designed and assembled. The ultimate goal of the project is to create a built environment where the quality of life is enhanced. Sustain design methods was simply a means to achieve enhance the quality of life in a high-density urban setting, in which people’s quality of life has been deteriorated by the loss of nature, polluted air, lack of social interaction, to name few. NEXT 21 is an exemplar of new concepts of collective housing and urban architecture.

## References

Utida, Yositika, Collective Housing Proposal for the Near Future  
Seiichi Fukao, Yositika Utida, Mitsuo Takada, Shinichi Chikazumi, Hideki Hayami, Takeshi Yamawaki, The Experimental Housing ÒNEXT 21Ó.

## Appendix I: General Project Information

<b>Name</b>	Future-Type Experimental Collective Housing NEXT 21
<b>Location</b>	6-13 Shimizudani Tennoji, Osaka City, Japan
<b>Client</b>	Osaka Gas Company
<b>Use</b>	Collective housing
<b>Project Completion</b>	October 1993

### Design and Supervision

Architecture	
Architect-in-Charge	Yositika Utida; Shu-koh-sha Architectural & Urban Design Studio
Staff	Osaka Gas NEXT 21 Construction Committee; Osaka Gas; KBI Planning and Design Office; Obayashi Corporation; HEXA; Naomi Tachibana; Keiko Sasaki; Coelacanth Architects; Kazuki Morino; Tokuichi Yoshimura; Akihiro Tsukaguchi; Marco Piva
Structure	Kimura Structural Engineers; Matsumoto Structural Design
Environmental Design	Japan Wild Birds Society; Naomi Tachibana; Atelier E2

### Designers of Individual Units

Units 1, 3, 9	The Housing Equipment Section, the Osaka Gas Company
Unit 2	Marco Piva; KBI; Kazuyuki Negishi
Unit 4	MIO Design Group
Units 5, 11	Tokuichi Yoshimura
Unit 6	Naomi Tachibana
Unit 7	Akihiro Tsukaguchi
Unit 8	Coelacanth Architects
Units 10, 13	KBI Planning and Design Office
Units 12, 14	Keiko Sasaki
Unit 15	Yositika Utida; Kouda Architectural Design Office
Unit 16	Design Department, Obayashi Corporation
Unit 17	Housing and Urban Development Corporation; HEXA
Unit 18	Osaka Gas Company

### Building Descriptions

Stories	1 basement, 6 aboveground floors
Building Area	895.21 square meters
Total Floor Area	4,519.14 square meters
Floor Areas	
Basement	896.33 square meters

1st Floor	672.07 square meters
2nd Floor	577.11 square meters
3rd Floor	663.66 square meters
4th Floor	640.92 square meters
5th Floor	593.74 square meters
6th Floor	462.71 square meters
Roof	12.60 square meters
Building Coverage	58.02% (permitted: 60%; corner site: 70%)
FAR	263.72% (permitted: 300%; area subject to FAR: 4,068.98 square meters)
Floor-To-Floor Height	4.2, 3.6 meters
Floor-To-Ceiling Height	2.4 meters
Maximum Height	22.66 meters

### **Site Conditions**

Site Area	1,542.92 square meters
Zone	Residential zone
Road Width	11 meters

### **Method of Construction**

Main Structure	
Basement-2nd Floor	Reinforced concrete
3rd Floor-6th Floor	Composite structure of precasts concrete and reinforced concrete
Piles and Foundation	Mat slab

### **Main Exterior Finish**

Roof, Exterior Wall	Colored stainless
Windows	Aluminum sash, natural color

### **Osaka Gas NEXT 21 Construction Committee Members**

Yositika Utida Meiji University	
Kazuo Tatsumi	Kyoto University
Seiichi Fukao	Tokyo Metropolitan University
Mitsuo Takada	Kyoto University
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