

Upgrading of Facilities

Seinojo TAKANO
Kazuyoshi OSHIMA

1. Introduction

The main construction targets for FY1995 included the completion of construction projects that had been planned in FY1992 and FY1993 and the start of new projects for which budgets were approved in FY1995.

The injector system building, upon which construction was started in February 1992, was completed in May 1995 together with the installation and adjustment of the accelerator. For the electrical facility, first and second substations of the extra-high voltage were completed in January and April 1995 respectively and the power supply as started. The electric power system will be finished with the completion of the emergency electricity generator in March 1996, and the uninterruptible power system in August 1995. Furthermore, as work on the roads, street lamps, and security guards' office comes to a conclusion in March, the administration function of the SPring-8 facility will be upgraded.

The approved budget for FY1995 was in the range of ¥10 billion, including the primary and secondary supplementary budgets, and as a result, it became possible to add two plans that were not included in the initial plan to the construction. These projects are now in their starting phase. The new facilities to be built in FY1995 include: a machine laboratory for the research and development of the accelerator and beamline; the assembly and adjustment experiment building; an administration building that is designed to enable overall administration of the facilities and to improve welfare functions; guest houses, and cafeteria. Also being planned are; extra-high voltage substation equipment, roads, street lamps, and tennis courts, which will improve the infrastructure and environment of the facility.

In the meantime, the main facilities completed up to 1994 consist of those

associated with the basic functions, such as the extra-high voltage switchyard, the water supply system building, the extra-high voltage monitoring room, outdoor underground utility piping (gas, service water, sewage, waste water, and experimental waste water), shared ditches, roads, street lamps, and greenery.

2. Outline of the Facilities

The details for the buildings and utilities that had been upgraded or were under construction as of the end of 1993 were included in the 1994 Annual Report. An outline follows which gives information about the facilities upon which construction is to begin with the approved budget of FY1995.

2.1 Machine Laboratory, Assembly

& Adjustment Experiment Building

A working group was formed which includes members responsible for the research and development of the accelerator and beamlines, with the duties of carrying out compilation and adjustment of requests concerning the design of machine laboratory and the assembly and adjustment experiment building.

The machine laboratory is a flat steel-framed building with a floor area of 720m² and a ceiling height of 11m. Its design allows for the space inside to be divided into five experiment zones. In order to enable the building to attract low-energy electrons and positrons from the linac, the structure is connected by a shielding tunnel.

The assembly and adjustment experiment building is a large flat steel-framed building with a floor area of 3,200m². This consists of an assembly and adjustment hall with a floor height of 11.4m (1,770m²), a precision adjustment experiment room with a floor height of 7.4m (150m² x 4 rooms), and a research and experiment room. The assembly and adjustment hall is capable of attracting electron beams using the maximum energy of the linac, and the location of building itself is based on the design of a beam transport. This allows for the installation of an SASE experimental unit that is expected to be a fourth generation radiation unit.

These experiment rooms are all provided with an overhead traveling crane and are floor-trenched to allow the drawing-in of various utilities. They also have a floor structure which will withstand heavy equipment (10t/m²). In addition, much thought has been given to ensuring easy installation, modification, and the moving around of equipment installed inside the facility. However, the room temperatures in the machine laboratory and assembly and adjustment experiment building cannot be expected to be equal to those normally attained in ordinary laboratories, as they are both built with high ceilings. Also, while upgrading these experiment rooms, extra-high voltage substation equipment will be newly installed. The power is set at 6MVA for the time being, but equipment capable of up to 30MVA could be installed in the future.

2.2 Administration Building

The administration building is a core facility to support general administration, the researchers' lodge, and radiation utilization. It is also expected to serve as the symbol of SPring-8. A working group was formed to comprise the administration, accelerator, radiation utilization, utilization & assistance departments of JAERI, RIKEN, and JASRI, to do the design work while making adjustments so that as many requests as possible will be met within the limited space of the building.

The administration building, a five storied ferro-concrete building with a floor area of 6,400m², communicates with the central control room of the storage ring building through a connecting corridor. The building accommodates a total of 300 staff, consisting of 150 from clerical and technical sections and 150 from the research section. The block plan for the administration building was designed as in the paragraph below, keeping in mind the following points; firstly, the administration building is about 4.3m lower in design ground level than the storage ring building, secondly, radiation users mainly work on the ground floor of the storage ring building, and lastly, the SPring-8 central control room is located on

the second floor of the storage ring building.

The first floor has a clerical and administration section and a room for the directors of the facility. The second floor houses the utilization assistance section and the facility section. The third floor houses the accelerator section. The fourth floor has a utilization section and the fifth floor has a machine room and an outdoor equipment area. Also on the fifth floor (top floor), are a refreshment area and an observatory which gives a panorama of the entire site. The researchers' lodge on the third and fourth floors is basically designed to house two people and air-conditioning is available.

To list the main architectural features: The skylight on the building on the north side: The administration building was designed to overlook the north side according to the overall plan of the facility. Thus, a skylight is adopted so that on fine days, as much natural light as possible shines into the facility to avoid giving a gloomy impression. The structure draws sunshine from the back of the building to the front, which brings brightness to the skyline of the building.

Central dugout skylight: To satisfy the requirements of the Building Standards Act as stipulated for dugout fire-fighting and staircase sections, eight pillars need to be installed in the central dugout section to support the fire door. Laue patterns of eight repeated symmetrical shapes representing the crystal structure of a Cr-Ni-Si alloy have been adopted for the lights at the top of the eight pillars, symbolizing the "8" of "SPring-8". The symbol is completed with the spiral stairs in the dugout section on the fifth floor (about 26m up to the top).

Appearance of the building: To create harmony with the storage ring and an image of high-technology, the building is finished mainly in aluminum spandrel and clear glass. Also, in order to give a good balance in design, it was decided that the aluminum spandrel and glass on the front of the building should be arranged to form the shapes of "--", "--", and "-" from the top to the bottom. But it was found later that their order constitutes "shin (震)", one of "hakke (八卦)" or eight

divinational signs as used in "shueki (周易)" (Chinese divination developed in Chou dynasty). This character has the meaning of "a shape in which a positive sign arises in a gloom-filled space to start its activity". We are proud of this design as we believe that the shape is ideal for the building as it represents a dramatic development in the radiation facility and the fundamental research which is being hoped for from the Harima Science Garden City.

External structures: Considering the size of the whole site, the area for the administration building is rather small, and an open space integral with the area at the opposite side of the road on the front of the building has been secured. Another consideration behind this decision was that it would provide easy access from the administration building to the various facilities, enable the greening of the areas around the sidewalk, and attractive scenery on both sides of the lecture hall. The entire plan of the outside structures is for them to be arranged on a parabola with the administration building in the center, according to the flow planning.

2.3 Cafeteria

The working group for the cafeteria was formed mainly with representatives from the clerical department, and as many opinions as possible were incorporated into the design of the cafeteria while at the same time stressing the administration and welfare functions.

Based on the assumption that it will be used by 300 people from JAERI, RIKEN, and JASRI, 300 radiation users, and 100 outside contractors, the facilities will be able to serve lunch for 500 people, and to accommodate 150 persons for breakfast and dinner at one sitting. The cafeteria is a flat ferro-concrete building with walls of unfinished concrete inside and a floor area of 1,200m².

As the main function of the cafeteria is to provide refreshment, it was built separately from the administration building. The cafeteria is located as shown in the block plan with the consideration that it should be near the administration building; that the research

environment should be in harmony with nature, and that those staying in the guest house may also make use of the cafeteria. A vault roof was used to ensure harmony with the research environment, and it was decided to partition the cafeteria from the open space of the administration building with earth in order to create a view integral with the vault roof. Also, considering that the majority of the proposed cafeteria guests would not wish to go there in cars or on bicycles and that as space is limited and a parking space cannot be easily provided near the cafeteria, walking was set as the general mode of transportation for areas around the cafeteria.

The cafeteria consists of a special cafeteria, coffee shop, hall, terrace, and kitchen, each of which have been designed to exhibit their own characteristics.

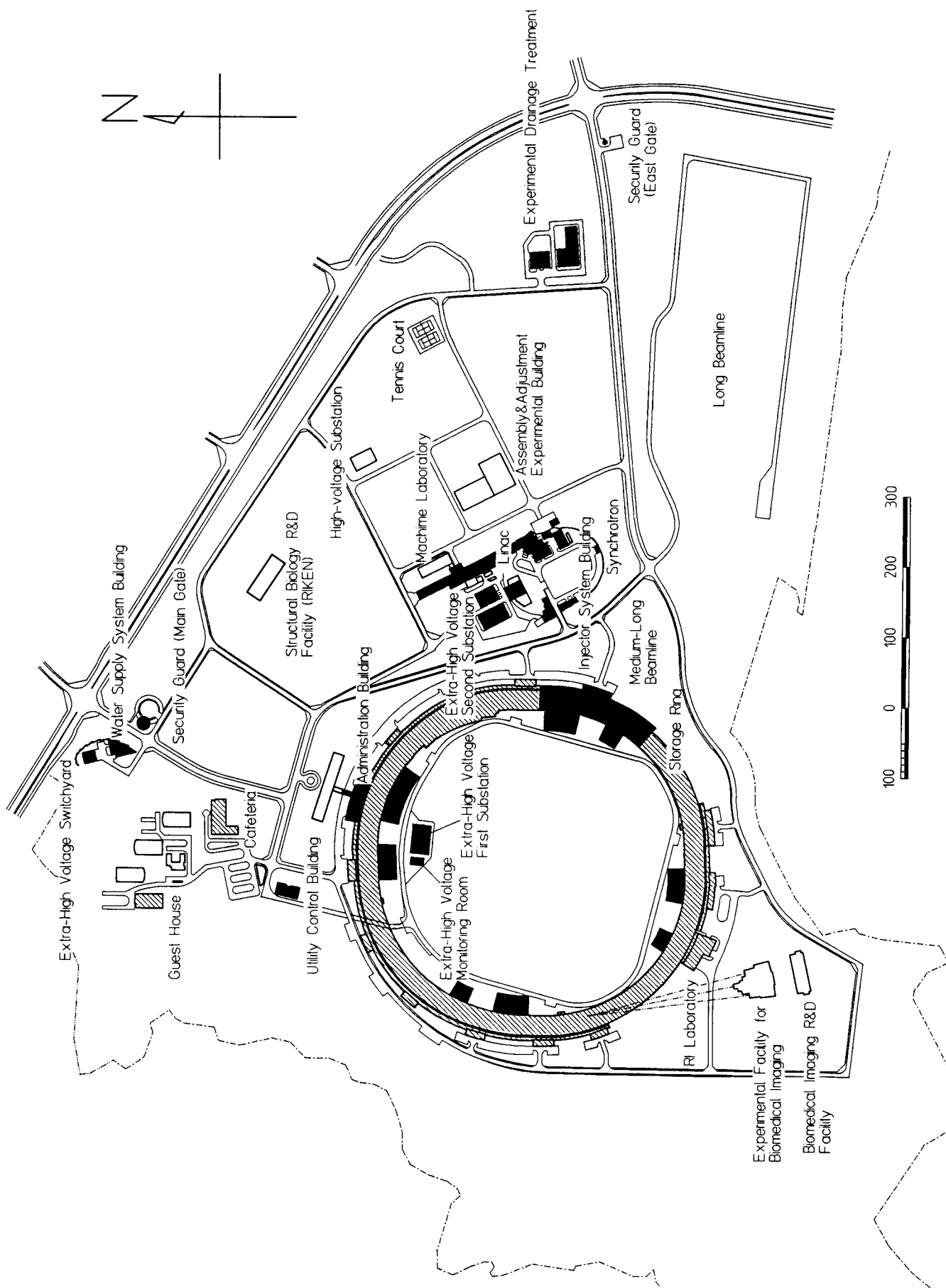
2.4 Guest Houses

Due mostly to time restrictions, a group has been tentatively formed which will comprise the administration department and the budget execution sections of JAERI and RIKEN and which will have the title of "the Research Exchange Working Group." The group will have the duty of making adjustments to the plan for the guest houses.

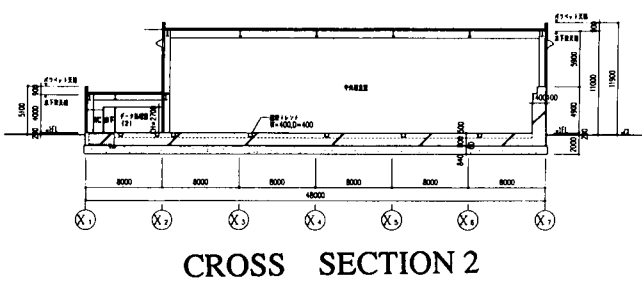
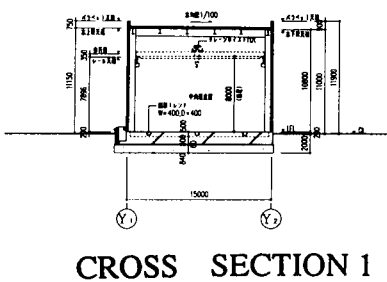
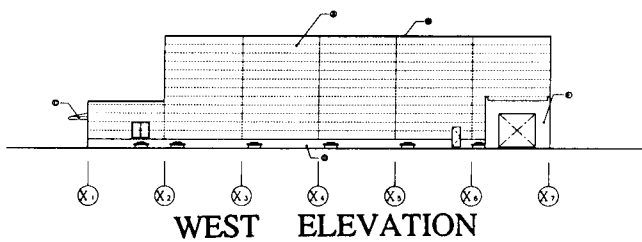
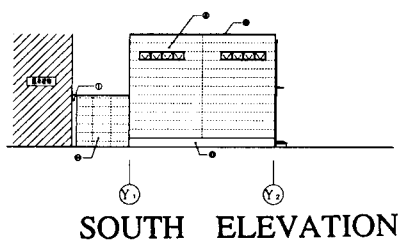
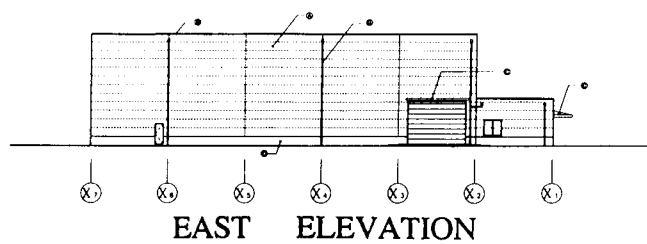
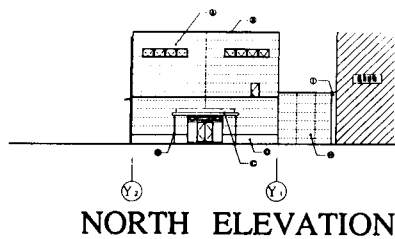
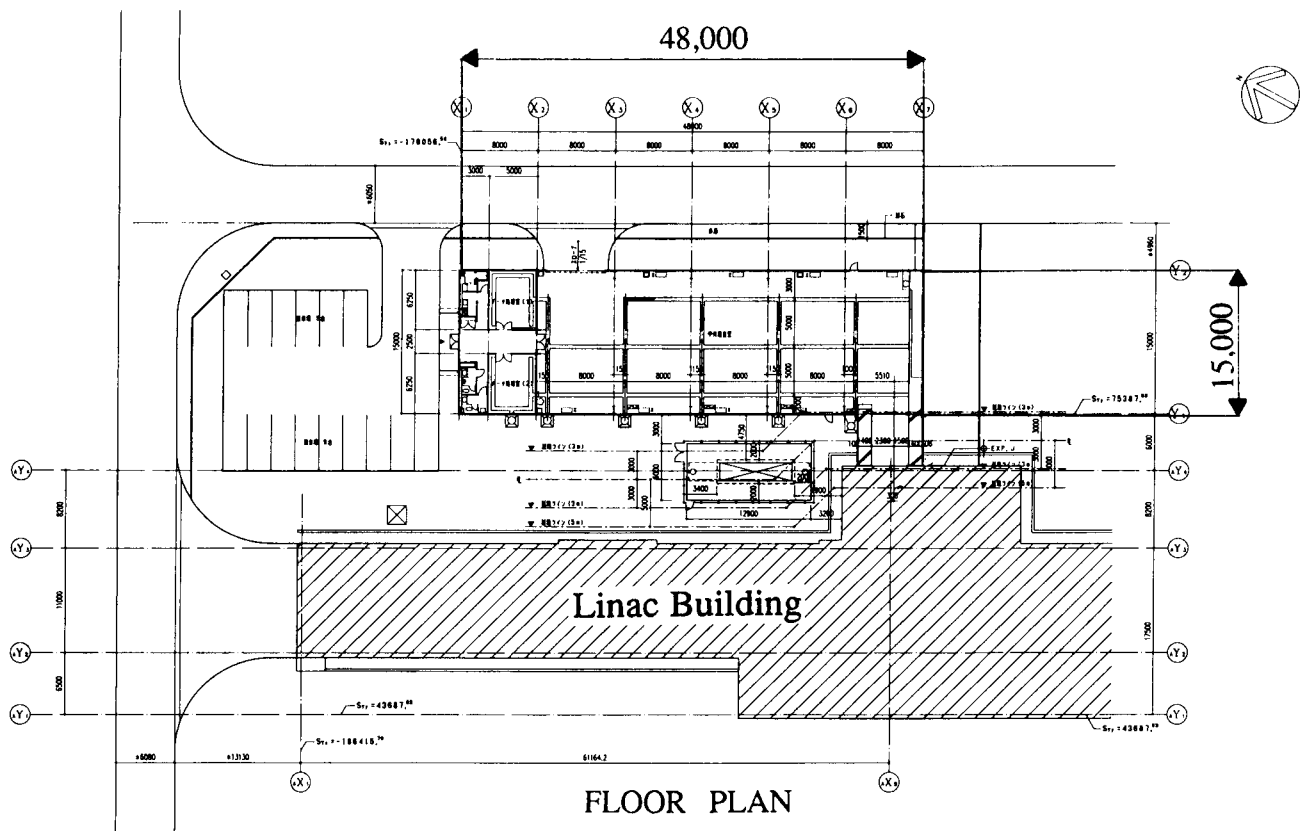
Four guest houses and their administration building are being provided.

The main function of the guest houses is to serve as waiting rooms for outside radiation researchers during short-term stays for research. The facilities consist of lodging houses with single rooms. According to the plan, 240 rooms are to be provided based on the assumption of 300 radiation researchers. Equipped with bath and toilet facilities in a room with an area of 25m², these rooms resemble "one-room apartments."

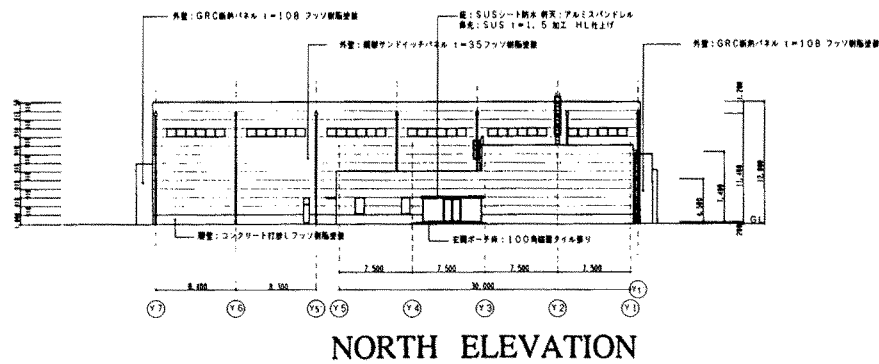
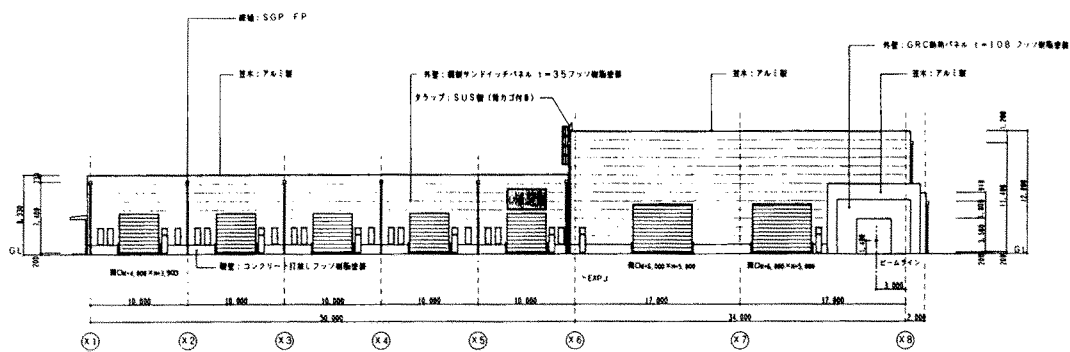
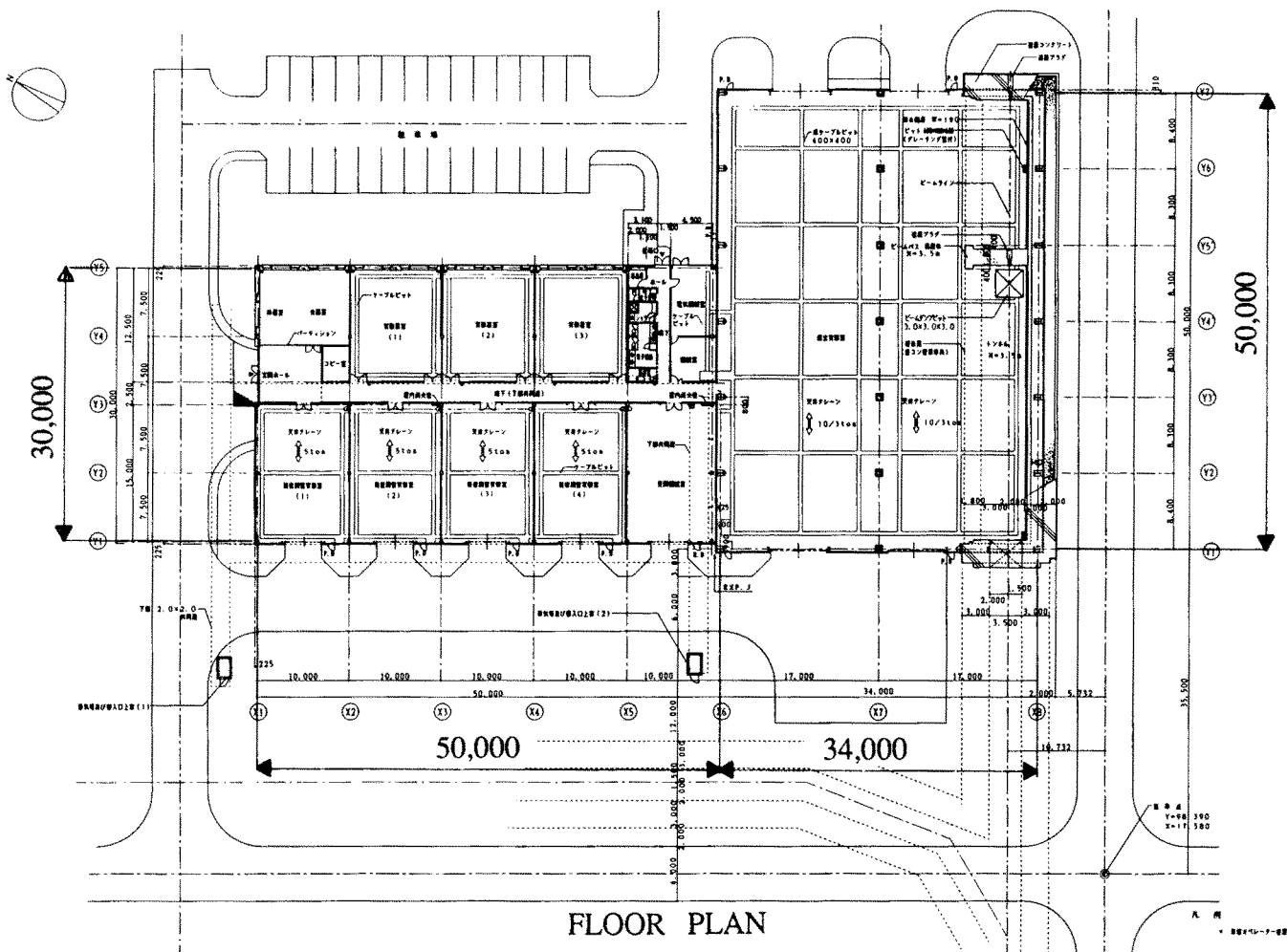
The floor area of the guest house administration building covers 400m². It provides various services for the guests, and also has a social hall where researchers can gather and exchange ideas and communication. The Japanese-style room in the hall is provided with a traditional open hearth which can be used for the tea ceremony.



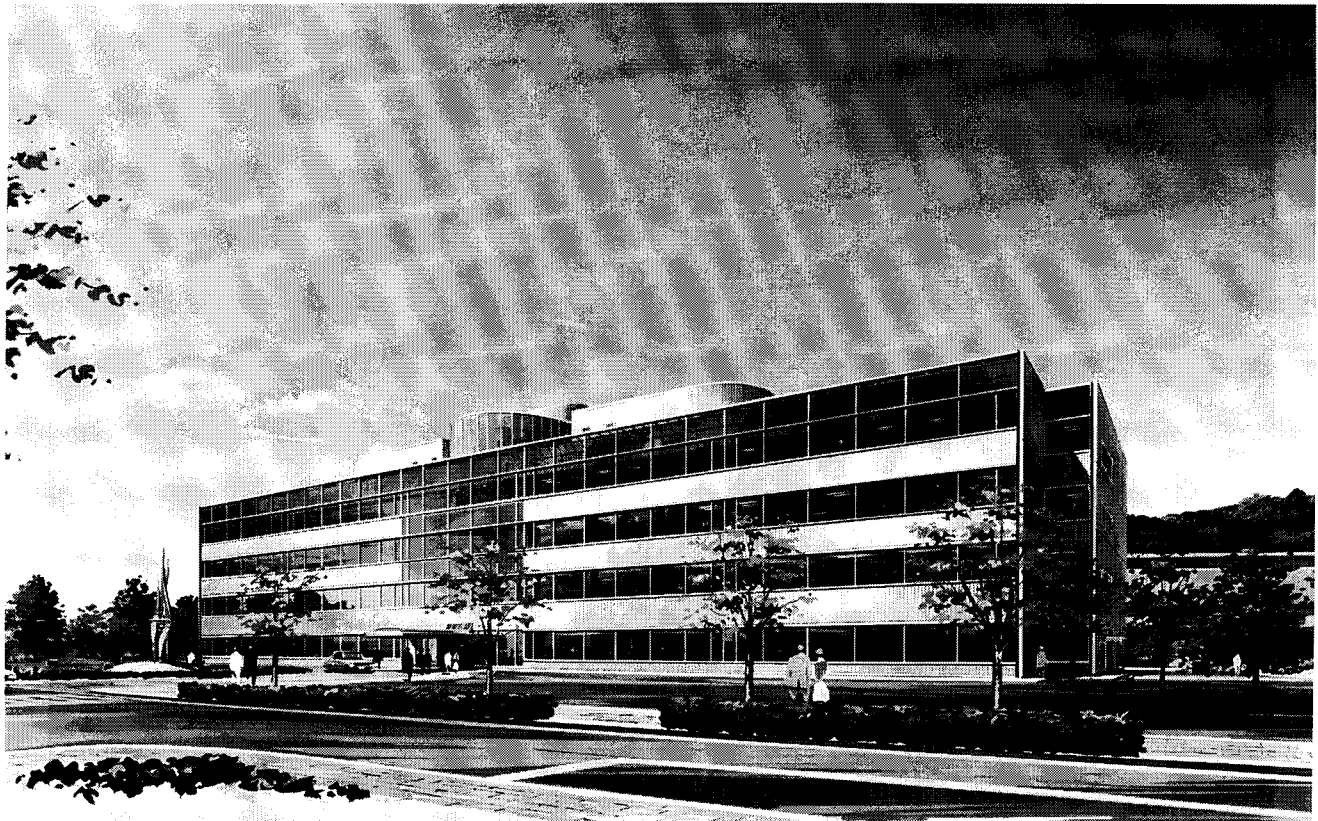
Spring-8 Facility Site



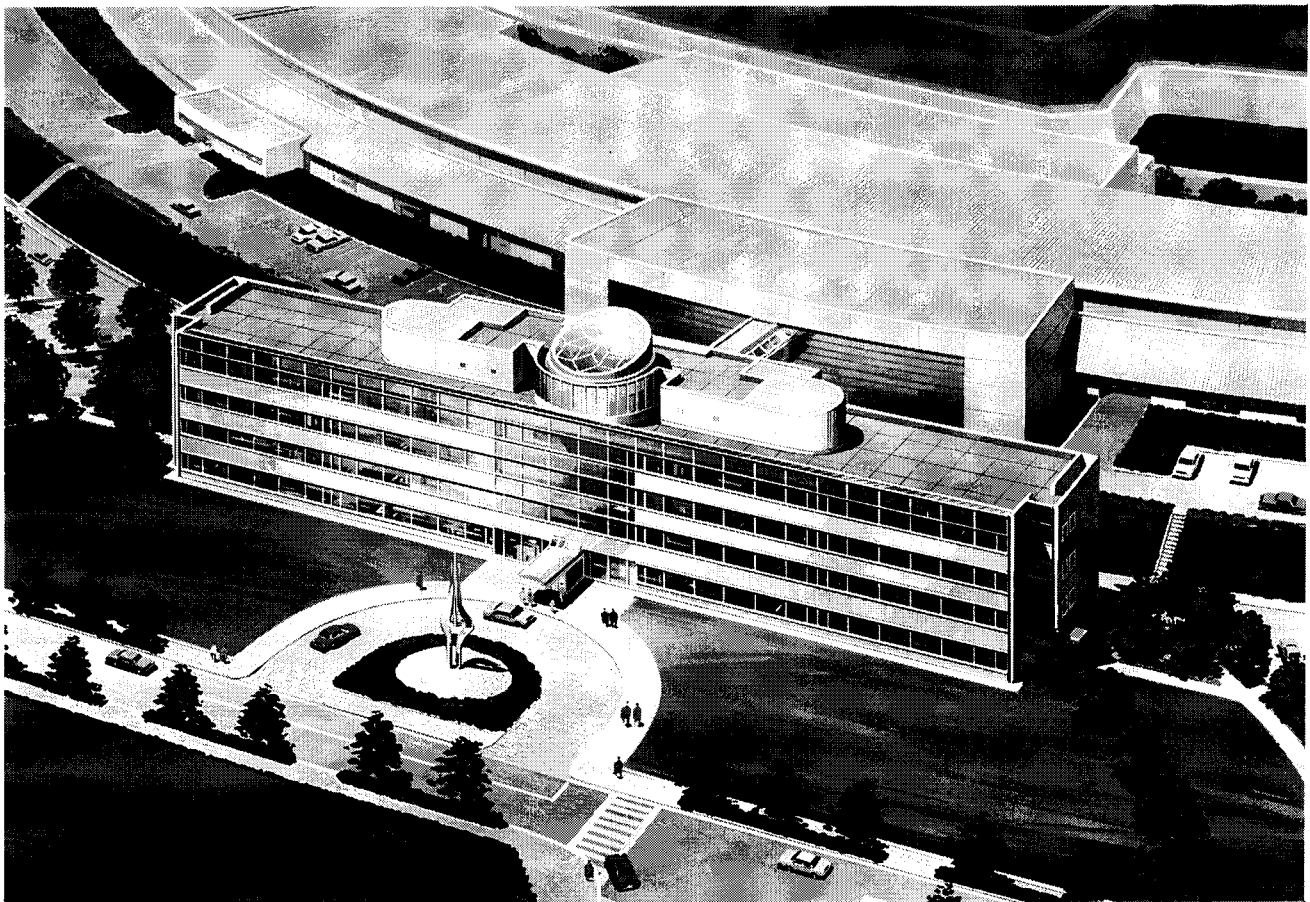
Machine Laboratory



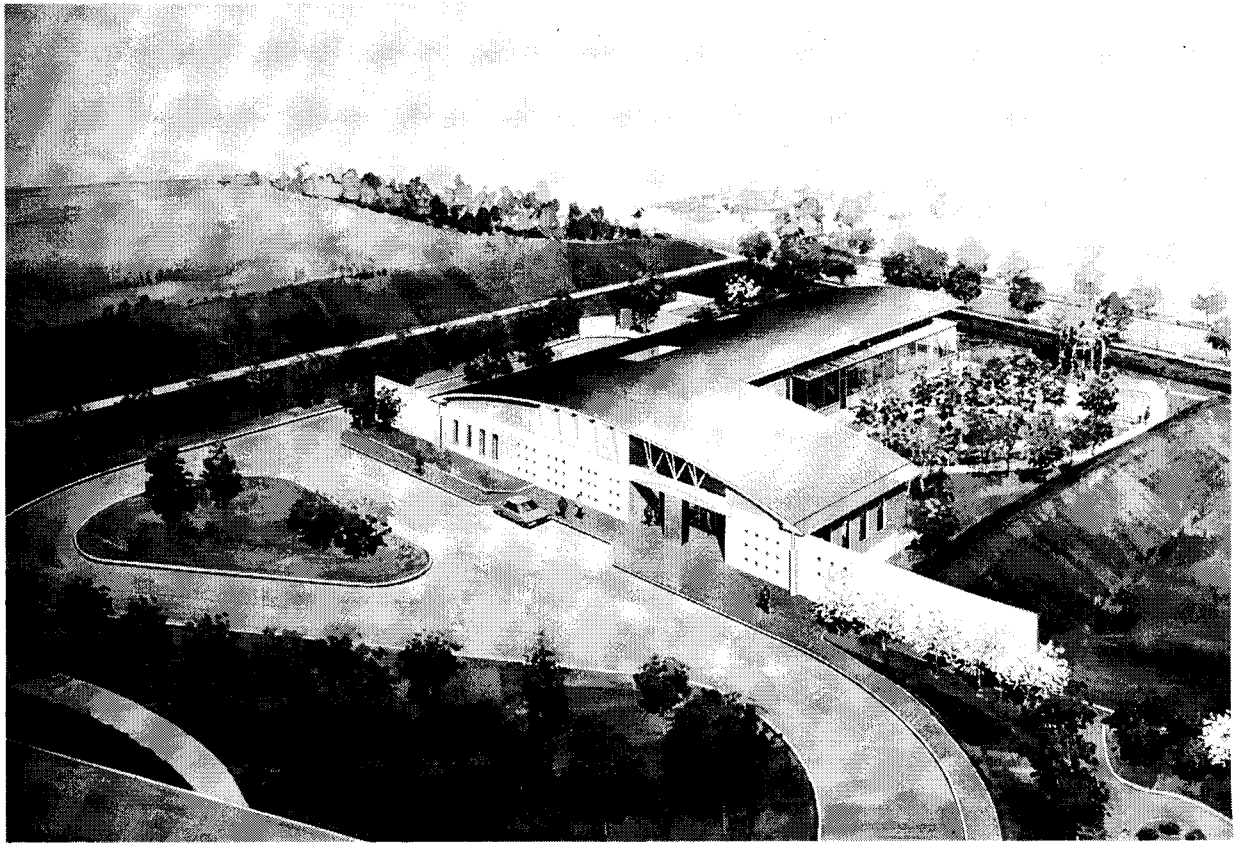
Assembly & Adjustment Experiment Building



Administration Building



Administration Building



Cafeteria



Guest Houses