

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE CONSTRUCTION
OF THE KHARAKHORUM MUSEUM
IN
MONGOLIA

MARCH, 2006

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to a request from the Government of Mongolia, the Government of Japan decided to conduct a basic design study on the Project for the Construction of the Kharakhorum Museum in Mongolia and entrusted to the Japan International Cooperation Agency (JICA).

JICA sent to Mongolia a study team from September 30 to October 26, 2006.

The team held discussions with the officials concerned of the Government of Mongolia, and conducted field studies at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Mongolia in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Mongolia for their close cooperation extended to the team.

March, 2006

Seiji Kojima
Vice President
Japan International Cooperation Agency

March, 2006

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for the Construction of the Kharakhorum Museum in Mongolia.

This Study was conducted by Yamashita Sekkei Inc., under a contract to JICA, during the period from September 30 to October 26, 2005. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mongolia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

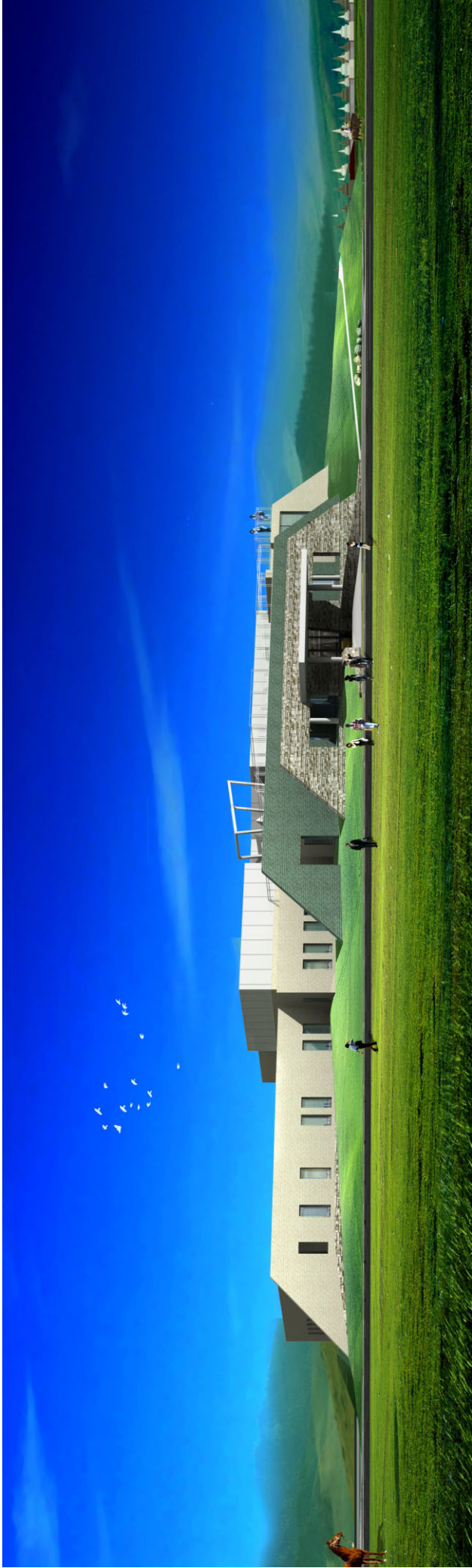
Takaaki Kimura
Project Manager,
Basic design study team on
The Project for the construction
of the Kharakhorum Museum
In Mongolia
Yamashita Sekkei Inc.



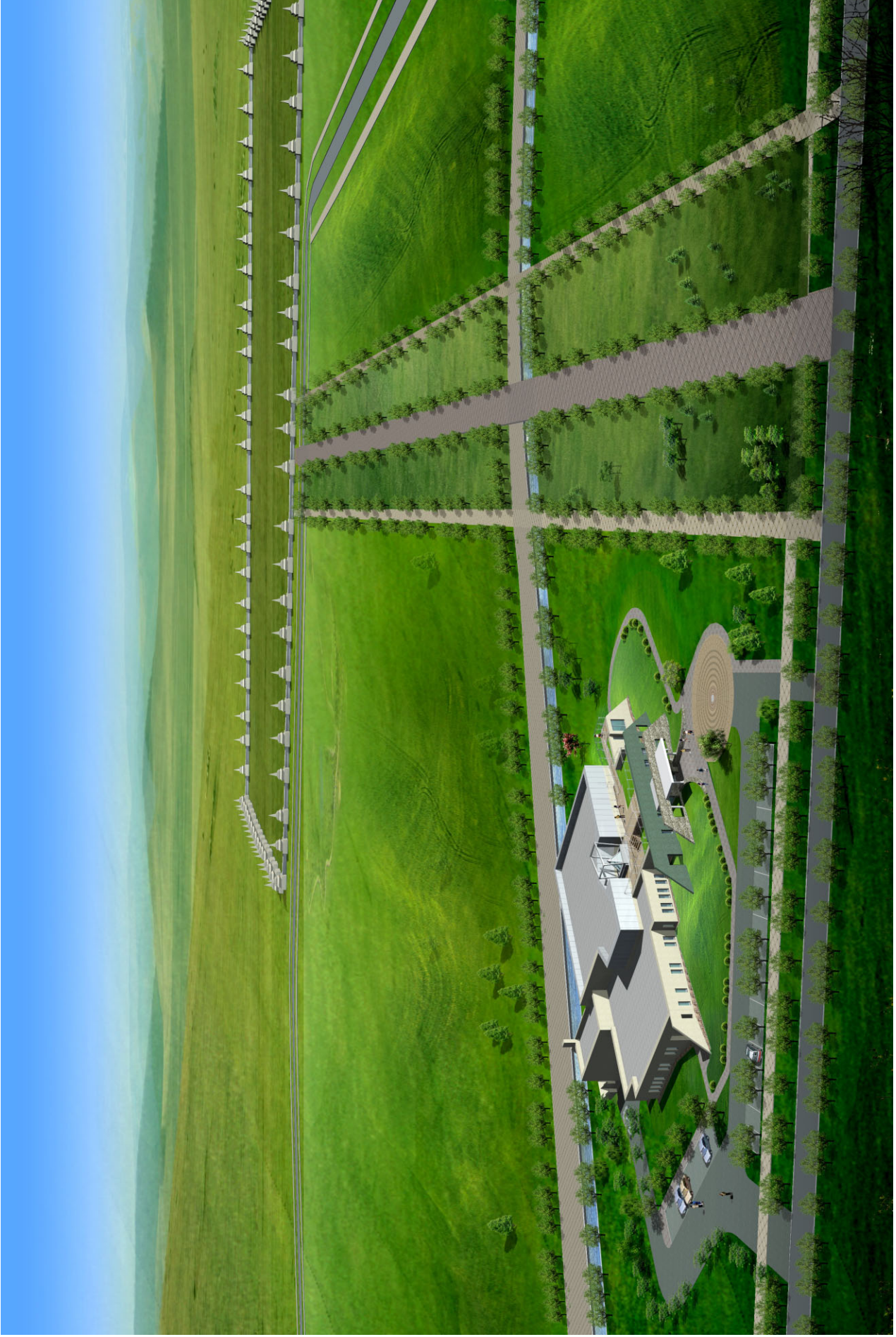
MONGOLIA MAP



SITE MAP



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Abbreviation

(Alphabetical Order)

AV	Audio Vidual
AVR	Auto Voltage Regulator
CPU	Central Processing Unit
DVD	Digital Video Desk
E/N	Exchange of Notes
EU	European Union
GB	Giga Bite
GDP	Gross Domestic Product
GHz	Giga Hertz
Hz	Hertz
JICA	Japan International Cooperation Agency
k Pa	Kiro pascal
lux	Lux
M	Magnitude
MDF	Main Distribution Frame
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OJT	On-the-job training
OS	Operation System
PBX	Private Branch Exchange
PC	Personal Computer
Tg	Tugrug
TICA	Turkish International Cooperation and Development Agency
UNESCO	United Nations Education, Scientific and Cultural Organization
VCD	Video Compact Desk

Summary

The remains of Kharakhorum, which used to be the capital of the Mongolian Empire, is located 350km southwest of Ulaanbaatar on the western bank of the Orkhon Valley in Kharakhorin sum, Uvurkhangai. It is said that the city of Kharakhorum originated as a military depot set up by Genghis Khan in 1220 and was constructed as the capital of the empire by Ogotai Khan in 1235. Although the buildings of Kharakhorum were destroyed by Ming around 1380, the city has never been abandoned completely and the Tibetan Buddhist Temple of Erdene Zuu was constructed in the city in 1586. Most of the ruins of the city have perished over time and only a few traces remain on the surface. As the remaining ruins are buried underground, archaeological surveys planned with meticulous care are required for future restoration of the ruins. The Soviet Union and Mongolia conducted a joint archaeological survey in 1948-49. Mongolia and Japan conducted a joint archaeological survey funded by the Japanese trust fund of UNESCO in 1995-98. A large-scale archaeological survey was proposed at the evaluation conference held in the summer of 1997, and it was decided to urgently carry out preliminary measures for protection of the ruins. As a part of the measures, wooden fences were set up for the conservation of the ruins. In addition, the farmland, roads, and factories within the area of the ruins were moved out from the area. A joint archaeological survey by the Mongolian Academy of Science and the University of Bonn of Germany has been carried out since 1999.

As the ruins were registered as a UNESCO World Cultural Heritage site in 2004, establishment of a base for the protection, research, and exhibition of the ruins has become an urgent task. However, to date, there is no facility to conserve and store the relics from the ruins. Some parts of the relics excavated with the cooperation of the University of Bonn (UOB) are currently on itinerary exhibition in Germany and other European countries whilst others are inevitably kept under very poor conditions, such as being kept in a garage of a nearby hotel under the management of UOB. It is anticipated that such conditions may lead the relics to further deteriorate and be damaged especially by the coldness of mid-winter. As the year 2006 is the 800th anniversary of the enthronement of Genghis Khan in 1206, many commemorative ceremonies and events have been planned all over Mongolia. As a part of these commemoration projects, the project for the construction of a museum in Kharakhorum, the capital of the Mongolian Empire, in order to display, conserve, study, and restore the relics from in and around the city, was planned and a request for its implementation was submitted to Japan as a cultural grant project of Japan's Grant Aid.

Based on the request from the Government of Mongolia, the Government of Japan decided to implement a Basic Design Study and JICA dispatched a Study Team to Mongolia from September 30th to October 26th 2005. The Study Team held discussions with the relevant Mongolian government officials and conducted a field survey at the proposed project site. The team continued their work on analyzing the field survey results in Japan and the Basic Design Study Report was finalized after the explanation of the Draft Report in Mongolia from February 11th to 25th, 2006.

Through the discussions with the Mongolia side, it has been agreed that the main functions and activities of the building shall be limited to the functions of a museum and that the total floor area of the building will not exceed 1,500m².

The Objectives of this project are; to systematically exhibit the conditions of excavation and the relics from the ruins, to educate visitors on history through domestic cultural heritage, to offer the latest information regarding the Orkhon Valley and Kharakhorum ruins, and to utilize the remains and relics as tourist attractions by constructing the museum near Temple Erdene Zuu and the ruins of Kharahorum City.

The basic design of this project will be devised so as not to impair the scenery of the ruins of Kharakhorum City and Temple Erdene Zuu. The facility and equipment will be of appropriate sizes in accordance with a cultural grant project from Japan's Grant Aid, be easily maintained, and be suitable for the extremely cold climate of the locality. Most of the construction materials and equipment, which are imported mainly from China and Russia, are locally available in Mongolia. The design of the facility will allow it to be constructed economically and be easily maintained by adopting local standard construction methods.

The museum building: Reinforced Concrete Structure, one story, floor area: 1,473m²

The main components of the facilities are shown in the following table.

Division	Room	Main functions and remarks
Display/artifact division	Orientation plaza	1. Give guidance to the entire permanent exhibition. 2. Exhibit the progress of excavation and restoration of Kharakhorum ruins.
	Permanent exhibition room	1. Exhibit the relics and other historical materials and models of the Mongolian Empire in chronological order. 2. Provide a lounge for rest with outside view in the Permanent exhibition room. 3. Install exhibition furniture fitted with various exhibition technologies.
	Temporary exhibition room	1. Install picture display rails for providing easy update of the exhibits. 2. Provide the ceiling with grid rails to ensure flexibility of exhibition layout and easy future renewal of facilities equipment.
	General Storage	1. Store the relics, finds, exhibits and cultural properties. 2. Include space for sorting the stored items and install shelves specially made for the purpose.
	Secure Storage	1. Entrance to this storage is made only through the general storage. 2. Provide constant temperature and humidity in order to store the delicate relics, finds or fragile properties in the storage
	Anteroom	Prevent fresh air from entering into exhibition rooms and storages.
	Treatment room	1. Used for treatment works (washing, arranging, etc.) of the relics and other items that are carried in and photographed for record. 2. Used for temperature adjustment of properties, which are carried in from outside in the cold winter season, before taking them into warmer rooms.
Entrance division	Entry	Prevent the wind blowing into the hall by constructing sidewalls.
	Foyer	1. Install reception counter, ticket counter and cloakroom and counter. 2. Provide a space for a museum shop that sells museum guidebooks and replicas. 3. Provide a space for rest and a canteen connected with an outdoor space.
	Observation room and Gallery	1. Provide views of Erdene Zuu Monastery Temple and the Kharakhorum ruins. 2. Gallery is designed to provide guidance to the cultural environment of the Kharakhorum ruins and Orkhon Valley.
Training division	Multipurpose hall	1. Designed to give; guidance to the museum by audio-visuals, training, conference, planned exhibitions. 2. The capacity of the hall is 75 seats.

Administration division	Administration offices	1. Provide rooms for the director, the chief officer and administration space, meeting space and stores according to the staff number of each division. 2. The floor areas are determined by the number of assistants as well as officers according to the staff distribution plan.
	Security office	The room for persons in charge of security and the coal-fired boiler operator is planned.
	Staff room	1. Used for preparing tea/coffee as well as resting and a locker room. 2. An outdoor resting space is also planned.
	Library	It is designed to be used for a library of common technical books and document.
Research/Restoration division	Research/Restoration laboratory	Provide space and facilities equipment for conducting research, registration, restoration and clerical work.
	Unpacking room	A platform and unpacking space designed to easily carry in excavated items is planned.
Service	Coal-fired boiler room	1. A boiler and a chimney for heating purposes is planned. 2. A bin for coal and stockyard of ashes are planned close to a coal-fired boiler room and for easy access of automobiles.
	Mach/Elec. rooms	Machine room for Airconditioning, substation, reservoir room, pump room are planned.
Exterior structure	Roof top terrace	Provide views of cultural heritage sites in the surrounding area.
	Outdoor exhibition area	Outdoor exhibition area is planned along the axis towards the Kharakhorum ruins from the permanent exhibition room.
	Others	Staff parking, visitors parking, a porte-cochere and pedestrian paths are planned according to needs.

The items of equipment supplied to this project will be the equipment of exhibition/training, restoration/storage and environmental measurement as shown in the following table.

Group	Equipment	Quantity
Exhibition/training	Personal computer	3
	DVD player	3
	LCD projector	1
	Chairs with a writing board	75
Restoration/ Storage	Hot air drier	1
	Sand blaster	1
	Balance	1
	Lighting fixture with a magnifier	1
	Shelf Open Type	16
	Shelf Casement Type	4
Environmental measurement	Illuminometer	1
	Thermometer/hygrometer (Portable)	1
	Thermometer/hygrometer (Mounted)	1

The implementing agency for this project is the Ministry of Education, Culture and Science and the Bureau of Culture & Art is directly in charge of management and maintenance of the Kharakhorum museum. Management and maintenance of the museum will be carried out by 21 staff including the director. The organization of the museum consists of 3 departments; the Marketing Department in charge of administration and planning, the Research Department in charge of exhibition and research, and the Finance Department in charge of maintenance.

Among them, only the director will be dispatched from the Ministry of Education, Culture and Science and all others will be recruited as local staff of Uvurkhangai or Kharakhorin sum. Since the project does not include specialized facilities equipment but only locally common ones, the technical level of the local staff for maintenance of the equipment will be sufficient.

The projected annual operating budget is 42,300,000 Tg (approximately 4,130,000 Yen), out of which 32,300,000 Tg will come from the national coffers and 10,000,000 Tg from the revenue of admission fees.

The annual operating budget of the Erdene Zuu Museum, which is situated very close to the new museum being managed by the local government, is 40,260,000 Tg that is covered by the revenue from the admission fees (20,000 to 23,000 visitors / year) and the remaining amount from sales at the museum shop. As a comparable number of visitors are expected for the new museum as well, it is considered possible for it to have the revenue sufficient to cover the entire operation and maintenance expenses. Therefore, even though the budget allocated from the national coffers dips from the budget expected at present, the operating budget of the museum will be fully compensated with the revenue of the admission fees.

The project costs are estimated as Japanese Yen 310 Million (299 Million Yen to be borne by the Japanese side, 11 Million Yen to be borne by the Mongolian side).

After conclusion of the Exchange of Notes, the project will take 7.5 months for the detail design work and tender procedure and 12.5 months for construction of the facilities and installation of the equipment after conclusion of the Exchange of Notes. Thus, the total period to complete the project will be 20.5 months.

As there have been no facilities for restoration and exhibition in Kharakhorum and a lack of facilities in Mongolia in general, relics excavated from the Kharakhorum ruins have been exhibited in Bonn (Germany) and other European cities. With the implementation of this project, it is expected that these ruins will be returned to Kharakhorin Sum for display in the new museum. It is also expected that the management and operation and capacity of human resources of the national historical museum will be developed and enhanced through training of researchers and persons in charge of restoration in the multi-purpose hall and the research/restoration room of the museum.

As mentioned above, by constructing exhibition rooms, a multipurpose hall, storage rooms and rooms for research/restoration, this museum will be the center of activities of restoration and conservation of the relics from the Kharakhorum ruins by the Mongolians. It is expected that exhibitions of the relics and lectures to be held in the multipurpose hall will induce awareness and interest of local residents, students and children in archaeological restoration and their traditional cultural heritage. Also, an increase of tourists including that of Japanese is expected by the establishment of the museum thereby strengthening the friendship between Mongolia and Japan.

It is considered that the implementation of this project is valid as a Cultural Grant of Japan's Grant Aid because this project will contribute to the development of conservation of the cultural heritage of Mongolia as well as to the conservation, restoration, and safekeeping of the relics from the Kharakhorum ruins and to development of education and tourist attractions by exhibition of the relics.

Furthermore, attractive display of the relics, which is the main feature of the museum, will contribute to an increase of visitors. The effects of the project, as the national historical museum of Mongolia where the precious relics will be permanently displayed, will be more effective if the display of the relics can be regularly changed/renewed at appropriate times in co-operation with the National Heritage Center, UNESCO and the World Heritage Committee of Mongolia.

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Chapter 1. Background of the Project

Chapter 1 Background of the Project

The remains of Kharakhorum, which used to be the capital of the Mongolian Empire, is located 350km southwest of Ulaanbaatar on the western bank of the Orkhon Valley in Kharakhorin sum, Uvurkhangai. It is said that the city of Kharakhorum originated as a military depot set up by Genghis Khan in 1220 and was constructed as the capital of the empire by Ogotai Khan in 1235. Although the buildings of Kharakhorum were destroyed by Ming around 1380, the city has never been abandoned completely and the Tibetan Buddhist Temple of Erdene Zuu was constructed in the city in 1586. Most of the ruins of the city have perished over time and only a few traces remain on the surface. As the remaining ruins are buried underground, archaeological surveys planned with meticulous care are required for future restoration of the ruins. The Soviet Union and Mongolia conducted a joint archaeological survey in 1948-49. Mongolia and Japan conducted a joint archaeological survey funded by the Japanese trust fund of UNESCO in 1995-98. A large-scale archaeological survey was proposed at the evaluation conference held in the summer of 1997, and it was decided to urgently carry out preliminary measures for protection of the ruins. As a part of the measures, wooden fences were set up for the conservation of the ruins. In addition, the farmland, roads, and factories within the area of the ruins were moved out from the area. A joint archaeological survey by the Mongolian Academy of Science and the University of Bonn of Germany has been carried out since 1999.

As the ruins were registered as a UNESCO World Cultural Heritage site in 2004, establishment of a base for the protection, research, and exhibition of the ruins has become an urgent task. However, to date, there is no facility to conserve and store the relics from the ruins. Some parts of the relics excavated with the cooperation of the University of Bonn (UOB) are currently on itinerary exhibition in Germany and other European countries whilst others are inevitably kept under very poor conditions, such as being kept in a garage of a nearby hotel under the management of UOB. It is anticipated that such conditions may lead the relics to further deteriorate and be damaged especially by the coldness of mid-winter. As the year 2006 is the 800th anniversary of the enthronement of Genghis Khan in 1206, many commemorative ceremonies and events have been planned all over Mongolia. As a part of these commemoration projects, the project for the construction of a museum in Kharakhorum, the capital of the Mongolian Empire, in order to display, conserve, study, and restore the relics from in and around the city, was planned and a request for its implementation was submitted to Japan as a cultural grant project of Japan's Grant Aid.

Chapter 2. Contents of the Project

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2-1 Basic Concept of the Project

Most of the Kharakhorum ruins, the capital of the Mongolian Empire, have perished, only a few traces of the ruins can be found on the earth's surface. An archeological survey designed to help recover the ruins buried in the earth has been carried out with the cooperation of Japan and many other foreign countries. At present, part of the ruins unearthed with the cooperation of the University of Bonn are on itinerary exhibition in Germany and many other European countries. As the ruins were registered as a UNESCO World Cultural Heritage site in 2004, establishment of a base for the protection, research, and exhibition of the ruins has become an urgent task. However, to date, there has been no facility to conserve and store the relics from the ruins. Under such circumstances, some of the relics are inevitably kept under very poor conditions under the management of University of Bonn, such as being kept in a garage of a nearby hotel. It is anticipated that such conditions may lead the relics to further deteriorate and be damaged especially by the coldness of mid-winter.

This project aims to improve the aforesaid conditions by establishing a museum in order to preserve and restore the relics uncovered in and around the ruins as Mongolia's cultural heritage. The preserved/restored relics will also be utilized as historical educational material as well as resources for tourist attraction by putting them on public display. To be constructed in concrete, the building consists of the construction of facilities including rooms for exhibition, preservation/restoration, research, training and the procurement of relevant equipment.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policies

2-2-1-1 Basic Policies

(1) Planned Building

Through the discussions with the relevant authorities, both sides have reached an agreement that the main functions of the building will be limited to the functions of a museum and that the total floor area of the building will not exceed 1,500m². It has also been confirmed that the museum will have the following main functions.

- 1) Display division (permanent/temporary exhibition rooms)
- 2) Artifact division
- 3) Foyer (including information for visitors about the surrounding cultural heritage)
- 4) Restoration/Research division
- 5) Training division
- 6) Library
- 7) Offices

(2) Site Selection

The project site is situated close to Erdene Zuu Monastery Temple in Kharkhorin sum in the Middle East of Mongolia, approximately 350 km west of Ulaanbaatar, the capital of the country. The project site that the Mongolian side has designated for this project is flat and has no obstacles such as existing buildings or ruins within it. There are two elevated high voltage power cables running across the project site. Although there is a 20 meter setback requirement from the cables for construction of buildings under the current building regulations, it has been confirmed that the project site is large enough and adequate space is available for the construction of the planned building and the existing power cables are scheduled to be relocated according to the master plan of Kharkhorin City.

It has also been confirmed, through the regional urban planning maps, that the project site is situated outside of the district for preservation of ruins (established by the use of UNESCO's Japan Trust Fund). Furthermore, resulting from a trial excavation survey conducted by the science academy of Mongolia, a certificate was issued on October 6, 2005 certifying that the site was free of archaeological relics to be protected.

At the time of the basic design study, there was no access road to the project site though a plan to construct an access road was indicated in the master plan for Kharkhorin City. A request was made by the study team to the Ministry of Education, Culture and Science that the Ministry construct an access road located in front of the southern side of the project site by the end of fiscal year 2007. The request has been confirmed in the minutes.

As stated above, the project site is confirmed to be suitable for construction of the museum.

(3) Display Plan

Mongolia, where there are many historical ruins, is a treasure house of historical resources that shows humankind's footprint from the Old Stone Age to modern times. The Kharakhorum ruins and its surroundings, in particular the Orkhon River Valley, is a place rich in important historical heritage. The Kharakhorum Museum, as the representing museum of Mongolia, will play a major role in introducing the history, culture and spiritual climate of Mongolia to the Mongolian people and overseas visitors.

The objective of the exhibitions at the Kharakhorum Museum is to present a broad overview of Mongolian history and culture with a central focus on the era of Mongolian Empire, which has been the largest empire in human history, of which, Kharakhorum was the capital. It will thereby serve to deepen people's interest in, and understanding of the country. Furthermore, the museum is to act as an orientation facility, to propagate the importance of the restoration of Mongolian cultural heritage by locally restoring the relics and motivating the Mongolians and foreigners to visit other historical ruins and regional museums in the country.

2-2-1-2 Facility Design

(1) Basic policy

- 1) Special attention will be paid to those aspects of exterior design so as not to spoil the historical and cultural properties of the site or as a Cultural Heritage Site.
- 2) Special attention is to be paid to thermal insulation and to obtain constant temperature to prevent the relics from weathering and deteriorating in the severe cold climate.
- 3) It is designed to satisfy the functional needs of a museum by using the building area to the maximum as well as the exterior and roof top area.

(2) The Museum's Functions and Required Facilities

The planned museum consists of facilities for restoration, research and training activities in addition to the preservation and exhibition of buried cultural properties excavated mainly from the Kharakhorum ruins. It is also expected to act as the base for cultural activities in the Orkhon River Valley designated as a UNESCO World Cultural Heritage. The main facility component corresponded to the activities of the planned museum are as follows.

Table 2-1 Main Facility Component

Division	Room	Main functions and remarks
Display/artifact division	Orientation plaza	1. Give guidance to the entire permanent exhibition. 2. Exhibit the progress of excavation and restoration of Kharakhorum ruins.
	Permanent exhibition room	1. Exhibit the relics and other historical materials and models of the Mongolian Empire in chronological order. 2. Provide a lounge for rest with outside view in the Permanent exhibition room. 3. Install exhibition furniture fitted with various exhibition technologies.
	Temporary exhibition room	1. Install picture display rails for providing easy update of the exhibits. 2. Provide the ceiling with grid rails to ensure flexibility of exhibition layout and easy future renewal of facilities equipment.
	General Storage	1. Store the relics, finds, exhibits and cultural properties. 2. Include space for sorting the stored items and install shelves specially made for the purpose.
	Secure Storage	1. Entrance to this storage is made only through the general storage. 2. Provide constant temperature and humidity in order to store the delicate relics, finds or fragile properties in the storage
	Anteroom	Prevent fresh air from entering into exhibition rooms and storages.
	Treatment room	1. Used for treatment works (washing, arranging, etc.) of the relics and other items that are carried in and photographed for record. 2. Used for temperature adjustment of properties, which are carried in from outside in the cold winter season, before taking them into warmer rooms.
Entrance division	Entry	Prevent the wind blowing into the hall by constructing sidewalls.
	Foyer	1. Install reception counter, ticket counter and cloakroom and counter. 2. Provide a space for a museum shop that sells museum guidebooks and replicas. 3. Provide a space for rest and a canteen connected with an outdoor space.
	Observation room and Gallery	1. Provide views of Erdene Zuu Monastery Temple and the Kharakhorum ruins. 2. Gallery is designed to provide guidance to the cultural environment of the Kharakhorum ruins and Orkhon Valley.
Training division	Multipurpose hall	1. Designed to give; guidance to the museum by audio-visuals, training, conference, planned exhibitions. 2. The capacity of the hall is 75 seats.

Division	Room	Main functions and remarks
Administration division	Administration offices	1. Provide rooms for the director, the chief officer and administration space, meeting space and stores according to the staff number of each division. 2. The floor areas are determined by the number of assistants as well as officers according to the staff distribution plan.
	Security office	The room for persons in charge of security and the coal-fired boiler operator is planned.
	Staff room	1. Used for preparing tea/coffee as well as resting and a locker room. 2. An outdoor resting space is also planned.
	Library	It is designed to be used for a library of common technical books and document.
Research/Restoration division	Research/Restoration laboratory	Provide space and facilities equipment for conducting research, registration, restoration and clerical work.
	Unpacking room	A platform and unpacking space designed to easily carry in excavated items is planned.
Service	Coal-fired boiler room	1. A boiler and a chimney for heating purposes is planned. 2. A bin for coal and stockyard of ashes are planned close to a coal-fired boiler room and for easy access of automobiles.
	Mach/Elec. rooms	Machine room for Airconditioning, substation, reservoir room, pump room are planned.
Exterior structure	Rooftop terrace	Provide views of cultural heritage sites in the surrounding area.
	Outdoor exhibition area	Outdoor exhibition area is planned along the axis towards the Kharakhorum ruins from the permanent exhibition room.
	Others	Staff parking, visitors parking, a porte-cochere and pedestrian paths are planned according to needs.

(3) Determination of Sizes of Facilities

Appropriateness of scale of each facility will be determined by taking into consideration the activities of the planned museum, visitor circulation paths in the exhibition rooms and equipment/furniture arrangement. The real size of each room and area will also be determined by taking into consideration consistency with the exhibition plan, circulation paths of large numbers of visitors, areas of each room, and widths of passages and entrances needed.

(4) Natural Conditions

In Kharkhorin sum, where the project site is situated, the average annual temperature is approximately 0 and falls to -30 in the winter season; heating of the museum is needed for 8 months a year. For this reason, top priority is given to thermal insulation and air tightness in designing the building since natural ventilation is likely to have negative effects on indoor environment, e.g. heat loss by letting in the cold fresh-air. In practice, the walls and roofs will be externally insulated, the windows will be double glazed and their area reduced to minimum requirements for efficient thermal insulation.

Furthermore, working rooms will be placed on the sunlit side of the building for better heating effect. Each entrance of the building will have an entry room for reduction of fresh-air intake. Exterior finishing materials that are highly resistant to freezing, drying, sunlight and dust storms will be selected to cope with the harsh environment of the region.

(5) Construction and Building Permit Application Procedures

In Mongolia there are well-organized laws, regulations and procedures pertaining to construction and building permit application. The building construction plan will therefore be drawn up in strict compliance

with the relevant local laws and regulations so that the building permit application procedures may be completed smoothly. These procedures are divided into three stages.

The prefecture government's land use permit and approval for technical conditions to be obtained by the Building Permit Authorities of the prefecture government.

After , detail design must be examined by the Construction Agency in Ulaanbaatar.

Relevant permits according to local laws and regulations to be obtained before starting the construction work.

The prefecture government's land use permit and approval for technical conditions was obtained by the Construction Bureau of Uvurkhangaï and the city government of Kharakhorin sum on 16th February 2006.

(6) Local Construction Situation

The construction methods in Mongolia are greatly influenced by those of the former Soviet Union where parts of the corresponding Russian industrial standards are applied mutatis mutandis although Mongolia has its own industrial standards applicable to building materials. Main building materials are imported from China, Russia and other East European countries. In implementing this project, according to the above construction situation, the common methods of construction in Mongolia will be adopted and the materials, which are easily obtained in the local market and in accordance with the Mongolian standards, will be used.

It is judged that adoption of the Japanese building standards will be inappropriate in terms of construction cost and facility maintenance/management.

(7) Use of Local Contractors' Services

In Mongolia, many buildings of official bodies and private businesses have been constructed by using local construction consultants and contractors. Furthermore, they been used for many projects funded by Japan and other foreign countries. It is therefore a precondition to use the local consultants and contractors where needed as it is considered easy and effective for implementation of the project.

(8) Facility Grades

No building has originally been designed as a museum in Mongolia to date. Therefore the priority of grading the planned facilities will be given to durability, ease of maintenance and management for the museum by referring the grades of common public cultural buildings of Mongolia. For example, building materials, which are highly durable and easily obtainable in the country, will be used. High priority is given to easy maintenance and management, e.g. no windows and lighting fixtures to be placed at high places for ease of their cleaning and replacement.

(9) Facility Operation, Maintenance and Management Capability

The facility maintenance of the museum will be managed by its own staff with the support of the Bureau of Culture and Art. However there is no plan to employ full-time engineers to take charge of facility maintenance/management except a coal-fired boiler caretaker. For this reason, those items of equipment that

require advanced maintenance/management techniques and which are not common in Mongolia will not be selected for this project. In selecting equipment that requires daily operation and maintenance, priority is given to 1) low operation and maintenance cost so that it would not put much burden on operation of the museum and 2) to availability of necessary consumables and spare parts.

(10) Determination of the Construction Period

There are two seasons in Kharkhorin sum, a long winter, which is from October to the middle of May, and a short summer, which lasts about three months. As the average temperature falls below 0° C during the winter, special consideration needs to be given against frost in carrying out exterior work and structure work such as painting and brick laying, which necessitate the use of water. Furthermore, it should be noted that it is impossible to carry out earthwork until April, when the frozen ground begins to thaw.

Most orders for building materials are customarily placed in early spring and therefore supply cannot usually meet with demand. Therefore, it is essential to complete the bidding and contracting procedures as early as possible during the wintertime so that sufficient time for ordering building materials can be secured.

A sufficient drying/aging period after concreting needs to be secured for protection of the relics and artifacts against moisture and ammonia gas that are emitted from concrete before starting exhibition and storage of them in the facilities.

The simple alkali examination method*, which makes it possible to determine the condition of concrete on construction sites, will be used to determine the drying/aging period.

* In this method, a piece of test paper similar to litmus paper is used to read the pH values ranging from 4 to 10. Also the discoloration index for linseed oil-immersed paper is calculated. (If the index stands at levels lower than 30, it means a safe atmosphere.) This is a simple alkali examination method used for determination of the condition of concrete.

2-2-1-3 Equipment Design Plan

(1) Selection of Equipment

This museum will be designed as a historical museum of which functions and activities range from collection, restoration and preservative treatment, research and study, storage of the relics, and information management to exhibitions. However, it was decided that the main activity of the museum is to be the exhibition of the relics with specialized level restoration and preservative treatment of the relics of Kharakhorum to be carried out at the Science Academy of Mongolia. Therefore, only primary level restoration will be carried out in the museum.

The equipment to be procured for this project will be selected in line with the activities of the project and in accordance with the criteria set especially for the project.

(2) Providing Equipment Specifications

The equipment to be procured for this project includes equipment of audio-visual, preservation, storage, restoration and environmental measurement. Remarks on providing equipment specifications are shown in the following table

Table 2-2 Remarks on Providing Equipment Specifications

Equipment	Remarks
Audio-visual equipment for exhibition and seminar	As Audio-visual equipment is basically fast-evolving equipment, the items to be procured for this project will be the latest and prevalent in Mongolia.
Equipment for storage of the relics	The equipment will be procured from China because of unavailability of locally made items. The specifications shall be made with due care in order to ensure quality of the items especially in terms of material and finish.
Equipment for restoration and preservation of the relics and equipment for environmental measurement.	Easy-use, easy-care and commonly used models will be specified for selecting the equipment so that operation and maintenance will be easy.

(3) Quantity of Equipment

The necessary quantity of equipment is determined by examining the activity of the museum and the purpose of their use.

(4) Maintenance Service by Local Distributors

In the case of equipment that requires regular supply of consumables and spare parts, ones that are supplied by local distributors delegated by the manufacturers will be selected.

(5) Equipment Operation and Maintenance

In the case of equipment that requires instructions and/or training, the suppliers will practice instruction and training of the equipment at the time of installation. Relevant manuals and a list of local distributors will be supplied.

- 1) Operating instruction (Explanation of features and function of equipment, procedure of operation, points that require special attention)
- 2) Maintenance instruction (Explanation of daily maintenance and service.)

(6) Procurement Policy

A market survey was conducted during the basic design study in Mongolia on the assumption that in principle, equipment for this project will be locally procured.

The following table shows the current local market conditions and the procurement policy.

Table 2-3 Local Market Conditions and Procurement Policy

Equipment	Local market conditions	Procurement policy
Audio-visual (A/V) equipment	Japanese-made A/V equipment such as personal computers, DVD players, projectors are available in the local market and market prices of those items are about 20% to 30% higher than those of other origins. There is no problem for maintenance of A/V equipment sold in the local market. Most of the items are imported from China and Singapore.	Japanese-made products or those manufactured in OECD member countries will be procured.
Equipment for storage and exhibition of the relics	Wood for wooden craft is currently supplied from Russia, since deforestation was banned in Mongolia in 2004. Due to this, the wood prices rose approximately 50% from 2004 to 2005. This uptrend in the wood prices is expected to continue throughout 2006 and to hinder procurement of Mongolian product for this project. Further, the locally available wood is pine only and is not suitable for storing the relics because it contains much resin. The Ministry of Education, Culture and Science stated that steel shelves are more suitable for storing the relics.	To be procured from a third country (China) since steel made cannot be procured in Mongolia.
Equipment for restoration/preservation of the relics and equipment for environmental measurement.	These items of equipment are specialty equipment for restoration of buried cultural properties and are not available in the market of the Mongolia.	To be procured from Japan on the condition that the manufacturers of equipment have distributors in Mongolia.

(7) Procurement Schedule

Because all items of the equipment for this project are to be simply placed in the building after the completion of construction work, procurement of the equipment will be scheduled so as to have the delivery of the equipment coincide with the completion of the construction work.

2-2-2 Basic Plans

2-2-2-1 Construction Plan

(1) Facility plan

1) Layout Plan

The project site stretches out long and thin from east to west. As a whole, the site is an irregular shape and is adjacent to an irrigation canal on its northern side. It is basically flat with gradual slope in a northeasterly direction. The road running in front of Erdene Zuu Monastery Temple would be the road that the access to the project site is to be connected to since it is expected that most of the visitors to the museum would use this road. Therefore, the planned building will be sited as close as possible to this road so that visitors to Erdene Zuu Monastery Temple can see the museum easily from this road. As the building is to be built on a field where there is no obstruction to the visitors' view, it will be designed with utmost emphasis on its external appearance from all directions. Special attention will be given to the relationship between the exterior view of the building and the landscapes of the Kharakhorum ruins and Erdene Zuu Monastery Temple. The coal shed and the like will be placed where it is hard to see from the direction of the ruins.

2) Access Plan

An access road to the planned building is to face the road to be built on the southern side. A lead-in road for vehicles, a carriage porch and parking lots for the museum's staff will be included in the project site. As most of the visitors are expected to use motor vehicles instead of public transportation, visitor parking is also planned, however, as the open space within the project site can be used as parking in case of a parking space shortage, only minimal number of visitors parking will be provided.

(2) Architectural Plan

1) Basic Concept Regarding Floor Plan

Particular attention will be paid to the following points in preparing the floor plan.

The administration rooms and the main entrance are placed on the southern side of the building in order to utilize the natural sun light/heat during the daytime. The exhibition rooms, where it is desirable to maintain a constant temperature in the rooms, be placed on the northern side.

The storage areas, where a constant temperature in the rooms is most desirable, are to be surrounded by other rooms and not face the external walls of the building, so that air conditioning costs of the storage areas will be minimized

The multipurpose hall for training, guidance to visitors and multimedia exhibitions will be placed at the center of the building.

A café and a museum shop, which would generate an extra income to cover a part of the operation cost of the museum, are planned for visitors' convenience.

The buildings will be half buried by soil in order to gain greater thermal insulation effect, reduction of depth of frozen soil and the cost of external wall finishes.

The total area of the external walls will be minimized for reduction of heat loss and construction cost.

Rooms that share the same functions will be integrated into one room and a part of a room will be used as a passage way to minimize area that is used only as passage ways in order to improve effective area rates and utilization rates of the facilities.

The buildings are to be designed as barrier-free, e.g. no floor gaps in the visitors' area.

2) Floor area of each department

Floor area of each department of the museum is to be determined based on the layout of furniture and equipment in each room after taking personnel allocation and contents of services into consideration. Also, rooms that share same functions will be integrated to enhance utilization rate of the facilities.

The following table shows rooms needed and the floor area of each room based on the results of the examination of facility planning.

Table 2-4 Planned Floor Area (by division)

Division	Room	Planned floor area (m ²)	Scale, Grounds for layout planning, Remarks
Display/Artifact division	Orientation plaza	59.65	Overall guidance and exhibition of the scenes of excavating of the Kharakhorum ruins
	Permanent exhibition room	282.17	Exhibition of the relics in chronological order, from the ancient to the Mongol Empire era. The layout and area are to be determined according to the exhibition plan.
	Temporary exhibition room	104.75	This exhibition room is to provide a space for temporary exhibitions that are updated annually. Showcases are to be arranged in the same way as in multipurpose galleries.
	Storage	11.53	To store display equipment, display panels, etc.
	General Storage	76.57	To store finds, exhibits and cultural properties.
	Secure Storage	40.60	To store valuable finds as a warehouse where security and constant temperature are maintained.
	Treatment room	16.74	To separate the warehouses and the exhibition rooms from the unpacking facility located nearby.
	Storage	9.57	To store equipment for use in the repositories and carriers.
Entrance division	Preparation room	14.57	Space for controlling the temperatures of finds and cleaning finds
	Entry	9.31	Umbrella stands are provided.
	Foyer	74.48	Including reception counter, ticket counter and cloakroom
	Museum shop	16.60	Space for selling guidebooks and replicas
	Café Lounge	43.11	It includes an indoor rest area for visitors and a tearoom (its operation is to be outsourced). The space is to be located adjacent to the outdoor rest area (approximately 15 m ²).
	Anteroom	17.11	It connects the multipurpose hall and the exhibition rooms
	Gallery	13.92	To give guidance on Orkhon River Valley Gorge, a Cultural Heritage Site.
	Observation room	9.07	Room that allows a view of Erdene Zuu Monastery Temple and the Kharakhorum ruins
	Toilet	41.69	For men: WC's;2, urinals;3 and washbowl;2 for women: WC's;2 and washbowls; 2 For disabled persons:WC's;1

Division	Room	Planned floor area (m ²)	Scale, Grounds for layout planning, Remarks
Training division	Multipurpose hall	84.94	75 movable chairs (2 classes plus lecturer). It is to be provided with a stage. Its layout is to be consistent with its functions as a multipurpose facility to be used for of training, multimedia exhibitions and many other events.
Administration division	Administration office	49.04	4 persons x 9m ² for staff members and approximately 14 m ² for passages and storage spaces
	Director's office	14.80	Desk plus space for preliminary discussions
	Chief clerk's office	14.80	Desk plus space for preliminary discussions
	Staff room	18.13	To serve also as a serving room, locker room, workers' anteroom or lounge
	Meeting room	12.76	To be used for joint meetings with the staff of the research/clerical divisions (12 seats at maximum)
	Library	6.06	Space to store specialty books for common use
	Warehouse	3.28	To store office equipment and multipurpose hall equipment
	Security office	12.3	To serve also as the guards' office and the coal-fired boiler manager's room (during the wintertime)
	Toilet	7.56	1 WC and 1 washbowl each for men and women
Passage	32.0	Spaces for entrances for the use of the staff	
Research/restoration division	Research/restoration room	50.73	Space for conducting research and restoration Worktable and shelves to store finds are to be installed.
	Research/restoration staff room	17.27	2 staff members x 9 m ² . Shelves to store finds are to be installed.
	Unpacking room	34.62	To be for usage of transportation of finds and cultural properties
Service	Water tank pump room	104.39	Heating equipment for preventing water tank from being frozen is to be installed.
	Electric room		Incoming panel and AVR are to be installed.
	Mechanical room		Intake fan is to be installed.
	Coal-fired boiler room		Boiler for heating purposes is to be installed.
Exterior	Rooftop terrace	-	Provide views of cultural heritage sites in the surrounding area
	Pedestrian pathway	-	Slope to the roof with an angle of less than 1/20 for wheelchair users
	Outdoor exhibition area	-	Due consideration is to be given to its relationship with temporary exhibitions and landscapes of the ruins.
	Unloading area	-	Areas for carrying in the relics and coals are to be separated.
	Parking lot	-	Parking lot for the staff and visitors are to be provided separately.
Total area (main rooms)		1,219.18	
Total floor area		1,472.13	

3) Sectional Planning

Prime importance will be placed on obtaining sufficient thermal insulation in sectional design. The roofs, the external walls and the perimeters of the foundations, in particular, will be insulated externally so that heat bridge may not take place. The height of the building will be designed to obtain sufficient ceiling height for creating a comfortable indoor environment, and aspects of heating efficiency, being economical and easy maintenance/management will be taken into account. Except for the entrance area, the outside of the buildings will be filled with soil up to 3 meters of height in order to obtain greater thermal insulation effect.

The roofs will be flat concrete roofs that are common in the country so that the facility volume may be

minimized.

The approach to the rooftop terrace will be a gentle slope for easy use by wheelchair users.

(3) Structural Plan

1) Foundation Plan

The result of a soil investigation shows that the project site has sandy soil and is almost free from the adverse effects of ground freezing. Therefore, it is judged to be appropriate to lay a foundation 2.0 to 2.5 meters deep for the planned museum. With the exception of spaces for the entrances, all around the building will be filled up high to provide sufficient thermal insulation to the external walls. This will also make the actual distance between the designed soil surface level and the base of the foundation level more than 5 meters except around the entrances.

2) Superstructure Plan

In Mongolia, most of the public buildings are of RC rigid-frame structures. Both outer and inner walls are generally made of concrete blocks. Common construction methods in Mongolia will be adopted for this project to obtain greater workability and economical efficiency. Although PC (pre-cast) panels are commonly used as floor slabs for the purpose of shortening the construction period, in situ concrete slabs will be used for the project because PC slabs will be inadvisable in terms of economic efficiency, workability and shortening the construction period in the case of this project, which is single story with an irregular shape plan that makes it difficult and not worthwhile to use PC slabs.

3) Guideline of Structure Plan

The standards for earthquake resistant design in Mongolia are based on Russian standards, which were established in the former Soviet Union. Under the earthquake standards, the project site falls into the category of magnitude 9 on the MSK scale (200 to 400 gals, 5 to 6 on the scale specified by the Meteorological Agency of Japan). Structural design for the project will be in accordance with the earthquake standards. As it is possible to procure reinforcing bars that meet the Japanese Industrial standards (JIS) in the local market, those which meet JIS will be procured for the construction of the project.

The design values of the wind force and the snow load are as follows, which are in accordance with the relevant local standards.

Wind load : 0.35kg/m^2 (35.0kpa)

Snow load : 0.30kg/m^2 (31.0kpa)

(4) Electrical Facility Plan

The project site has a stable supply of electric power since it is situated in a region where electric power is supplied through the Central Electric Power Supply Network of Mongolia although the voltage fluctuation rate in and around the project site is expected to be approximately 10%. Thus, installation of an automatic

voltage regulator in the building is planned for prevention of damage to lighting fixtures and other similar appliances by the fluctuation. There will be no emergency electric supply unit for the project, as there is hardly any power cut in the area according to the electric power company.

1) Power Receiving Facility

An underground service cable and hand holes are to be installed between the connection point outside of the project site and the electric room as low voltage (380 V/220 V) electric power is to be supplied to the project site. Cable installing work up to the power switchboard in the electric room is to be carried out by the Mongolian side.

2) Telephone Line

Underground conduits, hand holes are to be installed between the connection point and the Electric room. Installation of cables up to the Main Distribution Frame (MDF) is to be carried out by the Mongolian side.

3) Power Supply Facility

An incoming panel, an AVR and a low voltage power switchboard are to be installed in the electric room.

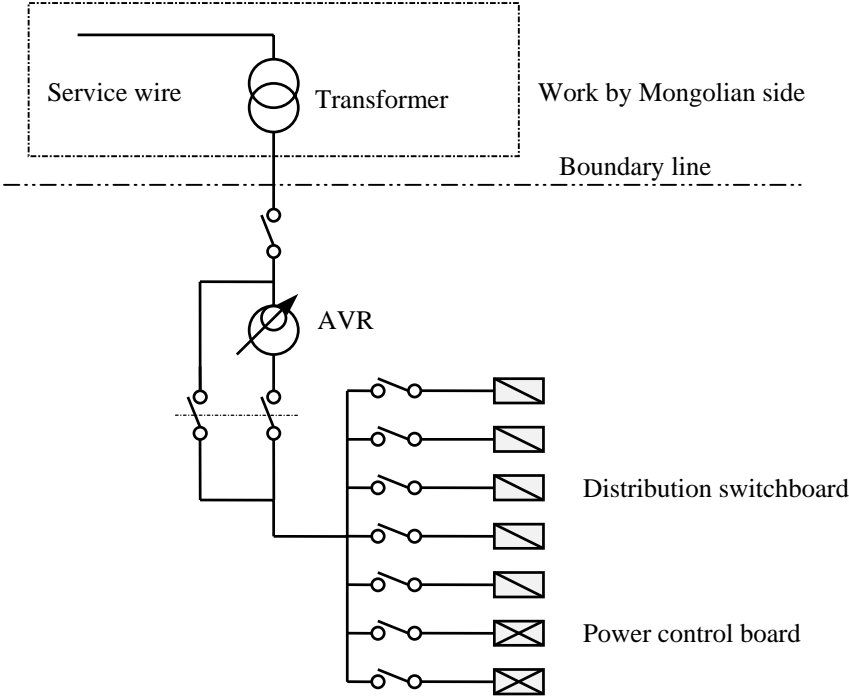


Fig. 2-1 Main Power Supply System

4) Main Power Supply Facility

Distribution switchboards, power control boards and main cables are to be installed in all the required places. In principle, cable trays and cables are to be installed in ceilings.

5) Lighting and Receptacle Facilities

The lights will be mainly fluorescent lamps. Spotlights will be installed in the exhibition rooms on an as required basis. The target illuminance for each of the main rooms is as shown in Table 2-5.

Table 2-5 Target Illuminance for Each of the Main Rooms

Main room	Target illuminance (lux)
Administration office/chief clerk's office/curator's office/meeting room	400
Exhibition room/multipurpose room	300
Lounge/gallery/observation room	150
Electric room/air conditioning machine room	300
Passage/toilet/warehouse	150

Wall-mount type receptacles, in principle, will be installed in places as needed.

6) Telephone Facilities

An extension network system is to be established with a MDF and PBX being installed in the administration office of the facilities. Multifunctional telephones are to be installed in all the offices and standard telephones are to be installed in most of the other rooms. Only telephone outlets are to be installed in the machine room and other incidental rooms.

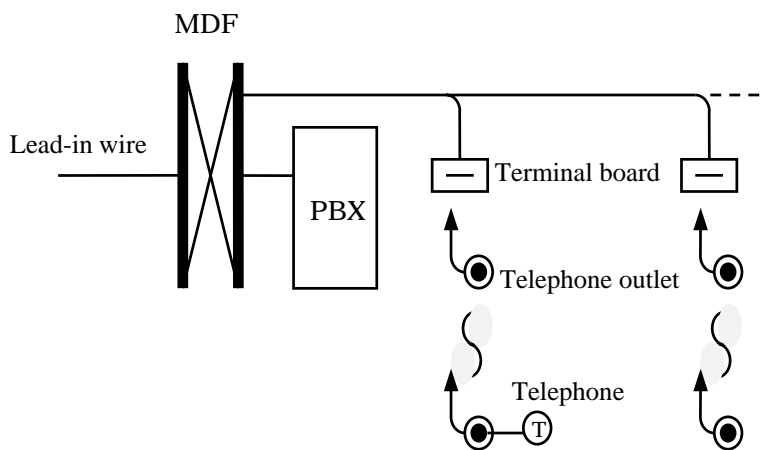


Fig. 2-2 Telephone System

7) Public Address Facilities

The planned public address system consists of an amplifier to be installed in the administration room and a remote microphone to be installed at the reception counter for providing public address to the whole museum.

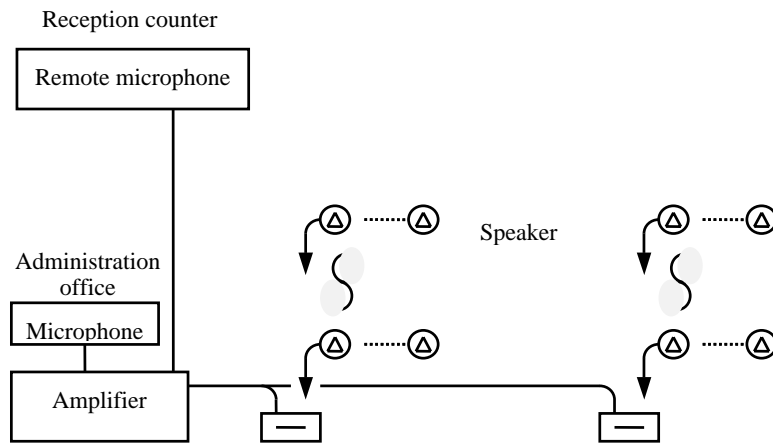


Fig. 2-3 Public Address System

8) Automatic Fire Alarm System

A receiver is to be installed in the guardroom, and sensors in all the required places, for early detection of fires and for early evacuation.

(5) Air Conditioning Facilities

1) Heating Facilities

A regional heating system, in which heated water produced in the coal-burning power plants is supplied to each building, is common in the urban area of the country's major cities. However, coal-fired boilers are commonly used as the main heat source for buildings larger than middle size outside the area covered by the regional heating system. A coal-fired boiler and hot water radiator system will be used for the project because the project site is out of the regional heating system area, it is a commonly used and reliable system because of ease of operation and management and a stable supply of fuel.

In this heating system however, it is difficult to control heat distribution in each of the rooms. As it is likely that temperature near the ceiling becomes higher than that of near the floor, controllable ventilation for exhausting warm air to outside will be planned. As the project site is situated in the coldest region in the country, a boiler caretaker room will be provided for continuously operating the boiler all day in order to prevent freezing of pipes in winter. In addition, the boiler must be a low-pollution boiler that meets the Environmental Standards for Smoke from the Boiler" established by the Ministry of Nature and Environment.

In the case of a heat source to be provided by a regional heating system in the future, it is possible to incorporate the change by simply connecting a hotwater inlet pipe from the regional heating system to the hot water circulation pump of the existing heating system. The boiler room can be converted to a store in that case.

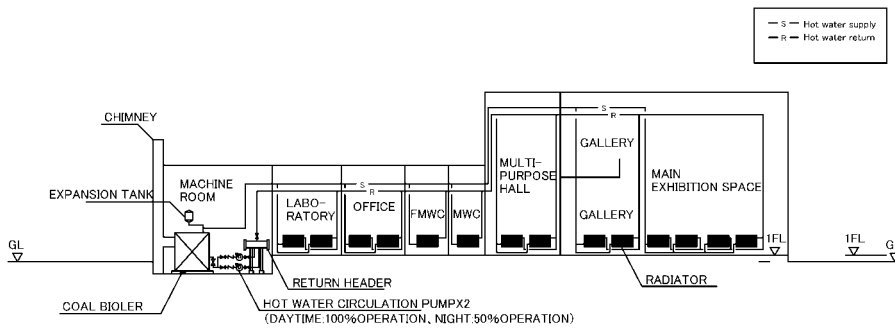


Fig. 2-4 Heating System

2) Cooling Facilities

Cooling systems are not installed in museums in Mongolia. There is no necessity for installation of cooling systems in public buildings in general, except for few exceptional cases.

However, the design will incorporate ease of natural ventilation by taking the balance with the effects of thermal insulation into consideration because the temperature occasionally rises close to 30° C for a short while during the summer due to the continental climate.

2) Ventilating Facilities

A mechanical ventilation system is to be installed in order to control/maintain the indoor environment as the building is designed to be airtight and all the windows are not openable during the winter. In addition, it is a requirement of the national building standards that all public buildings be provided with mechanical ventilation. A heat exchange air intake system, in which the cold fresh air will be warmed up by hot water and distributed to each room through ventilation ducts, will be installed in the building. The return air is to be mechanically exhausted from the toilets and passages.

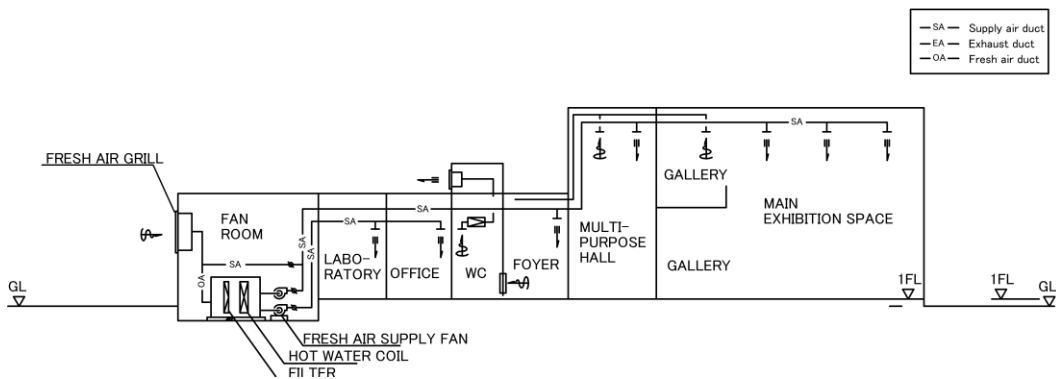


Fig. 2-5 Ventilation System

(6) Plumbing Facilities

1) Drainage Facilities

It is required to have more than 120 meters between the well and the permeation tank of the sewage system where there is no sewer main and the waste is disposed to the soil according to the Mongolian sanitation standards. It is not possible to plan permeation tanks for the disposal of this project because there is an existing well in the nearby tourist camp and some wells are expected to be made for houses around the site in the future. Therefore, as an alternative, a seepool system that the waste is stored in the tank first and taken away by a vacuum suction truck is to be constructed.

Particular care must be given to the depth of the tank which needs to be insulated and kept under the freezing level in winter, specifications for pipes, manholes and covers, etc. The capacity of septic tanks will be designed taking into account assumptions that approximately 25,000 tourists will visit the museum in 4 months during the summer and there are no other public lavatories near the project site.

2) Water Supply Facilities

Water will be supplied to the water reservoir tank by water supply trucks and to each part of the museum with a pressure pump, as there is no water main near the project site. The water supply system by elevated water tank will not be planned due to the difficulty of insulation, obtaining sufficient water pressure and the costliness of construction work.

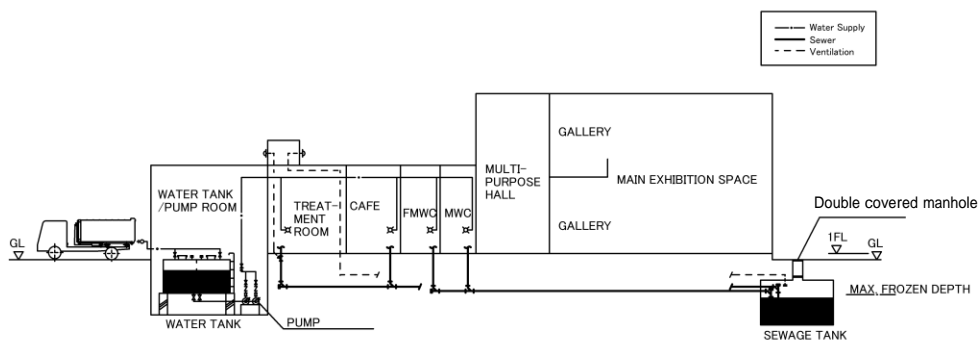


Fig. 2-6 Water Supply and Drainage System

3) Hot Water Supply Facilities

A commonly used hot water heater (tank type) will be installed.

4) Firefighting Facilities

The following fire control equipment will be installed in accordance with the relevant local standards.

- Indoor fire hydrant
- Movable fire extinguisher

(7) Materials/Construction Method Plan

Building materials and a construction method will be selected in consideration of the local climate, required performance, construction period, construction cost, quantity, maintenance and management, etc.

1) Exterior Finishing Materials

The following table shows the main exterior finishing materials selected and the rationale for their selection.

Table 2-6 Main Exterior Finishing List

Component	Finishing materials	Remarks
Roof	Protective block on asphalt waterproofing	The best performance of waterproofing is obtained among the locally available waterproofing materials.
Outer wall	Fair faced brick	It is used widely in the domestic market and highly durable. It is maintenance-free. It does not require periodic recoating or repair of cracks unlike mortar coating. It will contribute to reduction in maintenance/ management cost.
Furniture	PVC coated sash, double-glazed glass	PVC coated sash is better in terms of insulation performance than aluminum sash and copper sash. Double-glazed glass excels in insulation performance. Both products are used widely in the domestic market.

2) Interior Finishing Materials

The following table shows the main interior finishing materials selected and the rationale for their selection.

Table 2-7 Main Interior Finishing List

Room	Floor	Wall	Ceiling	Remarks
Exhibition room	Carpet tile (wooden flooring for some rooms)	Coated wall	Coated plaster board	Emphasis is put on humidity control function and ease of cleaning.
Multipurpose hall	Carpet tile	Coated porous plaster board	Metal open grid ceiling	Emphasis is put on acoustic effects and flexibility.
Foyer	Ceramic tile	Coating	Coated plaster board	Emphasis is put on ease of cleaning.
Office	Vinyl floor tile	Coating	Rock wool sound board	Emphasis is put on ease of maintenance and cleaning.
Toilet	Ceramic tile	Ceramic tile	Emphasis is put on water resistance and ease of cleaning.	Emphasis is put on water resistance and ease of cleaning

(8) Display Plan

1) Types of Exhibitions

- Permanent Exhibition

The permanent exhibition is designed to provide an overview of the history of Kharakhorum, the capital of the Mongol Empire, where various cultures were in harmony with one another. The exhibits will be reviewed, updated and remodeled as appropriate in keeping with future developments in data collection and research activities so that the latest information may be provided to visitors.

- Temporary Exhibition

The temporary exhibition is designed to introduce important relics at home and abroad to visitors for a given period of time with the aim of motivating them to revisit the museum. It is also designed to present the details of the historical and cultural characteristics of each of the regions in the country to visitors.

2) Components of the Permanent Exhibition

The permanent exhibition at the Kharakhorum Museum must present an overview of the history and culture of Kharakhorum in a manner that enables children and foreign visitors to understand the Kharakhorum ruins well. In this connection, it is proposed that the permanent exhibition will consist of the following components.

A. Orientation Plaza

This is to be the introductory part of the permanent exhibition. It is also to serve as a place where visitors take a rest and review the details of the ruins of Orkhon river valley they have seen before proceeding to the next stage of their tour of the ruins.

B. Display Exhibits in Chronological Order

The exhibits are to be displayed in chronological order, the exhibits being classified by period. The exhibits in each period classification are to be displayed in various forms. For example, the finds and events symbolic of the period and the natural environment in Kharakhorum may be presented in life-size form or in the form of true-to-life audio-visual presentation. Through such arrangement visitors will be able to really understand the cultural characteristics of each period, how people lived in each period and even the spiritual world of ancient Mongolians, without reading recondite commentaries. Visitors who have limited time will be able to see the whole picture of the history and culture of Kharakhorum in a short time.

C. Outdoor Exhibition

The outdoor exhibition is designed to prompt visitors to enter the museum by heightening their interest in the museum, lead them outdoors again, and then prompt them to visit other excavation sites. It is also designed to link the exterior and the interior of the museum by enhancing the sense of its spaciousness.

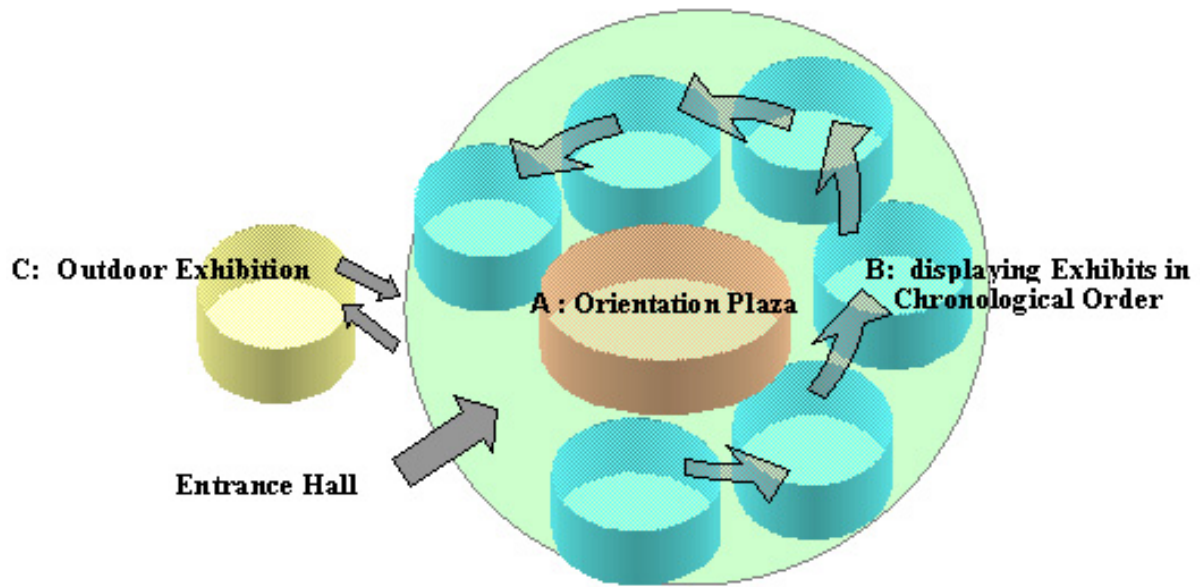


Fig. 2-7 Diagram of Zoning for Display

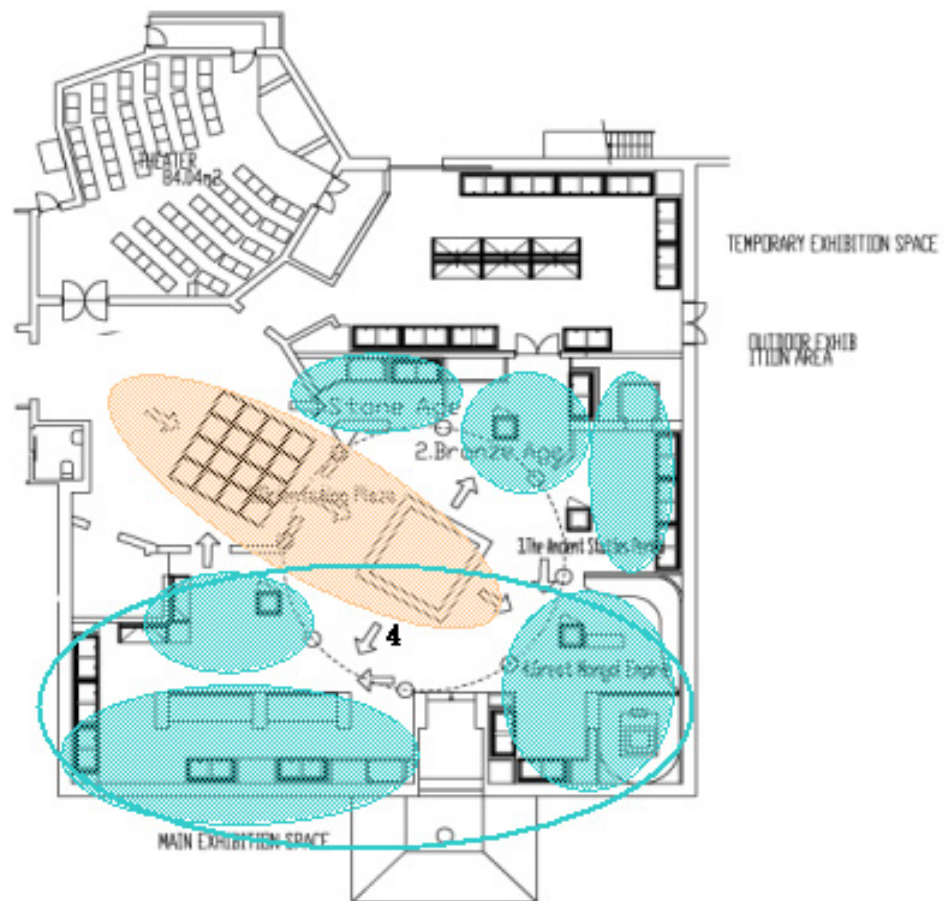


Fig. 2-8 Diagram of Display

2-2-2-2 Equipment Plan

(1) Criteria of equipment selection

- 1) To be consistent with main function of the planned museum
- 2) To be necessary for the operation of the planned museum
- 3) To be free from problems of operational/maintenance/management
- 4) To be suited to current technical levels

(2) Examination of the Requested Items of Equipment

Discussions on validity of the requested items of equipment were held with the representatives of the Mongolian side through the basic design study and outcome of the discussions was recorded as the requested items of equipment in the minutes of discussions. After the signing of the minutes, further discussions with the representatives of the Mongolian side were continued to confirm the details and the number of the requested items of equipment and to provide a draft of equipment list.

Items of equipment for excavation, analysis, preservative treatment and research were excluded from this project because these items of equipment are not for usage of activity and function of the planned museum. It was decided to include only the following items of equipment that were in conformity with the functions of this project.

- 1) Audio-visual equipment for usage of explaining ruins of Kharakhorum and articles of exhibition (DVD player, personal computer)
- 2) Audio-visual equipment for use in the multipurpose hall (LCD projector, DVD player, Personal computer, and etc.)
- 3) Equipment for usage of primary repair (Hot air drier, Sand plaster, Magnifier fitted with luminaries, Balance and Restoration tool kit)
- 4) Equipment for usage of storage/management (Storage shelf, Carrier and etc.)
- 5) Equipment for usage of environmental measurement in the exhibition and storage areas (Illuminometer and Thermometer/hygrometer)

Equipment list is shown in Table 2-8

(3) Examination of the Main Items of Equipment

The rationale for selecting the main items of equipment is as follows.

1) Display System

The display system will give an introduction of the details of Kharakhorum ruins and the buried cultural properties in the possession of the museum to visitors on the display screen and contribute to reduction in the number of the staff members in charge of guide. Furthermore, it will be possible to access data and information on the buried cultural properties in the possession of the museum,

which in turn will make it possible to provide researchers on Kharakhorum ruins with relevant data and information.

The number of Display System is 2 sets and each set includes with a Personal computer, a DVD/VCD player, a table and a couple of chairs. 4 persons can access the computer at the same time by 2 sets of Display System.

2) Equipment for Multipurpose Hall

The multipurpose hall is designed for various purposes. It will be for usage of orientation and explanation of Kharakhorum ruins and the buried cultural properties in the possession of the museum to schoolchildren who visits the museum as part of historical education on the Kharakhorum ruins before tour for information. It will also be used as a place for symposiums and seminars on the Kharakhorum ruins. Supposing that 70 schoolchildren (35 schoolchildren/a class and 2 class visit together) and 5 teachers will visit the museum, the hall's capacity is 75 persons.

75 chairs with a writing board for them will be placed in the multipurpose hall.

Audio-visual equipment is a LCD projector, a Personal computer, a DVD/VCD player, an Amplifier for microphone, a Speaker set and 2 microphones.

3) Equipment for usage of primary repair

Hot Air Drier

The hot air drier is for usage of drying buried cultural properties after washing and removing extraneous matter from them. This equipment is necessary for pretreatment (drying) of restoration.

Sand Blaster

A sand blaster is for usage of removing extraneous matters to very small parts of buried cultural properties by means of ultrasonic vibration. This equipment is necessary for restoration.

Electronic Balance

This instrument is for usage of weighing buried cultural properties. This equipment is necessary for restoration.

Lighting Fixture with Magnifier

This instrument is for usage of observing of buried cultural properties and fine works of restoration. This equipment is necessary for restoration.

Restoration tool kit

The Restoration tool kit is for usage of restoring and measuring sizes of buried cultural

properties.

Worktable

Worktables are for usage of washing, restoring, measuring and keeping records of buried cultural properties. This equipment is necessary for works of restoration.

Shelf

Shelf Open Type is specified shelf with a depth of 90 cm for storing buried cultural properties and this size of shelf is used widely for storing cultural properties in Japan.

Shelf Casement Type is usually in the form of what is called “chest of drawers” in Japan. It is for usage of storing precious cultural properties of small size.

Cabinet

Cabinet Type with a lock is for usage of temporarily storing buried cultural properties on the process of restoration.

4) Equipment for Storage/Management

Carrier

The carrier is for usage of transferring buried cultural properties in the planned museum. This equipment is necessary for safe transportation of buried cultural properties.

Storage Box

Most of the buried cultural properties from the Kharakhorum ruins are pieces of fraction of earthenware. It is necessary to affix a label with records of excavation, etc. to each of pieces and put them into storage boxes classified by place of excavation before storing them in the warehouse. This storage box is necessary for efficient storage of the buried cultural properties.

5) Equipment for Environmental Measurement

Illuminometer

The illuminometer is for usage of measuring the amount of light and UV in room and showcases. The illuminometer will be a Portable one because there will be a need to use it for measuring the amount of light and UV in each showcases when needed.

Thermometer/hygrometer

This instrument is necessary for measuring temperature and humidity to check environment in the exhibition rooms. Thermometer/hygrometer (Mounted type) is to be installed in the storage as well as in the Secure storage. Thermometer/hygrometers (Portable type) will be for usage of measuring temperature and humidity inside of exhibition cases when needed.

The following table shows the specifications and usage of the main items of equipment to be

planned for this project as a result of examination.

Table 2-8 Main Equipment List

Classification	Equipment	Specifications	Level	No. of units	Usage
Explaining exhibits/training	Personal computer	* Type of OS: Microsoft Windows XP Home Edition or more * Processor: Pentium Celeron versions or more *Memory: 512MB * Hard disk: 40GB or more	Intermediate	3	The component of display system will show visitors details of Kharakhorum ruins and the buried cultural properties in the possession of the museum on the display screen and contribute to reduction in the number of the staff members in charge of guide.
	DVD player	*DVD reproduction: DVD/Video,CD Player *Video characteristic: Compatible with NTSC	Intermediate	3	The component of display system will show visitors details of Kharakhorum ruins and the buried cultural properties in the possession of the museum on the display screen and contribute to reduction in the number of the staff members in charge of guide.
Restoration/storage	LCD Projector	* Brightness (ANSI Lumens) 2,000 Lumens *Zoom 1.6x *Screen size : 40 ~ 200" * Light source: 130 W or more	Intermediate	1	Display system to be for usage of orientations, seminars, workshop, etc in the multipurpose hall.
	Chair with a writing board	* Type: With a writing board Stacking type * Material of main body: Steel coated)* Material of seat and back: Vinyl leather stretched with arm rest *Leg: Chrome plated or painted steel with casters (Dual wheel)* Dimensions: Approximately 500 mm x 500 mm x 650 mm	Intermediate	75	Chairs for usage of the attendee. The number of units was determined on the assumption that two classes of 35 elementary school children/junior high school students and 5 teachers will visit the multipurpose hall.
	Hot air drier	*Air pressure: Included with the range of 20-90hpa*Consumption of air: Included with the range of 50-80L/min. * Temperature range of air supplied: Included with the temperature range 20-600	Intermediate	1	The hot air drier is for usage of drying them after washing and removing extraneous matter from buried cultural properties
	Sand blaster	*Operating pressure: Included with the range of 0.3-8 hPa*Diameter of Polishing agent: Included with the range of 5 - 500 μm*Polishing agent: Glass beads and Alumina	Intermediate	1	The sand blaster is for usage of removing extraneous matter to the very small parts of buried cultural properties by means of ultrasonic vibration.
	Balance	Weighing capacity : 620 g* Minimum display:0.001g (1mg)	Intermediate	1	Instrument for weighing buried cultural properties
	Lighting fixture with a magnifier	Power consumption of fluorescent lamp : 14 W *Arm length : 40 x 40 cm * Dimensions : 40 x 60 cm	Intermediate	2	Equipment for removing mud from buried cultural properties and restoring them
	Shelf Open Type	* Number of shelf boards: 4* Material of frame: coated steel pipe * Maximum load-carrying capacity: more than 30 kg *Dimensions : 1800(W) ×900(D)× 1800(H)mm	Intermediate	16	Instrument for storing buried cultural properties
	Shelf Casement Type	Type: upper 4 decks: each fitted with hinged doors; lower 7 decks: each fitted with drawers *Material: wood	Intermediate	4	Instrument for storing buried cultural properties
Environmental measurement	Illuminometer	*Display: 3.5 digits range of illuminance displayed on LCD* Sampling: 2.5 times/sec	Intermediate	1	Equipment for measuring amount of light and UV of exhibition hall and each place of storage .
	Thermometer/hygrometer (Portable)	Type: Portable : -50 ~ 70 °C、 Range of temperature 25 ~ 95 %、 *Precision of humidity measured : ± 5%*Precision of temperature measured : ± 1	Intermediate	1	Equipment for measuring temperature and humidity in exhibition halls and storages.
	Thermometer/hygrometer (Mounted)	Type: Portable : -50 ~ 70 °C、 Range of temperature 25 ~ 95 %、 *Precision of humidity measured : ± 5%*Precision of temperature measured : ± 1	Intermediate	2	Equipment for measuring temperature and humidity in exhibition halls and storages.

(4) Equipment List

The following table shows the equipment list with quantities, countries of origin, countries of procurement, and conditions of procurement (including the necessity of local distributors to provide replacement parts and maintenance services) according to evaluation and examination

Table 2-9 Equipment List with Origins and Quantities

Category	No.	Equipment	Number of units	Country of Procurement	Country of origin	Service of local distributor	
						Supply of Consumables and replacement parts	Maintenance service
Exhibition/ Training	1	Personal computer	3	Mongolia	Japan		○
	2	DVD player	3	Mongolia	Japan		○
	3	LCD projector	1	Mongolia	Japan	○	○
	4	Amplifier for microphone	1	Mongolia	Japan		○
	5	Speaker	1	Mongolia	Japan		○
	6	Microphone	2	Mongolia	Japan		
	7	Chair with a writing board	75	China	China		
Restoration/ Storage	8	Shelf (D=600)	6	Mongolia/China	Mongolia/China		
	9	Worktable	1	Mongolia/China	Mongolia/China		
	10	Chair	8	Mongolia/China	Mongolia/China		
	11	Hot air drier	1	Japan	Japan		○
	12	Sand plaster	1	Japan	Japan, USA, EU	○	○
	13	Balance	1	Japan	Japan		○
	14	Lighting fixture with a magnifier	2	Japan	Japan	○	○
	15	Restoration tool kit	1	Japan	Japan		○
	16	Steel Carrier	1	Mongolia/China	Mongolia/China		
	17	Plastic Carrier	2	Mongolia/China	Mongolia/China		
	18	Storage box	200	Mongolia/China	Mongolia/China		
	19	Worktable	3	Mongolia/China	Mongolia/China		
	20	Restoration Worktable	2	Mongolia/China	Mongolia/China		
21	Working Chair	10	Mongolia/China	Mongolia/China			
22	Shelf Open Type	16	Mongolia/China	Mongolia/China			
23	Shelf Casement Type	4	Mongolia/China	Mongolia/China			
24	Shelf (D=900)	3	Mongolia/China	Mongolia/China			
25	Cabinet	6	Mongolia/China	Mongolia/China			
Environmental Measurement	26	Illuminometer	1	Japan	Japan	○	○
	27	Thermometer/hygrometer (Portable)	1	Japan	Japan	○	○
	28	Thermometer/hygrometer (Mounted)	2	Japan	Japan	○	○

The following table shows the evaluation result of all of the requested items.

Table 2-10 The evaluation result of all of the requested items

<p>Criteria of selection</p> <ul style="list-style-type: none"> Consistent with the main function of the museum Necessary for operation of the museum No operational/maintenance/management problems Suited to present technical level in Mongolia 	<p>Overall rating</p> <ul style="list-style-type: none"> Rank A : Judged to be eligible for the project Rank B : To be excluded from the project by judging that the priority of equipment is lower, although its necessity is recognized. Rank C : To be excluded from the project Deleted : Not consistent with the main function of the museum or included in the construction work instead of the equipment work
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Use	No.	Equipment	No. of units					Overall rating	
Exhibition/ storage	1	Spotlight	15					Included in construction work	Deleted
	2	Lamp	24					Included in construction work	Deleted
	3	Light cover	15					Included in construction work	Deleted
	4	Light mounting rail	120					Included in construction work	Deleted
	5	Showcase	29					Included in construction work	Deleted
	6	Portable translator for guides	1					Use Display System in place of Portable transfer for guides.	Deleted
	7	Personal computer	6					Exclude with Personal computers for staff.	Deleted
	8	Personal computer for exhibition	3						A
	9	Copier	3					Born by Mongolian side.	Deleted
	10	Virtual display set	1					Included in construction work	Deleted
	11	Set of shelf decks	1						A
Training	12	Furniture for meeting room	1					Included in construction work	Deleted
	13	Furniture for library	1						A
	14	Furniture for lounge	1					Included in construction work	Deleted
	15	Safety system	1					Included in construction work	Deleted
Restoration	16	Hot air drier	-						A
	17	Vacuum immersion equipment	-	x	x	x	x		C
	18	Sand plaster	-						A
	19	Hume hood	-	x	x	x	x		C
	20	Pure water maker	-	x	x	x	x		B
	21	Ultrasonic washing equipment	-	x	x	x	x		C
	22	PEG immersion system	-	x	x	x	x		C
	23	Organic solvent immersion equipment	-	x	x	x	x		C
	24	Vacuum freeze drier	-	x	x	x	x		C
	25	Freezer	-	x	x	x	x		C
	26	Vacuum drier	-	x	x	x	x		C
	27	Water bath	-	x	x	x	x		C
	28	Hot plate	-	x	x	x	x		C
	29	Balance	-						A
	30	Cl ion measuring equipment	-	x	x	x	x		C
	31	Autoclave	-	x	x	x	x		C
	32	Ultrasonic scaler	-	x	x	x	x		C
	33	Binocular microscope	-					Changed to Lighting fixture with a magnifier	B
34	Lighting fixture with a magnifier	-						A	
35	Pencil for use in restoration	-	x	x	x	x		C	
36	Refrigerator	-	x	x	x	x		C	
37	Temperature/humidity chamber	-	x	x	x	x		C	
38	Soft X-ray examination system	-	x	x	x	x		C	
39	Hard X-ray examination system	-	x	x	x	x		C	
40	Metallographic microscope	-	x	x	x	x		C	
41	Binocular microscope	-	x	x	x	x		C	
42	Biological microscope	-	x	x	x	x		C	
43	Grinder	-	x	x	x	x		C	

Use	No.	Equipment	No. of units					Overall rating
Environmental measurement	44	Temperature control	-	x	x	x	x	C
	45	Microtome	-	x	x	x	x	C
	46	Thermometer/hygrometer	-	x	x	x	x	C
	47	Illuminometer	-					A
	48	Uviometer	-					A
	49	Chromatometer	-	x	x	x	x	C
	50	Ultraviolet lamp	-	x	x	x	x	C
	51	Camera	-	x	x	x	x	C
Training/restoration	52	Scanning electron microscope	-	x	x	x	x	C
	53	Gas chromatograph	-	x	x	x	x	C
	54	X-ray diffractometer	-	x	x	x	x	C
	55	Infrared fluorescence spectrometer	-	x	x	x	x	C
	56	Atomic fluorescence spectrometer	-	x	x	x	x	C
Training	57	Rotary vacuum evaporator	-	x	x	x	x	C
	58	Centrifuge	-	x	x	x	x	C
	59	Balance	-	x	x	x	x	C
Restoration/storage	60	Personal computer	5	Born by Mongolian side.				Deleted
	61	Color printer	2	Born by Mongolian side.				Deleted
	62	Monochrome printer	1	Born by Mongolian side.				Deleted
	63	Scanner	1	Born by Mongolian side.				Deleted
	64	Digital camera	2	Born by Mongolian side.				Deleted
	65	Computer desk/chair	10	Born by Mongolian side.				Deleted
	66	Camera	10	Born by Mongolian side.				Deleted
	67	Video camera	2	Born by Mongolian side.				Deleted
	68	TV set	1	x	x			C
	69	Video player	1	x	x			C
	70	Developing machine	1	x	x			C
	71	Worktable	3	x	x			C
	72	Shelf	5	x	x			C
	73	Slide scope	1	x	x			C
	74	GPS	8	x	x	x	x	C
	75	Refractometer	1	x	x			C
	76	Generator	2	x	x	x	x	C
77	Cabinet for storing finds	1					A	

2-2-3 Basic Design Drawings

The draft drawings that are made based on the results of the examination of the requested items of equipment are as follow.

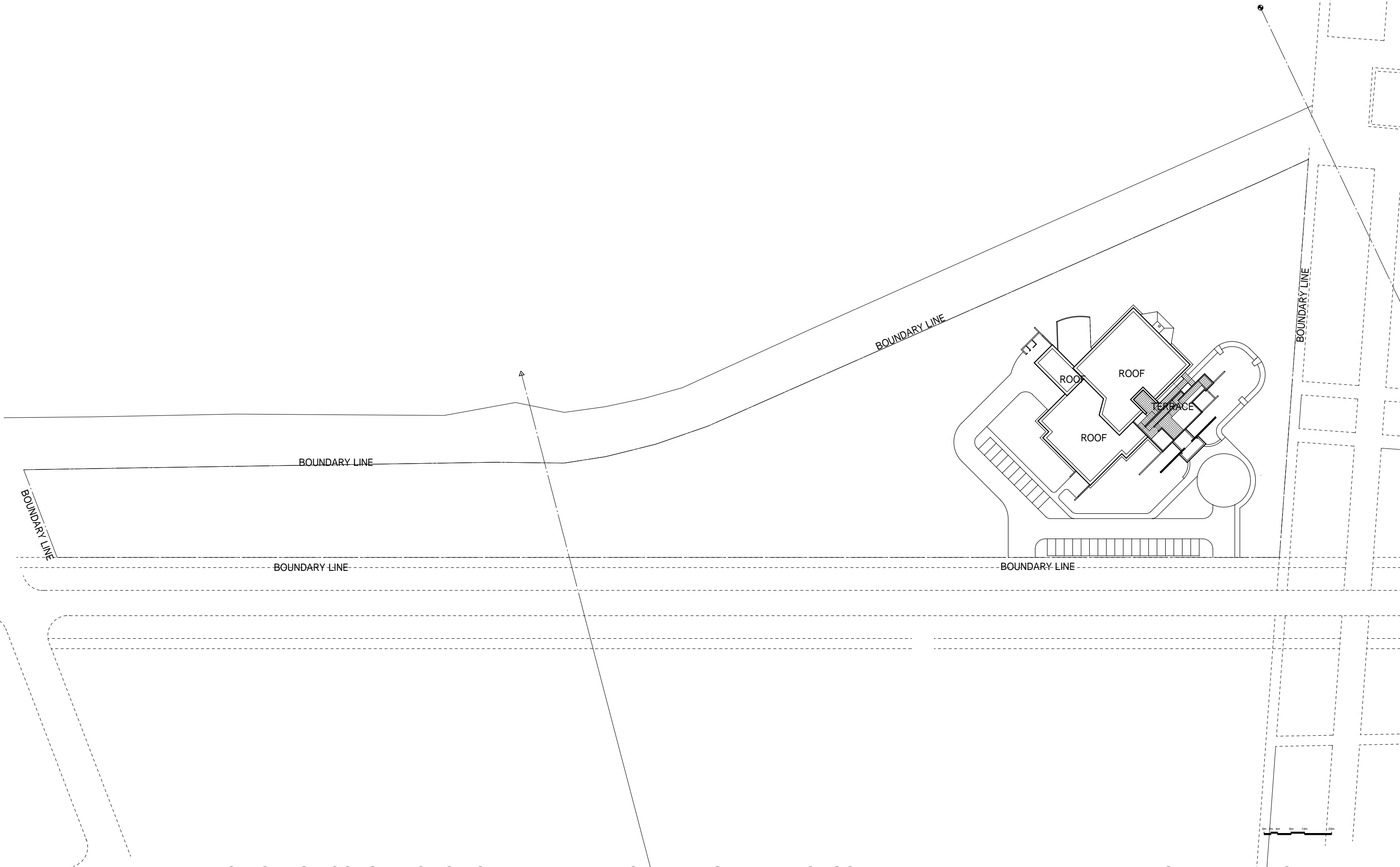
Site plan

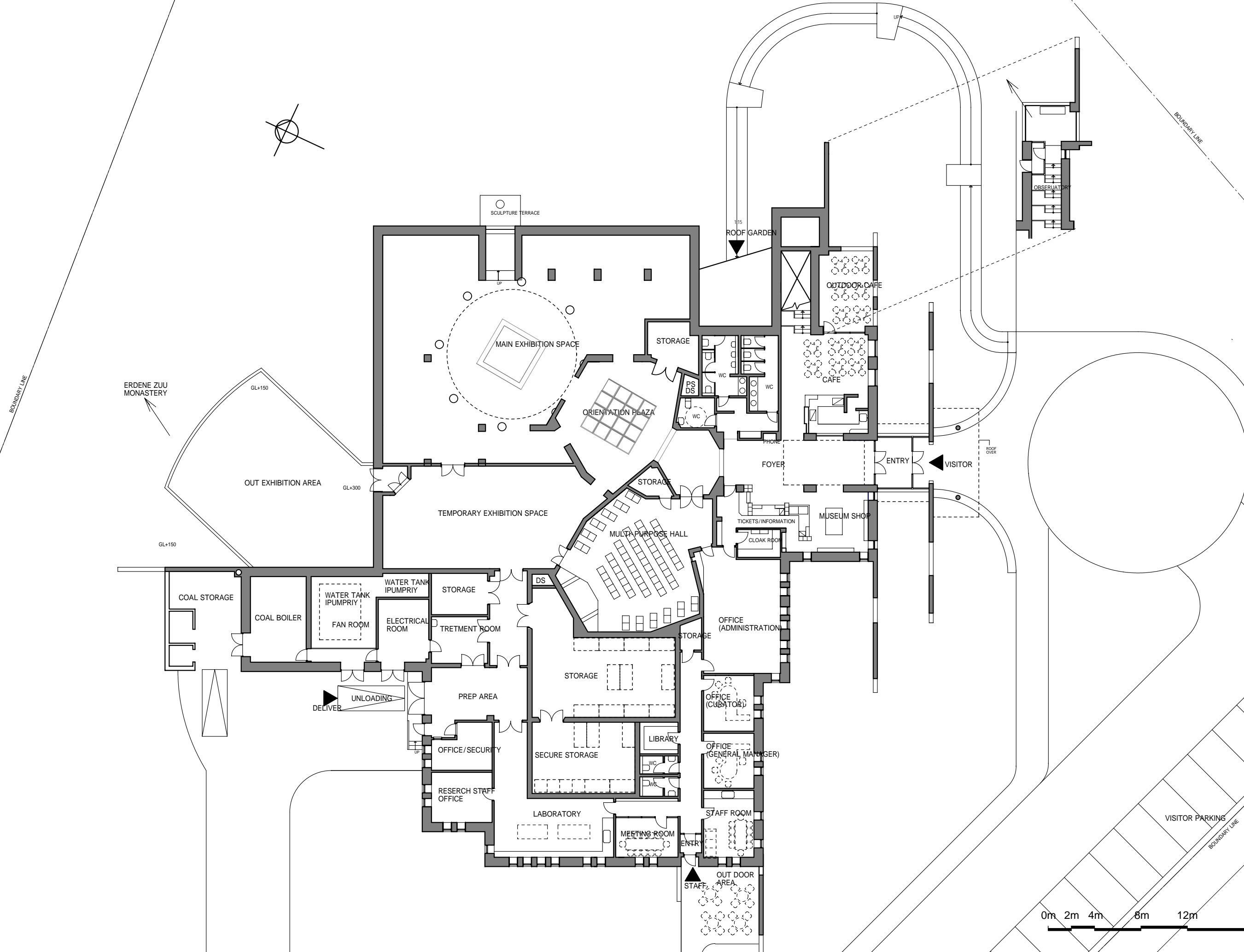
Ground Floor plans

Roof plan

Elevations

Sections





THE PROJECT FOR CONSTRUCTION OF THE KHARAKHORUM MUSEUM IN MONGOLIA

GF Plan S=1:250

BOUNDARY LINE

ERDENE ZUU MONASTERY

OUT EXHIBITION AREA

ROOF

ERDENE ZUU MONASTERY

OBSERVATION DECK

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BOUNDARY LINE

(WALL WAY TO ERDENE ZUU MONASTERY)

MAIN ENTRANCE

DROP OFF AREA

ROOF

DELIVER ENTRANCE

ROOF

STAFF ENTRANCE

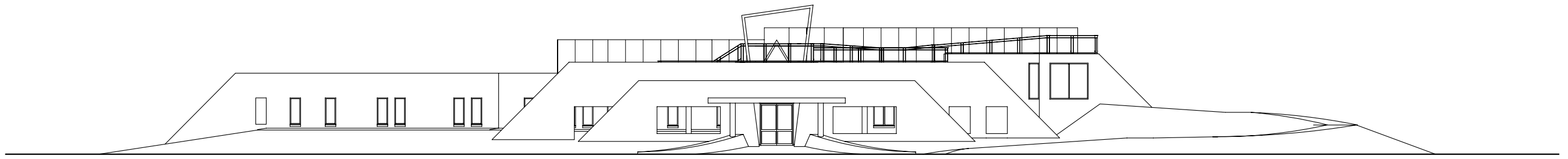
VISITOR PARKING

BOUNDARY LINE

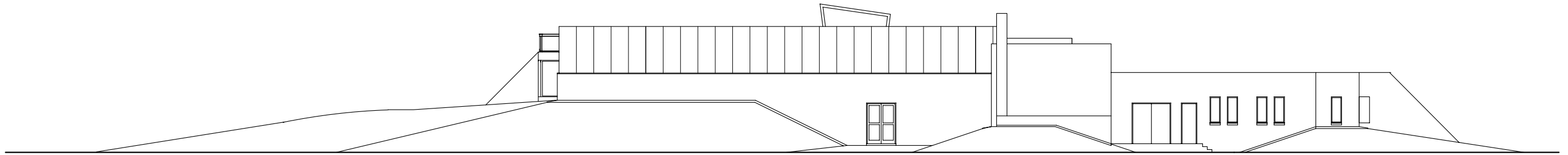
(ROAD TO BE CONSTRUCTED)

STAFF PARKING

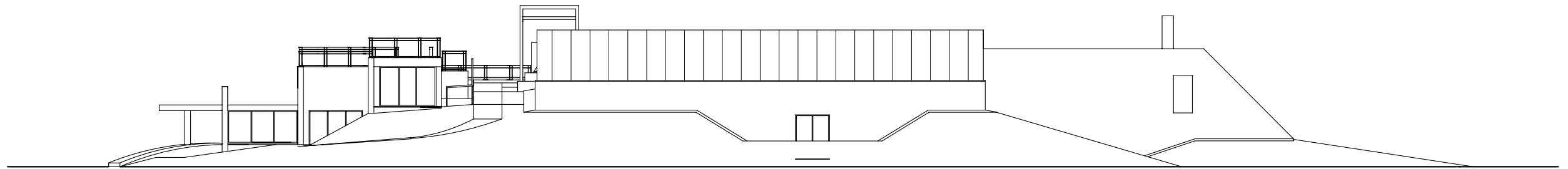
0m 2m 4m 8m 12m 20m



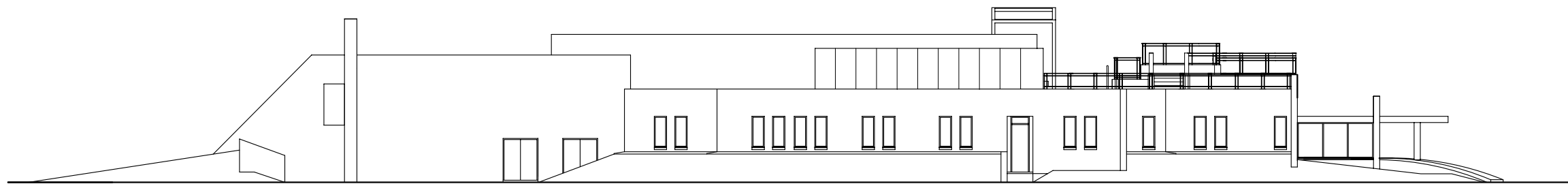
SOUTH ELEVATION



NORTH ELEVATION

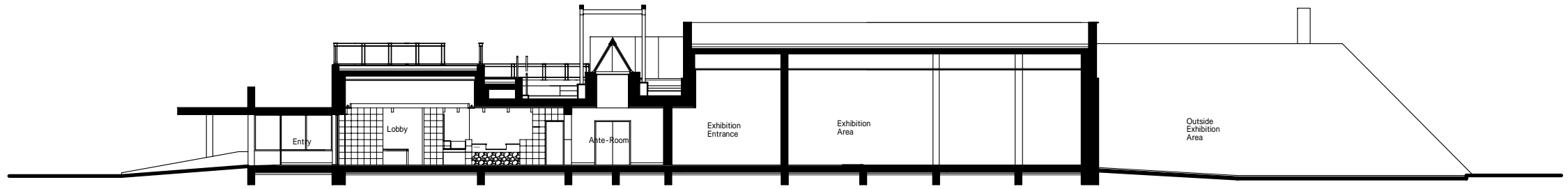


EAST ELEVATION

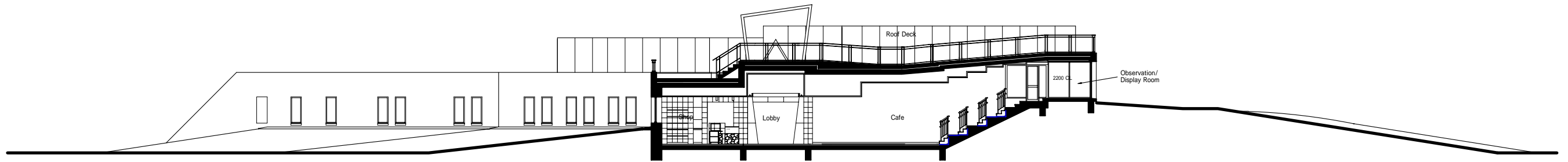


WEST ELEVATION

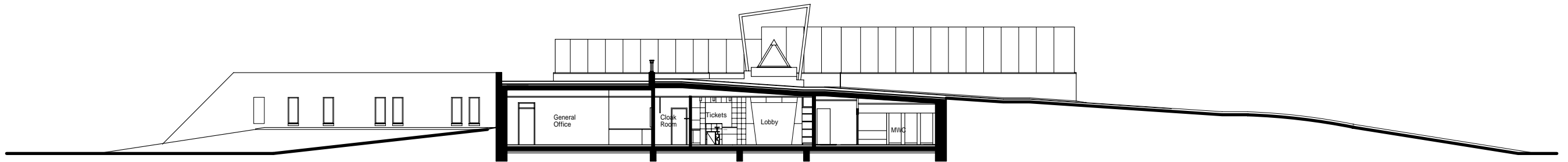




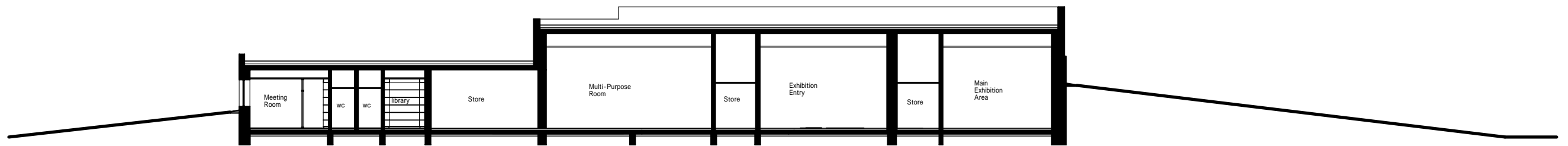
SECTION-1



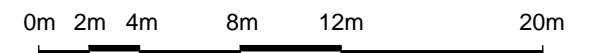
SECTION-2



SECTION-3



SECTION-4



2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

This project consists of construction work and equipment procurement and installation work. The scope of Japan's cooperation is to be carried out within the framework of the grant aid scheme of the Government of Japan.

This project is to be officially implemented after the two governments approve the contents of the project and exchange notes regarding implementation of this project. After conclusion of the Exchange of Notes (E/N), the implementing agency of the project and a consultant in charge of this project are to conclude the consultant agreement and the consultant will start detail design, preparation of tender documents of this project. Upon completing preparation of the tender documents, tender procedure will take place for selection of successful tenderors for the works. The respective successful tenderors, both of whom are Japanese companies, will carry out the construction work and the equipment procurement/installation work.

(1) Organizations in Recipient Country

The following Mongolian authorities are the implementing agencies responsible for each task.

1) Responsible for the project: Ministry of Education and Culture

This Ministry is to represent the Government of Mongolia in implementing the project.

2) Responsible for decision-making: Bureau of Culture and Art, Ministry of Education and Culture.

This Bureau in the Ministry is to carry out all activities related to this project. The director and the deputy director of the bureau will be the authorized signers for all official documents relating to this project.

3) Other relevant organizations:

World Heritage Committee of Mongolia, Mongol Academy of Science, National Cultural Property Center, selected universities, etc. are to carry out excavations, restoration work, registration work and research/analysis of the relics and other cultural properties in cooperation with the museum.

(2) Consultant

Immediately after the Notes regarding the Project are exchanged between the two governments, the implementing agency of Mongolia will conclude a consultant agreement with a selected Japanese consultant in accordance with the Grant Aid scheme of the Government of Japan. The consultant is to carry out the following services in accordance with the provisions of the consultant agreement.

1) Detail Design: Preparation of detail design documents (including specifications and other technical documents)

The consultant is to design the facilities in detail based on the Basic Design and prepare tender documents including drawings, specifications, instructions to tenderers and draft contracts in order to select Japanese contractor and supplier.

- 2) Assistance of Tendering: Assistance of tendering to select the contractor and the supplier and concluding the contracts with the contractor and the supplier.

In implementing tenders, the consultant is to prepare advertisements for tenders, receive applications, screen applicants, distribute tender documents, receive tenders, and evaluate the result of the tender. The consultant is also to assist on conclusion of the construction contract and the equipment procurement contract between the implementing agency and the contractor and the supplier, respectively, and report all these matters to the Government of Japan.

- 3) Supervision: Supervision of the construction work and the equipment work and of supplier's giving guidance on equipment installation/operation.

Supervision is a task to check to see whether or not the construction contractor and the equipment supplier are carrying out their respective works in accordance with the provisions of the relevant contracts, respectively, to ensure that the contracted obligations are properly fulfilled. In other words, it is to give the contractor and the equipment supplier guidances, advices and to coordinate their works for smooth implementation of the project. Details of supervision services are described below.

Guidance, advice and coordination to the contractor and the supplier

The consultant is to examine the execution schedule, the execution plan, and the construction equipment and materials procurement/installation plan and to coordinate, give relevant guidance and advice to the contractor and the supplier.

Examining and approving the working drawings and the manufacturing drawings

The consultant is to examine, instruct and approve the shop drawings and the manufacturing drawings and other relevant documents submitted by the contractor and the supplier.

Verifying and approving the construction equipment/materials

The consultant is to verify and approve the building materials and equipment proposed by the contractor and the supplier in compliance with the contract documents.

Factory inspection

The consultant is to inspect, when necessary, the building materials and equipment at the manufacturers' factories to ensure their quality and performance.

Reporting the progress of the construction work

The consultant is to get a good grasp of the progress of the construction work and to report the progress of the construction work to the governments of the two countries.

Completion inspection and commissioning test

Upon completion of the construction work, the consultant is to conduct a final inspection and commissioning tests of the completed facilities and installed equipment to ensure that all the works

are completed in compliance with the contract documents and then submit a certificate of completion of inspection to the Mongolian side.

Training for operation of equipment

Some equipment procured for this project requires expertise in operation, maintenance and management. It is, therefore, necessary that the contractor and the supplier give on site training to the local staff in charge of operation and repair of the equipment during the period of installation, adjustment and test-run period. The consultant is to give guidance and to advise regarding the training programme.

(3) The Contractor and the Equipment Supplier

The contractor is to construct the facilities and the equipment supplier is to procure, supply and install the equipment in accordance with the contract documents and give instructions for operation, maintenance and management of the facilities and the equipment to the Mongolian side. The supplier is to ensure after-sale services for obtaining technical assistance, procuring spare parts and consumables of major equipment without cost or at cost during the warranty period and to support the client with the assistance of manufacturers and their distributors in the country so that the client may receive pertinent instructions.

(4) Japan International Cooperation Agency (JICA)

JICA is to give relevant guidance to the consultant, the contractor and the equipment supplier so that this project will be implemented properly within the framework of grant aid cooperation of the Government of Japan. When necessary, JICA will confer with the project implementing agency with the aim of ensuring the smooth implementation of this project.

2-2-4-2 Implementation Conditions

(1) Construction Work

1) Building Code and Procedures for Obtaining Building Permits

Mongolia has well-organized standards for architectural planning and execution. Following the completion of the detail design, the project implementing agency must notify the relevant authorities of implementing the project and submit detail design drawings, specifications, etc. that are prepared in accordance with the relevant local standards. Since Mongolia has its own standards, it is necessary that building materials, equipment and other products to which the local fire fighting regulations apply will be in compliance with the regulations.

2) Likely adverse effects on the neighborhood

There are few houses and other structures in the area surrounding the project site. In addition, there is not much traffic on the roads running near the project site. For these reasons, there will be only a few adverse effects, such as noises, vibrations, waste and traffic congestions, of the implementation of this project on the neighborhood. However, in view of the fact that there runs an irrigation canal on the

northern side of the project site and well water is supplied to houses in the neighborhood, it is necessary to carry out the construction work giving due consideration to avoid possible water pollution and soil contamination.

(2) Equipment Procurement

1) Schedule Control

All the equipment to be procured will be installed in the newly built facilities of the project. It is therefore important that the timing of supply, installation, inspection and training of equipment be carefully scheduled between the contractor and the equipment supplier under the supervision of the consultant.

2) Dispatch of Engineer

It is very important for the staff of the museum to acquire skills to operate, maintain and manage the procured equipment in order for the equipment to be properly and effectively used. Since the audio-visual equipment for this project is to be locally procured, engineers from local distributors are to install, adjust, make trial runs and give an initial guidance on operation of equipment. In the case of equipment for use in restoration and preservation of relics, it is necessary that manufacturers' or local distributors' engineers are dispatched to install, adjust, operate, and give guidance on maintenance and management of such equipment. The following table shows a list of the main items of equipment and the operations required (installation, adjustment, trial run and/or guidance on initial operation) for each of them.

Table 2-11 List of Equipment and Required Work

NO.	Equipment	No. of units	Installation	Adjustment/trial run	Guidance on initial operation
1	Personal computer	3		○	○
2	DVD player	3		○	○
3	LCD projector	1		○	○
4	Amplifier for microphone	1		○	○
5	Speaker	1		○	×
6	Microphone	2		○	×
7	Chair with a writing board	75	×	×	×
8	Shelf (D=600)	6	○	×	×
9	Worktable	1	×	×	×
10	Chair	8	×	×	×
11	Hot air drier	1	×	○	○
12	Sand plaster	1	×	○	○
13	Balance	1	×	○	×
14	Lighting fixture with a magnifier	2	×	×	×
15	Restoration tool kit	1	×	×	×
16	Steel Carrier	1	×	×	×
17	Plastic Carrier	2	×	×	×
18	Storage box	200	×	×	×
19	Worktable	3	×	×	×
20	Restoration Worktable	2	×	×	×
21	Working Chair	10	×	×	×

NO.	Equipment	No. of units	Installation	Adjustment/trial run	Guidance on initial operation
22	Shelf Open Type	14	○	×	×
23	Shelf Casement Type	4	○	×	×
24	Shelf (D=900)	3	○	×	×
25	Cabinet	6	○	×	×
26	Illuminometer	1	×	○	○
27	Thermometer/hygrometer (Portable)	1	×	○	○
28	Thermometer/hygrometer (Mounted)	2	○	○	○

2-2-4-3 Scope of Works

(1) Scope of Construction Work

1) Work under Japan's Grant Aid

Construction of the building set forth in the basic design study report

Implementation of incidental works, eg. electrical, air-conditioning (heater, ventilation), and plumbing works, in the facilities

Preparation of infrastructure (power supply, water supply and drainage systems, etc.) within the project site

Installation and removal of temporary work facilities such as fence, building material store, etc.

Payment of power, water and telephone charges used for construction

Transportation to Mongolia

Inland transportation in Mongolia

2) Work under the Government of Mongolia

Securement and installation of exhibits

Securement of the project site for the construction of the planned facilities

Removal of existing buildings, other structures, waste and trees in the project site which are likely to hinder the construction work

Landscaping

Construction of boundary fences (if necessary)

Installation of high-tension cable up to the boundary and service cable up to the new building

Extension of telephone line to the boundary and installation of lead-in wire up to the new building

Provision of land for temporary site office, work area and materials storage shed, etc. during the construction work

Provision of power and water supply and connection of telephone line to the project site during the construction work

(2) Scope of Equipment Work (Procurement and Installation)

1) Work under Japan's Grant Aid

Procurement, transportation, loading and unloading of the equipment to the project site

Installation, adjustment and trial runs of the equipment

Explanation, operation and maintenance training for the equipment

2) Work under the Government of Mongolia

Provision of temporary storage area for the equipment

Construction of a temporary access road for motor vehicles bringing in equipment

2-2-4-4 Consultant Supervision

(1) Supervision Policy

In accordance with Japan's Grant Aid scheme, the consultant is to form a project implementing team to ensure smooth implementation of the project based on the basic design policy. The policies for construction supervision and equipment procurement supervision are stated below.

To keep close contacts with the officials in charge of the project of both the governments to ensure completion of construction of the facilities and procurement of the equipment without delay

To give prompt and proper guidance and advice with justice to the contractor, the equipment supplier and other concerned parties.

To give proper guidance and advice on equipment operation and management after installation and handover of equipment

To confirm completion of construction work and equipment work in compliance with conditions of the contract, to witness handover of the equipment and the buildings, and to conclude the consulting services by obtaining the consent of the Government of Mongolia.

(2) Supervision Plan

In view of the size of this project, the consultant is to dispatch a qualified engineer to the project site throughout the project implementation period. The consultant is to send other engineers to the project site on an as needed basis as the project progresses to conduct inspections, give guidance and act as coordinators. The consultant is to appoint an engineer in charge in its home office to establish a communication and support system for the site engineer. The consultant is also to report the progress of the project and matters to be arranged concerning the payment procedures, the completion and delivery of the construction and equipment works, etc. to all the parties concerned within the Government of Japan.

2-2-4-5 Quality Control Plan

As a rule, the consultant is to conduct construction supervision in accordance with the relevant Mongolian or Japanese standards as specified in the following table in order to ensure the prescribed quality level of the construction work.

Table 2-12 Quality Control Standards

	Main quality control standards			Remarks
	Item	Target value	Method of inspection	
Earthwork	Slope angle	Within range of target value	Slant gauge: visual inspection	The consultant is to have the contractor prepare an execution manual which describes examination items, target values, details of inspections, testing methods, curing methods, construction methods, etc. in advance.
	Accuracy of floor	Within range of +0 to 5 cm	Level: visual inspection	
	Height of groundwork	Within range of +0 to 3 cm	Same as above	
	Height of concrete sub-slab	Within range of ± 1 cm	Same as above	
Reinforcing bar work	Thickness of cover concrete	Portion that does not come in contact with ground 30m/m Portion that comes in contact with ground Foundation 60m/m Other 40m/m	Visual inspection, measurement	Same as above
	Accuracy of finishing	Stirrup, hoop (permissible level) ± 5 m/m Others ± 10 m/m		
	Tensile strength test	Test specimens: 2 reinforcing bars, each weighing 20 tons (on-site sampling)	Witnessing test conducted in the factory	
Concrete work (liquid concrete)	Compressive strength	Design strength 210kg/cm^2 and over	3 test specimens x 3 types per 150m^3 per concreting (witnessing of test conducted)	Same as above
	Slump	$15\text{cm} \pm 2.5\text{cm}$	Measured per concreting and per 150m^3 (witnessing of test conducted)	
	Chloride content	Less than 0.3 kg/m^3	Same as above	
Masonry	Compressive strength Other materials (cement, reinforcing bar)	$40 \sim 70\text{kg/cm}^2$	Witnessing test conducted by manufacturer Visual inspection	Same as above
Plaster work Painter's work Roof waterproofing work Finish carpentry	Material, method of storage, method of work, thickness of paint, curing, accuracy of work			Same as above
Water supply and drainage work	Water pipe Drain pipe	Pressure test High water level test	Witnessing/verifying of test	Same as above
Electrical work	Power cable	Insulation test Electricity conduction test	Same as above	Same as above

2-2-4-6 Procurement Plan

(1) Construction Work

1) Procurement of Equipment and Materials

Only a few kinds of construction materials, such as cement, aggregate and reinforcing bars, are manufactured in sufficient quantities in Mongolia. Most of the finishing materials and construction machines are imported from Russia, China and East European countries. Some of furniture, insulated windows and other items are manufactured by using imported machine tools in Mongolia. Most of the construction materials and equipment that are used widely in the country are in short supply and many products are imported for each project after the import procedures are followed. It is, therefore, necessary to select lighting fixtures and the like giving due consideration the availability of expendable and replacement parts. The following table shows the procurement sources of the construction materials and equipment for building, electrical, plumbing, and mechanical works for this project.

Table 2-13 Procurement Sources of Materials and Equipment

	Material/equipment	Procurement source	Remarks
Construction material	Cement	Mongolia	Domestic product
	Sand, gravel	Mongolia	Domestic product
	Reinforcing bar	Mongolia	Domestic product
	Mold, lumber	Mongolia	Domestic product
	Metal furniture	Mongolia,Third country	Imported products are widely used but domestic products may be procured.
	Steel furniture	Third country	Imported products are widely used.
	Furniture fittings	Third country	Imported products are widely used.
	Brick for wall	Mongolia	Most dressing tiles are imports.
	Floor tile	Mongolia,Third country	Imported products are widely used but domestic products can be procured.
	Paint	Mongolia,Third country	Imported products are widely used but domestic products can be procured.
Electrical equipment	Incoming panel, distribution switchboard	Third country	Imported products are widely used.
	Lighting fixture	Third country	Imported products are widely used.
	Power cable pipe (rigid PVC pipe)	Third country	Imported products are widely used.
	Electric wire/cable	Mongolia,Third country	Imported products are widely used.
Air-conditioning equipment	Heating equipment	Third country	Imported products are widely used.
	Ventilating fan	Third country	Imported products are widely used.
Plumbing equipment	Pump	Third country	Imported products are widely used.
	Sanitary fixture	Third country	Imported products are widely used.
	Water supply pipe/drainage pipe (rigid PVC pipe)	Third country	Imported products are widely used.
	Water tank	Third country	Imported products are widely used.

2) Method of transportation

As Mongolia is a landlocked country, the main transportation is by land. As shown in the diagram below, domestic products will be transported by land from Ulaanbaatar to Kharkhorin sum. Products imported from China will be procured in Beijing or Shanghai and transported by rail to Ulaanbaatar. Products procured from third countries and Japan will be transported by sea to Tianjin, from where products will be transported by rail to Ulaanbaatar. Under present circumstances, it is possible to procure the products

shown in Table 2-13 in China. In principle, all third country products will be procured from China.

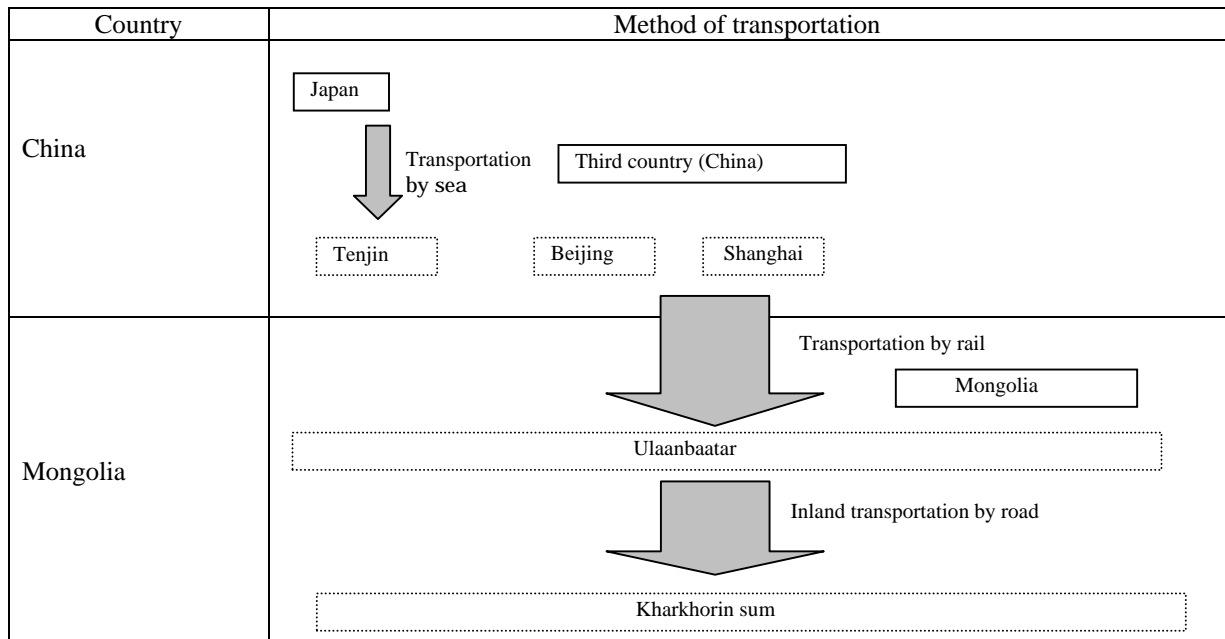


Fig. 2-9 Transportation Route

(2) Procurement of Equipment

1) Procurement of Equipment

In principal equipment, which does not require consumables or spare parts, will be procured in Japan or Mongolia. Regarding equipment, which requires supplies of spare parts, consumables, and maintenance services, will be procured from manufacturers who have local distributors that can supply necessary parts, consumables and services, in Mongolia. The possibility of procuring third country products will be considered so long as there are local distributors, which meet the above conditions.

The equipment, which will be from third country products and require services by local distributors or branches are shown in Appendix-4 titled “List of Selected Items of Equipment.”

Method of Transportation

Container transportation will be the basic method of transportation in light of the need to prevent theft and loss in transit.

Equipment that is to be procured from Japan will be transported by sea from Japan to Tenjin, and will be transported by rail to Ulaanbaatar. They will then be transported by land to the project site in Kharkhorin sum.

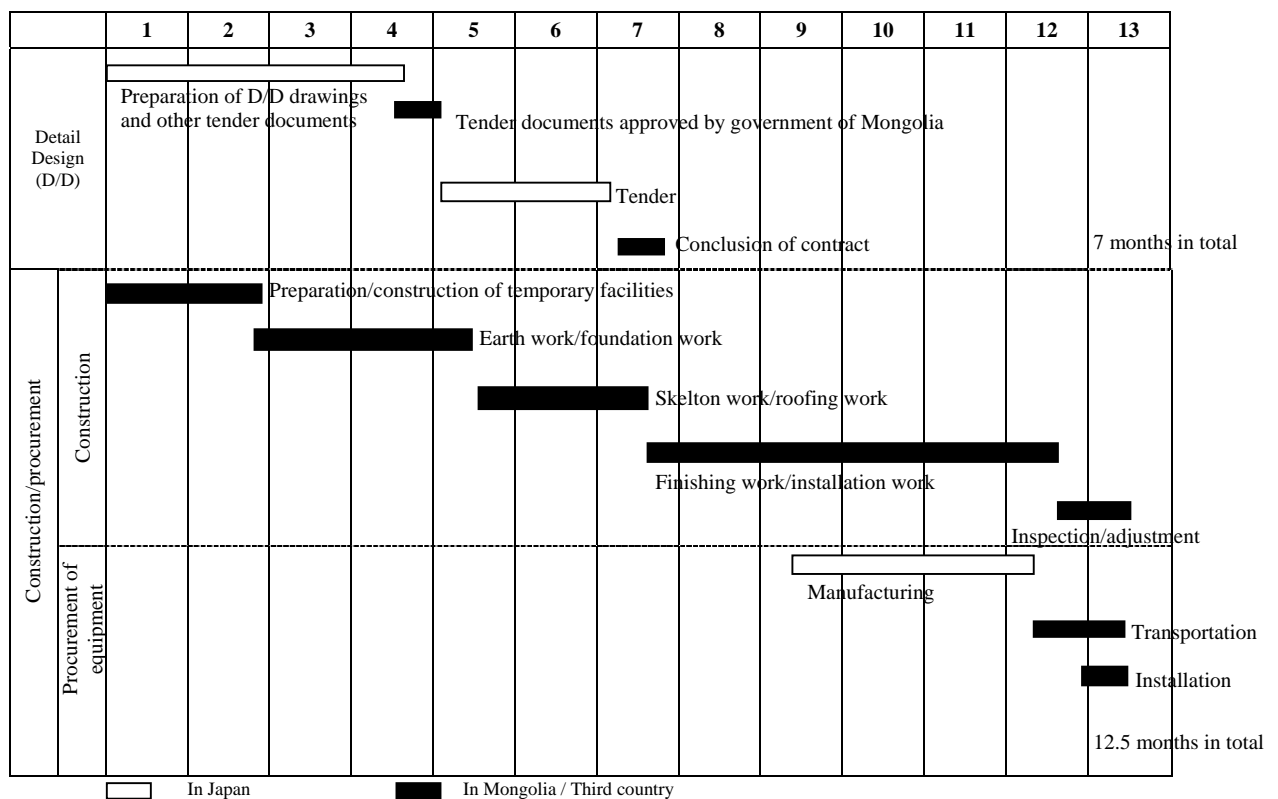
Those which to be procured from the third country (China) will be transported by rail from China to Ulaanbaatar, and then by land to the project site.

Those, which to be procured in Mongolia will be transported by truck to the project site.

2-2-4-7 Implementation Schedule

When the two governments sign the Exchange of Notes for the implementation of the project, the construction work and the equipment work are to be carried out according to the following schedule.

Table 2-14 Implementation Schedule



(1) Detail Design

After concluding the consultant agreement with the Ministry of Education and Culture's Bureau of Culture and Art, which is the project implementing agency of the Government of Mongolia, the consultant is to prepare detail design drawings, specifications, and other tender documents based on the basic design study report. In the meantime, the consultant is to have all the tender documents, including drawings and specifications, approved after due consultations with the representatives of the Government of Mongolia.

(2) Tender

The equipment supplier and the construction contractor are to be decided on by tender procedure. The order of the procedure is as follows, advertisement of tender, screening of applicants (prequalification), handing out of tender documents and explanation of the documents, question-and-answer session, tenders opening, evaluation of tenders, and conclusion of contracts. Meanwhile, the project implementing agency in Mongolia is to proceed with the procedures for obtaining permits, such as land use permission, permission to build, issuance of business visas, etc. prior the start of the project and the consultant is to support this process.

(3) Construction Work and Equipment Work

Judging from the details and sizes of the planned facilities and the local construction situation, it is expected that the period of implementation of this project, including installation of equipment, will be 12.5 months if the procurement of construction materials and equipment progresses smoothly.

2-3 Obligations of Recipient Country

In implementing this project, the project implementing agency is required to undertake the following within the specified period of time:

- (1) To obtain building permit prior to the start of the construction work,
(The project implementing agency must notify the relevant authorities of implementing the project and obtain building permit prior to commencement of the construction work.)
- (2) To remove existing structures, waste, trees and other obstacles to the construction work,
- (3) To implement exterior work such as landscaping and construction of gates, fences and guard house,
(The project implementing agency is to construct gates, boundary fences and (if needed) a guard house and to carry out landscaping.)
- (4) To provide the infrastructure (power supply, water supply and drainage) up to the boundary of the project site,
- (5) To secure land for temporary office, work area, materials storage shed, etc. and to provide temporary power, water supply and telephone service to the project site for the purpose of construction work during the construction period,
- (6) To operate, maintain and manage the facilities and equipment,
(The project implementing agency is to secure budgetary appropriations and staff members that are necessary for ensuring the proper and efficient use of the facilities constructed and equipment procured under this project.)
- (7) To bear commissions, namely advising commissions of an Authorisation to Pay (A/P) and payment commissions, to a Japanese bank for the banking services based upon the Banking Arrangement (B/A),
- (8) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,
- (9) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in Mongolia with respect to the supply of the products and services under the verified contracts,
- (10) To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Mongolia and stay therein for the performance of their work,
- (11) To provide necessary permissions, licenses, and other authorisation for implementing the Project, if necessary
- (12) To bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project.

2-4 Project Operation Plan

2-4-1 Operation Plan

(1) Staffing Plan

Number of museum staff is 21 including the director as shown in Fig. 2-10. The organization consists of 3 departments; Marketing Department for planning/ management, Financial Department for administration/ maintenance, and Research Department for exhibition/research. The director will be dispatched from the Bureau of Education and Culture and all others are to be newly employed as local government employees. Since the project does not include specialized facilities equipment but only locally common ones, the technical level of the local staff for maintenance of the equipment will be sufficient.

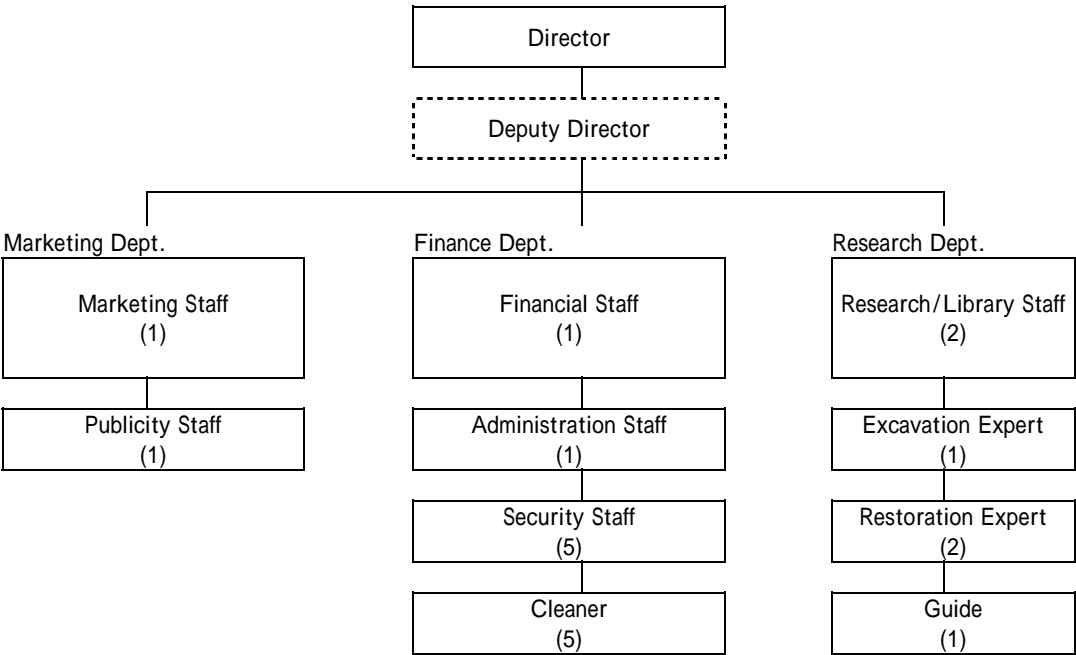


Fig. 2-10 Project Implementing Agency

(2) Budget Plan

The projected annual operating budget is 42,300,000 Tg (approximately 4,130,000 Yen), out of which 32,300,000 Tg will come from the national coffers and 10,000,000 Tg from the revenue of admission fees. The annual operating budget of the Erdene Zuu Museum, which is situated very close to the new museum being managed by the local government, is 40,260,000 Tg that is covered by the revenue from the admission fees (20,000 to 23,000 / year) and the remaining amount from sales at the museum shop. As a comparable number of visitors are expected for the new museum as well, it is considered possible for it to have the revenue sufficient to cover the entire operation and maintenance expenses. Therefore, even though the budget allocated from the national coffers dips from the budget expected at present, the operating budget of the museum will be fully compensated with the revenue of the admission fees.

2-4-2 Maintenance Plan

Except for the coal boiler caretaker, personnel for daily maintenance such as cleaning, replacing broken glass, etc., will be sufficient for this project because there is no sophisticated equipment that requires skilled personnel and it is possible to outsource maintenance services when necessary.

2-4-3 Operation and Maintenance Cost

The following table shows the estimated operation cost of the Kharakhorum museum.

Table 2-15 Estimated Operation Cost of the Kharakhorum Museum

Item	Estimated initial operating budget of Kharakhorum Museum (in thousands of Tg)
Disbursements	
Salary	15,360.0
Annuity	3,302.4
Health insurance	752.6
Total goods/service expenses	22,888.8
Stationery expenses	-
Electricity charges	1,040.0
Heating expenses	1,500.0
Water supply and drainage expenses	1,543.0
Fuel/transportation expenses	1,927.8
Communication expenses	850.0
Domestic travel expenses	450.0
Overseas travel expenses	660.0
Book expenses	580.0
Equipment expenses	1,600.0
Repair expenses	500.0
Charges	480.0
Scientific research expenses	1,500.0
Clothing expenses	250.0
Food expenses	2,508.0
Cultural property preservation expenses	
Bonus/lump sum	
Capital depreciation expenses	4,500.0
Exhibit purchase expenses	3,000.0
Total	42,303.8
Incomes	
Incomes from museum activities	10,000.0
Subsidies from national treasury	32,303.8
Total	42,303.8

It is estimated that there will be no significant difference in terms of the number of visitors and incomes from museum activities between the Erdene Zuu Monastery Museum and the new museum since the two museums are located close to each other. Income of the Erdene Zuu Monastery Museum of 2005 was 40,264,000Tg, which is about the same as the estimated expense of the new museum. It is possible to defray expenses of museums from incomes of the museums' activities in Mongolia. Therefore, it is concluded that even if the state contribution were reduced, there will be no problem with operation and maintenance of the museum, as it is possible for the Kharakhorum museum to defray the necessary expenses with ease.

2-5 Estimated Project Cost

Estimated project cost required for realization of the Project under the conditions described in (3) Conditions of Estimation is Japanese Yen 299 Million. The estimated project cost of Japanese Side is not necessarily the amount to be indicated in the E/N.

(1) Project Cost Borne by Japanese Side

Table 2-16 Project Cost Borne by Japan

Item		Estimated Cost (Million Yen)
Facility	Building Construction	228.4
	Installation of Building Facilities	
	Installation of Exhibition Case	
Equipment	Exhibition Equipment	8.8
	Restoration/Storage Equipment	
Detail Design, Supervision		61.8
Total		299.0

Note: This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant

(2) Project Cost Borne by Mongolian Side

Electricity, city water, sewerage, telephone cost	35.4 million Tg (approx. JY 3.5 million)
Access road construction cost	31.8 million Tg (approx. JY 3.1 million)
Exhibition Installation cost	59.0 million Tg (approx. JY 5.7 million)
Furniture/fittings purchase cost	5.9 million Tg (approx. JY 0.6 million)
Total	132.1 million Tg (approx. JY 12.9 million)

(3) Condition of Estimation

Estimated Date : January 2006

Exchange Rate : 1US\$=110.51Yen

Construction Period : As shown in Table 2-13

Others : The Project will be implemented in accordance with the rules and regulations of Japan's grant aid.

Chapter 3. Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

(1) Direct impact

Collected relics will be systematically classified and stored safely and more than 1000 items of the relics will be exhibited to the public.

(2) Indirect Impact

- The pupils and children around the region will be educated about restoration of the ruins of the Mongolian Empire and their understanding of and interest in their own traditional culture will be enhanced through orientations, which will be held at the multi-purpose hall.
- It will be possible for Mongolian side to start their own planned restoration activities at the excavation sites, which have not been touched.
- An increase of the number of tourists to Kharakholum is expected by the construction of the museum.
- It is expected that the museum will become the center of friendship between Mongolia and Japan through activities in the Temporary exhibition room such as special exhibitions.
- By exhibiting the relics, revenue is expected from the admission fees to the museum.

3-2 Recommendations

This project is expected to have sufficient beneficial impact and will widely contribute to the education of Mongolian people about their own traditional culture and civilization. However, in order to contribute further, the following improvement and preparation are also desirable.

(1) Continuous training of the specialists

It is expected that operation and administration of the museum will be managed well under the leadership of the museum director from the Bureau of Culture and other staff. However it is necessary to establish continuous education/training system of the staff, e.g. museum specialist, restoration specialist and guides, through OJT and seminars during winter season because it takes long time and many experiences to cultivate sufficiently experienced special staff in each field.

(2) Promotion of the implementation of Kharakhorum Master Plan

Timely opening of the museum is guaranteed since the access road construction on the south side of the museum premises is scheduled to be completed before the commencement of this project. However, it is indispensable to have infrastructure, such as water supply, sewerage, and regional hot water supply, for an economical operation of the facility and thus the provision of infrastructure according to the

masterplan is essential.

(3) Programmed change of exhibits

An attractive display of exhibits, the main characters of the museum, leads to increase in the number of visitors of the museum. As a historical museum, which permanently exhibits and stores relics and valuable cultural heritage as tourism attraction, the museum is required to periodically change/renew exhibits at appropriate time in cooperation with the Academy of Science, the Cultural Property Center, and UNESCO-Mongolia World Heritage Committee.