ENERGY DEPARTMENT
MINISTRY OF INFRASTRUCTURE DEVELOPMENT
MONGOLIA

BASIC DESIGN STUDY REPORT
ON
THE REHABILITATION PROJECT
FOR IMPROVEMENT OF THE 4TH THERMAL
POWER STATION IN ULAANBAATAR (PHASE II)
IN
MONGOLIA

OCTOBER 1996

JAPAN INTERNATIONAL COOPERATION AGENCY
EPDC INTERNATIONAL LTD.

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PREFACE

In response to a request from the Government of Mongolia, the Government of Japan decided to conduct a basic design study on The Rehabilitation Project for Improvement of the 4th Thermal Power Station in Ulaanbaatar (Phase II) and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Mongolia a study team from May 20 to June 14, 1996.

The team held discussions with the officials concerned of the Government of Mongolia, and conducted a field study 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 teams.

October 1996

Kimio Fujita

President

Japan International Cooperation Agency

October 1996

Letter of Transmittal

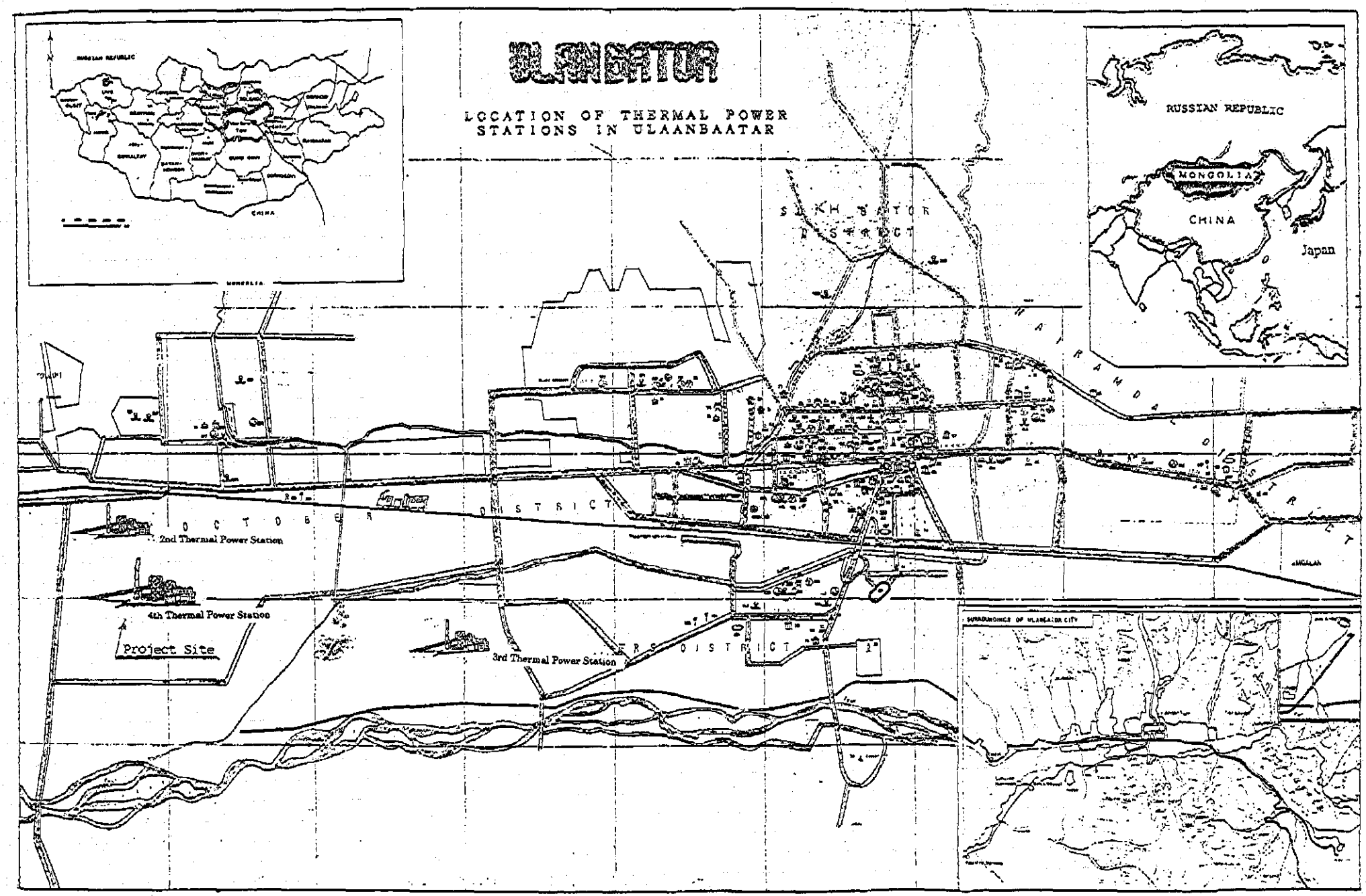
We are pleased to submit to you the basic design study report on The Rehabilitation Project for Improvement of the 4th Thermal Power Station in Ulaanbaatar (Phase II) in Mongolia.

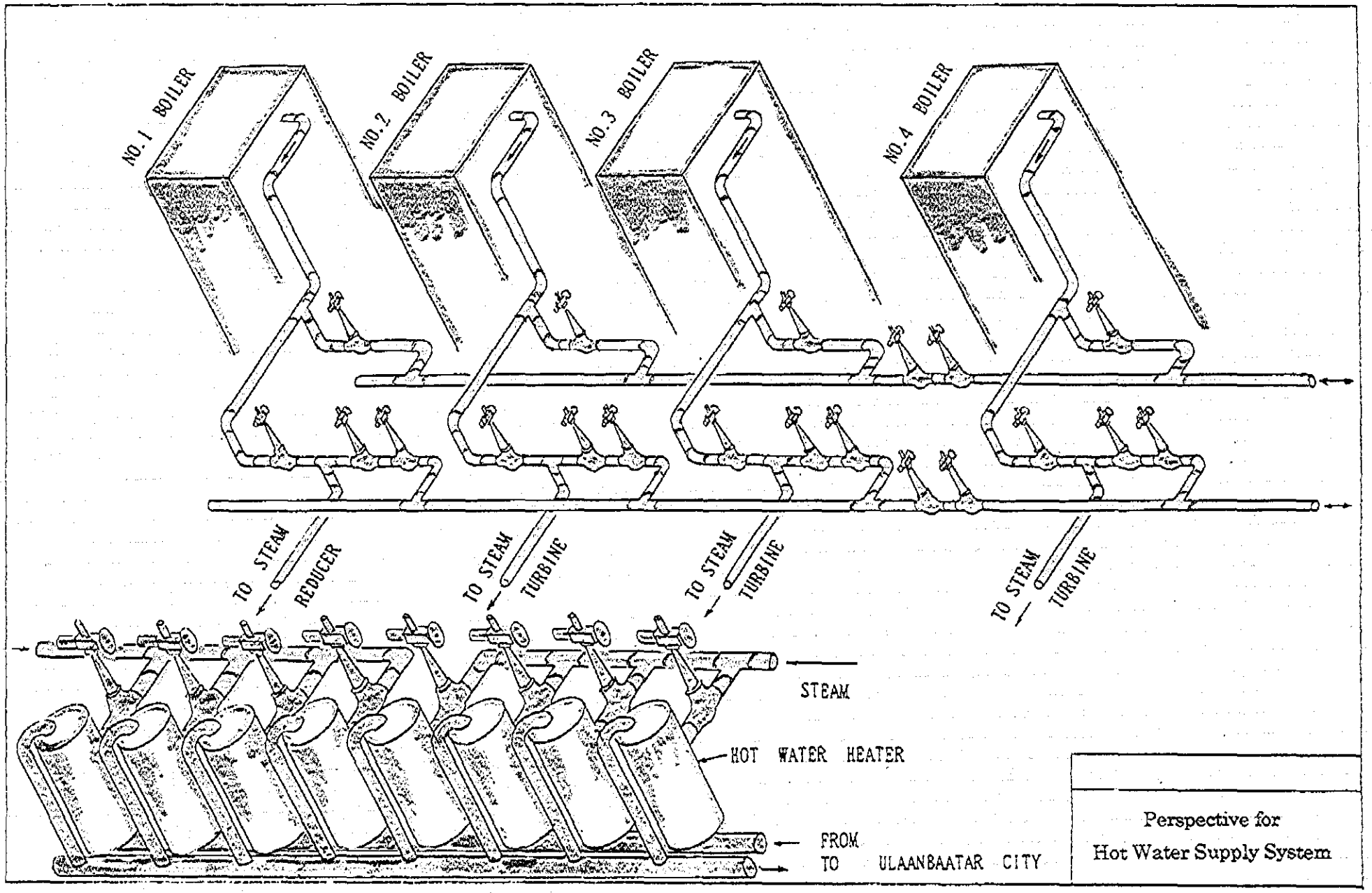
This study was conducted by EPDC International Ltd., under a contract to JICA, during the period from May 10, 1996 to October 31, 1996. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mongolia and formulated the 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,

Hiroshi Isaka
Project Manager,
Basic design study team on The Rehabilitation Project for Improvement of the 4th Thermal Power Station in Ulaanbaatar (Phase II)
EPDC International Ltd.


ULAANBATOR
LOCATION OF THERMAL POWER STATIONS IN ULAANBAATAR
RUSSIAN REPUBLIC
MONGOLIA
CHINA
Japan
SUKHBAATAR DISTRICT
CHINGELTEI DISTRICT
BAYANGOL DISTRICT
2nd Thermal Power Station
4th Thermal Power Station
Project Site
3rd Thermal Power Station
SURROUNDINGS OF ULAANBAATAR CITY



Perspective for
Hot Water Supply System

Abbreviations

ADB	Asian Development Bank
CES	Central Energy Systems
DANIDA	Danish International Development Assistance
DHC	District Heating Company
MEGM	Ministry of Energy Geology and Mining
OECF	Overseas Economic Cooperation Fund

CONTENTS

CHAPTER 1 BACKGROUND OF THE PROJECT

Chapter 1 Background of the Project

Mongolia is situated in the eastern part of central Asia and on its northern border it is surrounded by Russia and on its southern border, by China. It is a land-locked country with a surface area of 1.56 million square kilometers, a size roughly by four times larger than the land area of Japan. It has a continental climate, with the average atmospheric temperature being minus 1°C. During the harsh winter period from December through the end of January, the average ambient temperature reaches minus 20°C. The average annual rainfall ranges from 200 mm to 400 mm and the rainfall is concentrated during the period from June through the end of September. Under these harsh climatic conditions, Mongolia has traditionally been engaged in livestock farming in the form of pasture farming, including sheep, cattle and horse grazing.

The nation's total population stands at 2.31 million (1995). Of this total population 27%, namely about 620,000 inhabitants, live in the capital Ulaanbaatar. Mongolia's principal industry consists of pastoral livestock products and mining products such as copper and molybdenum ores. The gross national product (GNP) per capita is about 360 US dollars (1995). Electric power generation stands at 2,050,000 MWh (1995) for the nation as a whole, in addition 380,000 MWh, which shares 19% of the locally generated electricity is imported from Russia. Most of the electric power generated in Mongolia is produced in thermal power stations using the coal mined locally in Mongolia itself. These power stations function also as heat supply stations since the steam generated at the electric power stations is partly utilised to produce hot water which is supplied to the general households for heating and cooking, etc.

The total electric power generating capacity of Mongolia is approximately 877 MW. The six provinces in the country, namely, the central province of Tov with the capital Ulaanbaatar and two other provinces which are adjacent to the capital city, namely, the province of Bulgan with the industrial city of Erdenet and Serenge with the city of Dalhan as well as the neighboring three provinces have been linked through 220 kV and 110 kV power transmission lines named Central Energy System. It has the capacity of 788 MW (1995), with five power stations being operated, namely the 2nd, 3rd, 4th, the Dalhan and Erdenet power stations. The remaining 11 provinces outside this Central Energy System are supplied with power from individual diesel generating stations while the hot water is supplied from boilers exclusively intended for the hot water supply purpose, not from the Power Stations.

The 4th Thermal Power Station which comes under the present Project was built in Ulaanbaatar city by the Soviet Union in the 1980s. It has a power-generating capacity of 540 MW and is equipped with 8 boilers and 6 turbine generators. Its plant capacity accounts for approximately 70% of the entire Central Energy System.. The hot water supply from the 4th Thermal Power Station for the city of Ulaanbaatar is connected to the hot water supply pipelines from the 2nd and 3rd power stations, and the 4th Power Station has a major share as it supplies roughly 60% of the hot water for the city as a whole.

The hot water pipeline system covering the capital city has a total extension of 230 km and supplies hot water to the household apartments inhabited by about 360,000 people as well as to the kindergartens, schools and other educational facilities. It is clear, therefore, that the stable operation of this power station is indispensable in terms of securing healthy life of the inhabitants of Ulaanbaatar.

Due to the disintegration of the former Soviet Union, however, financial and technical support for the benefit of Mongolia has ceased and the shift of the national economy to a free-market oriented economy has created economic confusion. For the above reasons, the power station has been operated without the necessary maintenance so that there has been an increasing number and frequency of accidents by which stable supply of hot water cannot be assured. In view of this situation, the Government of Japan decided in 1992 to extend its support on the basis of an Emergency Grant Aid for Economic Cooperation. With these funds, rehabilitation has been carried out on pulverised coal supply system, ash treatment system, flue gas treatment system, and specific parts of the boiler plant system.

Upon the fulfillment of these rehabilitation, the boiler have been improved partly and the breakdown incidence has been reduced. Nevertheless, the power station has faced a lot of difficulties because of the natural aging of the plant equipment and machines which have been used over many years and the deficit of the necessary repair funds. In view of these situation in Mongolia, OECF has extended a Loan Assistance Fund for Economic Cooperation by which the renewal of the coal combustion systems and the control system for the Nos. 1, 2, 3 & 4 boiler units of the 4th Thermal Power Station is scheduled to start in 1996.

Within the equipment in this Power Station, the valves related to the hot water supply system has been worn out in recent years so that the hot water supply capability has been extremely decreased. As a result, the apartments and educational facilities such as schools cannot be heated more than 8°C even during the severe winter months. The low room temperature has an adverse effect on public health, and especially on the health of the children. It is a vital issue for Mongolia to keep the health of the inhabitants of Ulaanbaatar by the rehabilitation of the related equipment including valves to restore the capability of the hot water supply system. As a result, Mongolia has requested the Government of Japan for an Emergency Grant Aid for Economic Cooperation relating to the procurement of materials primarily the valves of the hot water supply system at this Power Station.

CHAPTER 2 CONTENT OF THE PROJECT

Chapter 2 Content of the Project

2-1 Objectives of the Project

Ulaanbaatar city, the capital of the State of Mongolia has a population of 617,000 people and approximately 53,000 households. Most of the residents are supplied with hot water from the power station for heating , cooking, etc. According to the statistics of the Mongolian Bureau of Statistics, the population of Ulaanbaatar is growing at an annual rate of around 2.4%, as shown in Table 2-1.

With the population growing up, the construction of new housing such as apartments is booming and the demand of hot water is also increasing. However, the thermal power station have faced a lot of difficulties such as deficit of funds for repair and the lack of maintenance technology after the disintegration of Soviet Union. At this moment, in the harsh winter period, the apartment housing (about 360,000 residents) and the educational facilities, including kindergartens and schools, are not satisfied with the hot water supplied.

Table 2-1 Populations in Ulaanbaatar city

Year	1991	1992	1993	1994	1995
Populations x (1000)	562.6	575.0	594.0	608.6	616.9

Source: State Statistic

Therefore, the objective of this Project is to repair and improve the hot water supply system of the 4th Thermal Power Station which plays a vital role on the production of hot water and to recover its capability. In line with the various other rehabilitation programs, the contribution to the everlasting stability of civilian lives in Ulaanbaatar through the stable supply of energy is the ultimate objective of this Project.

2-2 Basic Concept of the Project

2-2-1 Confirmation of the Request

The request initially made by the Government of Mongolia for this Project referred to the valves for the hot water supply system, communication facilities and mill-related epuipment. With reference to the mill-related equipment, ceramic linings as the wear-resistant material for the pulverised coal system and detectors for the iron lumps existing in the coal are requested. While the importance of the mill-related equipment is being acknowledged, it has been agreed through consultation with the Government of Mongolia that the equipment should be excluded because the equipment is closely related to the Loan-Based Construction Projects. It has also been agreed that the tools required for the installation during the course of this Project and for the proper maintenance and management which will be used after the fulfillment of this Project should be additonally procured.

2-2-2 Basic Concept

The objective of this Project is to implement the rehabilitation for the hot water supply system of the 4th Thermal Power Station which plays an major role for the hot water supply to the city of Ulaanbaatar. Through this rehabilitation it will be possible to ensure that the hot water temperature for the heating and cooking, etc. will be kept at the specified value.

In line with the ADB Rehabilitation Project for the 3rd Ulaanbaatar Thermal Power Station, the DANIDA Rehabilitation Project for the hot water supply piping system in the city, and the replacement of piping and lagging work scheme carried out in the old district of the city by the Public Heat Supply Corporation, this Project will interact to restore the capability of the hot water supply system which will ensure the health of the citizens during the harsh winter season.

Followings are the basic concept for the Project.

Valves

To minimize the stand-by equipment, the steam system of the 4th Thermal Power Station is of common header, namely the steam generated by each boiler is collected in a common header and then distributed to each turbine and/or the heater for hot water supply system. And water system also have a common header for same reason.

The valves are provided at each point where the steam piping from each boiler is connected to the common header. These valves are for isolation of respective unit from the common header. In addition to these valves, the isolation valves are also provided at the appropriate place of the common header to stop the multiple units at once by isolating the certain area of the common header.

It is preferable to provide the isolation valves in the common header by which any unit will be able to isolate for the shut-down while the other units are in operation. But this system requires high reliability of the constituent elements of each equipment. On the other hand, without any isolation valve in the common header, all units should be shut-down even if only one unit has to be stopped for repair. Also the repair of the said unit shall be waited until the whole units are ready for shut-down. The existing sysytem goes between those two systems. Namely, the shut-down including multiple units are possible and the repair of the relevant unit will be carried out without shut-down of the whole units.

In view of the unitwise and multiple shut-down, the valves provided at each point where the steam piping from each boiler is connected to the common header and also the valves in the common header are most important. Therefore, all these valves shall be replaced. On the water supply system, the pipings are also connected to their common header with isolated valves. These valves shall also be replaced for the same reason.

Water Level Gauge

For the safe operation of the boiler, it is indispesable to monitor the water level of the relevant equipment. The water levels are used to be monitored by means of the water level gauge by which the each water level is fed backed to boiler for automatic control by

means of electrical signal. At the 4th Thermal Power Station, the water level has been monitored by the naked eyes and the water level has been adjusted manually. As the renewal of the system to automatic control is necessary huge amount of cost and time, the same type of water level gauge (directlly reading by naked eye and controlling manually) as existing will be procured in this Project.

Communication Facilities

In operation and maintenance of the thermal power plant, the exchange of the mutual communication is very important. For this purpose the facilities named paging system have been used.

In this project, telephone and speaker system same as existing system will be procured. The existing telephne cables shall be re-used for this rehabilitation.

Tools and Equipment

Due to the lack of uniform quality control by insulating the motor coil manually, a lot of puncture of the motor has been reported in the power station. For the sake of keeping the quality of the insulation and prolonging the possible period to be used, the motor coil winding and forming machines will be procured in this Project.

To assure the maintenance after fulfillment of the Project, the maintenance tools including all types of grinders, drills verniers., etc. will also be procured.

2-3 Basic Design

2-3-1 Design Concept

(1) Natural (Ambient) Conditions

1) The meteorological data for the city of Ulaanbaatar covering the last five years (from the beginning of 1991 through the end 1995) indicate that the highest summer temperature recorded was 34.6°C (August) and that the lowest winter temperature,

minus 34.5°C (December). Since the equipment to be procured under the Project are all intended for indoor installation in the power station and their design temperatures shall be 40°C in highest , minus 10°C in minimum.

2) By the data of the meteorological statistics on seismic activity, typhoons and rainfall in the rainy season, there are no particular restriction for the design and installation of the equipment to be procured.

(2) Local Firms and Locally Available Equipment and Materials

1) Under this Project, the installation work associated with valves and water level gauges, etc. will be carried out by the staff of the 4th Thermal Power Station. For the high-temperature and high-pressure valves, however, special skills will be required for welding. While the 4th Thermal Power Station has welders with these special skills, there will be a manpower shortage of welders because of many welding works beeing carried out in short period.

Since it will not be possible to recruit such welders in the city of Ulaanbaatar as the city has no developed heavy industry sector, the 4th Power Station may have to ask assistance to the 3rd Thermal Power Station which is also located in Ulaanbaatar, and/or to the Power Station in near-by Erdenet or it may have to employ the Russian technicians who built the 4th Thermal Power Station.

2) The associated materials required for the installation of the valve, etc. such as scaffolding, thermal insulation, acetylene, and oxygen, etc. have to be procured by his own cost by Mongolia.

(3) Maintenance and Management Capabilities of the Executing Organizations

1) The 4th Thermal Power Station acting as the executing agency for this Project had been relied on the technical support of engineers of the Soviet Union until 1990 when the former Soviet Union had transferred their technical know-how within a short time and the power station had been entirely handed over to Mongolia side. By the short

experience and the deficit of the repair fund, the Power Station has had a large number of breakdowns which have encouraged the staffs of the power station to handle difficulties and study the know-how for the welding and installation work. It is therefore understood that the staffs of the Power Station will be fully competent to carry out the installation and welding of the valve procured under this Project.

Prior to the installation by Mongolia, Japanese engineer will demonstrate the installation of the typical valve to transfer the necessary technical know-how. Once the demonstration is fulfilled, the Mongolian staffs will be able to carry out the subsequent installation by themselves.

It is proposed that the maintenance and management technique of the equipment after installation shall also be transfered by manufacturer and the annual expense for maintenance and management shall be definitely appropriated.

2) Under the assistance and recommendation of JICA specialist staying at the 4th Thermal Power Station for two years starting from April 1996, it is deemed that management skills and technology of the Power Station staff will persistently be advanced.

3) The engineer and technician have been motivated through the in-house training programs established by MEGM. The technical skill examinations have been held on a regular intaval and the results have also been referred to their wages or salaries. By these training system and incentive on wages, the engineer and technician have persistence willingness to promote themselves. Terefore, it is presumed that the sound maintenance and management ability will be established upon the proper technical assistance and/or transfer.

(4) Grades of Equipment and Materials

For the valves that share the major portion of this Project, they are required to be of robust construction and having high reliability pursuant to the pressure and temperature

defined in the applicable standards. The electric control mechanism of motor driven valves are of integral type (all electric control mechanism together with contactors are furnished within a robust steel case as a whole) due to the contaminated atmospheric condition in the Power Station. The communication facilities are of digital type and has no mechanically operated contacts as maintenance free.

(5) Applicable Standard

The standards applicable to the design shall primarily pursuant to the Japanese Standards with the exception that equivalent or superior foreign standards may be used as applicable.

Japanese Industrial Standards (JIS) shall be used for the mechanical parts of the valves and water level gauges, the Standards of the Electrical Society and the Japanese Electrical Standards Committee (JEC), the Japanese Electrical Industry Association (JEM) and the Japan Electrical Wire and Cable Industry Standards (JCS), for the electric motors and communication facilities.

(6) Construction Period

The construction work associated with this Project is scheduled to be completed within Japanese one fiscal year (starting in April and ending in March next year). The valves to be connected to the common steam and water supply headers, and the valves for isolation of the common header pipe, however, shall be replaced in the summer of the fiscal year because the whole shut-down of the power station is vital for the replacement. During the same period, the project under the OECF Loan Assistance scheme will be commenced and scheduled to be completed within 18 months.

(7) Scope of Project Work

The hot water supply system consists of the boilers by which the steam is generated, the hot-water heater by which the water is heated with the steam, and the pumps which feed the hot water to the households in the city. The latter two equipment, namely the

hot-water heaters and pumps will be repaired by Mongolian side because very slight repair and improvement are expected. This Project shall therefore share the rehabilitation of the valves in the steam system from the steam generators (boilers) to the hot-water heaters and of the valves in the water supply system to the boiler.

(8) Installation Work

Prior to the installation by Mongolia, the Japanese engineer take part to demonstrate the installation of the typical equipment. After the technical skills have been properly transfered, Mongolia will execute the associated installation work.

The installation of each valve will require sophisticated quality control and has to be completely finished until coming winter. To ensure the installation work in keeping the quality control and the proper progress, Japanese engineers will be assigned to the Power Station. For the communication facilities, the existing telephone wire will be re-used. It will therefore be necessary to assign Japanese engineers to witness the check of wire and to perform the necessary interface tests on the communication facilities.

2-3-2 Basic Design

(1) Overall Plan

This Project envisages the replacement of the valves which are incorporated in the steam and water supply lines of the hot-water supply system, the replacement of the level gauges for monitoring the water level in relevant vessel, the replacement of the communication facilities affording the communication link throughout the Power Station compound, and the procurement of the tools required for the installation and maintenance of the equipment and materials. Essentially, these equipment and material shall be procured for the replacement of the existing equipment in use.

Overall plan for the valves, water level gauges, communication facilities and tools stipulated in the Basic Concept are as follows:

1) Valves

In designing the valves required to keep the capability of the hot-water supply system, the followings have been taken into consideration.

① Within the system of the hot-water, the procurement under this Project will be made for the valves and short pipings necessary for the rehabilitation of the system.

Compared with the length made in Japan and/or other third countries, the existing valves made in the former Soviet Union are long toward the flow direction of liquid. By replacing the existing valves to newly procured valves, about 100 mm - 300 mm gap will remain between the end of existing piping and the newly procured valves. Though this gap will be offset by shifting the existing piping toward the valve, the repositioning of the valve supports will be necessary and also the possibility of the increment of stress will be envisaged by bending of the existing pipings. The best solution to minimize the possible difficulties said above is to insert the short piece of piping having same size and composition into the gaps.

② The specification of the valve in terms of size, pressure and temperature shall be same as those of the existing USSR-made valves, without any upgrading.

③ The mate-flanges will be procured for the flanged valves. They are effective to prevent the valve from leaking along the interface of flange.

The detail design shall be as follows.

i) Irrespectve of initial requirement (4pcs), the full sets (8pcs) of motor operated steam valves (Table 2-1 No. 1, Fig. 2-1①) will be procured . Because the aging and deterioration of the worm gear, switches, etc. have been found for all these valves.

ii) The motor operated steam valves (Table No. 2-1 No. 2, Fig. 2-3 ②) existing between each boiler and common steam header, and also existing in the common header, to isolate the intended unit(s) shall be of the utmost reliability and operability. In view of above, full sets (18 pcs.) of valve instead of the initially required 15 pcs will be procured.

iii) The motor operated water supply valves (Table No. 2-1 No. 5, Fig. 2-3 ⑤), existing in each boiler feed water supply line and the common water header are most important same as the steam valve to isolate the unit(s). The full sets (20 pcs.) of valve instead of initiallly required 18 pcs will be procured.

iv) For the manually operated water supply valves (Table 2-1 No. 7-1, Fig. 2-3 ⑦-1), all valves (8 pcs) instead of initially required 4 pcs will be procured. Because it was found that all valves have some difficulties such as leaking from valve seats, burn-out of the gland packing, etc.

v) For the manually operated water supply valves (Table 2-1 No. 7-3, Fig. 2-2&2-3 ⑦ -3), the serious deterioration such as burn-outs, leaking from the gland packing, have been fund as whole. It is decided that the total number of the valve (16pcs) instead of initially required 13pcs will be procured.

vi) For the manually operated valves (Table 2-1 No. 7- 5, Fig. 2-4 No. ⑦-5), the serious deterioration such as leaking from the glands and broken valve handles have been found. It is decided to replace all valves (total 16 pcs.)

Table 2-1 Comparison of Requested Equipment and Basic Design

No.		Item	General specifications	Requested	Basic design	Reasons for change
Valves	1	Motor operated valves	Dia. 500A, pressure 20 kg/cm², temp. 500°C, flange type, with motor control unit	4	8	For both lines I/O one line
		(for steam)	With 8t hoist	4	4	
	2	Motor operated valves	Dia. 300A, pressure 140 kg/cm², temp. 560°C, welded type, with motor control unit	15	18	Added the isolation valves to be replaced
		(for steam)	With 8t hoist	4	4	
			With 3 t hoist	10	6	
		Bypass valves for the above	20A, 140 kg/cm², 560°C	30	30	
	3	Motor operated valves	Dia. 300A, pressure 140 kg/cm², temp. 560°C, welded type, with motor control unit	8	8	
		(for steam)				
	4	Motor operated valves	Dia. 175A, pressure 140 kg/cm², temp. 560°C, welded type, with motor control unit	10	10	
		(for steam)				
		Bypass valves for the above	20A, 200 kg/cm², 230°C	36	36	
	5	Motor operated valves	Dia. 250A, pressure 200 kg/cm², temp. 230°C, welded type, with motor control unit	18	20	Added the isolation valves to be replaced
		(for feed water)	With 1t hoist	10	10	
		Bypass valves for the above	20A, 200 kg/cm², 230°C	36	36	
	6	Motor operated valves	Dia. 65A, pressure 200 kg/cm², temp. 230°C, welded type, with motor control unit	8	8	
		(for feed water)				
	7	Manual operated valve (for water supply)	7-1 Dia. 400A, pressure 25kg/cm², temp. 230°C, (flange type)	4	8	For melted down of gland packing
			7-2 Dia. 250A, pressure 25kg/cm², temp. 230°C, (flange type)	5	5	
			7-3 Dia. 200A, pressure 25kg/cm², temp. 230°C, (flange type)	13	16	For deterioration of gland packings & handles
			7-4 Dia. 150A, pressure 25kg/cm², temp. 230°C, (flange type)	12	12	
			7-5 Dia. 300A, pressure 25kg/cm², temp. 230°C, (flange type)	0	16	Large amount of steam leakage
	8	Motor operated valve (for heat exchanger)	Dia. 100A, pressure 45kg/cm², temp. 420°C, welded type, with motor control unit	38	18	For one line I/O both lines (the soundness of one line is affirmed)
			Indicator for the above (with cable)	16	18	

No.		Item	General specifications	Requested	Basic design	Reasons for change
Communication equipment			Broadcasting amplifier, telephone exchange switchboard	1	1	
Water level gauge	1	For drums	Length 457 mm, pressure 150 kg/cm², two-colored water level gauge	8	8	
	2	For deaerator	Length 1720 mm/1500 mm, outer dia. 25ϕ x thickness 3t, pressure 10 kg/cm²	6	6	
	3	For heater	Length 1250 mm, outer dia. 18ϕ x thickness 4t, temp. 400°C, pressure 14 kg/cm²	10	8	Excluding spares
	4	For heater	Length 720 mm, outer dia. 18ϕ x thickness 4t, temp. 400°C, pressure 14 kg/cm²	14	12	Excluding spares
	5	For heater	Length 220 mm, 34W, temp. 265°C, pressure 13 kg/cm²	20	18	Excluding spares
	6	For heater	Length 220 mm, 34W, temp. 345°C, pressure 26 kg/cm²	20	18	Excluding spares
	7	For heater	Length 220 mm, 35W, temp. 420°C, pressure 45 kg/cm²	20	18	Excluding spares
Mill	1	Metal detector		2	0	Out of scope
	2	Electric chain block	8 t, 3 t	8	12	For valve setting
	3	Oil jack		2	0	Out of scope
	4	ceramic lining		16	0	Out of scope
Maintenance		Heat Treatment Equipment		0	2	Welding work in short period
	2	Motor Winding and Forming Machine		0	1	Keeping the quality for Mortor winding
	3	Tool		0	1	Maintenance after rehabilitation

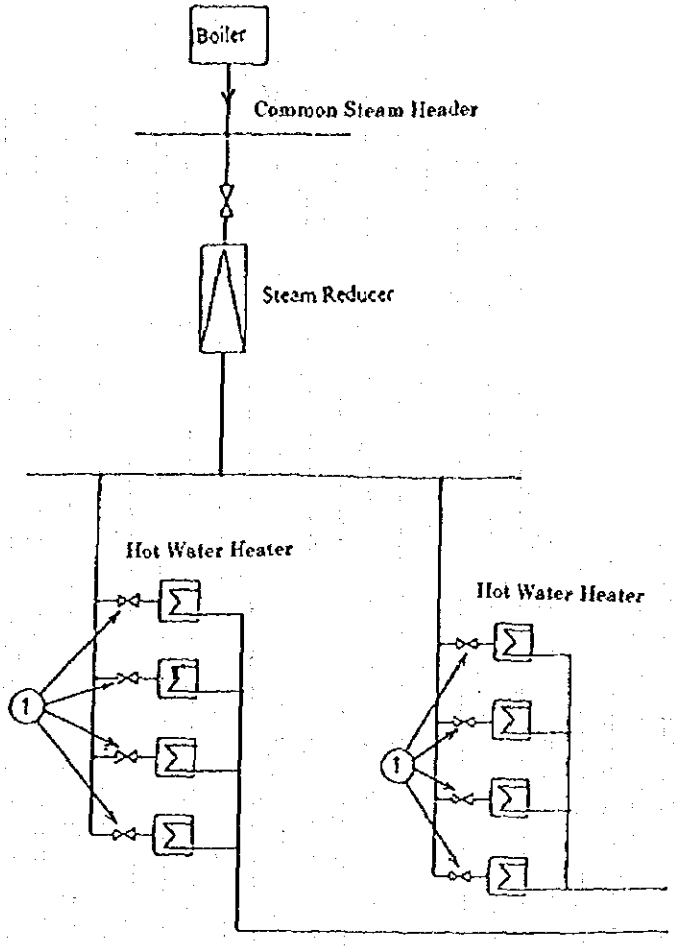


Fig. 2-1 Hot Water Supply System

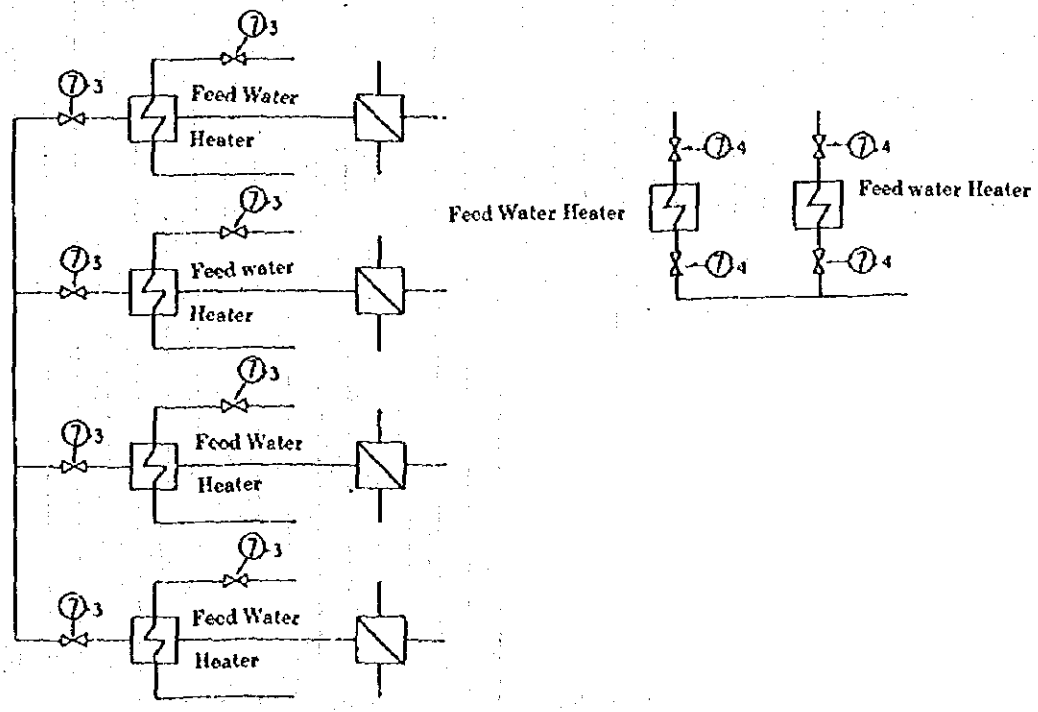
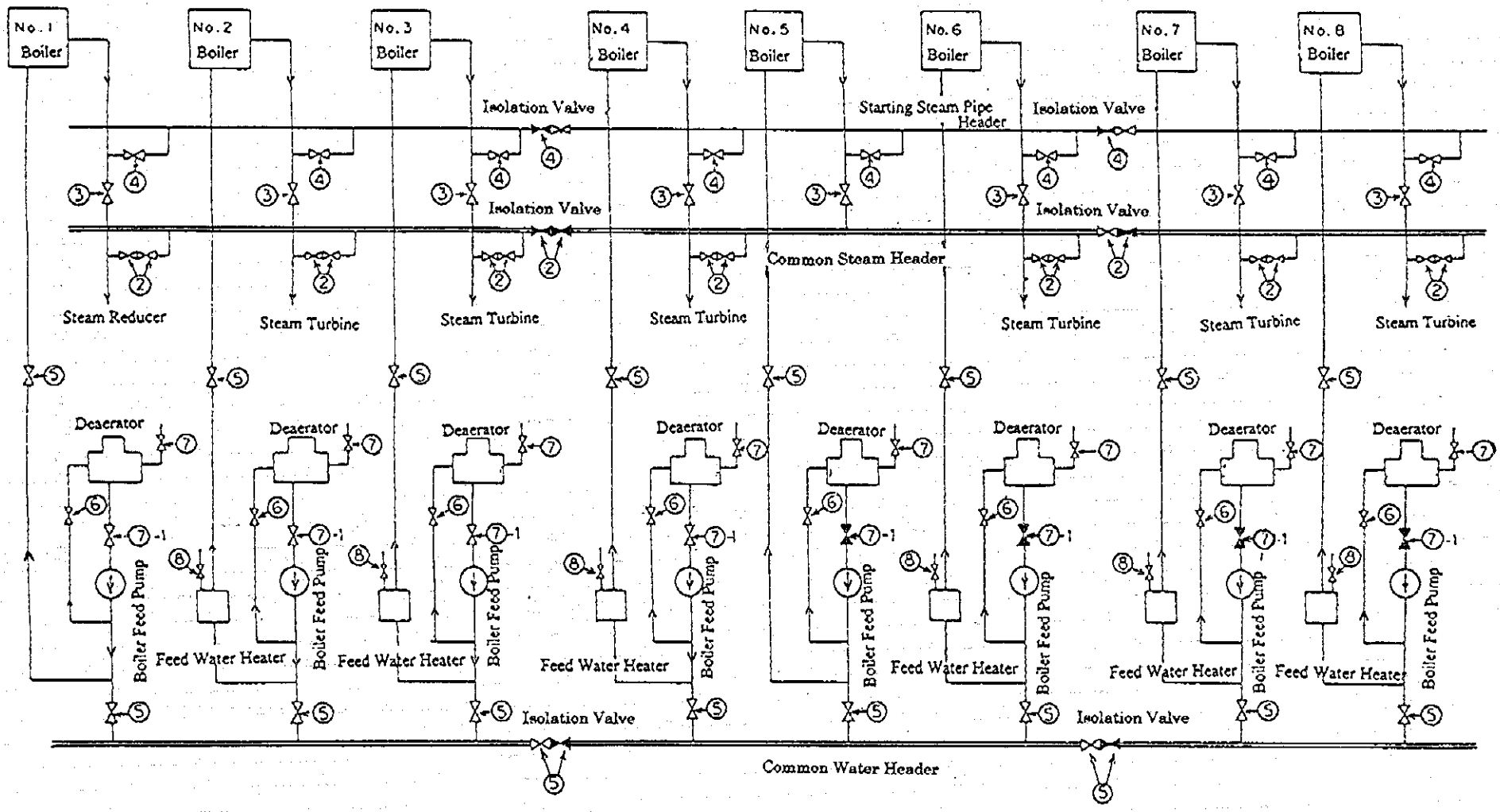


Fig. 2-2 Feed Water Supply System



Valves additionally Procured by the Request of Mongolia

Fig. 2-3 Piping Diagram

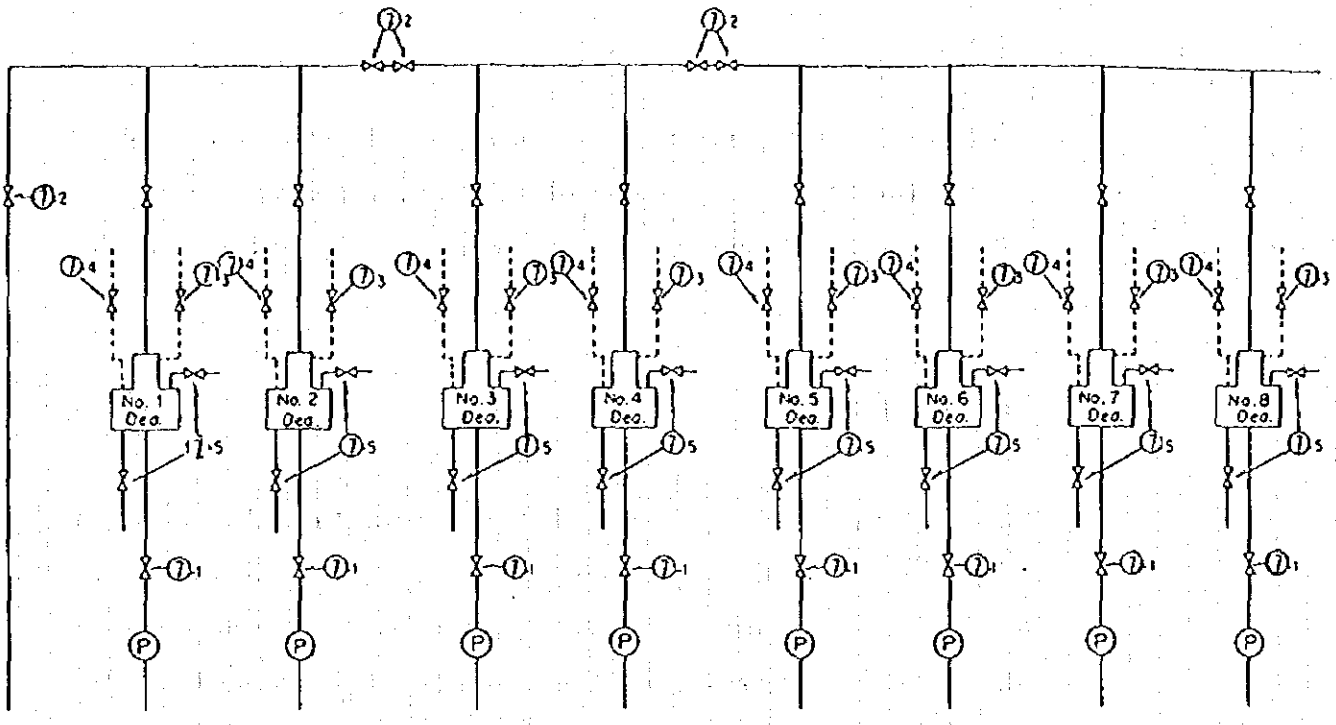


Fig. 2-4 Piping Diagram around Deaerator

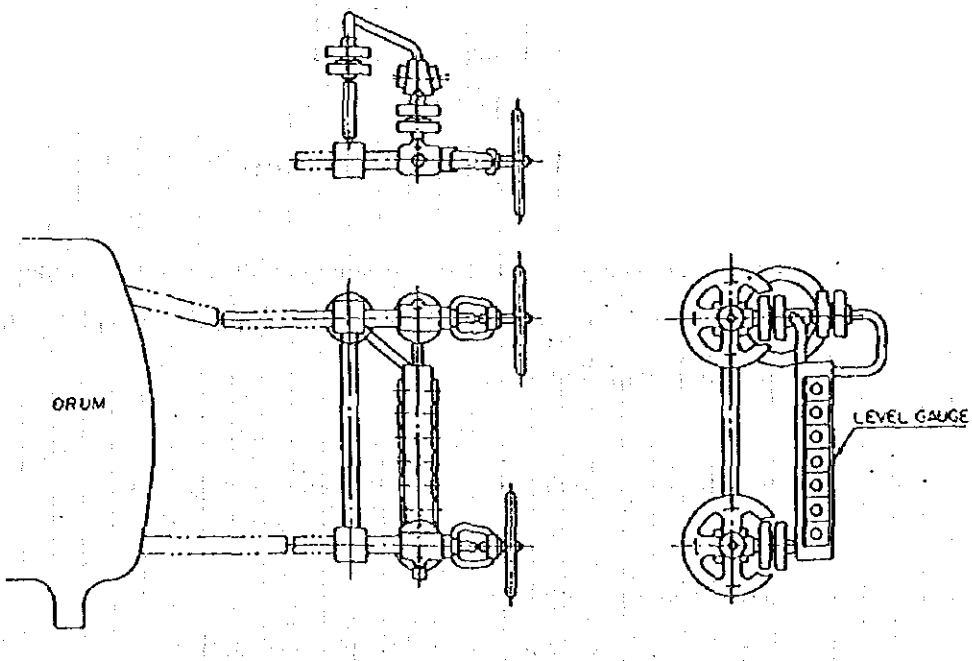


Fig. 2-5 Water Level Gauge

vii) With respect to the motor operated valves for the heat exchangers (Table 2-1 No. 8, Fig. 2-3 ⑧), it was found that the valves of one of the two lines were sound. Therefore the number of valves to be replaced was reduced to 18 pcs.

2) Water Level Gauges

The existing water level gauges supplied by former Soviet Union does not have any protection against mechanical damages. Terefore, the water level gauges for the high-pressure system to be procured shall be of robust construction (Fig.2-5). The water level gauges for low pressure system to be procured shall be protected by the cover.

3) Communication Facilities

At present, the Power Station uses broadcasting units to exchange mutual communication by furnishing the speakers through the Station compound and the speakers are initiated by a key man who will receive the request to broadcast through the telephone. But the existing facilities are very old type and any spare parts for operation and maintenance are not available. For this reason, the existing facilities including PBX for telephone system and amplifier for speaker system will be procured and renewed on this Project.

It is essential concept to re-use the existing facilities as much as they can. On this concept, the existing telephone lines, support, etc. which will be able to re-use shall be remain as they are.

4) Equipment and Materials for Maintenance and Management

i) Heat Treatment Equipment

As the installation work under this Project comprises more than a hundred welding locations and have to be completed within the short period, a large number of welders shall be assigned in two or three shifts a day.

After welding, the welded points shall be heat-treated at a specified temperature in order to relieve thermal stresses.

Though the Power Station has two sets of heat-treatment unit at present, they are very obsolete and insufficient in quantity to finish the relevant welding work in such a short period. To overcome this probrem, it was decided to procure new heat-treatment units in this Project. After the fulfillment of this Project , the units will been effectively used for daily repaire of the existing equipment.

ii) Motor Coil Winding and Froming Machine

More than 250 motor burn-outs a year have been recorded in the power station. One of the reasons for the high incidence of the burn-out is derived from the manually wounded coils. Because the manually wounded coil does not have uniform quality, namely the insulation resistance of the coil is not uniform in its entity and the electrical stress will tend to concentrate to the week point.

For the high-voltage motor, the uniform quality of insulation is especially essential. Without uniform quality, it would be difficult to keep the high insulation resistance of the coil for a long peiod. These high voltage motors are vital for boiler operation and, without them, the capability of the hot water supply system will not be maintained. This is a reason why the motor coil winding and forming machine will be procured. The Power Station has a large number of motors which coils have been replaced due to the inferior insulation resistance. The coil winding and forming machine will serve the renewal of the coil having uniform quality.

5) Miscellaneous

i) Engineers and Tools required for the Installation

The valves, water level gauges and communication facilities covered by the Project are essential equipment for the hot water supply system and the

power generating plant. As these equipment and materials interact together, the reliability of each material is very important. To maintain the reliability through the life of the power station, the confirmations and recording by the competent engineers or technicians at each phase of progress shall be carried out.

Prior to the installation by Mongolia, Japanese engineers will demonstrate typical installation work to transfer the technology including quality management . Once the technology is transfered to Mongolian side, the associated installation work will be carried out by themselves.

In additon to above, tools and instruments including grinders will be procured for the installation of the equipment.

ii) Transportation for the Equipment and Materials

The equipment and materials will be shipped by vessel to a Chinese seaport and then by rail to Ulaanbaatar. Finally the equipment and materials will be transported to unloading place of the power station by rail spur (FOR).

(2) Equipment and Materials Plan

1) Equipment and Materials Plan

① Valves

i) With respect to the motor operated steam valves (Table 2-1 No.1), the eight valves covering all heater units shall be replaced. These valves are motor driven and flanged type in compliance with the existing specification, having a diameter of 500 A, a pressure of 20 kg/cm^2 G and a temperature of 500 °C.

ii) The 14pcs of motor operated steam valves (Table 2-1 No. 2) will be procured to replace. The four valves connected to the corresponding section of the common steam header are also to be replaced. These valves are motor driven and welded type in compliance with the existing specification, having a diameter of 300 A, a pressure of 140 kg/cm^2 G and a temperature of 560 °C.

iii) The 8pcs of motor operated steam valves (Table 2-1 No. 3) will be procured to replace. These valves are required to be of quick-acting operation and have to be operated under remote control from the Central Control Room. These valves are motor driven and welded type in compliance with the existing specification, having a diameter of 300A, a pressure of 140kg/cm2 G and a temperature of 560 °C.

iv) The 8pcs of motor operated steam valves (Table 2-1 No. 4) will be procured to replace. These valves are required to be of quick-acting operation and have to be operated under remote control from the Central Control Room. These valves are motor driven and welded type in compliance with the existing specification, having a diameter of 175 A, a pressure of 140kg/cm^2 G and a temperature of 560 °C.

v) The 16pcs of motor operated water supply valves (Table 2-1 No. 5) will be procured to replace. The four valves connected to the respective section of the common header will also be replaced. These valves are motor driven and welded type in coompliance with the existing specification, having a diameter of 250 A, a pressure of 200kg/cm^2 G and a temperature of 230 °C.

② Water Level Gauges

The water level gauges for the drums shall be of two-colour type being similar to the existing ones and having a pressure of 170 kg/cm^2 G, a temperature of 560 deg. C and a visual length of 457 mm in compliance with existing ones.

③ Communication Facilities

The replacement of six units of 240W output amplifiers together with associated 70 sets of speakers and telephone exchangeunit (PBX) together with 400 sets of telephone will be procured and replaced.

④ Maintenance and Management Equipment

i) Heat treatment equipment shall be procured subject to the following specifications.

- High-frequency induction heater unit 1 Set
  200 V AC 3-phase, 56 kVA, with induction coil
- Nickel-chrome heater unit 1 Set
  200V AC 3-phase, 35 kVA, with cap tire cable

ii) Motor coil winding and forming machine and Related Equipment shall be procured subject to the following specifications.

- Hot air circulating typedrying oven Capacity: 8 m^3
  Power consumption 36 kW
- Coil winding machine: Coil length 2000 mm
- Coil forming machine: Coil length (straight portion) 1450 mm
- Coil heating press Heating temperature 200°C
  Pressure 70 Bar

iii) Miscellaneous

- Grinder 100 dia. 40 sets, 180 dia. 20 sets
- Taking into account the matters raised by the previous projects implemented under a Japanese grant aid for economic cooperation, necessary tools and lighting equipment as well as tires for forklift will be procured in this Project.

Table 2-2 shows an outline of the specification for Equipment and Material to be procured in this Project.

Table 2-2 Specifications for Equipment to be procured

No.	Name of equipment	General specifications	Unit	Q'ty	Use
1	Steam motor valves	Dia. 500A, pressure 20 kg/cm^2, temp. 500°C (flange type) (with motor control unit)	pc.	8	Warm water heater inlet valve for use in winter
2	Steam motor valves	Dia. 300A, pressure 140 kg/cm^2, temp. 560°C (welded type) (with motor control unit)	pc.	18	For unit section
	By-pass valve	20A 140 kg/cm^2, temp. 560°C	pc	36	
3	Steam motor valves	Dia. 300A, pressure 140 kg/cm^2, temp. 560°C (welded type) (with motor control unit)	pc.	8	For boiler outlet
	By-pass valve	20A 140 kg/cm^2, temp. 560°C	pc	16	
4	Steam motor valves	Dia. 175A, pressure 140 kg/cm^2, temp. 560°C (welded type) (with motor control unit)	pc.	10	For startup
	By-pass valve	20A 140 kg/cm^2, temp. 560°C	pc	20	
5	Water supply motor valve	250A, 200 kg/cm^2, 230°C (welded type) (with motor control unit)	pc.	20	For primary water supply connection
	By-pass valve	20A 200 kg/cm^2, temp. 230°C	pc	40	
6	Water supply motor valve	65A, 200 kg/cm^2, 230°C (welded type) (with motor control unit)	pc.	8	Minimum flow valve
7	Manual water supply valve	400A, 25 kg/cm^2, 230°C (flange type)	pc.	8	For water supply pump inlet
8	Manual water supply valve	250A, 25 kg/cm^2, 230°C (flange type)	pc.	5	For section
9	Manual water supply valve	200A, 25 kg/cm^2, 230°C (flange type)	pc.	16	
10	Manual water supply valve	150A, 25 kg/cm^2, 230°C (flange type)	pc.	12	
11	Manual water supply valve	300A, 25 kg/cm^2, 230°C (flange type)	pc.	16	
12	Motor Control Valves (for Water Level of Heat Exchanger C)	100A, 45 kg/cm^2, 420°C with motor control unit	pc.	18	
	(Indicator for above)	With Control Cable	pc.	18	
1	Broadcasting amplifier	Main amplifier - Output 240W x 6 units	set	1	For calling
2	Telephone equipment for communication	Telephone exchange switchboard - 400 lines	set	1	For connection

	1	Water level gauge	Length 457 mm, pressure 170 kg/cm^2 For drums, two-colored water level gauge	set	8	For water level measurement
	2	Water level Indicator for deaerator	Direct Reading	set	6	
			1,720L/1,500L (Length)			
			25 dia. x 3t x 10 kg/cm^2 (Rating)			
	3	Water Level for Heaters	Direct Reading	set	8	
			18 dia. x 4t x 1250L,			
			14 kg/cm^2, 400°C (Vertical)			
			18 dia. x 4t x 720L,	set	12	
			14 kg/cm^2, 400°C (horizontal)			
			34w x 220L, 13 kg/cm^2, 265°C	set	18	
			34w x 220L, 16 kg/cm^2, 300°C	set	18	
			34w x 220L, 26 kg/cm^2, 345°C	set	18	
			35wx 220L,45 kg/cm^2· 420°C	set	18	
	1	Heat treatment unit	Nickel-chrome heating	unit	1	For welding
			High-frequency induction heating	unit	1	For welding
	2	Motor coil winding machine	coil length 2000mm,coil press	set	1	For maintenance
	3	Electric grinder	100ϕ	unit	40	For maintenance
			180ϕ	unit	20	For maintenance
	4	Dryer	3 kW, 380 V	pc	5	
	5	Lighting	1000W, 400W, 250W	set	200	
	6	Hoist	10 ton (geared trolley type)	pc	4	
			10 ton (hook type)	pc	2	
			3 ton	pc	6	
			1 ton	pc	6	
	7	Chain Block	3 ton	pc	6	
			1 ton	pc	6	
	8	Rubber Wheel	for folk lift	pc	8	
	9	Drill		set	4	
	10	Air grinder		set	3	
	11	Electric Scissors		pc	3	
	12	Vise		pc	8	
	13	Vernier Calipers	200 mm	pc	25	
			280 mm	pc	20	
	14	Vernier Calipers with dial gauge	200 mm	pc	20	

	15	Micro Meter	175 mm	pc	2	
			150 mm	pc	2	
			100 mm	pc	2	
			75 mm	pc	3	
			50 mm	pc	3	
			25 mm	pc	3	
	16	Thickness gauge		pc	25	
	17	Ball bearing chuck		pc	30	
	18	Lever hoist		pc	3	
	19	Dial indicator		pc	10	
	20	Wrench		set	5	
	21	Box wrench		set	15	
	22	Driver set		set	10	

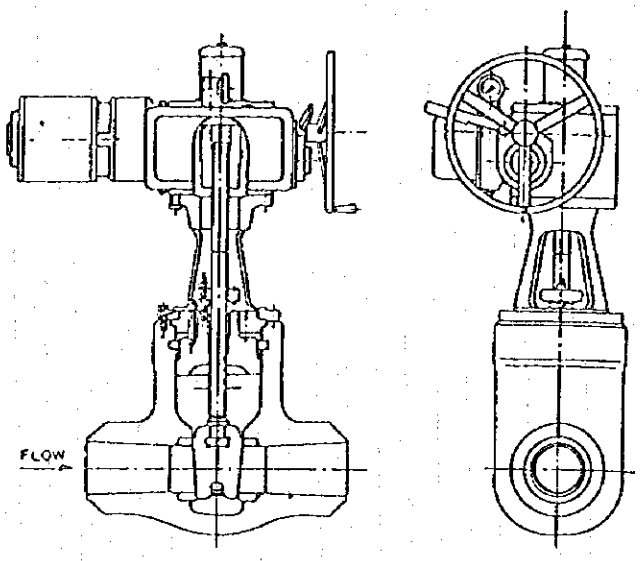


Fig. 2-6 OUTLINE OF WELDED AND MOTOR DRIVEN TYPE GATE VALVE

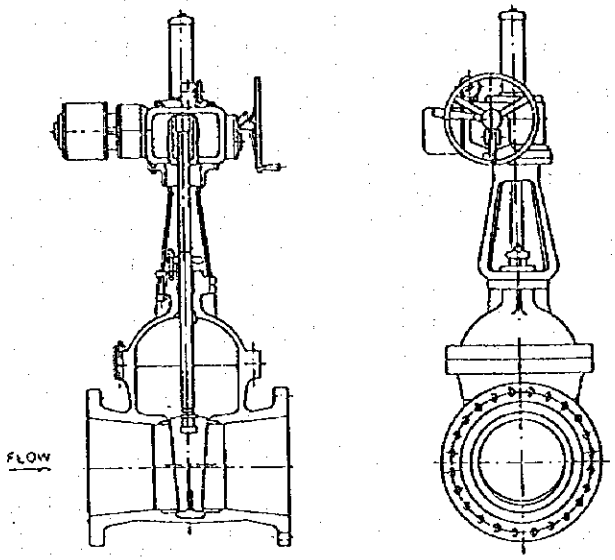


Fig. 2-7 OUTLINE OF FLANGE AND MOTOR DRIVEN TYPE GATE VALVE

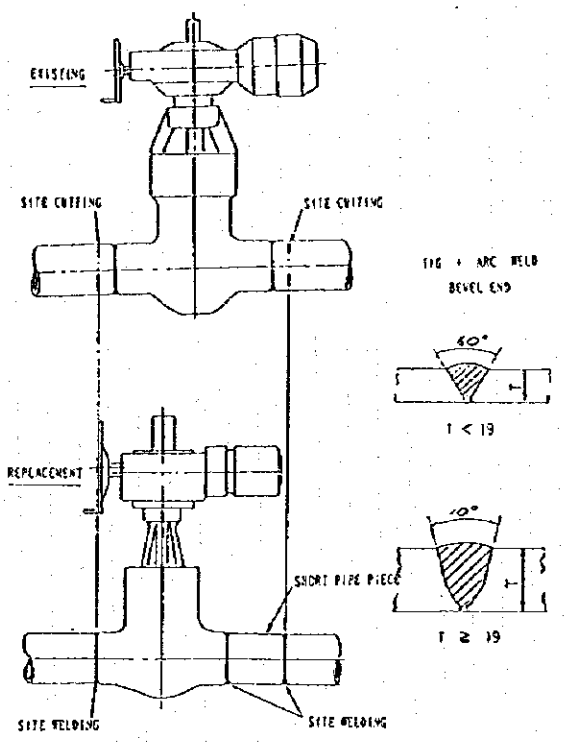


Fig. 2-8 SHORT PIPE ARRANGEMENT FOR WELDED TYPE VALVE

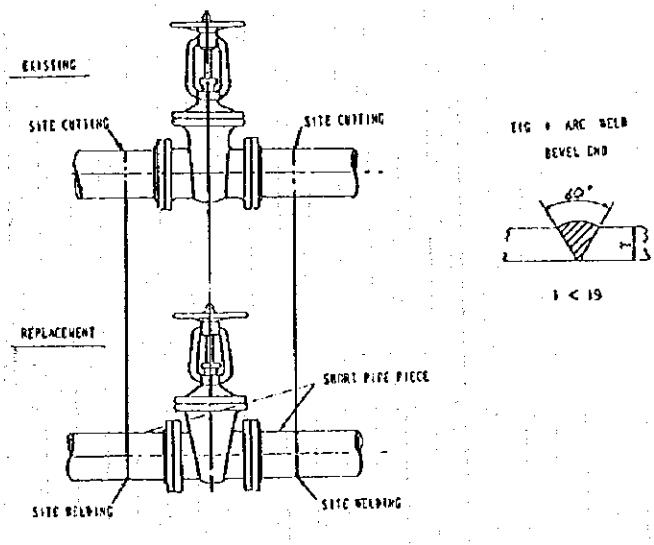


Fig. 2-9 SHORT PIPE ARRANGEMENT FOR FLANGE TYPE VALVE

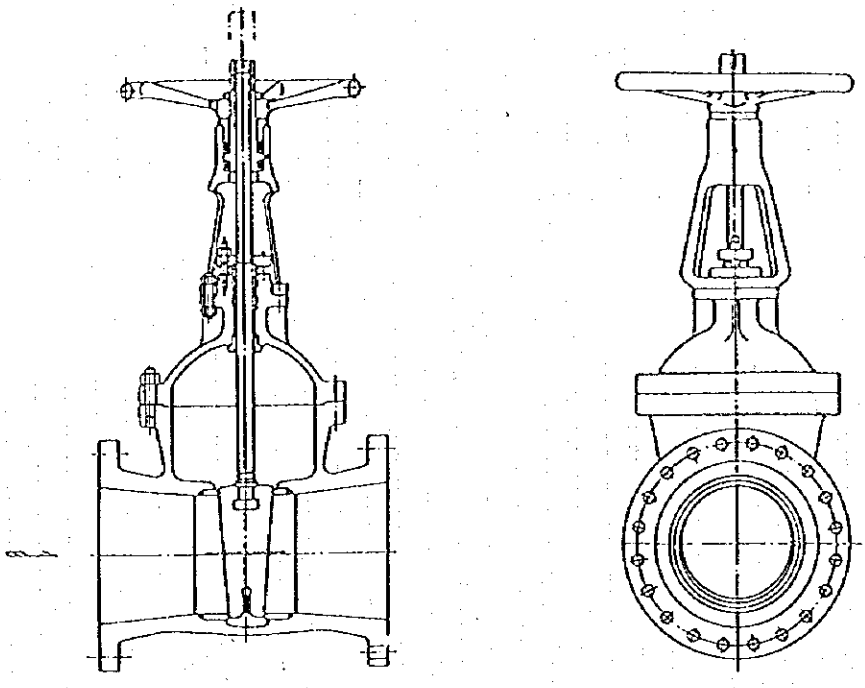


Fig. 2-10 OUTLINE OF HAND OPERATED GATE VALVE

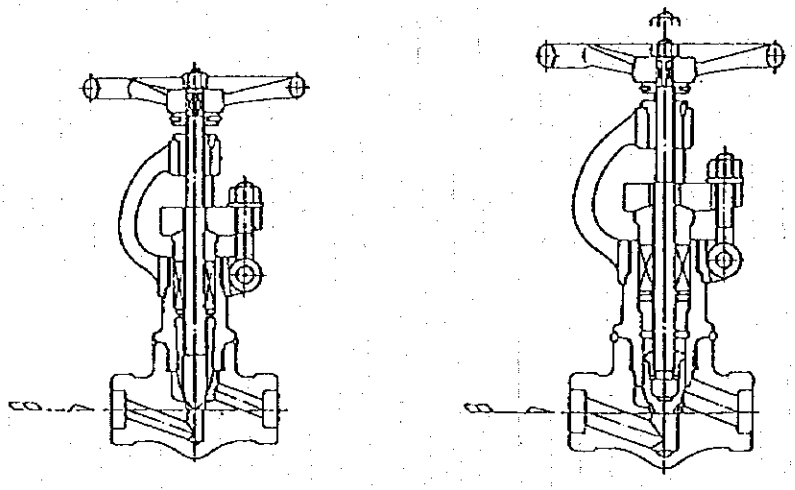


Fig. 2-11 OUTLINE OF GLOVE VALVE

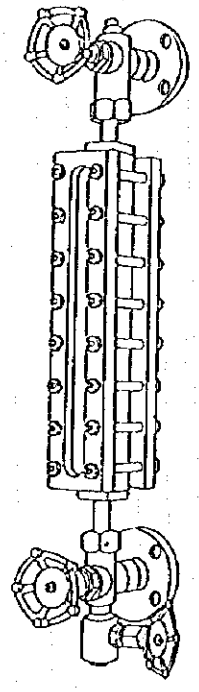


Fig. 2-12 OUTLINE OF WATER LEVEL GAUGE

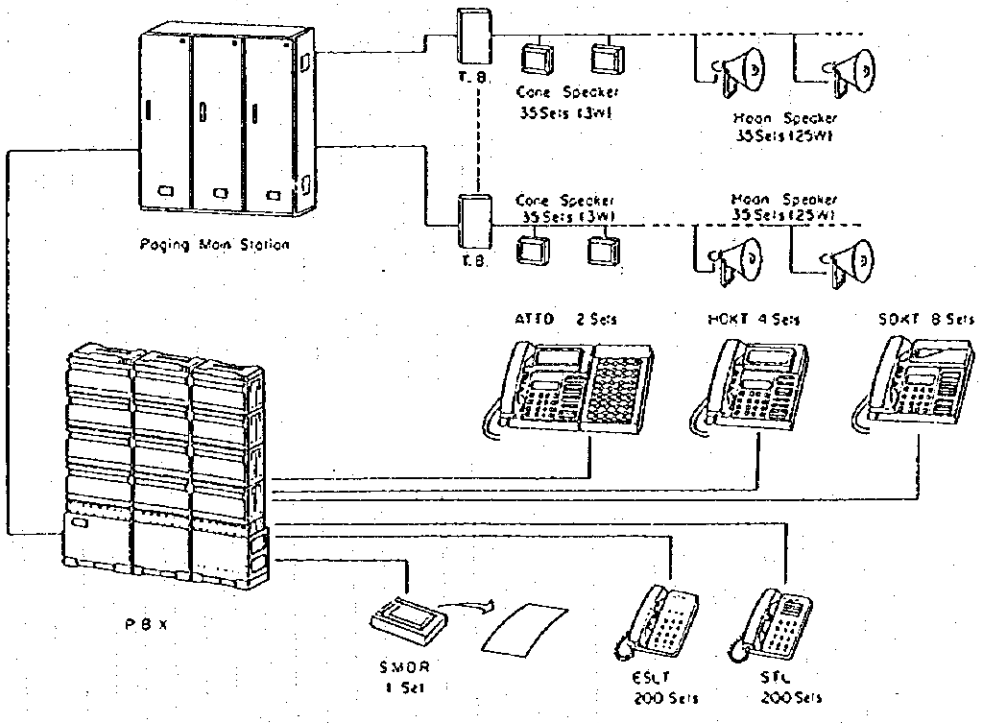


Fig. 2-13 COMMUNICATION SYSTEM

CHAPTER 3 IMPLEMENTATION PLAN

Chapter 3 Implementation Plan

3-1 Implementation Plan

3-1-1 Implementation Concept

This project is implemented on the 4th Thermal Power Station at Ulaanbaatar in Mongolia under the Grant Aid Assistance by the Government of Japan. In working out the Implementation Plan, the most appropriate set-up and schedule will be prepared with due consideration for the allowable period of time under the said Grant Aid System.

The Manager of Energy Department of Ministry of Infrastructure Development (Former MEGM) shall have overall responsibility for implementing the project. Engineers in charge of the project of Energy Department will be engaged in relevant work for the project. All personnel at the sections concerned, headed by the Chief Engineer in the 4th Thermal Power Station, will render assistance from time to time.

In implementing the project, the full-fledged support and cooperation of Ministry of Infrastructure Development will be required so that the project can be completed within the allowable period in the most economical manner with a high-level technical standard as required in view of the Japanese Grant Aid Project. After E/N is signed by the Governments of both countries, the assigned Japanese consultant will carry out investigations for detail design, preparation of tender documents, management related to tendering, rehabilitation and supervision for equipment and materials procured.

A Japanese firm assigned by the tendering will carry out the rehabilitation work. The said firm will fulfill the rehabilitation work in accordance with the Contract, specifications including drawings, etc. under the full assistance and management of Ministry of Infrastructure Development and under the supervision of the Japanese consultant.

The Japanese firm shall establish their construction office within the premises of the 4th Thermal Power Station and will undertake the management for schedule and quality control for the rehabilitation work.

This project envisages the rehabilitation work; viz. the replacement of large sized motor operated valves, of level gauges for high temperature and high pressure heaters, etc.

As the major works in this Project are the welding of large sized valve, the assignment of the welders of the 4th Thermal Power Station in which this Project will be fulfilled is advantageous from the technical and economical standpoints.

The welding skill has been examined by Ministry of Infrastructure Development every year and the results have been referred to the incentive of wages. Accordingly, not quite a few competent welders are available under the umbrella of Ministry of Infrastructure Development. Of course, a number of welders having high welding skills work for the 4th Thermal Power Station. In implementing the project, considerable number of portions shall be welded and the associated work shall be completed within short period. Consequently, it is recommended that the assistance of welders working at the 3rd Thermal Power Station shall be studied in advance.

The portable grinders for bevelling the ends of piping, welding lods for alloy steel, heat treatment equipment, etc. which will be essential for quality control of welding will be procured to fill the required quantity under this Project.

In view of the economical implementation within specifted period as scheduled and the quality assurance to be applied during the course of each phase of installation, technicians having special skills for welding, quality control/assurance, communications facilities, etc. will be dispatched from Japan and/or third country. They will demonstrate the installation in the typical equipment and transfer their know-how to Mongolian side. Once the transfer of the installation technique is made Mongolia will be able to fulfill the associated work by themselves.

3-1-2 Implementation Conditions

(1) Procurement of equipment and materials

The equipment and materials such as welding unit, scaffolding material, acetylene gas, oxygen gas, etc. other than those procured in this Project shall be provided by Mongolia at his own cost.

(2) The work to be executed during full shut-down of the 4th Thermal Power Station

The 8 sets of boiler are presently installed at the 4th Thermal Power Station, and the respective boiler is connected to the common header.

As the deteriorated isolation valve to isolate the common steam header sectionwise can not close, the valve existing between boiler and the common steam header can not repair without whole shut-down of the plant, namely the entire shut-down of the common steam header.

The replacement of these valves which are most important in operation and maintenance of the plant will be carried out spending one week full shut-down of the 4th Thermal Power Station in summer (July to August). The valves other than those said above will be replaced during partial shut-down period decided by the demand of energy.

3-1-3 Scope of Works

In implementing this project, the Japanese and Mongolian sides shall have the following work demarcated.

(1) Works to be performed by the Japanese side

(a) Procurement of equipment and materials in Japan and third country(ies).

(b) Marine and inland transportation of equipment and materials.

(c) Demonstration of installation and adjustment for typical valves

(d) Installation checking and adjustment of the communication facilities

(2) Works to be performed by the Mongolian side

(a) Removal of valves to be replaced, edge preparation (for welding), welding work and annealing work

(b) Provision and installation of scaffolding and temporary lightings required for welding works.

(c) Provision of space required for temporary storage of equipment and materials for the Project, and for temporary site office.

(d) Provision of work-force including technicians and labourers at no cost and management and control of the said work-force.

(e) Provision of power, water, telephone, etc. required for the Project in the premises of the power station.

(f) Exemption of customs duties and import taxes and levies to be imposed on equipment and materials procured in Japan and/or third foreign country, as well as services rendered by Japanese personnel for execution of the Project shall be made in proper manner and definitely by the Mongolian Government.

3-1-4 Consultant Supervision

The detail design and supervisory work for the project will be carried out by a Japanese firm and Japanese consultant under the Grant Aid extended by the Government of Japan.

The details of the work are as follows:

(1) Services to be rendered by the Consultant

Stage	Detail of Work
Preparatory Work prior to Construction work (Detail Design)	Investigation for detail design
	Preparation of tender documents
	Selection of Bidders on behalf of the Mongolian side
	Evaluation of bids
	Assistance for contract negotiation with a Prospective Bidder
	Check and approval of manufacture drawings
	Witness of shop tests at manufacturer's factory(ies)
Work during Construction (Construction Supervision)	Supervision of Project at site
	Report on Project during Construction
	Issuance of relevant reports, etc.

During detail design stage, the study of the specification for the facility and procurement will be worked out, based on the results of the detailed site survey. The tender documents will be issued, based on the results of the detail design and the tender date will be determined upon consultation with the Government of Japan.

After opening of bids, the consultant will evaluate the bids and also assist the implementing agency of Mongolia in making the Contract with a Japanese Contractor.

During stage of work during construction, the consultant will control and manage the quality and project implementation schedule in close contact with the Government of Mongolia.

Upon completion of the work, the consultant will issue a report on completion.

(2) Construction supervision system

To ensure the sound implementation of the project, the competent engineers as stated below shall be deputed to the site.

Classification of Personnel	Scope of Assignment	Dispatch Time/Duration
Mechanical Engineer; No. 1	Work during project execution	During project implementation, 0.5 months
Mechanical Engineer; No. 2	Work during project execution	During project implementation, 3.8 months

Assignment

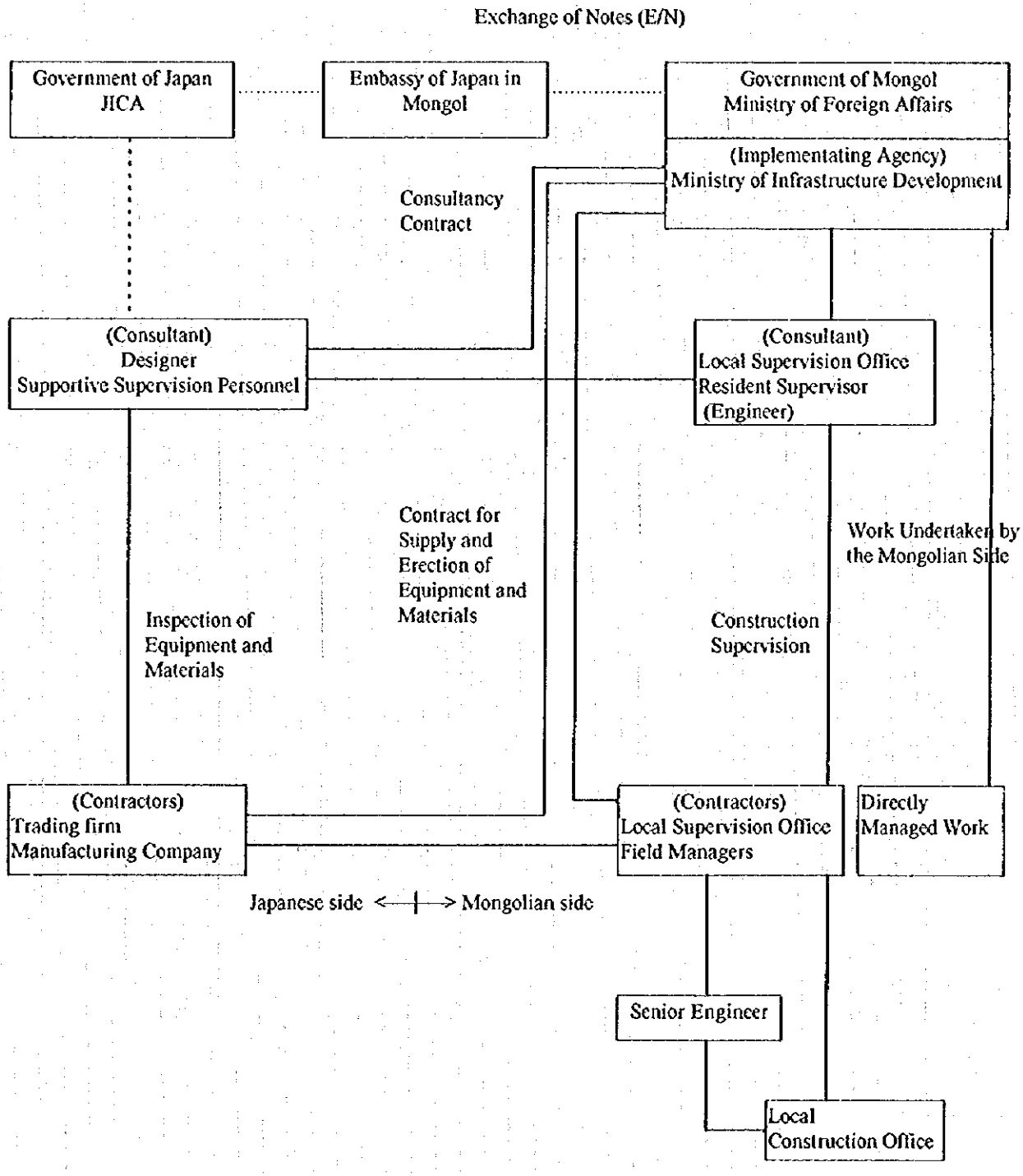
Mechanical Engineer No. 1: shall liaise with the Mongolian side for the associated construction work and shall also attend test(s) on completion of installation work including replacement of valves.

Mechanical Engineer No. 2: shall be engaged in monitoring of work progress and in attending tests on completion of water level gauge, communication facilities, etc. at site.

(3) Project Implementation System

The Project Implementation System shown in Fig. 3-1 has been prepared to elaborate the relation of work to be performed by respective authorities concerned. This figure also shows the managing supervision system of the consultant.

Fig. 3-1 Project Implementation System



——— : Contractual Obligations and Duties

..... : Liaison and Coordination

3-1-5 Procurement Plan

Almost all the equipment and materials to be procured for the implementation of the project have not been manufactured in Mongol. Even though some equipment and materials are able to be procured in Mongolia, they shall be procured in Japan or third country(ies) to assure the delivery period and required quality.

As shown in Table 3-1, equipment and materials owned by the 4th Power Station shall be provided by the Mongolian side on his own cost.

Table 3-1 Procurement Source List of Equipment and Materials

Name of equipment and material	Procurement source			Associated Equipment	Specification	Procurement source		
	Local	Japan	Third-country			Local	Japan	Third-country
Scaffolding and steel materials	O			Crane	10 Tons	O		
Thermal insulation material	O			Truck	4 Tons	O		
Wires and cables	O							
Oxygen and acetylene	O							
Temporary lighting	O							
Valves		O	O					
Communication facility		O	O					
Water level gauge		O						
Heat treatment equipment		O						
Motor winding & forming machine		O	O					

3-1-6 Implementation Schedule

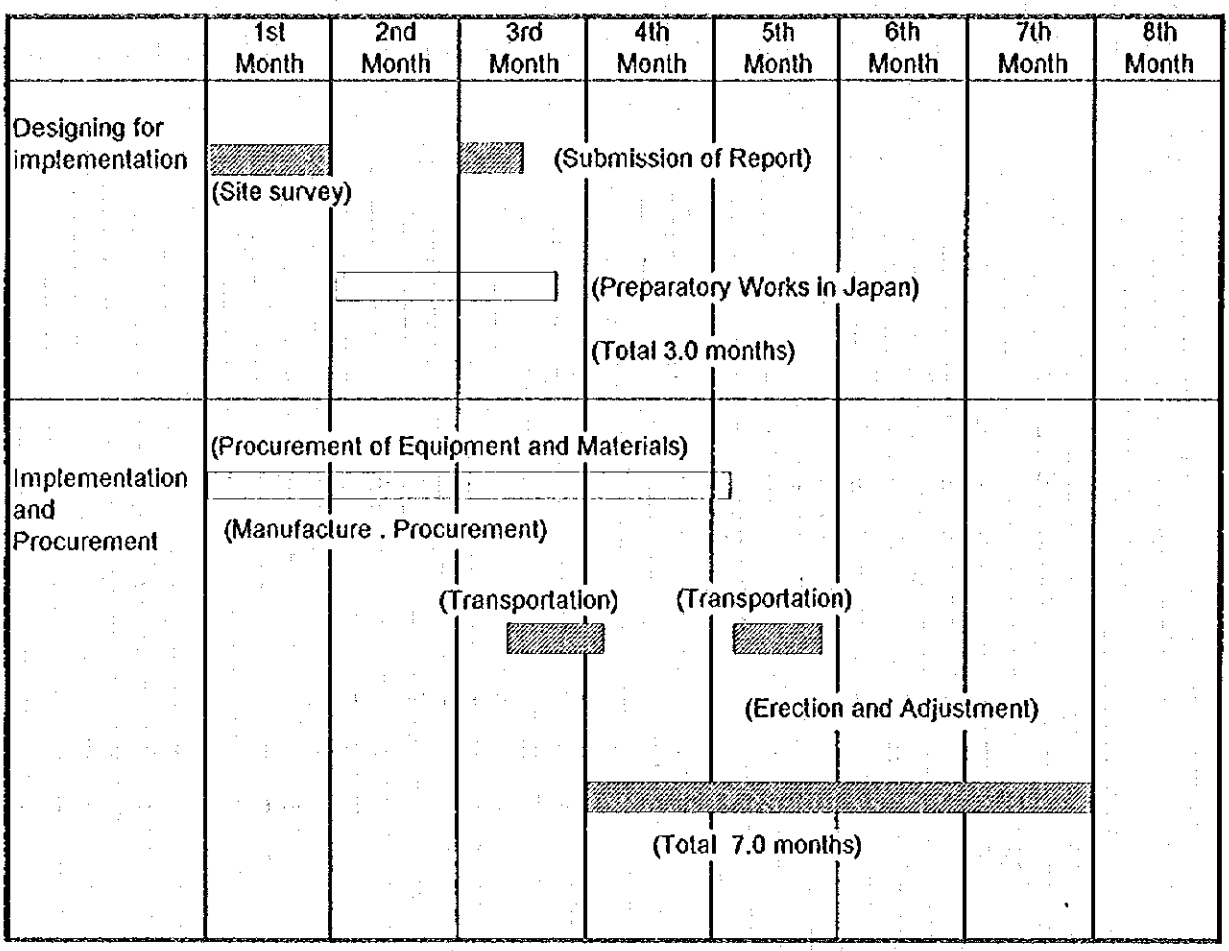
The implementation schedule of the project under the Grant Aid extended by the Government of Japan are as follows.

1) Exchange of Notes between both Governments (E/N)
2) Contract with a consultant
3) Detail design and preparation of tender document
4) Tendering and contract with a prospective bidder
5) Procurement of equipment and materials
6) Transportation and customs clearance of equipment and materials
7) Rehabilitation work at site
8) Completion and handing over

The overall project implementation schedule as shown in Figure 3-2 has been prepared by placing special emphasis on the design period, the procurement period of the equipment and the period of installation taking account the situation of site and the scope of the work as well.

It is estimated that about three (3) months will be required for the detail design and preparation of tender document, while about seven (7) months will be necessary for the installation and adjustment works including the periods for manufacture and transportation of equipment and materials.

Table 3-2 Implementation Schedule



3-1-7 Obligations of Recipient Country

The following necessary provisions shall be provided by the Government of Mongolia.

(1) To make provision for the following outdoor works along the boundary of the power station premises.

- Planting
- Fencing
- Gates
- Outdoor lighting

(2) To exempt all the import duties taxes and other levies imposed upon equipment and materials procured under the contract for the project implementation and also to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and local transportation of the equipment and materials.

(3) To exempt from customs duties, internal taxes and other fiscal levies which will be imposed by Mongolia with respect to the products and services brought by the Japanese under the Contract.

(4) To assist the Japanese to make application for bring-in items and services for the Project.

(5) To operate and maintain equipment procured and rehabilitated keeping the sound condition.

(6) To bear all expenses imposed on the transportation and installation of the equipment and material.

3-2 Operation and Maintenance Plan

(1) Estimated Expenses to be borne by the Government of Mongolia

Thermal Insulation Materials: 3,800 kg x 0.71 dollars	=	2,698 dollars
Lagging: 300 square meters x 9.66 dollars	=	2,898 dollars
Acetylene Gas, etc:	=	2,204 dollars
Total		7,800 dollars

(2) Estimating Conditions

(a) Date of Estimation: July 1996

(b) Exchange Rates of Currencies: US$1.00 = J¥107
US$1.00 = Tg450

(c) Duration of Work:
The Project shall be implemented in Japanese single fiscal year. The duration of detail design, procurement of equipment and materials and the period of erection are respectively indicated in Table 3-2.

(d) Others:
The Project shall be implemented pursuant to the Grant Aid Scheme extended by the Government of Japan.

(3) Operation and Maintenance Cost

The operation and maintenance of the hot water supply system require both the daily inspection on the operating conditions of the system and the scheduled inspection and maintenance to be conducted on shut down condition.

The daily inspection is conducted by the respective operators for the boiler(s) and

turbine(s) to check and record the pressure and temperature of the respective parts of the system as well as malfunction of the equipment. The scheduled inspection is conducted to overhaul the equipment for inspection and repair which extent depends on the length of operated period.

These inspection items are shown in Table 3-3.

Table 3-3 Inspection Items of Hot Water Supplying System

	Daily Inspection Items	Scheduled/Inspection Items
Valves	• Leakage from the gland. • Abnormal noises from electric actuating parts • Foreign materials contaminated on the valve shaft. • Thermal insulation peel off • Vibration and/or abnormal noises with the valve body.	• Overhaul of the valve body • Lapping of the valve seats. • Overhaul of the electric actuating parts. • Replacement of the packing. • Make-up the lubricant on the valve shaft. • Inspection of bending of the valve shaft.
Communication Facility	• Voltage and amperage of the respective parts.	• Tuning up • Cleaning of the amplifier. • Inspection of voltage and amperage of the respective parts.
Water Level Gauge	• Water level. • Contamination on the glass surfaces. • Leakage from the fixing.	• Cleaning of the interior surfaces of the glass. • Repair the leaking.

The scheduled inspection of the system is conducted mainly by the engineers who are assigned to the inspection and maintenance of boiler(s) and turbine(s).

As the technical personnel working for the 4th Thermal Power Station are fully competent, the proper guidance for operation and maintenance and the proper allocation of the appropriation for repair are the issue to be resolved.

The maintenance cost accounts for about three (3) percent of a total expenditure of the thermal power station.

The maintenance cost required for the equipment procured in this Project is estimated at about two (2) million Japanese Yen per year, which comes to 1.6% of the total maintenance cost of the thermal power station.

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

Chapter 4 Project Evaluation and Recommendation

4-1 Project Effect

(1) Direct Effects

It is estimated that heat supply volume is 400 (Gcal/H) produced by 2 sets of boiler in operation when room temperature goes down to around 8°C in severe cold period (Outdoor temperature is around -30°C).

The necessary heat supply volume to maintain room temperature at 18°C is 550 (Gcal/H) which is affordable by the operation of 3 sets of boiler to the full extent. An additional installation of valves in the common steam header will make it possible to stop the respective boilers and repair them at any time, and so it becomes possible any time to operate 3 sets of boiler necessary to maintain room temperature at 18°C in severe cold period.

Rehabilitation works of hot water supply facilities of The 4th Thermal Power Station under grant aid cooperation shall stabilize and improve steam supply capacity of the said hot water supply facility and thus increase heat volume of hot water supply. In this way, it is possible to maintain room temperature in apartments for inhabitants and public institutions around 18°C during the severe cold period and more than 360,000 inhabitants will enjoy this benefit. In other words, 360,000 Ulaanbaatar citizen may enjoy healthy lives. Further, by maintaining room temperature at 18°C, even in the severe cold period of outdoor temperature of -30°C to -40°C (3 days or more annually), people may lead their daily lives without such restraints as refraining from going outdoors.

The room temperature of 18°C corresponds to the average temperature in summer time in Mongolia and it is suitable for Mongolians to pass their normal lives.

(2) Indirect Effects

Electric power imported from Russia, of which capacity is about 25MW, is intended to be consumed during summer when Power Station in Ulaanbaatar stops its operation for undergoing inspection (about for 7 days), and fee of the imported electric power is about 25 Tug/kWh which is remarkably higher than ordinary power generation cost of 9.7 Tug/kWh. Equipment and materials under the present grant aid will make rehabilitation of power stations possible and it leads to saving of foreign currency to be paied to Russia. The saved amount corresponds to 1% of management budget of The 4th Thermal Power Station, or to 10% of annual repair cost and to 30% of material cost for repair.

4.2 Recommendation

In carrying out the project, the following tasks are suggested to be maid by Mongolian Government.

(1) To secure self-supported utility as Electric Power Enterprise, it will be necessary to study establishment of power fare which meet appropriately the cost of operation, maintenance and management. For instance, it is recommendable to apply increase-in-order power fare system where the more the consumption is made, the higher charge is levied to be consumers. Thus, the concept of electricity saving incentive works on large consumers, and it also decrease the financial burdens for the people in the poverty.

(2) To complete installation work of valves, etc. procured by the Japanese side in the given period under the responsibility of Mongolia , Mongolian Government and CES are asked to work out working schedule, manpower plan, material procurement plan, and to appropriate the adequate budget.

(3) To demonstrate positive effects of hot water supply in this project, it is essential to carry out both rehabilitation plans of boilers on the hot water supply side supported by OECF and downstream pipings supported by DANIDA in good harmony. Therefore, Mongolian side is asked to take necessary steps to demonstrate good harmony of these plans in the entire scopes of work.

Appendices

Data 1 Member List of the SurveyTeams

First Session

1. Leader : Hiromi Chihara
   JICA Senior Development Specialist

2. Grant Aid Planner : Masahiro Atsumi
   Grant Aid Division, Bureau of Economic Cooperation
   Ministry of Foreign Affairs

3. Project Manager : Hiroshi Isaka
   EPDC International Ltd.

4. Power Generation : Kazuhiko Nakaoji
   Hot Water Supply EPDC International Ltd.

5. Materials Plan : Yoshio Noguchi
   EPDC International Ltd.

6. Procurement / : Tatsuhiko Nakagawa
   Cost Estimate EPDC International Ltd.

Second Session

1. Leader : Masahiro Atsumi
   Grant Aid Division, Bureau of Economic Cooperation
   Ministry of Foreign Affairs

2. Project Manager : Hiroshi Isaka
   EPDC International Ltd.

3. Materials Plan : Yoshio Noguchi
   EPDC International Ltd.

Data 2 Survey Schedule(May and June ,1996)

Mr.Chihara、Mr. Atsumi May 19 ～May 30

Mr.Nakagawa May 19 ～June 5

Mr.Isaka,Mr.Nakaoji,Mr.Noguchi May 19 ～June 15

No	Date		Description
1	5/19	Sun	Tokyo 10:05 (NH905) Arrive Beijing 13:25
2	5/20	Mon	Beijing 14:10 (OM224) Arrive Ulaanbaatar 17:30
3	5/21	Tue	Courtesy visit to Japan Embassy and JOCV office Courtesy visit to Ministry of International Trade and Industry Courtesy visit to MEGM
4	5/22	Wed	AM: Explanation of Inception report and Questionaire in MEGM PM: Explanation of Inception report and Questionaire in the 4 th Thermal Power Station
5	5/23	Thu	Explanation of Inception report and Questioner in CES
6	5/24	Fri	Investigation of the 4 th thermal power station
7	5/25	Sat	Investigation of the 4 th thermal power station
8	5/26	Sun	Data arrangement
9	5/27	Mon	AM: Explanation on Annex 3 to the 4 th Thermal Power Station PM: Explanation on draft minute in MEGM
10	5/28	Tue	AM: MEGM discussion on minute PM: Signing on minute
11	5/29	Wed	Investigation on communication facility and data collection for valves in the 4 th Thermal Power Station Mr.Chihara and Mr.Atsumi leave Mongolia
12	5/30	Thu	Investigation on communication facility and electric equipment , data collection in the 4 th Thermal Power Station

13	5/31	Fri	Investigation on communication facility and hot water supply line
14	6/1	Sat	Data arrangement Mr. Nakagawa leave Mongolia
15	6/2	Sun	Data arrangement
16	6/3	Mon	Schedule arrangement on OECF loan and Grant aid project Study for support system on Russian engineer Mr.Nakagawa investigates valve manufacturer in Beijing
17	6/4	Tue	Training and promotion for worker Mr.Nakagawa investigates valve manufacturer in Beijing
18	6/5	Wed	Investigation of control valve and level gauge Mr.Nakagawa leaves Beijing
19	6/6	Thu	Investigation on tools
20	6/7	Fri	Investigation on repair shop and store house
21	6/8	Sat	Investigation on tools and Data arrangement
22	6/9	Sun	Data arrangement
23	6/10	Mon	Investigation on hot water system and data collection
24	6/11	Tue	Investigation on coal handling
25	6/12	Wed	Study on operating data and statistic data, preparing of minute
26	6/13	Thu	Signing of minute and reporting to Japan embassy reporting to JOCV
27	6/14	Fri	Leave Ulaanbaatar 14:35 (CA902) arrive Beijing 15:35
28	6/15	sat	Leave Beijing 15:00 (NH906) Arrive Tokyo20:00

Survey Schedule(September,1996)

Draft Basic Design

No	Date		Description
1	9/1	Sun	Leave Tokyo 10:35 (NH905) arrive Beijing 13:35
2	9/2	Mon	Leave Beijing 15:00 (OM224) arrive Ulaanbaatar 17:30
3	9/3	Tue	Courtesy visit to Japan Embassy Courtesy visit to JOCV Courtesy visit to Ministry of foreign affairs and Infrastructure Development
4	9/4	Wed	Explanation on draft basic design in the 4 th Thermal Power Station
5	9/5	Thu	Explanation on draft basic design in the 4 th Thermal Power Station
6	9/6	Fri	Discussion on minute
7	9/7	Sat	Preparing of minute
8	9/8	Sun	Data arrangement
9	9/9	Mon	Signing of minute
10	9/10	The	Leave Ulaanbaatar 14:35 (CA902) Arrive Beijing 15:35
11	9/11	Wed	Leave Beijing 15:00 (NH906) Arrive Tokyo 20:00

Data 3 List of Prty Concerned in the Recipient Country

Organization	Name	Title
Japan Embassy	Keizo Kagawa	First secretary
	Taira Iwasaki	Second secretary
JOCV	Yukio Sasaki	Ex representative
	Yoshifusa Shikama	Representative
Ministry of External and industry	P.GANKHUYAG	Assistant of Director Ministry of External and Industry
Ministry of International Trade	Enebish	Deputy Director of Trade of Dep. International Trade & Cooperation
	Otgontsetseg SANJID	Officer of Dep of International Trade & Cooperation
	Olsiibajar	Officer
Ministry of Energy Geology & mining	Degeriin MISHA	Deputy Ministry
	Tsegmidyn SUKHBAATAR	Director of Department for cooperation
	Baatar PUREVJAV	General Director of Energy Department
	D.BATTSEND	Executive Director
	Tumen AVARZED	Expert
Central Energy System	A.Tleikhan	Director of center investment & technology renovation
	Choennamdaggiin BAYAR	Director
	BALDAI	Chief Engineer
	O.BUYANTSOG	Deputy Chief Engineer

	Gunsengiin BALDAI	Chief engineer
District Heating Company	SH.BAASANJAV	General engineer
4 th thermal power station	G.YONDONGOMBO	Chief engineer
	S.BOR	assistan chief engineer
	CH.SUKHBAATAR	Project Engineer
	Y.MUNKHJARGAL	Head of Operation and Technical Division
	G.GALBADRAKH	Head of Technical Policy and Maintenance Division
	OSGOO	
	RADNAA SED	Head of turbine
	ERDENEBAYAR	Training engineer
	DAVAAJARGAI	Electric engineer
	D.BATAA	Mechanical engineer
	C.TSEREN	Coal handling
	E.OCHIR	Metal treatment

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
OF
THE REHABILITATION PROJECT
FOR
IMPROVEMENT OF THE 4TH THERMAL POWER STATION
IN ULAANBAATAR
IN
MONGOLIA

In response to the request from the Government of Mongolia, the Government of Japan decided to conduct a Basic Design Study of the Rehabilitation Project for Improvement of the 4th Thermal Power Station in Ulaanbaatar (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

The JICA sent to Mongolia the Basic Design Study Team (herein after referred to as "the Team"), which is headed by Mr. Hiromi CHIHARA, Senior Development Specialist, Institute for International Cooperation, JICA, and is scheduled to stay in the country from May 20 to May 28, 1996.

The Team held discussions with the officials concerned of Mongolia and conducted field survey at the study area. In the course of the discussions and field survey, both sides have confirmed the main items described on the attached sheets.

Ulaanbaatar, May 28, 1996

MR. Hiromi CHIHARA	Mrs.P.Narangua	Mr. Baatar PUREVJAV
Leader,	Head of International	General Director,
Basic Design Study Team,	Trade and Cooperation	Energy Department
JICA	Department,	Ministry of Energy,
	Ministry of Trade	Geology and Mining
	and Industry	

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the existing hot water supply system through rehabilitation of the 4th Thermal Power Station (hereinafter referred to as "the Power Station") in Ulaanbaatar.

2. Project Site

The site for the Project is in the premises of the existing No.4 Thermal Power Station.

3. Responsible and Executing Organizations

(1) The responsible organization for the Project is the Ministry of Trade and Industry, which is to act as coordinating authority for the Japan's Grant Aid Cooperation to consult with each other in respect of any general matter that may arise from or in connection with the Project.

(2) The executing organization for the Project is the Ministry of Energy, Geology and Mining (hereinafter referred to as "MEGM"), who is to operate and manage the Central Energy System (hereinafter referred to as "CES"), and the Power Station through supervision of CES. And the Director of the Power Station is responsible for implementing the Project through making technical and administrative arrangements with JICA and other Mongolian organizations and/or authorities as required.

4. The Japan's Grant Aid System

(1) The Government of Mongolia understood the system of the Japan's General Grant Aid, which is outlined in ANNEX II.

(2) On condition that the Grant Aid Assistance by the

Government of Japan is extended to the Project, the Government of Mongolia will take necessary measures as described in ANNEX I for a smooth implementation of the Project.

5. Items Requested by the Government of Mongolia

(1) The intent of the equipment and materials supply

The supply of the equipment and materials for this Project is intended to contribute specifically to the health and welfare of the citizens of Ulaanbaatar through improving the existing hot water supply system within the battery limits of the Power Station.

Therefore, the equipment and materials considered not crucial to the hot water supply system, such as those associated with the pulverized coal firing system, etc., may not be considered or not eligible for the Project. Further, the equipment and materials generally classified as items of normal operation and maintenance may be of less priority.

(2) Prioritizing the equipment and materials

After discussions with the Team, the items shown in ANNEX III were finally requested by the Government of Mongolia. Each item of the equipment and materials has been rated in order of priority considering such factors as;

- relevancy to the hot water supply system of the plant
- urgency of the matter, especially relating to the common system like steam generating facility
- nature of those items generally fallen under categories of normal operation and maintenance which shall be budgeted yearly by MEGM

The rating has been made by classifying each item as follows:

Category A: Requested with Top priority
Category B: Requested with 2nd priority
Category C: Deleted from the original Request

However, the final components of the Project will be decided after further studies such as on the current boiler rehabilitation project.

6. Schedule of the Study

(1) The consultants will remain in Mongolia and proceed with the further study until June 14, 1996.

(2) Based on the minutes of the discussions and further studies, JICA will prepare the Draft Basic Design Report and dispatch another mission to explain the results of the Basic Design Study in due course, possibly around August, 1996.

(3) In case that the contents of the Draft Basic Design Report are accepted in principle by the Government of Mongolia, JICA will complete the Final Report for submission to the Government of Mongolia. It is safely expected that such a submission would be due by the end of 1996.

7. Other Issues

7.1 The MEGM shall assign as scheduled the budget and personnel necessary for the proper execution of the Project. The budget necessary for normal yearly operation and maintenance including consumables and minor repair work shall be secured by the Power Station from the revenue of its whole selling of electricity and heat to the CES.

The CES provided for information the recent balance sheets, profit and loss statements and tariff tables, etc. for the Team to appreciate the financial situation of the energy

related organizations.

7.2 The scope of field installation work

Both sides confirmed that the Mongolian side would generally be responsible for all the field installation work of the equipment and materials of the grant aid cooperation under the site supervision to be provided by the Japanese side. Some principles of the split of work between the Mongolian and Japanese side are described below;

The Mongolian side will provide;

- Scaffolding
- Removing and mounting of valves and fittings, etc.
- Supply of instrument and electric cables, trays and their wiriness, etc.
- Edge preparation and welding under the Japanese supervision

The Japanese side will provide;
Provision of welding rods and welding machine (TIG)

The Mongolian side confirmed that the budget specific to the field installation cost necessary for the grant aid items would be allocated by CES.

7.3 The progress of privatization

The Mongolian side confirmed that there would be no expectation of privatizing the 4th Thermal Power Station for the time being, by referring to the energy law being effective from January 1st, 1996. The Article 7 of the law stipulates that the CES shall be controlled and managed by the Government, while the No.4 Thermal Power Station is the largest entity which belongs to the CES.
As a matter of fact, the MEGM is now preparing a list of energy entities being subjected to privatization for the Cabinet disccussion in the near future, but at present the No.4 Thermal Power Station is not included in the proposed

MEGM's list. Further, The MEGM stated that the power generation facilities with a capacity of more than 100 MW would not be expected to be privatized.

The Japanese side understood the explanation, and insisted that the Mongolian Government should take any necessary measures in maintaining properly its ownership of the equipment and materials donated through Japan's Grant Aid even after the station becomes partly privatized.

The Mongolian side accepted the proposed idea.

7.4 Compatibility with Other Relevant Projects

(1) The Japan's Grant Aid Project from 1992 through 1995

The project was executed to cope with the energy crisis caused by serious deterioration of the facilities observed at the Power Station, and the efforts have been focused on enforcing the maintenance of the Power Station by concentrating on countermeasures against wear of pulverized coal firing system and normalization of electrostatic precipitator operation and achievement of normal operating conditions for the ash treatment system. The implementation of the scheme has made a contribution to reducing the incidence of accidents and breakdowns and achieving environmental improvements.

(2) OECF Loan Project expected to commence from 1996

Subsequent to the above mentioned emergency measures, an improvement of constructive conversion of the vital systems on the basis of a repayable aid scheme has been decided in agreement with the Japan's OECF loan mechanism. This scheme is to focus on the rehabilitation of four(4) boilers through upgrading of the instrumentation and control system, conversion of the pulverized coal firing system to direct and partial replacement of the boiler tubes, so that the

steady boiler operation would be ensured.
According to the OECF SAPROF report issued in August,1995, the financial internal rate of return (FIRR) is estimated at 12.9%, and reportedly considered financially viable.

The concerted efforts between the Project and this OECF loan project which is to stabilize the heat production source is very important because the steam produced at these boilers is commonly served to the hot water system, steam to industries, as well as to the turbine generators for electricity generation.

(3) The Grant Aid Project by the Danish International Development Assistance (DANIDA)

The power rehabilitation project for the No.3 Thermal Power Station including the district heating (DH) rehabilitation and heat metering is under negotiation with the assistance of Nordic Development Fund (NDF) and DANIDA under the coordination of the Asian Development Bank (ADB). NDF intends to give loans to the rehabilitation of the turbine generators at NO.3 Thermal Power Station.

The leakage of water and heat losses in the DH system in Ulaanbaatar is a major problem for the Central Energy System (CES), and the DANIDA component is to finance the district heating rehabilitation with a number of feasibility review on the grant basis with a budget of about 5.1 million US$. The Mongolian side is now expecting to receive a new proposal in June from DANIDA for further negotiation after their scope discussion in February and March,1996 , and hopes that the project will begin in the course of the year 1997.

Taking all these circumstances relevant to the Project into consideration, the Project can be well justified for implementation, however the scope and schedule of the Project shall be carefully examined in co-

ordination with the development of the above three(3) projects.

7.5 International Procurement

The equipment and materials for the Project may be procured through internationally competitive bidding if the following conditions are met for the Mongolian market situations;

- Good interchangeability with the equipment and materials of the existing power projects is expected.
- Good accessibility to spare parts and consumables as well as after care arrangements are guaranteed by the suppliers.
- The delivery requirements of the Project are secured.
- The products are manufactured to the internationally recognized standards and specifications such as ANSI, DIN, BS and JIS, etc. with good past supply records in the markets.

Further, the other purchase terms and conditions according to the guide lines of the Japan's grant aid procedures shall closely be observed when local and/or third country purchasing can be sought out.

7.6 Questionnaire and Answers

In reply to the questionnaire of JICA, the Mongolian side will submit the data and information within three (3) weeks from the date of signing of this Minutes of Meetings through the Embassy of Japan. These data and information shall be written in English, unless otherwise agreed by the Japanese side.

ANNEX I

Necessary measures to be taken by the Government of Mongolia in case Japan's Grant Aid is executed

1. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the sites.

2. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project.

3. To exempt Japanese nationals from customs duties, internal taxes and other levies which may be imposed in Mongolia with respect to the supply of products and the services under the verified contractors.

4. To accord Japanese nationals whose services may be required in connection with the supply of products and the 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.

5. To use and maintain properly and effectively all the facilities rehabilitated and equipment purchased under the Grant.

6. To bear all the expenses other than those to be borne by the Grant, necessary for rehabilitation of the facilities as well as for the transportation and the installation of the equipment.

ANNEX II

Japan's Grant Aid System

1. Grant Aid procedure

(1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and approval by Cabinet)
Determination of the implementation	(The Notes exchanged between Government of Japan and the recipient country)

(2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondary, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Government of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter refereed to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.

b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.

d) Preparation of a basic design of the Project

e) Estimation of costs of the Porject

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guideline of Japan's Grant

Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of consultants

For smooth implementation of the Study, JICA uses (a) registered consultant(s). JICA select (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid ?

The Grant Aid program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulation of

Japan. Grant Aid is not supplied through the donation of materials as such.

(2) Exchange of Notes(E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions, and amount of the Grant Aid , etc., are confirmed.

(3) "The period of the Grant Aid " means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes , concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

(4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporation controlled by persons of Japanese nationality).

(5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

a) To ensure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.

b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

c) To secure buildings prior to the procurement in case the installation of the equipment.

d) To ensure prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

f) 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 the recipient country and stay therein for the performance of their work.

g) "Proper Use"
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively, and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

h) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

i) Banking Arrangements (B/A)

The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter refereed to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the designated authority under the Verified Contracts.

The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

ANNEX III

Items requested by the Government of Mongolia

1. PLANT AUXILIARY

(1) VALVES

Item No.	ITEM	Specification	Q'ty (set)	Category
1	Motor Valves (for Steam) Flange Type	500A, 20kg/sq.cm 500 deg.C with motor control unit, sealed packing	4	A
			4	B
		with 10t Hoist (geared trolley type)	2	A
			2	B
2	Motor valves (for Steam)	300A, 140kg/sq.cm, 560 deg. C, with motor control unit (Motor operated)	8	A
		Ditto (Hand operated)	7	B
		with 10t Hoist (Hook Type)	2	A
	By-pass Valves (for Steam)	20A, 140kg/sq.cm, 560 deg. C.	30	A
3	Motor Valves (for Feed Water)	250A, 200kg/sq.cm, 230 deg. C with motor control unit	8	A
			7	B
	By-pass Valves	20A, 200kg/sq.cm, 230 deg.C	36	A
4	Motor Valves (for Feed Water)	65A, 200kg/sq.cm, 230 deg. C with motor control unit	4	A
			4	B
5	Hand Valves (for Feed Water) Flange Type	400A, 25kg/sq.cm, 230 deg.C	6	A
			2	B
		250A, 25kg/sq.cm, 230 deg.C	5	A
		200A, 25kg/sq.cm, 230 deg.C	8	A
			8	B
		150A, 25kg/sq.cm, 230 deg.C	12	A
		300A, 25kg/sq.cm, 230 deg.C	16	A
6	Motor Valves (for steam)	300A, 140kg/sq.cm, 560 deg. C with motor control unit (remote operation)	8	A

Item No.	ITEM	Specification	Q'ty (set)	Category
6	Motor Valves (for Steam)	175A, 140kg/sq.cm, 560 deg. C with motor control unit (8 sets should be remote operation)	8 2	A B
	By-pass valves for above	20A, 140kg/sq.cm, 560 deg.C	36	A
7	Motor Control Valves (for Water Level of Heat Exchanger	100A, 45kg/sq.cm, 420 deg.C with motor control unit	18	B
	Controller for above	with Control Cable, Indicator	18	B

(2) Communication

Item No.	ITEM	Specification	Q'ty (set)	Category
1	Communication Equipment		1	A

(3) Level Gauge Portion

Item No.	ITEM	Specification	Q'ty (set)	Category
1	Water Level Indicator for Drum (with torque wrench and spare)	Direct Reading (Tow Color) 457mm (Reading Length) 170kg/sq.cm	8	A
2	Water Level Indicator for deaerator	Direct Reading 1,720L/1,500L (Length) 25 dia. x 3t x 10kg/sq.cm (Rating)	6	A

Item No.	ITEM	Specification	Q'ty (set)	Category
3	Water Level for Heaters	Direct Reading 18 dia. x 4t x 1250L, 14kg/sq.cm, 400 deg.C (vertical)	8	A
		18 dia. x 4t x 720L, 14kg/sq.cm, 400deg.C (horizontal)	12	A
		34W x 220L,16 kg/sq.cm 300 deg.C	18	A
		34W x 220L, 26 kg/sq.cm 345 deg.C	18	A
		35W x 220L, 45 kg/sq.cm 420 deg.C	18	A

2. Mill Auxiliary

Item No.	ITEM	Specification	Q'ty (set)	Category
1	Metal Detector		2	C
2	Electric Chain Block		8	C
3	Ceramic Lining		5	B
			5	C

3. Construction and Maintenance

Item No.	ITEM	Specification	Q'ty (set)	Category
1	Dryer		5	A
2	Grinder	with spare stone	later	A
3	Welder	TIG, ARC, 30KVA	6	A
4	Welding Rod	For alloy steel	later	A
5	Oil Jack		4	A
6	Lighting		100	A

Item No.	ITEM	Specification	Q'ty (set)	Category
7	Lever Hoist	3 tonnes 1 tonne	6 6	A A
8	Chain Block	3 tonnes 1 tonne	6 6	A A
9	Sawing Machine		1	B
10	Rubber Wheel for fork lift		2	B
11	Crane for Truck	3 tonnes	1	B
12	Coil Winding Machine for Motor	Low Voltage	1	B

Minutes of Meeting

Consultant team of the basic design study of the rehabilitation project for improvement of the 4th power station had conducted field survey ,and both consultant team and 4th power station have confirmed following modification of ANNEX 3 of the minute of discussion May 28 as of official.

1. ANNEX 3 1.Plant auxiliary (1) Valve
   - Mongolian side strongly requested to change category from B to A.
   - Mongolian side also strongly requested technology transfer on valve maintenance .

2. ANNEX 3 1.Plant auxiliary (1) Valve

Item No 2: 300A ,140kg/cm², 560℃,with motor control unit valves were added two sets.
and same specification without motor control unit valve was added one set.

Item No 3: 250A ,200kg/cm², 230℃,with motor control unit valves were added three sets.
and same specification without motor control unit valve were added two sets.

Reasons ,these valves are very important to divide main header of steam and feed water.

3. ANNEX 3 2. Mill Auxiliary

Item No 1: Metal detector was changed category from C to B.

Reasons , many metal in the conveied coal caused serious damage to the conveyer or mill etc.

4. ANNEX 3 3. Construction and maintenance

Item No	item	Q'ty	category	description
· 2	grinder	60	A	attached list
· 3	welder	6	C	no need
·	heat treatment equipment	2	A	use for valve welding
·	heat treatment coil	4	A	use for valve welding
· 5	oil jack	4	C	no need
· 9	saw machine	1	C	no need
· 10	rubber wheel for forklift	8	A	need
· 11	truck crane	1	C	no need

Another maintenance tools are attached .

4th power station ,June 13, 1996

Hiroshi ISAKA
Leader of consultant

G.YONDONGONBO
Chief Engineer

List of Tools

1.Drill		4
2.Grinder	100 Ø	40
	180 Ø	20
3.Knematic grinder		3
4.Electric Scissors		3
5.Vise		8
6.Vernier Calipers	200mm	25
7.Vernier Calipers	280mm	20
8.Vernier Calipers with dial gauge	200mm	20
9.Micro meter	175mm	2
	150mm	2
	100mm	2
	75mm	3
	50mm	3
	25mm	3
10.Thickness gauge		25
11.Ball bearing chuck		30
12.Lever hoist		3
13.Dial indicator		10
14.Gear tool end mill		5
15.Wrench		5
16.Box wrench		15
17.Driver set		10