

**BASIC DESIGN STUDY REPORT  
ON  
THE PROJECT FOR IMPROVEMENT OF  
MEDICAL EQUIPMENT  
FOR SECOND GENERAL HOSPITAL  
IN  
MONGOLIA**

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MINISTRY OF HEALTH AND SOCIAL WELFARE  
MONGOLIA

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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 Project for the Improvement of Medical Equipment for Second General Hospital and entrusted the study to the Japan International Cooperation Agency (JICA).

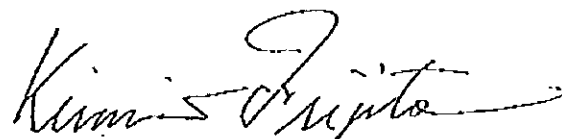
JICA sent to Mongolia a study team from September 19 to October 14, 1998.

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.

March, 1999

A handwritten signature in black ink, reading "Kimio Fujita", written in a cursive style. The signature is positioned above a horizontal line.

Kimio Fujita

President

Japan International Cooperation Agency

March, 1999

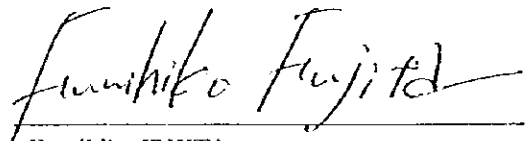
### Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of Medical Equipment for Second General Hospital in Mongolia.

This study was conducted by Medical Engineering & Planning Co.,Ltd., under a contract to JICA, during the period from September 18, 1998 to March 25, 1999. 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,

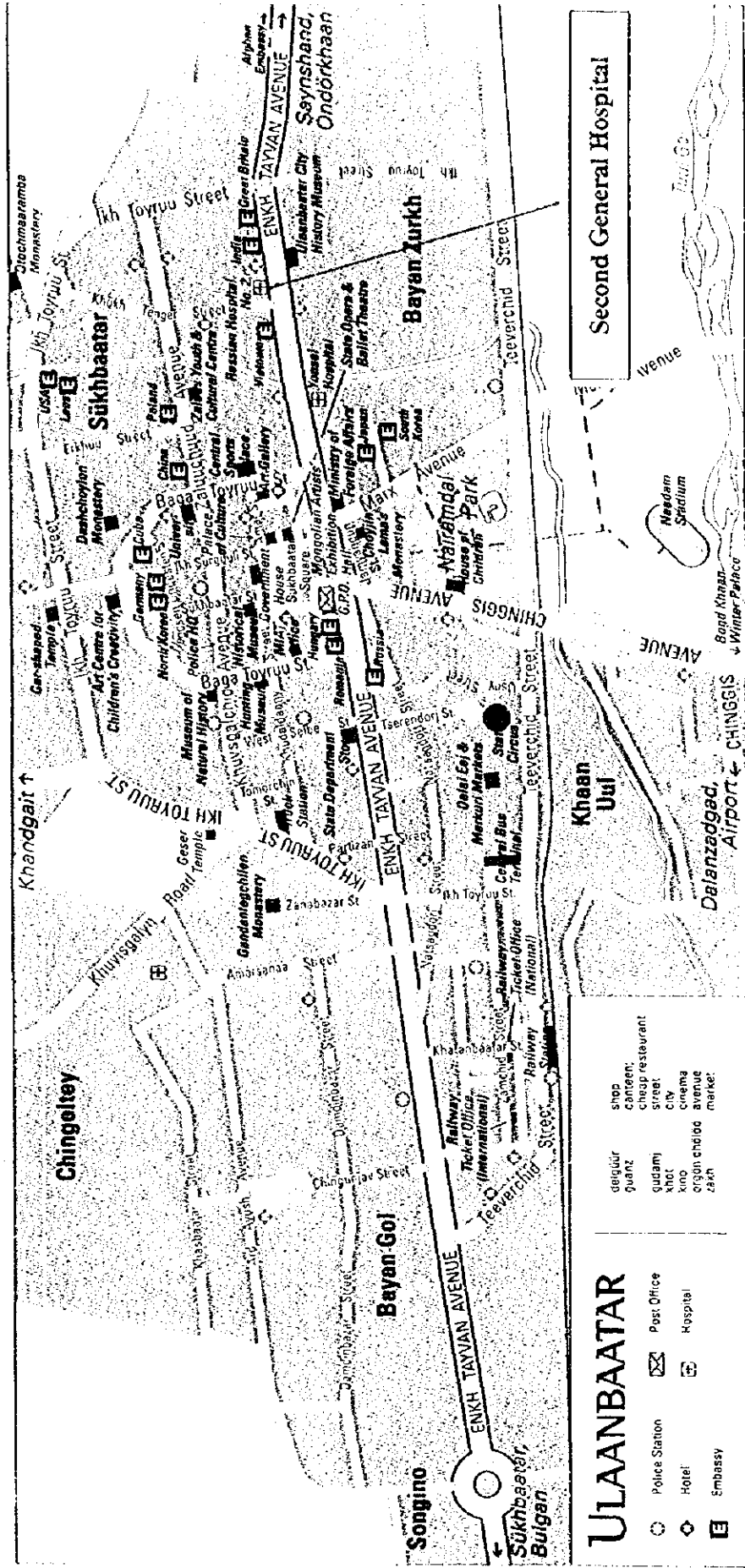


Fumihiko FUJITA

Project manager,  
Basic design study team on the Project  
for Improvement of Medical Equipment  
for Second General Hospital  
Medical Engineering & Planning Co., Ltd.



# MAP OF ULANBAATAR



## ULANBAATAR

- Post Office
- Police Station
- Hotel
- Embassy
- shop
- canteen
- cheap restaurant
- street
- city
- cinema
- origin ch/bo
- avenue
- market

- deigür
- quánz
- gudamj
- xhot
- kino
- origin ch/bo
- zakh

## Abbreviations

CEE : Central and Eastern Europe

CIS : Commonwealth of Independent States

UNFPA : United Nations Population Fund

COMECON : Council for Mutual Economic Assistance, Communist Economic Conference

PHC : Primary Health Care

UNICEF : United Nations International Children's Emergency Fund

WHO : World Health Organization

ADB : Asian Development Bank

PCM : Project Cycle Management

PDM : Project Design Matrix

NGO : Non Governmental Organization

ICU : Intensive Care Unit

CICU : Children Intensive Care Unit

MMT : Mongolian Medical Technics

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## **CHAPTER 1**

# **BACKGROUND OF THE PROJECT**

## Chapter 1 Background of the Project

### 1.1 Brief Description of the Circumstances of the Request

Mongolia is a territorially vast 156.5 km<sup>2</sup> inland country that is bordered by Russia on the north and China on the east, west and south. Because of insufficient health and medical care facilities and personnel the present situation is one in which it is not possible to adequately furnish its population of approximately 2,510,000, particularly those living in rural areas, with adequate health and medical care services. Furthermore, in view of the trend in recent years of growing concentration of population in the capital city, Ulaanbaatar, improvement of medical care functions in that area has become a particularly urgent task.

The Mongolian Government, besides introduction of a medical care system making use of aircraft, ambulances, etc. for improvement of the health services utilization network and strengthening of provincial medical care systems, in 1991 formulated a "National Health Policy" as a basis for its efforts since then to bolster prevention and treatment activity systems. However, the country is presently faced with difficulties in securing adequate budgeting for the health and medical care sector in view of discontinuation of aid from Russia, deterioration of the national economy and changes in the political and economic system that have not yet fully taken hold. The government is trying hard to secure sources of funds for national medical care security and insurance-such efforts having included transition from a free medical care system to a pay medical care system in 1992 and institution of a health insurance system in 1994-but those efforts have not yet had much effect.

The Second General Hospital, which is covered by the present request, is located in Ulaanbaatar. It is a Level-4 hospital with the eastern part of the city of Ulaanbaatar and four nearby Gobi "aimag" as its sphere of service coverage, and it not only has diagnosis and treatment functions as a rear hospital for district hospitals in the city and the provincial general hospital but also guidance, assistance and other similar functions with respect to provincial and district hospitals. It plays a central role in the whole national medical care system network in terms of provision of high-level medical care services, but for the reasons stated above it has not been able to renew its equipment, and that is making it impossible for it to furnish adequate and appropriate medical services as a Level-4 hospital.

As a result of revision of the Medical Care Law in January 1999 the whole country is now included in the scope of coverage of the Second General Hospital instead of just the eastern part of the city of Ulaanbaatar and four Gobi "aimag." In the sphere of coverage before such revision about 60% of the population the Bayanzurkh district of the eastern part of the city of Ulaanbaatar live in yurts, and a large part of the population of the four Gobi "aimag," too, consists of people in low income brackets.

The Second General Hospital was assigned the role of providing guidance to the primary, secondary and tertiary levels as the country's "model Level-4 hospital," but in the last request for Japanese cooperation it was excluded since it was considered to be a hospital for high-ranking bureaucrats and government officials. This time it has been

decided to include it in Japanese cooperation in view of the above-mentioned revision of the Medical Care Law and the fact that recently it has had considerable coverage of low income brackets. Furthermore, since it is now intended to actively work for building of organization that will enable the Second General Hospital to assume responsibility for regional medical care and for improvement of its medical care functions so as to enhance the effect of benefiting the provinces in view of the large gap in medical care between the capital and the provinces that has resulted from such circumstances as a vast national territory and low population density, the Japanese side has decided to give its supply to that.

The following is a description of the division of roles between the three national general hospitals in Ulaanbaatar.

The First General Hospital, the hospital attached to the Mongolian School of Medicine, is outstanding particularly in terms of its kidney, liver, blood vessel and ophthalmology departments, and the Third General Hospital has cardiology and neurosurgery departments. The Second General Hospital, covered by the present project, particularly excels in surgical operations, diagnosis of heart ailments, diagnosis by endoscope, diagnosis by ultrasonic waves, etc. and is a hospital with a position of leadership in community health promotion in local medical care and with nationwide coverage in that respect. Furthermore, the Ministry of Health and Social Welfare has identified it as a model Level-4 hospital playing a central role in view of the fact as well that it is the only national hospital with an emergency station.

In order to fulfill that role the Second General Hospital is putting a great deal of effort into the important goals of (1) improvement of its patient diagnosis functions and (2) improvement of its function of guidance and advice to local and district hospitals in the area for which it is responsible. However, deterioration of medical equipment because of aging has brought about decline in its diagnosis and treatment functions, and its situation now is such that it is not able to adequately provide the medical services expected of a referral hospital, which makes enhancement of the functions of the Second General Hospital an urgent task.

Against such a background the Mongolian government has requested Japanese grant aid for improvement of the equipment of the Second General Hospital in view of the role that has assigned it.

## **1.2 Content of the Request**

### **1.2.1 Initial Content of the Request**

The Mongolian side initially requested 928 items of equipment for the following departments:

1. Operating room
2. Out-patient internal medicine dept.
3. Out-patient pediatric dept.
4. Out-patient gynecology dept.
5. Out-patient ophthalmology dept.
6. Out-patient ENT dept.
7. Out-patient urology
8. Out-patient dental
9. Emergency post
10. ICU
11. CICU
12. In-patient internal medicine dept.
13. In-patient surgery room
14. In-patient pediatric dept.
15. Radiology dept.
16. Central sterilization
17. Echo diagnostic room
18. Endoscopy room
19. Cardiological diagnostic room
20. Rehabilitation & physiotherapy
21. Laboratory dept.
22. Pathological laboratory
23. Equipment for Training and administration
24. General, transport, laundry, kitchen, etc.
25. Supply and Maintenance Unit

### 1.2.2 Changes Made in the Content of the Request in the Basic Design Survey

Furniture, clothing, consumables, etc. were included in the initial request, but Japanese cooperation has been limited to equipment, leaving those items to be supplied by the Mongolian side itself.

While, on the one hand, undertaking selection of the equipment on the basis of the policy of giving first priority to replacement of worn out existing equipment, equipment not included in the request but which has been judged to be indispensable for the hospital's operations has been added. The equipment proposed to the Mongolian side taking into account the operational and functional aspects of the hospital is as follows:

Table 1-1 Additional Equipment

Department	Designation of the equipment
Operating room	Electro surgical unit, Laundry cart, Defibrillator
Out-patient surgery	Suction unit, X-ray film illuminator, Dressing table, examination light with battery
Out-patient ophthalmology	Perimeter
Out-patient urology	Urological examining treatment table with chair
Emergency post	Bedside cabinet, medicine cabinet
ICU	Examination light with battery
CICU	Infant incubator, Infant warmer, Infant transport incubator, Oxygen monitor, Examination light with battery
In-patient internal medicine dept.	Bedside monitor, wheelchair, Examining couch, screen, X-ray illuminator
In-patient surgery room	Instrument cabinet, Medicine cabinet, Suction unit
In-patient pediatric dept.	Infant scale, IV hanger stand
Cardiological diagnostic room	Electroencephalograph
Rehabilitation & physiotherapy	Pulse generator
Laboratory department	Blood cell counter
Laundry	Hot wagon
Operating room, etc.	Ventilation system
Pharmacy	Hot air sterilizer, High-press. steam sterilizer w. boiler, Water distillation Apparatus, Refrigerator, Pharmacy Instrument set

As a result of discussions with the Mongolian Ministry of Health and Social Welfare and the Second General Hospital, acquisition of maintenance know-how for the medical equipment included in the project has also been requested as a part of Japanese cooperation aimed at the Second General Hospital.



## **CHAPTER 2**

### **CONTENTS OF THE PROJECT**



## Chapter 2 Contents of the Project

### 2.1 Objectives of the Project

The aim of this project is that of making it possible for the hospitals covered by it to restore their role of high-level medical care entities by accomplishing qualitative and quantitative improvement of their health and medical care activities through replacement of medical care equipment that is very worn out, in extreme shortage or urgently requiring improvement and supplementing equipment the quantities of which are insufficient so as to solve the problem of deterioration of basic medical care services to low-income residents that has arisen as a result of super-annuation and breaking down of medical care equipment. Another aim is that of promoting the grooming of more persons engaged in providing medical care by giving them better educational and training opportunities on the basis of a better situation regarding available equipment.

The Second General Hospital, the hospital covered this time, has been assigned the status of a model No. 4 medical care facility by the Ministry of Health and Social Welfare. In particular, it is one of the national general hospitals in the function of diagnosis of mental ailments, that of surgical operations, that of endoscopic diagnosis and that of ultrasonic wave diagnosis in the scheme of division of labor in the top referral system.

It is also a hospital covering the entire national territory in terms of its leading role in local health and preventive services in rural medical care. Considering those roles that it has in the scheme of division of labor among hospitals, improvement of the hospital functions of the Second General Hospital is an urgent task, the goals being the following:

- ① Enhancement of patient diagnosis and treatment functions at the Second General Hospital
- ② Enhancement of the guidance and advisory functions of the Second General Hospital with respect to local and district hospitals in rural areas.

## 2.2 The Basic Concept of the Project

### 2.2.1 Cooperation Policy

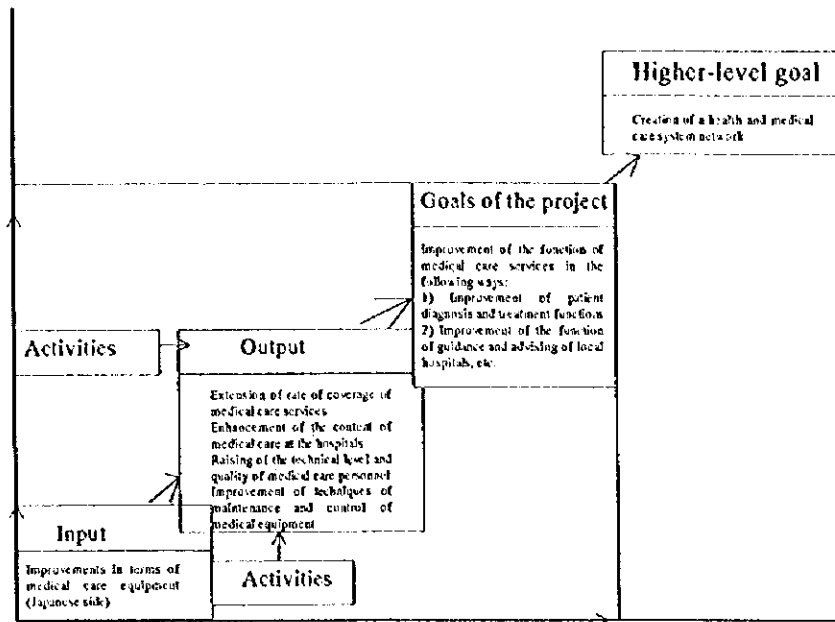
Through survey work in Mongolia and collection of information it has been determined that the hospital in question is appropriate for coverage by the project in terms of its position in the overall scheme of health and medical care in that country, the content of its medical care activities, the level of its medical care personnel, the footing for implementation of the project, the state of the existing equipment, etc. Such appropriateness has been made clear on the basis of determination of the fact that the beneficiaries will be mainly low-income people, which has been ascertained particularly by checking the hospital's relationship with other medical facilities in the benefiting area (whether it receives referrals and the system of linkage with them), the area's structure of ailments, differences in the content of health and medical care services, etc. which show its position in the overall picture.

By confirming the fact that implementation of the project will benefit low-income people on the basis of determination of linkage of the project with plans higher in Mongolia's planning hierarchy (national development plans, health and medical care plans, etc.) and its degree of priority in the field of health and medical care, it has been determined that the project is appropriate in terms of both its relationship with upper-echelon plans and who it will benefit. Furthermore, it was decided to study the securing of a system for operation and maintenance and management of the equipment after implementation of the project as a basis for procuring it for the purpose of enhancement of health and medical care services to low-income people, who will constitute the greater part of those receiving such services, as well as improvement of public upper-level medical care facilities.

The criteria for selection of the equipment are that it represent renewal and supplementation of existing equipment that it will be possible to use under the present system and that it does not require the setting up of any new departments of diagnosis and treatment or introduction of new technology. Furthermore, in order to encourage self-help efforts on the part of the Mongolian side, it has been decided not to include in the present project equipment that it is able to procure on its own.

The overall equipment plans in the present project have the purpose of enhancing health and medical care services by renewal of equipment superannuation and breaking down of which is seriously detracting from the basic diagnosis and treatment activities that the hospitals covered by the project have. That being the case, the equipment plans are drawn up on the basis of giving priority to equipment that is basic and essential to basic diagnosis and treatment activities, that in principle represents existing equipment and that it will be possible to use under the existing system (physicians and technical personnel). Consideration is also given, however, to some introduction of new kinds of equipment in cases where it can be expected to strengthen linkage with lower-level referral hospitals considering the fact that all of the hospitals covered by the project are final referral hospitals for the poor people in their respective areas (Equipment for the community health promotion section).

## 1) Project Action Plan



The starting point of this scheme is "project goals," and the content of "activities" and "input" as premises for them is an important factor.

Fig. 2.1 The Action Plan

Regarding attainment of the project goals, a premise is bringing about the best output, and the "activities" and "input" that are effective for that purpose have an important role in terms of an action plan.

## 2) Activities Plan

The present project is aimed at the activities that the Second General Hospital should work on as the forth level hospital and the output thereof. The following goals can be cited regarding workshops:

### (1) Enhancement of patient diagnosis and treatment functions at the Second General Hospital

It is necessary to make efforts for the sake of achieving suitable diagnosis and treatment functions, operational management, patient services, etc. Furthermore, in order to promote development of outstanding human resources for medical care it is necessary to undertake training activities covering diagnosis and treatment techniques, testing techniques, nursing techniques, medical care equipment maintenance and operation techniques, etc.

- (2) Improvement of the functions of guidance and advising of local and district hospitals in the region that the Second General Hospital covers

Technical guidance and advising of local hospitals, etc. are necessary for extension of medical care services to the Gobi region and other areas besides providing patients in Ulaanbaatar with them. There is also the goal of establishing a referral system since as a forth level hospital, it is based on linkage with other medical care institutions. The following can be cited as the project team planned by the Second General Hospital, it being scheduled to select the members by the time of the survey for summary explanation of the basic design:

- ①Improvement of diagnosis and treatment functions
- ②Improvement of the way the hospital is run
- ③Improvement of promotion of regional health and preventive activities
- ④Improvement of maintenance and operation of facilities and equipment

Particularly the Second General Hospital, in view of the fact that it has a role of providing guidance to local hospitals, district hospitals and public health centers in efforts for promotion of local medical care and prevention, is planning to establish up the following new sections:

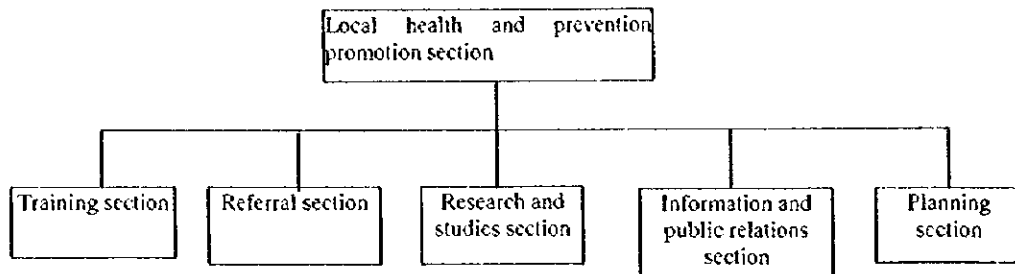


Fig. 2.2 Local Health and Prevention Promotion Section

The Second General Hospital has the following targets regarding increase in number of patients:

**Table 2.1 Change in Rate of Increase of Outpatients and Inpatients Over the Years**

Year	Annual total	Total number of days in hospital	Average number of days of use of bed	Number of patients treated	Deaths	Rate	Outpatient consultations	Health checkups	Rate	The four Gobi provinces and the Bayazurkh district	Rate
1993	230	67,300	16.5	4,076	59	1.4%	117,112	23,565	20.1%	46,841	39.9%
1994	230	67,188	15.3	4,382	42	0.9%	116,174	29,425	25.0%	52,278	45.0%
1995	222	72,737	15.2	4,781	45	0.9%	136,503	39,834	29.2%	69,619	51.0%
1996	225	72,207	14.8	4,849	47	0.9%	138,193	37,287	26.9%	93,973	80.0%
1997	240	64,607	13.7	4,701	53	1.1%	139,018	38,923	27.9%	97,312	70.0%
1998	240	75,214	15.5	4,852		1.0%	149,149	41,741	30.0%	107,387	72.0%
1999	240	76,800	15.5	4,954		0.9%	155,732	49,831	32.0%		80.0%
2000	240	78,000	15.5	5,032		0.9%	162,315	53,563	33.0%		80.0%

Note: Nine to ten dispatched teams of physicians are to examine 15% (22,930 persons) of the population of the 4 Gobi provinces (152,962) by 1999 and 20% (30,572 persons) by 2000.

The content of the different activities has been proposed in the workshop at the time of the basic design study, but it is necessary to study and revise it by the time of commencement of the project so that it will consist of effective activities. After that it will be decided in the form of an activity plan table.

### 3) Input

The input needed in the present project is as follows:

**Table 2.2 Input Plan Table**

<b>The Mongolian side:</b>	<p>It is necessary to build the following system by completion of the present project:</p> <ol style="list-style-type: none"> <li>1) Sending of medical care personnel Hiring of new staff.</li> <li>2) Arranging for supply of medicaments, consumables, etc. Building of a physical supply system within the hospital.</li> <li>3) Arranging for provision of operating funds Completion of relocation of existing equipment and repair work by installation in the present project. Securing of consumables procurement funds, depreciation funds, maintenance, upkeep and management funds, etc.</li> </ol>
<b>Japanese side:</b>	<ol style="list-style-type: none"> <li>1) Procurement of medical care equipment, etc. for hospitals Shipment in several consignments according to the time of installation.</li> <li>2) Operation training or Management guidance Carrying out of consultation in the following field for the benefit of the implementation organization on the Mongolian side as the project progresses: <ul style="list-style-type: none"> <li>• Technical guidance of maintenance for medical equipment</li> </ul> </li> </ol>

The activities and input action plan table on the Mongolian side is as follows:

Table 2.3 Activities and Input Action Plan Table

		1	6	12	
Mongolian side	Inputs	Arranging for medical care personnel			
		Arranging for supply of medical goods and consumables			
		Arranging for operating funds			
	Activities	Improvement of medical care functions	Preparation of activities	Implementation of activities	
		Improvement of how hospitals are run	Preparation of activities	Implementation of activities	
		Improvement of enhancement of promotion of local health and prevention	Preparation of activities	Implementation of activities	
		Improvement of maintain and control of facilities and equipment	Preparation of activities	Implementation of activities	
	Japanese side	Inputs	Making improvements regarding medical care equipment	(Confirmation of Tender Documents) (Bidding and selection of contractors)	(Transportation and installation of equipment)
			Operation Training or Management Guidance		



## 2.3 Basic Design

### 2.3.1 Design Concept

#### 1) Policy Regarding Medical Equipment

The policy regarding medical equipment for the main departments is as follows:

##### ① Operating Rooms

There are three operating rooms, and about 1,200 major operations take place in them a year (figure for 1997). Renewal of equipment will be the main emphasis so as to be able to cope with the increase to 1,284 operations in the year 2000 that is expected as a result of strengthening of the referral system.

##### ② Out-Patient Departments

The departments covered in this category are internal medicine, surgery, pediatrics, gynecology, ophthalmology, ENT, urology, dentistry and emergency station, and the policy adopted is selection of equipment that will make it possible to provide appropriate diagnosis and treatment as a top referral general hospital.

##### ③ ICU

There are presently 6 beds for patients requiring intensive care. Emphasis will be placed on replacement of equipment that is in very poor condition after long use.

##### ④ CICU

There are two ICU beds for children. Functional improvement will be made in view of how deteriorated the equipment has become.

##### ⑤ Radiology

There are presently two radiology rooms, where about 12,500 (1997) patients a year are X-rayed, but the equipment, which has been in use for about twenty years, needs to be, and therefore will be, replaced.

##### ⑥ Others

The equipment in other departments that will be replaced on the basis of judgment that it needs to be includes ultrasonography equipment, endoscopes and electrocardiographs.

As for consumables, since the hospitals in question need about 18 months for procurement thereof themselves, the basic design will be that of equipment plans that include 18 months' worth of consumables plus the consumables needed for trial operation and the acceptance procedure after delivery.

#### 2) Replacement of Vehicles

The Second General Hospital has a role of an emergency station and as such has a fleet of 15 ambulances. Two of them will be replaced since they are no longer in useable condition. Also to be replaced is the no longer useable radio equipment of four of the vehicles from the standpoint of supporting hospital's present emergency

medical service activities. Of the four radio equipment sets, two will be installed in the new ambulances to be provided by the Japanese side.

The community health promotion section's itinerant medical examination and treatment team consists of about six physicians and nurses selected from the different departments of the hospital on the basis of the state of ailments in the four Gobi "aimag." The itinerant medical examination and treatment team's vehicles also have to carry medical equipment, fuel, food, accommodation gear, etc. Furthermore, considering the fact that the team visits areas with very poor road conditions, including unpaved roads, it has been decided to use 2-vehicle convoys so as to be able to cope with vehicle breakdowns and other emergencies.

### 3) Policy Concerning Maintenance and Operation Capacity of the Implementing Agency

Regarding operating funds and the technical level of the users of the equipment, it is considered that there should be hardly any problems after implementation of the project that would be different to deal with on the Mongolian side since the equipment to be supplied in the project will be mainly equipment replacing existing equipment. Nevertheless, in view of the fact that the equipment to be supplied in the project includes some sophisticated medical equipment, adequate guidance in operating it and maintenance training for it will be given to the personnel who will be using it.

### 4) Policy Concerning Construction Performance Time

The periods of construction will be set taking into consideration the local natural conditions, social conditions and the fact that the facilities in question are facilities for provision of routine medical services. The installation schedules will be planned so as to minimize interruption of medical services at the facilities and temporary relocation thereof. The plans are to make it possible to complete the equipment layout and installation work efficiently in a short amount of time. Furthermore, it is necessary to modify the facilities for addition of large medical equipment requiring considerable installation work, and the work schedule will be such that the revamping work will be completed by the end of October, after which concrete work becomes no longer possible.

### 5) Policy Regarding Setting of Scope and Grade of the Equipment

The plans will be prepared so as to provide basic equipment that will make possible diagnosis and treatment of generally prevalent ailments in the area in question taking into account ease of maintenance and operation, sureness and compatibility with the other equipment of the hospital. Also included must be peripheral equipment for utilization of automatic voltage stabilization devices, power supply devices immune to outages, tool sets for routine maintenance of machinery and equipment, etc.

For radiation diagnosis devices it is also necessary to consider aprons, gloves, screens, etc. for protection from X-rays.

The scope of the cooperation will be limited to what is considered to be appropriate in terms of necessity, urgency, priority, cost-benefit effect, etc., to what is considered to be appropriate for implementation as Japanese grant aid and to the extension to which it

is considered to contribute to development of Mongolia's self-reliance as based on the above-mentioned principles.

On the basis of the above items of consideration Table 2-4 : consideration of the required equipment has been drawn, and the equipment plans was formulated on the basis of the overall results thereof.

### 2.3.2 Basic Design

#### 1) Process of Study of Which Equipment to Select

At the time of the basic design study the study team discussed with the Mongolian side the equipment requested by the different departments on the basis of the equipment selection principles and the following order of priority:

Priority A: Equipment judged to be indispensable to hospital operation

Priority B: Equipment with a high degree of necessity but for which study is required concerning operation and maintenance and management

Priority C: Equipment that is not considered to be necessary for diagnosis and treatment activities

Regarding equipment assigned priority B in analysis in Japan, further consideration was given on the basis of equipment selection policy to whether or not to include it. As for equipment of priority C, it was in principle excluded from consideration.

In view of the present situation in which basic medical equipment has become superannuated and is short in quantity, the equipment plans have been drawn up so as to contain equipment that will be effectively used after project implementation, for which sure operation and maintenance are possible and which will lighten the Mongolian side's burden the most. In selection of equipment from among that required by the different departments, various changes were made in the original lists by increasing or decreasing quantities, eliminating items, etc. on the basis of the facility scale confirmed in the basic design study. (See Table 2-4, Equipment Analysis Output.)

#### 2) Equipment Plan

Judging from the above considerations and the hospital's patient demand, personnel plans, planned equipment, technical level, etc., the list of the equipment for the present project has been drawn up as follows on the basis of the design policy for it set forth in the preceding section and the findings and conclusions of the study and discussions.

The content and quantities of main equipment indicated in Table 2-5.





Table 2-4 Evaluation Criteria for Medical Equipments for Second General Hospital

Planning No.	Machine No.	Dept	DESCRIPTION	11 Criteria for grading (100 points)												Final Result		Remarks												
				Priority	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Result		Qty											
85	89	OUT-PATIENT GYNECOLOGY DEPARTMENT	Xenon compatible hydrocollator	A	1																				0	1				
86	90	OUT-PATIENT GYNECOLOGY DEPARTMENT	Vaginal speculum warmer	A	1																						0	1		
87	91	OUT-PATIENT GYNECOLOGY DEPARTMENT	Aspirator unit	A	2																							0	2	
88	92	OUT-PATIENT GYNECOLOGY DEPARTMENT	Craniol set for abortion	A	2																							0	2	
89	93	OUT-PATIENT GYNECOLOGY DEPARTMENT	Dispenser (sterile disposable) delivery type	A	1																							0	1	
90	94	OUT-PATIENT GYNECOLOGY DEPARTMENT	Teal unit radiography	C	1																							0	0	Change in quantity
91	95	OUT-PATIENT GYNECOLOGY DEPARTMENT	Diagnostic instrument set for Gyn.	A	2																							0	2	
92	96	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Chlorax table	A	1																							0	1	
93	97	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Defluore (set chart)	A	1																							0	1	
94	98	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	SLI (low magnification)	A	1																							0	1	
95	99	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Sight Tester Unit	A	1																							0	1	
96	100	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Trial lens set	A	1																							0	1	
97	101	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Ultrasonic scanner	A	1																							0	1	
98	102	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Autocomography	A	1																							0	1	
99	103	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Echocscan	A	1																							0	1	
100	104	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Stress (index) camera	A	1																							0	1	
101	105	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Medical cabinet	A	1																							0	1	
102	106	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Examining table	A	1																							0	1	
103	107	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Hand magnet	A	1																							0	1	
104	108	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Diagnostic instrument for eye	A	2																							0	2	
105	109	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Treatment instrument set for eye	A	2																							0	2	
106	110	OUT-PATIENT OPHTHALMOLOGY DEPARTMENT	Perimeter	A	1																							0	1	
107	111	OUT-PATIENT ENT DEPARTMENT	Laryngeal endoscopy	A	1																							0	1	
108	112	OUT-PATIENT ENT DEPARTMENT	Automatic endometer	A	1																							0	1	
109	113	OUT-PATIENT ENT DEPARTMENT	ENT (throat) with & chair	A	1																							0	1	
110	114	OUT-PATIENT ENT DEPARTMENT	Cosmetology	A	2																							0	2	
111	115	OUT-PATIENT ENT DEPARTMENT	Nasopharyngoscopy	A	1																							0	1	
112	116	OUT-PATIENT ENT DEPARTMENT	Otoscopy scope	A	1																							0	1	
113	117	OUT-PATIENT ENT DEPARTMENT	Cold light source	A	1																							0	1	
114	118	OUT-PATIENT ENT DEPARTMENT	Instrument table	A	2																							0	2	Change in quantity
115	119	OUT-PATIENT ENT DEPARTMENT	Instrument cabinet	A	1																							0	1	
116	120	OUT-PATIENT ENT DEPARTMENT	Section unit	A	1																							0	1	
117	121	OUT-PATIENT ENT DEPARTMENT	Dressing gown stand	A	2																							0	2	
118	122	OUT-PATIENT ENT DEPARTMENT	Diagnostic instrument set for ENT	A	2																							0	2	
119	123	OUT-PATIENT ENT DEPARTMENT	Treatment instrument set for ENT	A	2																							0	2	
120	124	OUT-PATIENT UROLOGY	Cystoscalenoscope	A	2																							0	2	
121	125	OUT-PATIENT UROLOGY	Lithotripsy	A	2																							0	2	
122	126	OUT-PATIENT UROLOGY	Bacinoscope	A	2																							0	2	
123	127	OUT-PATIENT UROLOGY	Visual endoscopy	A	1																							0	1	
124	128	OUT-PATIENT UROLOGY	Light source unit	A	1																							0	1	
125	129	OUT-PATIENT UROLOGY	Treatment instrument set for ENT	A	1																							0	1	
126	130	OUT-PATIENT UROLOGY	Instrumentation unit	A	1																							0	1	
127	131	OUT-PATIENT UROLOGY	Urethra scope (insulator)	A	2																							0	2	
	132	OUT-PATIENT UROLOGY	Urethroscope	A	1																							0	1	

Table 2-4 Evaluation Criteria for Medical Equipments for Second General Hospital

Planning No.	Item No.	Dept	DESCRIPTION	(1) Criteria for getting life priority											(2) Criteria for getting low priority			Remarks					
				DD Study		1	2	3	4	5	6	7	8	9	10	11	12		Final Result				
				Priety	Qty														1	2	3	4	5
128	133	OUT-PATIENT UROLOGY	Instruments sterilizer		A	2														O	2		
129	134	OUT-PATIENT UROLOGY	Treatment instrument set for Uro		A	2															O	2	
130	135	OUT-PATIENT UROLOGY	Urological Examining Treatment Table with Chair		A	1															O	1	
131	136	OUT-PATIENT DENTAL	Chair mounted unit		A	4															O	4	
132	137	OUT-PATIENT DENTAL	Air compressor		A	4															O	4	
133	138	OUT-PATIENT DENTAL	Treatment cabinet		A	4															O	4	
134	139	OUT-PATIENT DENTAL	Apparatus tray for Dental		B	1															O	1	
135	140	OUT-PATIENT DENTAL	Portable radiograph unit		A	2															O	2	
136	141	OUT-PATIENT DENTAL	High air sterilizer		A	4															O	4	
137	142	OUT-PATIENT DENTAL	Laser sterilizer cabinet type		A	1															O	1	
138	143	OUT-PATIENT DENTAL	Ultrasonic cleaner		A	3															O	3	
139	144	OUT-PATIENT DENTAL	Hydraulic back pump		A	1															O	1	
140	145	OUT-PATIENT DENTAL	Dental laboratory engine		A	2															O	2	
141	146	OUT-PATIENT DENTAL	Laboatory table		A	2															O	2	
142	147	OUT-PATIENT DENTAL	Projector		A	1															O	1	
143	148	OUT-PATIENT DENTAL	Casting machine centrifugal		A	1															O	1	
144	149	OUT-PATIENT DENTAL	Roast, oral instruments		A	3															O	3	
145	150	OUT-PATIENT DENTAL	Diagnostic instrument set for DENTAL		A	5															O	5	
146	151	EMERGENCY POST	Electrocardiograph, 1ch		A	1															O	1	
147	152	EMERGENCY POST	Resuscitator		A	1															O	1	
148	153	EMERGENCY POST	Defibrillator		A	1															O	1	
149	154	EMERGENCY POST	Biologic Monitor		B	1															O	1	
150	155	EMERGENCY POST	Electric suction unit		A	1															O	1	
151	156	EMERGENCY POST	HALO stretcher reely		A	1															O	1	
152	157	EMERGENCY POST	Treatment table		A	4															O	4	
153	158	EMERGENCY POST	Patient Bed, 2' oval		A	3															O	3	
154	159	EMERGENCY POST	Patient Bed		A	1															O	1	
155	160	EMERGENCY POST	Laundry cart		A	1															O	1	
156	161	EMERGENCY POST	Nursing stand		A	1															O	1	
157	162	EMERGENCY POST	Washed chair		A	1															O	1	
158	163	EMERGENCY POST	X-ray illuminator		A	1															O	1	
159	164	EMERGENCY POST	Diagnostic instrument set for Emergency		A	3															O	3	
160	165	EMERGENCY POST	Biologic Cabinet		A	7															O	7	
161	166	EMERGENCY POST	Medicine cabinet		A	3															O	3	
162	167	ICU	ICU Bed, with Side Rail		A	6															O	6	
163	168	ICU	Bunk bed monitor		A	4															O	4	
164	169	ICU	Ventilator		A	2															O	2	
165	170	ICU	Electric suction unit		A	4															O	4	
166	171	ICU	Electrocardiograph, 1ch		A	1															O	1	
167	172	ICU	Dedfibrillator		A	1															O	1	
168	173	ICU	Pulse oximeter		A	3															O	3	
169	174	ICU	Storage infusate pump		B	2															O	2	Therapeutic-CBU (1)
170	175	ICU	X-ray film illuminator		A	1															O	1	
171	176	ICU	Portable suction unit		A	2															O	2	















Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
1	Anaesthesia apparatus, with Ventilator and monitor	3	<ol style="list-style-type: none"> <li>1. Flowmeter: O<sub>2</sub>, N<sub>2</sub>O</li> <li>2. Oxygen flush valve: auto-return type, flowrate - 35 or more lit./min.</li> <li>3. Alarm: oxygen concentration/ supply pressure</li> <li>4. Vaporizer: halothan</li> <li>5. With ventilator</li> <li>6. With monitor</li> </ol>	Used for giving general inhalation anaesthesia or for supplementing vein, intrathecal, or epidural anaesthesia. Equipped with a ventilator.
2	Multi-purpose operating table	3	<ol style="list-style-type: none"> <li>1. Table top elevation : approx. 75 - 100 cm</li> <li>2. Reverse trendelenburg : 25° or more.</li> <li>3. Lateral tilt : 20° each side or more.</li> <li>4. Manual Type</li> </ol>	Used for laying a patient during surgery. Unlike regular beds, it tilts and rotates to position the patient for easier and safer operation.
3	Operating light	3	<ol style="list-style-type: none"> <li>1. Light intensity: Main;120,000lux. or more, Aux.;60,000lux. or more at a distance of 1m</li> <li>2. Main - 8 bulbs or more Aux. - 4 bulbs or more</li> </ol>	Provides proper irradiation, illuminance, and athermal color temperature for surgery.
4	Operation microscope for Eye	1	<ol style="list-style-type: none"> <li>1. Eyepiece: 10x or more</li> <li>2. Table magnifications: 6x, 10x, 16x, 25x</li> <li>3. Illuminant: 12~15 V, 50 W or more halogen</li> </ol>	A microscope used in surgery.
5	Binocular operating microscope for ENT	1	<ol style="list-style-type: none"> <li>1. Objective lens: f250mm or more.</li> <li>2. Halogen lamp: 12V, 50 W or more</li> <li>3. Illuminance: 48,000 lux or more</li> <li>4. Zoom: 1: 2.6 or more</li> </ol>	Used for operating ear, nose, and throat with narrow and deep orifices.
6	Defibrillator	4	<ol style="list-style-type: none"> <li>1. Output energy: 3 - 360 joules or more (more than 10 steps)</li> <li>2. With monitor, ECG amplifier, recorder, and cart</li> </ol>	Used for converting fibrillation. Not needed for daily practice but a necessity in emergency cases. It shall be of the most basic type with a movable cart.
7	Examining table	1	<ol style="list-style-type: none"> <li>1. Dimension:(L)1800 or more (W)600 or more (H)600mm~620mm or more</li> <li>2. Main frame: Made of steel</li> <li>3. Table: Made of urethane foam covered with artificial leather</li> </ol>	Used for examining and treating postoperative patients who are revisiting the surgical outpatient department.
8	Examining table for gynecology	3	<ol style="list-style-type: none"> <li>1. Manual Foot pedal type</li> <li>2. Height adjustment: 600 to 900mm or more</li> </ol>	Used for gynecological examination.
9	Stereo colposcope	1	<ol style="list-style-type: none"> <li>1. Working distance: 250mm approx.</li> <li>2. Illuminance: 2-step selection Low: 30,000 luxes approx. High: 60,000 luxes approx.</li> <li>3. Overall magnification: 8x~20x or more</li> </ol>	Used in gynecology for accurate diagnosis of diseased parts.
10	Sight tester unit	1	<ol style="list-style-type: none"> <li>1. Chair</li> <li>2. Stand</li> <li>3. AO Photopter</li> <li>4. Automatic Chart Projector</li> </ol>	Equipped with an eidoptometer, dioptometer, and other testing instruments to test the visual acuity of a patient sitting in a fixed position.
11	Auto-tonography	1	<ol style="list-style-type: none"> <li>1. Type: Non-contact type</li> <li>2. Measuring range: 0~60mmHg</li> <li>3. Monitor: more than 4 inch</li> </ol>	Used for the quantification of ocular tension (essential to the diagnosis of glaucoma) and aqueous outflow coefficient.

Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
12	Echo-scan	1	1. Measuring method: pulse type 2. Modes: A, B 3. Accuracy: $\pm 0.01\text{mm}$ 4. Frequency: approx. 10 MHz	This device displays the images of the internal structure of the eyeball by emitting ultrasound waves to it and analyzing their echoes. By detecting and observing these echoes, it diagnoses ophthalmological diseases formations and tissue characteristics.
13	Stereo funds camera	1	1. Field angle: 20°~50° or more 2. Total observation magnification: 8.5-10x, 12-13.4x or more magnification 3. Minimum diameter of pupil required: $\phi 4\text{ mm}$ , at 40° 4. Working distance: 39.5-45 mm	Used for photographing eyeground to check the chronological changes in glaucoma and various other conditions of the eyeground.
14	Perimeter	1	1. Transparency A: 0.0315, 0.10, 0.315, 1.00 B: 0.40, 0.50, 0.63, 0.80, 1.00 C: 0.01, 0.0001 2. Gauge: 1/16, 1/4, 1, 4, 16, 64mm <sup>2</sup>	Used for testing all visual functions from retina to optic nerves to detect the onset and progress of glaucoma, optic nerve disorders of retina, brain tumor, and other diseases.
15	Automatic audiometer	1	Test items: Pure tone audiometry (manual) Pure tone audiometry (auto) SISI test ABLB test Self-recording audiometry	Used to diagnose conductive deafness, perceptive deafness, and other auditory disorders.
16	ENT treatment unit & chair	1	1. Compressor: More than 200W oil pump 2. Suction pump: More than 200W oil pump 3. Max. pressure of compressor: 5Kg/cm <sup>2</sup> 4. Air tank: 8000cc approx. 5. Irrigation air volume of cont.: 25lit/min.	Used for otolaryngological examination. The table is for a patient, and the chair is for an otolaryngologist examining the patient.
17	Cysto-urethroscope	2	Sheath: 19.8 Fr., 22.5 Fr. Bridge: 1 way Working insert: 2 way Telescope: 4 mm, 12° 4 mm, 70° 4 mm, 30°	Used for observing, diagnosing, and treating the bladder.
18	Lithotriposcope	2	1. Optical system: Field of view: More than 90° 2. Outer diameter: 3.0mm 3. Bending section Range of tip bending: Up, more than 180° Down, more than 100° 4. Working length: 350mm or more	Breaks up calculi in the urethra, etc. by inserting a fiberscope through the urethra.
19	Resectoscope	2	1. Telescope: 4 mm, 12° 2. Direction of view: 12° or more 3. Field of view: 55° or more 4. Outer diameter: 4mm 5. Working length: 300mm approx.	Used for electrically removing or clotting postatic hyperplasia, bladder tumor, and prostate cancer by inserting an endoscope via the urethra.
20	Visual urethrotome	1	1. Telescope: 0° 2. Sheath: 13.5 Fr. 3. Bridge 4. Working element 5. Knife	Used for observing, diagnosing, and treating the urethra.
21	Electrosurgical unit	1	1. Mode: cut mode, coagulation mode 2. Output characteristics: 350KHZ approx. 3. Output: monopolar 300W approx., bipolar 100W or more (Cut)	Used for cutting and clotting in endoscopic operation.



Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
22	Urethroscope	1	1. Telescope: 12°, 70°, 30° 2. Sheath: 19.8-20Fr. 22-22.5Fr. 3. Bridge: one 4. Working insert	Used for observing, diagnosing, and treating the urethra of adult patients.
23	Chair mounted unit	4	1. Seat movement method: Hydraulic 2. All tube are made of silicon 3. Film viewer 4. Light 5. Automatic char	Used for radical cure in dentistry.
24	Portable treatment unit	2	1. Micro motor hand piece 2. Handpiece 3. Speed geared contra angle 4. 3 way syringes 5. Compressor 6. Vacuum syringe 7. Foot switch 8. Water tank:300cc 9. Waste-disposal tank with float switch:400cc	A portable unit used in house visits for radical dental cure.
25	Bedside Monitor	11	1. Measuring parameters display: ECG, Respiration, SpO2, NIBP, Temperature 2. Measuring method: ECG: 3 electrodes Respiration: impedance method SpO2 Measuring range:50-100% or wider Temperature:22-45°C or more NIBP:Oscillo-metric	Used to monitor a patient's vital conditions in ICU. Specifications shall include the measurement function of basic ECG, respiration, epidermal oxygen concentration, and blood pressure through cables.
26	Ventilator	3	1. Ventilation modes(main): CMV, ASSIST, SIMV, FLOW 2. Ventilation rate: CMV:5-40 breaths/min. approx. IMV:1-40 breaths/min. approx.	Used to take over respiration in a patient who lacks or has lost the ability to breathe after a surgery, etc.. It shall provide both volume-controlled and pressure-limited respiration for patients of all ages from children weighing 10 kg or more to adults.
27	Infant ventilator	1	1. Modes: CMV, ASSIST, SIGH 2. Ventilation rate: 6-40 BPM 3. I/E ratio: approx. 1:1- 1:99 4. O2 concentration: 21 - 100% 5. High pressure limit: 10-70 cmH2O or more	Used for the assist-control ventilation of a newborn patient with spontaneous respiration.
28	Integrated radio. Tomography system	1	1. High voltage generator 2. X-ray tomographic attachment 3. X-ray tube unit 4. Anode rotation starter 5. H.V. cable 6. Auto voltage regulator for main unit 7. Protective glass 8. X-ray tube support 9. Bucky table 10. Bucky stand 11. Collimator	Used for the tomography of the auditory organ, pharyngolarynx, accessory sinus, skull base, spinal cord, chest, joint, bile duct, gallbladder, etc.
29	Diagnostic X-ray TV system	1	1. Radiography Tube voltage:40~150KV or more mAs:1.0~500mAs 2. With TV 3. Number of X-ray tubes: Up to 2 units	Used for all types of radioscopy and radiography of the digestive tract and other organs.

Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
30	Mobile X-ray unit	2	1. Max. tube voltage: 125 kV 2. Max tube current: more than 100mA 3. Max Power: more than 10Kw	Used for patients in severe conditions who are unable to move to the x-ray room. It can take plain x-ray images of all body parts and shall have the maximum capacity of 125 kV and more than 100 mA.
31	C-arm X-ray TV system for surgery	1	1. Short cycle: 45-100 kV/100 mAs 2. Long cycle: 100 kV/3 mA 3. Tube voltage: 40 - 100 kV 4. Current: 0.5 - 30 mA 5. Tube focus: 0.35 mm/1.2 mm 6. With TV monitor	A fluoroscopic X-ray system designed to allow free positioning of an immovable patient in the operating, reposition, or emergency room.
32	High press. Steam sterilizer w. boiler	2	1. Vertical type 2. Capacity: approx. 420 lit. or more 3. With boiler	Used for sterilizing instruments that can withstand constant-temperature, high-pressure, steam saturation. Used especially for sterilizing a large number of forceps, clothes, and instruments used in surgery.
33	Ultrasonic cleaner	1	1. Vibration power: 75W 2. Vibration frequency: 28kHz 3. Capacity: 1.5lit. approx. 4. Timer: 0~30 minutes or continuous	An ultrasonic unit for cleansing various testing and therapeutic instruments.
34	Ultrasound system with doppler	1	1. Display modes: B, B/B, B/M, M, D, B/M/D, M/D,B/D 2. Probes: convex 3.5 MHz, linear 7.5 MHz 3. Monitor: Color, more than 12-inch 4. With printer	Ultrasound waves are emitted to the body and echoes are processed and displayed on the screen to give an image of internal organ, diseased part or characteristics of tissue. It shall be equipped with an easy-to-see 12-inch monitor and two probes.
35	Ultrasound scanner	3	1. Display modes: B, B/B, M, B/M 2. Probes: 3.5 MHz, 6.5 MHz 3. Observation monitor: 12-inch, black and white 4. With printer	Ultrasound waves are emitted to the body and echoes are processed and displayed on the screen to give an image of internal organ, diseased part or characteristics of tissue. It shall be equipped with an easy-to-see 12-inch monitor and 8 probes for use at each section in common.
36	Gastrointestinal fiberscope set	2	1. Visual field: 105° or more 2. Working length: 1,000 mm or more 3. Total length: 1,350-1,370 mm	Used for the observation and biopsy of the stomach and the esophagus.
37	Duodeno fiberscope	2	1. Visual field: 80° or more 2. Working length: 1,030 mm or more 3. Total length: 1,555-1,610 mm	Used for observation and diagnosis as well as for a wide range of therapeutic applications.
38	Colono fiberscope	1	1. Visual field: 125° or more 2. Working length: 1,600-1,680mm 3. Total length: 1,980-2,015 mm	Used for the observation and biopsy of lesions of lower digestive tract from the sigmoid colon to ileocecum as well as for polypectomy. It is generally used to confirm or discriminate an abnormality found by a colonic x-ray or to observe the progress of treatment for infectious diseases.
39	Broncho fiberscope	1	1. Visual field: 100-120° 2. Working length: 550mm or more 3. Total length: 770-840 mm	Used for diagnosing lung cancer, tuberculosis, and other lung and bronchial diseases by observing the bronchia, performing biopsy with forceps, performing cytological examination using a curette or brush, or taking out cleansing fluid. It is also used for finding and removing foreign materials in the bronchia and for suctioning and cleansing thereof for treatment.

Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
40	Endoscopic TV system	1	1. TV monitor: PAL 2. Camera control unit 3. Camera head standard 4. Adapter	Displays endoscopic views on the TV monitor to provide better views for the doctor and patient.
41	Video-endoscopic system	1	1.Video recording system 2.Universal Light source	Video-tapes the images of the endoscopy TV system. Used also for educational purposes.
42	Laparoscope for cholecystectomy set	1	1. Telescope(A): 0°,10mm 2. Telescope(B): 30°,10mm 3. Light source: Xenon 300W 4. Camera control unit 5. Camera head	A cholecystotomy kit used under a abdominoscope without celiotomy incision.
43	Stress test system	1	1. ECG 2. Treadmill	Used for examining the function of the heart by observing the ECG traces of a patient during and after walking on a treadmill.
44	Electroencephalograph	1	1. EEG channel: 6-10 EEG & bio-electric signal plus 2 marker channels 2. Sensitivity : off, 1-200 $\mu$ V/mm 3. With electrode for measuring brain waves	Used widely to supplement the diagnosis of the dysfunction of the central nervous system associated with epilepsy.
45	Whirlpool bath for full body	2	1. Timer: 30min. 2. Temperature adjustment: 35 - 45°C (in digital) 3. Tank Capacity: 200 lit. or more	Used for thermotherapy, massage, and resistive exercise. Used as an exercise bath to strengthen muscles.
46	Galvanization & faradization unit	2	1. Stimulation mode: 8 kinds 2. Treatment time:5-60min. or more	Cures affected areas in the neck and lumbar parts by conducting a low frequency current.
47	Electric traction	2	1. Max. traction force:99Kg 2. Treatment time:99min. 3. With Safety device	A traction machine for neck and lumbar areas that pulls, holds, and releases the patient as programmed.
48	Ultra-low temperature freezer	1	1. Effective capacity: 163liters or more 2. Compressor: Hermetic 350W or more 3. Range: -20°C~-85°C	Used for storing specimens in the clinical laboratory.
49	Densitometer	1	1. Light source: 6V 20W, halogen lamp 2. Measuring sample monitor: 20 samples per one sheet 3. Measuring time: 1sample 14sec. ,20 samples/5min.	A colorimetric densitometer that analyzes components by separating them with an electric flow.
50	Electrolyte analyzer	1	1. Subject: Na, K, CL 2. Sample volume: 100-190ul 3. Speed: 70-80 test/hr.	Measures ion activities by selectively creating a reflux for specific ions in a solution, such as Na, K, and CL.
51	Blood gas analyzer	1	1. pH: 6,000-8,000 or more 2. PCO2: 5.0-250.0Torr or more 3. PO2: 0.0-800.0Torr or more 4. B.P.:600-900Torr or more 5. Measurement speed: 30 test/hour (Max.) or more	Analyzes blood gas for evaluating the breathing function and controlling the respiration of a patient during surgery and artificial ventilation.
52	Clinical spectrophotometer	1	1. Wave length range: 340-900nm or more 2. Wave range: 8nm 3. Accuracy: 2nm more less	One of the most basic analyzing devices in the laboratory that measures protein, various types of acids, oxygen, etc. in the blood and urine. Analysis results are used for diagnosing patients.

Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
53	Fume hood	1	1. Dimension: 1,200(W)×750(D)×2,200(H)mm or more 2. Main structure: Steel, melanine eameled 3. Duct:PVC	Used for protecting people from harmful chemicals when preparing and burning drugs in the laboratory.
54	Large capassity refrigerated centrifuge	1	1. Capacity:6600ml or more 2. Speed: 6,000rpm or more 3. Temperature: Digital display: -10°+40°	Used for separating sediments, cleansing, antigen adjustment, and other applications that require a low-temperature, high-speed centrifugal force.
55	Blood Cell counter	1	1. Measurement items: leukocyte count, red blood cell count, hemoglobin content, hematocrit value, mean cell volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, platelet count, grain size, etc. Total more than 18 parameters 2. Throughout: 60 samples/ hour or more	The most basic equipment used for white and red blood cell count and other blood tests. Results obtained from this equipment are used to diagnose patients.
56	Autopsy table	1	1. Table & sink: stainless steel 2. Size: 2600 (W) x 650 (D) x 800 (H)mm approx. 3. hot + cold water 4. With hand shower	A basic autopsy table with a sink. It shall be made of stainless steel with pipes to supply cold and hot water and to discharge wastewater.
57	Cooling unit	1	1. Cooling unit 2. Capacity: 3,000(W)×3,000(D)×2,800(H)mm approx. 3. 0-8 °C 4. Compressor: hermetic rotary type	Refrigerates a mortuary that stores dead patients.
58	Automatic tissue processor	1	1. Paraffin bath: round stainless steel 2. Station number: 12 stations or more 3. Timer: 3, 6, 12, 24, 48, 96 hours 4. Suction power: 500 mmHg	A rapid automatic system to handle histological observation processes from dewatering and delipidizing to paraffin embedding.
59	Central Calling System for Ambulance	1	1. Frequency range:68-88MHz 2. No. of channels:More than 4 ch. 3. Voltage requirement:13.8 VDC±10%	Radio equipment to be installed in the hospital and ambulance.
60	Automatic washer extractor	2	1.Capacity:30Kg/load approx. 2. Cylinder: 920mm φ x 620mmL approx.	Used to wash and spin-dry bed sheets, pillow cases, and clothing used in the hospital.
61	Hot wagon	4	1. Body: SUS430 or SUS304 2. Door: aluminium, polycarbo 3. 32 trays or more	Used for serving meals to inpatients and hospitals staff.
62	Automatic dish washer	2	1. Washing capacity: 55racks/hr. or more 2. Washing tank:30Ltr. 3. Washing type: Upper & lower rotation nozzle	Washes tableware used for serving meals to inpatients and hospital staff.
63	Cooling unit	1	1. Function:cooling unit 2. Cooling capacity:3000Kcal/T or more 3. Temp. control:-2°-+12°	Refrigerates a warehouse that stores meat for hospital meals.
64	Water distillation Apparatus	1	1. Water taken amount: 20Ltr./hr. 2. Tank Capacity: More than40Ltr.	Makes distilled water for diluting various chemicals in the pharmacy.
65	Printing Machine	1	1. Original size:100 x 148-297 x 420mm 2. Printing speed:5steps, 60,80,100,120,130 copies/min. 3. Paper capacity:1,000 sheets	Used for printing a large number of advertisement bills and handouts.

Table2-5 List of the main equipment

NO.	Equipment	Q'ty	Specification	Purpose of use
66	Vehicle with Microphone	2	1. Type: 4WD 2. Drive seat: left side 3. Displacement: 2,300CC or more 4. Transmission: 5-speed manual	Used for transferring nurses and equipment to provide medical services in remote and suburban areas.
67	Ambulance, 4-wheel Drive	2	1. Type: 4WD 2. Drive seat: left side 3. Displacement: 2,000CC or more 4. Transmission: 5-speed manual	A vehicle to transport emergency patients. It shall be of a 4WD jeep type to cope with bad road conditions. The stretcher shall fit in the vehicle.

## **CHAPTER 3**

### **IMPLEMENTATION PLAN**

## Chapter 3 Implementation Plan

### 3-1 Implementation Plan

#### 3-1-1 Implementation Concept

##### 1) System of Implementation

###### (1) Implementing Agency

The agency responsible for the management and implementation of this Project shall be the Department of Policy Coordination and International Cooperation of the Ministry of Health and Social Welfare of Mongolia. The Second General Hospital, the subject facility of this Project, shall be in charge of actual operation of the Project. The Director of the Department of Policy Coordination and International Cooperation, who served as the Mongolian representative during the basic design study, shall be responsible for the supervision of overall operations. The Director of the subject hospital shall be in charge of practical affairs. The Supply and the Maintenance Unit of the subject hospital shall be in charge of the maintenance and operation of the equipment to be provided, and the Accounting Unit shall be responsible for the procurement and management of consumable items.

###### (2) Consultant

Immediately after the signing of Exchange of Notes (E/N) between the governments of Mongolia and Japan, the Japanese consultant will execute a consultant agreement with the Ministry of Health and Social Welfare of Mongolia in accordance with the procedures of the Japanese grant aid system. This agreement will take effect after the verification by the government of Japan, based on which the consultant will carry out the following tasks:

- ① Confirmation of tender documents : work of final confirmation of the content of the project and approval of the tender documents
- ② Tendering phase : Cooperates in the selection of equipment suppliers and in the execution of supply agreement with them.
- ③ Procurement phase : Manages the procurement of equipment and materials and conducts pre-shipment inspection.
- ④ Installation phase : Supervises and guides the installation, operation, and maintenance of the equipment.

The consultant will form a team of two personnel comprised of a project manager and equipment planning manager to carry out the Confirmation of the contents and supervision of the project.

- ◇ Project Manager : Assumes the overall responsibility for all the processes from confirmation of the contents to the completion of the project and coordinates communications between the governments of Japan and Mongolia.

- ◇ Equipment Planning : Conducts a final verification of the equipment specifications jointly with the personnel of the Ministry of Health, the subject hospital, and the manufacturers of the equipment during the Confirmation stage of the contents regarding this project. He also prepares the working drawings and specifications as well as other documents required to submit to the governments of Japan and Mongolia and inspects the equipment and the installation thereof at the time of transfer.

### (3) Equipment Supplier

The equipment supplier, who will be selected through tendering, will conclude an agreement with the Ministry of Health and Social Welfare. This agreement will also take effect upon verification by the Japanese government, based on which the supplier will supply, carry in, and install the relevant equipment and provide technical guidance with regard to the operation and maintenance of the equipment. The supplier will then establish a system for the maintenance and management of the equipment after the transfer of ownership, including the procurement of spare parts and consumables and the provision of technical guidance. In addition, it will prepare manuals and other technical documents necessary for the maintenance of supplied equipment as well as a list of agencies of the equipment manufacturers situated in the neighboring countries. The supplier is required to carry out its tasks smoothly by deciding the timing of delivery and installation of the equipment based on close coordination with the implementing agency.

### (4) Japan International Cooperation Agency

For the smooth implementation of this Project, the Japan International Cooperation Agency will verify and authorize various documents to be submitted to the government of Japan.

## 2) Implementation Policy

- (1) After the signing of E/N, the consultant shall follow necessary procedures to ensure smooth implementation of this Project based on thorough discussions with the relevant government agencies of Japan and Mongolia, equipment supplier, and other relevant organizations in each stage of tendering, selection of contractors, execution of contractor's agreement, confirmation of production schedule, pre-shipment inspection, and payment of project cost.
- (2) Considering the nature of the services rendered by the subject hospital, it will be difficult to ask the hospital to stop its daily operations during the carrying in and installation of the equipment. Thus, the consultant shall develop a carefully thought out work schedule and other plans with the relevant personnel of the subject hospital in the confirmation of tender documents stage so as not to delay the progress of this Project. In addition, extreme caution shall be exercised to minimize the noise and to control other health hazards during the installation work, and strict safety control shall be enforced especially when carrying in the medical equipment.



- (3) Thorough quality control, manufacturing inspection, and pre-shipment inspection shall be conducted in advance for the equipment to be procured in Japan.
- (4) Equipment items that require special installation work shall be installed by the engineers who will be dispatched from the equipment manufactures as instructed by the supplier. If such engineers cannot be dispatched from Japan, the consultant shall instruct the supplier to send substitute engineers from local agencies of the manufacturers.
- (5) Upon delivering the equipment, the consultant shall provide necessary training to the local staff, check the precise layout of the equipment in each department, and confirm the completion of delivery.
- (6) To widely disseminate the techniques and knowledge of the operation and maintenance of the equipment, the equipment supplier shall provide training and orientation to the representatives of each department. Training shall not be conducted if such knowledge can be acquired through the usage of operation and maintenance manuals. To enhance the effect of the training, periodic inspection and other maintenance procedures used by the staff of the Supply and Maintenance Unit shall be verified.

### **3-1-2 Implementation Condition**

#### **1) Japanese Side**

The equipment will be transported and delivered to the subject hospital via China. If the delivery is to take place in winter, the unpacking, installation, adjustment, and operational training of the equipment will have to be done in sub-zero temperature. To ensure smooth implementation, all preparatory work should be done in advance.

#### **2) Mongolian Side**

Completion by the end of October of removal of existing equipment to be replaced and revamping of existing facilities for installation of new equipment. To ensure that the equipment will be carried in and installed without delay, all relevant organizations should establish close coordination beforehand.

### 3-1-3 Scope of Work

Scopes of work for this Project for Japanese and Mongolian side are as follows:

#### 1) Japanese Side

- ① Procurement of planned equipment
- ② Ocean freight and inland transport of the equipment to the subject hospital
- ③ Installation and setting up of the equipment
- ④ Provision of technical guidance with regard to the trial operation, operation, inspection, and maintenance of all equipment supplied

#### 2) Mongolian Side

- ① Submission of information and documents necessary for the installation and setting up of the equipment.
- ② Provision of an office space in the hospital site during the implementation period.
- ③ Provision of necessary facilities and space for the installation of the equipment.
- ④ Preparation of necessary infrastructure (electric power, water, sewage, etc.) and the completion of the construction of primary-side service systems as well as the removal of existing equipment before the arrival of the new equipment.
- ⑤ Provision of a space to store the equipment between its arrival and installation.
- ⑥ Provision of necessary assistance in the unloading, customs clearance, and inland transportation of the imported equipment of the Project.
- ⑦ Exemption of Japanese personnel, who will be staying in Mongolia for the implementation of the Project, from customs duties and other taxation.
- ⑧ Provision of necessary assistance and securing of safety for the Japanese personnel in bringing in necessary equipment and performing their duties for the Project.
- ⑨ Payment of expenses incurred in connection with the Banking Arrangements (B/A) and Authorization to Pay (A/P).
- ⑩ Allocation of budget and personnel necessary for the effective implementation of this Project, including the O/M cost of the equipment to be provided through Japanese grant aid.
- ⑪ Preparation of a 5-year usage plan of the equipment to be provided through Japanese grant aid and periodic reporting of actual usage to the Japanese Embassy in Mongolia.
- ⑫ Proper maintenance and operation of the equipment to be provided through Japanese grant aid as well as payment of expenses related to such maintenance and operation.
- ⑬ Issuance of licenses, permits, and certificates necessary for the implementation of the grand aid project.
- ⑭ Payment of expenses incurred in connection with the exemption of taxation.
- ⑮ Payment of expenses necessary for the implementation of the Project other than those specified above for the Japanese and Mongolian sides.

### **3-1-4 Consultant Supervision**

According to the procedures of the Japanese grant aid system, the Japanese consulting firm will conclude a consultant agreement with the Ministry of Health and Social Welfare of Mongolia, which is the implementing agency of this Project, and carry out the implementation and supervision of this Project. The purpose of the supervision is to verify whether or not the Project is implemented according to the schedules and specifications set forth in the working documents and to ensure proper execution of the equipment procurement agreement by providing fair guidance, advice, and coordination to achieve better quality. The supervisory work will include the following:

**1) Tendering and Contracting**

The consulting firm will select Japanese contractors who will supply and install the equipment for the Project through a tendering process. The firm will prepare tender documents, announce the tender, accept applications, examine the qualification of the applicants, distribute tender documents, accept filled-out tender documents, and evaluate the tenders. It will also give advice with regard to the conclusion of contracts between the Mongolian Health Ministry and Japanese equipment suppliers and contractors.

**2) Provision of Guidance, Advice and Coordination for Equipment Supplier**

The consulting firm will review the implementation schedule, implementation plan, equipment and material procurement plan, medical equipment procurement plan, installation plan, etc. and provide guidance, advice, and coordination for the equipment suppliers.

**3) Inspection and Authorization of Manufacturer's Drawings and Shop Drawings**

The firm will inspect the shop drawings, manufacture's drawings, and other documents to be submitted by the equipment suppliers and provide guidance if necessary before approving them.

**4) Confirmation and Approval of Equipment to be Procured**

The firm will approve the medical equipment to be procured by the suppliers upon verifying its consistency with the contract documents.

**5) Factory Inspection**

As necessary, the firm will attend the inspection of the medical equipment at the manufacturer's production site to ensure adequate quality and performance.

**6) Reporting of the Progress of Work**

The firm will check the status of the implementation work and report the progress to relevant agencies of both countries.

**7) Completion Inspection and Trial Operation**

At the completion of the installation work, the firm will conduct an inspection and trial operation of the medical equipment and facilities. Upon verifying that the installation work has been completed as specified in the contract documents, it shall

submit the certificate of completion to the relevant Mongolian authorities.

#### 8) Technical Guidance in Operation and Maintenance

Since some of the equipment items require certain technical knowledge with regard to their operation and maintenance, Mongolian personnel, who will be in charge of such equipment items, needs to be trained at the site in the operation, inspection, repair, and other aspects of the equipment during the installation, adjustment, and trial operation period. The consulting firm will provide necessary guidance and advice with regard to such training.

In carrying out the above tasks, the consulting firm will not have to dispatch personnel who will stay in the site throughout the implementation process. In view of the scale of the Project, it will be sufficient that the firm will occasionally dispatch engineers, who will inspect, guide, and coordinate the work in the site according to the progress of the Project. At the same time, it will assign engineers in Japan, who will support and communicate regularly with the dispatched personnel. In addition, the firm will report the progress of the Project and other required items regarding the payment and handing-over procedures to the relevant Japanese authorities. No legal or labor-related problems in the Mongolia are found in this regard.

### 3-1-5 Procurement Plan

#### 1) Local Procurement

After examining the distribution of equipment and expendable items as well as the service system of equipment repair and maintenance in Mongolia, it was determined that local procurement was not feasible for the Project. Presently, there is no Mongolian-made medical equipment, but only syringes and injection needles made by a joint venture with a Korean manufacturer.

#### 2) Possibility of Third-Country Products

Most of the equipment of hospital covered by the project was made in Czechoslovakia or Russia more than 20 years ago. Furthermore, no system of agencies of medical equipment manufacturers has yet been established in Mongolia. Since in recent years there have been considerable deliveries of Japanese medical equipment, priority will be given to Japanese products. The kind of equipment, for which proper installment and solid after-care service is ensured, will be selected.

#### 3) Transportation

This Project will use multi-modal transport via ocean, rail, and truck. The equipment will be first shipped to Sin Port of China. It will then be moved to Tianjin Station, the nearest train station to the port, from which it will be transported to the Zamyn Uud Station on the Mongolian border. At this station, the equipment will clear the customs and transferred to another train since the width of the railway track in Mongolia differs from that of China. The train will arrive directly at the container yard in Ulaanbaatar, from which the equipment will be transported to the subject hospital by truck. It will take about four weeks to ship the equipment from the Japanese port to the hospital. The transport schedule shall allow sufficient time for unloading and customs clearance.

### **3-1-6 Implementation Schedule**

Upon signing of the E/N for the Project between the governments of Japan and Mongolia, the Project will be implemented in three stages of confirmation of Tender Documents, tendering, and equipment procurement. The confirmation of Tender Documents and tendering will comprise the working design.

1) **Confirmation of Tender Documents**

After the conclusion of a consultant contract between the Ministry of Health and Social Welfare of Mongolia and the Japanese consulting firm and upon verification of the contract by the Japanese government, the consulting firm will begin confirming the final contents of the Project based on the detail drawings and specifications made during the basic design study phase as well as the list of tender requirements and other tender documents. During this stage, the consulting firm will discuss the particulars of the facilities and equipment with relevant Mongolian agencies and obtain approval for all the tender documents from the Mongolian authorities before the end of the stage. The time period required for the final confirmation of the project contents is estimated at around one and half month.

2) **Tendering**

The contractor to supply the equipment will be selected through tender. The tendering process will take place in the order of the announcement of tender, acceptance of applications, qualification, distribution of tender documents, tendering, report of tender result, appointment of the contractor, and conclusion of an equipment procurement contract. The whole process will take about two months.

3) **Equipment Procurement**

After the signing of the equipment procurement contract and upon verification of the contract by the Japanese government, the contracted work will begin to be implemented. In view of the present conditions of the subject facility, scale and contents of the contract, weather conditions, and other factors, the implementation work is estimated to take about 7.5 months.

Shown below is the implementation process from the signing of E/N to the completion of the Project.

Table 3-1: Implementation 2 Schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12
Working Design	Exchange of Notes (E/N)	○										
	Consultant Contract	○										
	Confirmation of the contents of the project	—	—									
	Create of the tender documents		—									
	Approval of the tender documents											
	Announcement of tender			○	—							
	Distribution of tender documents			○								
	Tendering				●							
	Evaluation of tenders											
	Contractor Agreement				●							
Supervision	Issuance of order for equipment				○							
	Manufacturing of equipment					////	////	////	////	////	////	
	Preliminary construction and verification							///	///	///	///	
	Factory inspection, etc.							////	////	////	////	
	Pre-shipment inspection								—	—	—	
	Loading & transport											
	Installation, acceptance inspection, transfer of ownership											
	<p>— Work in Mongolia</p> <p>//// Work in Japan</p>											

### 3-1-7 Obligations of recipient country

Obligations of Mongolia regarding this project are indicated in 3-1-3, but in particular following matters have to be endorsed properly by Mongolian side.

- ① Preparation of necessary infrastructure (electric power, water, sewage, etc.) and the completion of the construction of primary-side service systems as well as the removal of existing equipment before the arrival of the new equipment.
- ② Provision of a space to store the equipment between its arrival and installation.
- ③ Provision of necessary assistance in the unloading, customs clearance, and inland transportation of the imported equipment of the Project.
- ④ Exemption of Japanese personnel, who will be staying in Mongolia for the implementation of the Project, from customs duties and other taxation.
- ⑤ Provision of necessary assistance and securing of safety for the Japanese personnel in bringing in necessary equipment and performing their duties for the Project.
- ⑥ Payment of expenses incurred in connection with the Banking Arrangements (B/A) and Authorization to Pay (A/P).
- ⑦ Allocation of budget and personnel necessary for the effective implementation of this Project, including the O/M cost of the equipment to be provided through Japanese grant aid.
- ⑧ Issuance of licenses, permits, and certificates necessary for the implementation of the grant aid project.
- ⑨ Payment of expenses incurred in connection with the exemption of taxation.

### 3-1-8 Operation or Management Guidance

The Mongolian Ministry of Health and Social Welfare positions the Second General Hospital as the country's top referral hospital as a model of whose medical services for other hospitals. However, the hospital struggles to function adequately because of its aging medical equipment. In order to ensure a smooth startup of this Project and effective utilization of the equipment to be provided thereunder, we will implement the following soft components.

- Technical guidance medical equipment for maintenance

Since nearly 400 items of equipment are scheduled to be procured on the basis of Grant Aid from the Government of Japan, technical guidance for strengthening of a maintenance system for Equipment maintenance techniques will be furnished.

#### **(To give guidance in strengthening the Supply and maintenance unit.)**

Analysis of Problems in Supply and maintenance unit

To hold workshops to solve the problems.

To give guidance for staffs and budget for Supply and maintenance unit system.

To give technical guidance(Maintenance, Repairs, and how to use tools for maintenance etc.) to staff ,and to advice on the maintenance work subcontracting.

**(To give guidance in preparation of the Maintenance Manual, etc.)**

In order to strengthen the role of the Supply and maintenance unit, providing the Supply and maintenance unit with assistance for the purpose of preparing a detailed manual on for handling equipment trouble, safe use of the equipment, routine maintenance for prevention of trouble, etc.

**(To give guidance in the Inventory List and the Maintenance History)**

To give guidance in order to drawn up a Inventory List which clearly defines the names, locations, quantities, manufacturers, models, and delivery date, and so on for the equipment. Also guidance for establishment of a system for keeping maintenance history for the equipment for management thereof on the basis of records kept on performance, state of operation, repairs of equipment trouble, state of use of consumable supplies, and so on.

**(Monitoring)**

Checking the situation regarding maintenance after installation of the equipment, making a review thereof to identify problems and providing guidance on possible improvements.



### 3-2 Project Cost Estimation

#### 3-2-1 Rough Estimate of Project Cost

The breakdown of the expenses to be borne by the Mongolian side is estimated as follows:

##### 1) Expenses to be Borne by the Mongolian Side

Category	Total (1,000 Tg.)
1. Removal of existing equipment	1,660
2. Repair of existing equipment	3,735
Total	5,395

##### 1) Basis of Estimation

- ① Date of estimation: February 1999
- ② Exchange rate: 1 US dollar = 125.0 yen
- ③ Duration of working design and supervision: approx. 11 months
- ④ Purchase order: lump sum
- ⑤ Other: This project will be implemented according to the Japanese grand aid system. It is assumed that the import duties on the materials and equipment, corporate tax on Japanese corporations, value-added tax, and other internal taxes in Mongolia will be exempted or paid by the Mongolian government. In addition, the Mongolian government should take into account the following charges and taxes:
  - a. Fees for going through formal procedures for delivering the equipment.
  - b. Customs duties on the materials and equipment.
  - c. Service charges on the issuance of B/A and A/P.
  - d. Exemption fees of internal tax and other financial charges and necessary expenses for added-value payment.

To ensure the smooth implementation of the project and effective utilization of the equipment immediately after the installation thereof, the government of Mongolia is advised to allocate a budget for the above items in a timely manner.

### 3-3 Operation and Maintenance Costs

#### 1) Management and Maintenance System and Procedures of the Hospital

Most of the medical equipment to be provided under the Project will be of basic type, replacing or supplementing the existing equipment to minimize the burden on the hospital. However, to improve the effectiveness of the current maintenance system, we recommend that the hospital adopt the following:

##### (1) Supply system of spare parts and consumables

The equipment procurement contract should require the supplier to provide spare parts and consumables with charge for at least five years after the expiration of the warranty period, when the equipment will need to be updated. For frequently needed spare parts and consumables, a quotation should be submitted in advance to the Accounting Unit of the hospital so that it can estimate the purchase cost and allocate a necessary budget.

##### (2) Training of maintenance staff

At the MMT, there are three equipment engineers, who draft the overall maintenance plan of the medical equipment in Mongolia. However, training in the operation and maintenance of medical equipment in hospitals to ensure proper operation has yet to be conducted.

Three personnel in the Supply and Maintenance Unit of The Second General Hospital (18 personnel) are in charge of periodic inspection of their medical equipment. Mongolian hospitals are generally equipped with only minor tools of poor quality and do not have manuals for aged equipment mostly made in East Europe. To cope with the shortage of maintenance personnel, Mongolian Ministry of Health and Social Welfare is currently bringing up technicians at Mongol Technical College.

For that purpose it is necessary for the maintenance personnel of the hospital involved in the project to implement the following:

- The maintenance personnel will make the rounds of inspection to assess the status of facilities and equipment and to keep periodic maintenance records and, at the same time, accepts reports on equipment problems from other departments. Such problems will be first sorted out by the maintenance personnel and then reviewed by the policy committee of the hospital. If repair work is required, a necessary budget will be allocated before issuing a purchase order. Equipment repair may be entrusted to the manufacturer depending on the type of equipment and the nature of trouble.

##### (3) Training by equipment supplier

At the time of installation, the equipment supplier will dispatch engineers to the hospital to provide guidance in the proper operation, daily inspection, troubleshooting, and other technical aspects of the equipment. As a condition to participate in the tender, the supplier will prepare operational and maintenance manuals and other documents necessary for such training in Mongolian language.

The consulting firm, along with personnel from the Ministry of Health and other medical organizations, will check the translated manuals before the delivery of the equipment for any mistranslation or unclear or difficult expressions. If necessary, the manuals will be corrected by the equipment supplier and delivered to the hospital along with the equipment.

In this Project, training will be provided only for those equipment items that require training.

Before the handing-over of the equipment to the Mongolian side, the supplier will explain the following to ensure that the operators and maintenance personnel will acquire necessary knowledge:

- ① Daily maintenance (cleaning, adjustment, etc.)
- ② Operation and maintenance (simple troubleshooting)
- ③ Charge and storage of spare parts and expendables
- ④ Charge and storage of various manuals

Training will be given in the early detection and the reporting to the manufacture of problems in X-ray equipment, ultrasound scanner, blood gas analyzer, automatic blood cell counter, electrolyte analyzer, anesthesia machine, ventilator, patient monitoring system, and other complex machines.

The equipment supplier will provide operational and maintenance manuals, parts list, drawings, list of manufacturers, list of agencies, and other technical documents as outlined below. The supplier will dispatch engineers to the site who will give training to the maintenance personnel of the hospital in the proper operation, daily inspection, troubleshooting, etc. of the equipment at the time of installation.

- ① Operation manual : for the operation of the equipment, to be kept by the Maintenance Unit and the hospital
- ② Maintenance manual : to be kept by the Supply and Maintenance Unit and the hospital
- ③ Parts list : to be kept by the Supply and Maintenance Unit and the hospital
- ④ Drawings : to be kept by the Supply and Maintenance Unit and the hospital
- ⑤ List of manufacturers : to be kept by the Supply and Maintenance Unit and the hospital
- ⑥ List of agencies : to be kept by the Supply and Maintenance Unit and the hospital

(4) Rough Estimation of Maintenance Cost

The annual maintenance cost of 16 main equipment items that require high maintenance and operational cost is estimated as outlined in Table 3-4 below:

Table 3-4 The annual maintenance cost of main equipment

No.	Description	Quantity	Annual maintenance cost per unit (1,000 yen)	Annual maintenance cost by equipment type (1,000 yen)	Basis of calculation
1	Anaesthesia apparatus with Ventilator	3	265	795	Time of operation: 1.5 hrs/person No. of patients: 2/day No. of operating days: 250 days
2	Bedside monitor	11	30	330	No. of operating days: 300 days
3	Ventilator	4	90	360	No. of operating days: 300 days
4	Electrocardiograph, 1 channel	5	6	30	No. of operating days: 300 days
5	Electrocardiograph, 3 channel	2	6	12	No. of operating days: 300 days
6	Electroencephalograph	1	53	53	No. of operating days: 150 days
7	Integrated radio. tomography system	1	375	375	No. of operating days: 150 days No. of patients: 5/day
8	Mobile X-ray unit	2	112	224	No. of operating days: 250 days No. of patients: 10/day
9	Diagnostic X-ray TV system	1	500	500	No. of operating days: 250 days No. of patients: 10/day
10	C-arm X-ray TV system for surgery	1	112	112	No. of operating days: 150 days No. of patients: 5/day
11	Ultrasound scanner	4	50	200	Time of operation: 1.5 hrs/person No. of patients: 10/day No. of operating days: 250 days
12	Stress test system	1	24	24	No. of operating days: 300 days
13	Apparatus x-ray for Dental	1	187	187	No. of operating days: 250 days No. of patients: 5/day
14	Electrolyte analyzer	1	450	450	No. of operating days: 250 days No. of specimens: 20/day
15	Blood gas analyzer	1	450	450	No. of operating days: 250 days No. of specimens: 20/day
16	Blood Cell counter	1	450	450	No. of operating days: 250 days No. of specimens: 20/day
17	Other equipment	1	750	750	
total				5,302	

**(8) Maintenance Personnel and Equipment Plan of the Hospital**

As this Project will focus on replacing the existing equipment with new equivalent models, no additional personnel will be employed, except for one staff already hired in 1998. The Supply and Maintenance Unit of the subject hospital will be in charge of the maintenance system after the implementation of the Project, including the maintenance and repair of the equipment. Currently, maintenance records and other documents are properly managed but not utilized effectively.

**(9) Maintenance Cost of the Hospital**

The annual maintenance cost is estimated at 5,302,000 yen, exclusive of the depreciation cost and electrical charges. As most of the new equipment items will be replacing the existing ones, the actual annual maintenance cost will hardly increase.

The maintenance fees to be paid to the manufacturers as set forth in the maintenance contract is 3,998,000 yen, inclusive of the dispatch fees of engineers twice a year, technical charges, and simple parts.

**(10) Financial Analysis**

**① Revenue**

The Second General Hospital has three revenues: allotment from the Ministry of Health, health insurance, and remuneration for medical services. The revenue has been increasing, and the remuneration has doubled since 1995.

**② Expenditure**

Of the items of expenditure, the stationary expenses recorded the most significant increase in 1996 and 1997 from previous years and dropped substantially in 1998. Although stationary and publication expenses have been fluctuating, another sudden increase will be unlikely as most of the basic items are now in place for the hospital. The hospital seems to be in good financial standing as the increase rate of expenditure falls below that of revenue, except for 1997.

**③ Financial analysis**

Table 3-5 "Projected Revenue and Expenditure of The Second General Hospital" shows a projection of future changes in revenue and expenditure after the inauguration of the Project up to the year 2005 based on the past financial records.

Income		
National budget	GDP growth rate	2.6%
Health insurance	1999 : Average increase rate of days of hospitalization between 1996 and 1998	2.9%
	2000 : Increase rate of days of hospitalization + 1.5% (Hospital's target)	4.4%
	2001 : Increase of 1.5% over last year (Hospital's target)	5.9%
	2002- : Average increase rate of days of hospitalization between 1999 and 2001	4.4%
Second General Hospital's income from operation	1999 : Average increase rate of inpatients between 1996 and 1998 + GDP growth rate	5.0%
	2000 : Increase rate of inpatients +1.5% (Hospital's target) + GDP growth rate	6.5%
	2001- : Average increase rate of inpatients between 1998 and 2001 + GDP growth rate	5.6%
Expenditures		
Salaries and wages	GDP growth rate	2.6%
Social insurance	GDP growth rate	2.6%
Office supplies	GDP growth rate	2.6%
Electricity	1999, 2000 : Average increase rate of inpatients between 1996 and 1998	2.4%
	2001 : Increase rate of inpatients +1.5% (Hospital's target)	3.9%
	2002- : Average increase rate of inpatients between 1998 and 2001	2.8%
Heating	GDP growth rate	2.6%
Fuel and transportation	1999, 2000 : Average increase rate of inpatients between 1996 and 1998	2.4%
	2001 : Increase rate of inpatients +1.5% (Hospital's target)	3.9%
	2002- : Average increase rate of inpatients between 1998 and 2001	2.8%
Telecommunications	GDP growth rate	2.6%
Water and sewage	1999, 2000 : Average increase rate of inpatients between 1996 and 1998	2.4%
	2001 : Increase rate of inpatients +1.5% (Hospital's target)	3.0%
	2002- : Average increase rate of inpatients between 1998 and 2001	2.8%
Personnel temporary assignment expenses	GDP growth rate	2.6%
Purchase of publications	GDP growth rate	2.6%
Fixtures and office equipment	GDP growth rate	2.6%

Uniforms	GDP growth rate	2.6%
Food	1999, 2000 : Average increase rate of inpatients between 1996 and 1998	2.4%
	2001 : Increase rate of inpatients +1.5% (Hospital's target)	3.9%
	2002- : Average increase rate of inpatients between 1998 and 2001	2.8%
Medicine	1999, 2000 : Average increase rate of inpatients between 1996 and 1998	2.4%
	2001 : Increase rate of inpatients +1.5% (Hospital's target)	3.9%
	2002- : Average increase rate of inpatients between 1998 and 2001	2.8%
Consumable supplies	1999, 2000 : Average increase rate of inpatients between 1996 and 1998	2.4%
	2001 : increase of expense of purchase of consumable supplies by introducing equipment	36.3%
	2002- : Average increase rate of inpatients between 1998 and 2001	2.8%
Repair expenses	GDP growth rate	2.6%
Other expenses	GDP growth rate	2.6%
Maintenance cost	GDP growth rate	2.6%

#### ④ Projected revenue and expenditure

An increase of income is expected due to the improved efficiency to be brought about by the new equipment. As for the expenditure, labor cost will not rise as no major increase of staff is being scheduled. Although a substantial increase in the maintenance cost, purchase cost of expendables, and other expenses relating to the newly installed equipment is projected in 2001, it will be set off by the increasing number of patients and revenue brought in by the new equipment.

#### ⑤ Overall comment

The hospital will be able to pay for its own labor, maintenance, and administrative cost without relying on a substantial increase of budgetary allotment from the Ministry of Health, as long as it can find ways to increase remuneration from its patients. The hospital should seek for financial independence and growth by generating its own income without relying on additional financial assistance from the government.

Table 3-5 Projected Revenue and Expenditure of The Second General Hospital

(単位:円)	1995		1996		1997		1998		1999(Projected)		2000(Projected)	
	Amount	Amount	previous year's rate (%)	Amount	previous year's rate (%)	Amount	previous year's rate (%)	Amount	previous year's rate (%)	Amount	previous year's rate (%)	
<b>Income</b>												
National budget	68,300,000	108,000,000	158.13	192,600,000	178.33	205,989,700	106.95	211,345,432	102.6	216,840,413	102.6	
Health insurance	136,055,482	178,091,677	130.90	178,034,646	99.97	245,522,407	138.47	253,671,557	102.9	264,833,106	104.4	
Second General Hospital's income from	458,741	6,950,072	1,515.13	24,051,778	346.07	21,278,942	88.47	22,342,889	105.0	23,795,177	106.5	
Subtotal A	204,814,193	293,041,749	143.08	394,686,424	134.69	473,791,049	120.04	487,359,878	102.7	505,468,696	102.7	
<b>Expenditures</b>												
Salaries and wages	74,890,282	96,131,940	128.36	113,972,931	118.56	156,777,768	137.56	160,853,990	102.6	165,036,193	102.6	
Social insurance	14,741,683	18,388,874	124.74	25,385,796	138.05	35,829,509	141.13	36,761,077	102.6	37,716,865	102.6	
Office supplies	434,340	1,427,216	328.59	6,140,176	430.22	7,361,490	119.89	7,552,859	102.6	7,749,264	102.6	
Electricity	13,469,465	13,427,156	99.69	25,934,109	193.15	25,697,639	99.09	26,982,521	105.0	28,331,647	105.0	
Heating	21,305,119	22,124,510	103.85	54,310,674	245.48	53,793,507	99.05	55,194,190	102.6	56,629,239	102.6	
Fuel and transportation	7,222,803	9,890,541	136.93	14,099,485	142.56	12,180,608	86.39	12,789,638	105.0	13,620,965	106.5	
Telecommunication	1,725,411	2,680,603	155.36	4,678,870	174.55	6,430,554	137.44	6,597,749	102.6	6,769,290	102.6	
Water and sewage	4,059,273	6,847,882	168.70	12,933,260	188.87	15,598,200	120.61	16,378,110	105.0	17,442,687	106.5	
Personnel temporary assignment expenses	217,254	1,132,150	521.12	623,710	55.09	192,650	30.89	197,659	102.6	202,798	102.6	
Purchase of	345,009	342,568	99.29	257,310	75.11	235,650	91.97	242,803	102.6	249,116	102.6	
Fixtures and office equipment	2,115,809	1,557,665	73.62	2,084,539	133.82	8,154,010	391.65	8,376,274	102.6	8,594,057	102.6	
Uniforms	1,319,133	3,543,087	268.59	2,017,755	56.95	1,354,260	67.61	1,399,731	102.6	1,436,124	102.6	
Food	19,406,131	27,055,444	139.42	37,670,322	139.23	31,181,270	82.77	31,929,620	102.4	32,695,931	102.4	
Medicine	43,416,549	67,899,788	156.39	83,884,188	123.54	73,900,097	88.10	75,673,699	102.4	77,489,868	102.4	
Repair expenses	2,699,607	1,517,758	56.22	4,358,366	287.16	8,117,530	140.36	6,276,586	102.6	6,439,777	102.6	
Articles of daily use	4,465,849	5,023,935	112.50	4,083,526	81.28	4,460,467	109.23	4,576,439	102.6	4,695,427	102.6	
Other expenses	0	0	0	0	0	0	0	0	0	0	0	
Maintenance cost	211,833,723	278,991,119	131.70	397,575,554	142.50	439,288,209	110.5	451,782,974	102.8	465,099,248	102.9	
Subtotal B												
Balance	-7,019,530	14,030,630		-2,889,130		34,502,840		33,576,904		40,369,448		
(Japanese yen)								7,115,381		8,073,890		

(単位:円)	2001(Projected)		2002(Projected)		2003(Projected)		2004(Projected)		2005(Projected)	
	Amount	previous year's rate (%)	Amount	previous year's rate (%)	Amount	previous year's rate (%)	Amount	previous year's rate (%)	Amount	previous year's rate (%)
<b>Income</b>										
National budget	222,478,264	102.6	228,262,699	102.6	234,197,529	102.6	240,286,665	102.6	246,534,118	102.6
Health insurance	280,458,259	105.9	292,798,422	104.4	305,681,553	104.4	319,131,541	104.4	333,173,329	104.4
Second General Hospital's income from	25,127,707	105.6	26,534,858	105.6	28,020,810	105.6	29,589,976	105.6	31,247,014	105.6
Subtotal A	528,064,230	103.6	547,595,980	103.0	567,899,892	103.0	589,008,182	103.0	610,954,462	103.0
<b>Expenditures</b>										
Salaries and wages	169,327,134	102.6	173,729,640	102.6	178,246,611	102.6	182,881,022	102.6	187,635,929	102.6
Social insurance	38,697,503	102.6	39,703,638	102.6	40,735,933	102.6	41,795,067	102.6	42,881,739	102.6
Office supplies	7,950,745	102.6	8,157,464	102.6	8,369,558	102.6	8,587,167	102.6	8,810,433	102.6
Electricity	30,173,204	106.5	31,802,557	105.4	33,519,895	105.4	35,329,969	105.4	37,237,788	105.4
Heating	58,101,599	102.6	59,612,241	102.6	61,162,159	102.6	62,752,375	102.6	64,383,937	102.6
Fuel and transportation	14,356,497	105.4	15,131,748	105.4	15,948,862	105.4	16,810,100	105.4	17,717,846	105.4
Telecommunication	6,945,292	102.6	7,125,859	102.6	7,311,142	102.6	7,501,232	102.6	7,696,264	102.6
Water and sewage	18,384,592	105.4	19,377,360	105.4	20,423,738	105.4	21,526,620	105.4	22,689,057	105.4
Personnel temporary assignment expenses	208,071	102.6	213,491	102.6	219,031	102.6	224,726	102.6	230,569	102.6
Purchase of	255,593	102.6	262,238	102.6	269,056	102.6	276,052	102.6	283,229	102.6
Fixtures and office equipment	8,817,503	102.6	9,046,758	102.6	9,281,974	102.6	9,523,305	102.6	9,770,911	102.6
Uniforms	1,473,463	102.6	1,511,773	102.6	1,551,079	102.6	1,591,407	102.6	1,632,784	102.6
Food	33,971,073	103.9	34,922,263	102.8	35,900,086	102.8	36,905,288	102.8	37,938,637	102.8
Medicine	105,859,625	136.6	108,823,695	102.8	111,870,758	102.8	115,003,139	102.8	118,223,227	102.8
Repair expenses	6,607,211	102.6	6,778,999	102.6	6,955,253	102.6	7,136,089	102.6	7,321,628	102.6
Articles of daily use	4,817,508	102.6	4,942,763	102.6	5,071,275	102.6	5,203,128	102.6	5,338,409	102.6
Other expenses	19,990,000	—	20,509,740	102.6	21,042,993	102.6	21,590,111	102.6	22,151,454	102.6
Maintenance cost	533,532,836	107.5	549,461,144	103.0	565,906,970	103.0	582,889,138	103.0	600,427,245	103.0
Subtotal B										
Balance	-5,468,607		-1,865,165		1,992,922		6,119,044		10,527,217	
(Japanese yen)	-1,093,721		-373,033		398,584		1,223,809		2,105,443	