CHAPTER 1

BACKGROUND OF THE PROJECT

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Mongolia is an inland country located between Russia and China with the population of about 2.4 million. Owing to large-scale transition from the social system carried out in 1990, the country continues to experience difficulties in implementing minimum public administration service required for civil life.

The population of the capital city Ulaanbaatar and its suburbs has swollen to some 780,000 (as of 2000) as a result of rapid concentration of population that followed the transition to the market economy and continues to increase by several thousands every year. A large number of densely populated area that are susceptible to disaster were formed inside and outside the urban district concurrently with overcrowding. As a result, the number of fire incidents soared from 571 in 1995 to 1,100 in 2000. This accounts for nearly half of the fire incidents in Mongolia, and the number of casualties and the amount of damage continue to increase. Furthermore, enormous loss is incurred in terms of livestock and forest resources from fires that are frequently breaking out in the surrounding forests and grassland. The danger of forest and grassland fires has become imminent in the recent years with the outbreak of large fires drawing near Ulaanbaatar.

Under these circumstances, the Government has been seeking to improve and expand the fire fighting system at UBFS to protect the capital city of Ulaanbaatar from disasters caused by fire while safeguarding the lives, physical body and assets of the citizens as well as natural environment and resources, although the effort has so far failed to implement realistic measures for effective fire fighting activities due to its difficult fiscal situation. For this reason, UBFS continues to use decrepit equipment and ill-equipped radio communication facilities that were introduced during the former Soviet Union days. This is rendering prompt response impossible, incurring extensive damage on the people and making it impossible for the organization to respond to the expectations of the society.

To cope with this situation, expectations are rising to make significant contributions to the solution of the present problem by improving the fire fighting system and recover the fire service strength at UBFS through renewal or redeployment of the existing equipment at UBFS in an effort to safeguard the lives, physical body and assets of the citizens. Realization of the project for this purpose has therefore become a pressing task for the fire fighting and disaster prevention sector.

At fire stations in the city of Ulaanbaatar, it has become difficult to perform even the minimum fire fighting activities and the means of fire fighting is being lost not only due to the

aging of fire fighting equipment advancing close to the limit of its life span but also due to the declining operation rate of equipment caused by shortage of spare parts as well as increase in number of fires.

For the background set forth above, the Ministry of Justice and Home Affairs has requested to Japan the implementation of a grant aid "The Project for Improvement of Fire fighting Equipment and Maintenance Workshop" (hereinafter referred to as "the Project") concerning the procurement of fire fighting equipment including fire fighting vehicles and of their maintenance equipment for recovery and improvement of fire service strength at the 13 existing fire stations in Ulaanbaatar with the aim of improving the fire fighting and disaster prevention system which forms the foundation of public administration for protecting the people from disasters.

CHAPTER 2

CONTENS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 BASIC CONCEPT OF THE PROJECT

2-1-1 Outline of the Project

The Action Programme 2000 – 2004 of the GOM sets the reform of the political, social and legal systems as a priority policy and emphasises collaboration between the Fire Fighting Department of the central government and those of local governments, strengthening of the law related to fire prevention, improvement and expansion of the fire service strength and the enactment of fire regulations comparable to international standards as fire service-related policies. Meanwhile, the population of Ulaanbaatar has swollen to some 780,000 (as of 2000) due to rapid population migration to urban areas and the resulting increase of densely populated areas without fire protection has more than doubled the number of fire incidents a year from some 571 in 1995 to 1,100 in 2000. The potential for large-scale special types of fires, i.e. fires involving high rise buildings or hazardous substances, has also increased as a result of the change of industrial structure and there has been a rapid increase of the number of fires in suburban forests or at grassland which threaten urban areas.

While the GOM has been planning to improve and expand UBFS to protect the lives and assets of the citizens, natural environment and resources of Ulaanbaatar from fire damage, it has so far failed to implement realistic measures for effective fire fighting activities due to its difficult fiscal situation. As a result, UBFS is still using old equipment and insufficient communication equipment which were introduced from the former Soviet Union. The necessary fire fighting activities are, therefore, restricted and the inability of UBFS to quickly respond to an outbreak of fire results in major losses on the part of citizens. In short, UBFS is finding it extremely difficult to meet the social expectations of its service.

The fire equipment at existing fire stations in Ulaanbaatar has almost reached its expected life span. The shortage of spare parts which has caused a decline of the use of fire equipment and the increase of the number of fires form the background for UBFS's difficulty to provide the minimum level of fire fighting activities and the fire service strength to effectively combat fires is rapidly declining. In particular, the means of fire fighting is being lost in ger areas where the development of roads and fire fighting water sources and the implementation of disaster prevention measures, including fire prevention measures for buildings, have been very slow despite the fact that approximately half of the city's population live in this district and fires frequently occur.

In order to redress the situation, the GOM has set the target of protecting the lives and assets of citizens, which is the basis of public administration, by means of improving the fire fighting system and the fire service strength of UBFS through the renewal and redeployment of the existing fire equipment.

The Project aims at selecting an appropriate range and content of fire equipment and its deployment or installation at the most appropriate sites in order to achieve the target set by the GOM. It is hoped that the fire fighting system and fire service strength of UBFS will be improved by these efforts to ensure the safety of citizens and to protect the natural environment and resources. To be more precise, the Project intends the procurement and provision of fire vehicles and radio communication equipment of the optimal size and systems for UBFS Headquarters and fire stations under the jurisdiction of UBFS.

2-2 BASIC DESIGN OF THE REQUESTED JAPANESE ASSISTANCE

2-2-1 Design Policy

2-2-1-1 Basic Principles

(1) Scope of Assistance

The Project aims at improving the fire fighting system and fire service strength of UBFS by planning, procuring and providing appropriate fire vehicles, radio communication equipment, laboratory equipment and maintenance equipment for UBFS Headquarters and 12 fire stations out of 13 fire stations controlled by UBFS excluding Fire Station No.79 which was closed. As such, the scope of assistance is the procurement and provision of such equipment. However, it must be noted that improvement of the fire fighting system and fire service strength itself will not necessarily benefit the public who will be the beneficiaries of the improved fire service. The benefits of improvement will only be realised when the fire vehicles and equipment to be newly procured and provided for fire stations in Ulaanbaatar are used for swift fire fighting activities to extinguish fires and protect its citizens and their assets from fire damage. It is, therefore, essential to ensure the continuous linkage of the following processes.

① Urban planning incorporating appropriate roads and fire fighting water sources based on the relevant law(s), and building design providing fire protection equipment and escape facilities which meet the relevant regulations

② Preparation of a fire prevention plan to thoroughly publicise the importance of fire prevention and methods of responding to fires to all citizens through volunteer fire corps and other community organizations

③ Establishment of an adequate fire fighting system at each fire station and the selection and provision of the optimal fire equipment for each fire station

④ Establishment of an adequate equipment maintenance system to ensure that equipment is ready for operation at any time

⑤ Establishment of a communication and command system under which all fire personnel share the necessary information required for fight fighting to ensure a swift response to fires

⑥ Assured arrival at the scene of a fire following dispatch within the maximum arrival time

⑦ Efficient operation of fire companies and integrated fire fighting activities at the scene of a fire to prevent the spread of the fire and to contain the fire to the original burning building

⑧ Accurate identification of the causes of fires to make future fire prevention measures reflect such causes

The scope of assistance under the Project covers processes ③, ⑤ and ⑦ above as it intends to provide appropriate fire vehicles and radio communication equipment for the 12 existing fire stations of UBFS. Processes ④ and ⑧ above are also included in the scope of assistance as the renewal of laboratory equipment and the procurement of vehicle maintenance equipment for UBFS Headquarters are planned as other components of the Project.

(2) Identification of Target Sites

From an administrative point of view, Ulaanbaatar is a special city of which the administrative organization and authority are comparable to those of a province (aimag). The geographical area of the city is as huge as some 4,700 km^2 and incorporates the central area with commercial and industrial districts with some high-rise buildings and a high-rise residential area, densely populated urban ger areas, suburban areas of which the population and industrial output are comparable to those of a town or city in other provinces and huge forest and grassland areas. These districts and areas of the city have different characteristics and, accordingly, the 12 fire stations in these districts and areas are required to have a different fire fighting system to deal with different types and scale of fires. Each fire station faces different requirements in terms of facilities, staff strength, equipment and operating system. The different geographical area, population, fire prevention targets, different type and scale of facilities handling hazardous substances and different level of development of roads and fire fighting water sources in the area covered by each fire station demand different types, performance, specifications and quantity of fire equipment. As such, the necessity and suitability for cooperation differ from one fire station to another. It is, therefore, necessary to firstly identify the sites, i.e. fire stations requiring new equipment, with a strong necessity and suitability for cooperation based on the following criteria.

1) Fire station controlling a ger area with a continual rapid increase of fires and where a large-scale disaster could occur due to the spread of fire

2) Fire station controlling an area with medium-height and tall buildings and/or large-scale buildings

3) Fire station controlling an area with large-scale facilities to handle hazardous substances, energy-related facilities and/or an industrial zone

4) Fire station controlling an area other than those described above but where there is a frequent occurrence of fires or an area with a high risk of fire occurrence

The fire service strength essentially means an integrated system as well as capabilities covering such matters as the strategic deployment/locationing of fire stations and the number of basic fire fighting vehicles (pumper tankers) deployed at these stations. However, the original request made by the Mongolian side does not include an increase of the number of fire stations. For the planning of the Project, the existing fire stations of UBFS are considered to be the target sites for selection and the number and locations of the existing fire stations constitute the preconditions for the Project.

(3) Selection of Equipment

The contents of the required equipment (vehicles and others) vary depending on the characteristics and types of disasters in the area covered by each fire station and also on the operation, command structure and tactics applied to the fire companies in each area. The main fire vehicles used by the fire stations controlled by UBFS are pumper tankers (2,100 L or 2,400 L), water tank trucks (6,000 L), 30 m ladder trucks, personnel carriers and command cars, all of which were made in the former Soviet Union, a pumper tanker (1,500 L) made in Japan and donated by a NGO and a 20 m ladder truck made in the US. While fixed or mobile radio communication equipment is available at the Headquarters and several key fire stations in the centre of the city, it is not properly functioning as the radio communication system of the main disaster prevention organization because of ageing.

Meanwhile, the range of the requested equipment is not confined to fire vehicles but also includes support equipment for fire fighting and rescue activities, such as radio communication equipment and fire suits, etc., equipment required to extinguish forest and grassland fires, laboratory equipment used for investigation and analysis of the causes of fires and fire vehicle maintenance equipment. The criteria to judge the necessity and suitability differ from one type of equipment to another. Accordingly, the basic selection principles are determined in this section (3) for all types of equipment which may be procured under the Project and the “concrete selection principles for fire vehicles as the standard on fire service strength required for the formulation of a deployment plan” is also determined in 2-2-2-1 – Basic Plan: Basic Design Concept.

The basic equipment selection principles under the Project is described below.

1) Equipment suitable for the purpose of improving the fire service strength of the 12 fire stations controlled by UBFS which are the target sites of the Project; basic, general-purpose, highly durable (including high anti-freeze performance) and high cost performance equipment, excluding special equipment of which the scope of benefit is limited

2) Urgently required equipment, equipment without excessive ability and equipment which is less likely to be converted for purposes other than fire fighting; equipment not requiring large-scale remodelling of the existing facilities or the construction of new facilities (remodelling/new construction of buildings, workshops and/or garages, etc.)

3) Equipment with a high maintenance efficiency, equipment of which repair work as well as the procurement of spare parts and consumables such as fuel can be easily as well as steadily conducted in Mongolia, equipment which can be operated with the existing level of skill and which does not require new training at the manufacturers, equipment for which maintenance staff (including subcontractors) can be secured and equipment which does not cause any environmental concern due to waste.

For the formulation of the basic plan, the following selection principles reflecting the basic selection principles described above are adopted for the selection of fire vehicles which form the basis of the fire service strength.

1) Minimum equipment directly required for fire fighting activities in ger areas and in low-rise residential areas where fires frequently occur and where the night fire ratio is high

2) Minimum equipment directly required for fire fighting activities in commercial areas with medium-height and tall buildings and/or large-scale buildings and also in industrial areas with large-scale hazardous substance storage facilities and energy-related facilities

3) Vehicles with high mobility and driving capability to reach a fire scene as first response vehicles in ger areas with poor road conditions and fire water supply sources to enable the implementation of initial fire fighting and rescue activities

4) Deployment of a water tank truck with a large tank capacity and sufficient hose length at fire station controlling ger areas with poor fire water supply sources and base station (which has a duty to support smaller fire stations) to enable the provision of additional water supply to a number of first response fire vehicles which have deeply advanced inside a ger area

(4) Determination of Range of Equipment

There are no clear standards in Mongolia which regulate the locationing of fire stations and the scale of equipment (quantity and specifications) to be deployed at fire stations. Accordingly, the range of equipment under the Project is determined in accordance with the following principles based on the expected types of equipment to be operated at the target sites (fire stations), in turn in line with the principles to determine the target sites and the equipment selection principles described above.

1) Adequate range of equipment which can be dealt with by the present equipment operation and maintenance capabilities of UBFS
2) Equipment quantity which represents the minimum requirement to raise the level of the fire service strength at a target site to a level which is comparable with similar areas, referring to the standards for the fire service strength and the fulfilment ratio of cities and areas in other countries, including Japan
3) Adequate range of equipment to implement fire fighting tactics of which the effectiveness has been proven by fire services in Japan and other countries where the types of fires are similar to those at the subject sites (coordinated operation between pumper tankers and water tank trucks)
4) Independent radio system backed by an adequate range of communication equipment which is capable of supporting communication between the UBFS Headquarters and the fire stations as well as fire companies and which has a highly reliable communication network function for a disaster prevention organization
5) Minimum range of laboratory equipment for the exclusive investigation and analysis of the causes of fires, enabling the analysis results to be reflected on fire prevention measures
6) Minimum range of maintenance equipment and tools suitable for the daily checking and minor repair of the types and range of fire vehicles to be procured under the Project

2-2-1-2 Natural Conditions

(1) Altitude

As the altitude at all of the target sites where the equipment to be procured under the Project will be used is above 1,000 m, equipment and fittings which is suitable for such a high altitude must be designed in the equipment plan.

(2) Temperature

The mean minimum temperature at the target sites can drop as low as –30°C in winter and that equipment which is installed or used outdoors must have cold weather specifications to deal with such a low temperature. Even in the case of indoor equipment, the temperature conditions for fire vehicles, for example, must be determined taking the reliability of the existing garage heating system into consideration. The design specifications of vehicles and fittings must be capable of accommodating such conditions. The body design and driving mechanism for vehicles must ensure stability and drivability, assuming emergency travelling on snow-covered or frozen road surfaces in winter and on slippery, muddy surfaces after rain.

2-2-1-3 Socioeconomic Conditions

The design specifications of the equipment to be procured under the Project must conform to the following laws and standards, etc.

①	Traffic law	:	"Road Traffic Law" of Mongolia
②	Industrial standards	:	in principle, Japan Industrial Standards (JIS)
③	Units	:	metric units as standard
④	Communication laws	:	"Radio Communication Law" and "Radio Wave Law" of Mongolia

2-2-1-4 Procurement and Installation Conditions

(1) Permit and Approval Systems and Related Laws for Project Implementation

1) Procedure Relating to Radio Communication

The existing "Radio Communication Law" and "Radio Wave Law" of Mongolia regulate the allocation, operation, protection, ownership and use of radio waves. It has been confirmed that the Mongolian side will be responsible for compliance with the procedure relating to radio communication.

2) Labor Law

Simple electrical work as well as the minor work of mounting the vehicle fittings, etc. is expected to take place at the target sites under the Project. At present, the Labor Law revised in 1991 is in force in Mongolia. This Law stipulates labor agreements, working hours, rest time, wages, employment rules, working environment, work rules relating to women and minors, labor adjustment and

supervision of the implementation of rules, etc. Even though the on-site work mentioned above is minor work requiring only a small number of assistants, the Labor Law will be applied to the equipment installation work.

3) Acquisition of Land

As all of the equipment to be procured under the Project will be installed at the existing facilities or kept inside the existing facilities, no compulsory purchase or acquisition of land will be necessary.

(2) Design Standards to be Complied With

The Project will involve electrical and communication equipment work for the installation of the radio communication and command system. The relevant design standards used in Mongolia are the SNIP (Russian design standards) for such work and the YCT for materials (based on the Russian material standards: GOST). However, some of these domestic standards currently only exist in name and Japanese, US and European standards are often used together with the conventional domestic standards. In the case of ODA projects in particular, if the standards of donors are comparable with the relevant international standards, these standards are used. Given the fact that it is planned to base the standards for electrical equipment in Mongolia on JIS, the application of Japanese standards under the Project is judged to be appropriate. However, local coupling shall be used for joining fittings such as for water spouts of fire trucks for the purpose of securing compatibility with existing equipment.

2-2-1-5 Operation and Maintenance Capabilities of Project Executing Organization

Each fire station controlled by UBFS currently operates a fire fighting system which incorporates the operation and maintenance of fire vehicles, radio communication operation and fire prevention activities, etc. This system is backed by a suitable operation and maintenance system. In the case of Fire Station No.34 which is expected to move to a new building to be completed in November, 2001, the fire fighting system was operated until 1997 and the fire personnel were then transferred to other fire stations. It is, therefore, judged that new recruitment following the implementation of the Project will be unnecessary as the existing operation and maintenance system will be able to cope with the new vehicles and equipment.

However, the fire equipment, particularly the fire vehicles and radio communication equipment, to be introduced under the Project use new technologies compared to the existing

equipment, much of which was made in the former Soviet Union several decades ago. The provision of education and training using the soft component will, therefore, be examined so that the minimum level of skills required for the operation and maintenance of the new vehicles and radio communication equipment can be taught to the Mongolian side.

2-2-1-6 Equipment Grade

As already described in 2-2-1-1 (2) – Identification of Target Sites, the target sites for the basic design are the 12 existing fire stations controlled by UBFS and UBFS Headquarters and the sites with a strong necessity and suitability for cooperation, i.e. fire stations requiring the deployment of new equipment, are determined to finalise the target sites. The types and range of equipment are determined based on the principles explained in 2-2-1-1 (3) – Selection of Equipment and 2-2-1-1 (4) – Determination of Range of Equipment. As the Project is required to continually achieve project effects, the equipment to be provided must have excellent general-purpose usage, durability and cost performance. Ease of maintenance is also an essential requirement for equipment. From this point of view, the types of equipment to be procured are those types which have good operating records with the application of proven technologies rather than equipment to which advanced technologies are applied.

2-2-1-7 Project Method and Project Period

(1) Procurement Method

Equipment of which the procurement is planned under the Project is not produced in Mongolia. The construction of foundations for the installation of the new equipment or the construction of new buildings to store the new equipment will be unnecessary. Accordingly, equipment which meets the requirements described in 2-2-1-6 – Equipment Grade and which is capable of dealing with the local natural conditions, such as temperature and altitude, will in principle be procured at a reasonable cost.

(2) Project Period

It will be necessary for the planning of the project schedule to take the severe local conditions, including extremely low outdoor temperatures in winter and difficult transportation to the target sites, into proper consideration. As the Project must be completed within a single fiscal year, the installation period, including trial operation, adjustment and handing over, must be completed by the end of March in the fiscal year concerned.

(3) Place and Method of Handing Over of Procured Equipment

The equipment to be procured under the Project will be handed over to the Mongolian side at the following places in the manner described below.

① Fire Vehicles

The fire vehicles transported to UBFS Headquarters will be handed over to the Mongolian side at UBFS Headquarters after outfitting, trial operation, adjustment and confirmation of operability.

② Radio Communication Equipment

The radio communication equipment transported to each fire station for deployment will be installed and wired and handed over to the Mongolian side after trial operation, adjustment and confirmation of operability. The places for handing over will be the places for installation at UBFS Headquarters and fire stations. In the case of relay units, the completion of installation will be regarded as handing over.

③ Fire Suits Set

Fire suits sets transported to UBFS Headquarters will be handed over to the Mongolian side at UBFS Headquarters after adjustment and confirmation of operability.

④ Equipment for Forest and Grassland Fires

The equipment transported to UBFS Headquarters will be handed over to the Mongolian side at UBFS Headquarters after trial operation, adjustment and confirmation of operability.

⑤ Laboratory Equipment, Maintenance Equipment and Spare Parts

The equipment transported to UBFS Headquarters will be handed over to the Mongolian side at UBFS Headquarters after inspection, adjustment and confirmation of operability. Spare parts will be handed over to the fire stations at which the new vehicles are deployed.

2-2-2 Basic Plan

2-2-2-1 Basic Design Concept

The flow of the Basic Plan is shown in Fig. 2-2-1. Firstly, the fire service strength of each existing fire station is checked to clarify its capability to deal with the environment for the local fire service (local characteristics) and this fire service strength is compared with the basic design policy and principles (criteria). The analysis results of such soft and hard internal factors as the fire fighting tactics and deployment of fire companies, etc., the improvement and introduction of which are required to consolidate the functions of the fire service organization, are then added so that the deployment plan (plan which includes the redeployment of existing equipment which is found to be continually used) reflects the desirable fire service stength. The equipment plan spells out the types, specifications and quantity of the minimum equipment to maintain the necessary fire service strength, leading to the procurement and provision of such equipment to the recipient.

The purpose of the Basic Plan is not simply the formulation of an equipment plan for the replacement of aged equipment but plans the minimum required equipment, including existing equipment, to maintain the fire service strength required by each fire station. Accordingly, the first step of planning is the planned deployment of equipment corresponding to the required fire service strength based on the process shown in Fig. 2-2-1. The main component is the deployment plan for fire vehicles which are basic equipment constituting the fire service strength.

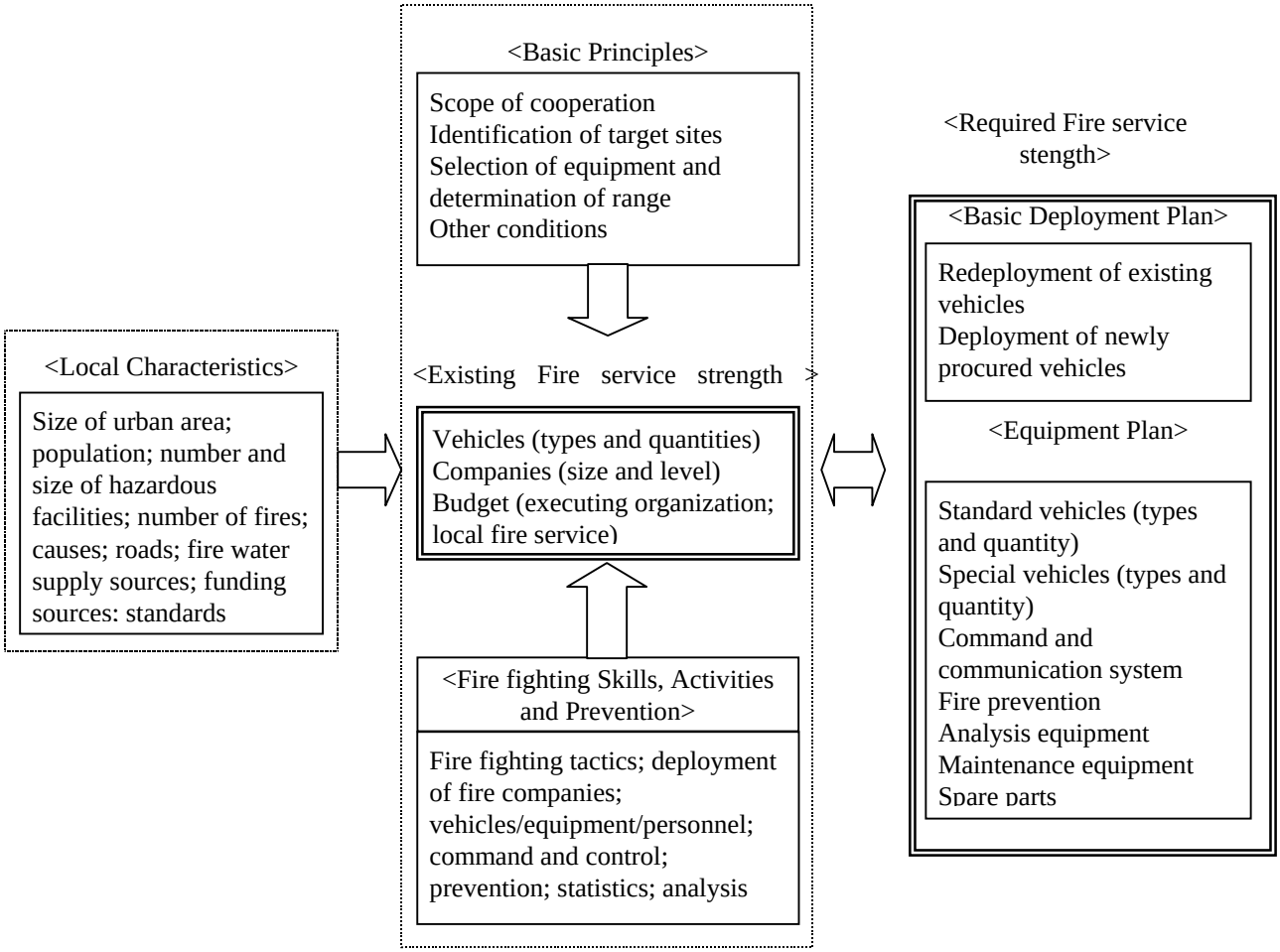


Fig. 2-2-1 Planning Process for Basic Plan

2-2-2-2 Fire Vehicle Deployment Plan

(1) Analysis of Target Sites and Existing Fire Vehicles of UBFS

For the formulation of the fire vehicle deployment plan, it is anticipated that the new fire vehicles to be procured under the Project will be given priority deployment at “key stations” which require priority deployment of fire service strength because of facing an expansion of the ger area and an increase of the number of high-rise buildings and large-scale commercial facilities and at “local base stations” which require redeployment of fire service strength because of including oil storage facilities and/or energy-related facilities within their controlling areas and having difficulty in a request for aid from other stations due to geographical conditions.

In contrast, there are fire stations in areas where the scaling down of administrative services, including the fire service, is necessary due to population outflow. It must be

noted that those vehicles which can only be used as second line vehicles at “key stations” and “local base stations” can be redeployed at those stations serving the above-mentioned sparsely populated areas with a small number of fires as first line vehicles. The planning of the deployment plan must take this possibility into consideration.

Table 2-2-1 – Existing Fire Vehicles of UBFS shows the results of a detailed study on the state of maintenance and possibility of continued use (transfer/redeployment) of all fire vehicles currently deployed at the fire stations. The study results regarding the possibility of continued use are briefly described below. In short, while some 60% of pumper tankers and 30% of water tank trucks, which form the basis of the fire service strength, have been withdrawn from service (although they are kept for parts or the preservation of government assets), the remaining vehicles can be transferred or redeployed at ordinary fire stations for their continued use as first line vehicles.

	Pumper Tankers	Water Tank Trucks
1) Number of vehicles deployed/kept	23	13
2) Use is impossible (withdrawn from service)	14	4
3) Continued use is possible	9	9

(2) Transfer/Redeployment of Existing Vehicles and Newly Required Vehicles

Table 2-2-2 summarises (i) the fire service-related characteristics of areas where each fire station controlled by UBFS is located and (ii) the problems faced by each fire station in regard to the existing fire service strength (summary of the requests put forward by each fire station). Table 2-2-3 shows the basic deployment plan which reflects the minimum required fire service strength of UBFS, taking the improvement and needs of the soft and hard aspects of the fire service, including fire fighting tactics, command, skills and activities, etc., and continued use of existing fire vehicles into consideration. Prior to this, it is necessary to clarify the fire service strength of the existing fire stations in accordance with the process of the Basic Plan and to compare it with the Basic Design policy and principles (criteria). There can be several options for the transfer destinations of vehicles for redeployment. One idea which forms the basis of the basic deployment plan described above is described in Appendix 6-1 “Examination of Redeployment of Existing Vehicles Which Can Continue to be Used”.

The following principles are adopted in addition to those described in 2-2-1-1 and 2-2-1-1(3) in regard to fire fighting tactics, skills and activities of which the improvement is required.

1) Fire fighting Tactics

The deployment and operation of one pumper tanker and one water tank truck as a unit will be necessary. The effectiveness of such a unit has been proven in areas where fire water supply sources are not yet available and this arrangement (tactic) is appropriate for the target sites.

2) Priority Deployment of New Vehicles at “Key Stations” and “Local Base Stations”

The deployment of one pumper tanker with a large capacity water tank and one water tank truck will be necessary at each fire station serving a large-scale ger area or an area in which urban-type fires are anticipated in view of a sufficient number of discharge outlets and a sufficient water volume to prevent the spread of a fire and to encircle a building which is on fire.

3) Introduction of 4WD Leading Fire Vehicles (Pumper Tankers)

The road conditions in ger areas are extremely hard condition as the areas have been established without proper planning. In addition to the roads being unpaved, undulating, sloping and narrow, they tend to be muddy even in fair weather due to the lack of drainage facilities. In order for fire vehicles to approach a fire scene within the required response time to quickly commence fire fighting activities, the introduction of 4WD leading fire vehicles (pumper tankers) with high mobility and a high driving performance is essential.

The concrete types and specifications of the fire vehicles and the types, specifications and quantities of other equipment (radio communication equipment, fire suits set, simple fire extinguishing equipment for forest and grassland fires, laboratory equipment and maintenance equipment) are determined based on the number of vehicles, number of fire personnel, company deployment tactics, fire prevention and operation and maintenance systems, etc., in turn determined on the basis of the above-mentioned Deployment Plan. More concrete details are given in 2-2-2-3 – Equipment Plan for the formulation of the overall deployment plan for the equipment to be procured under the Project.

Table2-2-1 Existing Fire Vehicles of UBFS

Fire Station	Vehicles	Spec					Radio	Year Bought *	Run(km)	Condition	
		Body	Reg.No.	Personnel Capacity	Axel	Drive mode				Good or Bad	Remarks
HQ	Command car for chief of FDD	YA3	33-77UBE	5	2	4×4	Alinco	2001	5,500	○	
	Command car for chief of UBFS	YA3	24-08UBE	5	2	4×4	Alinco	1996	79,351	○	
	Command car for officer	YA3	27-22UBE	5	2	4×4	Alinco	1996	45,229	○	
10	Pumper Tanker(2,100L)	ZIL130	18-03UBB	7	2	6×4	Alinco	1988	459,785	○	
	Water Tank Truck (6,000L)	ZIL130	91-87UBE	3	2	6×4		2000	110,458	○	
	Pumper Tanker(2,100L)	ZIL130	65-28UBB	7	2	6×4	Palma	1982	262,893	×	Pump
	Water Tank Truck (6,000L)	ZIL130	65-35UBB	3	2	6×4		1979	304,585	×	Tank
	Pumper Tanker (1,500L)	ISUZU	72-59UBH	7	2	6×4		1979	350,077	○	
	Pickup Truck(500L)	Mitsubishi	95-08UBO	3	2	4×2		1997	123,572	○	
	Water Tank Truck (6,000L)	ZIL130	65-30UBB	3	2	6×4		1990	332,825	△	Suction
	Ladder Truck (30m)	ZIL131	65-29UBB	3	3	6×6		1991	255,148	×	Drive
	Ladder Truck (20m)	GM	80-41UBH	7	3	6×4		1980	215,743	×	Pump
11	Forest Fire Truck	GAZ66	34-92UBD	2	2	4×4		1997	111,020	○	
	Pumper Tanker(2,400L)	ZIL131	65-44UBB	7	3	6×6		1978	333,634	×	Tank
14	Pumper Tanker(2,100L)	ZIL130	65-42UBB	7	2	6×4	Palma	1988	241,282	×	Tank
	Water Tank Truck (6,000L)	ZIL130	65-45UBB	3	2	6×4		1977	365,148	×	Chasis
	Pumper Tanker (2,100L)	ZIL130	64-98UBB	7	2	6×4	Palma	1995	12,769	○	
18	Pumper Tanker (2,100L)	ZIL130	65-53UBB	7	2	6×4	Palma	1987	235,277	△	Form Tank
	Water Tank Truck (6,000L)	ZIL130	65-34UBB	3	2	6×4		1985	224,518	△	Suction
	Pumper Tanker (2,100L)	ZIL130	65-69UBB	7	2	6×4		1985	234,244	×	Form Tank
26	Pumper Tanker (2,100L)	ZIL130	65-37UBB	7	2	6×4	Palma	1982	340,343	×	Chasis
	Pumper Tanker (2,100L)	ZIL130	65-38UBB	7	2	6×4		1976	457,828	×	Engine
	Water Tank Truck (6,000L)	ZIL130	65-31UBB	3	2	6×4		1993	108,992	○	
	Ladder Truck (30m)	ZIL131	65-48UBB	3	3	6×6		1983	301,559	×	Drive
	Forest Fire Truck	GAZZ66	92-02UBH	2	3	4×4		1990	106,308	○	
28	Pumper Tanker (2,100L)	ZIL130	60-05NAA	7	2	6×4	Motorora	1979	417,605	×	Over
	Water Tank Truck (6,000L)	ZIL130	60-04NAA	3	2	6×4		1984	310,790	△	Suspention
	Pumper Tanker(2,400L)	ZIL131	60-07NAA	7	3	6×6		1993	111,386	×	Pump
29	Pumper Tanker (2,100L)	ZIL130	65-27UBB	7	2	6×4	Alinco	1992	114,040	○	
	Pumper Tanker (2,100L)	ZIL130	65-32UBB	7	2	6×4		1988	420,119	×	Over
	Ladder Truck (30m)	ZIL131	65-39UBB	3	3	6×6		1981	310,316	○	Oil Pressure
30	Pumper Tanker (2,100L)	ZIL130	65-24UBB	7	2	6×4	Alinco	1995	222,665	○	
	Water Tank Truck (6,000L)	ZIL130	65-47UBB	3	2	6×4		1985	232,476	△	Tank Chasis
	Pumper Tanker(2,400L)	ZIL131	65-40UBB	7	3	6×6		1987	322,899	×	Engine
34	Pumper Tanker (2,100L)	ZIL130	65-43UBB	7	2	6×4		1990	328,406	×	Engine
	Water Tank Truck (6,000L)	ZIL130	65-46UBB	3	2	6×4		1990	329,707	△	Suction
64	Pumper Tanker (2,100L)	ZIL130	70-93BRA	7	2	6×4	Alinco	1980	341,493	×	Pump
	Water Tank Truck (6,000L)	ZIL130	70-94BRA	3	2	6×4		1978	366,595	×	Suspension
	Pumper Tanker(2,400L)	ZIL131	70-95BRA	7	3	6×6		1991	224,052	△	Form Tank
	Water Tank Truck (6,000L)	ZIL130	70-92BRA	3	2	6×4		1981	325,191	△	Suciton
	Ladder Truck (30m)	ZIL131	70-91BRA	3	3	6×6		1983	256,795	×	Oil Pressure
65	Water Tank Truck (6,000L)	ZIL130	65-36UBB	3	2	6×4		1985	315,148	×	Tank
	Pumper Tanker (2,100L)	ZIL130	84-55UBB	7	2	6×4		1984	221,990	×	Engine
	Pumper Tanker (2,100L)	ZIL130	66-25UBB	7	2	6×4		1980	352,246	×	Drive
80	Pumper Tanker (2,100L)	ZIL130	71-04UBB	7	2	6×4		1985	303,386	△	Pump
	Water Tank Truck (6,000L)	ZIL130	72-02UBB	3	2	6×4		1991	217,027	○	

＊Years after 1980s are purchasing year of used vehicles and remodeling years of used trucks to fire vehicles, not purchasing year of new vehicles.

: Bad Condition(Include out of order)

Table 2-2-2 Summary of Local Characteristics and Problems Faced

Fire Station No.	Urban Area Served (km^2)	Population	Local Characteristics	No. of Fires (Responded)			Problems Faced Regarding Fire service strength
				1998	1999	2000	
10	157.0	457,600	Offices; medium to high apartment buildings; dense ger area	570	526	740	Serves a large area, including the city centre and northern ger area with a high fire occurrence rate; a large capacity pumper tanker and a water tank truck with a high level of mobility to deal with anticipated large-scale fires in the ger area are required.
11	53.0	6,000	Children's forest centre; forest and grassland areas	1	2	2	The current use of the forest fire vehicle GAZ 66 (4 WD) is appropriate for this mountainous area; the extreme water shortage necessitates the use of a pumper tanker and a water tank truck .
14	48.0	64,000	Industrial park; medium-height apartment buildings	64	50	74	Given the likelihood of factory fires developing into large-scale fires, vehicles with a sufficient water and pumping capability are essential for initial fire fighting purposes.
18	120.0	1,200	Industrial area; offices; commercial area	33	26	43	At present, plays a supplementary role vis-à-vis other fire stations; the provision of a sufficient water volume is required.
26	120.0	1,186	Commercial and industrial areas; medium- height apartment buildings; dense ger area	89	72	70	A new residential area in Ulaanbaatar with many medium height apartment buildings; controls a large ger area, requiring highly mobile vehicles.
28	68.8	20,400	Mining and industrial areas; offices; medium- height apartment buildings	36	70	64	Sufficient water supply sources are required in view of the population, area and difficulty of receiving support from nearby fire stations.
29	62.2	746	Oil storage base; hazardous material handling facilities	0	2	0	Serves a petroleum complex; the deployment of a chemical truck is required regardless of the number of fires.
30	25.6	3,400	Commercial area; dense ger area	16	15	29	The expansion of the ger area in recent years necessitates the deployment of mobile fire vehicles to ensure prompt fire fighting activities.
34	80.9	37,190	Dense ger area; small-scale apartment buildings	-	-	-	Located in a large ger area with ger fires constituting the anticipated type of fires. Vehicles with good mobility and a sufficient water carrying capacity are required.
64	40.0	23,000	Mining and industrial areas; offices; medium to high apartment buildings; dense ger area	48	30	75	A mine which supplies 90% of the coal consumed by the coal-fired power station in Ulaanbaatar is located in this area. A major fire at the mine in 1999 was dealt with by only one pumper tanker and one water tank truck. The deployment of many such vehicles is required.
65	5.0	2,500	Forest and grassland; dense ger area; industrial zone	1	3	1	All four of the existing vehicles require replacement.
80	14.0	5,300	Ger area; food storage base	2	4	2	The pump of the pumper tanker requires repair because of frequent problems.

Table 2-2-3 Deployment Plan and Vehicles to be Procured

< Current Fire Situation and Existing Fire service strength >

Fire Station			Existing Fire service strength		
			Standard Vehicles		
Fire Station No.	Function	Expected Types of Fire and Possibility of Fire Spread or Major Disaster	Pumper Tanker/ Water Tank Truck	No. of Fire Personnel	No. of Vehicles
HQ	Command and control	—	Command car	each 1	3
10	Key station	Large-scale urban-type fire Fire at medium-height and tall buildings in city centre Large-scale building fire Large-scale fire in neighbouring ger area	Pumper tanker (2,100 L) Water tank truck (6,000 L) Pumper tanker (1,500 L) 500 L pick-up truck Water tank truck (6,000L)	7 1 7 1 1	1 1 1 1 1
11	Station	Forest and grassland fire Ordinary fire in resort area	Forest fire truck	1	1
14	Local base station	Urban-type fire Fire involving hazardous substances in industrial area	Pumper tanker (2,100 L)	7	1
18	Station	Urban-type fire Fire involving hazardous substances in industrial area	Pumper tanker (2,100 L) Water tank truck (6,000 L)	7 3	1 1
26	Key station	Ordinary house fire Fire at medium and tall residential buildings and commercial facilities Large-scale building fire Large-scale fire in neighbouring ger area	Water tank truck (6,000 L) Forest fire truck	1 -	1 1
28	Station	Ordinary house fire; ger fire	Water tank truck (6,000 L)	1	1
29	Local base station	Fire involving hazardous substances Large-scale fire at oil storage facilities	Pumper tanker (2,100 L) 30 m ladder truck	6 1	1 1
30	Local base station	Ordinary house fire; ger fire Large-scale fire in neighbouring ger area	Pumper tanker (2,100 L) Water tank truck (6,000 L)	7 1	1 1
34	Key station	Large-scale ger fire Large-scale fire in neighbouring ger area	Water tank truck (6,000 L)	-	1
64	Key station	Ordinary house fire; fire involving hazardous substances Large-scale fire of medium-height buildings and houses in district centre and at mining facilities	Pumper tanker (2,400 L) Water tank truck (6,000 L)	7 1	1 1
65	Station	Ordinary house fire; ger fire		-	-
80	Station	Ordinary house fire; ger fire	Pumper tanker (2,100 L) Water tank truck (6,000 L)	5 1	1 1

Total	Pumper tankers and water tank trucks (6,000 L) Command car/forest fire trucks/ladder truck	18 (9/9) 6 (3/2/1)

Decision on sites Redeployment of existing vehicles

Scope of cooperation Selection of equipment Decision on equipment size

Planning of required fire service strength and vehicle deployment			
Target sites based on the Basic Principles			
Vehicles to be Deployed	No.		Planning of required fire service stength and vehicle deployment
Command car	3		Target sites based on the Basic Principles
Pumper tanker (large tank capacity) Pumper tanker (4 WD) Water tank truck (large tank capacity) Ladder truck/floodlight car	1 1 1 2 (1/1)	New	Vehicles to be Deployed / No.
Pumper tanker (1,500 L) and 500 L pick-up	2 (1/1)		Pumper tanker (large tank capacity) 1 Pumper tanker (4 WD) 1 Water tank truck (large tank capacity) 1 Ladder truck/floodlight car 1 Floodlight car (4 WD) 1
Pumper tanker (2,100 L); water tank truck (6,000 L)	2(1/1)		
Forest fire truck	1		
Pumper tanker (2 WD) Water tank truck (large tank capacity)	1 1	New	Pumper tanker (2 WD) 1 Water tank truck (large tank capacity) 1
Pumper tanker (2,100 L) Water tank truck (6,000 L)	1 1		
Pumper tanker (large tank capacity) Pumper tanker (4 WD) Water tank truck (large tank capacity) Forest fire truck	1 1 1 1	New	Pumper tanker (large tank capacity) 1 Pumper tanker (4 WD) 1 Water tank truck (large tank capacity) 1
Pumper tanker (2,100 L) Water tank truck (6,000 L)	1 2		
Chemical truck	1	New	Chemical truck 1
Water tank truck (6,000 L); 30 ladder truck*	1		
Pumper tanker (4 WD) Water tank truck (large tank capacity)	1 1	New	Pumper tanker (4 WD) 1 Water tank truck (large tank capacity) 1
Pumper tanker (4 WD) Water tank truck (large tank capacity)	1 1	New	Pumper tanker (4 WD) 1 Water tank truck (large tank capacity) 1
Pumper tanker (2,100 L); water tank truck (6,000 L)	2 (1/1)		Pumper tanker 1 Water tank truck (large tank capacity) 1
Pumper tanker Water tank truck (large tank capacity)	1 1	New	
Water tank truck (6,000 L) Pumper tanker (2,400 L); water tank truck (6,000 L)	1 2 (1/1)		
Pumper tanker (2,100 L) Water tank truck (6,000 L) Pumper tanker (2,100 L) Water tank truck (6,000 L)	1 1 1 1		

Total	No. of vehicles to be newly procured	17
	Number of existing vehicles	24
TOTAL		41

Total	Pumper tanker (large tank capacity)	2
	Pumper tanker (4 WD/2 WD)	6 (4/2)
	Water tank truck (large tank capacity)	6
	Ladder truck/chemical car/floodlight car	3 (1/1/1)

※1 Continued use

※2 Redeployment

Basic Principles

Principles to Identify Target Sites (Stations)

① Fire station controlling a ger area with a continual rapid increase of fires as well as night fires and where a large-scale disaster could occur due to the spread of fire
② Fire station controlling an area with medium-height and tall buildings and/or large-scale buildings
③ Fire station controlling an area with large-scale facilities to handle hazardous substances, energy-related facilities and/or an industrial zone
④ Fire station controlling an area other than those described above but where there is a frequent occurrence of fires or an area with a high risk of fire occurrence

Principles to Select Equipment and to Determine Equipment Range

① Equipment directly required for fire fighting activities in ger areas where fires frequently occur and where the night fire ratio is high and also in low-rise residential areas
② Equipment directly required for fire fighting activities in commercial areas with medium-height and tall buildings and/or large-scale buildings
③ Equipment directly required for fire fighting activities in industrial areas with large-scale hazardous substance storage facilities and energy-related facilities
④ Vehicles with high mobility and driving capability to reach a fire scene as first response vehicles in ger areas with poor road conditions to enable the implementation of initial fire fighting and rescue activities
⑤ Deployment of a water tank truck with a large tank capacity and sufficient hose length at each base station controlling a ger area to enable the provision of additional water supply to a number of first response fire vehicles
⑥ Equipment quantity which can be dealt with by the present equipment operation and maintenance capabilities
⑦ Equipment quantity which represents the minimum requirement to raise the level of the fire service stength at a target site to a level which is comparable with similar areas

2-2-2-3 Equipment Plan

Here, the concrete types, specifications and performance level of equipment are examined based on the types and scale of the fire vehicles as identified in 2-2-2-2 – Fire Vehicle Deployment Plan. The examination results are shown in Table 2-2-11 in 2-2-2-4 – Overall Equipment Deployment Plan.

(1) Fire Vehicles

1) Pumper Tanker and Water Tank Truck

① Situation of Existing Vehicles

The existing fire vehicles used by UBFS mainly consist of pumper tankers, water tank trucks (6,000 L), ladder trucks and a command car as shown in Table 2-2-1. The evaluation of these fire vehicles as part of the field survey found that some 60% of the existing main fire vehicles are in need of replacement because of pump failure, corroded water tank, dysfunctional chassis and multiple component failures, etc. This situation suggests that an adequate response to fires is a difficult task for UBFS.

Table 2-2-4 shows the specifications of these vehicles. All of the vehicles are some 20 years old or more as they were originally produced in the former Soviet Union. Their production has since ceased and repairs are conducted using parts from those vehicles withdrawn from service or parts specially tooled by a lathe and other machine tools.

Table 2-2-4 Specifications of Main Fire Vehicles of UBFS

	Total Length (mm)	Total Width (mm)	Total Height (mm)	Max. Speed (km/hr)	Max. Loading Capacity (kg)	Engine Output (kW)	Pump Capacity (L/min)	Water Tank Capacity (L)
ATS-40 Pumper Tanker	7,670	2,460	2,790	85	7,950	117.6	2,400	2,100
TSB-6 Water Tank Truck	7,670	2,460	2,790	85	7,950	117.6	-	6,000

As far as the fire water supply sources in Ulaanbaatar are concerned, some fire plugs have been installed in the city centre in the past. Since the withdrawal of

Soviet (Russian) aid, however, these fire plugs have not been properly maintained and are currently not used.

This situation means that fire fighting activities rely on water carried by fire vehicles, making it an important task for UBFS to equip both pumper tankers and water tank trucks with a large capacity water tank.

The basic configuration of the current fire fighting activities of UBFS is shown in Fig. 2-2-2 and a pumper tanker and water tank truck are always deployed as a pair at fire stations.

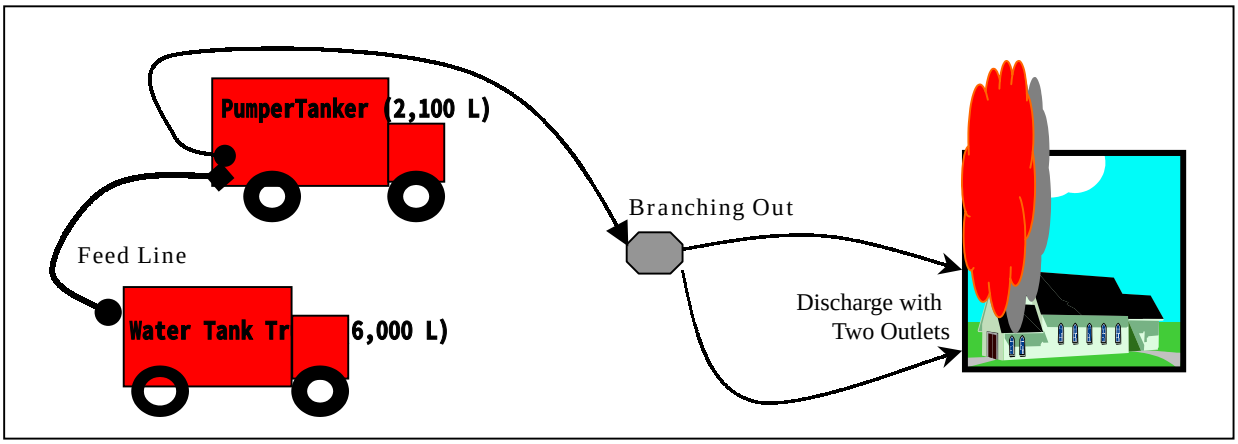


Fig. 2-2-2 Standard Fire fighting Activities of UBFS

Fire fighting activities using the existing vehicles are based on a water volume of 8,100 L (2,100 L + 6,000 L). UBFS uses the following three types of nozzles at the scene of a fire.

Type A nozzle	:	two outlets with a nozzle pressure of approximately 3 kgf/cm^2 and a water discharge rate of 7 L/sec, i.e. 420 L/min
Type B nozzle	:	four outlets with a nozzle pressure of approximately 3 kgf/cm^2 and a water discharge rate of 3.5 L/sec, i.e. 210 L/min
Large diameter nozzle	:	single outlet with a nozzle pressure of approximately 5 kgf/cm^2 and a water discharge rate of 14 L/sec, i.e. 840 L/min

The hose usually branches out near the fire scene to allow the use of two Type A nozzles.

Given the above data, operation duration based on a combined tank capacity of 8,100 L is approximately 10 minutes.

$$8{,}100\ \text{L} \div (420\ \text{L/min} \times 2) = 9.643$$

Statistical data on the duration of fire fighting activities (from commencement of water discharge to extinguishing of the fire) of UBFS in 2000 shows that only 21% of the actual activities ended within 10 minutes (Fig. 2-2-3), indicating insufficient fire service strength because of insufficient water availability. The disfunctioning of the fire communication system means that a water tank truck must leave the scene to request reinforcements and to resupply water to its own tank after the original water has been used.

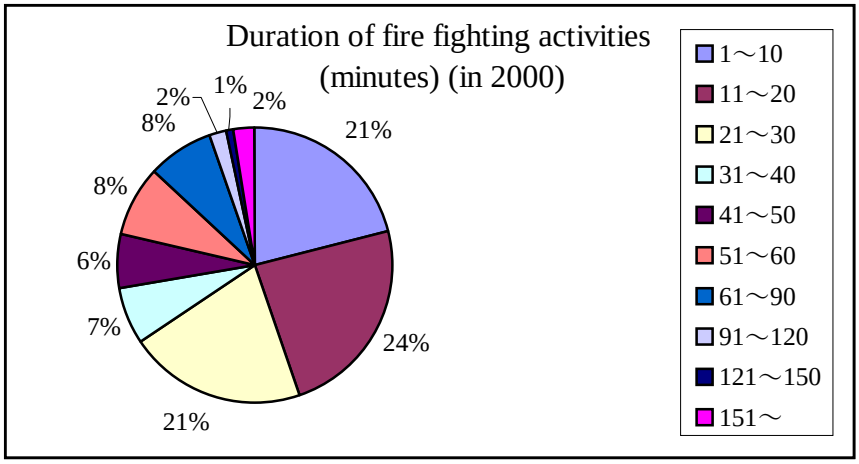


Fig. 2-2-3 Duration of Fire fighting Activities of UBFS
(From Commencement of Water Discharge to Extinguishing of Fire)

② Situation at Target Sites

The areas served by UBFS are largely classified as fireproof high-rise building areas in the city centre, areas with medium to high apartment buildings, grassland areas, ger areas on sloping land and industrial areas.

The ger area in the central city is where a rapid population inflow into Ulaanbaatar has been taking place in recent years. To be more precise, more than 50% of the city's ever increasing population of currently more than 780,000 is concentrated in this area, forming a dense ger area.

In dense ger areas, natural grassland or hillsides have been encroached by wooden panels to accommodate tent housing and makeshift housing using bare

wood. The areas in which these gers are located are designated by the authorities which stipulate that a minimum distance of 5m between neighbouring gers must be maintained. However, as the minimum distance is not strictly adhered to, ger areas are designated as fire hazard areas. These areas lack paved roads and the uneven, muddy, sloping and/or narrow roads make it difficult for fire vehicles to travel to the scene of a fire to conduct efficient fire fighting activities.

③ Required Performance of Pumper Tankers and Water Tank Trucks

Having analyzed the situation and problems of UBFS in a comprehensive manner, the requirements to rebuild the fire service strength of UBFS were examined. The results of this examination are described below.

a) As shown in Fig. 2-2-3, some 80% of fires require fire fighting activities for more than 10 minutes to be extinguished. Given the average water discharge rate discussed in ① above, the combined water tank capacity (of a pumper tanker and a water tank truck) is 10,000 L – 12,000 L to allow continuous water discharge for 12 – 15 minutes by a first response company. Accordingly, the deployment of a pair of pumper tanker (4,000 L) and water tank truck (8,000 L) under the Project is judged to be necessary. (combined water tank capacity : 12,000 L)

b) As the implementation of initial fire fighting activities is the key to prevent the spread of a fire, the vehicle deployment must be planned to ensure the availability of a sufficient water volume at each fire station. Particularly at Fire Station Nos. 10, 26, 34 and 64 which serve such fire hazard areas as densely populated urban and ger areas, a large number of outlets must be available at the initial stage of a fire to prevent the fire from spreading and to encircle the burning building. These stations are, therefore, regarded as “key stations” and the deployment of two pairs (or a 10,000 L pumper tanker) at these stations is judged to be necessary.

c) Fire Station No.28 is 45 km east of the city centre and is located in the village of Naraiha with a population of 20,400. A total of 49 fires occurred in 2000. Because of the absence of other fire stations nearby, the insufficient fire service strength due to the shortage of water requires improvement to compensate for the long traveling time for any reinforcements. The transfer of existing vehicles within the operational

system of UBFS is, therefore, necessary to establish the deployment of a pumper tanker (2,100 L), a water tank truck (6,000 L) and an additional water tank truck (6,000 L).

d) As already described in ② above, the uneven, muddy, sloping and/or narrow roads in the dense ger areas significantly affect the traveling and arrival time of fire vehicles. As the initial response is most important for fire fighting and rescue activities, highly mobile vehicles capable of approaching a fire scene in these areas are required. In view of this requirement, 4 WD vehicles are deployed at fire stations serving ger areas.

④ Cold Weather Specifications

As the mean monthly minimum temperature in Ulaanbaatar is –28.9°C (January), the application of the cold weather specifications shown in Appendix 6-2 for each fire vehicle is judged to be necessary using –35°C as the reference temperature.

⑤ Minimum Ground Clearance

Mongolian side asked for a design having the same minimum ground clearance as the vehicles under their present possession.

The vehicles they presently own, such as ZIL130, have an old-style chassis design with large tire diameter. For this reason, they have minimum ground clearance of nearly 30cm and have proven to be effective when running on rough roads in the ger district despite the fact that they have rear two-wheel drive mechanism. However, only restricted number of fire fighting vehicles in use today inside or outside Japan have 30cm minimum ground clearance because the majority have superior suspension and chassis performance compared to the outmoded vehicles currently owned by UBFS. In other words, securing the same ground clearance as the vehicles currently owned by UBFS would lower the cost effectiveness in terms of scale and price as it would mean designing a superfluously large chassis or a chassis converted from a military vehicle.

For this reason, we have designed a four-wheel drive vehicle in this cooperation project as mentioned in ③ d) above for pumper tankers that would be sent to the ger district where road condition is expected to be poor. Incidentally, this

fire truck has minimum ground clearance of 24cm at the lowest section of the differential gear box and more than 30cm at axle and propeller shaft.

⑥ Foam Tank

The pumper tanker currently owned by UBFS has a built-in foam tank with capacity of about 150L. The problems with built-in foam tanks include: 1) corrosion of tanks and pipes; 2) less water tank capacity and less space for taking in equipment; and 3) higher cost.

In Japan, pumper tankers usually do not have built-in foam tanks. In the case of oil fires, dedicated chemical trucks are asked or a portable foam tank, an outline-proportioner and simple foaming nozzle equipped on pumper tanker are used. Moreover, small oil fires can be extinguished by pressurized water spraying equipped on pumper tanker.

Since the pumper tanker provided through this cooperation project will include portable foam tank, outline-proportioner and simple foaming nozzle as accessories in addition to being equipped with high-pressure pump and spray nozzle, we have determined that there is no need to bother to equip a built-in foam tank.

However, it would be desirable for UBFS to plan a reinforcement of chemical trucks in the future considering the striking changes of Ulaanbaatar's industrial structure in the recent years.

2) Chemical Truck

① Situation of Existing Vehicles

UBFS currently has no chemical trucks. Fire Station No.29 which has a petrochemical complex in its jurisdiction has converted the foam tank on the pumper tanker to the capacity of 0.4m^3 and mixes foam-liquid and water at the time of discharging water with simple foaming nozzle. As the horizontal reach of this nozzle is less than 10m, initial fire fighting activities may be unsatisfactory.

② Situation at Target Sites

Mongolian side has requested the deployment of a chemical truck at Fire Station Nos. 29 and 79 under the Project to replace the existing pumper tanker because of the need to deal with oil fires. Fire Station No.29 covers an area where the oil storage base of the National Oil Corporation is located while Fire Station No.79 also covers an area where another oil storage base, now closed, is located. As the reopening of this base during the project period has not been confirmed, Fire Station No.79 is omitted from the scope of chemical truck deployment under the Project.

③ Required Performance of Chemical Truck

The type of raw foam liquid used by UBFS inflates into foam of six times its volume when its 3% solution is discharged through a foam nozzle. As a foaming agent extinguishes a fire by depriving it of oxygen, it is necessary for the discharged foam to create a layer of some 1 m in thickness above the fire source to ensure that the fire is extinguished. The estimated effective area for fire fighting based on the present fire service strength is 80 m^2.

(0.4 m^3 of raw foam liquid + 13 m^3 of water) $\times$ 6 = 80 m^3

This means that an area of only 80 m^2 can be covered by a foam layer of 1 m in thickness.

The petroleum complex served by Fire Station No.29 has 18 oil tanks with a maximum storage volume of 45,000 m^3. Each cylinder-type tank is 15 m in diameter and 15 m in height with a storage capacity of some 2,500 m^3 as shown in Fig. 2-2-4. The surface area at the top is some 176 m^2. The National Oil Corporation has installed fire plugs at some 50 m intervals around the complex.

Assuming that only one tank is on fire, foam discharge from above must be capable of covering an area of at least 176 m^2. The current capacity of Fire Station No.29 of 80 m^2 is, therefore, only half of the minimum requirement.

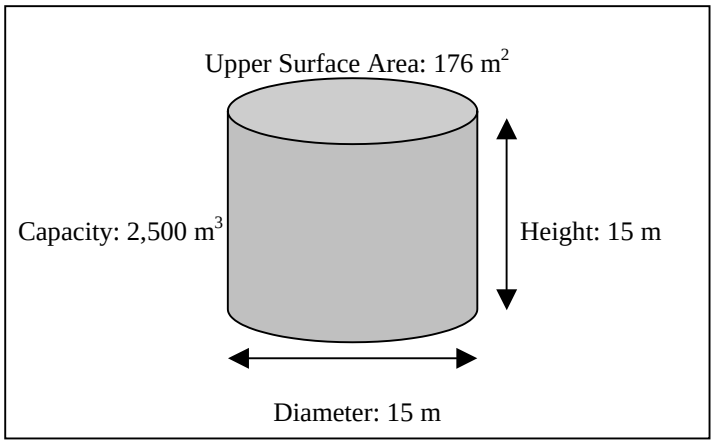


Fig. 2-2-4 Petroleum Complex of the National Oil Corporation

For the deployment of a new chemical truck at Fire Station No.29, it will be sufficient if this truck has a foam tank capable of containing 1 m^3 of raw foam liquid to cover the minimum discharge area.

(1 m^3 of raw foam liquid + 32 m^3 of water) $\times$ 6 = 198 m^3

Based on the comprehensive judgement on the required water volume to deal with oil fires and ordinary fires, the deployment of one chemical truck (8,000 L water tank + 1 m^3 foam tank) at Fire Station No.29 station is judged to be appropriate.

④ Extendable arm

Mongolian side asked to equip the chemical truck with an extendable arm about 20m in height. Chemical trucks with an extendable arm are called high squirt and are in full force in fighting fires at high-rise buildings and petroleum terminals. However, these vehicles become large and are generally not equipped with water tanks and chemical foam tanks. For this reason, the Enforcement Order for the Law on “Prevention of Disasters at Petrochemical Complexes” in Japan requires deployment of large chemical trucks and foam liquid carriers in addition to high squirt. Since the chemical fire truck in this cooperation project assumes its use in control of individual chemical fires in addition to normal fire fighting, carrying water tank, foam liquid tank and rescue equipment were considered essential. However, in order to equip an extendable arm, the use of larger vehicles, the limitation of the amount of water and foam liquid and the limitation of the space for taking in equipment is required. For this reason, it was determined that equipping of an extendable

arm is difficult. Foam fire extinguishing by a foam monitor nozzle (emission volume 3,000 L/minute, range 66 meters) equipped on the vehicle can deal with petroleum tank fires.

3) Ladder Truck

① Situation of Existing Vehicles

Because the existing ladder truck has been converted from a former Soviet military truck (ZIL 131), it uses a three axle, six wheel chassis. The ladder is of the 30 m class and no lifter or basket is available.

There is only one operational ladder truck at Fire Station No.29. The others deployed at Fire Station Nos.10, 26 and 64 are beyond repair and are kept in the garage for use as spare parts.

② Situation at Target Sites

As hardly any high-rise buildings exist in areas which are far from the city centre, such as Baganur, Naraiha and Bagahangai, etc., the sites which are believed to require the deployment of a ladder truck are those serving central Ulaanbaatar.

Many of the city's high-rise buildings are located along Peace Street which runs east to west from Sukhbaatar Square around which government offices are concentrated. These buildings are mainly apartment buildings constructed with the assistance of the former Soviet Union and most of them have 6 – 9 floors. Fire fighting Department standpipes and other fire service facilities are only available at some office buildings in the city centre. If a fire breaks out on a higher floor, extension of the hose to the floor of the fire and reliance on water supply or discharge from a ladder truck are necessary.

③ Required Performance of Ladder Truck

99% of the medium to high-rise buildings in central Ulaanbaatar are nine storey buildings or lower as shown in Table 2-2-5. The field survey conducted by the Study Team on high-rise buildings found that the floor of the first floor tends to be approximately 1 m higher than the ground because of high foundations and each floor has an approximate height of 3.5 m.

The maximum height from the ground to allow the effective operation of a ladder truck with a ladder angle of 75° at a nine storey building is 32.5 m.

3.5 m × 9 + 1 m = 32.5 m

It is not always possible for a ladder truck to park in the best position near a building on fire because of the trees and shrubs around buildings. The ladder length must be determined to enable the ladder to reach a building even if the truck is some 10 m away from a building because of obstacles as shown in Fig. 2-2-5.

Based on the above considerations, the introduction of a 35 m class ladder truck is judged to be the minimum requirement.

Table 2-2-5 Number of Medium to High-Rise Buildings in Central Ulaanbaatar

No. of Floors	3 – 4	5	6	7	8	9	10	12	14	Total
No. of Buildings	1,250	3,476	1,342	1,036	809	295	2	59	1	8,270

(Excluding Baganur, Bagahangai and Naraiha)

The use of a ladder truck is most effective if it is used for rescue activities during initial to mid-fire fighting activities. The deployment of one ladder truck for each area with a radius of some 2.5 km is, therefore, judged to be appropriate so that it can reach a fire scene within 5 minutes at an average traveling speed of 30 km/hour in central Ulaanbaatar.

Also taking the garage situation into consideration, appropriate fire stations for the deployment of a ladder truck are No.10 to replace the existing ladder truck and No.29 for the continued use of the existing ladder truck.

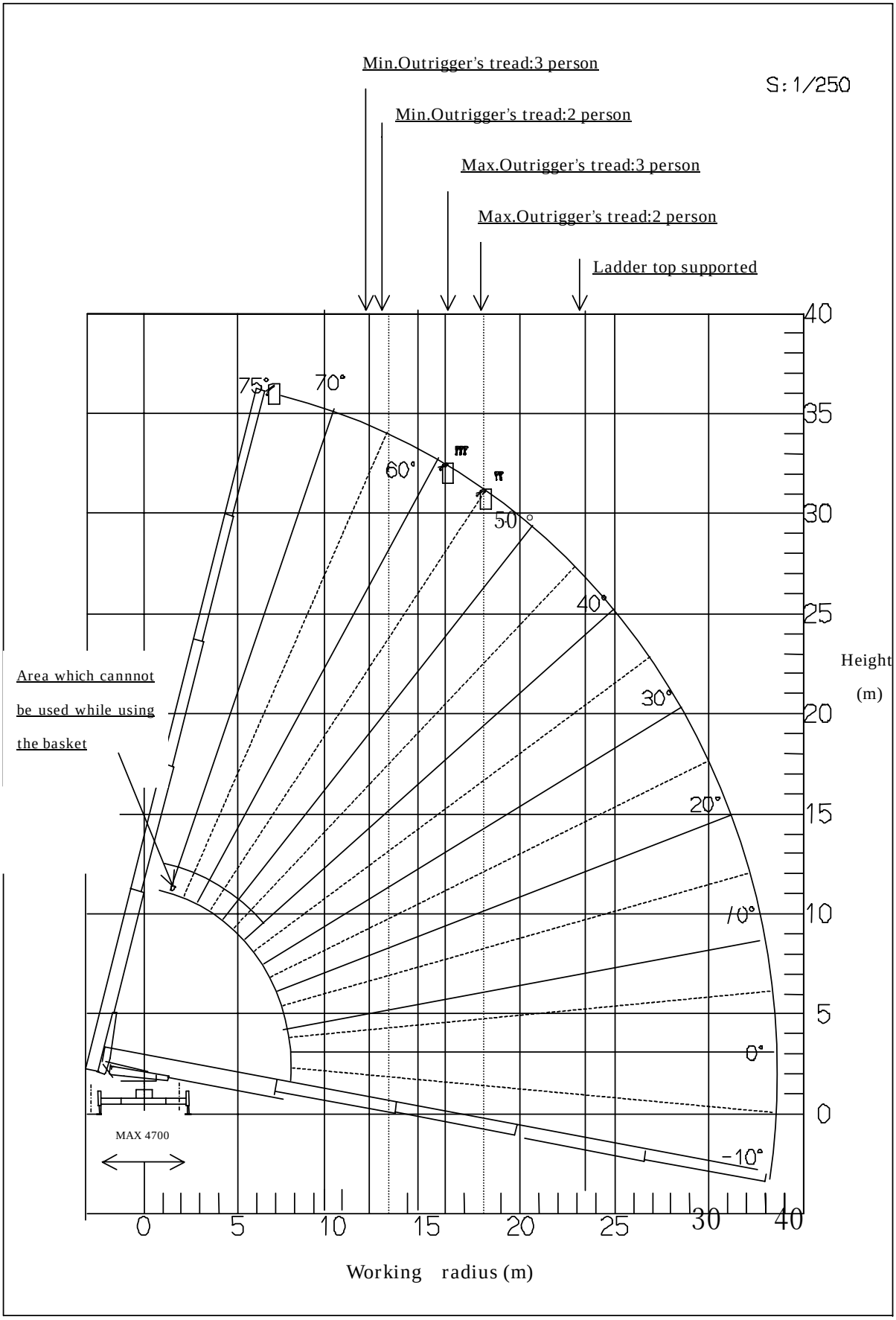


Fig. 2-2-5 Scope of Operation of 35 m Class Ladder Truck

4) Floodlight Car

① Situation at Target Sites

Mongolian side has requested the provision of a floodlight car as a support vehicle for fire fighting activities at night.

Some 40% of the fires in Ulaanbaatar occur at night (21:00 to 05:00) and fire fighters struggle in the darkness. To be more precise, as electricity supply to the distribution line(s) near a fire scene is cut off for safety or due to short-circuiting caused by fire, the areas around a fire scene fall into total darkness because of the absence of street lighting. Fire fighters are forced to do all types of activities at a fire scene in darkness, including fire fighting, rescue, first aid, safety control and investigation of the cause of a fire.

② Necessity for Floodlight Car

As the deployment of one floodlight car to support fire fighting activities at night is deemed to be necessary to ensure the smooth actions and safety of fire fighters, the deployment of one floodlight car at Fire Station No.10 is judged to be appropriate because of its convenient location for the dispatch of the car to various parts of the city. Assuming its dispatch to dense ger areas, good drivability on poor roads must be taken into proper consideration and 4WD vehicle is necessary.

5) Other Vehicles

① Command Car

The existing command car is a jeep-type car manufactured in Russia. While the conditions of this vehicle are good, its radio communication equipment is no longer usable.

The command car is a vehicle from which fire companies are given instructions at a fire scene and it plays a central role in fire fighting activities. However, the vehicle and its equipment do not require any special specifications and a passenger-type car equipped with a radio communication system will be sufficient. Accordingly, the command car has less priority and it is judged that only the on-board radio communication equipment will be replaced under the Project.

② Fire Research and Laboratory Car

Mongolian side has also requested the provision of a fire research and laboratory car to investigate the causes of fires. No corresponding vehicle is used in Japan. It was judged that the mounting of precision analytical equipment on a vehicle would present technical and operational difficulties.

In Japan, cars used to investigate the causes of fires are transport vehicles which mainly carry personnel and equipment for investigation of the causes of fires and they do not carry any special equipment. The requested car is, therefore, omitted from the scope of the Project as it can be substituted by another car.

③ Rescue Truck

Although the Mongolian side has requested a rescue truck and rescue equipment, rescue work in Mongolia is under the jurisdiction of the Civil Defence Agency. The fire service is only responsible for rescue work at fire scenes. Ordinary traffic accidents and work-related accidents are handled by ambulances controlled by the Ministry of Health, the Police and parties to an accident and no reporting to the fire service appears to be made. Accordingly, there appears to be little need for UBFS to have its own rescue truck and this truck is omitted from the scope of the Project.

Given the importance of rescue work at fire scenes, however, accessories to be carried by pumper tankers, etc. will be provided under the Project to assist efficient rescue activities at fire scenes.

Based on the above analysis, a total of 17 fire vehicles will be procured under the Project and will be deployed at the fire stations listed in Table 2-2-6.

Table 2-2-6 Deployment of Fire Vehicles Procured Under the Project

Fire Station		Pumper Tanker (10,000 L)	Pumper Tanker (4,000 L; 2 WD)	Pumper Tanker (4,000 L; 4 WD)	Chemical Truck	Water Tank Truck (8,000 L)	Ladder Truck	Floodlight Car (4 WD)
10	◎	1		1		1	1	1
11								
14	○		1			1		
18								
26	◎	1		1		1		
28								
29	○				1			
30	○			1		1		
34	◎			1		1		
64	◎		1			1		
65								
80								
Total		2	2	4	1	6	1	1

* ◎: key station; ○: local base station

(2) Fire Suits Set

1) Conditions of Existing Fire Suits

Fire suit set was originally requested to fight forest and grassland fires. However, the field survey found that the existing fire suits for ordinary fires are very dilapidated and that their renewal is urgently required for the safety of fire fighters. The fire suits currently used by UBFS consist of the following items.

Helmet : made of FRP with a clear plastic hood and neck flap
Jacket : single canvas layer half coat with a safety belt
Trousers : single canvas layer three-quarter length trousers
Gloves : not used in summer; leather padded with cotton to protect against the cold in winter
Boots : worn throughout the year; leather working boots of knee or ankle length

As these specifications do not specifically have a fireproof performance, their improvement is necessary to ensure the safety of fire fighters. The fire suits of some fire fighters appear to have exceeded their life as they are considerably worn.

Given the fact that UBFS is responsible for the work safety of their employees, i.e. fire fighters, it is judged that there is a strong need to improve the fire suits worn by fire fighters by providing suitable fire suits for fire fighting. New fire suits are, therefore, included in the scope of the Project.

2) Required Performance of Fire Suits

The fabric of the fire suits should conform to ISO Standards (Fire Suits) or should be fire-retardant. The level of impact resistance of the helmets should at least meet the comparable Japanese standard.

The contents of the new fire suits will be the same as the existing fire suits.

Calculation of the required quantity is based on the number of pumper tanker companies and chemical truck companies. Each company consists of seven members, i.e. chief, aide, four fire fighters and driver. Six fire suits (excluding the driver) are, therefore, required for each company. In the case of a ladder truck, two fire suits (excluding the driver) are required.

The total quantity of required new fire suits is, therefore, 98 sets.

(6 sets × 16 companies) + (2 sets × 1 company) = 98 sets

When the M/D were signed, 99 sets were believed to be necessary. However, one set was withdrawn because it was found that the existing ladder truck is operated by only one driver.

The new fire suits to be procured under the Project will be deployed at fire stations as shown in Table 2-2-7.

Table 2-2-7 Deployment of New Fire Suits Procured Under the Project

Fire Station No.	No. of New Fire Suits
10	14
11	6
14	6
18	6
26	12
28	6
29	6
30	6
34	12
64	12
65	6
80	6
Total	98

(3) Equipment for Forest and Grassland Fires (Knapsack-Type Fire Fighting Water Bags)

1) Situation of Existing Equipment

Mongolian side has requested the provision of individual equipment (hatchets, canteens, goggles and compasses, etc.) and knapsack-type fire fighting water bags for fire fighters as it only has 30 knapsack-type fire fighting water bags (provided by a Japanese NGO in 1997) at Fire Station No.10. However, as individual equipment can be procured in Mongolia at relatively low prices, their procurement under the Project is judged to be unsuitable.

2) Situation at Target Sites

The responsibility for fighting forest and grassland fires has been transferred from the Civil Defence Agency to the Fire Fighting Department following the revision of the Fire Service Law in 1999, clarifying the responsibility of the Fire Fighting Department.

In Ulaanbaatar, 10 forest and grassland fires occurred in the five years from 1996 to 2000 with the loss of some 1,000 ha of forests. In some cases, the fire approached the airport and residential areas.

When a forest/grassland fire occurs, the work shifts are supposed to be changed from four shifts to three shifts to release a team of eight fire personnel from each fire

station. The system of dispatching fire companies to fight a forest/grassland fire based on interviews is described in more detail in Appendix 6-3 Response to forest and grassland fires.

3) Required Performance of Equipment for Forest and Grassland Fires

The equipment owned by UBFS to fight forest and grassland fires consist of broom-like fire beaters, spades, rakes and buckets, etc. which do not appear very effective tools. Meanwhile, 30 knapsack-type fire fighting water bags donated by a Japanese NGO in 1997 are effectively used.

In short, there is a justifiable need for the provision of knapsack-type fire fighting water bags, which are the most effective fire equipment in forest and grassland areas beyond the reach of fire vehicles.

When the M/D were signed, 74 knapsack-type fire fighting water bags (8 bags x 13 fire stations – 30 existing bags) were believed to be necessary. However, since Fire Station No. 79 was closed, the number of target fire stations under the Project is 12 and it is judged that the provision of 66 bags (8 bags×12 stations – 30 existing bags) will be necessary.

These knapsack-type fire fighting water bags should be centrally stored in the warehouse of UBFS Headquarters because of the following advantages.

① It will be easy for UBFS Headquarters, which is responsible for equipment transportation, to fulfill its responsibility.
② Number control can be easily conducted.
③ The existing 30 bags are controlled by UBFS Headquarters under an appropriate system.
④ As staff members of Fire Station No.10 always monitor the warehouse of UBFS Headquarters, it is less likely that these bags will be lost.

It will be necessary to request UBFS to tidy the warehouse to provide storage space for the new equipment and also to strengthen the maintenance system.

(4) Radio Communication System

The existing radio communication system of UBFS consists of VHF communication between the fire stations in the city centre, HF communication between distant fire stations and telephone communication between all fire stations. The lack of replacement

and proper maintenance means that many items of equipment are quite old and/or not in use due to the lack of a repair system. Consequently, the communication system of UBFS cannot be described as functioning well given its status as an important disaster prevention organization.

The present situation of the existing system studied by the Study Team is described below.

< Wire (Telephone) System >

The command console to receive 101 calls (reporting a fire) and to issue commands at UBFS Headquarters was made in East Germany in 1975. The subsequent withdrawal of aid and the suspension of the supply of spare parts mean a lack of proper maintenance and the only operable equipment are the telephone lines and the call identification system which was added three years ago. Wire communication with four outlying fire stations located more than 40 km away from the city centre is non-existent or is cut off during bad weather.

< Radio Communication >

VHF radio equipment using the 170 MHz band is used by each fire station and by some vehicles while HF radio equipment using the 3 MHz band is provided at UBFS Headquarters and four outlying fire stations.

VHF system : Only part of the VHF radio equipment is currently used. Communication between the eight fire stations in the city centre is apparently hardly possible because of frequency slippage and output decline, in turn caused by secular deterioration. None of the mobile radio equipment is in operational order.

HF system : All of the equipment is out of order, making it impossible for UBFS Headquarters to communicate with or obtain information from outlying fire stations using the HF system.

Given the above situation, the suitability of the equipment requested by Mongolian side under the Project is examined below.

1) Communication and Command System at UBFS Headquarters

The existing system was made in East Germany in 1975 and the console has the following functions. Table 2-2-8 shows the contents of the system and the problems.

The 101 call receiver is practically the only equipment which can continue to be used during a power failure.

Table 2-2-8 Conditions of Command System at UBFS Headquarters

Exclusive 101 call receiver (telephone line)	2	Only one is in operation even though it frequently breaks down because of its 25 years of use.
101 call receiver during a power failure	3	Simply telephone receivers which can continually be used.
Call identification system	One set	Usable at present and linked to the exclusive 101 call receiver
Public address system	One set	Not in use
VHF radio equipment	1	Not in use due to frequency slippage and insufficient amplification, in turn caused by secular deterioration
HF radio equipment	1	Not in use due to frequency slippage and insufficient amplification, in turn caused by secular deterioration
Company situation display panel	One set	Not in use

As 101 calls are the most important means of detecting the occurrence of fires for UBFS, UBFS has made a strong request to the Study Team for the improvement of the communication and command system at the UBFS Headquarters.

The provision of the following equipment, etc. is judged to be appropriate to allow a simultaneous response by up to three operators to ensure smooth communication and command activities at the time of a large disaster and the simultaneous reporting of multiple fires while effectively using the currently available three telephone lines and usable equipment.

① Operation console : 3
② VHF radio equipment : 1
③ Public address system : one set
④ Company situation display panel : one set

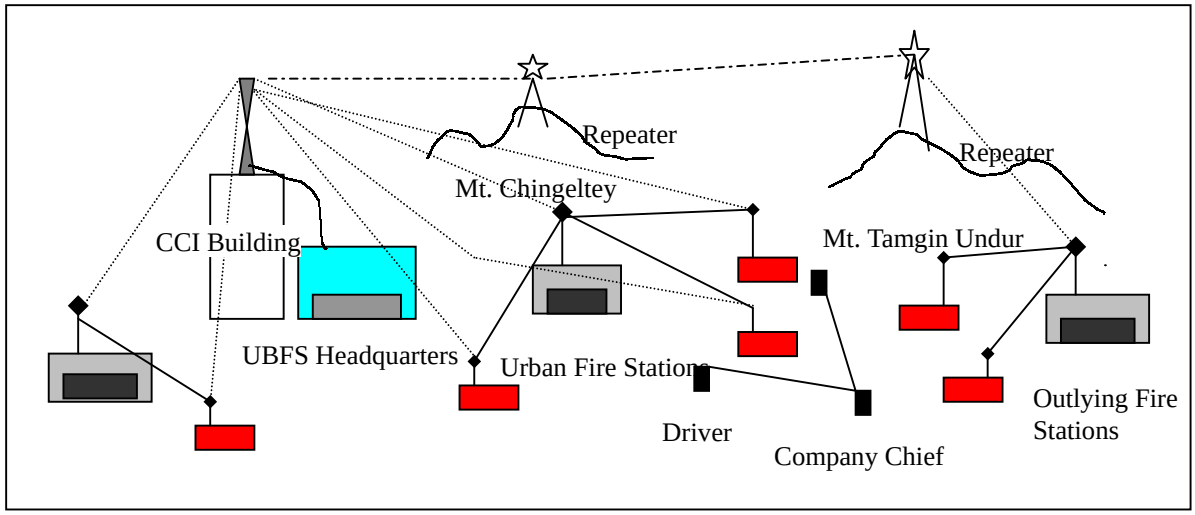


Fig. 2-2-6 Conceptual Drawing of Radio Communication System of UBFS

2) Conclusions Regarding Radio Communication System

① Frequency

UBFS formerly used VHF and HF for communication purposes. However, the HF band can be disrupted depending on the conditions of the ionosphere and voice transmission is unclear. In contrast, the VHF band is characterised by linear propagation of the wave, clarity of voice transmission, small installation space for equipment and antenna and low cost and is widely used by fire and other services in Japan and other countries.

Given this situation, the provision of a VHF radio communication system under the Project is judged to be appropriate.

② Antenna

UBFS currently has only a GP antenna on a stand on top of the buildings of the UBFS Headquarters and fire stations. None of the radio antennas at the fire stations have been renewed since being installed in 1975 and those currently in use are highly corroded as their expected life has already elapsed.

Replacement of the antenna together with the radio equipment is, therefore, judged to be appropriate to ensure the effective operation of the radio equipment to be provided under the Project.

UBFS has secured an agreement to install the new antenna to be provided under the Project on the roof-top of the neighbouring Chamber of Commerce and Industry (CCI) building and the installation of the new antenna at this location is judged to be appropriate with the use of a remote control system at UBFS Headquarters.

③ Output

The measuring results of the field strength based on the output (25 W) of the radio equipment formerly used by UBFS indicate that sufficient strength for stable communication is unavailable, making it necessary to increase the output to 40 W or stronger. The specifications of the new equipment will reflect this requirement.

④ Repeater

UBFS formerly communicated with outlying Fire Station Nos. 28, 64, 79 and 80 using HF radio equipment. Under the Project, however, the installation of repeaters (devices to amplify the signal received on a certain frequency and to transmit on another frequency) is judged to be more appropriate than the provision of new HF radio equipment to ensure reliable communication.

A VHF radio communication system to cover distant areas using repeaters is a rational choice in terms of cost and technology. It was confirmed at the technical discussion meeting (held on 9th September 2001) that Mongolian side will be responsible for securing the required frequency (band).

The Study Team conducted an experiment using a repeater set up on top of Mt. Chingeltey and Mt. Tamgin Undur and the radio reception was good enough at the farthest Fire Station No.64 (130 km east of UBFS Headquarters) in Baganur.

3) Significance of Each Radio Equipment

Radio communication occupies an important position as a means of information gathering and information conveyance for effective fire fighting activities. It is no exaggeration to say that efficient fire fighting activities are impossible without radio communication. At present, any request for reinforcements and reporting of the situation at the scene of a fire involve extra activities due to the absence of radio communication equipment, causing such negative effects as the spread of fire,

increase of the losses due to fire, excessive work load for fire personnel and uneconomical fire fighting activities.

As all mobile radio equipment of UBFS is currently out of order, it is practically impossible to decide on the necessity for reinforcements, to gather information at the scene of a fire, to convey commands from the UBFS Headquarters and to respond to a fire in another location, even in the central part of the city, once the fire vehicles have left the fire station. As a result, the efficient deployment of fire companies, including requests for reinforcements to prevent the spread of fire, is difficult.

The inability of the UBFS Headquarters to accurately understand the ongoing activities of fire companies is not efficient for fire fighting activities which require proper organization. It also poses a safety risk for fire personnel.

Table 2-2-9 outlines the concrete radio operation required for the efficient deployment of fire companies and fire fighting activities.

Table 2-2-9 Radio Operation for Fire fighting Activities

	Main Communication Channel	Example of Communication
Fire Station Radio Set	Station ⇔ Headquarters	Dispatch order from the HQ and reporting from stations to the HQ
	Station ⇔ Response Group	General communication from the station to the companies in operation
Mobile Radio Set	Response Group ⇔ Headquarters	Request for reinforcements from the response group to the HQ and general communication
	Response Group ⇔ Station	Request for reinforcements from the response group to the station and general communication
Portable Radio Set	Company Chief ⇔ Driver	Request for a specific water pressure from the company chief to the driver operating the pump; request to the driver to use the mobile radio equipment to request reinforcements to the HQ
	Company Chief ⇔ Driver of Another Company	Issue of commands to assist others and to warn of risks, etc.
	Driver ⇔ Driver of Another Company	Communication to request water supply and assistance, etc.

When there is a large-scale fire or a fire at an important government building, senior staff members of UBFS and the Fire Fighting Department are present at the fire scene to conduct the following activities at the command post and in other places. The provision of three sets of portable equipment and mobile equipment for the

Chief of the Fire Fighting Department, Head of UBFS and senior staff member responsible for fire suppression at the fire scene is, therefore, judged to be appropriate.

<Response of Senior Staff Members to Large-Scale Fire or Fire at Important Government Building>

Chief of Fire Fighting Department:

general coordination as the supreme commander; instructions to the Head of UBFS and senior staff members

Head of UBFS:

assistance to the supreme commander; instructions on company deployment; logistics regarding personnel and food supply, etc.

Senior staff members at fire scene (sharing of the following duties by divisional heads) :

(Fire suppression) : command of fire fighting activities; safety control at the fire scene

(Public relations) : gathering of fire information; dealing with the press; evacuation instructions to local residents; public relations at the fire scene

(Investigation) : liaisoning with the police and related organizations; preservation of the fire site; investigation of the cause of the fire

(Equipment) : assistance for the supply and change of equipment

The above examination results suggest the need to establish the network shown in Fig. 2-2-6 and, therefore, the following equipment is included in the scope of the Project in addition to the communication and command system at UBFS Headquarters described in 1).

Fire Station Radio Set	One for each fire station	12
Mobile Radio Set	HQ command car(3) and, in principle, each fire vehicle at all fire stations	38
Portable Radio Set	Three for HQ senior members + (chief of each fire station × 12) + (chief of each pumper tanker company, etc. × 16) + (one for each driver × 36)	67

Of the two water tank trucks to be deployed at Fire Station No.28, one person is added for the 6,000 L water tank truck. As this truck plays a supplementary role, no mobile radio equipment will be provided for this truck.

This truck will be operated in the following manner.

Mobile radio set:

In principle, this truck receives a dispatch command at the fire station. It will, therefore, be sufficient to acknowledge a command sent to the fire station radio equipment. For the dispatch of this truck to a neighbouring area to fetch water, the flexible use of the portable radio equipment for another water tank truck should be sufficient for this type of operational need.

Portable radio set:

This truck will be operated solely for water supply and radio communication with the company chief at the scene of a fire can be conducted using the portable radio equipment of the driver of another water tank truck which arrived at the fire scene earlier.

Based on the above, the radio equipment to be provided under the Project will be distributed as shown in Table 2-2-10.

Table 2-2-10 Distribution of Radio Equipment Procured Under the Project

Station	Fire Station Radio Set	Mobile Radio Set	Portable Radio Set
HQ	-	3	4
10	1	7	10
11	1	2	4
14	1	2	4
18	1	2	4
26	1	3	6
28	1	2	4
29	1	3	5
30	1	2	4
34	1	4	7
64	1	4	7
65	1	2	4
80	1	2	4
Total	12	38	67

(5) Equipment for Fire Research Laboratory

The contents of the original request covered all types of laboratory work which is currently conducted (as well as that which will hopefully be conducted in the future) at the Laboratory of the Fire Fighting Department. In view of the purpose of the Project of providing, in principle, replacement equipment and equipment for human safety, the minimum range of equipment required to clarify the causes of fires and to provide scientific data was examined.

1) Laboratory Work

The Laboratory is part of the Fire Fighting Department and is expected to mainly conduct the following work.

① Research on and investigation of the causes of fires and preparation of materials to be submitted to the police

② Preparation of fire prevention data, including fireproof performance data of building materials and judgement data on the properties of petrochemical products

③ Research on fire extinguishing agents and protective masks for fire personnel

④ Preparation of statistical data

While all of the above work is important from the viewpoint of basic research and investigation for the fire service, the scope of responsibility of the fire service and related laws, regulations and standard are unclear in regard to ② above. In the case of ③, no work is undertaken because of equipment breakdown and other reasons. Therefore, there appears to be no urgent necessity to conduct this type of work and it is judged that this type of work is unsuitable for the Project.

In contrast, ① above, i.e. investigation of the causes of fires, is clearly stipulated by fire service laws as a duty of the Fire Fighting Department. As scientific data relating to fire hazards is gathered and analysed under this work to contribute to various fire prevention measures and PR activities, it is judged to be important as the basis of the fire administration.

2) Situation of Existing Equipment

The Laboratory is situated on the third floor of the Fire Fighting Department Building. Balances, measuring instruments and testing equipment, etc. made in the former Soviet Union are kept in a room of approximately 15 m^2 in size. Most of the equipment has either broken down or is no longer used. The X-ray analysis unit and the thermostatic oven are the only two pieces of equipment which are in good working order. Although the photo processing room has an old-fashioned monochrome developing machine, the breakdown of the focusing mechanism makes the developed photographs unreliable as evidence. The Laboratory has eight staff members who studied physics, chemistry and nuclear power, etc. at universities in the former Soviet Union.

3) Examination of Required Measuring and Analytical Equipment for the Laboratory

The range of originally requested equipment was mainly to replace the existing equipment to conduct the work listed in ① through ④ in 1) above. Based on the reasons given above, the types of equipment mainly used by Japanese fire services to investigate the causes of fires were selected as described in more detail in Appendix 6-4 and the possibility of their introduction at UBFS was examined.

This examination revealed the following problems in relation to the maintenance cost and the procurement of consumables.

① Maintenance

All of the equipment in question is precision equipment and a lack of regular cleaning could lead to malfunctioning due to the attachment of dust. Regular cleaning is an essential part of maintenance work and a lack of regular cleaning can cause equipment failure.

When the board which is at the heart of such equipment breaks down, most manufacturers demand that repair is conducted by an authorised engineer using a genuine part. This means that repair work cannot be conducted in Mongolia, placing a heavy financial burden on UBFS.

② Computer Operation

Each equipment is linked to a computer for data processing and analysis. As the application software for this purpose uses English, local researchers must be highly conversant with the English language, including technical terminology.

All researchers at UBFS have undergone higher education at a university in Russia. At the time of the field survey, only one senior inspector and one female laboratory researcher were found to understand English. The language used for computers was either Mongolian or Russian.

③ Cost of Consumables

The consumables required by laboratory equipment vary depending on the frequency of use, purpose of use, voltage/current fluctuations and technical level of the user, etc. As shown in Appendix 6-4, all are quite expensive. Even though the procurement of genuine consumables produced by the equipment manufacturers is necessary, these products may be unavailable in Mongolia, rendering the equipment useless.

Based on the above considerations, the exclusion of laboratory equipment from the scope of the Project is judged to be appropriate.

4) Photo Development Set

The replacement of the existing photo development set (a monochromatic enlarger, a dryer, an automatic photographic paper developing machine and a washer for the said automatic developing machine) is judged to be necessary.

The main consumables associated with the above are such chemicals as fixing solution and stabilisation solution, lamps for the enlargers and photographic paper. Procurement prices for main supplies in Japan when developing colour photos by using the development set in the equipment provided through this cooperation are as follows.

- Chemicals : approximately ¥6,000 for replenishment and change once every two months, totalling some ¥36,000/year; further savings can be made by means of careful topping up
- Lamps for enlargers : depends on the handling and frequency of use; last some 100 days with daily use for two hours in the case of an expected life of up to 200 hours; ¥5,400/lamp, resulting in an annual cost of ¥21,600 for four lamps
- Photographic paper : approximately ¥90 per sheet

UBFS generally takes 24 photos per fire. Given the 1,000 fires/year, some 24,000 photographs/year are developed. The cost of each photograph is estimated to be approximately ¥92 based on the use of the consumables listed above.

However, all of these supplies are already being distributed in Mongolia. Annual procurement price in Mongolia is 33,000 Tg (about 4,300 yen) for chemicals, 120,000 Tg (about 15,600 yen) for enlarger lamp and 450 Tg (about 60 yen) for photographic paper based on annual number of paper developed at UBFS. When converted into cost per copy, this amounts to about 61 yen per copy.

The development currently used at UBFS is expensive at 70 yen per copy because it is using the chemicals for monochrome printing which is not very common in the market.

However, maintenance cost can be reduced through the use of the new equipment.

5) Fire Investigation Tool Set

Investigation of the causes of fires involves photography, reproduction of the situation prior to the outbreak of fire, collection of fire damaged items which are believed to be the causes of fire and recording the situation of the spread of the fire at actual fire scenes. Accordingly, it is judged that the fire investigation tool set should include a camera, scale, metal detector, tweezers, magnifier, sample collection bottles and container case, etc.

In principle, the investigation system of UBFS involves the dispatch of two senior investigators to the site of a fire. When fires simultaneously break out at two locations, a senior investigator and another staff member form a team so that the two fire sites can be simultaneously investigated. If there is a third site, fire fighters dispatched to the site are responsible for the preservation of the site. Given this arrangement, the provision of at least two sets under the Project is judged to be appropriate. The items included in these sets do not require special maintenance and the relevant consumables can be procured in Mongolia.

(6) Equipment for Maintenance

The principal concept for the selection of maintenance equipment is the deployment of equipment to be provided under the Project.

1) Present Situation of Maintenance

The present maintenance system of the fire vehicles, etc. of UBFS is outlined below.

① Daily checking and maintenance are conducted by drivers.

② Regular checking and maintenance are conducted in accordance with the rules on vehicle mileage and engine operating hours, etc. set forth by the Fire Fighting Department. The maintenance section of UBFS has two mechanics and conducted the repair of a total of 93 vehicles in 2000.

③ Such major maintenance work as the overhauling of the engine and the replacement of the chassis, etc. is conducted at the Workshop of the Fire Fighting Department and some 25 vehicles were repaired in 2000.

④ At present, the maintenance equipment in working order is limited to an air hammer, grinder, cutter and oil changer, etc. and requires reinforcement with other necessary equipment.

⑤ The vehicles and special units, such as pumping units, etc., are checked and maintained by engineers who received the relevant training at the Heavy Machinery Training Centre in Irkutsk in Russia. Because of the absence of genuine spare parts, a limited range of machine tools is used to manufacture such parts. The painting and welding capabilities are comparable with those of private sector workshops and meet the practical requirements.

2) Problems at Target Sites

① As most of the vehicles are old Soviet-made vehicles of which the expected life has long since elapsed, no parts for repair purposes are available. Much of the maintenance equipment is old and unusable, resulting in failure to meet the repair demand.

② At present, light maintenance work is conducted at the maintenance garage (8.5 m $\times$ 15m =127.5m^2) at the north side of UBFS headquarters. However, hardly any systematic checking and maintenance is conducted because of too many breakdowns, the absence of inspection and maintenance equipment and the absence of manuals.

③ Maintenance System

The current equipment maintenance work emphasises the repair of the old Soviet-made vehicles and the request for equipment is made to establish the capability to maintain all types of vehicles at UBFS.

The fire vehicles to be introduced in the coming years, including those to be provided under the Project, will not require any major maintenance work, including overhauling, for at least 10 years after their delivery.

The Soviet-made fire vehicles currently in use require both major maintenance work and repair. However, it will be necessary to expand the range of maintenance equipment to conduct such work and there is no existing space to accommodate such equipment. In addition, no spare parts for these old vehicles are currently produced and the number of repairs will decrease because of the introduction of the new vehicles. For these reasons, the maintenance of fire vehicles is not included in the scope of the Project and it is proposed that UBFS entrust major maintenance work to the Ulaanbaatar Municipal Bus Corporation or others.

The range of maintenance equipment to be provided under the Project is planned based on the following principles.

a) Maintenance work will be conducted at the maintenance garage of UBFS Headquarters.

b) The Fire Fighting Department will adopt preventive maintenance based on the checking and maintenance programme as the basic maintenance practice.

c) The pump units and other equipment unique to the fire vehicles will be checked and maintained.

d) Only light maintenance work, such as minor repair work, will be conducted as it is assumed that major maintenance work will be entrusted to the Ulaanbaatar Municipal Bus Corporation or others.

e) Guidance will be provided on the preparation of a maintenance programme and maintenance manuals and also on the required skills.

3) Required Maintenance Equipment

The maintenance equipment to be provided under the Project consists of the following.

① Body repair equipment
② Maintenance tools
③ Sheeting equipment

④ Painting equipment and tools
⑤ Parts storage

See 2-2-2-5 (Outline of Main Equipment) for more details.

2-2-2-4 Overall Equipment Deployment Plan

The results of the examination of the types, specifications and scale of and the target sites for the equipment in 2-2-2-1, 2-2-2-2 and 2-2-2-3 are shown in Table 2-2-11.

As already described in 2-2-2-1, it is essential to operate and maintain the equipment to be newly procured and deployed under the Project, particularly fire vehicles which are based on the basic deployment plan for fire vehicles which are essential for the maintenance of the fire service strength of UBFS in harmony with the existing equipment to be redeployed for continued use.

Table 2-2-11 Overall Equipment Deployment Plan

Fire Station	Function	Overall Equipment Deployment Plan		No. of Personel	Equipment																											
					Fire trucks			Command system at headquarter		Fire Station Set		Mobile Radio Set		Portable Set		Repeater		Fire Suits Set		Knapsack-type Fire-Fighting Water Bag		Laboratory Equipment			Maintenance Equipment	
		Type	No. of Vehicles		Code No. of Item	Type	No. of Vehicles	Code No. of Item	No.	Code No. of Item	No.	Code No. of Item	Set	Code No. of Item	No.	Code No. of Item	Set	Code No. of Item	Set	Code No. of Item	Set	Code No. of Item	Kind	Set	Code No. of Item	Set
HQ	Command and Control	Command car	3	each 1				CH1	1	—	—	CM1-CM3	3	CP1-4	4*(3)	RP1-2	2	—	—	BF1-66	66	LB1	Photo Development Set	1	MA1	1
10	Key station	Pumper Tanker (10,000L)	1	7	TL1	Pumper Tanker (10,000L)	1	Total	1	CF1	1	CM4	1	CP5-7	3 **(1)	Total	2	FS1-6	6	Total	66	LB2-3	Fire Investigation Tool Set	2	Total	1
		4WD Pumper Tanker (4,000L)	1	7	PT1	4WD Pumper Tanker (4,000L)	1					CM5	1	CP8-9	2			FS7-12	6			Total		3		
		Water Tank Truck (8,000L)	1	2	TS1	Water Tank Truck (8,000L)	1					CM6	1	CP10	1			-	-							
		Ladder Truck(35m)	1	3	LA1	Ladder Truck(35m)	1					CM7	1	CP11	1			FS13-14	2							
		Floodlight car	1	1	FG1	Floodlight car	1					CM8	1	CP12	1			-	-							
		Pumper Tanker (1,500L)	1	1								CM9	1	CP13	1			-	-							
		Pickup truck(500L)	1	1								CM10	1	CP14	1			-	-							
11	Station	Pumper Tanker (2,100L)	1	5						CF2	1	CM11	1	CP15-17	3**(1)			FS15-20	6							
		Water Tank Truck (6,000L)	1	1								CM12	1	CP18	1			-	-							
		Forestfire truck	1	-								-	-	-	-			-	-							
14	Local base station	Pumper Tanker (4,000L)	1	7	PW1	Pumper Tanker (4,000L)	1			CF3	1	CM13	1	CP19-21	3 **(1)			FS21-26	6							
		Water Tank Truck (8,000L)	1	2	TS2	Water Tank Truck (8,000L)	1					CM14	1	CP22	1			-	-							
18	Station	Pumper Tanker (2,100L)	1	7						CF4	1	CM15	1	CP23-25	3 **(1)			FS27-32	6							
		Water Tank Truck (6,000L)	1	1								CM16	1	CP26	1			-	-							
26	Key station	Pumper Tanker (10,000L)	1	7	TL2	Pumper Tanker (10,000L)	1			CF5	1	CM17	1	CP27-29	3 **(1)			FS33-38	6							
		4WD Pumper Tanker (4,000L)	1	7	PT2	4WD Pumper Tanker (4,000L)	1					CM18	1	CP30-31	2			FS39-44	6							
		Water Tank Truck (8,000L)	1	2	TS3	Water Tank Truck (8,000L)	1					CM19	1	CP32	1			-	-							
		Forestfire truck	1	-								-	-	-	-			-	-							
28	Station	Water Tank Truck (6,000L)	1	4						CF6	1	CM20	1	CP33-35	3 **(1)			FS45-50	6							
		Water Tank Truck (6,000L)	1									—	—	—	—			-	-							
		Pumper Tanker (2,100L)	1	7								CM21	1	CP36	1			-	-							
29	Local base station	Chemical Truck (8,000L+1,000L)	1	7	CE1	Chemical Truck (8,000L+1,000L)	1			CF7	1	CM22	1	CP37-39	3 **(1)			FS51-56	6							
		Water Tank Truck (6,000L)	1	1								CM23	1	CP40	1			-	-							
		Ladder truck(30m)	1	1								CM24	1	CP41	1			-	-							
30	Local base station	4WD Pumper Tanker (4,000L)	1	7	PT3	4WD Pumper Tanker (4,000L)	1			CF8	1	CM25	1	CP42-44	3 **(1)			FS57-62	6							
		Water Tank Truck (8,000L)	1	2	TS4	Water Tank Truck (8,000L)	1					CM26	1	CP45	1			-	-							
34	Key station	4WD Pumper Tanker (4,000L)	1	7	PT4	4WD Pumper Tanker (4,000L)	1			CF9	1	CM27	1	CP46-48	3 **(1)			FS63-68	6							
		Water Tank Truck (8,000L)	1	2	TS5	Water Tank Truck (8,000L)	1					CM28	1	CP49	1			-	-							
		Pumper Tanker (2,100L)	1	7								CM29	1	CP50-51	2			FS69-74	6							
		Water Tank Truck (6,000L)	1	1								CM30	1	CP52	1			-	-							
64	Key station	Pumper Tanker (4,000L)	1	7	PW2	Pumper Tanker (4,000L)	1			CF10	1	CM31	1	CP53-55	3 **(1)			FS75-80	6							
		Water Tank Truck (8,000L)	1	2	TS6	Water Tank Truck (8,000L)	1					CM32	1	CP56	1			-	-							
		Pumper Tanker (2,400L)	1	7								CM33	1	C57-58	2			-	-							
		Water Tank Truck (6,000L)	1	1								CM34	1	CP59	1			FS81-86	6							
65	Station	Pumper Tanker (2,100L)	1	5						CF11	1	CM35	1	CP60-62	3 **(1)			FS87-92	6							
		Water Tank Truck (6,000L)	1	1								CM36	1	CP63	1			-	-							
80	Station	Pumper Tanker (2,100L)	1	5						CF12	1	CM37	1	CP64-66	3 **(1)			FS93-98	6							
		Water Tank Truck (6,000L)	1	1								CM38	1	CP67	1			-	-							
		Total	41	139		Total	17	Total	1	Total	12	Total	38	Total	67	Total	2	Total	98	Total	66		Total	3	Total	1

Existing vehicles

*for Senior staff of HQ

**for chief of each fire station

2-2-2-5 Outline of Main Equipment

Fire Vehicles

	Pumper Tanker (10,000L)	Pumper Tanker (4,000L)	4WDPumper Tanker (4,000L)	Chemical Truck	Water Tank Truck	Ladder Truck	Floodlight car
Length(mm)	8,500～9,000	6,300～6,800	6,300～6,800	8,500～9,000	7,200～7,600	9,800～10,400	5,200～6,000
Width(mm)	2,300～2,500	2,300～2,500	2,300～2,500	2,300～2,500	2,300～2,500	2,300～2,500	2,000～2,400
Height(mm)	3,000～3,500	3,000～3,400	3,300～3,700	3,300～3,700	3,000～3,400	3,700～3,900	3,000～3,400
Gross Vehicle Weight(kg)	25,000～27,000	10,000～12,000	12,000～14,000	25,000～27,000	15,000～17,000	25,000～27,000	4,000～6,000
Output	over220kw	over125kw		over220kw	over130kw	over220kw	over65kw
Drive Mode	6×4 (Rear Wheel Drive)	4×2 (Rear Wheel Drive)	4×4 (Four Wheel Drive)	6×4 (Rear Wheel Drive)	4×2 (Rear Wheel Drive)	6×4 (Rear Wheel Drive)	4×4 (Four Wheel Drive)
Steering	Left hand drive with power assisted						
Cabin	Double Cabin				Single Cabin		
Capacity of Personnel	7				3		
Performance	Low： more than 2,850L/min at total head 1.03MPa			more than 3,500L/min at total head 1MPa	More than 1,100L/min Portable pump (over33kw)	More than 2,850L/min at total head 1.03MPa	Lamp：1,800 W x 2 pcs Generator：over9,000W
	High： more than 400L/min at total head 3.92MPa						
	Water:10,000L	Water:4,000L	Water:4,000L	Water:8,000L Foam:1,000L	Water:8,000L	35m at 75 degrees	
Equipment & Accessories	Delivery Hose,3section extension ladder,Portable winch,Chain saw,Manual Rescue tool,Engine cutter,Rope,Portable Foam Tank& Foaming nozzle(except:chemical truck),Suction hose,Serch light,Spare Tire,Wheel chock,Standard tool,Manual				Delivery Hose,Suction hose,Serch light,Spare Tire,Wheel chock,Standard tool,Manual		Serch light,Spare Tire,Wheel chock,Standard tool,Manual
Finish and Painting	Red						
Anti-Low Temperature Treatment	-35℃						

Fire Suits Set

1 Helmet
made of glass fiber or resin
impact ressistance to falling or dropping objects (comparable to Japanese standards), with protective hood and
2 Jacket
made of fire-retardant fabric conforming to ISO standard or with sufficient heat-protection property
3 Trousers
made of fire-retardant fabric conforming to ISO standard or with sufficient heat-protection property
4 Safty Belt
approx: L 1,200mm and W 50mm with 1.5 m rope and carabiner
5 Boot
made of leather(or rubber or synthetic leather)
with safty plate on a sole and tip (conforming to JIS)
6 Gloves
made of heat- and cutting-resisting fiber

Knapsack Type Fire Fighting Water Bag

1 Water Bag
made of nylon, coated with special synthetic rubber, capacity:more than 18L
2 Pump
manual, changeable of 2 types (water spray, mist), discharging distance:over 10 m(water spray)
over 3 m(mist), discharging volume:over 100cc(per stroke)
3 Hose
made of rubber, length :more than 1 m
4 Weight
2kg (within +-1kg)

Head Quarters Set

1 Operation Console
Number of console: 3 (simultaneous) Number of emergency line (101 lines): 3 lines
Local PSTN lines: 2 lines Output for PA: 2 outputs
2 VHF Radio
Frequency range: 150-174MHz Power output: More than 50 watts.
Number of channels: 3 +1 backup Simultaneous operation
Input 220-234V(AC) Output 13.6-13.8V(DC)
Backup period more than 24 hours at 50% transmission Charging periods less than 24 hours
4 stacked wide band dipole antenna, anti-ice coating protection Antenna base and pole are supplied
3 PA unit
PA amplifier: More than 50watts, More than 2channels
Loud speaker with enclosure Connection cable to the operation consoles
4 Vehicle status indicator
Operation type: via switches Display 2 units, Number of signs more than 12

Fire Station Set

1 VHF Radio unit
Frequency range: 150-174MHz Power output: More than 40W
Number of channels: More than 12 Input 220-234V(AC) Output 13.6-13.8V(DC)
Power supply
Backup period more than 24 hours at 50% transmission Charging periods less tan 24 hours
2 Antena
RF surge protector
4 stacked wide band dipole antenna, anti-ice coating protection

Mobile Set

1 VHF Radio unit
Frequency range: 150-174MHz Power output: More than 40W
Number of channels: More than 12
VHF antenna base with cable Mobile whip antenna , wideband type
2 DC-DC converter for the VHF radio unit

Portable Set

1 VHF Hand held transceiver with battery
Frequency range: 150-174MHz Power output: More than 5W
2 Charger type: Rapid type, Input voltage 220V(AC),Speaker Microphone,Spear Battery 2 pcs each

Repeater

1 General
Frequency range: 150-174MHz
2 Power supply for radio unit
Input 220-234V(AC) Output 13.6-13.8V(DC) Backup period more than 24 hours at 100% transmission
Charging periods less tan 24 hours
3 Transmitter
Power output: More than 50 watts.
4 Receiver
Selectivity: More than 70dB
5 Antenna unit
4 stacked wide band dipole antenna, anti-ice coating protection
Antenna base (fitting materials on the tower)

Equipment for Maintenance

1 CHASSIS BAY
- (1) Electric chain block
- (2) Portable Gantry Crane
- (3) Garage jack
- (4) Tire changer
- (5) Wheel Changing Devise
- (6) Lubrication tools
- (7) Mobile workbench
- (8) Brake Lining Riveter

2 TOOL ROOM
- (1) Mechanic tool set
- (2) Air impact wrench and accessories
- (3) Automotive puller set
- (4) Torque wrenches
- (5) Solderless terminal kit

3 FABRICATION EQUIPMENTS
- (1) DC Arc welding machine
- (2) Body puller
- (3) Body repair tool set

4 PAINTING TOOLS
- (1) Paint tools
- (2) Air compressor
- (3) Air reserve tank

5 PARTS STORAGE
- (1) Parts shelf, open type
- (2) Parts shelf, box shelf with partition type
- (3) Parts shelf, drawer type
- (4) Work bench
- (5) Parts carrier
- (6) Pallet truck
- (7) Hand truck

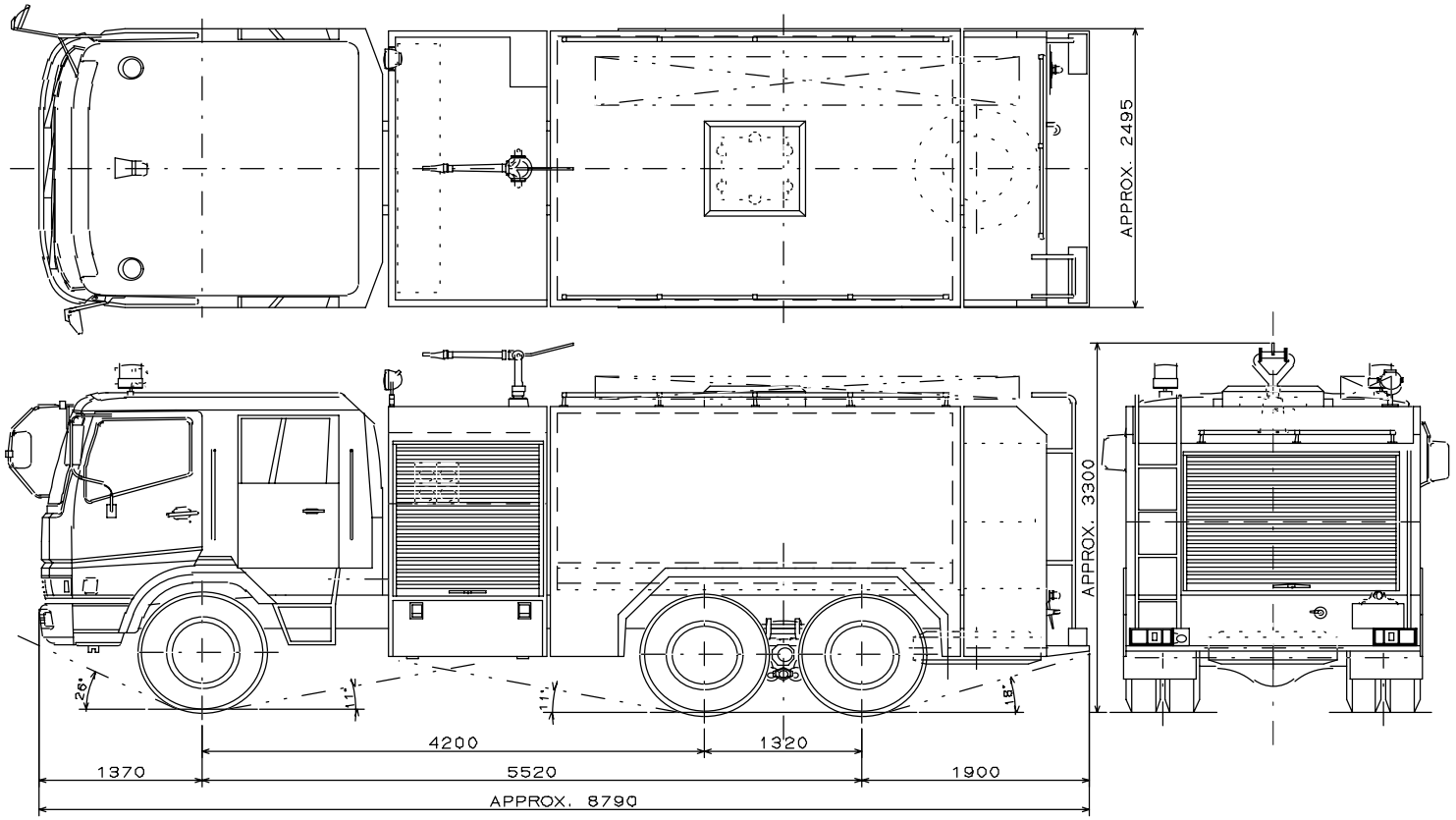
Investigation set (Set to collect and classify fire evidences at the fire scene.)

1 Camera
2 Steel measuring tape
3 Driver set
4 Tweezers
5 Re-chargeable light
6 Metal detector
7 Caliper
8 Loupe
9 Magnifier with scale counter
10 Gloves
11 Bottles for sample collection
12 Container case

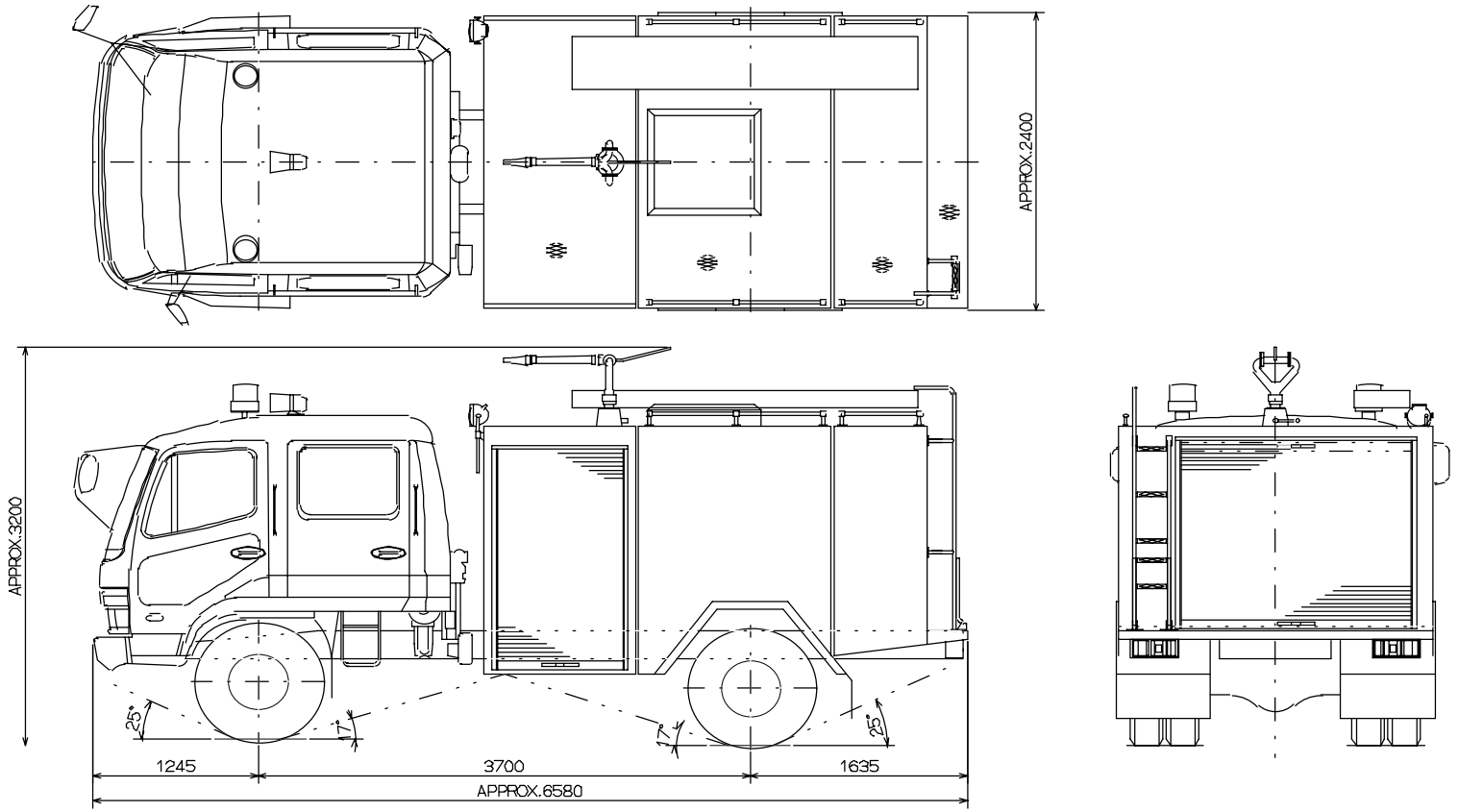
Photo processing equipment

1 Color enlarger
2 Paper dryer
3 Paper processor and washer

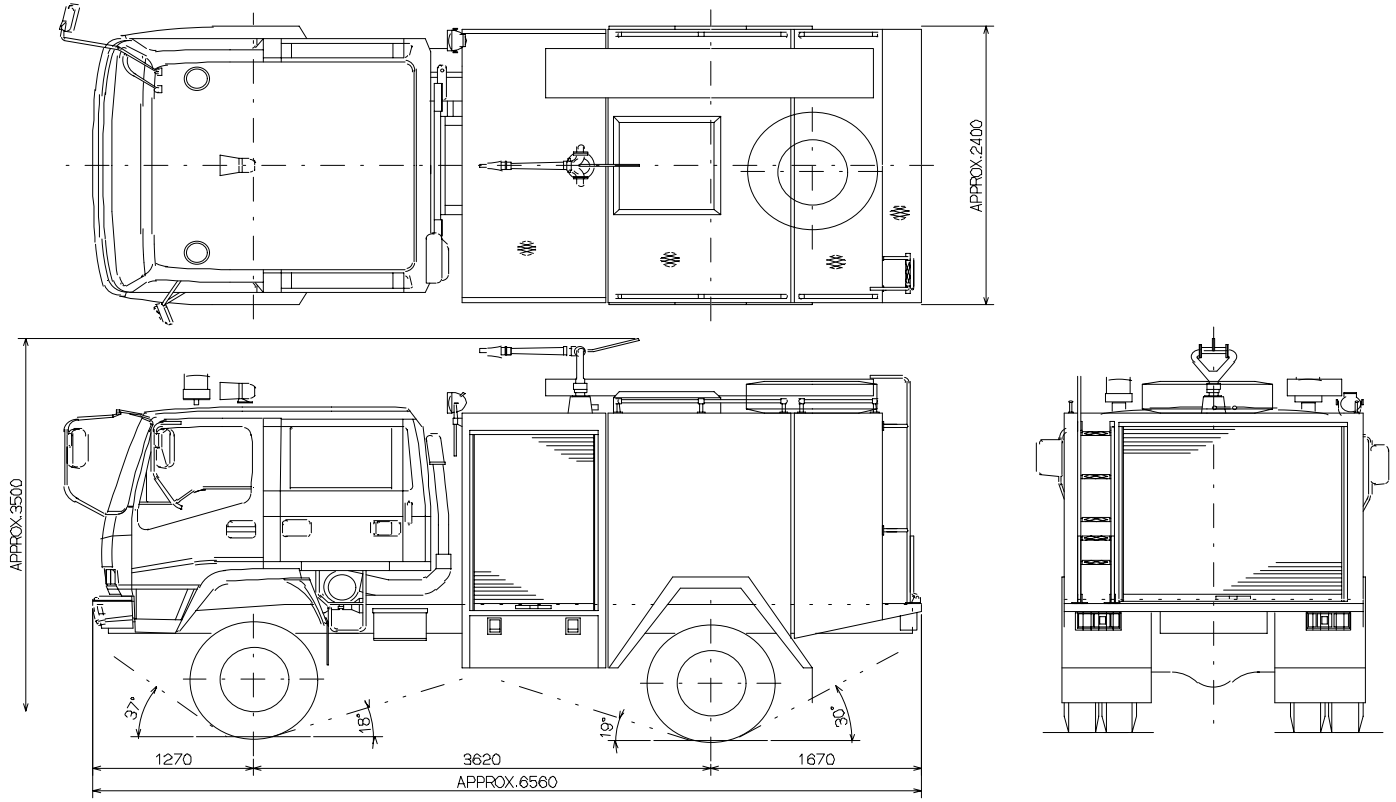
2-2-3 Basic Design Drawing



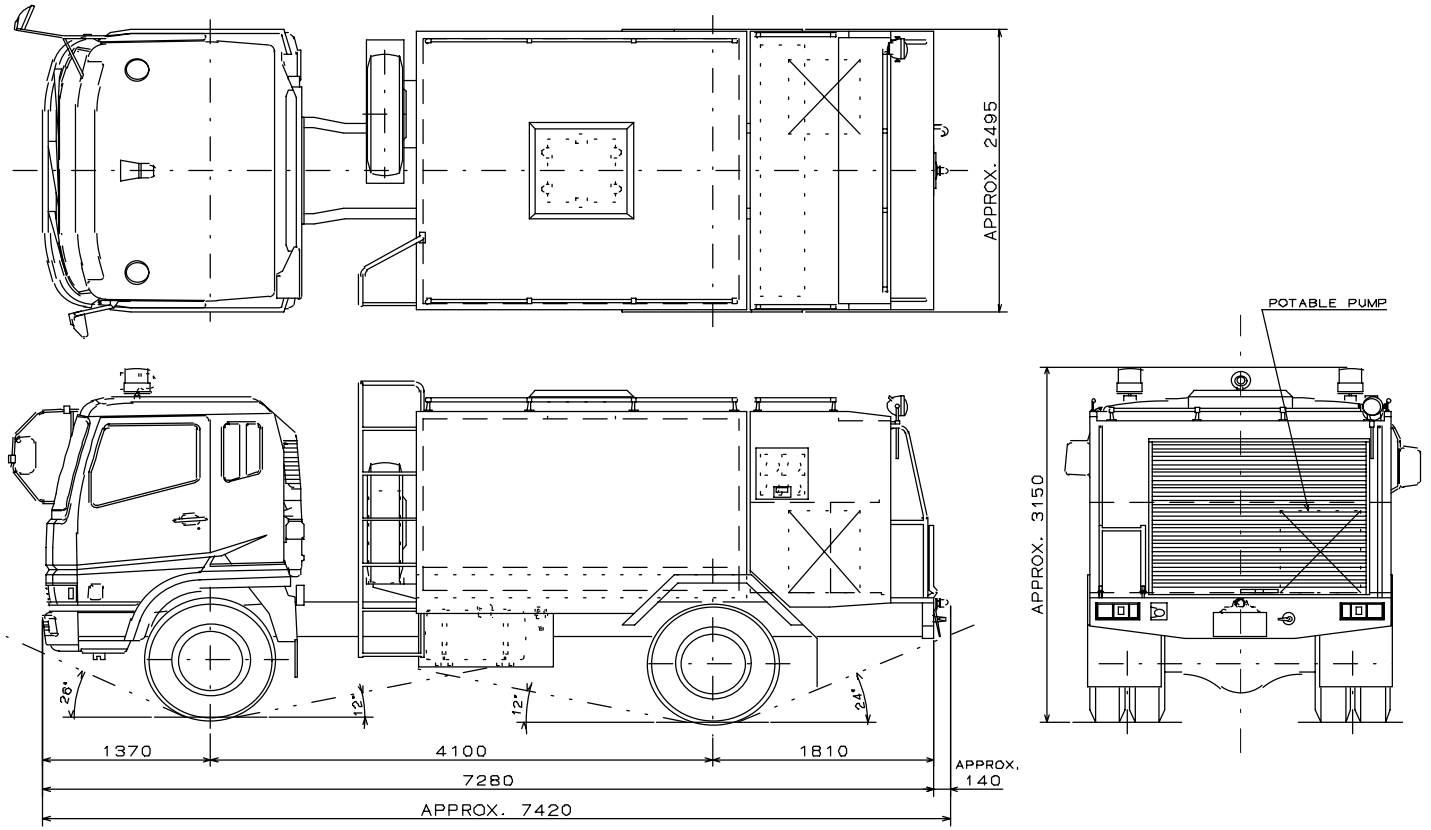
Pumper Tanker (10000L)



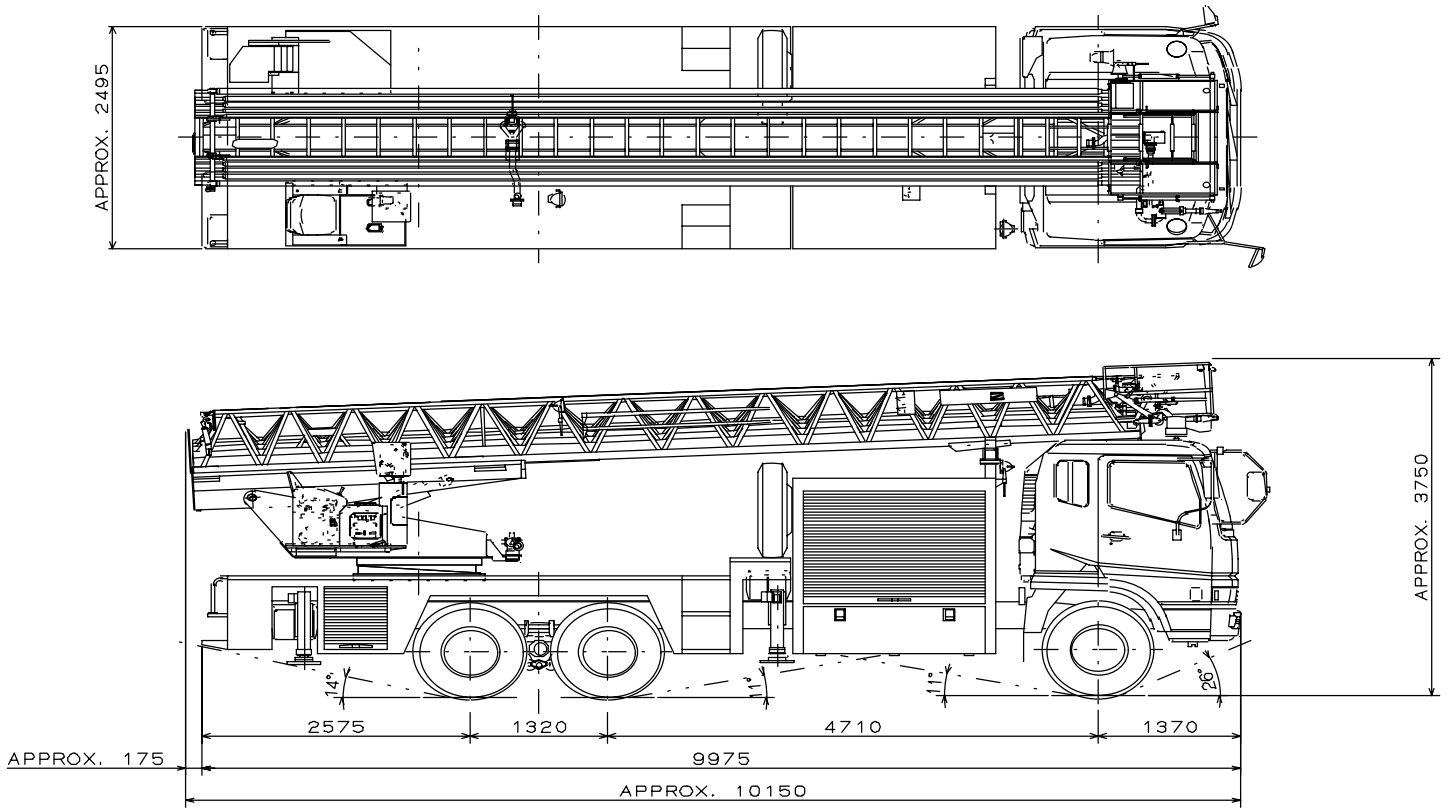
Pumper Tanker (4000L) (2WD)



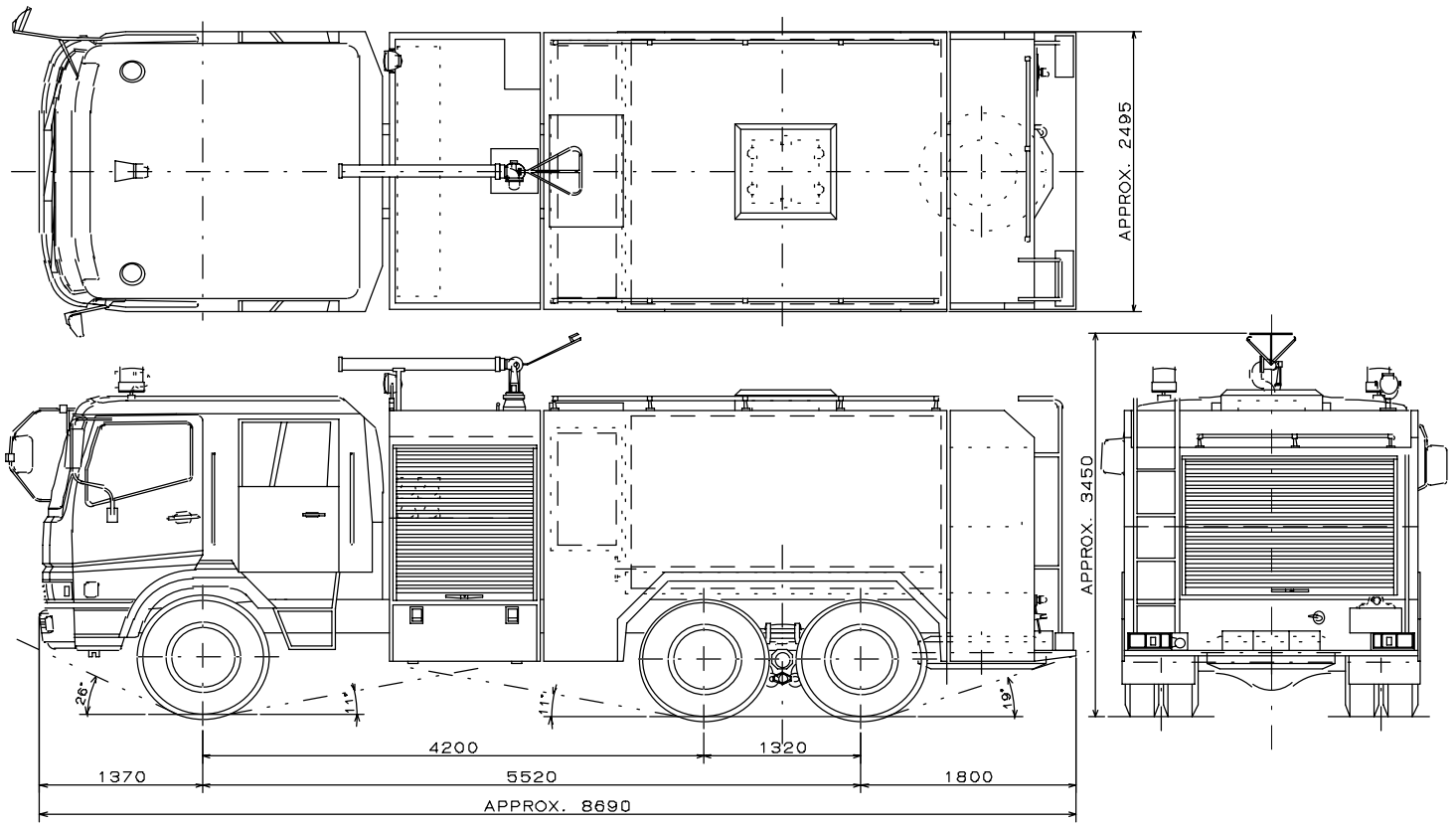
Pumper Tanker (4000L) (4WD)



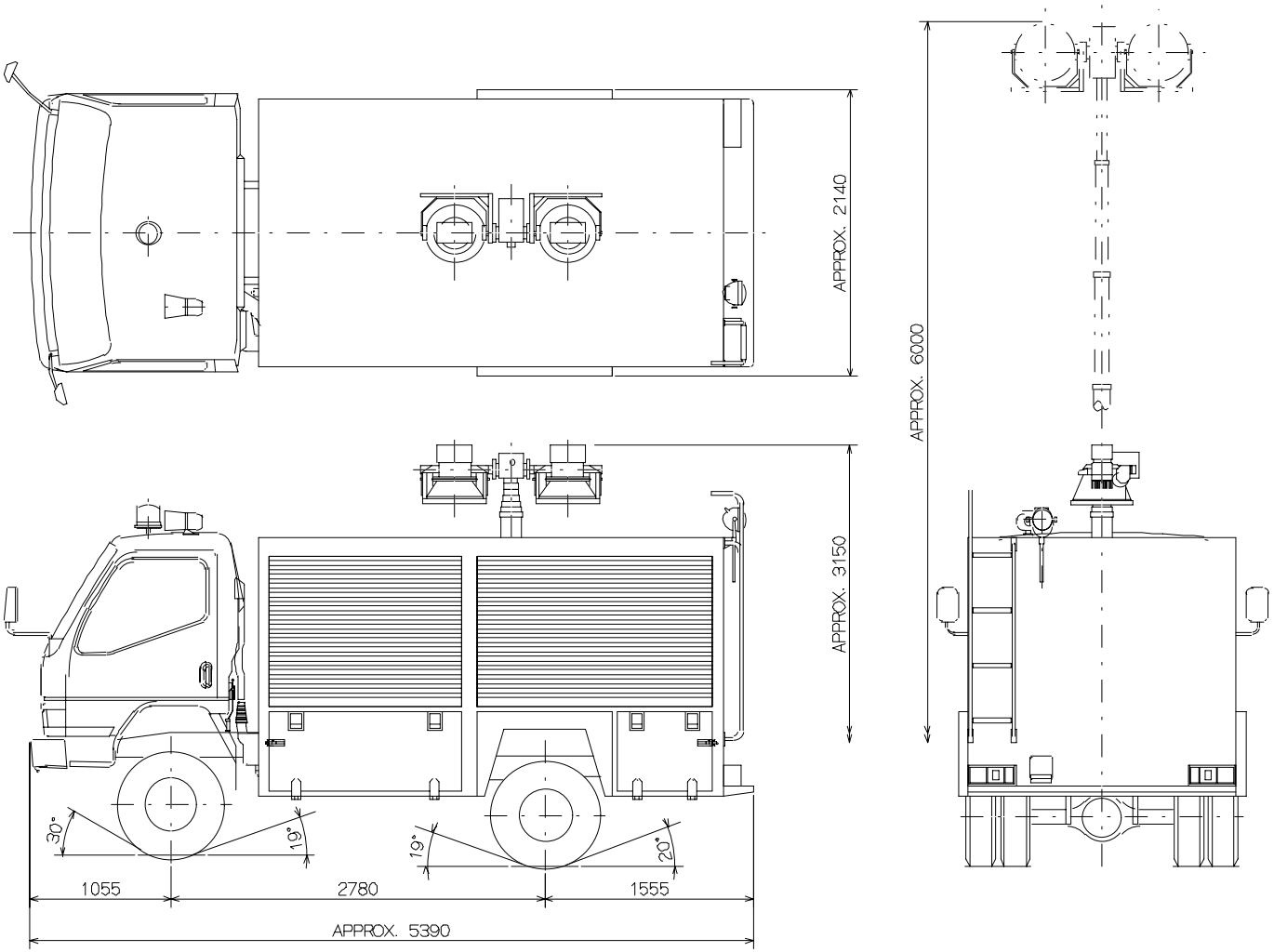
Water Tank Truck (8000L)



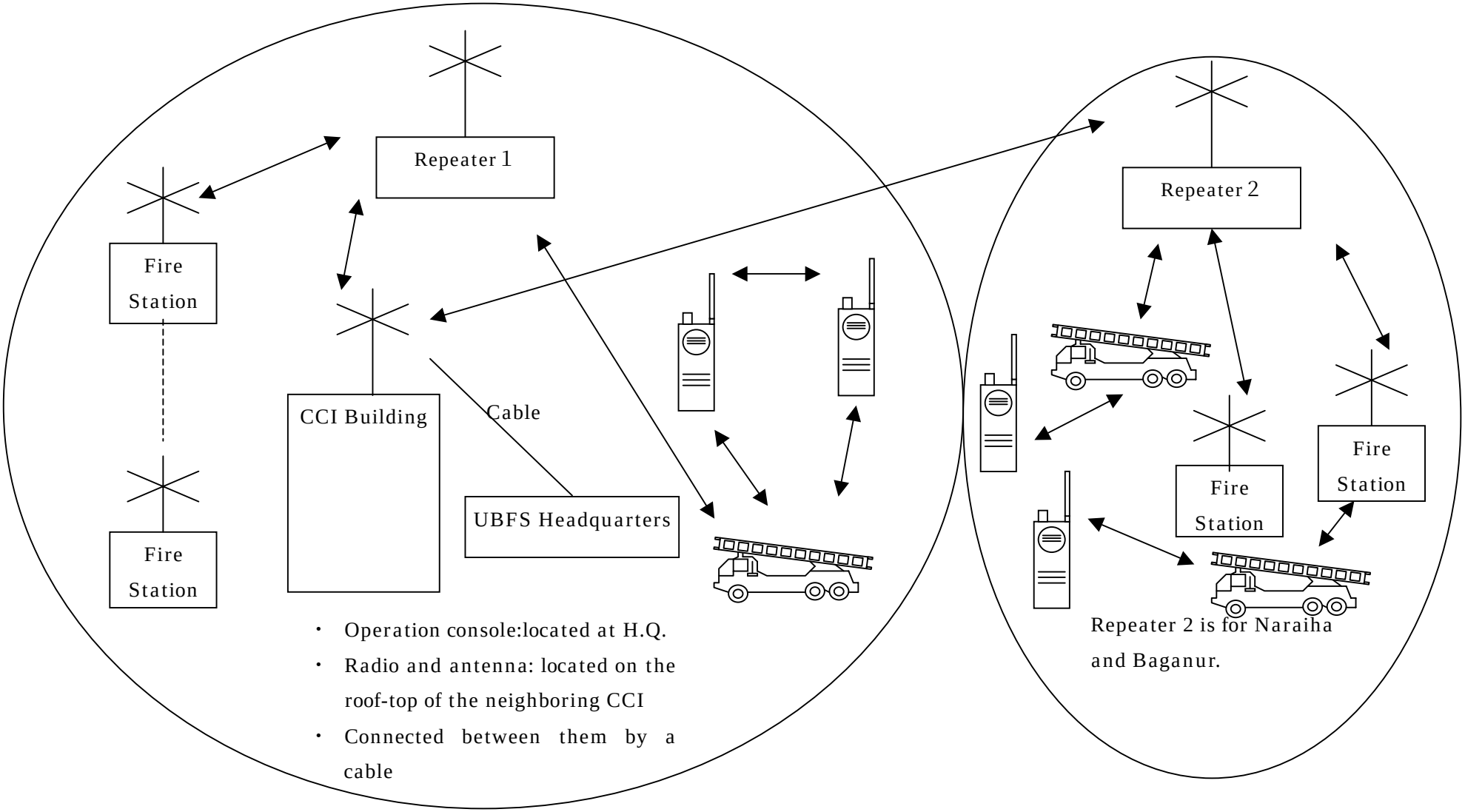
Ladder Truck



Chemical Truck



Floodlight Car



Conceptual Drawing of Radio Communication System

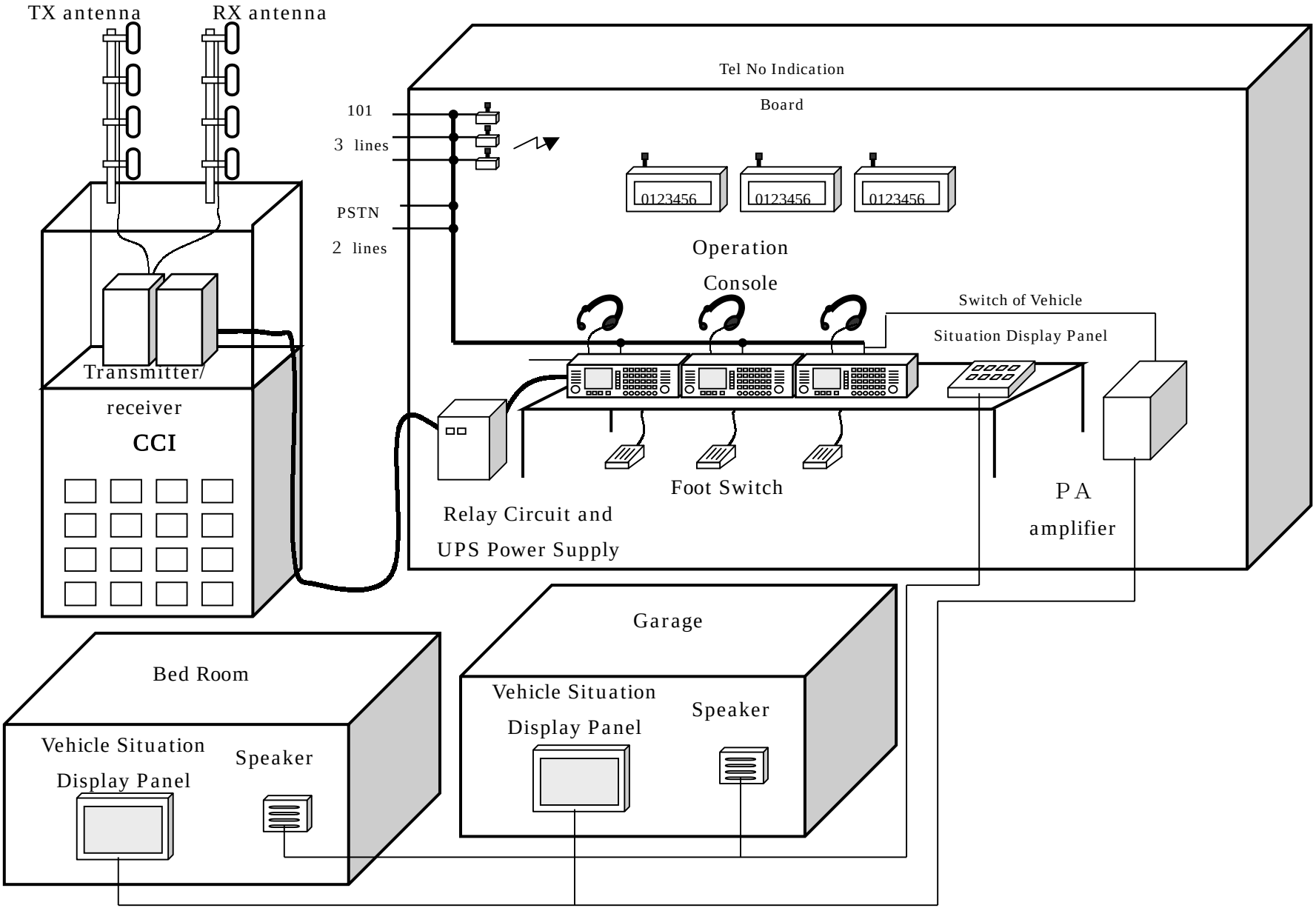


Diagram of Head Quarters Set

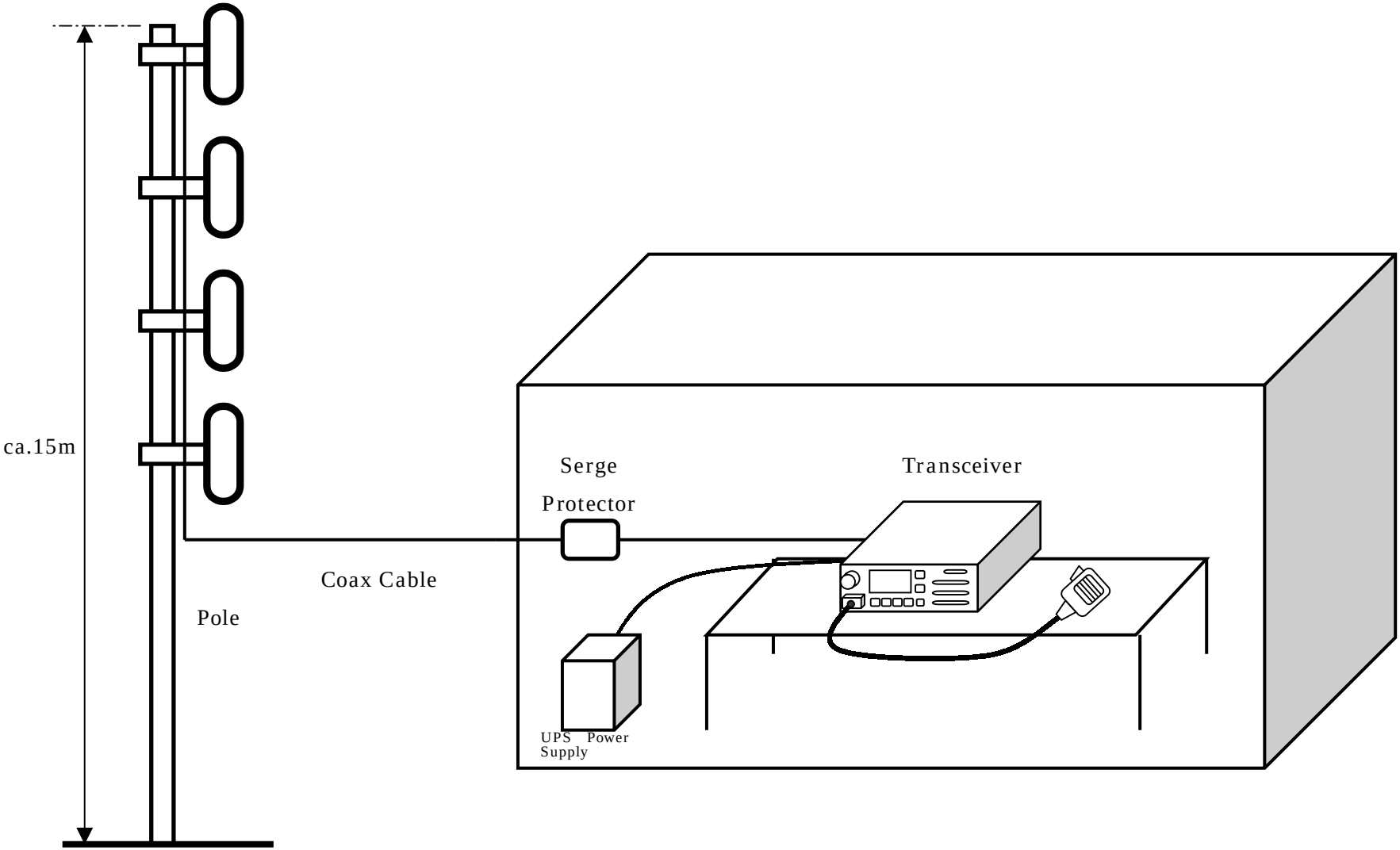


Diagram of Fire Station Set

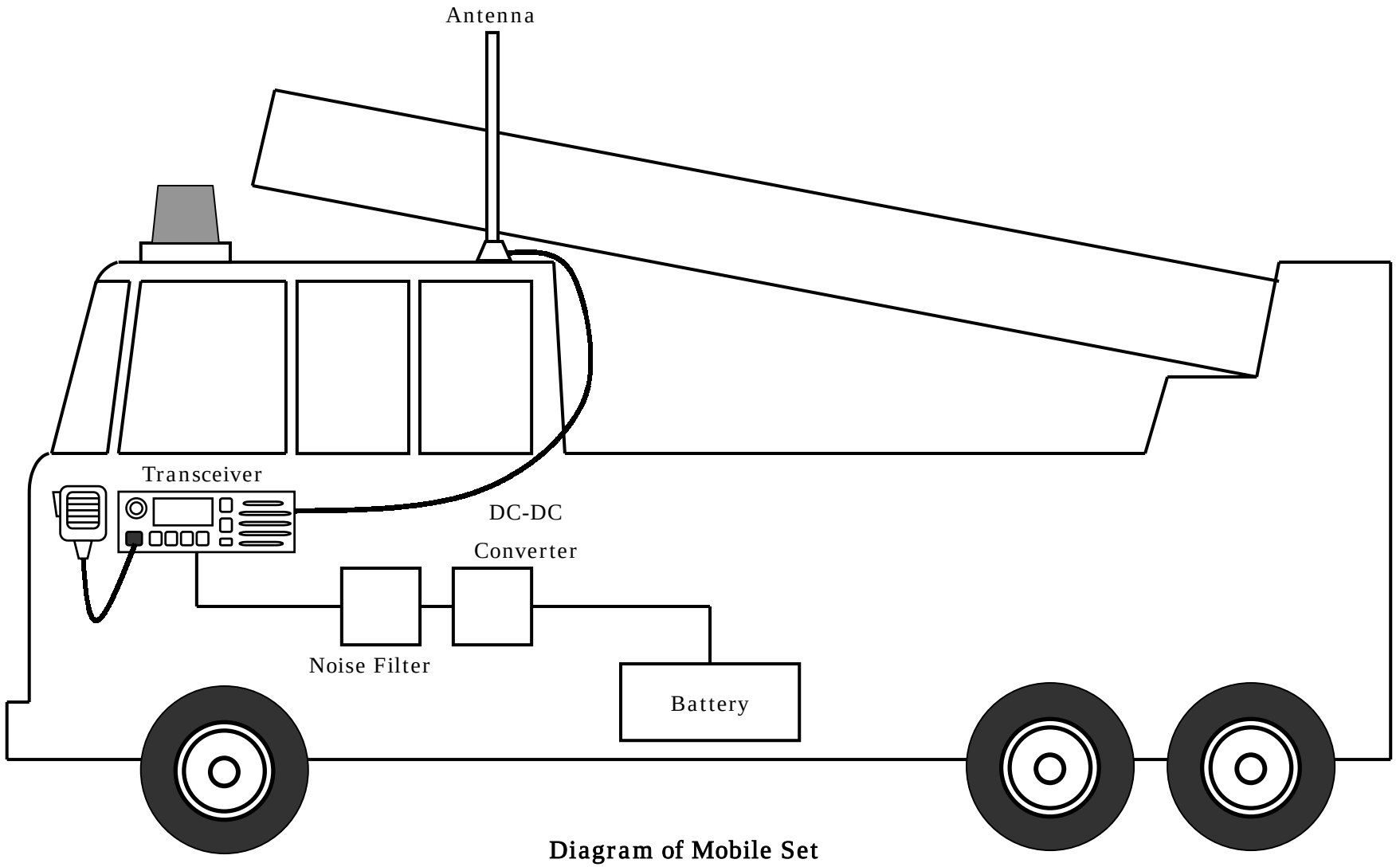


Diagram of Mobile Set

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Basic Procedure

The Project will be implemented within a single fiscal year to ensure the efficient achievement of the project effects. The Project will also be implemented in accordance with the following procedure for grant aid projects of the Government of Japan.

1) After a Cabinet decision by the Government of Japan, the E/N on grant aid cooperation will be concluded between the Government of Japan and the GOM.
2) Following the conclusion of the E/N, a design and supervision agreement will be concluded between a consultant with Japanese nationality and the Mongolian side. The work will commence immediately after approval of the said agreement by the Japanese Ministry of Foreign Affairs.
3) The tender to select the equipment supplier with Japanese nationality will be held in accordance with the tender guidelines of the Japan International Cooperation Agency (JICA).
4) While the tender will be conducted by the project executing organization on the Mongolian side, the consultant will provide full assistance under the guidance of the JICA.
5) The selected equipment supplier will conclude a procurement agreement with the Mongolian side and will immediately commence the work following approval of the said agreement by the Japanese Ministry of Foreign Affairs.

(2) Equipment Procurement Policy

The equipment and other items to be procured under Japan's grant aid scheme will, in principle, be procured in Japan and the recipient country (Mongolia). However, if so found necessary by both countries, procurement from a third country is possible. The possibility of third country procurement was, therefore, studied for the main equipment, i.e. fire vehicles, for the Project.

The fire vehicles used in Mongolia were made in the former Soviet Union except for one vehicle which was made in Japan and donated by a NGO and another vehicle made in the US. No fire vehicles have ever been imported from other countries, such as Korea and European countries. As Japanese fire vehicle manufacturers have a certain after-sales

service system in Mongolia via local agents, the procurement of parts after the initial delivery of the vehicles will be possible. In contrast, Korean and European (German, French and Russian, etc.) fire vehicle manufacturers do not have such an after-sales service system and the procurement of spare parts for their vehicles in Mongolia will be difficult.

Based on the above consideration, the procurement of fire vehicles from Japan is judged to be appropriate under the Project. The results of the study on the possibility of the third country procurement of fire vehicles are shown in Table 2-4-1.

The import of all of the radio communication equipment, laboratory equipment and maintenance equipment will be necessary as this type of equipment is not manufactured in Mongolia. In principle, the radio communication, laboratory and maintenance equipment for the Project will be procured in Japan. However, procurement from a third country will be considered if the detailed examination of equipment finds the procurement of some equipment from a third country necessary.

(3) Equipment Transportation and Use of Local Transporters

The equipment to be procured under the Project will be transported in one or separate consignments from Japan to their destination of Ulaanbaatar. The main bodies and accessories of the fire vehicles will be transported to the vehicle yard at UBFS Headquarters and will be handed over to UBFS after final outfitting, trial operation and adjustment.

The transportation route will be largely classified as “from Japan to Ulaanbaatar” and “from Ulaanbaatar to the target sites”.

Transportation from Japan to Ulaanbaatar will be made through China which has been used for Japanese grant aid projects in Mongolia in the past. Cargo departing Japan by sea will be unloaded at the New Tianjin Port (some 10 services/week), followed by railway transportation via Beijing and Dadong to Mongolia. Some 27 days will be required for initial shipment from a Japanese port to arrival in Ulaanbaatar. A Japanese transporting company will be used to conduct this work because of the procedures involved and reliability. The equipment supplier will be requested to conduct a detailed study on the transportation details of similar cargo in the past to avoid any problems.

Table 2-4-1 Comparison of Fire Vehicle Manufacturers

No.	Country	Japan	Europe	USA	Korea
	Main Outfitting Makers	Morita and Japan Machine Industries, etc.	Magirus (Germany), Cides (France), Mercedes (Germany) and others	Oshkosh, Emergency-One, etc.	Namyoung and Samil
	Vehicle Manufacturers	Mitsubishi, Nissan, Hino and Isuzu, etc.	Renault (France), Volvo (Sweden) and Mercedes (Germany), etc.	MAC International and others	Hyundai and Daewoo
1	Manufacturing experience of types of fire vehicles to be procured	Yes	Yes	Yes	Only pumper tankers and water tank trucks
2	Quality control system	Reliable	Reliable	Reliable	Some concern
3	Quality and durability (front-line vehicles)	High (12 – 15 years)	High (12 – 15 years)	High (9 – 10 years)	Low (6 – 7 years)
4	Past delivery to Mongolia	Yes (three by a NGO)	None	Yes (one by a NGO)	None
5	Availability of after-sales service and parts supply systems in Mongolia	Yes (agent)	No	No	Not available for large vehicles
6	Procurement cost	—	Similar to Japanese vehicles	Similar to Japanese vehicles	70% of Japanese vehicles
7	Transportation cost and transportation risks	—	More expensive than transportation from Japan with some risk	More expensive than transportation from Japan with some risk	Slightly cheaper than transportation from Japan
8	Business stability	Relatively stable	Relatively stable	Relatively stable	Unstable
9	Opinions of Fire Fighting Department of Mongolia	Good quality and little concern regarding after-sales service	Concern in regard to after-sales service	Concern in regard to after-sales service	Concern in regard to after-sales service and product quality
10	Evaluation	Suitable for the Project from the viewpoint of product quality and after-sales service	Not used in the past and concern in regard to after-sales service and parts supply	Concern in regard to after-sales service and parts supply	Product quality and durability are not ideal; concern in regard to reliable after-sales service and business stability

The transportation of the main equipment from Ulaanbaatar to the target sites will consist of road transportation from the Ulaanbaatar Central Freight Station where the cargo from Japan will arrive to UBFS Headquarters. There is a local transporting company which knows the domestic traffic situation and customs clearance procedure in Mongolia, etc. and which has acted as the subcontractor for the aid projects of Japan and other donors in the past. This company will, therefore, be used as a subcontractor for the Japanese equipment supplier.

(4) Use of Local Installation Company

Local installation companies have little experience of fitting accessories to fire vehicles and radio communication equipment and, therefore, their technical expertise cannot be fully ensured. For the installation of the equipment in an economical manner while maintaining the equipment quality, the Japanese equipment supplier will act as the contractor for the Project to directly supervise a local installation company and workers.

(5) Design and Supervision Policies

The design and supervision work under the Project will mainly consist of the following.

1) Work in Japan

① Final confirmation of the contents of the Project
② Preparation of the tender documents
③ Tender and evaluation of bids
④ Assistance for negotiations and conclusion of the contract
⑤ Approval and verification of the shop drawings and documents
⑥ Factory inspection and pre-shipment inspection
⑦ Inspection at the manufacturing stage and issue of test certificates
⑧ Explanation of and reporting to the Project-related organizations

2) Work in Mongolia

① Examination and adjustment of the work schedule
② Procurement supervision
③ Safety management
④ Transfer of technology (skills) to the Mongolian side
⑤ Approval of the acceptance test and inspection implementation plan and witnessing of the said test and inspection
⑥ Preparation of monthly reports
⑦ Issue of the completed work and payment certificates

⑧ Preparation of the work completion records
⑨ Inspection of defects
⑩ Reporting to the Project-related organizations
⑪ Implementation of soft components

(6) Implementation System

The implementation system of the Project is as follows.

1) The responsible organization for the grant aid project on the Mongolian side is the Ministry of Justice and Home Affairs.
2) The executing organization for the Project is the Fire Fighting Department (FFD) of the Ministry of Justice and Home Affairs.
3) If the cooperation of the Posts and Telecommunications Agency (of the Ministry of Infrastructure), which controls radio communication bands, etc., is required (for coordination of the allocation, operation, protection, ownership and use of radio bands), the Ministry of Justice and Home Affairs will be requested to act as an intermediary.

The overall project implementation system involving both the Japanese and Mongolian sides is shown in Fig. 2-4-1.

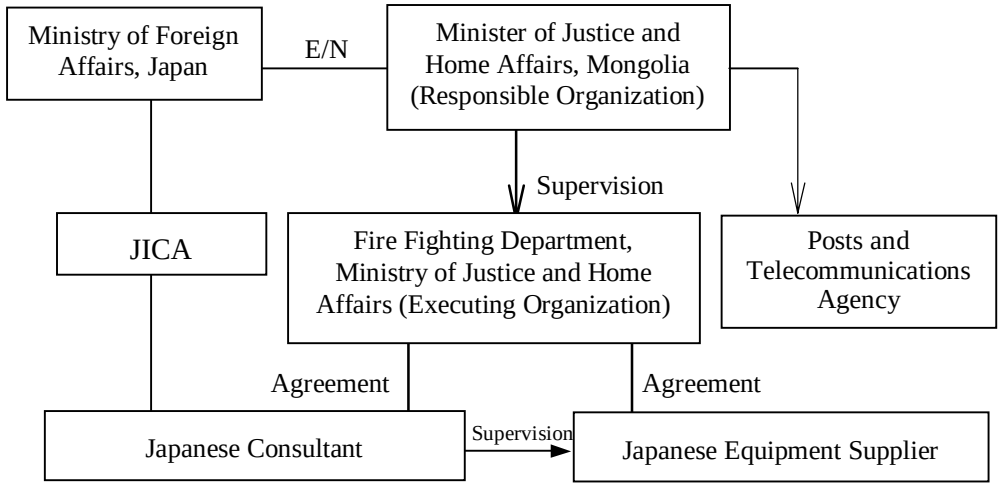


Fig. 2-4-1 Project Implementation System

2-2-4-2 Implementation Conditions

(1) Transportation Plan

As the safe transportation of all of the equipment to Ulaanbaatar within the planned period is essential, the transporting company should fully understand the situation of cargo vessels and customs clearance so that an adequate maritime transportation period can be incorporated in the implementation plan.

(2) Preparation of Implementation Plan

While the installation of the equipment during winter will be difficult, it may be necessary to conduct such work in winter because of the project implementation schedule. For the preparation of an appropriate implementation schedule, it will be necessary to identify the period in which the equipment installation work can be completed without fail, taking the indoor and outdoor working conditions of the facilities where the equipment will be installed into careful consideration.

(3) Avoidance of Disruption of Existing Radio Communication System

UBFS Headquarters and fire stations operate a communication system which uses radio equipment, antenna, power supply unit and transmission lines, etc. and the temporary suspension of this system will be required under the Project. However, such suspension must be kept to a minimum and the existing system should continue to operate during the installation of the new equipment. Detailed consultations should be held with UBFS to prepare the installation plan in order to avoid any unnecessary disruption of the existing system. Moreover, the installation plan should ensure the smooth introduction of the new equipment while avoiding any damage to the existing equipment.

The planned new radio communication system will require the installation of a repeater and antenna at the summit of both Mt. Chingeltey (El. 1,952 m) and Mt. Tamgin Undur (El. 1,965 m). Repeaters and antennae will be installed at the existing facilities (building and antenna tower of the police radio system). Detailed consultations will be necessary with the Police to prepare an appropriate installation plan. This installation plan must ensure that no damage will be caused to the existing police radio system.

2-2-4-3 Scope of Work

The scope of work for the Japanese and Mongolian sides in the case of the Project's implementation as a grant aid project of the Government of Japan is outlined in Table 2-4-2.

Table 2-4-2 Scope of Procurement and Installation Work

No.	Work Item	Japanese Side	Mongolian Side
1	Provision of buildings where the procured equipment will be installed or stored		●
2	Preparation of access roads to the above buildings		●
3	Building work • Entrance for equipment delivery • Repair of flooring • Improvement of lighting, heating and ventilation		●
4	Removal of equipment which becomes unnecessary with the implementation of the Project		●
5	Procurement, trial operation and adjustment of fire vehicles; provision of guidance on operation and handling	●	
6	Procurement and adjustment of radio communication equipment; provision of guidance on handling	●	
7	Procurement of maintenance equipment; provision of guidance on handling	●	
8	Procurement and adjustment of laboratory equipment; provision of guidance on handling	●	
9	Procurement of spare parts (for replacement and reserve) for the procured equipment	●	
10	Improvement of power supply, water supply and drainage facilities required for the procured equipment		●
11	Earthing for the procured equipment		●
12	Power source for repeaters and antennae		●
13	Removal of the existing radio communication system		●
14	Removal of ground and underground structures which interfere with the installation of the procured equipment		●
15	Provision of a temporary equipment yard and work sites (indoor and outdoor)		●
16	Transportation of the procured equipment to Ulaanbaatar	●	
17	Tax exemption and customs clearance of the procured equipment		●
18	Self-propelled transfer of the fire vehicles from UBFS Headquarters to the various fire stations		●
19	Soft components	●	

2-2-4-4 Consultant Supervision

The Japanese consultant will conclude the detailed design and procurement supervision agreement for the Project with the Government of Mongolia in accordance with the implementation procedure for the grant aid scheme of the Government of Japan and will execute the work following approval of the agreement by the Government of Japan. The main work of the consultant is described below.

(1) Detailed Design

1) Detailed Design

Based on the basic design study results and the contents of the E/N, the consultant will conduct the final confirmation of the project contents, review the equipment specifications and prepare the tender documents which are necessary for the bidders for the equipment procurement and transportation work to prepare a cost estimate.

2) Tender-Related Work

The consultant will discuss the qualification of tenderers and tender methods with the project executing organization in Mongolia and will conduct the tender on behalf of the said organization. The components of the tender-related work are listed below.

① Preparation of the tender documents
② Announcement of the tender
③ Distribution of the tender documents
④ Witnessing of the tender
⑤ Review of the tender result

(2) Procurement Supervision

The consultant will conduct supervisory work to ensure the proper procurement and installation of the equipment, the progress of the work as planned and the compliance of the procured equipment with the technical specifications. The Project includes the deployment and installation of fire vehicles, radio communication system equipment, maintenance equipment and laboratory equipment. The consultant will introduce a supervisory system under which expert supervisors will conduct schedule and quality control in line with the progress of the installation work, liase with and explain to related organizations as required and conduct spot supervision at important stages. The

consultant will dispatch a chief supervisor to the site to supervise the handing over of the equipment.

In Japan, the consultant will witness the performance testing and inspection at factories as required in order to ensure the quality of the manufactured equipment.

Table 2-4-3 Staffing Plan for Procurement Supervision

Supervisor	Specialist Field	No.
Spot supervision		
Chief supervisor	Fire equipment	1
Fire vehicles deployment supervisor	Vehicles	1
Radio communication system installation supervisor	Radio systems	1

2-2-4-5 Procurement Plan

(1) Procurement Sources

The main items, consisting of fire vehicles, radio communication system equipment, maintenance equipment and laboratory equipment, for the Project will, in principle, be procured in Japan. Procurement from a third country may be considered if further detailed examination of the possible procurement sources finds third country procurement necessary.

(2) Scope of Spare Parts

The road conditions in Ulaanbaatar are extremely poor and all types of vehicles are liable to damage due to such conditions. For the proper maintenance of the fire vehicles which must be ready for dispatch at all times, spare parts must be provided. The purchase of spare parts in Mongolia through a local agent is extremely expensive and a long time is required for the delivery of such parts. The inclusion of an adequate range and quantity of spare parts in the scope of cooperation under the Project is, therefore, considered to be appropriate from the viewpoints of the special nature of equipment operation and economy.

For the selection of the required spare parts for the fire vehicles, an appropriate maintenance programme is assumed, taking the spare part procurement situation in Mongolia, the operating conditions of the fire vehicles (engine-related parts deteriorate first because of the high operating rate of the engine without travelling), the operational

requirements (continually ready for dispatch in good maintenance condition) and the maintenance standards suggested by the manufacturer into consideration. In short, the minimum range of spare parts required after 3,000 hours of operation (corresponding to 2 – 3 years of operation based on the operation of the existing fire vehicles of UBFS) will be selected.

(3) Equipment Supplier

The equipment supplier will be responsible for the design, manufacturing, painting, factory testing/inspection, packaging, transportation and installation of the equipment in line with the specifications prepared by the consultant and will hand over the equipment to UBFS after full verification of its operability by means of on-site testing and inspection.

The equipment supplier will also prepare the necessary materials to obtain permission for inland transportation and the installation work and will prepare necessary documents for the removal of the existing equipment, etc. in full consultation with UBFS. The above-mentioned acquisition of permission and the removal work will be conducted by the Mongolian side.

(4) Procurement Sources

The procurement sources for the main equipment are listed in Table 2-4-4.

Table 2-4-4 List of Equipment Procurement Sources

No.	Equipment	Procurement Source	
		Japan	Mongolia/ Third Country
1	Fire vehicles (pump tanker, water tank truck, chemical truck, ladder truck and floodlight car)	●	—
2	Radio communication system equipment (HQ set)	●	—
3	Radio communication system equipment (fire station set)	●	—
4	Radio communication system equipment (mobile set)	●	—
5	Radio communication system equipment (portable set)	●	—
6	Repeaters and antennae	●	—
7	Fire suit	●	—
8	Knapsack-type fire fighting water bag	●	—
9	Laboratory equipment (development set and fire investigation tool set)	●	—
10	Maintenance equipment	●	—

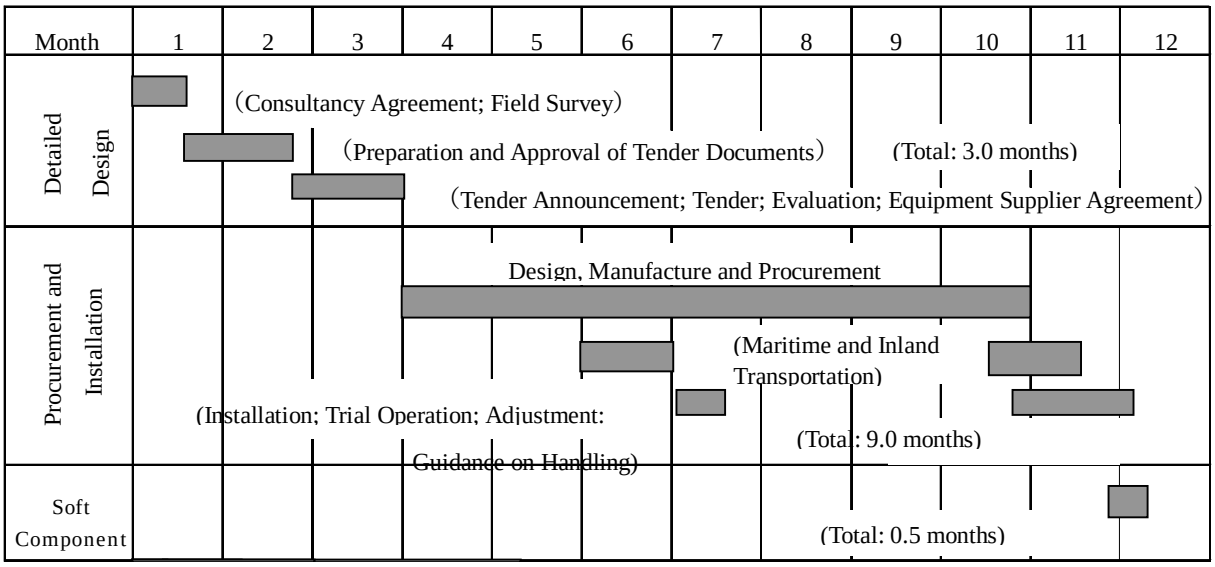
(5) Transportation Plan

Equipment transportation is described in (3) of 2-2-4-1. One important issue here is the advance booking of the necessary freight cars on the railway in China. As the container cargo passing through China will be through cargo, i.e. no opening of the containers from the port of departure to the point of destination, fumigation of the cargo will be unnecessary.

2-2-4-6 Implementation Schedule

The project implementation schedule whereby the procurement and installation work under the Project will be completed in the most efficient manner is shown in Table 2-4-5. It must be noted that both the indoor and outdoor installation work may be difficult during the severely cold period from December to February depending on the temperature (which can be as low as –35°C).

Table 2-4-5 Project Implementation Schedule



2-3 OBLIGATIONS OF RECIPIENT COUNTRY

It has been confirmed by both the Japanese and Mongolian sides that the GOM will undertake the following measures as part of the Project which will be implemented as a grant aid project of the Government of Japan.

(1) Procedural Items to be Conducted by Mongolian Side

1) Acquisition and Provision of Land

As the Project will use the space inside existing facilities, the acquisition of land will be unnecessary. However, the ownership of the sites shall be secured.

2) The legal procedure for the deployment or installation of the fire vehicles, personnel and radio communication equipment, etc., including the existing fire vehicles, in accordance with the equipment deployment plan formulated under the Project shall be completed.

3) Permission for Radio Communication

The application procedure to obtain permission for radio communication shall be completed pursuant to the Radio Wave Law or the Postal Service and Telecommunications Law of Mongolia. This permission must be obtained prior to the commencement of the operation of the radio equipment procured under the Project.

4) Procedure Relating to Environmental Law

Should any permission be required pursuant to the Environmental Impacts Assessment Law of Mongolia, the required permission shall be obtained from the Ministry of Natural Environment in accordance with the stipulated legal procedure.

5) Tax Exemption

Japanese nationals entering Mongolia in regard to the provision of equipment or other work specified in the procurement agreement for the Project will be exempt from customs duty, internal taxes (including VAT) and other taxes and levies. The customs clearance of the procured equipment must be quickly conducted and such equipment shall be exempt from any tax.

6) Provision of Facilities

Japanese nationals who are required in relation to the services and equipment to be provided under the verified contracts shall be guaranteed all necessary facilities for their entry to and stay in Mongolia.

7) Banking Arrangements and Issue of Authorization to Pay (A/P)

An account in the name of the Government of Mongolia shall be opened at a bank in Japan and an A/P will be issued to the said bank. The advice commission for the A/P and payment commission shall be paid without fail based on the banking arrangements with the said bank.

(2) Work to be Undertaken by Mongolian Side

1) Fire Equipment Deployment Plan

Deployment of the fire vehicles, personnel and radio communication equipment, etc., including existing fire vehicles, in accordance with the equipment deployment plan prepared under the Project

2) Preparation of Sites and Access Roads

Arrangement of space for the installation of the equipment to be procured under the Project and preparation of access roads for the delivery of equipment

3) Erection of Fencing

Erection of perimeter fencing at the sites where the equipment to be procured under the Project will be installed

4) Extension of Infrastructure

Extension of the existing building services (electricity supply, water supply and drainage) to the designated points at each site

5) Improvement of Relay Stations

Completion of the necessary improvement work for the existing equipment at relay stations prior to the arrival of the equipment to be procured under the Project.

6) Earthing for Procured Equipment

Provision of earthing conductors for the equipment to be procured under the Project and power sources

7) Removal of Existing Facilities, Equipment and Structures which obstruct the Planned Work Under the Project

Removal of ground and underground facilities, equipment and structures which will obstruct the installation work for the equipment to be procured under the Project

8) Provision of Temporary Equipment Yards and Work Spaces

Provision of temporary equipment yards and work spaces which will be required for the implementation of the Project

2-4 PROJECT OPERATION PLAN

2-4-1 Operation and Maintenance Plan for the Project

(1) Organizational System

The fire administration in Mongolia is under the jurisdiction of the Ministry of Justice and Home Affairs and the Fire Fighting Department (FFD), which is directly controlled by the Ministry of Justice and Home Affairs, is responsible for all aspects of the fire and disaster prevention administration. The operation and maintenance system of FFD which is the execution agency of the Project and UBFS which has target sites for the Project was studied. The organizational structure, authority and responsibility, etc. of both bodies were found to be clearly defined and no specific problem was found in regard to their project implementation capability as the staffing level is adequate.

(2) Staff Members

UBFS has 672 fire personnel and operates 46 fire vehicles. As the fire vehicles to be provided under the Project are, in principle, replacements for existing comparable vehicles, the recruitment of new fire personnel will be unnecessary. However, a reshuffle of staff members will be required following the redistribution of the fire vehicles.

(3) Maintenance System

The present maintenance system for fire equipment demands that the drivers of fire vehicles are principally responsible for the checking and maintenance of the vehicles. Regular checks and maintenance and minor repairs are conducted by the repair section of UBFS Headquarters while such major maintenance work as overhauling is conducted at the Workshop of the FFD.

The checking and maintenance of special equipment/vehicles, including pumper tankers, at UBFS is conducted under the leadership of engineers trained at a heavy machinery training centre in Irkutsk in Russia. There are specialist engineers in each of the maintenance, painting, welding and other fields.

These specialist engineers have been repairing the old Soviet-made vehicles by manufacturing the parts with old-fashioned machine tools to compensate for the absence of maintenance manuals and the lack of spare parts. Because of this, it was verified by the field survey that the technical skills of these engineers to deal with breakdowns and

engine problems, etc. are comparable with those of privately-run workshops in Ulaanbaatar.

Based on the above, it is judged that the positive effects of the provision of equipment and vehicles under the Project together with the transfer of maintenance skills as a soft component of the Project will be highly significant.

(4) Garages and Fire Station Buildings

As part of the field survey, the actual dimensions of the garage at each fire station were measured and a satisfactory structure and internal space were verified. Every garage was found to have piping for steam heating using the wide area heat supply system (the standard heating system in urban areas in Mongolia) and the temperature inside the garages is kept at around 3°C – 10°C even during the intensely cold season. No problems are anticipated in regard to the operation of the fire vehicles to be provided under the Project given the special specifications to suit the cold weather.

All of the fire station buildings have sufficient storage space for various fire equipment. Since the key of each storage is controlled by an officer or a chief of fire station on duty, locking is thoroughly managed. Therefore, it is judged that there will be no problem in regard to the management system, including the storage of equipment to be provided under the Project.

(5) Equipment Maintenance Cost

The budget for UBFS is financed by the FFD and the Municipal Government as well as by the authorities of the districts where a fire station is located. The maintenance budget is determined based on the actual expenditure during the previous year for each of these three financing sources.

As there will be no increase of equipment/vehicles or staff strength due to the implementation of the Project in addition to the absence of any new equipment incurring a special maintenance cost, the new equipment and vehicles can be maintained provided that the relevant budget is secured in the traditional manner.

(6) Spare Parts and Fuel, etc.

The procurement of spare parts for vehicles, etc. from manufacturers which do not have an agent in Mongolia is not easy. The spare parts supply system in Mongolia should, therefore, be confirmed prior to the selection of the equipment/vehicle manufacturers.

2-5 OTHER RELEVANT ISSUES

2-5-1 Soft Component Services Plan

In regard to the soft component of the Project, assistance will be provided in the following fields. Details are shown in Appendix 7.

(1) Maintenance of Fire Equipment and Communication Equipment

At present, the maintenance of the existing fire equipment is conducted at the workshop of the Fire Fighting Department and UBFS (in the case of fire vehicles) and at the fire stations (in the case of other types of equipment). However, the maintenance work predominantly consists of repair work because of the frequent breaking down of the old vehicles and equipment and also because of the shortage of spare parts. Hardly any systematic checking or preventive maintenance is conducted. Examination of the soft component of the Project based on the following targets and work description is, therefore, necessary.

1) Targets

① All fire equipment will be maintained in the best condition and will properly perform its function at the time of a disaster.

② Preventive maintenance will be introduced to extend the equipment life, thereby reducing the maintenance cost.

2) Work Description

① Guidance and advice will be provided in regard to the following work to establish an appropriate fire equipment maintenance system.

- Equipment maintenance system
- Development of a maintenance equipment and spare parts control system
- Preparation of a maintenance plan and implementation guidelines

② Education/training on maintenance skills will be provided.

- Preparation of maintenance manuals
- Training of trainers
- Preparation of an education/training curriculum, textbooks and teaching aids

③ Implementation method, etc.

- Staff and duration : one trainer×half a month
- Timing : after equipment delivery
- Subject persons : those responsible for equipment maintenance (control)

(2) Operational Skills for Fire Equipment and Communication Equipment

It is essential to establish a system under which the fire companies and fire personnel most suited to the situation of a disaster operate when a fire or disaster occurs.

Partly because of the aging of the communication system, UBFS does not have a well-organized operation system.

The complicated or advanced operation of fire equipment does not exist, including tactics and coordinated actions to deal with fires involving high-rise buildings, large-scale buildings and/or hazardous substances, all of which are products of urbanisation and modernisation and which may necessitate water conveyance over a long distance. Examination of the soft component of the Project based on the following targets and work description is, therefore, necessary.

1) Targets

① Fire companies, personnel and equipment will be operated in a manner best suited to the specific situation of a disaster.

② Fire fighting tactics, including the coordinated action of fire companies in response to a disaster situation, will be established and the equipment operation skills of fire fighters will be improved.

2) Work Description

① A fire company response plan and a fire company operating plan will be prepared to ensure the proper deployment of fire companies utilising the fire communication system.

② Fire tactic manuals and equipment handling manuals for different types and scales of fires will be prepared.

③ The skills to handle fire equipment will be improved.

- Preparation of an education/training plan and curriculum, etc.

④ Implementation method, etc.

- Staff and duration : one trainer×half a month

- Timing : after equipment delivery
- Subject persons : senior FFD personnel, fire company chiefs and those responsible for command work

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATION

3-1 Project Effect

Actual effects (results) of which attainment can be expected from the implementation of the Project in contrast to the goals of the Project are described in the following by dividing into direct effects and indirect effects.

3-1-1 Direct Effects of Implementing the Project

The direct effect from implementing the Project is the ability to provide the means for safeguarding the foundation of public administration such as life, physical body and assets of the people, natural environment and resources by recovering the fire service strength of UBFS which is rapidly being diminished by superannuation of the existing fire fighting vehicles and fire fighting materials/equipment.

Following concrete effects are anticipated.

Effect 1

At existing fire stations, deployment of fire fighting vehicles that are suited for the road condition and fire fighting water sources condition in the urban district and for the type of fire will reduce the arrival time at the fire site by enabling prompt dispatch. This enables to prevent the fire from spreading and to reduce the expansion of damage.

Effect 2

Improvement of fire fighting radio communication system will also realise appropriate fire extinguishing activities proportionate to the scale of fire by enabling deployment of fire companies based on accurate information and supervision and by integrated fire fighting activities.

Effect 3

Introduction of laboratory equipment will make it possible to investigate the cause of fire in a prompt and accurate manner and to reflect the result in disaster prevention administration.

Effect 4

Renewal of superannuated fire fighting vehicles will contribute to reduction of efforts and expenses that have been required for maintenance of vehicles.

3-1-2 Indirect Effects of Implementing the Project

As implementation of the Project will make it possible to recover the fire service strength of UBFS, it is anticipated to meet the following needs or generate the following indirect effects.

(1) Economic loss of people's assets, livestock and forest resources from fire will be minimised by the reducton of arrival time and implementation of efficient fire fighting activities through deployment of fire fighting vehicles suiting the road condition and fire fighting water sources condition.

(2) Fire protection knowledge and behaviour of people and businesses will improve as it becomes possible to investigate the cause of fire promptly and accurately and reflect the results in fire prevention measures.

(3) Improvement of fire fighting system in the city of Ulaanbaatar will contribute to the promotion of administrative services that are required for securing the safety of the people.

Moreover, mastering the basic technical knowledge through the software component offered through the Project will make it possible to build the foundation for effective operation and maintenance. In addition, transfer of technology for operation and maintenance of equipment to Mongolia through initial instructions of operation can be regarded as one of indirect effects.

3-2 Recommendations

The Project is expected to have the aforementioned direct and indirect effects. The adequacy of implementing the Project through a grant aid is therefore deemed to be high. However, the following tasks that exist at the time of implementing the Project require measures for further increasing the effectiveness and efficiency of the Project so that it can be maintained over a long period of time.

(1) Fires occurring in Ulaanbaatar are unique in the sense that overwhelming some 50% of such fires occur in the ger district and residential area. Preventing occurrence and spreading of fires from the ger district have become the top priority task in advancing the fire and disaster prevention measures. Against ger fires, it is important to take effective fire prevention measures that takes the flammability of ger into consideration while carrying out concrete education activities for fire prevention among the residents.

Aside from hardware-realm proposals such as improvement of fire fighting water sources, it is necessary to establish a practical fire prevention system conforming to local situation in the software realm such as: 1) fostering fire prevention organisations; 2) public relations activities for the residents (concerning initial fire fighting, rescue and aid, evacuation and assistance to fire companies); and 3) guidance on fire prevention of buildings.

(2) A systematic training in anticipation of various fire fighting patterns including mastering of basic operation and applied operation skills that have been accumulated from activity experience is needed for effective and efficient operation of equipment deployed by the Project. In addition, for the purpose of effective and long time use of the latest equipment, it is necessary to execute steps which secures technique required for operation and maintenance. Promotion of technical cooperation such as dispatching fire fighting experts, for instance, would be deemed effective in order to improve the operation of fire companies and the capabilities of operation and maintenance.