AN INTERIM REPORT ON
THE PRE-FEASIBILITY STUDY FOR THE DEVELOPMENT
IN
TSAV AREA,
MONGOLIA

MARCH, 1993

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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PREFACE

The Government of Japan, in response to the request of the Government of Mongolia, has decided to conduct the pre-feasibility study for the development in Tsav Area located in northeastern part of Dornod Prefecture, Mongolia and has entrusted the survey work to the Japan International Cooperation Agency. The Agency, considering the importance of technical nature of the study work, in turn, has sought the cooperation of the Metal Mining Agency of Japan to accomplish the work.

The Metal Mining Agency of Japan dispatched the mission consisting of seven members to Mongolia from August to September, 1992 for the planning of the study. The work was carried out successfully with cooperation of the Government Authorities of Mongolia.

This interim report summarizes the results of the work for the planning of the study.

We wish to take opportunity to express our heartfelt gratitude to the officials of the Government of Mongolia, the Ministry of Foreign Affairs and the Ministry of International Trade and Industry of Japan, the Embassy of Japan in Ulaanbaatar and the authorities concerned.

March, 1993

Kensuke YANAGIYA
President,
Japan International Cooperation Agency

Takashi Ishikawa
President
Metal Mining Agency of Japan

I N D E X

List of Figures conferred in the Report

Total 26 Sheets

List of Figures attached to the Report

Total 41 Sheets

1.Introduction

1.1.Particulars

Mongolia has a potential of occurence of various kinds of metallic mineral resources and, actually, several mines of copper, molybdenum, tungsten, tin and flourite are in operation. It is hoped that Mongolia will be one of the important supplyers of metallic minerals such as copper, lead, zinc etc., with the progress of development of mineral resources in the future.

In Mongolia, the reformation of economic structure has been progressed since 1987. However, it seems that the sharp reduction of the scale of the technical cooperation with Russia and the East European countries in recent years has caused a baneful influence upon the mineral resources industry which is one of the important origin for the acquisition of foreign currencies.

The Government of Mongolia expressed the positive attitude to develop the Tsav deposit, located in the northeastern part of Dornod Prefecture, and, in February, 1992, requested the tecnical cooperation of the Government of Japan on the study for the development of the polymetallic deposit in the eastern Dornod area.

In response to the request, the Government of Japan deceided to conduct a pre-feasibility study for the development in Tsav area and took necessary measures in Japan, taking into consideration that the development of a new mine in Mongolia will produce a good effect for its economy.

The Japan International Cooperation Agency(JICA) and the Metal Mining Agency of Japan dispatched a preparatoy survey team and had a series of discussions with the State Geological Center of Mongolia and both sides agreed upon and signed the Scope of Work on July 30th, 1992.

In accordance with the Scope of Work, the Japanese study team was dispatched to Mongolia to design the master plan of mine development program.

1.2.Outline of the Scope of Work

(1) Purpose of the study

JICA and MMAJ will study on items necessary for the development of the Tsav deposit in cooperation with the Ministry of Geology and Mineral Resources(MGMR).

(2) Outline of the study

1)Region to be studied
: the area including Tsav deposit.

2)Period : within three years since 1992.

3)Contents of the study
: designing of the study, survey by tunneling and drilling and laboratory works, pre-feasibility study in Japan.

4)Detailed plan
: to be discussed and determined by JICA, MMAJ and MGMR.

(3) Reports

JICA and MMAJ shall prepare and submit interim and final reports in English to MGMR.

(4) Others

1)Mongolian side shall take necessary measures to facilitate the smooth conduct of the study.

2)Japanese side shall dispatch the Japanese study team by its own cost and transfer technology to the Mongolian counterparts during the period.

2.Principal plan of the study

2.1.Necessity of the study

In Tsav area, the exploration had been carried out since 1986 in cooperation with Soviet Union and the final report was completed after the prparatory survey finished in July, 1991. According to the report, there are more than ten vein type deposits(Fig.2, Fig2.2) in the area, however, the veins that should be the objects of the study are as follows.

Ore Reserve C1 and C2 Class Vein

Vein No. of parts	Category	Ore Reserve (tons)	Grade Pb (%)	Zn (%)	Ag (g/t)	Cu (%)	Converted Grade Pb(%)
1	C2	190,715	6.08	6.34	229	0.13	21.81
1A	C2	142,525	6.22	7.98	182	0.18	21.89
1B	C2	83,782	6.29	2.10	146	0.13	13.98
Total		417,022	6.17	6.34	196	0.15	20.26
2	C2	629,812	8.73	3.42	251	0.33	24.77
4 Central	C1	97,324	6.25	4.79	224	0.30	21.89
Central	C2	295,400	7.64	3.48	122	0.25	17.09
Total		392,724	7.29	3.80	147	0.26	18.28
4 North	C2	86,147	6.83	1.68	114	0.07	13.94
4A	C2	352,699	10.20	3.41	356	0.09	30.85
4 Total		831,570	8.48	3.41	232	0.17	23.16
6	C2	821,901	5.71	3.29	210	0.11	19.01
8 Central	C1	20,831	1.02	2.20	475	0.02	26.50
Central	C2	439,215	2.74	2.74	366	0.06	23.28
Total		460,046	2.66	2.71	371	0.06	23.43
8 South	C2	111,194	7.53	2.43	376	0.16	28.68
8A	C2	123,662	2.43	1.96	270	0.03	17.50
8 Total		694,902	3.40	2.53	354	0.07	23.21
9	C2	54,591	5.31	5.17	344	0.13	26.78
10	C2	39,942	3.75	1.66	295	0.03	20.00
Grand Total	C1	118,155	5.33	4.33	268	0.25	22.70
	C2	3,371,585	6.52	3.50	252	0.16	22.14
	C1+C2	3,489,740	6.48	3.53	253	0.16	22.16

(Note C1, C2 : Russian category of ore reserve)

During the cooperative exploration between Mongolia and Soviet Union, the most of works were concentrated on No.4 and 8 veins, so there exist many data on these two veins. And judging from these data(the largest ore reserve with relatively high grade, high grade of gold on the surface and well gathered enriched zone), No.4 vein can be deemed to be the main deposit among the Tsav deposits.

For the survey of No.4 vein, a vertical shaft(No.14) with the depth of 183.6m and a drift at the level of +630mL above the sea level were excavated. However, these existing drift and shaft are not enough to comply with requirements of Mongolian side, i.e., development within a short term with modern methods. Rather, at the early stage of the development, the approach to the shallow part of the deposit and the confirmation of the occurrence of the deposit should be required because of lack of detailed survey on the shallow parts of the deposit, especially the study on the continuity of enriched zone. Consequently, the supplementary exploration should be carried out in the shallow parts of No.4 vein.

2.2.Calculation of ore reserve of No.4 vein(4,4A) by Japanese side

The possible or expected ore reserve of No.4 vein was calculated at 320,000 tons by the Japanese side, using data included in the final report provided from the Mongolian side in 1991. The difference in ore reserve between the Japanese side and the Mongolian side(calculated at 831,570 tons) was only caused by the difference of adoption of specific gravity and probability rate of ore. Further, judging from that both sides adopted almost the same scale of ore block, there exists no great question in the calculation process of No.4 vein by both sides.

2.3 Target of the study

2.3.1 Characteristic of No.4 vein

The characteristic of No.4 vein revealed in the process of ore reserve calculation by the Japanese side is as follows:

The continuity of enriched zone is estimated at 20-30 meters horizontally and less than 50 meters vertically and that the average width of the vein is also estimated at less than 1 meter.

The distribution of grade of Pb has the tendency that the grade in the upper part of the vein is high and becomes low toward the lower part while in the case of Zn the contrary tendency is shown. The same tendency as Pb is observed in the distrbution of grade of gold and silver.

2.3.2 Selection of the target

It has been almost revealed that No.4 vein is the main one among Tsav deposits as mentioned in 2.1. And also the outline of No.4 vein has been almost cleared by the study of the Japanese side. Accordingly, it is desirable that the target of our study should be No.4 vein. And the study should have two objects. One is to select the ore block to be developed and another is to clear the potentiality of No.4 vein. At the early stage of the study, the former should have a preference to the latter.

2.3.3 Principal object of the study

The principal object of the study is to rank ore block in enriched zone of No.4 vein from possible ore block to probable ore block. For this purpose, the construction of an inclined shaft is planned from the surface in order to approach the enriched zone and at +750mL the construction of a level as a main prospect tunnel is also planned. In the main prospect tunnel, some horizontal shallow drillings will be carried out at intervals of 20 meters for the confirmation of enriched zone and ore quality. At the same time, some directional drillings will be carried out at intervals of 30 meters on the surface from the hanging side of No.4 vein in order to confirm the continuity of veins between the existing level(+630mL) and the main prospect tunnel. And, finally, after the metallurgical test of ore

samples extracted from No.4 vein and the designing of basic mine development plan, pre-feasibility study will be conducted.

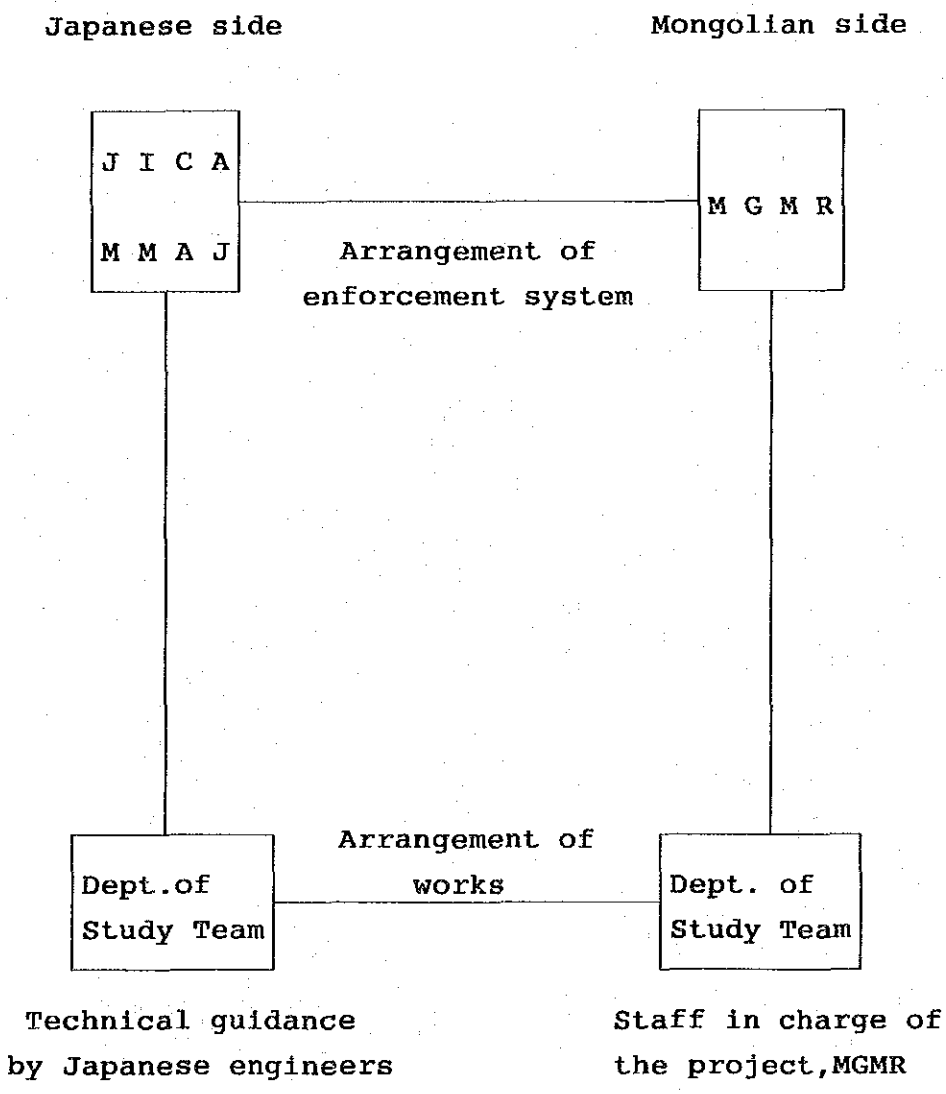
2.4.General plan(period and process of study)

The period and the process of study are shown in annex 1.

2.5.Enforcement system

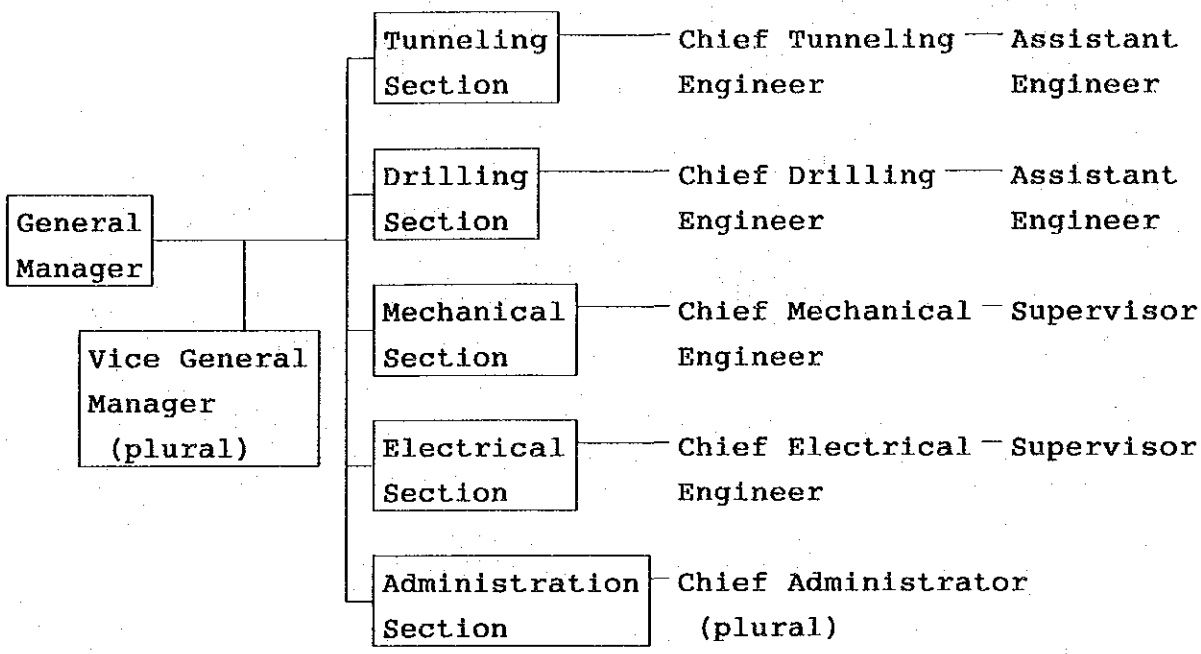
2.5.1 Cooperation system between the both sides

(1) General scheme

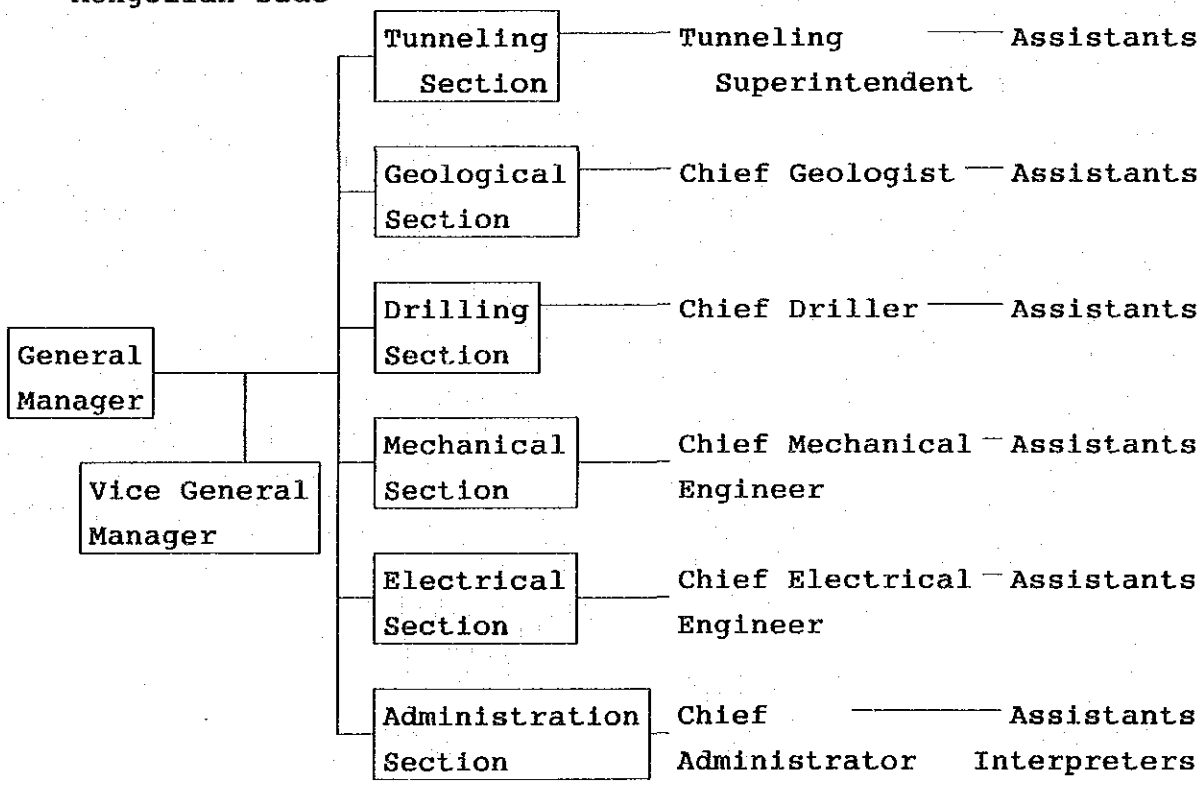


(2) Organization of of Study Team (Annex 2)

Japanese side



Mongolian side



Annex 1

S C H E D U L E O F T H E S T U D Y

Works	Schedule of Works																											
	1992 F/Y							1993 Fiscal Year												1994 Fiscal Year									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1.Transport of materials																															
(1)Preparation					———									———			———				———			———								
(2)Transport to Tsav						———		———		———																					
(3)Transport to Japan																———											———				
2.Constructions																															
(1)Dormitories(Japanese)								·····———																							
(2)Office								·····———																							
(3)Workshop								·····———																							
(4)Setting of generator								·····———																							
(5)Magazine,handling pit								·····———																							
(6)Storehouse								·····———																							
(7)Garage								·····———																							
3.Tunneling																															
(1)Mine portal										———																					
(2)Inclined shaft											———																				
(3)Pump station																															
(4)Drift																															
4.Drilling																															
(1)Surface drilling											———																				
(2)Underground drilling																															
5.Geological Survey											———																				
6.Metallurgical test					—																							———			
7.Trainning in Japan					—			—										—											———		
8.Report,development plan					—																								—		

Annex 2 SCHEDULE OF DISPATCH AND ARRANGEMENT OF PERSONNELS

Ocupations and numbers		1992 F/Y							1993 Fiscal Year												1994 Fiscal Year											
		9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Japanese																																
General Manager	1																															
Administrator(Purchase)	1																															
Chief(Tunneling)	1																															
Chief(Tunneling)	2																															
Vice Chief(Tunneling)	3																															
Vice Chief(Tunneling)	3																															
Chief(Mechanical)	1																															
Chief(Electrical)	1																															
Driller	3																															
Driller	1																															
Driller	3																															
Mechanic	1																															
Mechanic	3																															
Electrician	1																															
Electrician	2																															
Mongolian																																
Tunneling	6																															
Tunneling(Assistant)	9																															
Underground workers	3																															
Surveyor	3																															
Mechanic(heavy machine)	5																															
Mechanic(machine)	3																															
Electrician	3																															
Operator(generator)	3																															
Driller(surface)	9																															
Driller(underground)	9																															
Clerk	2																															
Treasurer	2																															
Purchasing Officer	2																															
Housekeeper	4																															
Cook	3																															
Washer	2																															
Sweeper	2																															
Driver	4																															
Interpreter	4																															

3.Designig of the study

3.1.Base of design

3.1.1 Selection of mine portal

The location of the mine portal of the inclined shaft was decided at the point under the foot wall side with the cross cutting direction of No.4 vein, considering the occurence condition of the vein, the quantity of support and effect to the shaft by exploitation in the future. The underground development plan is shown in Fig.11.

3.1.2 Layout of mine site facilities

Mine site facilities are centralized around the mine portal, considering their effectiveness, direction of wind(westerly wind) and noises. Existing facilities such as power plant and magazine etc. are to be untilized as much as possible. General view of mine site is shown in Fig.3.

3.1.3 Construction and procurement of materials

Kitchen, bathroom, wash room, lavatory, power distribution station, radio station and garage are planned to be constructed and assembled at mine site, utilizing existing buildings, containers etc. as much as possible. Materials are planned to be procured in Mongolia, however, it seems that procurement of industrial goods is rather difficult.

3.2 Mine site facilities

3.2.1 Land readjustment and plan of buildings

Site for buildings and roads that connect each facility are to be readjusted and constructed by Mongolian side.

Main facilities are as follows:

Dormitories : the total floor area of 857 m^2

5 gers for 4 persons
3 gers for 3 persons
1 ger for dining room
4 containers for toilets and bath room

Office : the total floor area of 171 m^2
2 gers and 2 sets of unit type toilet

Workshop : floor area of 240m^2 with overhead traveling crane and pit for checking

Garage : 6 containers with total floor of 106 m^2

Existing building
: total floor area of 582 m^2
for power station, garage for trucks, workshop and storehouse

(Fig.4, 5, 6, 7, 8)

3.2.2 Electric power generation and its distribution

The independent power plant will be constructed at mine site A spare generator will be installed for mine safety because electromotive pumps are used underground. The capacity of generator is as follows:

Voltage : 3,300V
Capacity : 750kVA(2 generators)

Power distribution plan are shown in Fig.9.1,9.2,10.1,10.2.

3.2.3 Water supply and dranage

For the time being, the mine water in No.14 shaft will be utilized for industrial use. 2-inch gas pipes will be used for piping.

The capacity of water pump is as follows:

Head : 30m
Volume : 0.5m^3/min

The well located at 6km southwest will be utilized for drinking water using 1.5-inch pipe.

The capacity of water pump is as follows:

Head : 100m
Volume : 0.1m^3

Sewage will be drained after treated in septic tank with the capacity of 21 persons.

3.2.4 Waste deposit yard

Existing yard will be utilized as waste deposit yard. The yard will be preserved and controlled under the Mongolian laws or Mine Safty Law of Japan.

3.3 Prospect by tunneling and drilling

3.3.1 General plan

As the Tsav Deposit is the polymetallic deposit of Pb and Zn with Au and Ag, and with the average width of about 1m, it is necessary to adopt the mining method with high efficiency, low cost and low percentage of dilution. Further, in order to recover the initial investment, it is reasonable to begin the exploitation from the upper part of the deposit where the grade of Au is high and the transportation cost is low. For these reason, a trackless inclined shaft and a level at 750mL are planned to be developed. A level will be developed along the foot wall where the enriched zones are aggregated most. And it will be able to commence exploitation at any time, as it will have been revealed the occurence of enriched zones by horizontal drilling after development of level.

Location of cardinal point
X : 77,996.335
Y : 22,395.304
+790m above the sea level
Direction of the inclined shaft
N68°30'E
(Fig.11)

3.3.2 Tunneling

(1) Quantity of work, method and machines to be used

The quantity of work is as follows:

Inclined shaft	251m(including 3.6m at mine portal with gradient of 8°30′)
Waste pit	30m(2 pits, 15m each)
Pump station	15m(1 station)
Transform station	(30)m^3(2 stations)
Drainage pond	(15)m^3(1 station)
Depository for heavy machines	(130)m^3(2 stations)
Drift	524m
Waste pit	65m(2 pits)

Trackless mining method and usual method(without NATM)will be adopted.

In the trackless mining method, diesel engined heavy machines with tires such as mobile jumbo and LHD(Load Haul Dump)are adopted. It is easy to transfer the technology to Mongolian side because all are mechanized in this method.

The hydraulic drill carriage(mounted on mobile jumbo) is adopted in drilling, that is used both for tunneling and drilling for rock bolts).

5yd^3(3.8m^3 bucket volume)LHD designed for underground use is adopted for loading and transporting wastes.

(2) Drilling and blasting

The burn cut method is adopted in blasting. There are other methods such as V-cut and Pyramid-cut methods for blasting. However, these methods are inappropriate for blasting small scale section. The burn cut method is appropiate for blasting small section and hard rocks of Tsav deposit and the technology is easily transferred to Mongolian side because of its easiness of standardization.

The outer side of tunnel will be blasted by smooth blasting method in order to avoid damaging outer wall. This is the safe and economical method as, under the normal ground condition of hard rocks, it is not necessary to support in almost cases.

(Fig.13.1, 13.2, 14)

(3) Section of tunnel

The size of section(4.0m width and 3.4 height) was decided, considering sizes of machines to be used in tunnel, limit distances from underground facilities, and economical and efficient aspects. This size allows to use 15 to 20-ton underground dump truck in the future exploitation.

(4) Gradient of tunnel

The slope of the inclined shaft should be gentle as much as possible within the economical limits, in view of mine safety, loads to machines and transportation in the future.

The gradient 8°30′ of the inclined shaft was adopted in view of transpotation of ore by underground trucks and freezing of mine portal area in winter.

The gradient 1/150 of the level drift was adopted for drainage.

3.3.3 Space for supplementary facilities

Facilities which require spaces are as follows :

(1) Waste pit

2 waste pits in the inclined shaft, 15m each

2 waste pits in the level, 30m and 35m each

(2) Depository for heavy machines

2 stations in the inclined shaft, L13m, W2m, H2.5m

(3) Pump station and Drainage pond

1 pump station and 1 drainage pond at the bottom of the inclined shaft, 15m with the gradient of 15°

1 pump station at the middle of the inclined shaft, L3m, W2m, H2.5m

(4) Transform station

2 transform stations at the bottom and the middle of the inclined shaft, L4.0m, W2.0m, H2.5m

3.3.4 Timbering

(1) Steel timberings

Type 150 and 125 H-beam steel bended in arch will be used for timbering with percentage of 10 and at intervals of to 1.5m. (Fig.15, 16.1, 16.2, 16.3, 16.4)

(2) Rock-bolt

9 rock-bolts(22mm diameter and 2.0m length) in line at intervals of 1.5m will be inserted in the wall of the tunnel with no steel supports.

3.3.5 Ventilation and drainage

In view of mine safety and efficiency of works, it is important to keep necessary quantity of airflow in underground in order to take out dusts and harmful gases to the surface.

(1) Ventilation

The quantity of airflow calculated is 816m /min. The air will be ventilated by propeller fan with the capacity of 75kW and 1,000m /min installed at mine portal through FRV duct with the diameter of 800mm. 2 auxiliary fans will be installed in the level at for auxiliary ventilation through FRV duct with the diameter of 700mm. Vinyl ducts will be used in the area about 50m from the face, in order to avoid damages by small rocks blown by blasting. The ventilation system is shown in Fig. 17.

In order to lower the raise of dusts and oil mists, hydraulic drill is adopted. Remove of dusts after blasting and while loading wastes will be prevented by water sprinkling.

The density of NO_x, CO, CO_2 and carbide in gases exhausted from diesel engines will be lowered by purifier equipped to engines.

Dust musk will be supplied to all underground workers to prevent inhalation.

(2) Drainage

The maximum quantity of drainage is deemed to be 0.5m . The

underground water collected in the water pit at the bottom of the inclined shaft will be pumped up through 4 inch pipe to the surface via a relay pump equipped at the middle of the shaft.

The water pump has the capacity of 0.5m /min. in quantity and 30m in head. (Fig. 18)

3.3.6 Air supply

Compressed air is used for drilling by leg drill and for charge of AN-FO. The portable compressor will be equipped at mine portal and compressed air will be supplied through 4 inch gas pipe to the face and other works. (Fig. 19)

3.3.7 Transportation of waste

Wastes in the face are transported to waste pits and further to temporal yard on the surface by LHD. Wastes in the temporal yard is loaded on 11 ton dump truck by 1.5m^3 class shovel and is transported to waste deposit yard. The quantity of waste in solid is 12,333m^3.

3.3.8 Communication

INMARSAT will be used to communicate with Japan and with Ulaanbaatar because there is no communication system with the out side of Tsav.

3.3.9 Arrangement of personnels

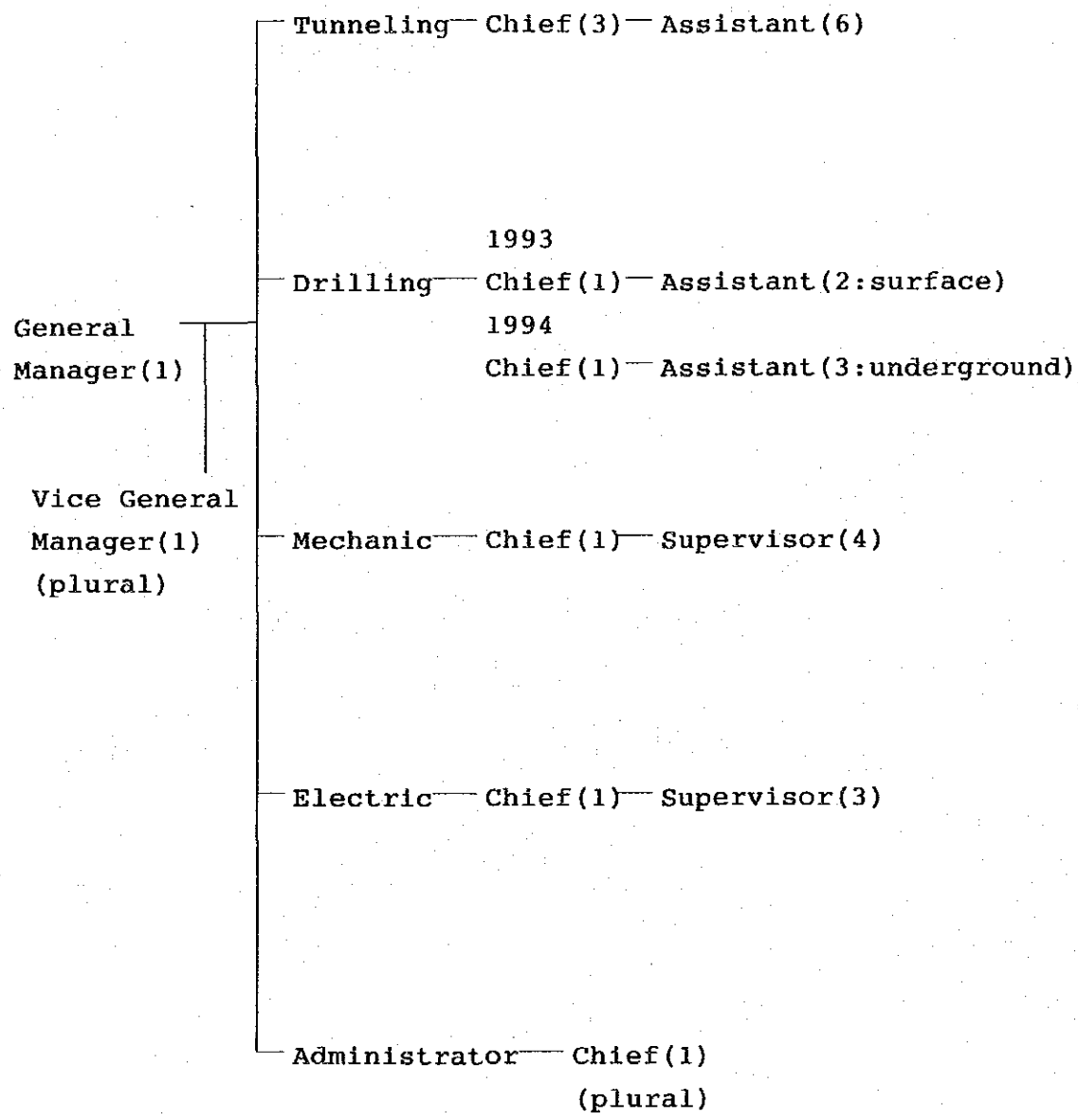
Personells and organization of both Japanese and Mongolian sides are as follows:

(1) Japanese personnel and organization

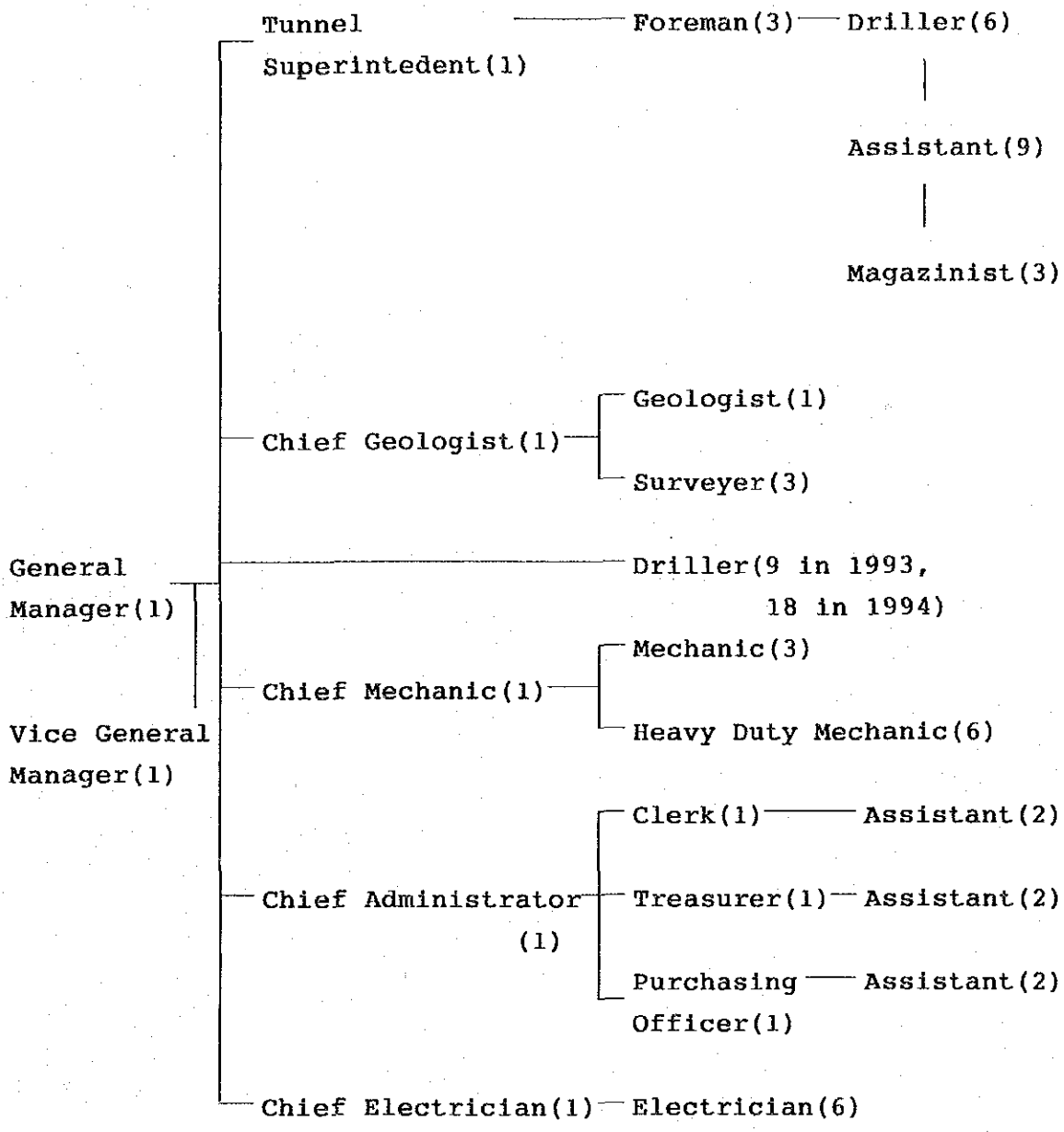
Personnels in charge of tunneling and drilling will be reduced with the progress of skill of Mongolian side. The period of work of three of six vice chiefs in charge of tunneling will be three months and that of the rest three vice chiefs will be four months. The number of vice chiefs in charge of surface

drilling will be three in 1993 and will be one in 1994.

Japanese Personnel and Organization



(2) Mongolian personnel and organization



3.3.10 Drilling and selection of machine

(1) Surface drilling

One set of drilling machine(Longyear L-38 class) will be brought into Mongolia from Japan.

The quantity of surface drilling is 2,190 meters (15 holes in total) (7 holes with the length of 130m/hole and 8 holes with

the length of 160m/hole). The final diameter of drilling will be BQ size.

(2) Underground drilling

The quantity of underground horizontal drilling is 760 meters(22 holes in total) (12 holes with the length of 30m/hole and 10 holes with the length of 40m).

The machine to be used is Longyear L-24 class and the final diameter will be AQ size.

(Fig. 20.1, 20.2)

3.4 Assessment on the effects to environment

Mining activities will possibly produce a bad effect on environment such as surface water, underground water, atmosphere, landscape and wild plants and animals, etc. Consequently, it will be necessary to make the plan and to conduct the assessment on the effects to the environment in accordance with the development plan before the construction stage of the development of the Tsav Mine.

3.4.1 Surface and underground water

The items of the assessment will be as follows:

(1) Periodical observations on the underground water level in proper well and the weather

(2) Present state of utilization of underground water by cattle-breeders around the area to be developed

3.4.2 Pollution of water

The items of the assessment will be as follows:

(1) Analysis of pH, SS, DO, number of bacterium, content of impurities such as Fe, Mn, Cu, Pb, Zn, Cr, As

(2) State of pollution

3.4.3 Pasture land

The items of the assessment will be as follows:

(1) The present state of pasture land, (i.e. kind of grasses state of utilization of pasture land, kind and number of cattles and their economical value, state of pollution)

(2) The present state of wild plants and animals

3.4.4 Monitoring of environment

The items of monitoring should be listed up on the basis of the results of the assessment conducted in accordance with the development plan. However, the items that can be listed up at present are as follows:

(1) The underground water level in proper wells

(2) Meteorological observations

(3) Periodical analysis of surface and undeground water

(4) Periodical analysis of soil of pasture land

It will be necessary to decide methods of monitoring in parallel with the selection of items.

3.5 Transportation of materials

The following route is adopted for the transportation of materials.

Yokohama(ship)/Dalien(rail)/Manchouli(overland)/Tsav

3.6 Geological survey

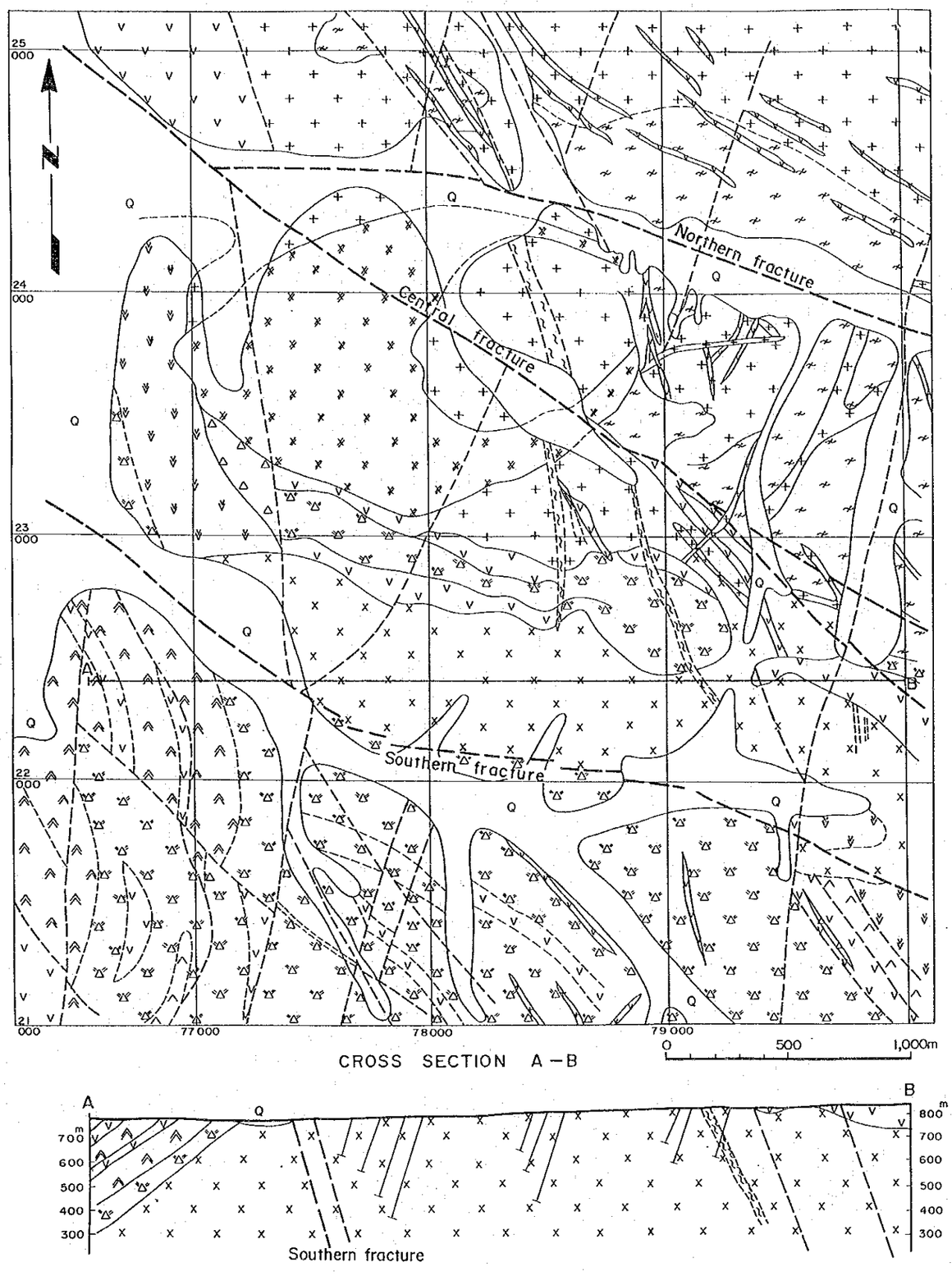
The tunnel prospect, the determination of drilling cores and analysis of samples will be carried out to clarify the distribution of the enriched zone of No.4 vein and the potentiality of the whole Tsav deposit.

3.7 Metallurgical test

The metallurgical test of ore samples of No.4 vein will be carried out. The percentage of dilution will be considered before the test. Further, the full attention will be paid to the grade of Au, Ag and the harmful ingredients such as As and Hg in order to draw up the flow sheet that makes the sales merit of concentrates maximum.

3.8 Preparatory feasibility study and report

The final report will be submitted after drawing the mine development plan based upon the results of the above mentioned study and after carrying out the preparatory feasibility study (Pre-F/S).



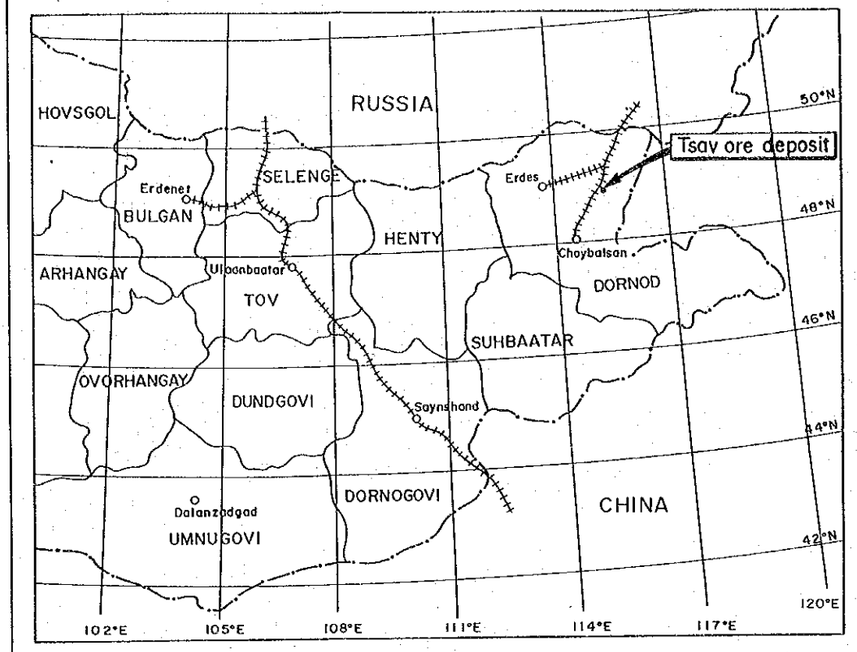


Fig. 1 Location map of Tsav ore deposit

LEGEND

- Vein
- ④ Number of vein
- Shaft
- Fault
- Fracture
- Fault with sheared zone
- Q — Quaternary
- PR₂S — Gneiss, schist, marble (Upper Proterozoic, "Salkhit" series)

VOLCANIC ROCKS

- Basalt, basaltic andesite
- Andesite, andesitic porphyrite
- Dacite, dacitic porphyry
- Andesitic "tuff-lava"
- Dacitic porphyry
- Volcanic breccia

(Middle~upper Jurassic, "Tsav" series)

INTRUSIVE ROCKS

- γJ₃ — Granite porphyry
- Syenite – diorite
- Monzodiorite

(Late Jurassic, Granitic complex mass)

- γPZ₁ — Granite (Early Paleozoic)

DIKES

- Andesitic porphyrite (Early~middle Jurassic)
- Granite, felsite, syenite (Late Jurassic)

Fig. 2 Geological map of Tsav ore deposit

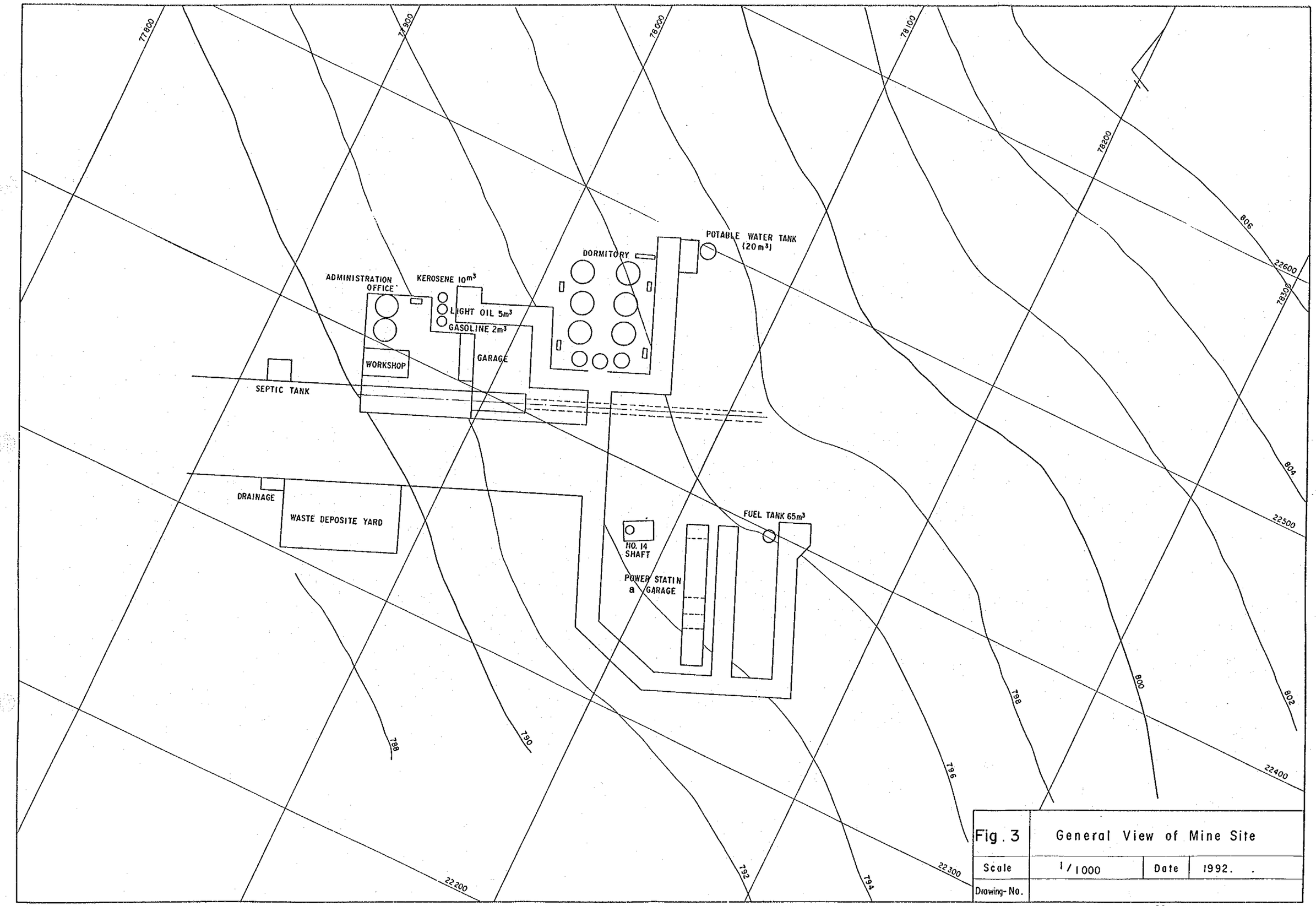
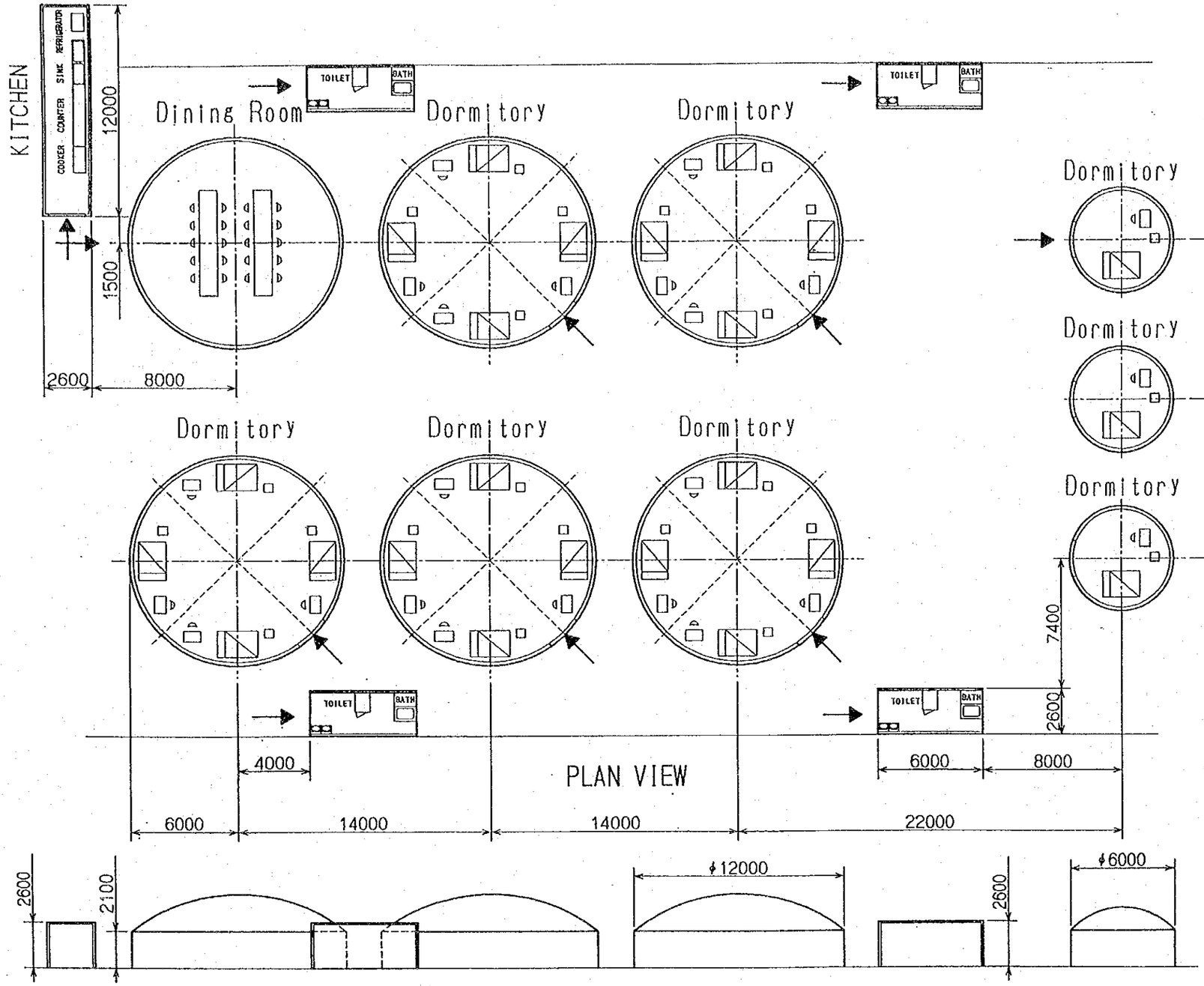


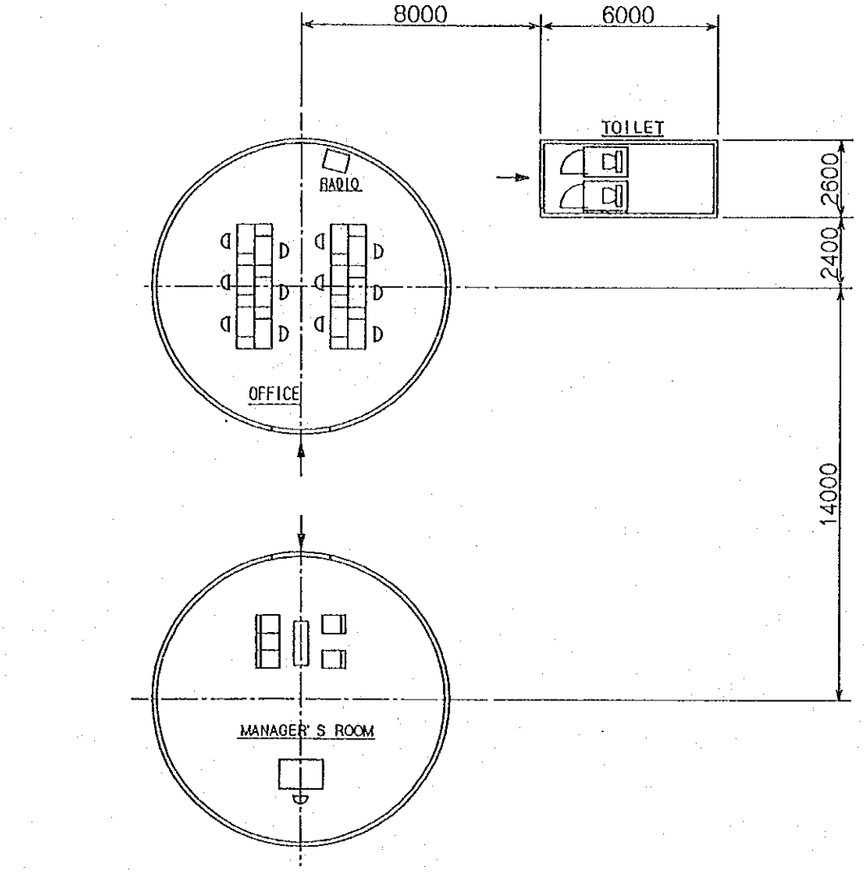
Fig. 3	General View of Mine Site		
Scale	1/1000	Date	1992. .
Drawing-No.			



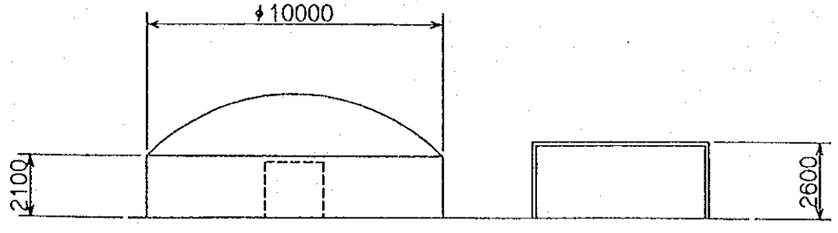
BASIC SPECIFICATIONS

※FLOOR AREA	
DORMITORY FOR STAFF	:565.2 ㎡
DORMITORY FOR STAFF	: 84.8 ㎡
DINING ROOM	:113.0 ㎡
KITCHEN	: 31.2 ㎡
TOILET. BATH	: 62.4 ㎡
※STRUCTURE	:"PAO"
TOILET/BATH/KITCHEN	:PREFABRICATED UNIT INSTALLED IN CONTAINER
※ARCHITECTURAL EQUIPMENT	
PLUMBING/SANITARY WORKS	:HOT-WATER. BATH. SEPTIC TANK
ELECTRICAL WORKS	:LIGHTING. RECEPTACLE. COMMUNICATION EQUIPMENT
HEATING	:KEROSENE HEATER. ELECTRIC HEATER

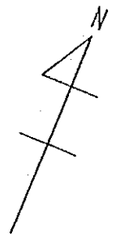
Fig.4	Dormitories		
SCALE	1:250	DATE	
DWG. No.			



PLAN VIEW



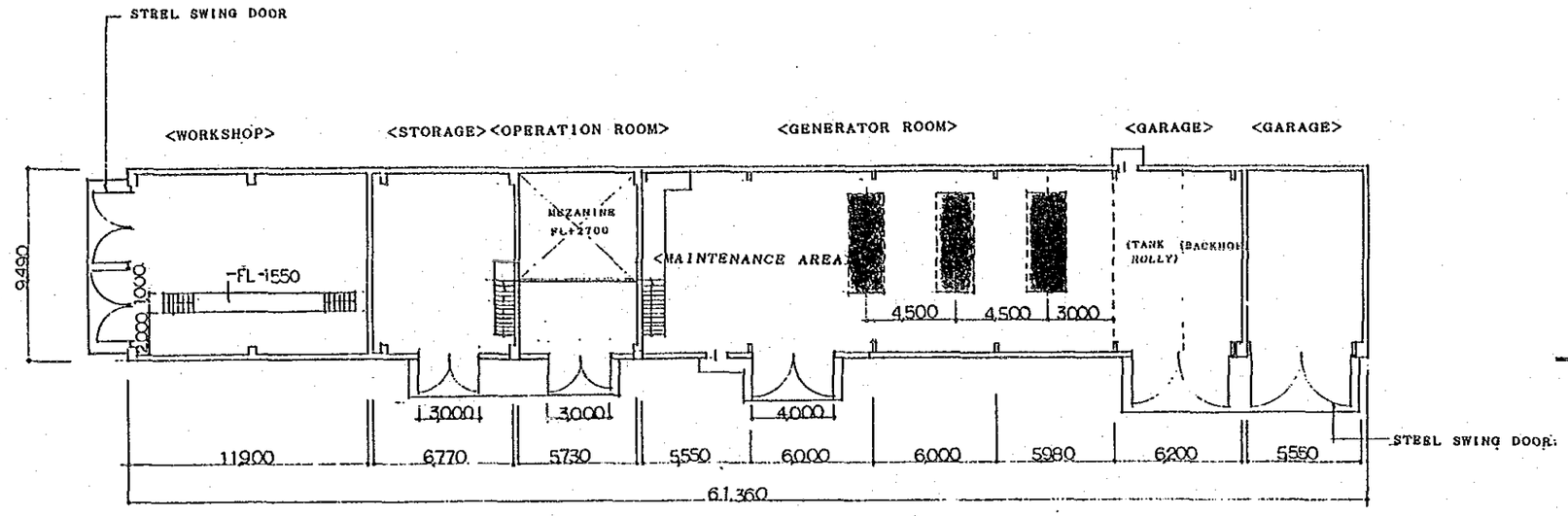
SIDE VIEW



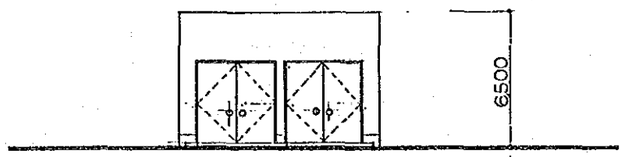
BASIC SPECIFICATIONS

※FLOOR AREA	
OFFICE	: 157.0m²
TOILET	: 13.8m²
※STRUCTURE	
OFFICE	: "PAO"
TOILET	: PREFABRICATED UNIT INSTALLED IN CONTAINER
※ARCHITECTURAL EQUIPMENT	
PLUMBING/SANITARY WORKS	: SEPTIC TANK
ELECTRICAL WORKS	: LIGHTING, RECEPTACLE, COMMUNICATION EQUIPMENT
HEATING	: KEROSENE HEATER, ELECTRIC HEATER

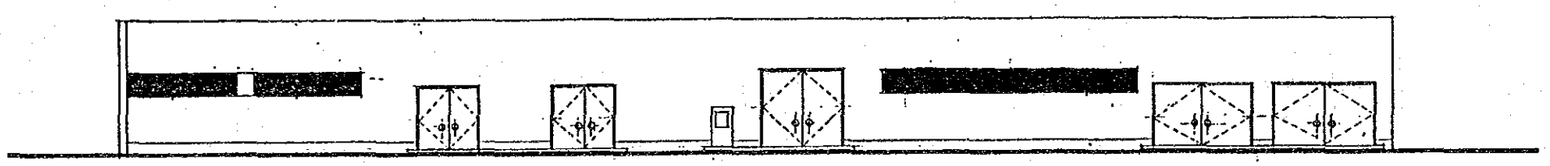
Fig. 5	Administration Office		
SCALE	1:200	DATE	
DWG. No.			



FLOOR PLAN



SOUTH ELEVATION



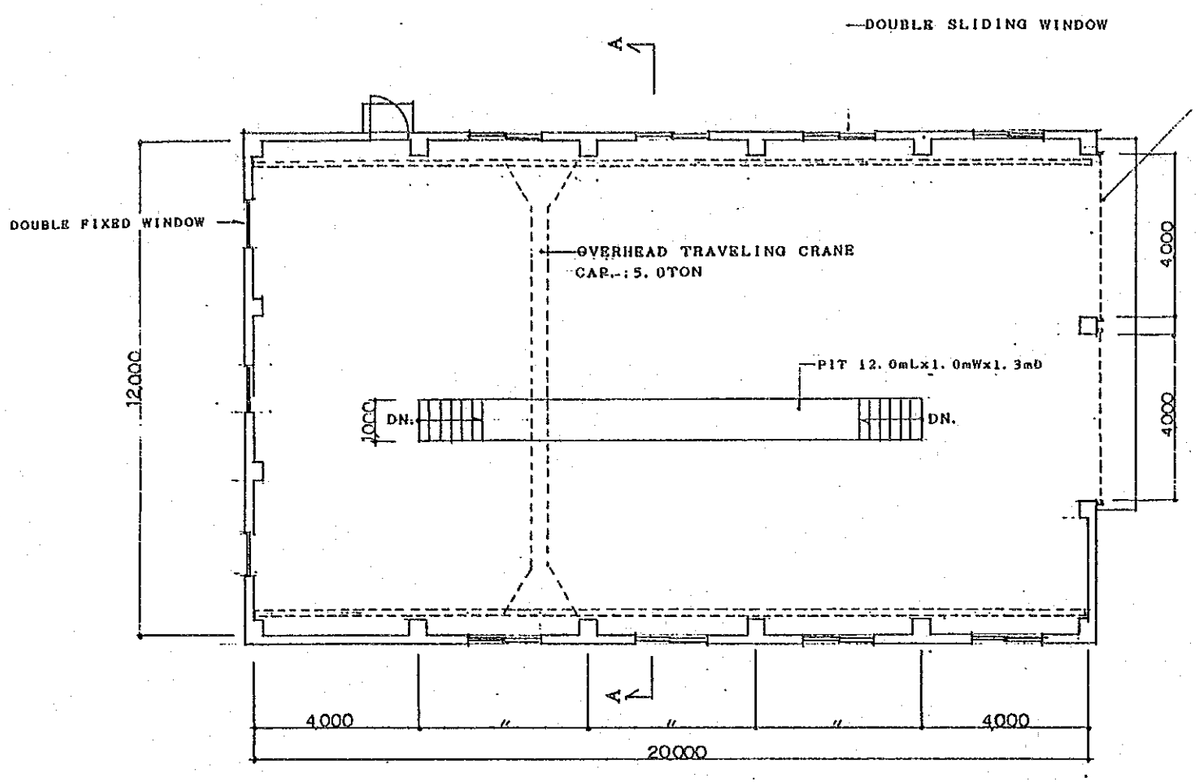
EAST ELEVATION

FUNDAMENTAL SPECIFICATIONS

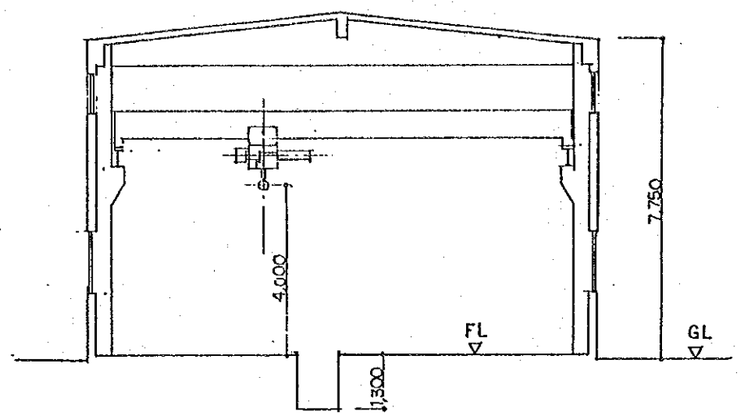
MODIFICATION AND REPAIR OF AN EXISTING REINFORCED CONCRETE BUILDING (582.3m²), INCLUDING FOLLOWING WORKS;

- EXTERIOR WALL (BRICK WALLS, STEEL SWING DOORS)
- FLOOR (BACK FILLING OF EXISTING PITS)
- OTHER MISCELLANEOUS WORKS

Fig. 6	Power Station Detailed Layout		
Scale	1/200	Date	1992
Drawing-NO.			



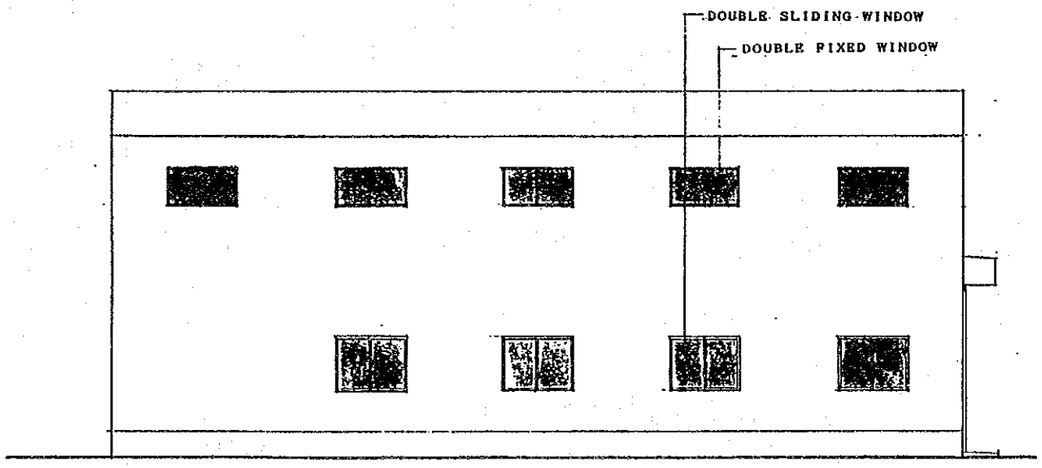
FLOOR PLAN



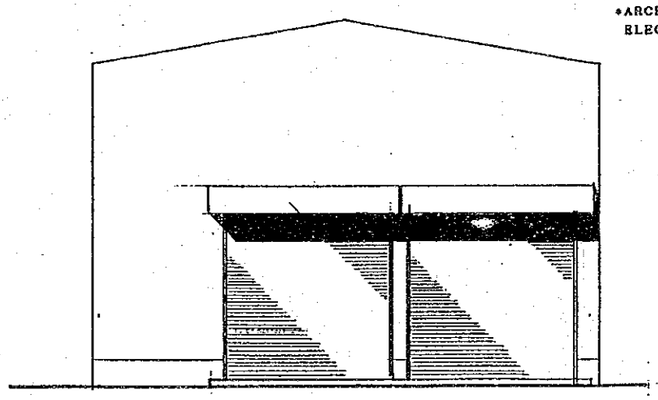
A~A SECTION

FUNDAMENTAL SPECIFICATIONS

•FLOOR AREA	; 240.0m²
•STRUCTURE	
FOUNDATION/FRAME	; REINFORCED CONCRETE
FLOOR/ROOF SLAB	; REINFORCED CONCRETE
WALL	; MASONRY BRICK
•EXTERIOR FINISH	
WALL	; CEMENT MORTAR
ROOF	; WATER PROOF MORTAR
WINDOW	; DOUBLE ALUMINIUM SASH
DOOR	; MANUAL STEEL SHUTTER, OIL PAINT
•INTERIOR FINISH	
FLOOR	; CEMENT MORTAR
WALL	; CEMENT MORTAR
CEILING	; ARCHITECTURAL CONCRETE
•ARCHITECTURAL EQUIPMENT	
ELECTRICAL WORK	; LIGHTING, RECEPTACLE

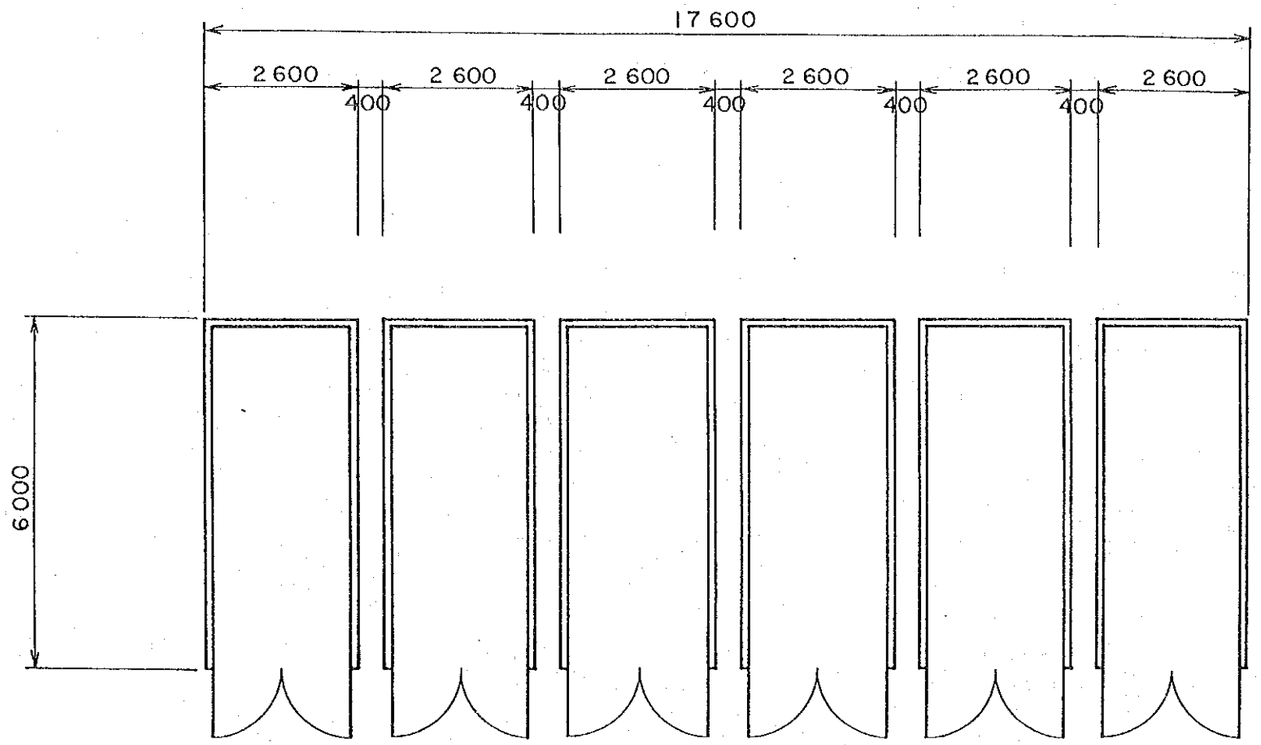


SOUTH ELEVATION

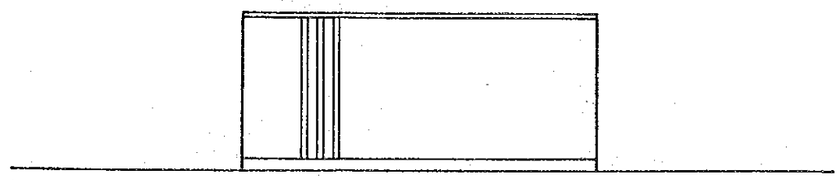


EAST ELEVATION

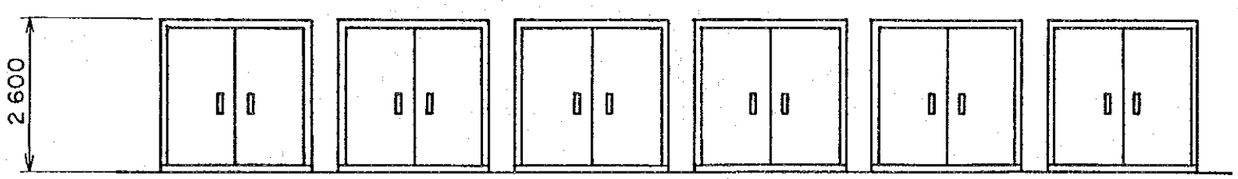
Fig. 7	Workshop		
Scale	1/100	Date	1992.
Drawing-NO.			



FLOOR PLAN



SOUTH ELEVATION



WEST ELEVATION

FUNDAMENTAL SPECIFICATIONS

‡ FLOOR AREA	:106 m²
‡ STRUCTURE	:CONTAINER
‡ ARCHITECTURAL EQUIPMENT	
ELECTRICAL WORK	:LIGHTING RECEPTACLE

Fig. 8	Garage		
Scale	1/100	Date	1992. .
Drawing – No			

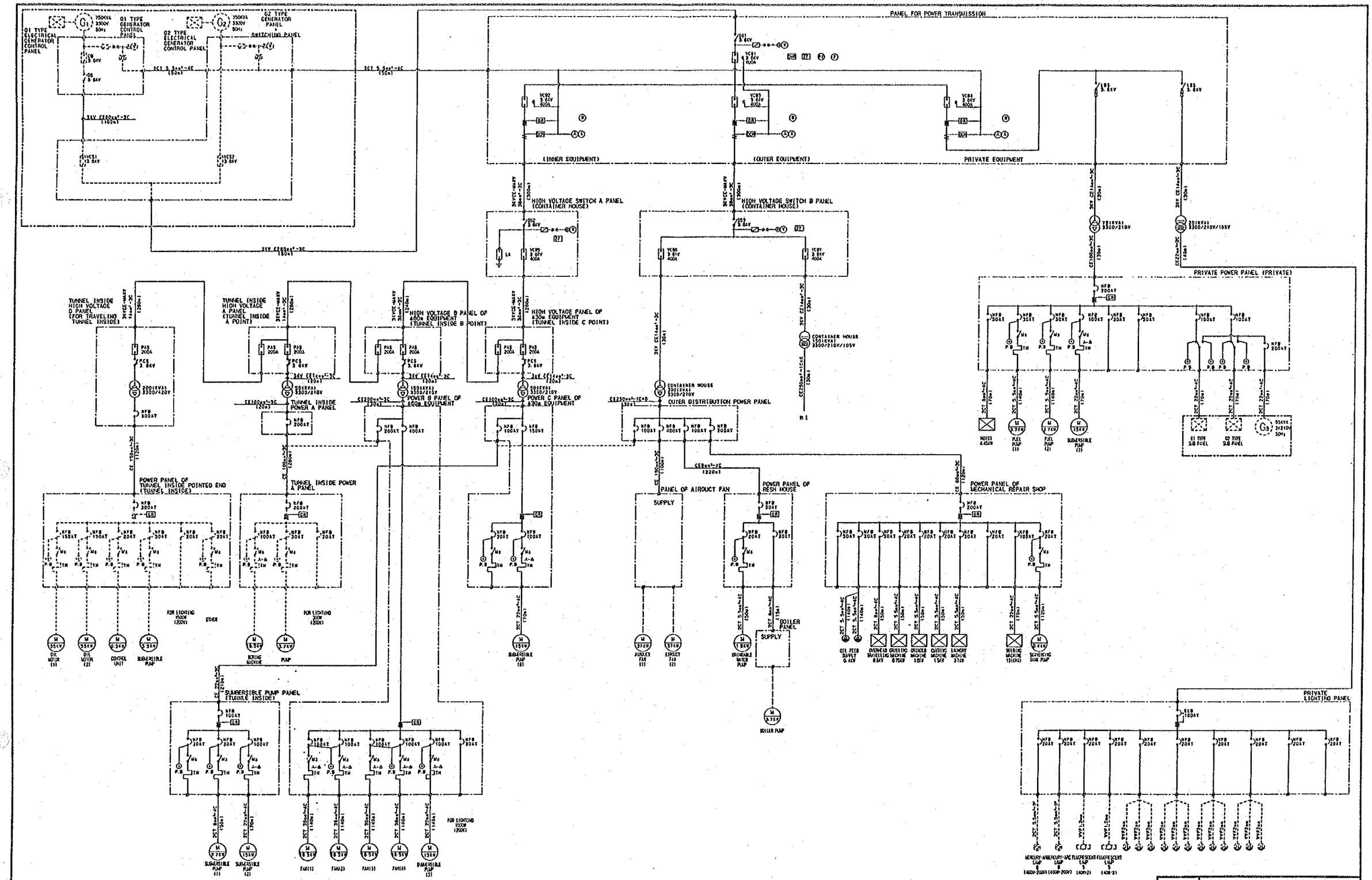


Fig.91 SINGLE LINE DIAGRAM (1)

SCALE | DATE

DWG. No.

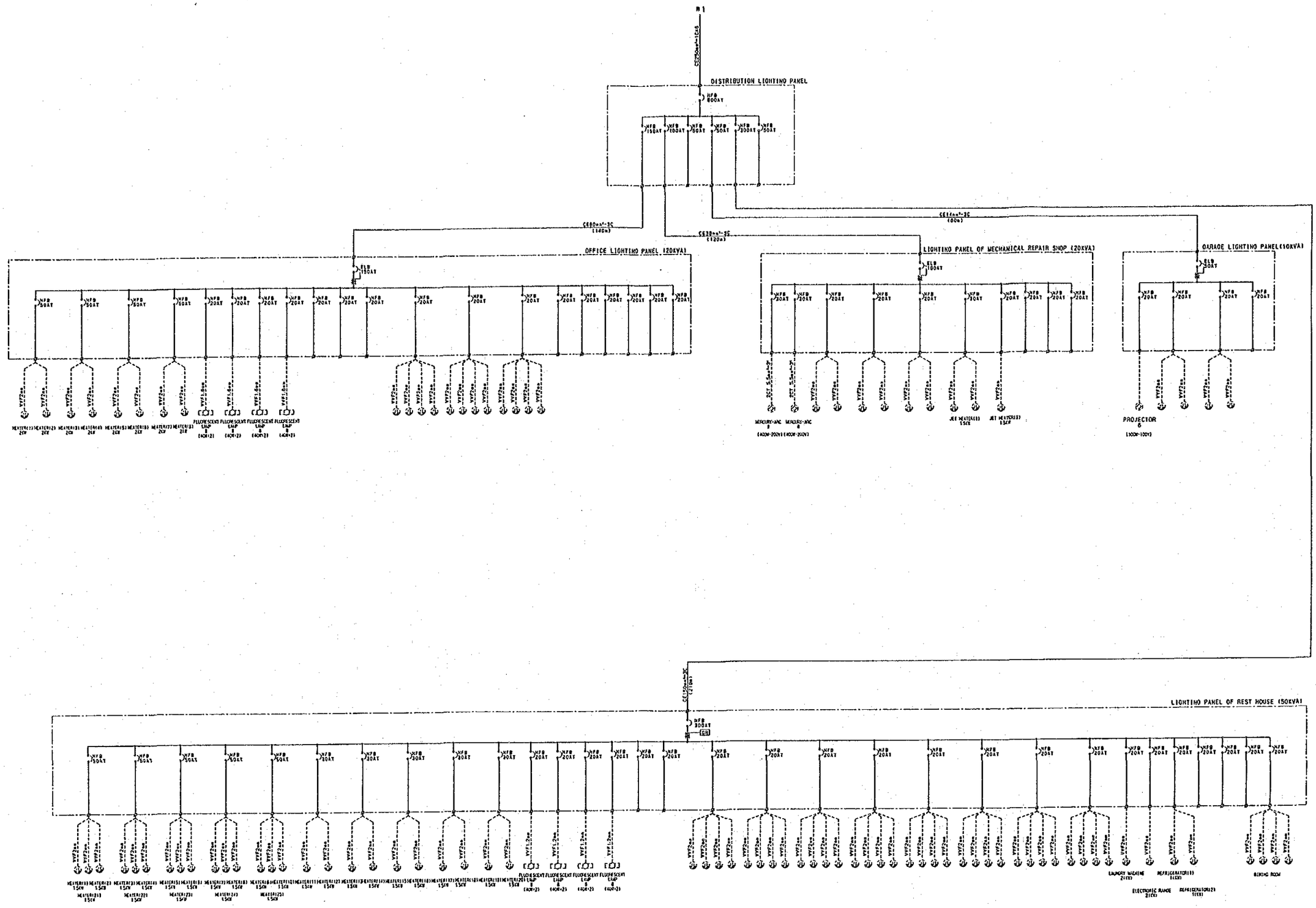
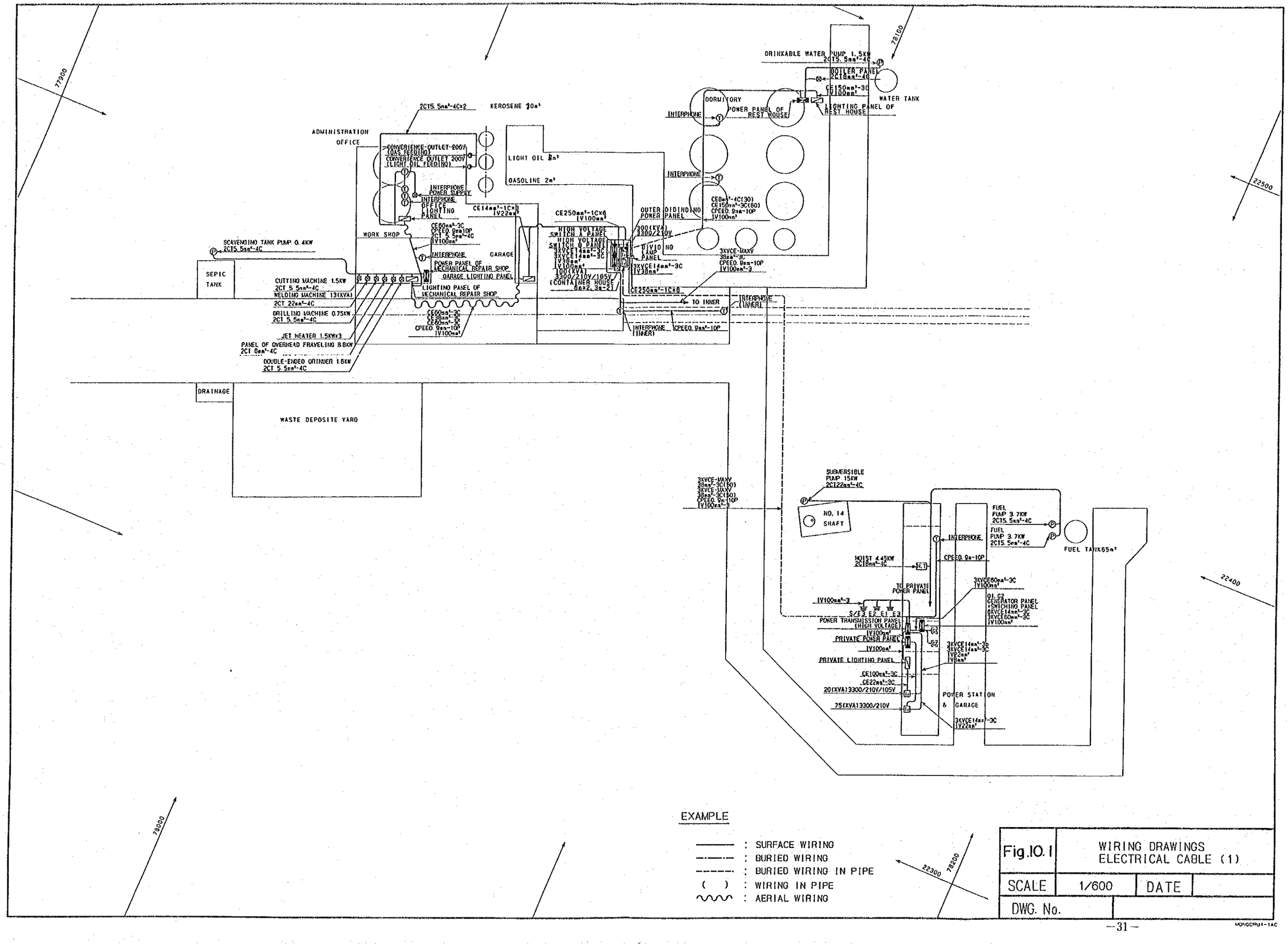


Fig.9.2	SINGLE LINE DIAGRAM (2)		
SCALE		DATE	
DWG. No.			



EXAMPLE

——— : SURFACE WIRING
—·—·— : BURIED WIRING
– – – – – : BURIED WIRING IN PIPE
( ) : WIRING IN PIPE
~~~ : AERIAL WIRING

Fig.10.1	WIRING DRAWINGS ELECTRICAL CABLE (1)		
SCALE	1/600	DATE	
DWG. No.			

MONGCRU1-1AC
~~~

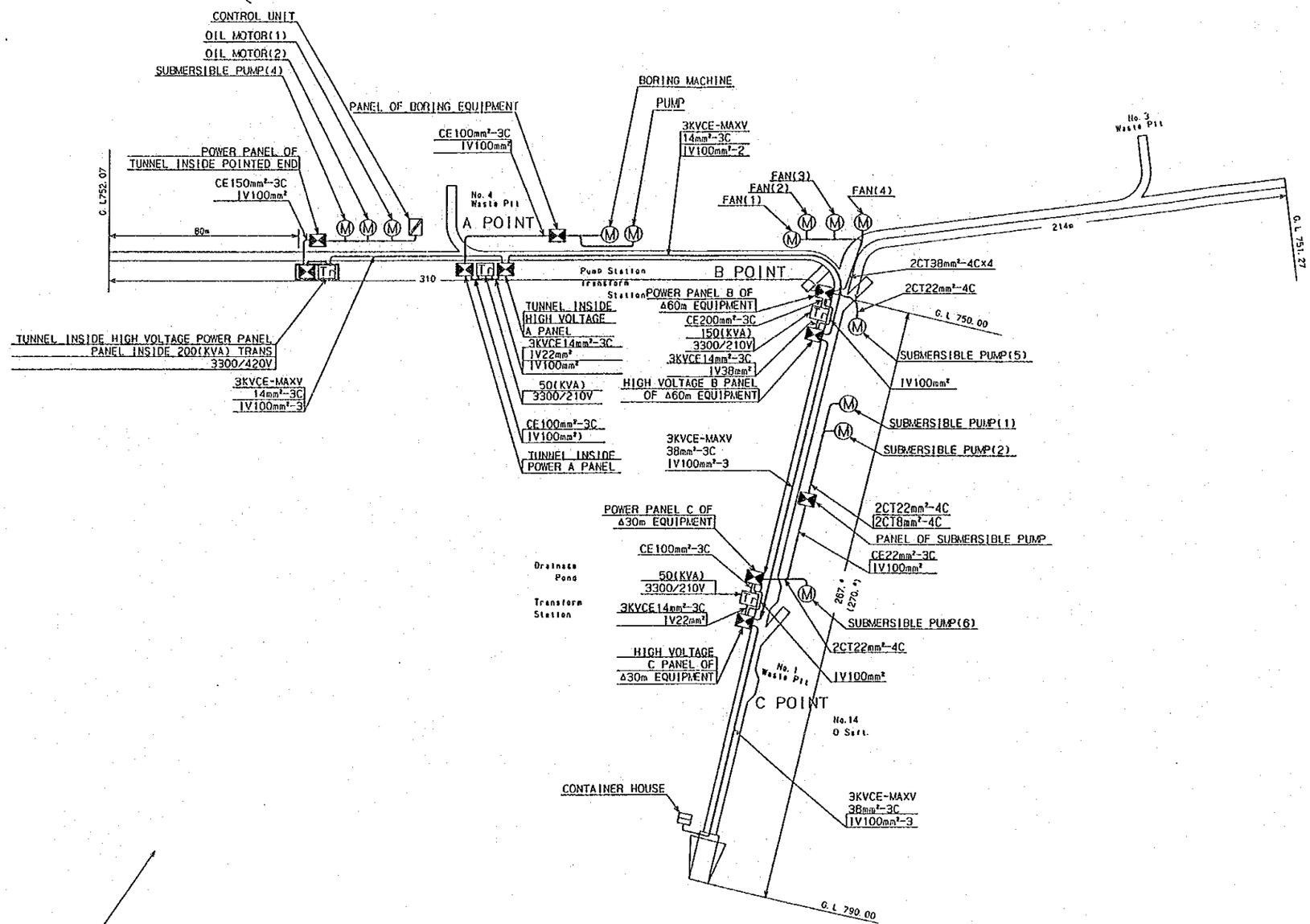
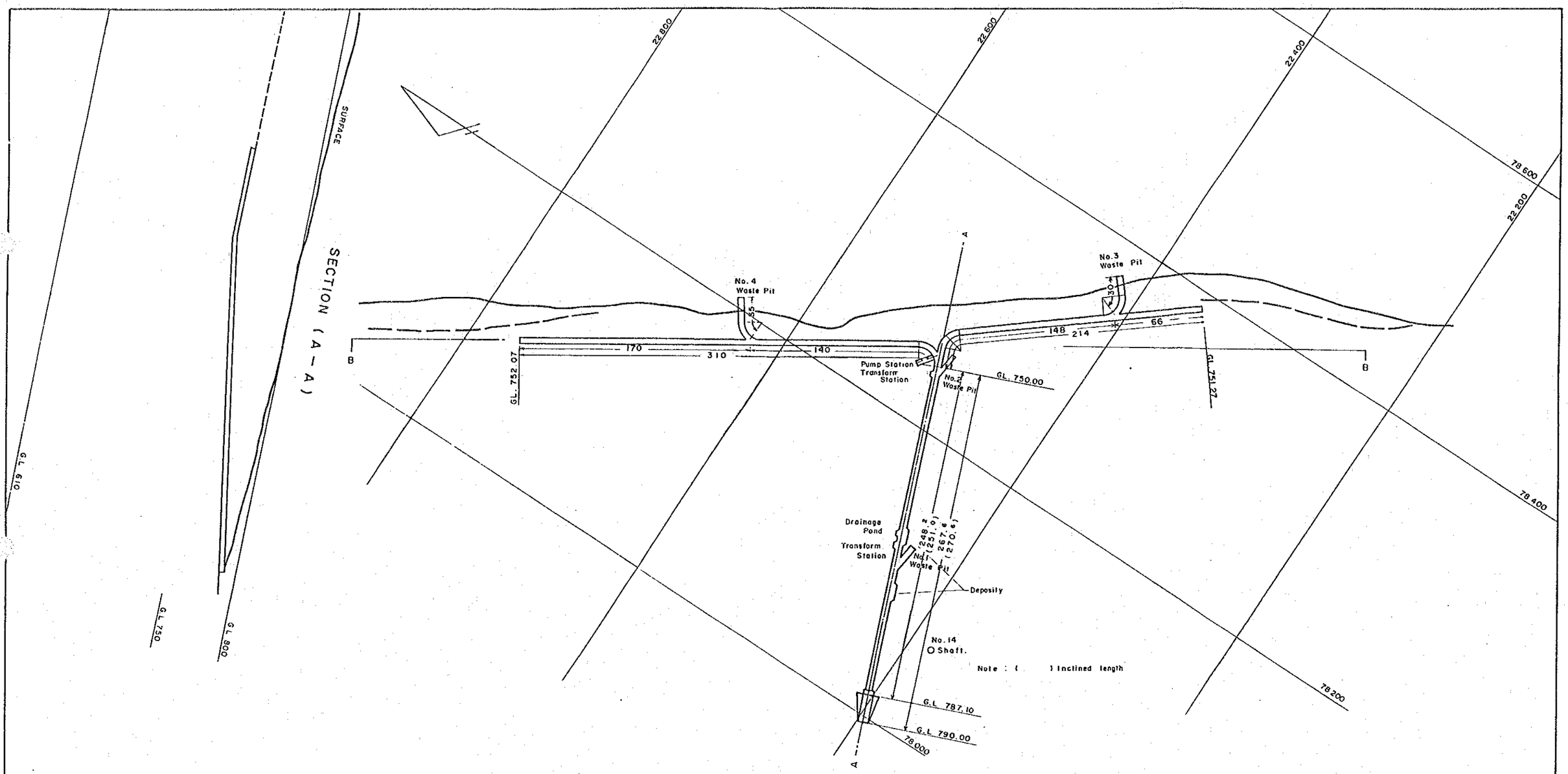
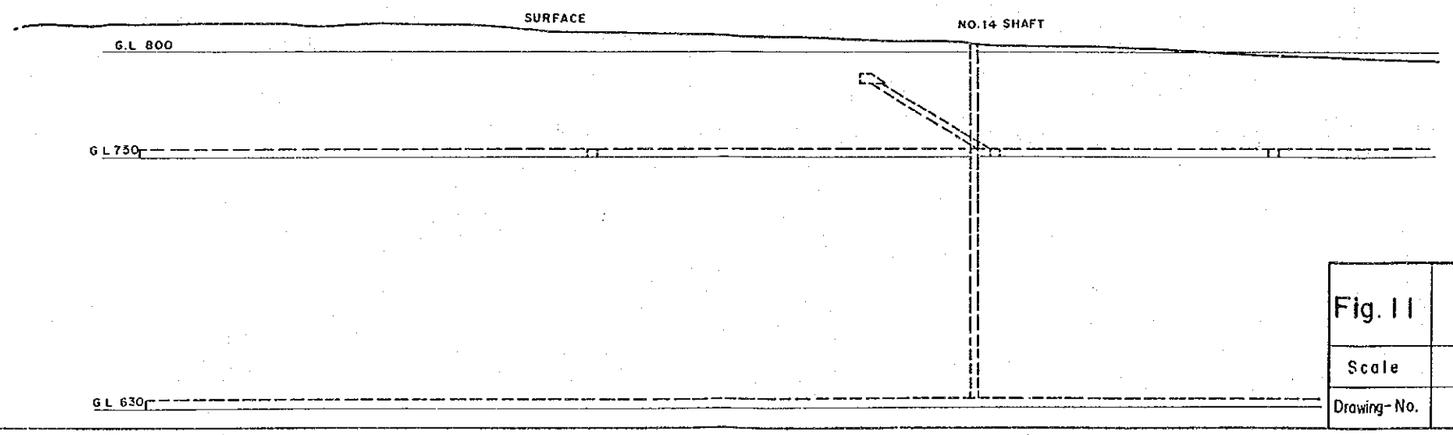


Fig.10.2	WIRING DRAWINGS ELECTRICAL CABLE (2)		
SCALE	1/1500	DATE	
DWG. No.			



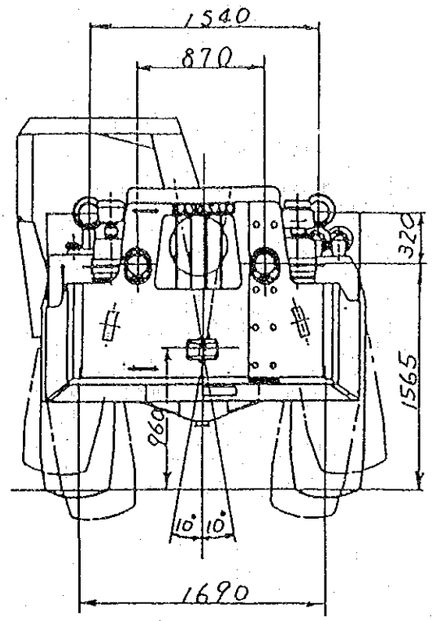
Place	Quantity	Note
Inclined Shaft	251 m	8° 30' (degree) (Mine Mouth 3.6m)
Waste pit	30	15m x 2
Pump Station	15	15° (degree)
Transform Station	(30) m³	15m³ x 2
Drainage Pond	(15)	15 x 1
Depository	(130)	65 x 2 (for Jumbo'8 LHD)
Drift	524m	
Waste pit	65	

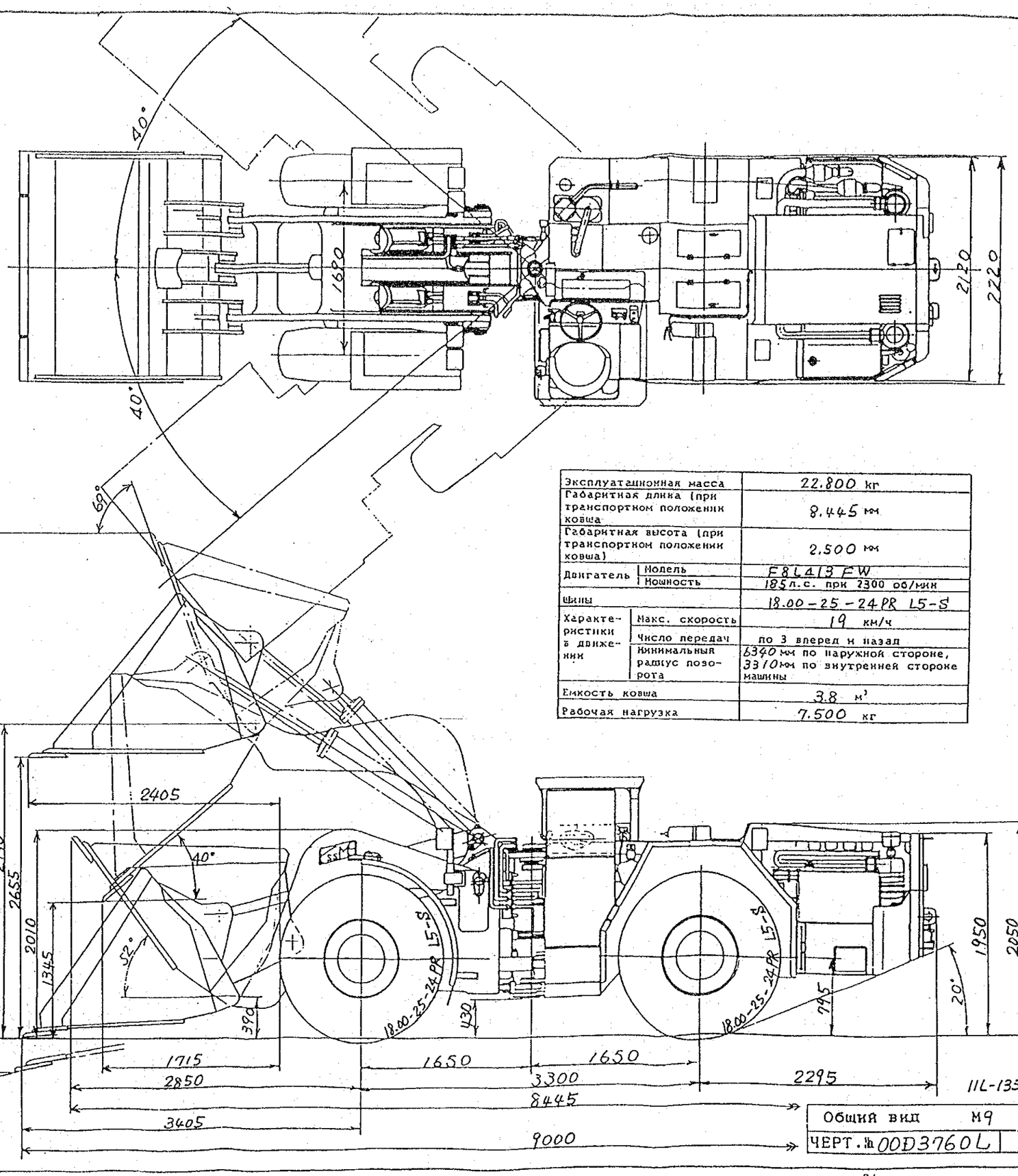
SECTION (B – B)



0 100m

Fig. 11	Underground Development Plan		
Scale	1/2000	Date	1992. .
Drawing-No.			





Эксплуатационная масса		22.800 kr
Габаритная длина (при транспортном положении ковша)		8.445 мм
Габаритная высота (при транспортном положении ковша)		2.500 мм
Двигатель	Модель	F8L413FW
	Мощность	185 л.с. при 2300 об/мин
Шины		18.00-25-24PR L5-S
Характеристики в движении	Макс. скорость	19 км/ч
	Число передач	по 3 вперед и назад
	Минимальный радиус поворота	6340 мм по наружной стороне, 3310 мм по внутренней стороне машины
Емкость ковша		3.8 м³
Рабочая нагрузка		7.500 кг

IIL-1353

Общий вид	M9
ЧЕРТ. №	00D3760L

Fig.12 Lood Haul Dump (LHD)

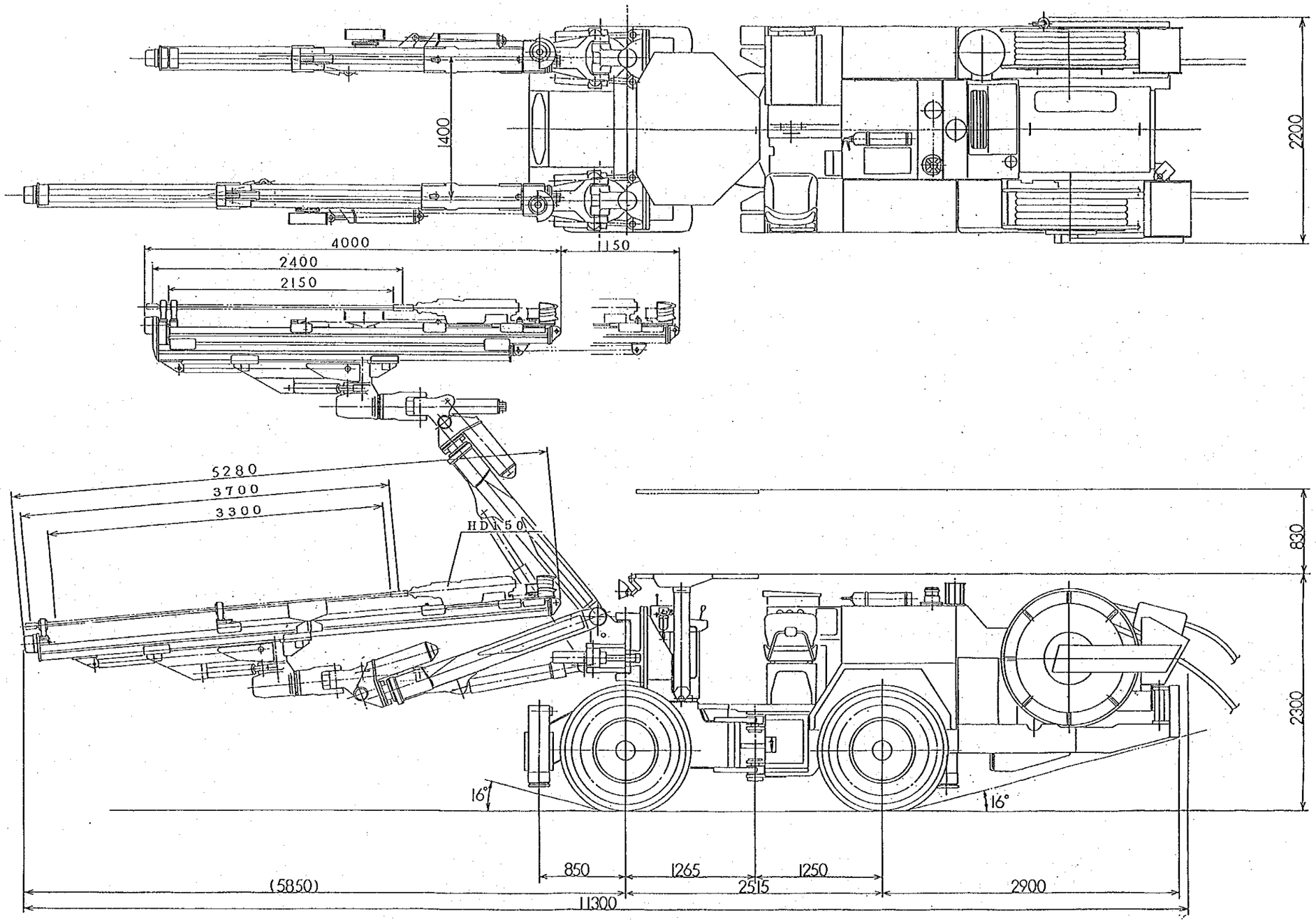
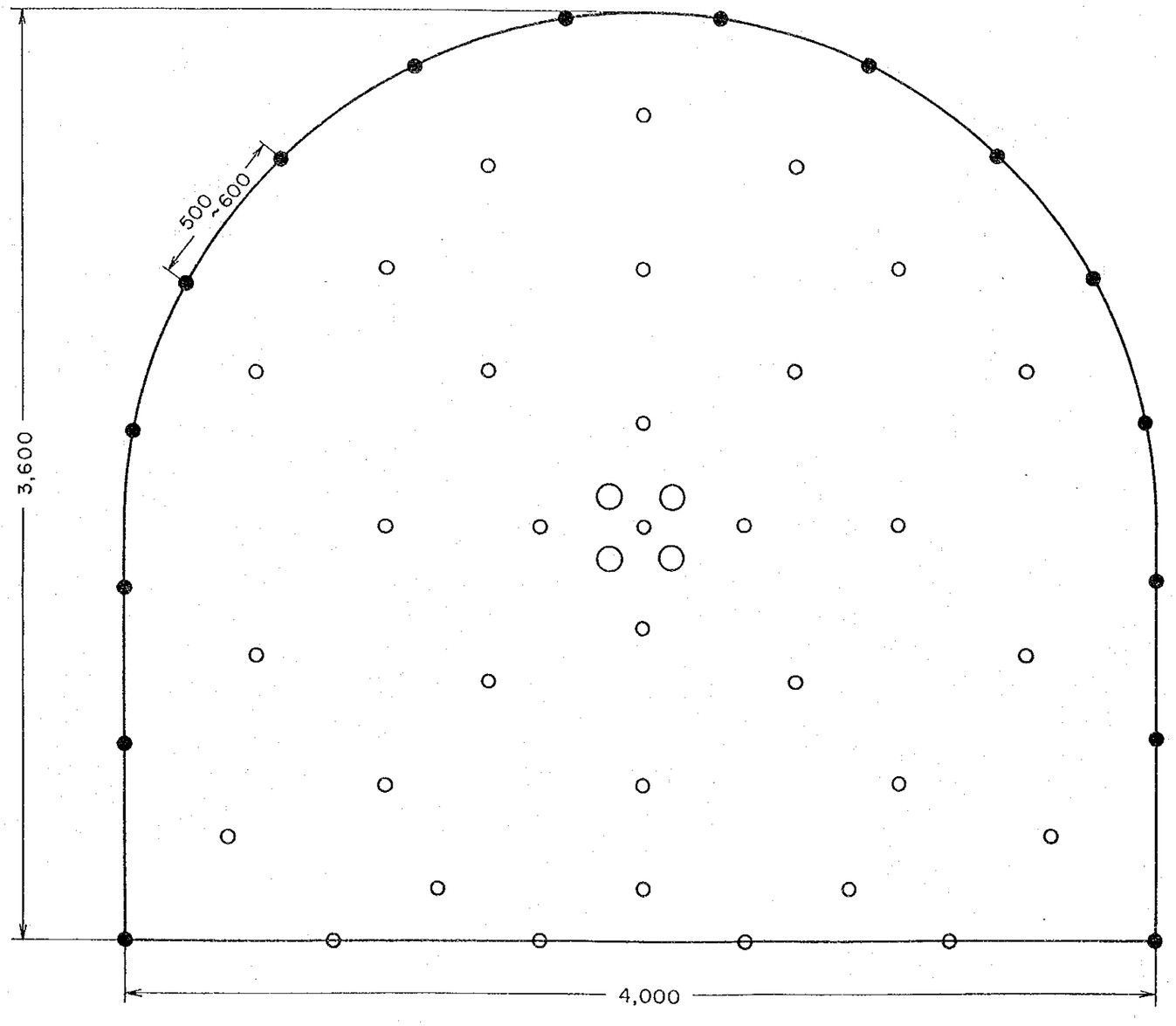


Fig.13 Wheel Jumbo Drill

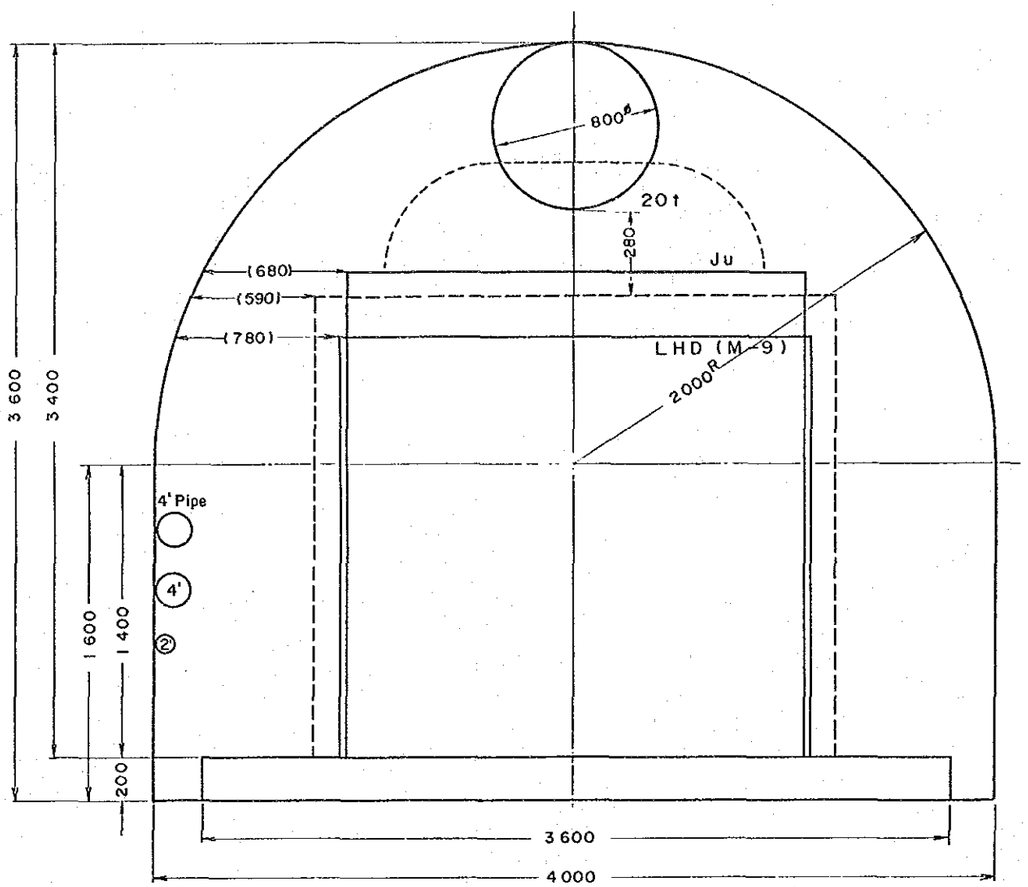


Burnt hole	4本	○
Charging hole	33本	○
Smooth Blasting hole	16本	●

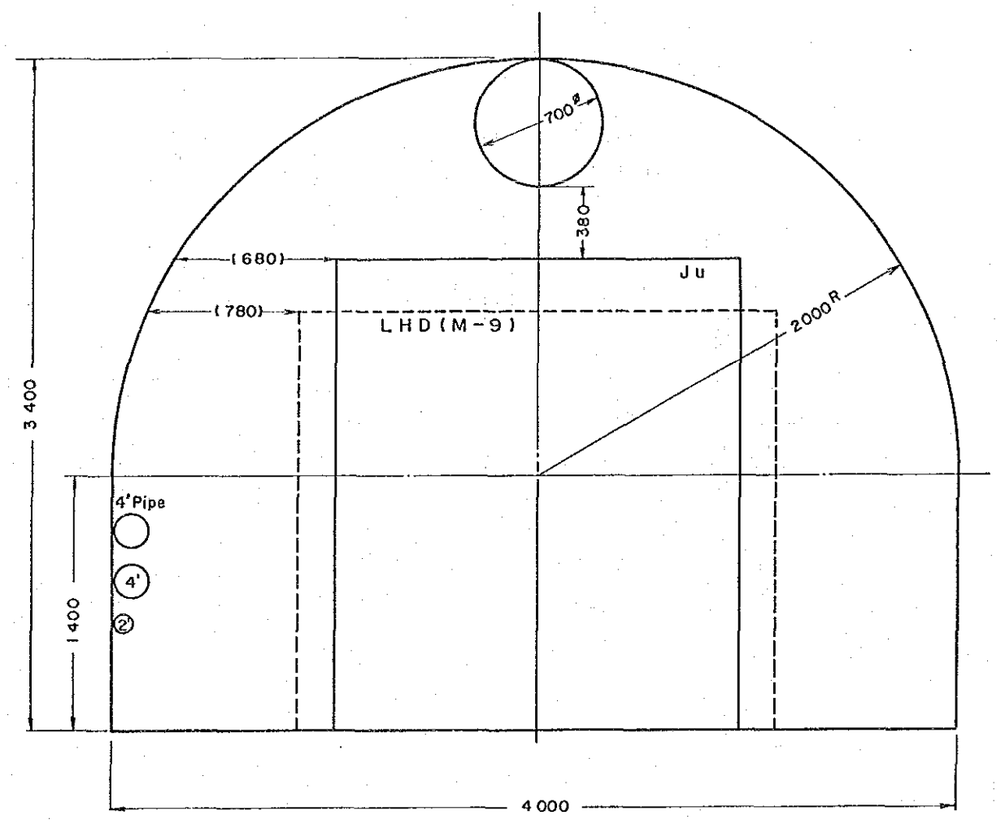
0 5 10m

Fig. 14	Drilling Hole Arrangement		
Scale	1/20	Date	1992. .
Drawing-No			

Inclined Shaft & Drift Section



Inclined Shaft Section

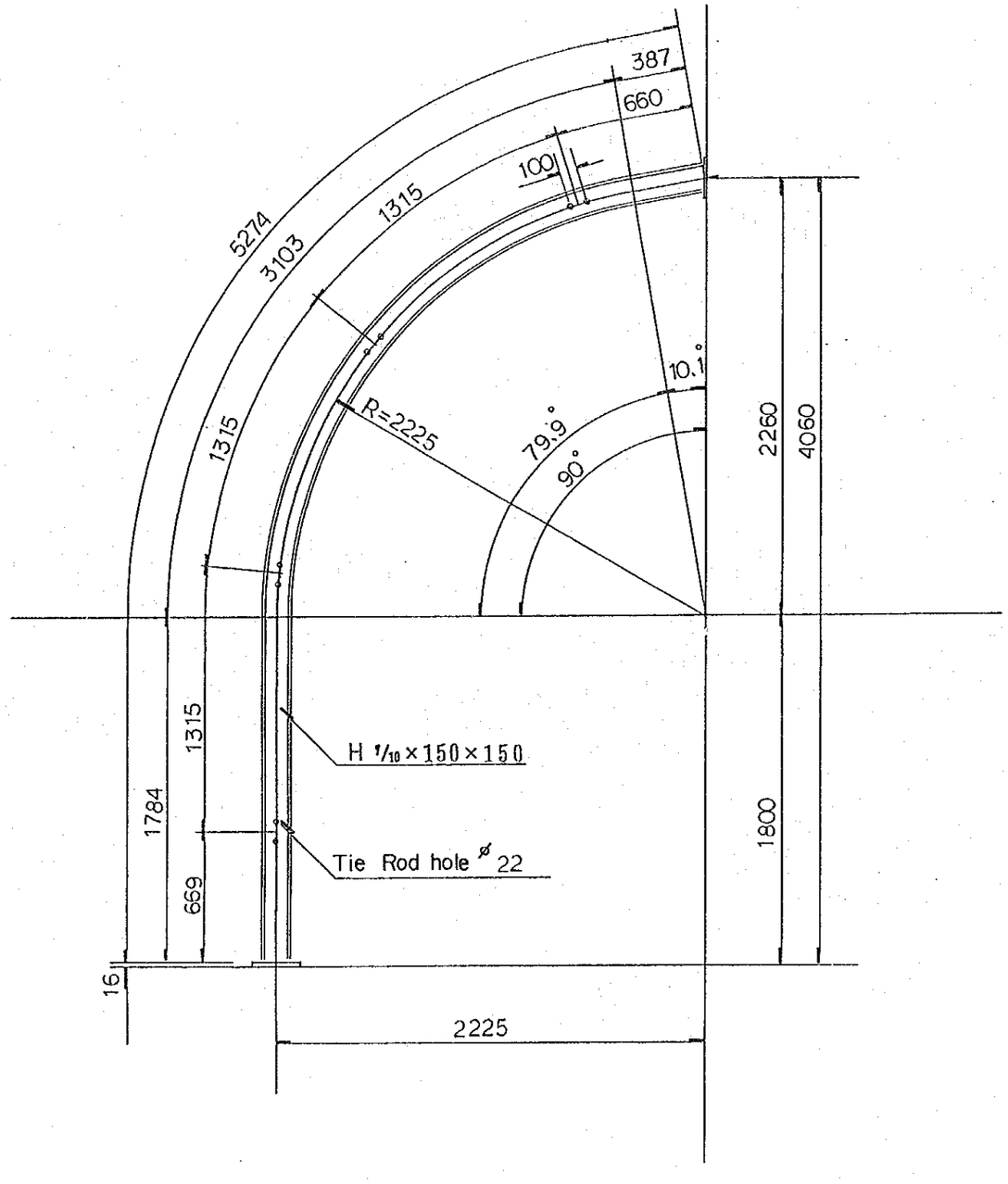


Drift Section

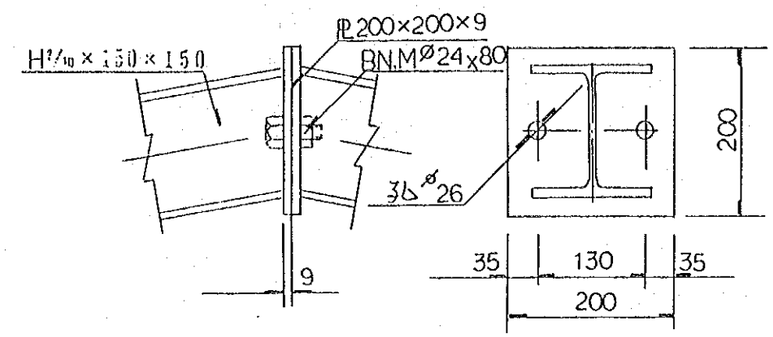
Fig. 15	Detailed Plan of Drift (1)		
Scale	1/20	Date	1992.
Drawing-No.			

Fig.16.1 150H Steel Timberings S=1/20

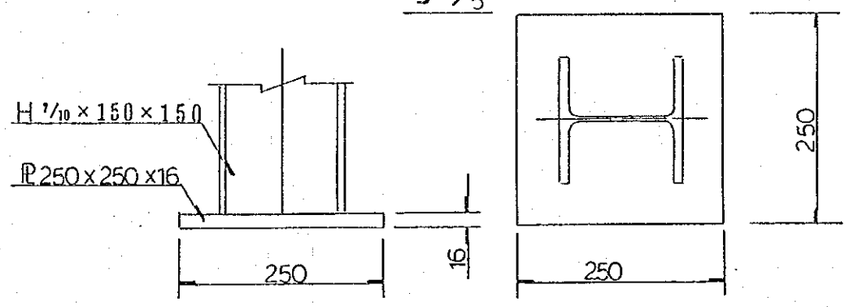
Inclined shaft : type Ⅳ



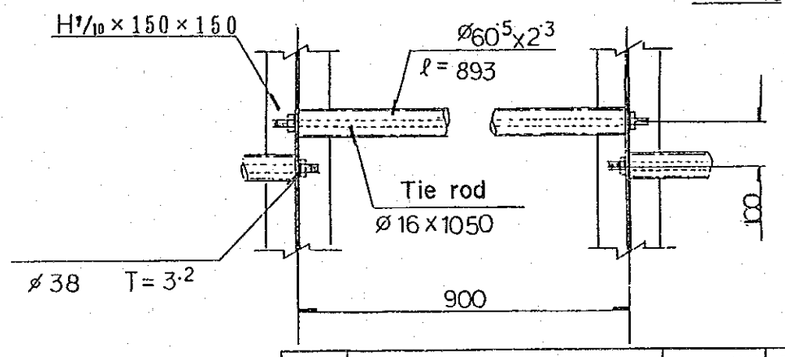
S=1/5



S=1/5



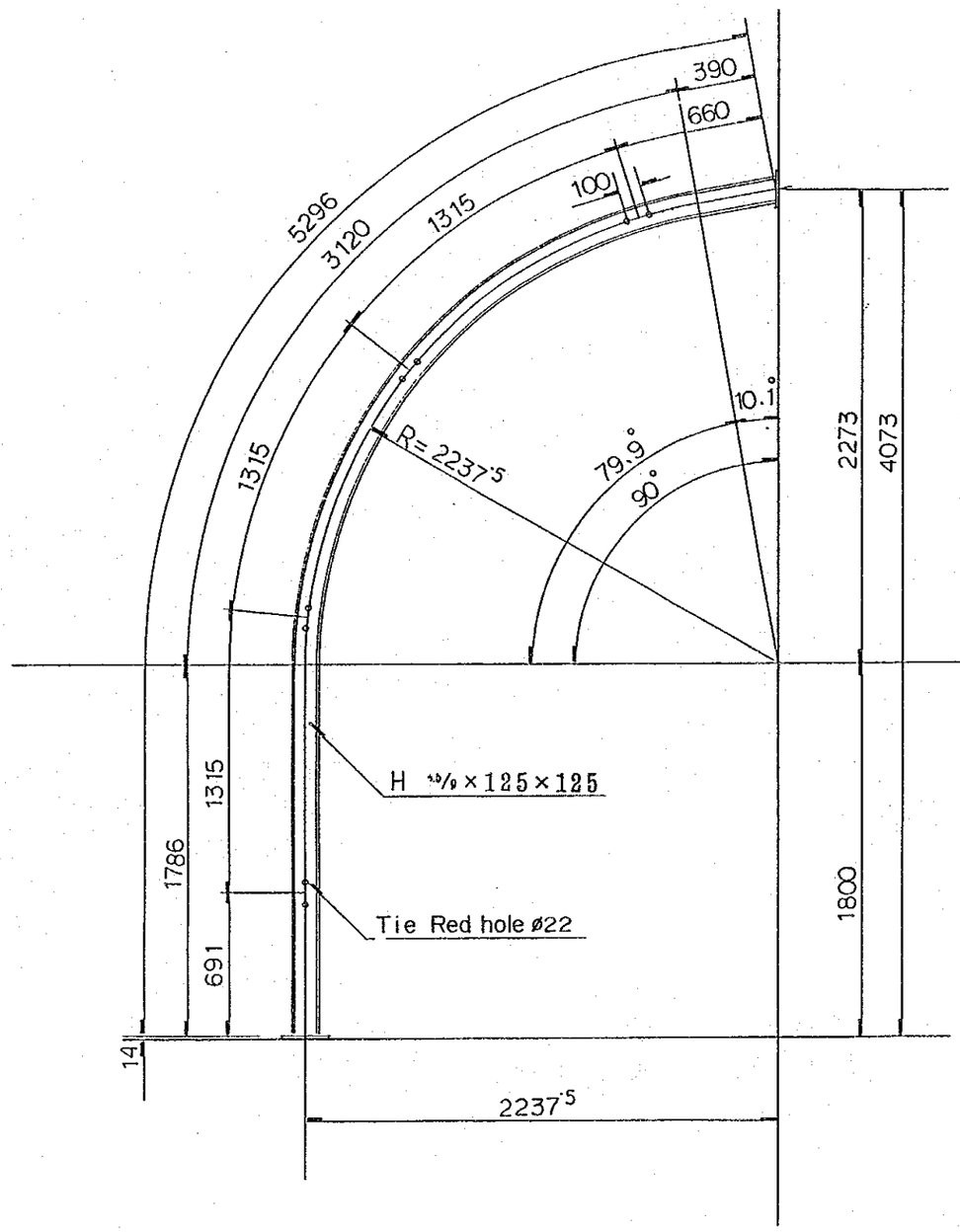
S=1/10



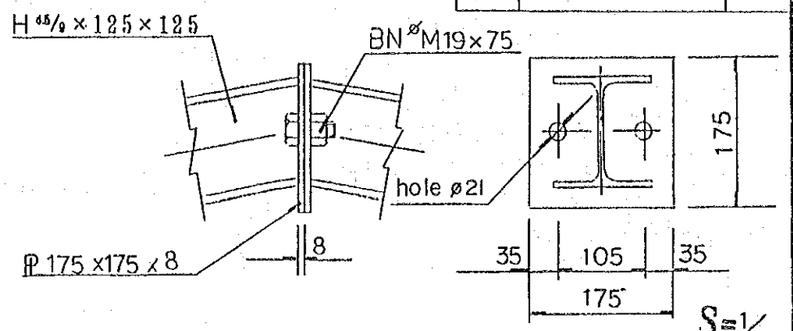
		0162	3

Fig. 16.2 125H Steel Timberings

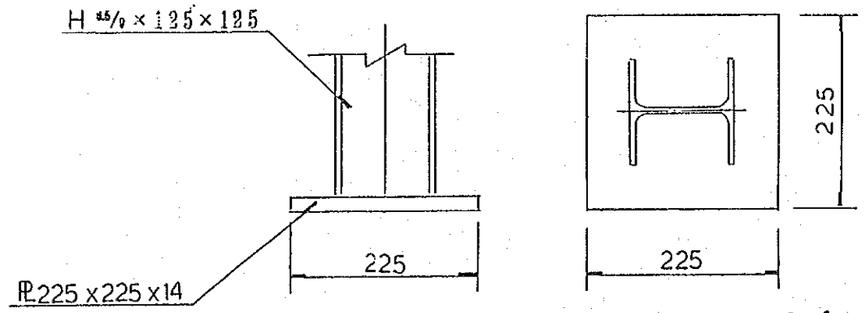
Iuclined shaft : type Ⅲ



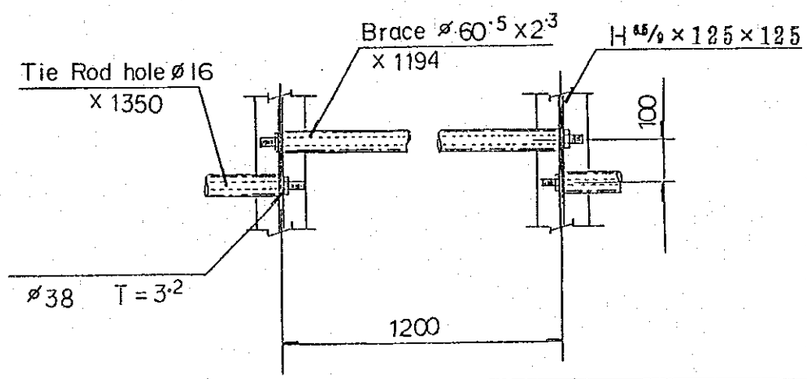
S=1/5



S=1/5



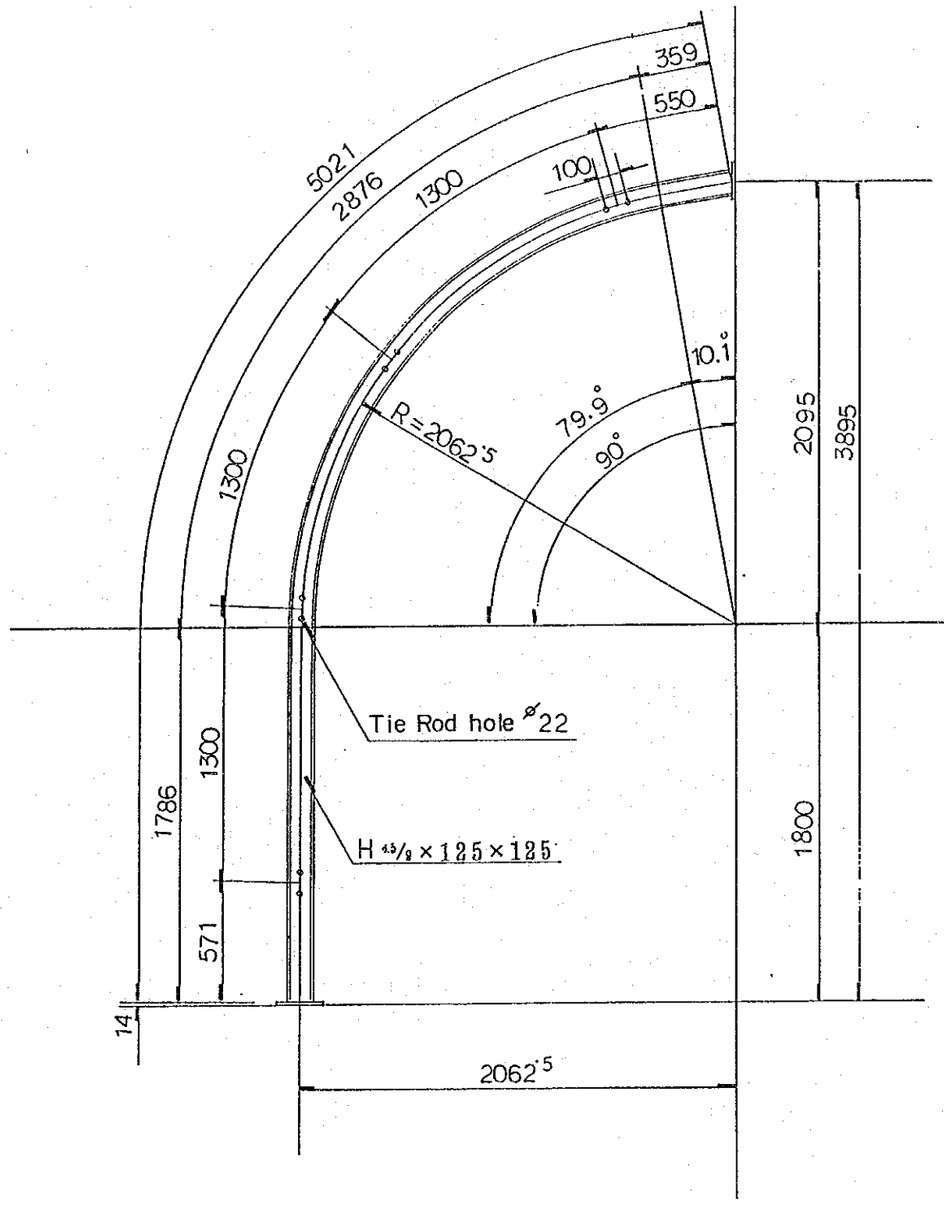
S=1/10



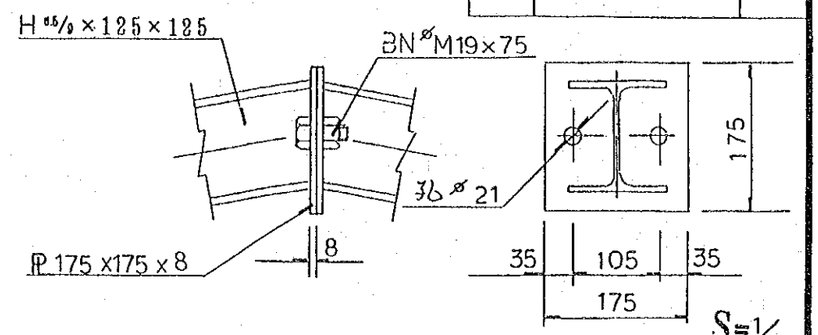
		0162	2	
	NO			

Fig.16.3 125H Stecl Timberings

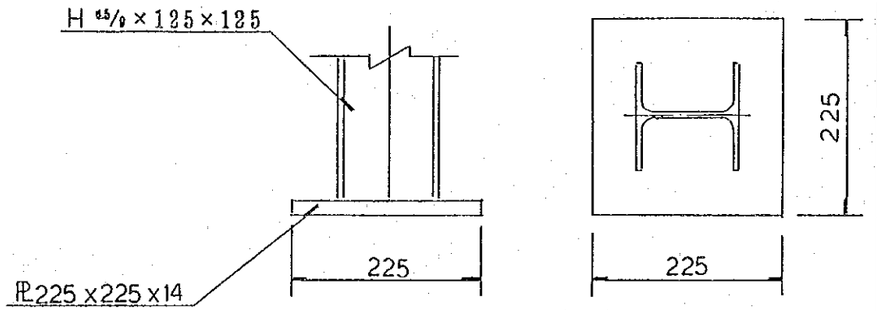
Inclined Shoft tyre Ⅱ



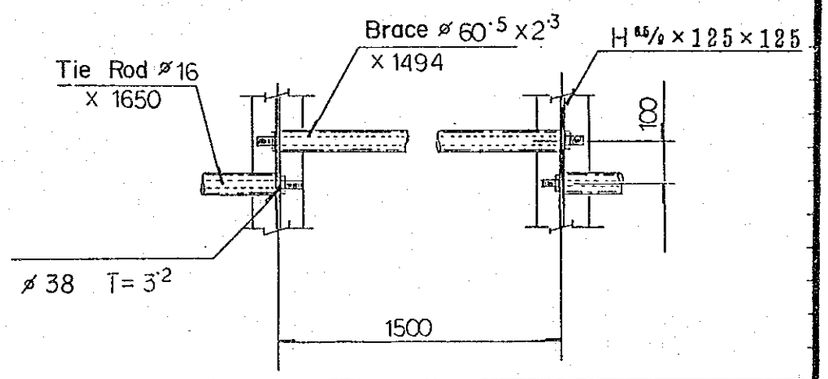
S=1/5



S=1/5



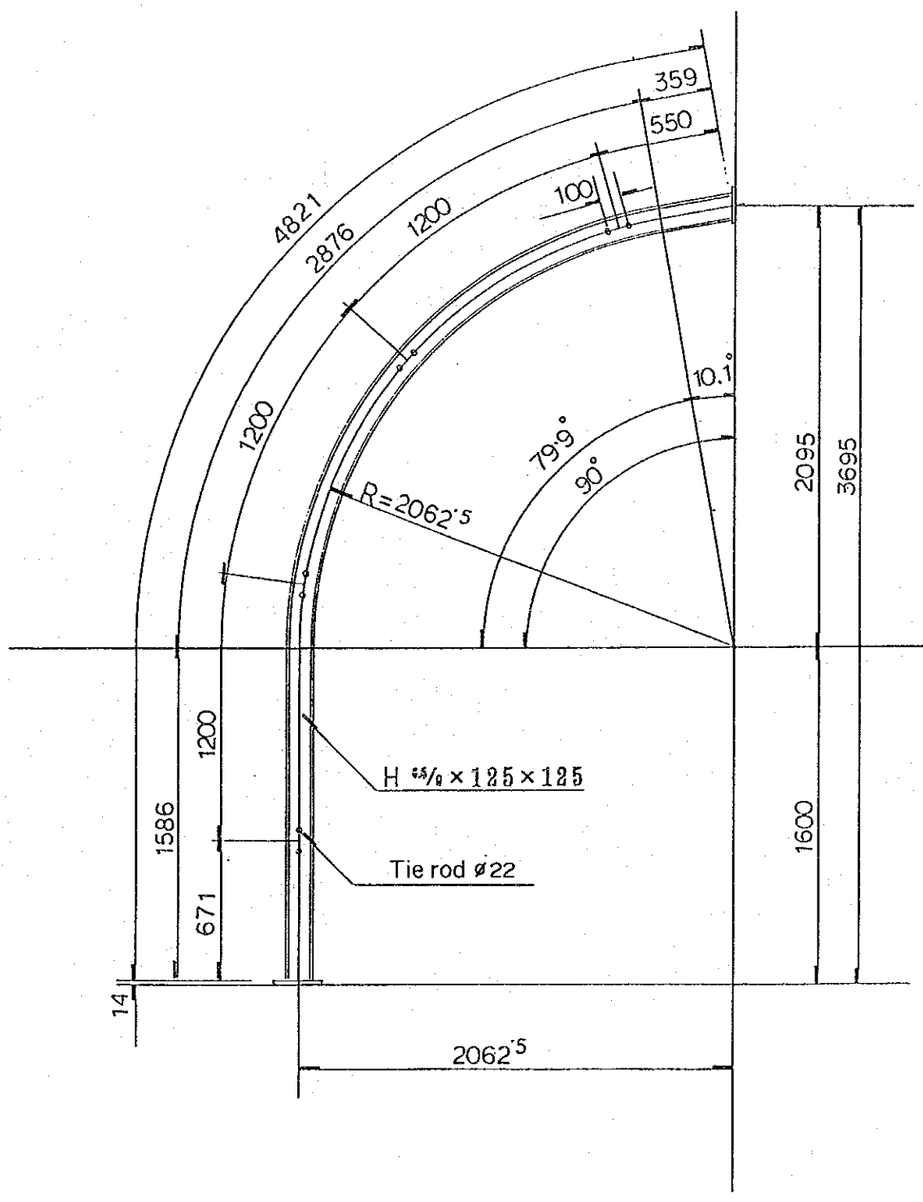
S=1/10



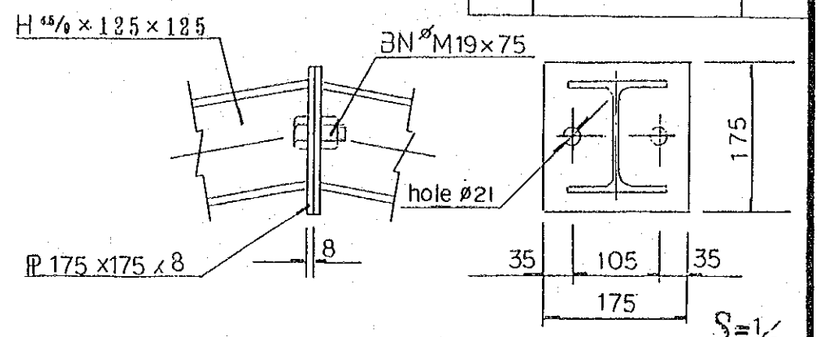
		0162	4
	NO		

Fig. 16.4 125H Steel Timberings

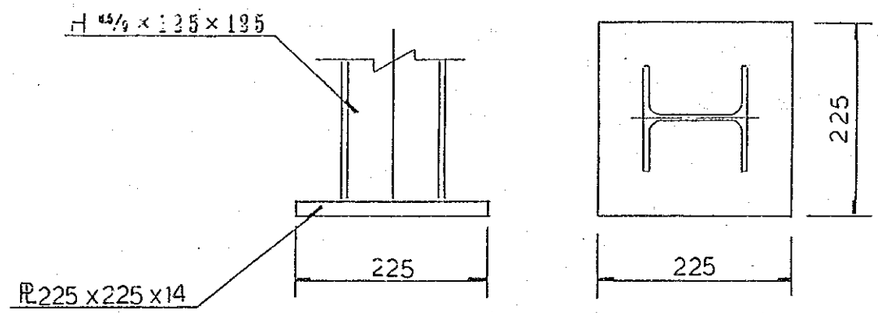
Drift : type II



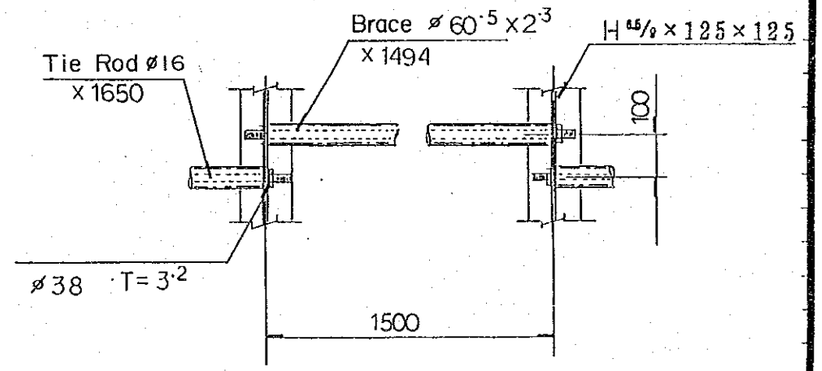
S=1/5



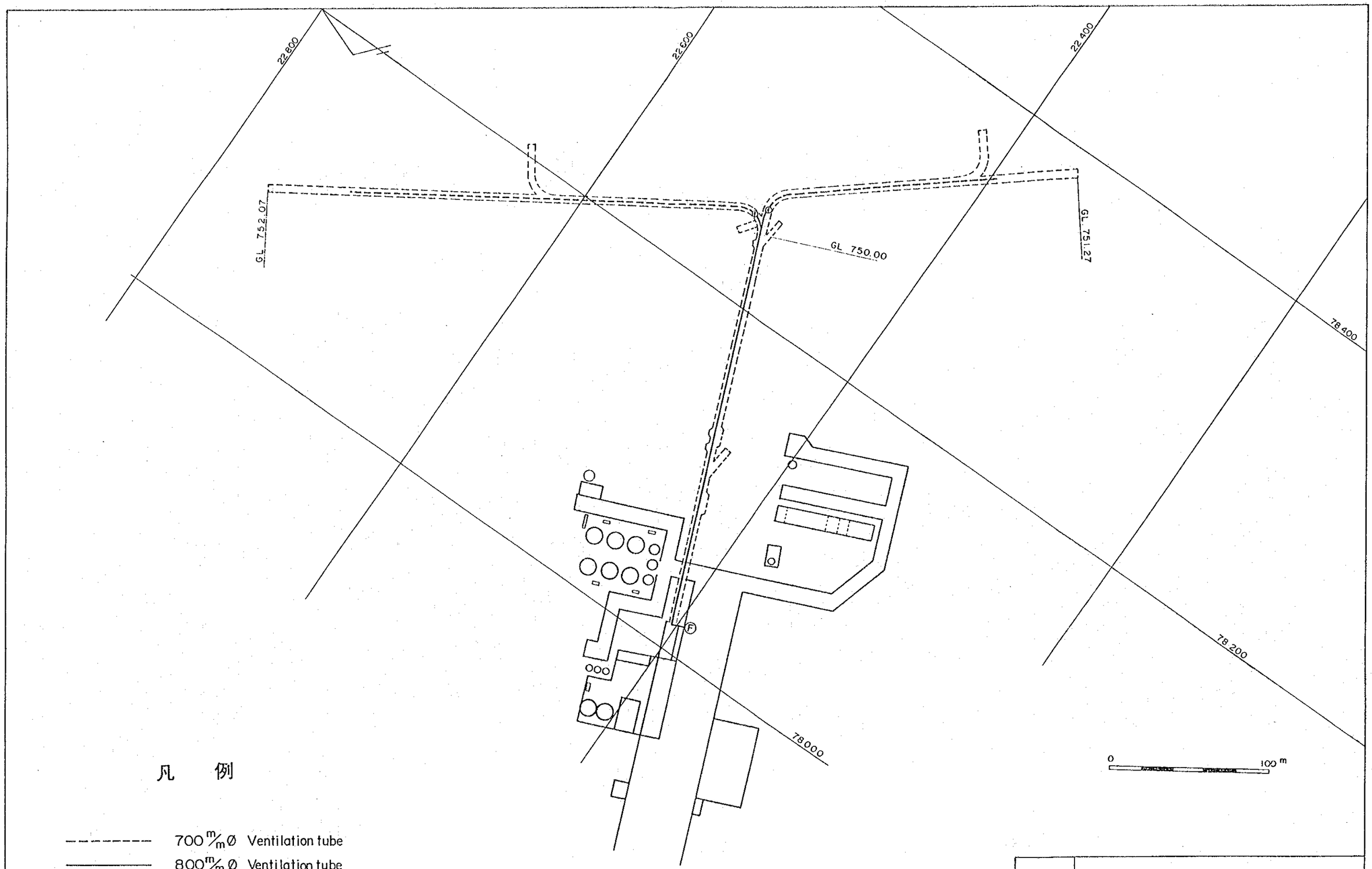
S=1/5



S=1/10



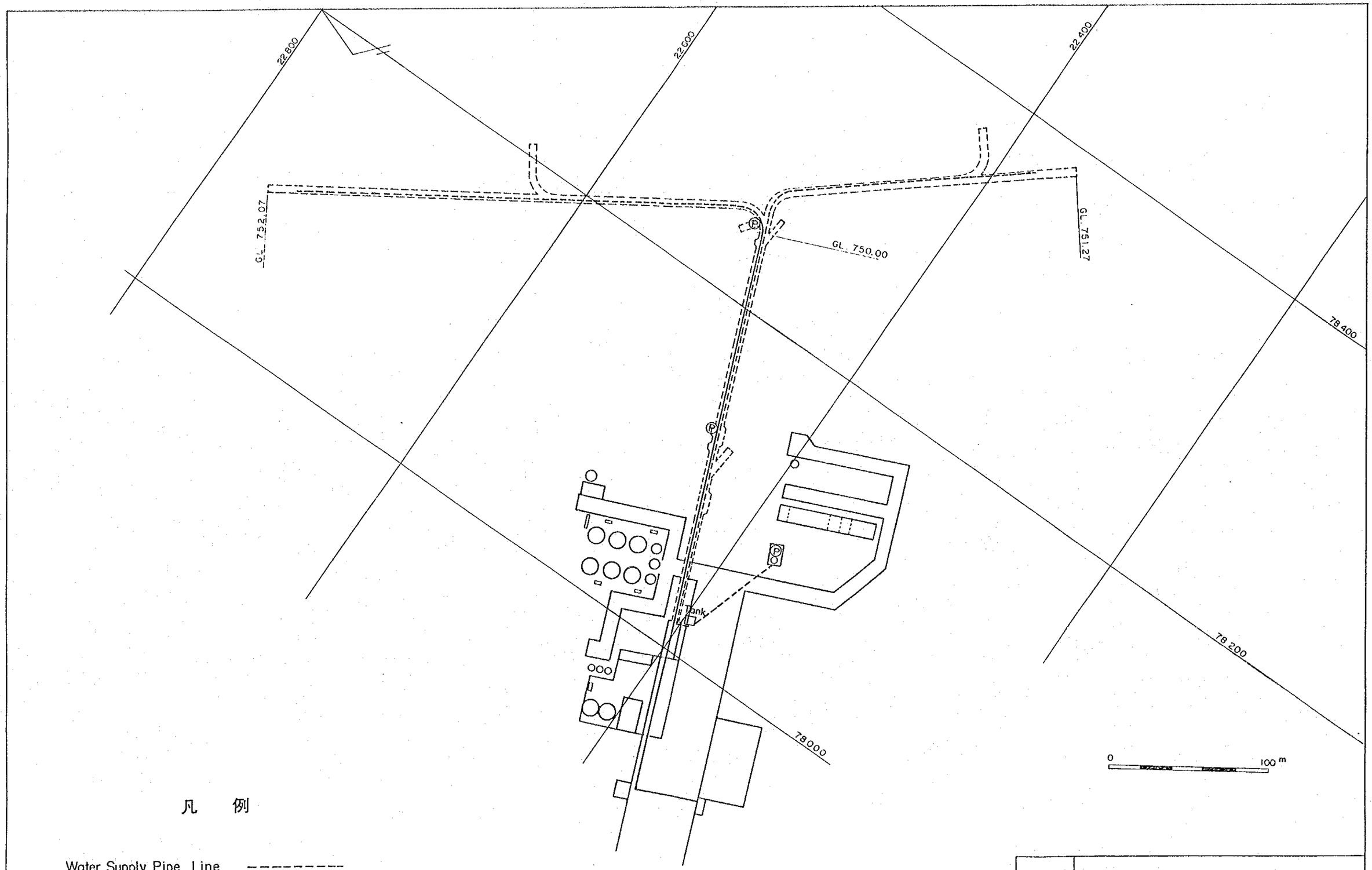
		0162	1	
	NO			



凡　例

- 700 m/m Ø Ventilation tube
- 800 m/m Ø Ventilation tube
- Ⓕ Main Fan
- ⓕ Local Fan

Fig. 17	Ventilation Plan		
Scale	1/1500	Date	1992.
Drawing - No			

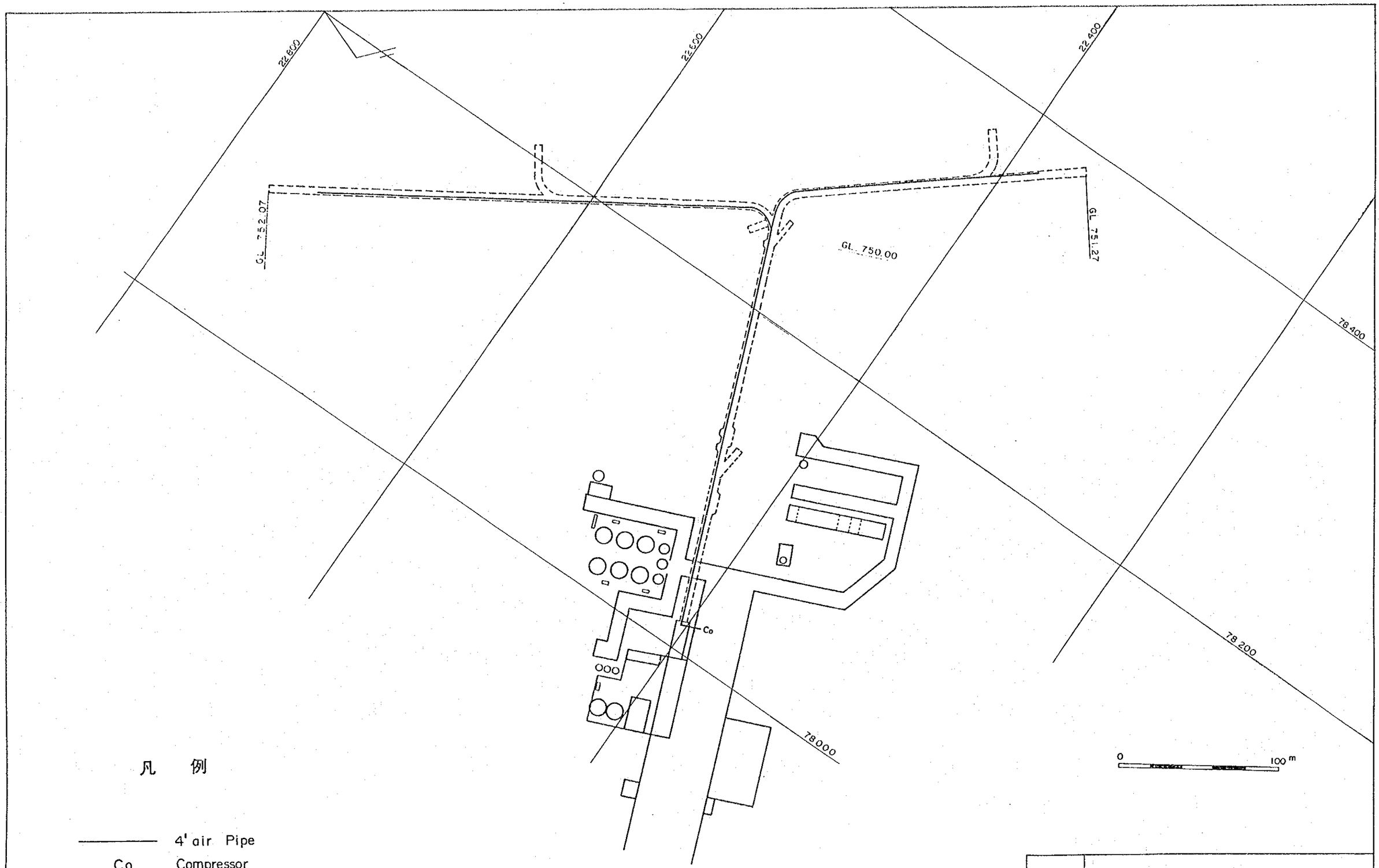


凡　例

Water Supply Pipe Line ----------

Drainage Pipe Line ——————

Fig. 18	Water Supply & Draimage Piping Plan		
Scale	1/1500	Date	1992.
Drawing - No			

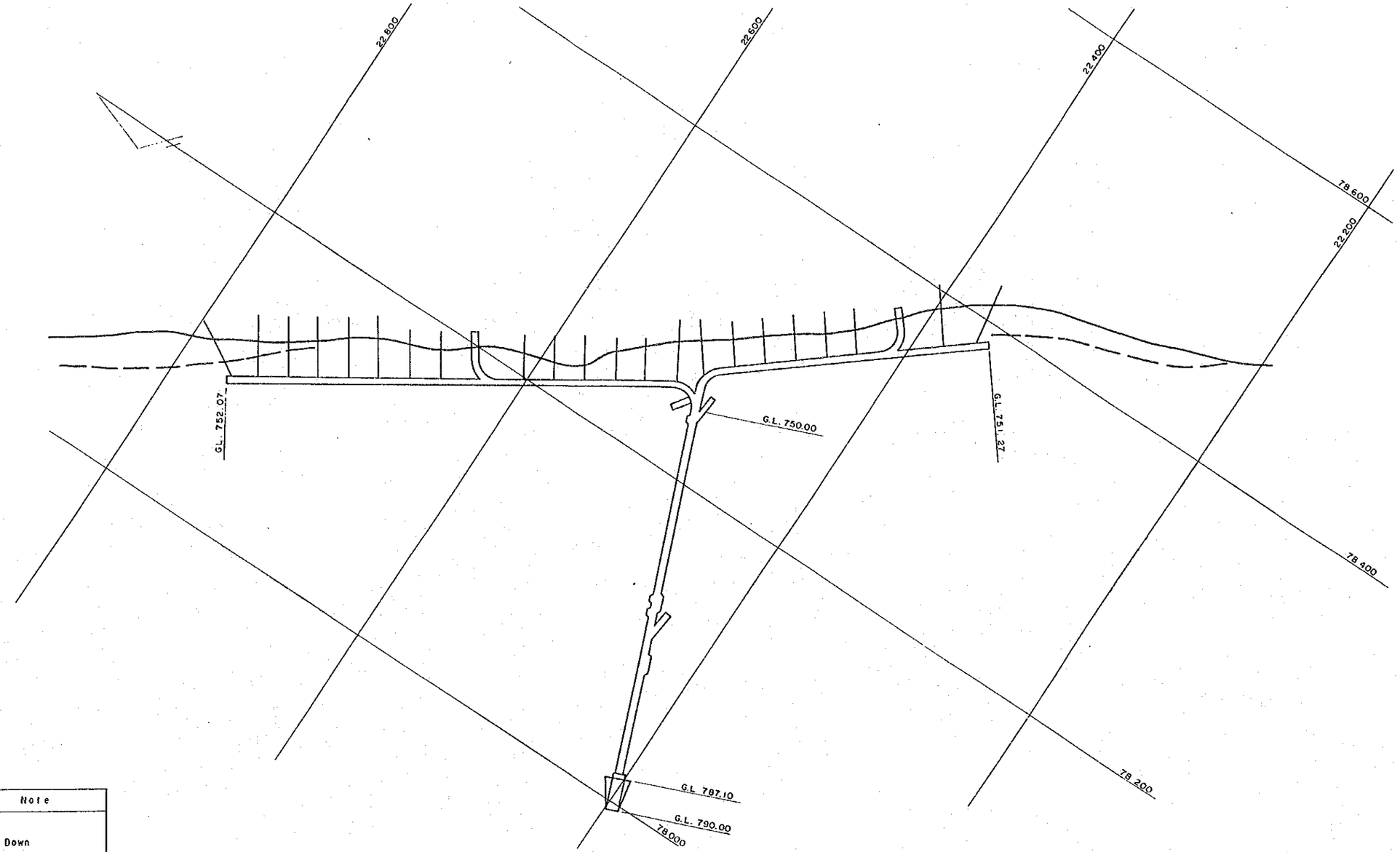


凡　例

——— 4' air Pipe

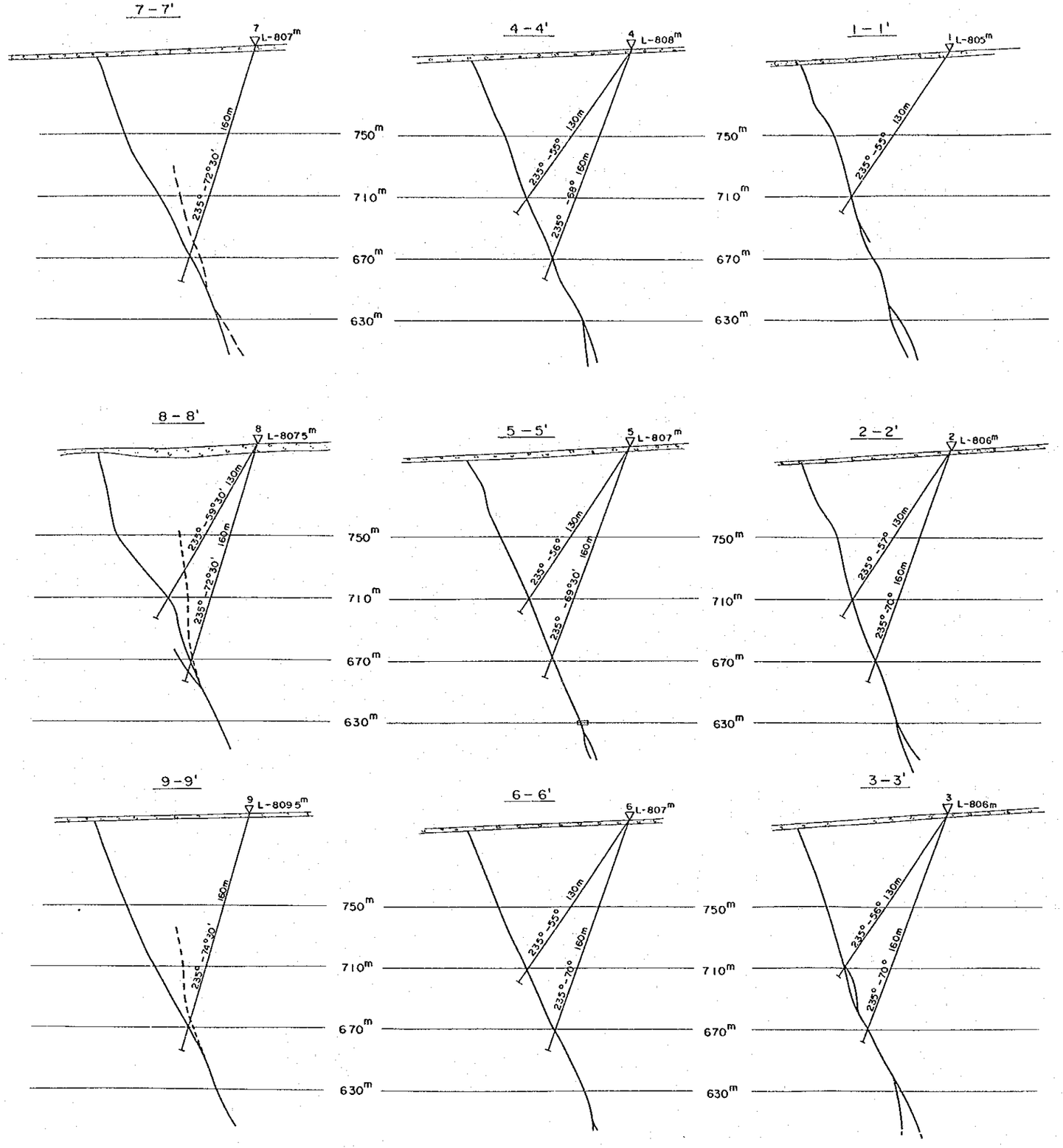
Co Compressor

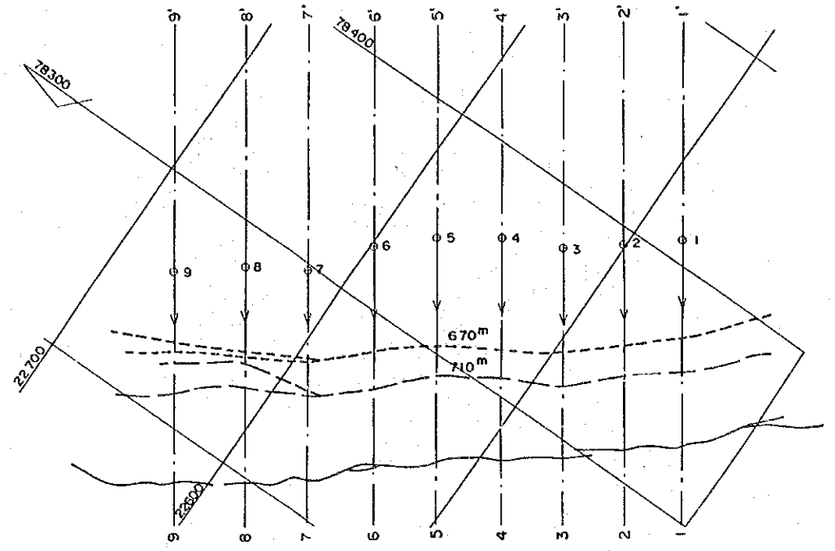
Fig. 19	Compressed Air Piping Plan		
Scale	1/1500	Date	1992.
Drawing - No			



Boring	Quantity	Note
Level -100m, -140m	2,190 m (15 pie) 130m x 7Pie 160 x 8	Down
Level - 60m	760m (22 pie) 40m x 10pie 30 x12	Horizontal

Fig.20.1	Drilling Plan Underground		
Scale	1/2000	Date	1992.
Drawing- No.			





1 : 2,000

0 100m

Fig.202	Drilling plan (Surface)		
Scale	1/2 000	Date	1992.
Drawing -No			


76|500
77|000
77|500
78|000
78|500
79|000
79|500
80|000
80|500
PR₂S
J₂-₃Z
γPZ₁
γπ3J3
δνξ1J3
γδ2J3
μνJ3
πJ2-3Z
PIII-15
PIII-14

78 000 | 78 500 | 79 000 | 79 500 | 80 000 | 80 500 | 81 000

25 000 | 24 500 | 24 000 | 23 500 | 23 000 | 22 500

LEGEND

- Quarternary
- Middle ~ Upper Jurassic
- Upper Proterozoic

Intrusive Rocks Upper Jurassic Complex

- Leucocratic Granite porphyry
- Granodiorite (Syenite ~ Diorite)
- Monzonidiorite Porphyrite
- Medium ~ Coarse grained Monzonidiorite

Early Pareozoic Complex

- Fine ~ Cryptocrystalline Biotite Granite

Dike Complex

- Granite Porphyry
- Syenite Porphyry
- Marginal facies : Syenite Porphyry to Andesitic basalt
- Monzonidiorite Porphyrite
- Microgabbro
- Middle ~ Late Jurassic : Andesite Porphyrite
- Marginal facies Andesitic Porphyrite
- Early Pareozoic Complex : Felsite Porphyry, Quartz Porphyry

Lithologic-Petrograpbic Legends

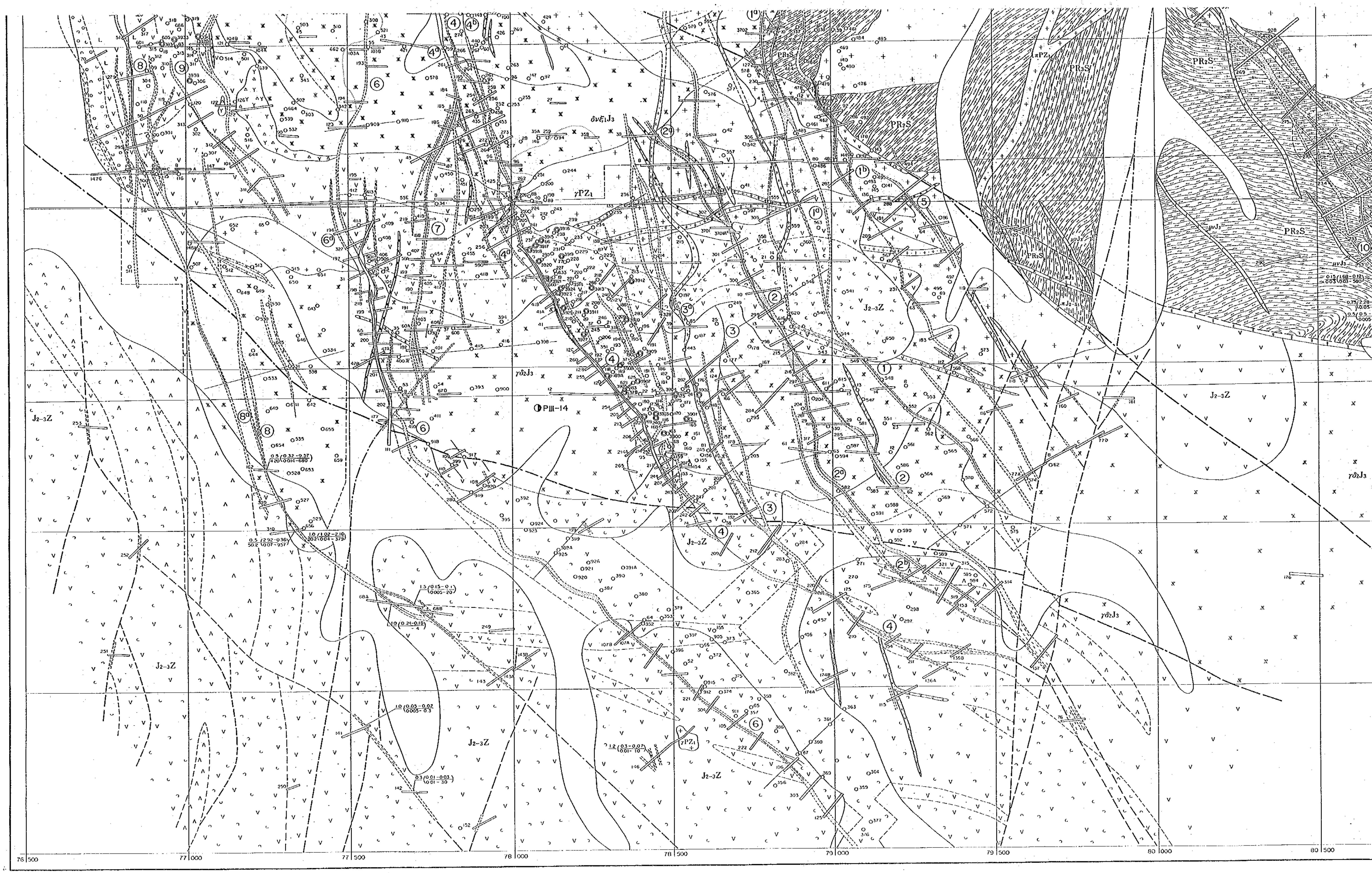
- Rhyolite
- Dacite
- Andesite
- Andesite ~ Basalt
- Tuff lava and Andesitic Clastics
- Tuff lava and Rhyolitic Clostics
- Tuffaceous Sedimentary Rocks
- Granite ~ Gneiss
- Gneiss
- Shist with Quartzite and Sandstone
- Granite Porphyry
- Granodiorite (Syenite ~ Diorite)
- Monzonidiorite
- Monzonidioritic Porphyrite
- Granite

Tectoric Symbols

- Fault : Confirmed(1), Inferred(2) and Inferred in Quarternary (3)
- Sheared zone and Mylonitized zone
- Beresitized zone
- Quaitz - Carbonate Vein

Other Symbols

- Trench
- Mining Shaft and its Number
- Drilling Site



PR2S
γPZ1
J2-3Z
γδ2J3
PIII-14
76 500
77 000
77 500
78 000
78 500
79 000
79 500
80 000
80 500

- Rhyolite
- Dacite
- Andesite
- Andesite~Basalt
- Tuff lava and Andesitic Clastics
- Tuff lava and Rhyolitic Clastics
- Tuffaceous Sedimentary Rocks
- Granite~Gneiss
- Gneiss
- Shist with Quartzite and Sandstone
- Granite Porphyry
- Granodiorite (Syenite~Diorite)
- Monzonidiorite
- Monzonidioritic Porphyrite
- Granite

Tectoric Symbols

- Fault : Confirmed(1), Inferred(2) and Inferred in Quarternary (3)
- Sheared zone and Mylonitized zone
- Bercsitized zone
- Quaitz-Carbonate Vein

Other Symbols

- Trench
- Mining Shaft and its Number
- Drilling Site
- ④ Name of the Vein
- 0.15/1.68-0.12 / 25.68·0.03-583 Thickness (Pb %, Zn % / Cu %, Ag %)
- The area showing basement geology beneath the Quarternary formation

Fig. I	Geological Map of the Tsav Mining Area		
Scala	1/5000	Date	1992.
Drawing-No.			

N

78 800

78 400

78 200

78000

23000

22800

22600

22400

22200

22 200

Section 4-3

Section 4-5A

Section 4-8

O PⅢ-14

Legend

++ Leucoclatic Granite-porphyry

\+ Fine~Coarse grained Biotite Granite

v Andesitic Pyroclastics and Lava

x Granodiorite (Syanite~Diorite)

Vein

Fig. 2	**Geological Map of No.4 Vein**		
Scale	1/2000	Date	1992. .
Drawing-No.			