(3) Study on allowable bearing capacity of the soil at PHU MY

In the case of utilizing spread foundation, the contact pressure of underlying foundation must not exceed the allowable bearing capacity of the soil.

The allowable bearing capacity of the soil is calculated by the following formula;

$$q_a = 1/3\ (\alpha C N_c + \beta \gamma_1 B N_r + \gamma_2 D_f N_q)$$

where, q_a : Allowable bearing capacity of soil (t/ m^2)
C : Cohesion of soil (t/ m^2)
γ_1 : Unit weight of soil below foundation bottom (t/ m^3)
γ_2 : Unit weight of soil above foundation bottom (t/ m^3)
α, β : Shape factors of foundation as given in Table V-5-1
Nc,Nr,Nq : Bearing capacity factor as given in Table V-5-2
D_f : Depth of foundation in underground (m)
B : Shorter side length of foundation (m)
L : Longer side length of foundation (m)

Table V-5-1 Shape Factors for Foundation

Shape factor	Continuous	Square	Rectangular	Round
α	1.0	1.3	1.0+0.3B/L	1.3
β	0.5	0.4	0.5-0.1 B/L	0.3

Table V-5-2 Bearing Capacity Factors

Φ	Nc	Nr	Nq
0°	5.3	0	3.0
5°	5.3	0	3.4
10°	5.3	0	3.9
15°	6.5	1.2	4.7
20°	7.9	2.0	5.9
25°	9.9	3.3	7.6
28°	11.4	4.4	9.1
32°	20.9	10.6	16.1
36°	42.2	30.5	33.6
40°over	95.7	114.0	83.2

(Φ:Angle of internal friction)

Table V-5-3 shows the design value of the condition of calculation at PHU MY

Table V-5-3 Condition of Calculation at PHU MY

Shape of foundation B×L	5 m×10 m	
Depth of foundation in ground Df	3 m	
Cohesion of soil C	8 t/ m^2	by soil testing data
Unit weight of soil below foundation γ 1	0.95 t/ m^3	by soil testing data
Unit weight of soil above foundation γ 2	1.95 t/ m^3	by soil testing data
Shape factors of foundation α	1.15	
Shape factors of foundation β	0.45	
Bearing capacity factor Nc	5.3	
Bearing capacity factor Nr	0.0	
Bearing capacity factor Nq	3.0	

Result of the calculation

Allowable bearing capacity q a = 22. 1 t/ m^2.

The soil condition at PHU MY has enough bearing capacity because the above-mentioned contact pressure (p) of spread foundation is estimated as 5 t/ m^2 to 15 t/ m^2.

Allowable bearing capacity q a > Contact pressure of spread foundation p

(4) Study on the floor level of the new cold rolling mill complex

In general, the determination of the floor level needs to consider the following items ;

1) Floor level should be set higher than circumference ground level to prevent the rainfall water flowing into the underground structure of the plant.
2) Floor level should not be an obstacle for transportation. The access road from circumference road to the plant should be designed with gentle slopes to ensure smooth transportation.
3) Earth volume of excavation should be considered elaborately for the civil works. Therefore, the floor level and circumference grand level should be determined to minimize the surplus soil.

According to the site survey, the ground level at the center of the candidate site is reckoned as 7.0 m above the sea level. A slight slope is observed from north to south in the site. North ground level is 7.6 m, and south one is 6.0 m. The south and west sides are facing a road, the level of which is planned, in Industrial Zones Authority, at the same level with the circumference ground level. The drainage equipment is also planned under the road.

In this F/S, the floor level and circumference ground level can be determined simply by calculating the earth volume because the site condition is fairy good with regard to the existing

ground level and drainage equipment.
Consequently, altitude from 7.5 m to 7.8 m is recommended as the floor level of the new cold rolling mill complex. Similarly, the circumference ground level should be set at approximately 7.0 m to 7.3m.

5.1.3 Rough Estimation of Quantity for Civil Work

Table V-5-4 shows the rough estimation of quantity for civil work for the new cold rolling mill complex.

Table V-5-4 Rough Estimation of Quantity for Civil Work

	Concrete Vol.	Pile	Others
PPPL YARD	6,500 m^3	–	Floor Concrete 1,800 m^2
RCM・R/S YARD	8,900 m^3	–	Floor Concrete 2,500 m^2
ECL・SHIPPING YARD	5,400 m^3	–	Floor Concrete 7,600 m^2
RCL・SHIPPING YARD	2,500 m^3	–	Floor Concrete 5,100 m^2
CCU/BAF・ SHIPPING YARD	5,900 m^3	–	Floor Concrete 5,400 m^2
HOT COIL YARD	1,500 m^3	–	
WATER TREATMENT	3,900 m^3	–	
ROAD AND EXTERIOR WORK	500 m^3	–	Road Pavement 12,000 m^2
Total	35,100 m^3	–	

5.2 Structural Specifications of Buildings

5.2.1 Structural Type

Generally, in case of the size of the cold rolling mill complex in consideration, the structural type is chosen between steel structure and reinforced concrete structure (RC structure). Steel structure is strongly recommended for this cold rolling mill complex, taking into consideration the structural characteristic, to secure the quality and to shorten the construction term. The reasons for choosing the steel structure are explained in detail below.

(1) It is necessary to build a long span (span: 25 m~30 m) at the main building. Steel structure is more suitable than RC structure because of its light weight and high strength.

(2) The main building must support a huge crane load. In case of using the steel structure, structural members can be designed comparatively compact. Consequently, the degree of freedom is increased for the factory layout. (For example: the utility piping can get through main latticed column)

(3) The steel structure is suitable to shorten construction term due to its prefabrication in a factory. Furthermore, the quality of steel structure can be controlled more easily and confidently in prefabrication process than RC structure constructed at the site.

(4) Factory buildings may be frequently extended and re-constructed in the future. Steel structures can be rebuilt easily by cut and weld.

On the other hand, sub buildings are planned either by steel structure or RC structure, corresponding to each structural characteristics as follows:

(5) Sub buildings adjacent to the main building should be constructed by steel structure because of intimate relationship with the main buildings with regard to the construction area and terms.

(6) Independent sub buildings (Power station, Compressor room, Water treatment EER, Offices and Canteen) are to be planned as RC structure because of the small impacts on the critical schedule of the main construction.

5.2.2 Structural Planning

(1) The pitch of main column erection is basically set to 10 m, the best length to save the steel quantity for building the size of this scale of construction. When the location of main column is interrupted with the operation of transportation cars, the column pitch should be extended to 20 m.

(2) Expansion joints are to be attached on the corner of right-angle building connection to set free the deflection caused by heat load.

(3) Sub buildings equipped with the electrical panels are to be planned as independent structure to prevent the transmission of vibration from crane operations in the main building.

5.2.3 Roofing and Siding

(1) Roofing and siding for steel structure

Colored galvanized steel sheet is chosen for the materials for roofing and siding. They have the merits of shortening the construction schedule, keeping high structural quality and having the constructional reliability based on numerous factory constructions.

1) Colored galvanized steel sheet deck roofing is strongly recommended as roofing material due to the following reasons:
   ① This roofing material is so light that the design dead load can be reduced in design procedure. Therefore, the structural members can be designed economically.
   ② Especially in four parallel-linked buildings, three valley gutters between each roofing cause rain leaking frequently. A large size roofing is therefore applied to cover all four buildings and to erase the valley gutters. In that case, use of high deck-plate as a roofing member can make the roof slope gentle enough to keep the roof height rather low.
   ③ The roofing procurable domestically in Viet Nam is not available for main building roof because the sectional height of the roofing as 40 mm is too short to meet the long rain flow length of main building.
2) Colored galvanized steel sheet siding is chosen as the best siding material because of the following reasons:
   ① In the case of using brick wall popular in Vietnam, it is feared that the crack is raised on the wall by the vibration of crane operation.
   ② Colored galvanized steel sheet siding has been widely used for factory construction and has sufficient flexibility for such mechanical vibration as the crane operation.
   ③ Lighting sidings are to be installed on the upper side of the wall to get the natural lighting.

(2) Roofing and siding for RC structure

1) Sheet proofing work is planned on concrete roofing.
2) Siding wall is made of brick with mortar and painting works.

5.2.4 Ventilation Equipment

(1) PPPL Yard, RCM Yard, CCU/BAF Yard and ECL Yard are exposed to large heat load and gas fume caused by the product machines. The ventilation equipment should be installed to keep a guaranteed temperature (generally 45℃ at crane height level) for crane electrical panels and to exhaust the gas fume.

(2) Ventilation system should be the natural ventilation one without any running cost.

5.2.5 Air Conditioning Equipment

(1) Because electrical control panels can be damaged with high temperature, air conditioning equipment needs to be installed in EER equipped with these panels. Air conditioning facilities are to be installed in plural in each EER for the back-up purpose in case one of them gets down.

(2) Air conditioning equipment is to be installed in each operation room to keep the environment comfortable.

5.2.6 Drawing of Building Planning

Following figures show the building planning for the new cold rolling mill complex.

(1) Fig. V-5-7 : General Plan of Building
(2) Fig. V-5-8 : Roof Plan
(3) Fig. V-5-9 : Elevation Plan
(4) Fig. V-5-10 : Structural Plan
(5) Fig. V-5-11 : Detailed Section Plan

5.2.7 Rough Estimation of Quantity for Building Work

Table V-5-5 shows the rough estimation of quantity for building work for the new cold rolling mill complex.

Table V-5-5 Rough Estimation of Quantity for Building Work

MAIN BUILDING	Column No.		WIDTH (m)	LENGTH (m)	FLOOR AREA (m^2)	EAVES HIGHT (m)	STEEL (TON)
	E-W	N-S					
HOT COIL YARD1	1-4	B-O	30.0	100.0	3,000	15.0	150
HOT COIL YARD2	4-7	B-O	30.0	100.0	3,000	15.0	150
PPPL YARD	1-13	A-B	25.0	125.0	3,125	13.0	310
RCM YARD/ROLL SHOP	13-14	A-R	35.0	145.0	5,075	15.0	510
CCU/BAF YARD	14-19	C-G	30.0	55.0	1,650	23.0	250
SHIPPING YARD	19-36	C-G	30.0	170.0	5,100	15.0	510
SHIPPING YARD	14-36	G-J	25.0	225.0	5,625	15.0	560
ECL/PACKING/SHIPPING YARD	14-36	J-M	25.0	225.0	5,625	15.0	560
SHIPPING YARD	24-36	M-Q	30.0	120.0	3,600	15.0	360
TOTAL	-	-	-	-	35,800	-	3,360

SUB BUILDING	FLOOR AREA (m^2)	REMARK
EER and Operation Room (Steel structure)	4,621	
Power Station etc. (RC structure)	1,350	
Office and Canteen	4,400	
TOTAL	10,371	

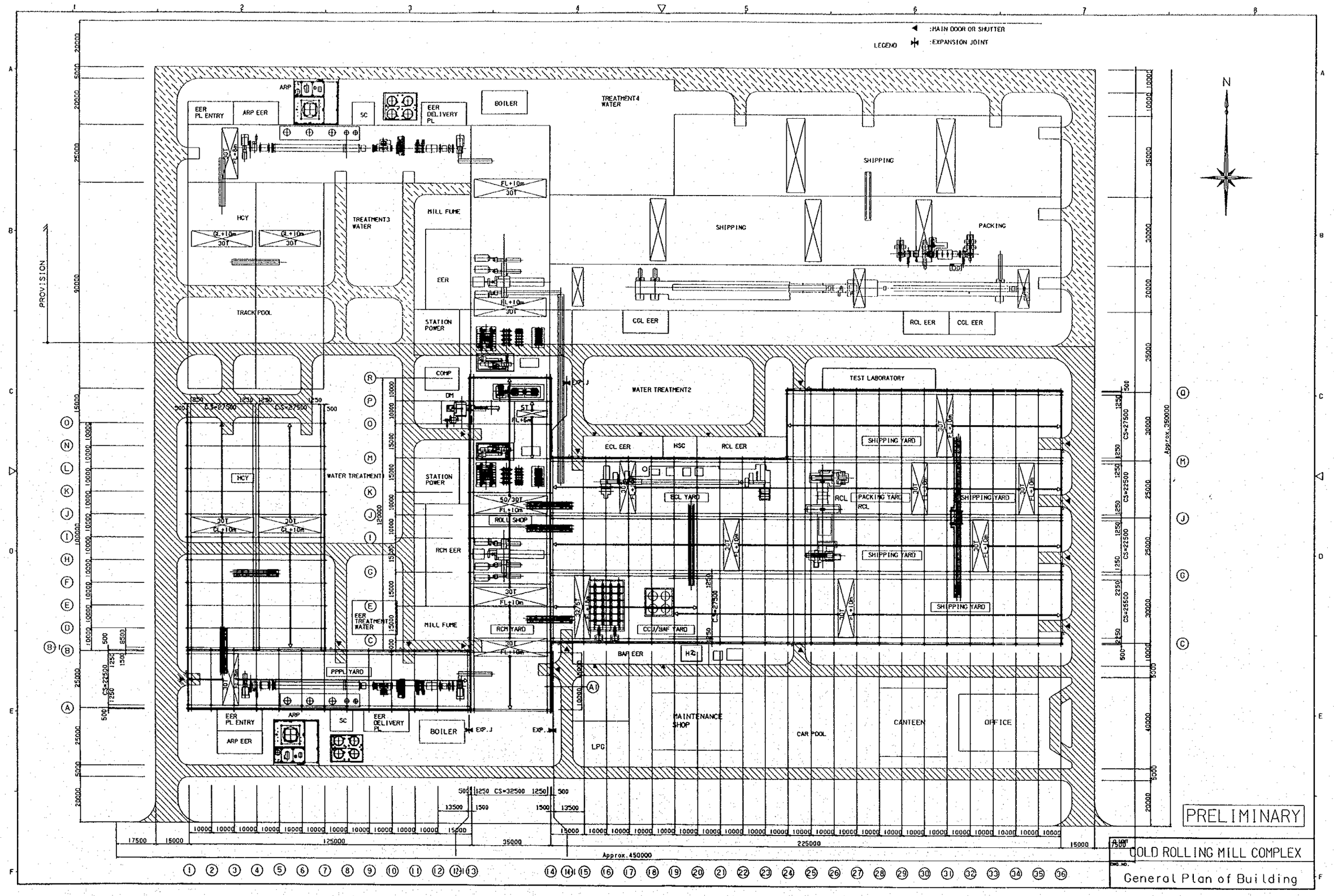


Fig.V-5-7 General Plan of Building

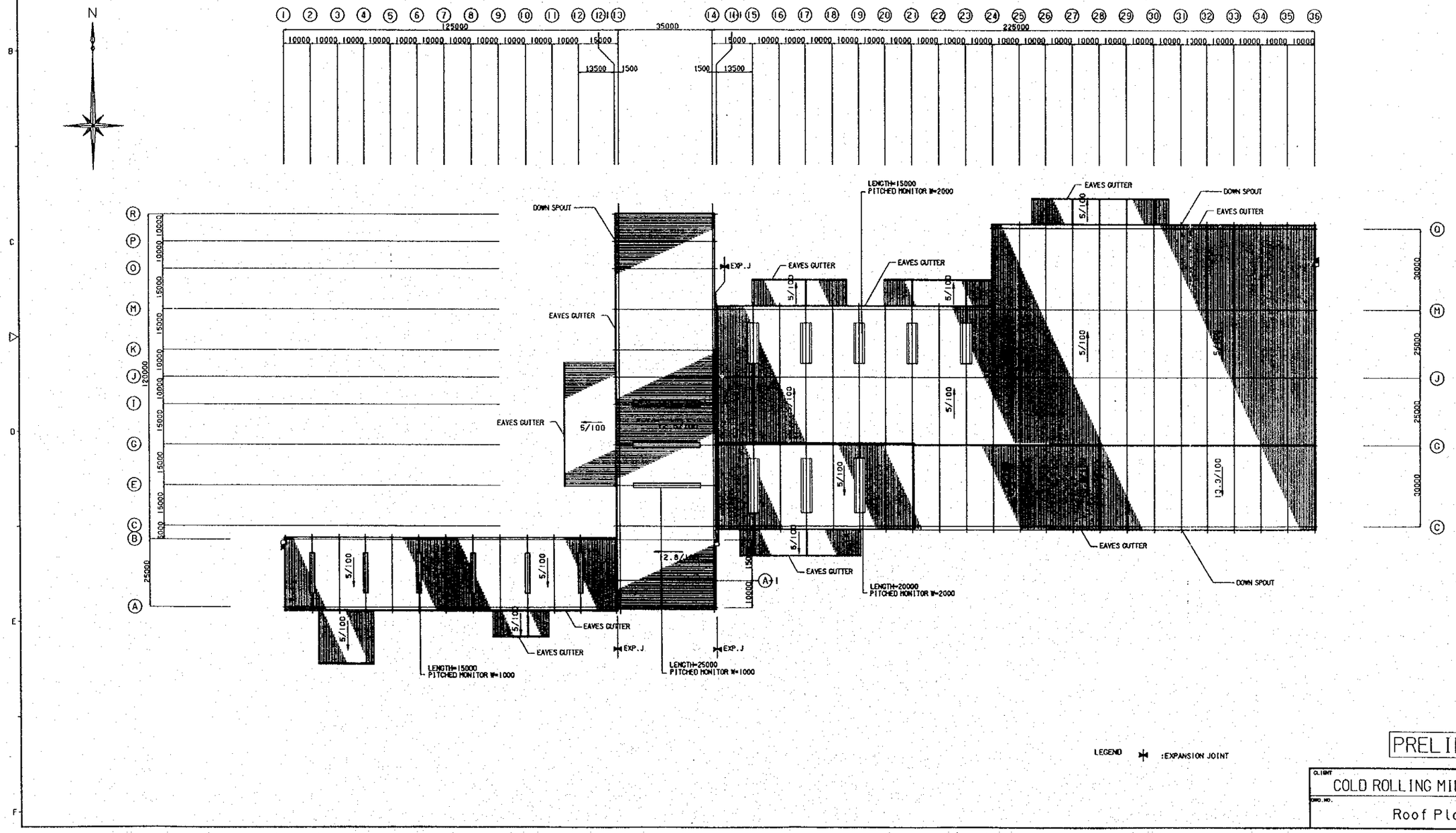
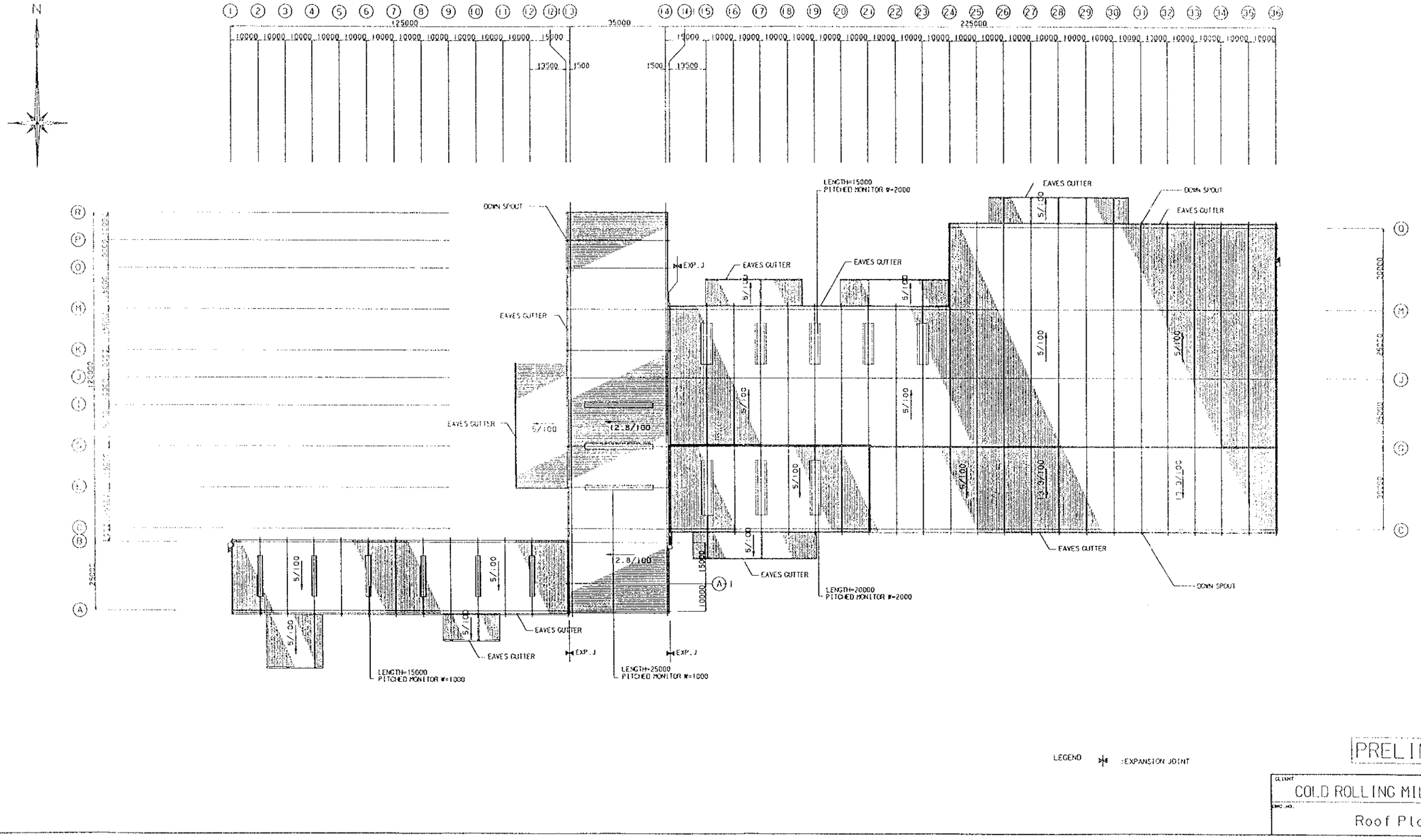


Fig. V-5-8 Roof Plan

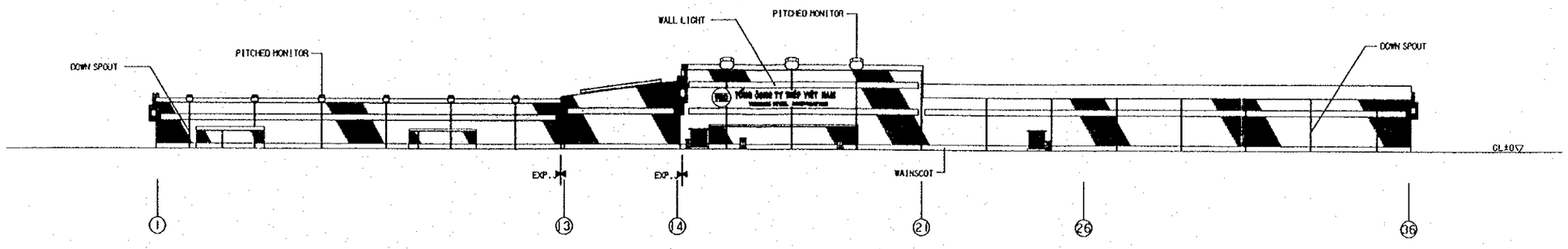


PRELIMINARY

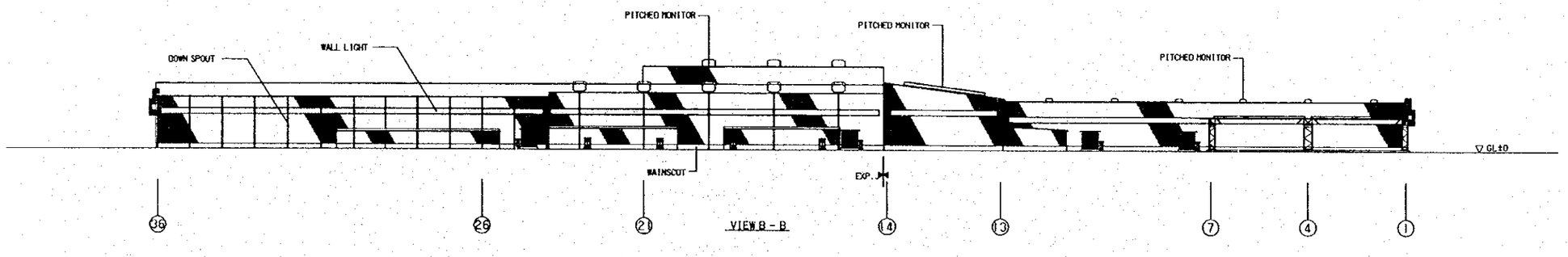
CLIENT: COLD ROLLING MILL COMPLEX

DWG NO.: Roof Plan

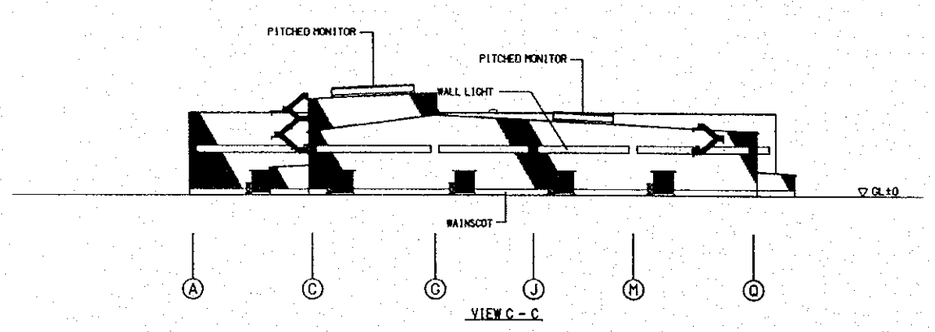
Fig. V-5-8 Roof Plan



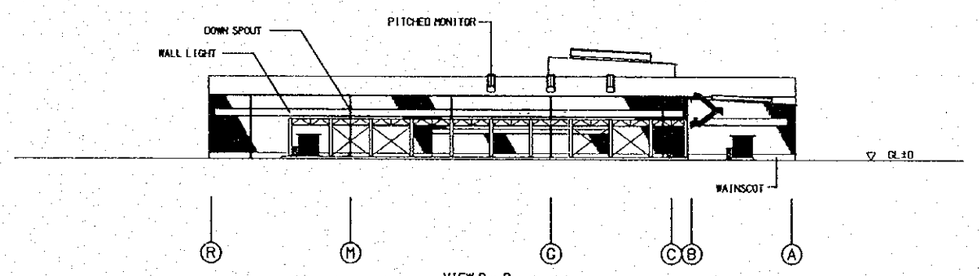
VIEW A - A



VIEW B - B

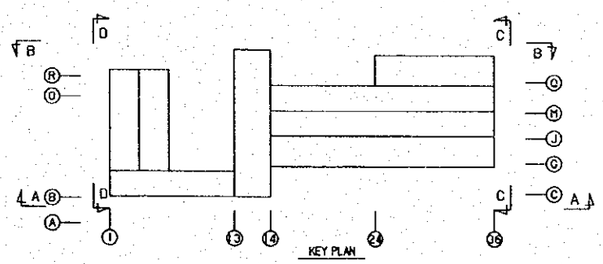


VIEW C - C



VIEW D - D

LEGEND :EXPANSION JOINT

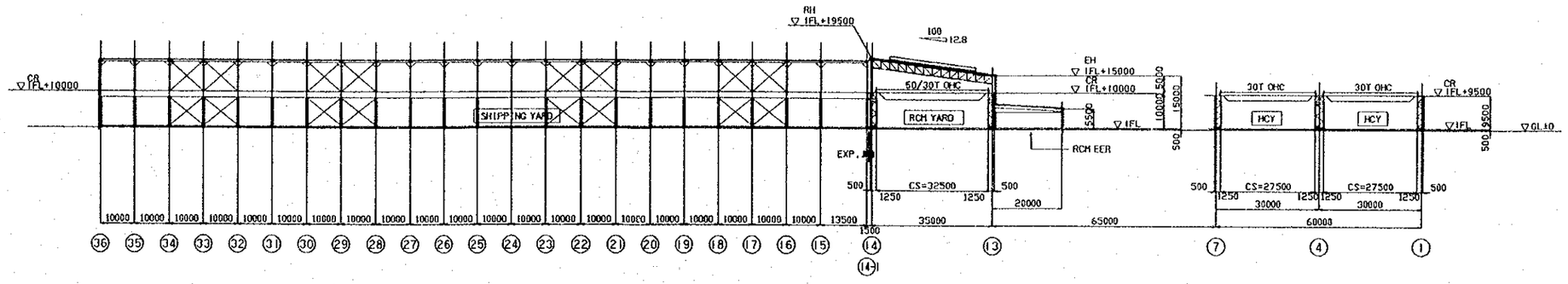


PRELIMINARY

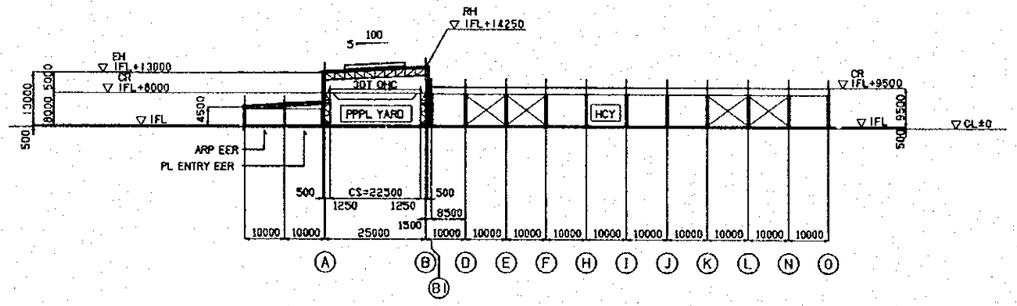
CLIENT
COLD ROLLING MILL COMPLEX

DWG. NO.
Elevation Plan

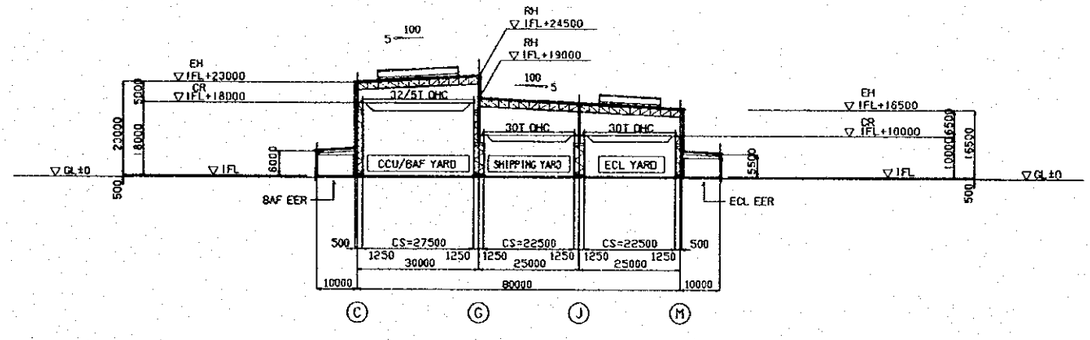
Fig. V-5-9 Elevation Plan



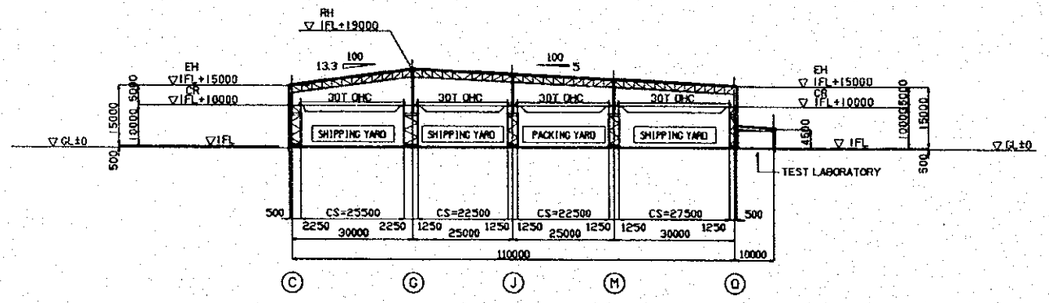
SECTION A - A



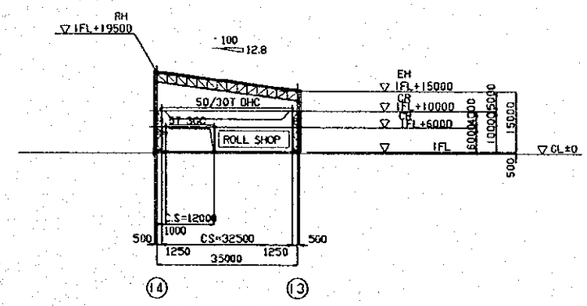
SECTION B - B



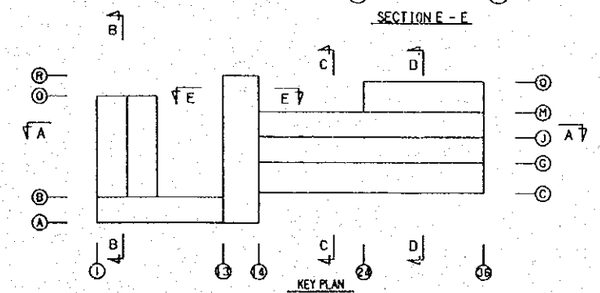
SECTION C - C



SECTION D - D



SECTION E - E



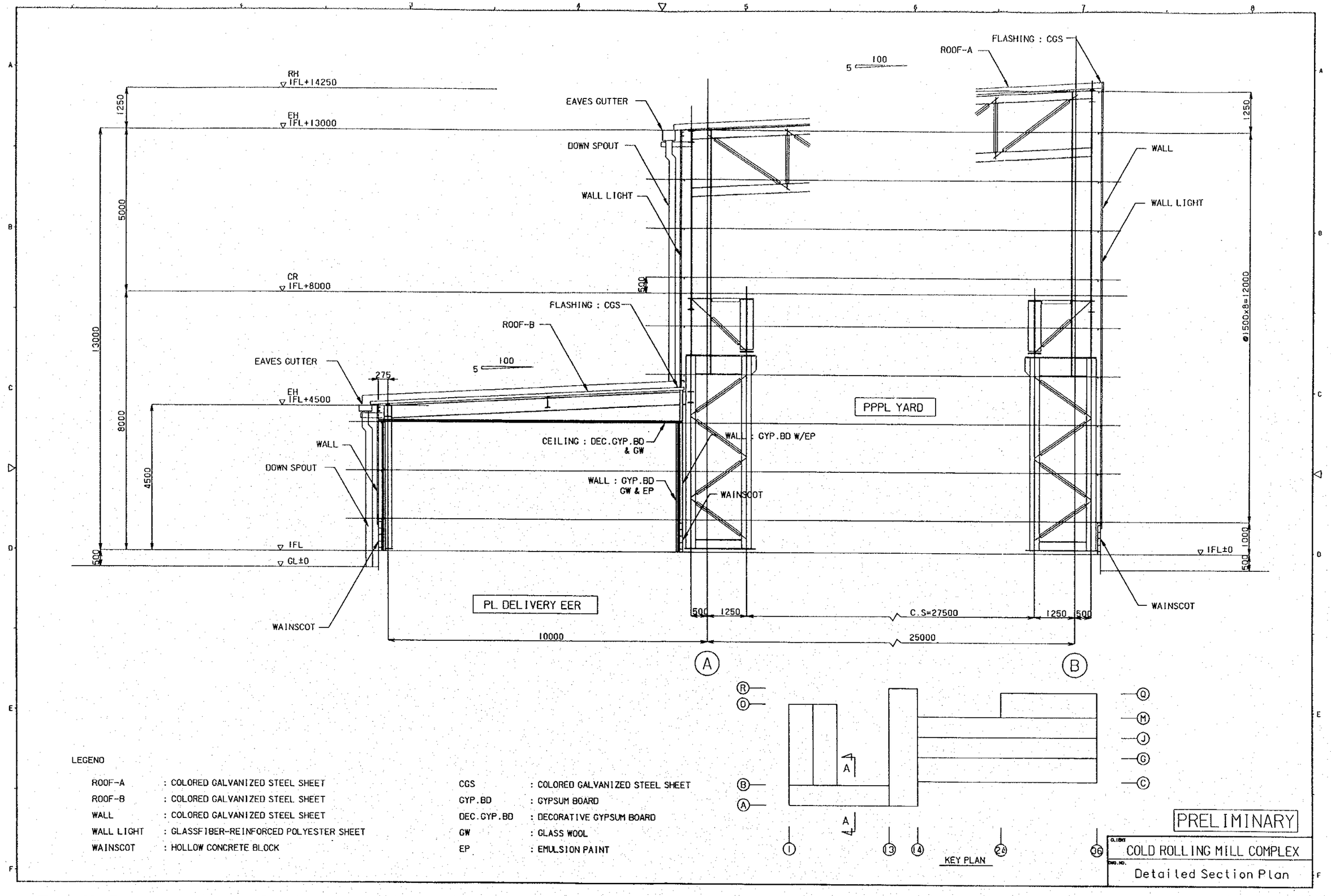
LEGEND : EXPANSION JOINT

PRELIMINARY

CLIENT
COLD ROLLING MILL COMPLEX

DWG. NO.
Structural Plan

Fig. V-5-10 Structural Plan



LEGENO

ROOF-A	: COLORED GALVANIZED STEEL SHEET	CGS	: COLORED GALVANIZED STEEL SHEET
ROOF-B	: COLORED GALVANIZED STEEL SHEET	GYP.BD	: GYPSUM BOARD
WALL	: COLORED GALVANIZED STEEL SHEET	DEC.GYP.BD	: DECORATIVE GYPSUM BOARD
WALL LIGHT	: GLASSFIBER-REINFORCED POLYESTER SHEET	GW	: GLASS WOOL
WAINSCOT	: HOLLOW CONCRETE BLOCK	EP	: EMULSION PAINT

PRELIMINARY

COLD ROLLING MILL COMPLEX

Detailed Section Plan

Fig.V-5-11 Detailed Section Plan

6. Conceptual Design of Infrastructure

6.1 Power Supply to the New CRM

(1) Design Basis

110 kV power from Phu My power plant will be received at the receiving station of CRM with overhead line and will be distributed to load of CRM

a) Basic specification of power distribution
- Receiving voltage : 110 kV ± 10%
- Maximum short circuit current : 40 kA
- Power supply capacity : 40 MVA or more
- Number of line : 1 line
- Type of distribution line : Over head line with steel tower and ACSR (Aluminum conductor steel reinforced) wire

b) Name and location of power supply substation for CRM
- 110 kV switch yard at Phu My power plant
- Approx. 2500 m from CRM

(2) Equipment consists of :

a) 110 kV switch gear with auxiliary equipment
- Number of set : 1 set
- Installed at 110 kV switch yard of Phu My power plant

b) Power distribution line
- Number of line : 1 line ,
- Length : 2500 m
- Route plan : Refer to Fig. V-6-3

6.2 Water Supply and Waste Water Discharge

6.2.1 Water Supply

(1) Design basis

Water for Phu My Industrial Zone (IZ) which supplied by Ba Ria Vung Tau water company through under ground pipe line will be provided to factories through internal underground network with water pump station boosting pressure to be 0.3Mpa. Outline of the network in the IZ is shown in the Fig. V-6-4.

The CRM receives the water from the network to use for make-up of circulated industrial water and general purpose. A take over point of CRM is shown in the Fig. V-6-4.

Water quality is mentioned in the Table VIII-3-5.

(2) Equipment consists of :

a) Piping with accessories 1 set
b) Metering device 1 set

6.2.2 Waste Water Drainage

(1) Design basis

Phu My IZ has two drainage networks laid under the side walk of the IZ. One is rain-water drainage and the other is waste water drainage. The outline of the networks are shown in Fig. V-6-5 and Fig. V-6-6, respectively. CRM should discharge separately both drainage to corresponding network. The take over point of these drainage of CRM is shown in the above figures.

Waste water from factories of the IZ subject to the discharging standard "C "will flow to final water treatment station through the network in gravity running and will be treated to meet discharge standard "B" of Viet Nam. The estimated water volume of waste water from CRM is approx. 60 m^3/h.

(2) Equipment consists of :

- Piping 1 set
- Accessories 1 set

6.3 Fuel

(1) Design basis

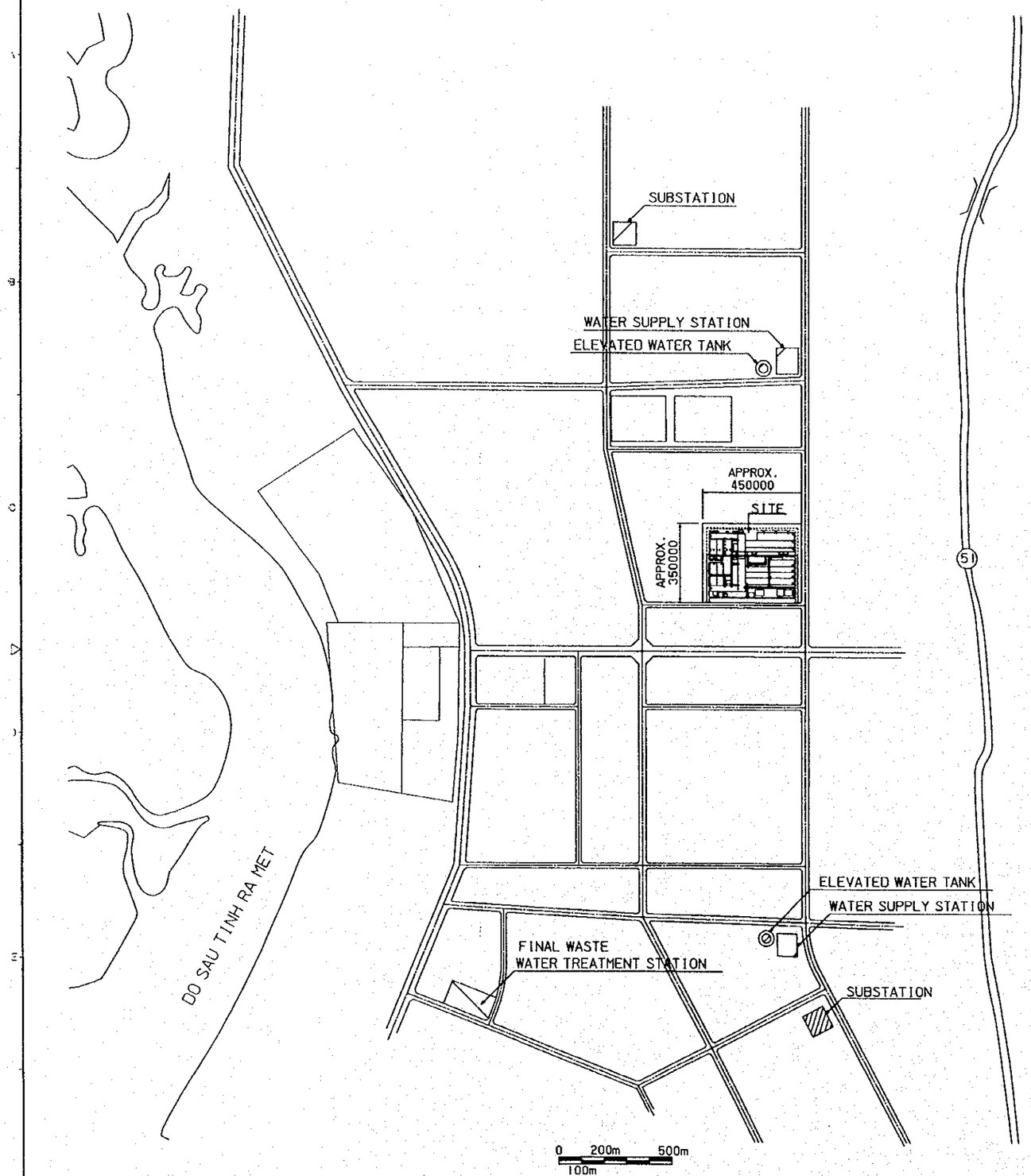
Fuel in CRM is used mainly for BAF, ARP and boiler. It is possible to use LPG, natural gas and heavy oil as fuel. In this project, LPG is adopted for fuel of BAF and APR , and heavy oil for boiler. Reasons are as follows:

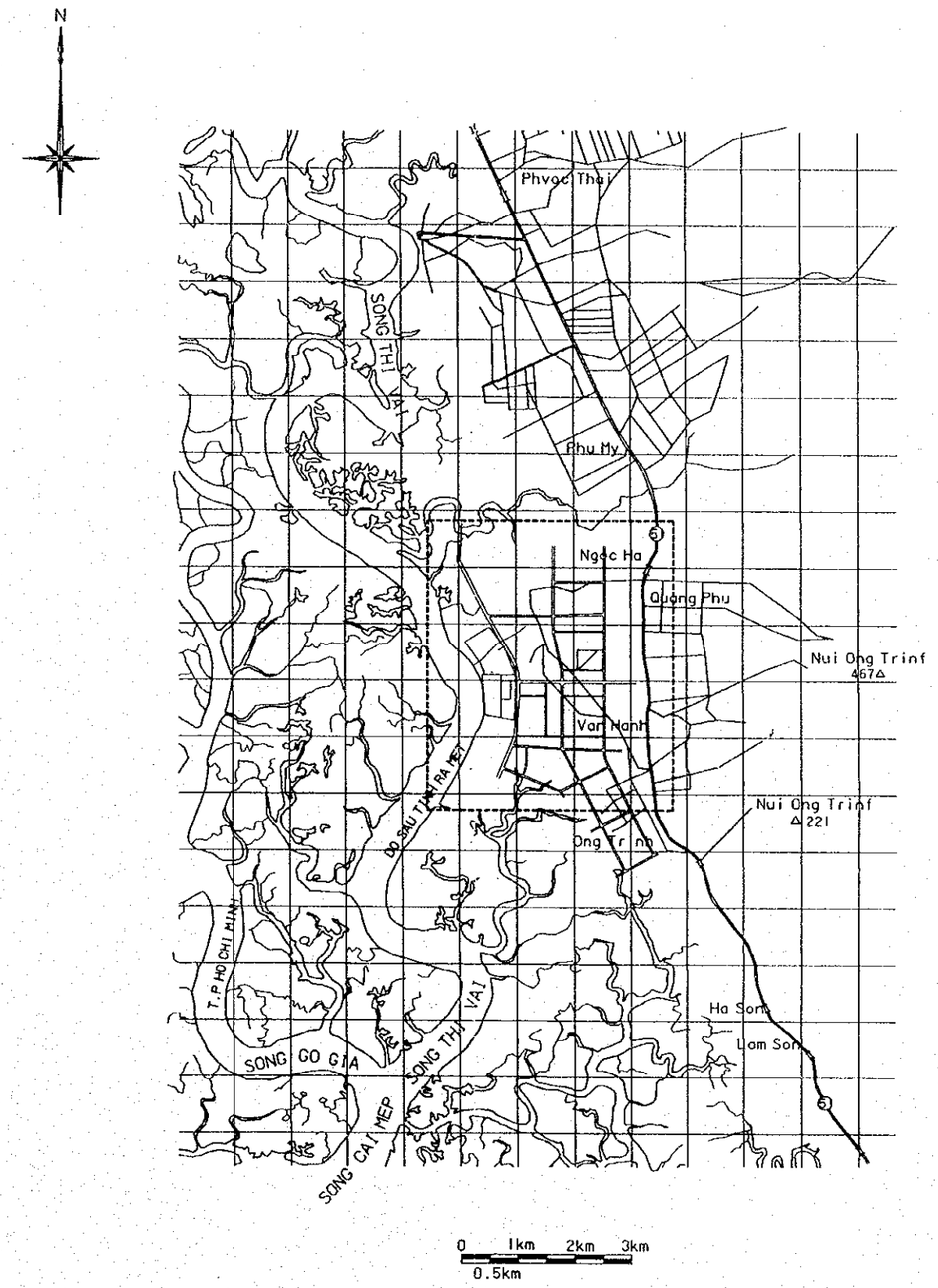
- LPG does not require any heavy investment for receiving equipment such as pipe line, compared with natural gas.
- Price of heavy oil is cheaper than that of LPG and natural gas, however it seems that the combustion of heavy oil affects the quality of products such as cold coil.

LPG and heavy oil will be procured in market by CRM itself and transported with tank truck.

(2) Equipment consists of:

- Storage equipment: 1 set





PRELIMINARY

CLIENT
COLD ROLLING MILL COMPLEX
DWG. NO.
Location and General Arrangement

Fig.V-6-1 Location and General Arrangement

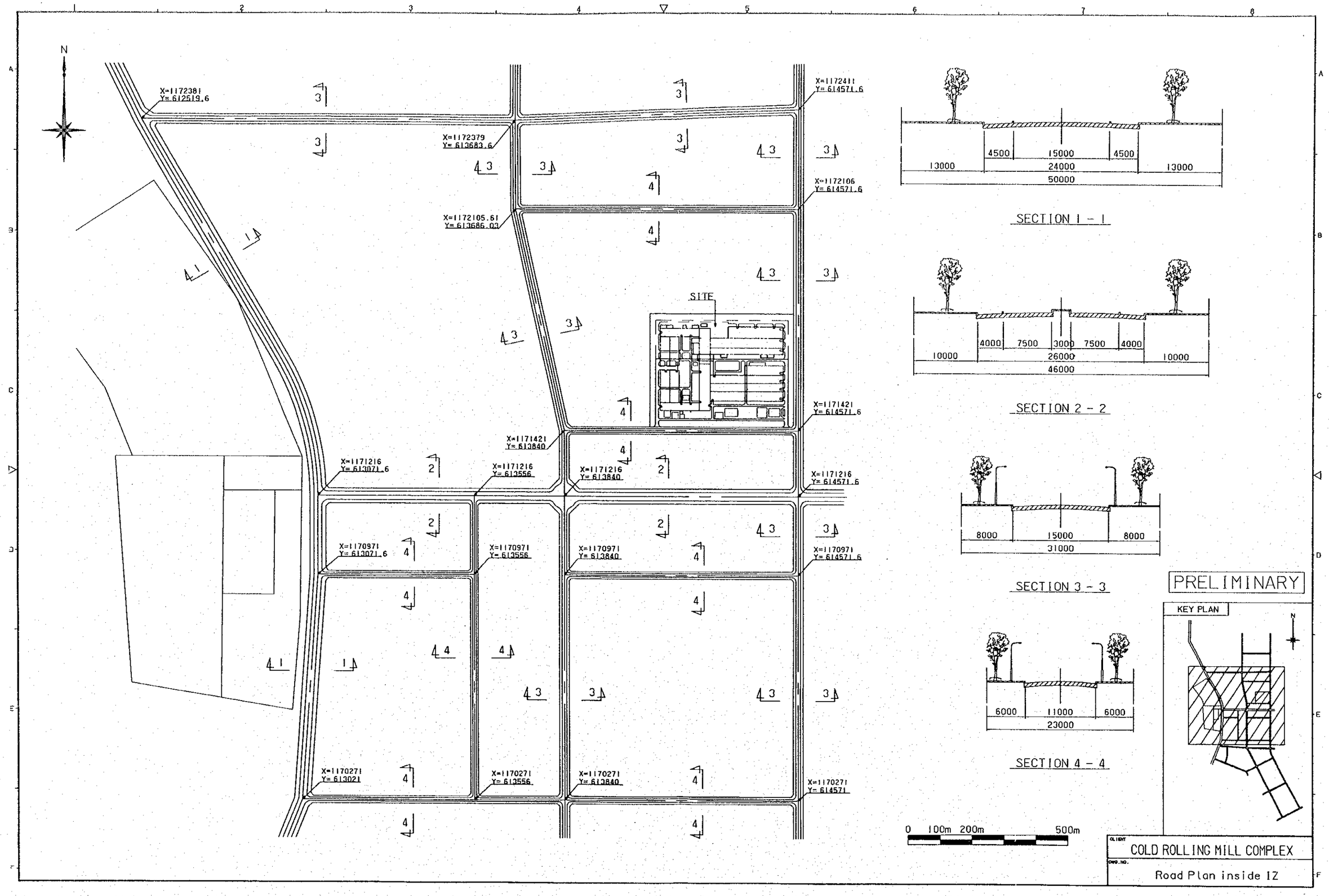


Fig.V-6-2 Road Plan inside IZ

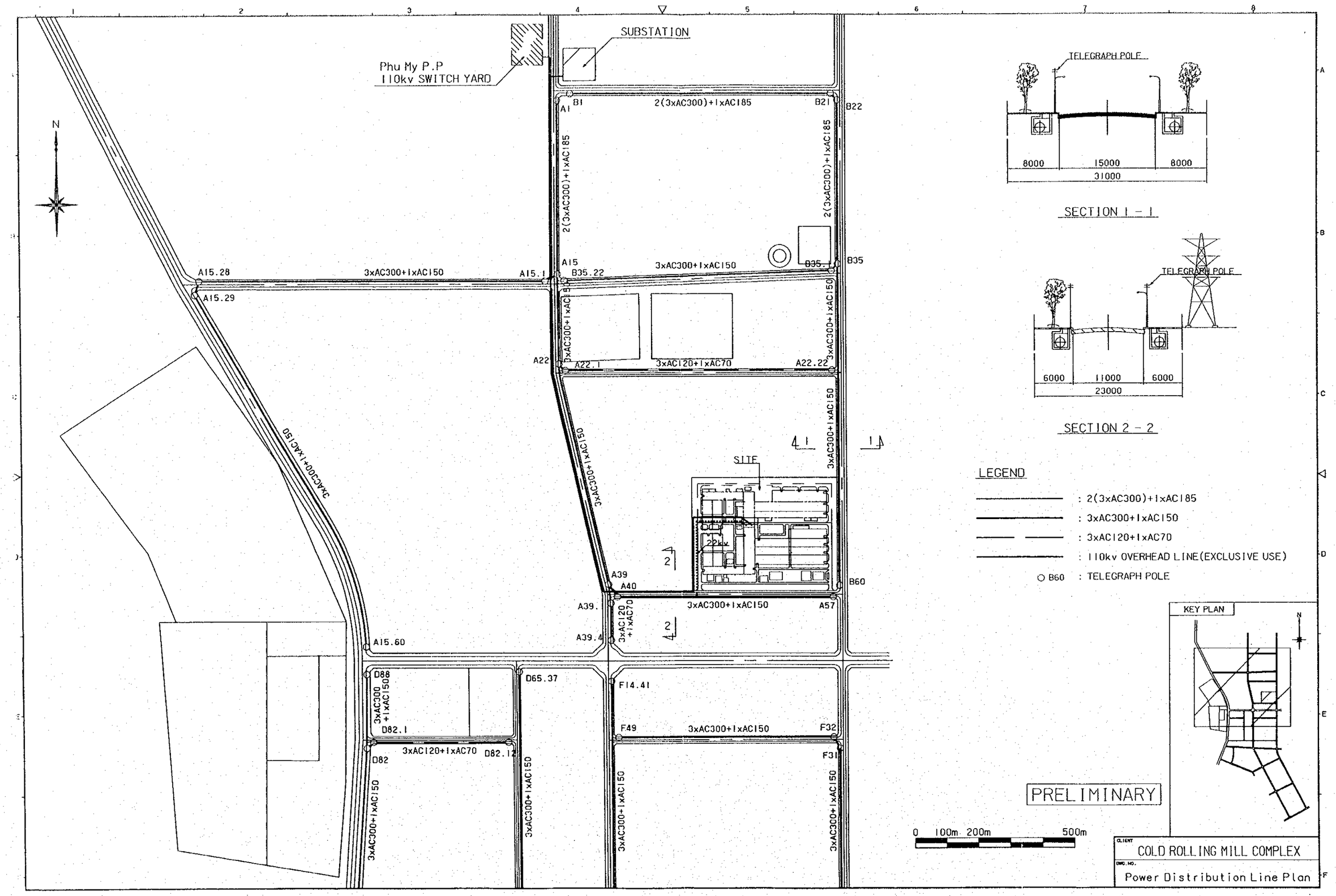


Fig.V-6-3 Power Distribution Line Plan

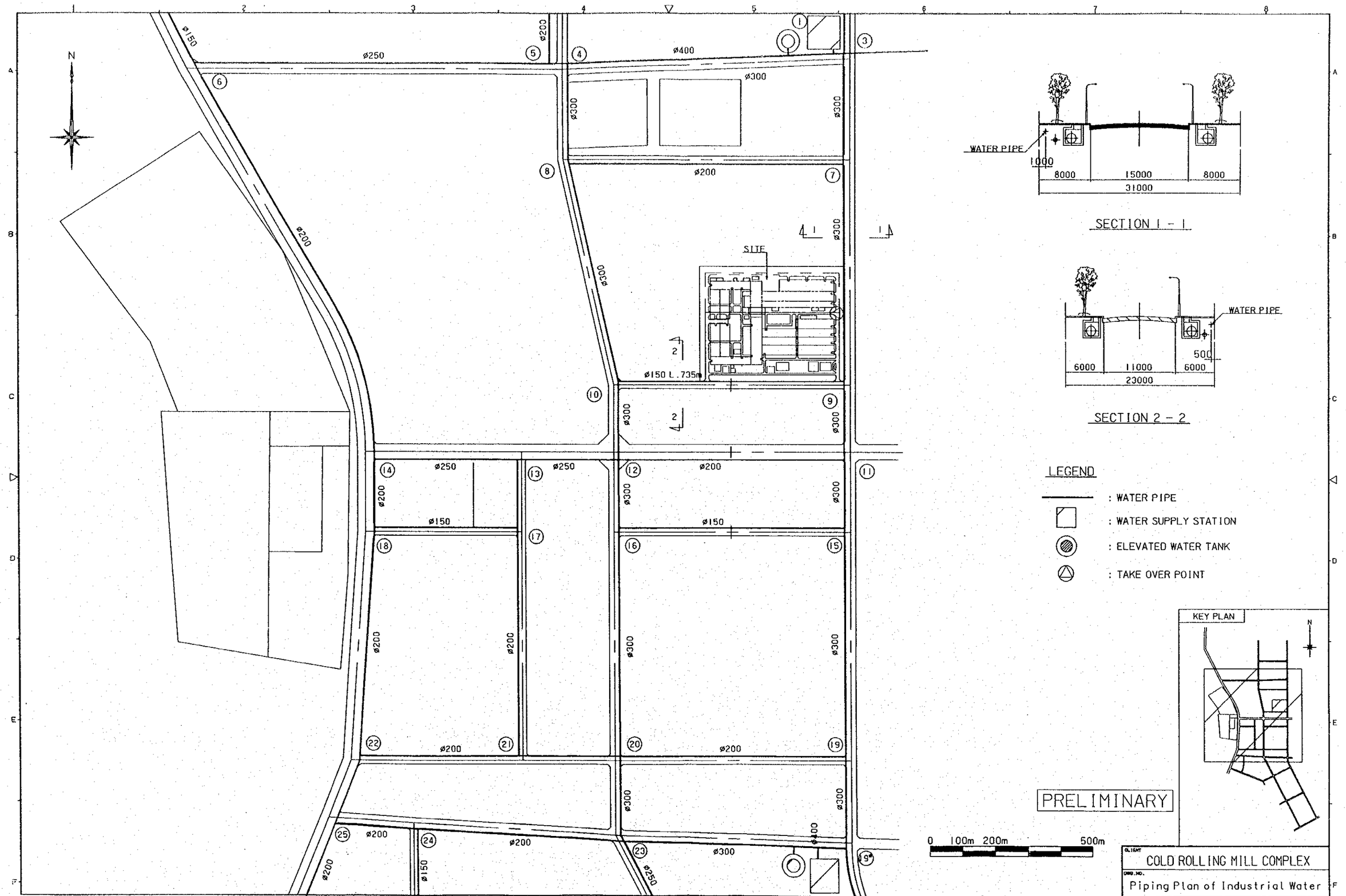
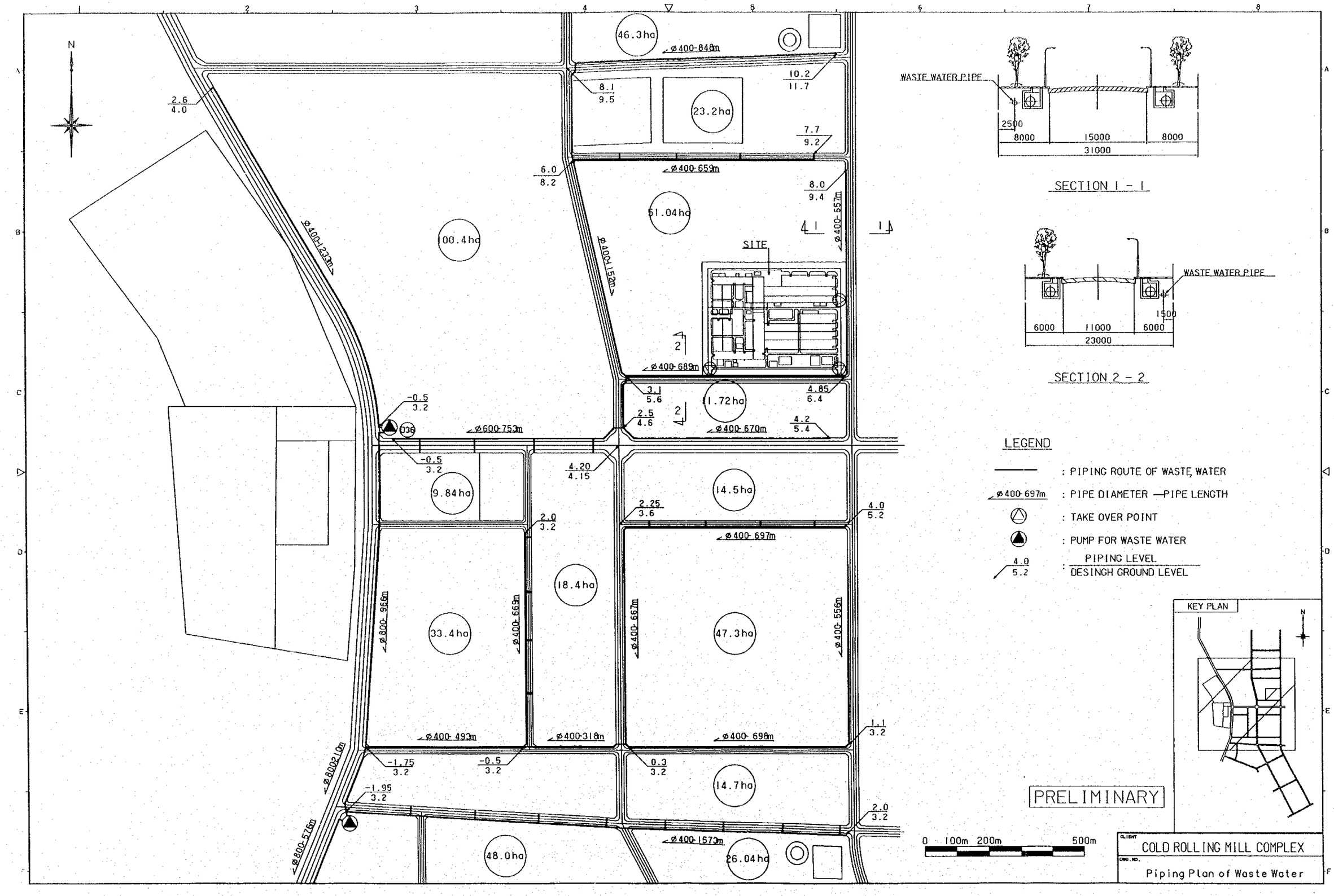


Fig.V-6-4 Piping Plan of Industrial Water



SECTION 1 - 1

SECTION 2 - 2

LEGEND

——— : PIPING ROUTE OF WASTE WATER

ø400-697m : PIPE DIAMETER —PIPE LENGTH

△ : TAKE OVER POINT

▲ : PUMP FOR WASTE WATER

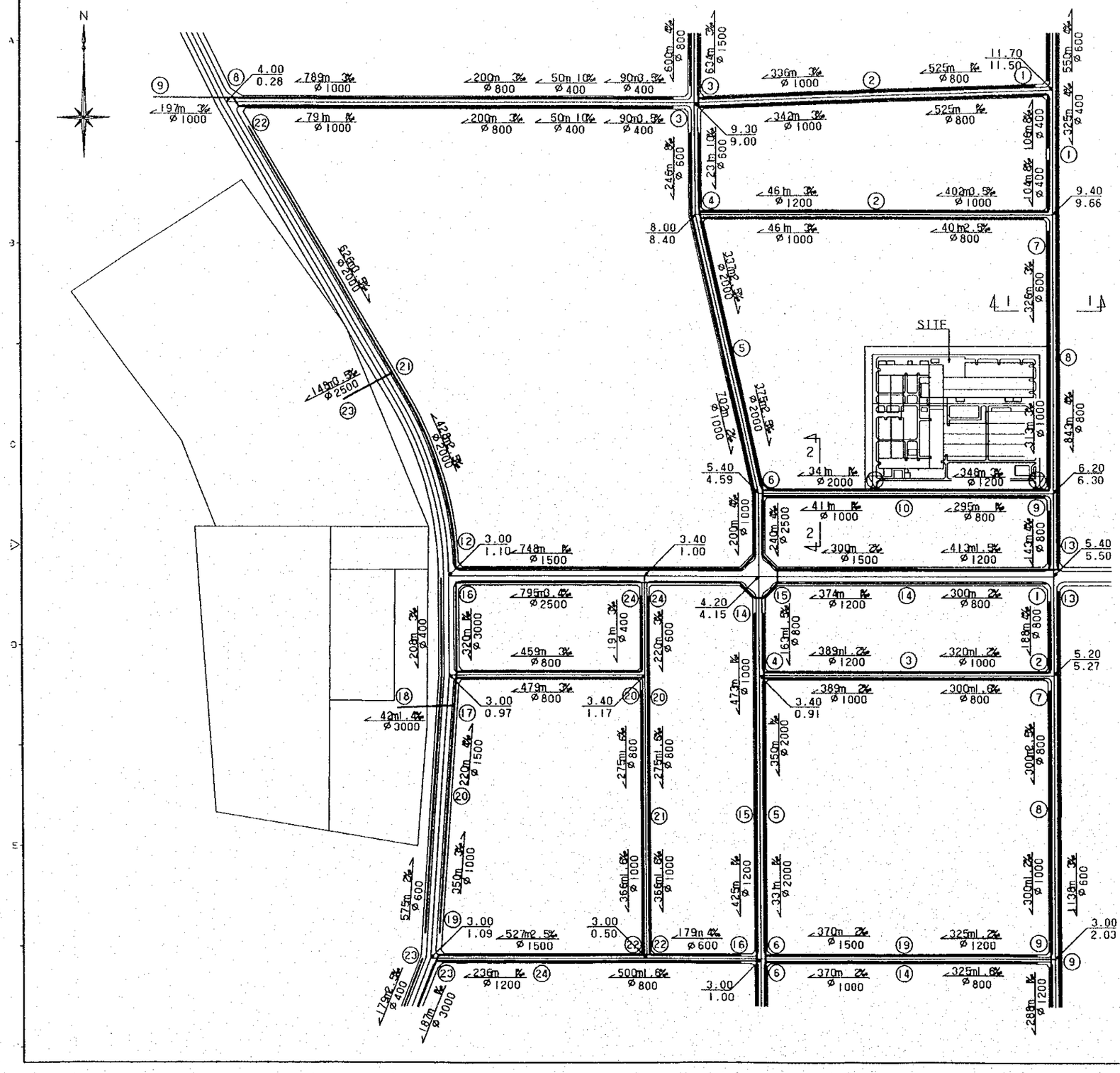
4.0 / 5.2 : PIPING LEVEL / DESINGH GROUND LEVEL

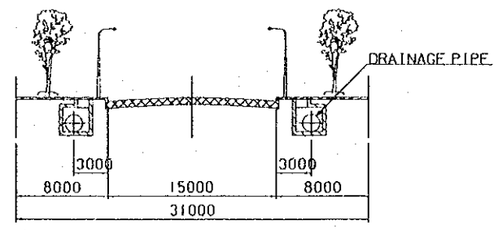
PRELIMINARY

0 100m 200m 500m

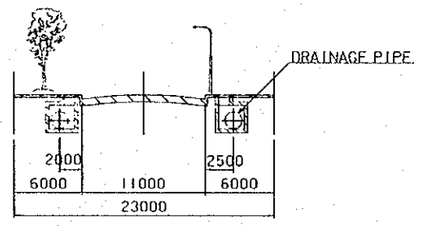
CLIENT
COLD ROLLING MILL COMPLEX
DWG. NO.
Piping Plan of Waste Water

Fig.V-6-5 Piping Plan of Waste Water





SECTION 1 - 1



SECTION 2 - 2

LEGEND

——— : PIPING ROUTE OF DRAINAGE

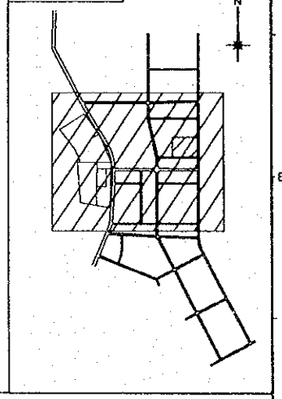
△ : TAKE OVER POINT

5.20 / 5.27 : DESINGH GROUND LEVEL / EXISTING GROUND LEVEL

PRELIMINARY

0 100m 200m 500m

KEY PLAN



CLIENT
COLD ROLLING MILL COMPLEX

DWG. NO.
Piping Plan of Drainage

Fig.V-6-6 Piping Plan of Drainage

7. Manning Plan

In principle, manning plan is made based on ;

1) the organization described in V.8
2) the production with three crews of three shifts
3) the extent of automation described in V.3

Manning plan obtained with the above-mentioned principle is shown in Table V-7-1.

Table V-7-1 Manning Plan

White Collar Staffs	
Managing Director	1
Deputy Managing Director	1
Department Managers	7
Section Managers	13
Engineers	8
Foreman	16
Clerk	16
Secretary	2
Sub total	64

Blue Collar Workers				
(3 Crew 3 Shift)	(Foreman)	Skilled Worker	Un-skilled Worker	Total
PL	(1)	15	3	18
RCM	(2)	15	3	18
ECL	(1)	12	3	15
BAF	(1)	12	3	15
RCL	(1)	15	3	18
Packing	(1)	30	6	36
Crane	(1)	42	6	48
Roll Shop	(1)	15	3	18
Production control	(1)	15	3	18
Testing & quality	(1)	12	3	15
Utility	(1)	15	3	18
Inspection	(1)	12	3	15
Maintenance	(2)	48	9	57
Hot coil yard & Shipping yard	(1)	21	6	27
Sub total	(16)	279	57	336
			Grand total	400

For reference, the detailed description of the white collar workers in the table is given below.

1) Department Managers : Manufacturing×1, Equipment×1, Quality Control×1, Production Control×1, Sales×1, Accounting & Procurement×1, Administration×1
2) Section Managers : Manufacturing×2, Equipment×2, Quality Control×2, Production Control×2, Sales×2, Accounting & Procurement×2, Administration×1
3) Engineers : PL×1, RCM & Roll Shop×1, ECL & BAF×1, RCL×1, Crane & Utility×1, Maintenance(Mechanical)×1, (Electrical)×1, (Instrumentation & Computer)×1

8. Mill Management

The proposals for mill management of the first flat steel production plant in Viet Nam are given mainly from the view point of characteristics of the cold rolled products.

8.1 Characteristics of Cold Rolled Products and Required Management

8.1.1 Strict Product Quality

Almost all the long steel products are used inside of concrete or inside of buildings. However, the cold rolled products have the special characteristics in terms of required quality, especially surface quality, because the cold rolled products are quite likely to be exposed to customers' eyesight. Accordingly, the quality management is crucial at every stage from procurement of hot coils as raw material, production planning to manufacturing the products.

8.1.2 Production Process

In the cold rolling complex many processes as PL - CRM - ECL - BAF - SPM - RCL -Packing - Shipping are necessary. Accordingly, attention should be paid to the following points.

1) Necessity of satisfactory control and planing of coils at every process because of the long periods required for the production of cold rolled products from hot coils
2) Possible deterioration of production cost due to inefficient production
3) Importance of coil handling because of a lot of possibilities of coils being damaged

8.1.3 Wide Range of Application

Cold rolled products are used in many areas such as automobile, electric appliance, furniture and so on. It is to be well understood in which industry and how the cold rolled products are used and what the requirements for the products are. Management and improvement with regard to overall production must be made to satisfy said requirements. For this purpose, collection of relevant information and follow-up of delivered products are indispensable. Without these activities it is difficult to keep the customers for the cold rolled products under the condition of tough competition with imported products.

8.2 Proposals for Management

In consideration of the features shown in the item 1 above and the fact that a steel flat product plant will be managed for the first time in Viet Nam, JICA would like to suggest the following items for particular attention:

1) Organization of the mill
2) Introduction of cold rolling technologies
2) Quality
3) Production
4) Cost

8.2.1 Organization of the Mill

The following organization of the new cold rolling mill is recommended as a proposal on the basis of the main functions of the mill. However, revisions suited to the actual state at VSC should be examined in the future.

President

Vice president

Department	Main function
Production Control Department	Formation of production plans, order receipt job, procurement of hot coils, adjustment of shipping, transportation planning and control
Quality Control Department	Determination of manufacturing specifications, preparation and control of manufacturing standards, solving complaints and claims of customers, customer management
Manufacturing Department	Preparation of and compliance with operation standards, manufacturing control(production, quality, cost), primary quality judgment
Equipment Department	Maintenance and improvement of equipment, equipment control
Accounting and Purchasing Department	Budget control, cost calculation, procurement of spare parts
General Administration Department	General affairs, personnel affairs, etc.
Sales Department	Sales activity

Fig. V-8-1 Organization of Mill

Each department should carry out its tasks by having a responsibility to perform its functions. However, all departments have bearings on production, quality and cost and it is necessary to make constant efforts to improve these items. For this reason, it is important that all departments exchange and share information on a daily basis.

8.2.2 Introduction of Cold Rolling Technologies

(1) Technical level of cold rolling equipment

There are many cold rolling mill plants in operation in the world, and many developments and improvements have been made in terms of equipment and various kinds of control. The cold rolling equipment to be constructed this time will have similar functions. In other words, judging from the functions of the new cold rolling equipment, the products which will be produced will have to have sufficient international competitiveness. Therefore, it is recommended that the cold rolling equipment to be constructed this time be based on existing and established technologies. Although the new cold rolling mill will be sufficient in terms of equipment, there are many areas in which human factors are involved in order to keep initial performance and functions by performing operation control, operation, quality check, maintenance of equipment, etc.

In order to meet these requirements, JICA would like to make the following suggestions:

(2) Technical training of technical staff

When the execution of the construction of the cold rolling mill complex is determined, technical staff should be appointed as soon as possible, and the technical staff should start the learning of cold rolling.

(Technical staff: quality control, production control, cold rolling technologies, etc.)

(3) Technical training for operators

At least six months prior to the startup of the operation, operators who will provide the main force for each process should be appointed and they should learn the knowledge of the equipment constructed and be given an opportunity to learn actual operations for about one month.

Further, in a certain period from the stage of trial run to the start of operation, the operators should also receive training by experts who have experience with operations.

By carrying out the forgoing, the start -up period after construction can be shortened and , at the same time, the stabilization of production and quality can be realized.

8.2.3 Quality

The quality of products must meet standards required by users and it is necessary to constantly supply such products in a stable manner. If the requirements cannot be met, cold-rolled coils produced at VSC inevitably would be placed behind the imported cold-rolled coils, causing a decrease in sales volume. Therefore, JICA proposes that the following measures be taken:

(1) Standards of products and specific agreements with users are to be made. They constantly require to upgrade their standards and revisions are required. So the departments concerned must be ready for these changes.

(2) It is important for the manufacturing department to meet with those users' requirements and systems capable of meeting these requirements in terms of inspection and control are to be established.

(3) Information exchanges with users are to be thoroughly carried out to know whether the users are satisfied or not. If there is any room for improvement, it must be done without delay.

For this purpose, it is important that the quality control department and the manufacturing department have awareness of the necessity for maintaining quality by close cooperation with each other. The roles of both will be as follows:

1) Role of the quality control department :
   a) Preparation of manufacturing standards based on the public standards or agreed specifications with customers
   b) Giving instructions to the production floor about items to be controlled for producing the materials
   c) Investigation of the level of users' satisfaction regarding the shipped products

2) Role of the manufacturing department :
   a) Conformance to methods of operation based on the manufacturing standards
   b) Judgment as to whether manufacturing standards can meet the standards required by the customers execution measures

8.2.4 Production

To achieve a planned volume of production is one of the most important points for a company because this has a great effect on the profitability of business and has a direct effect on keeping delivery times. A production plan for each month is to be formulated, and in order to execute the plan it is necessary for manufacturing department to make efforts by carrying out the control of everyday production volume, working ratio, failure rate, etc., of each shift.

(1) Projection of products and production volume

If products cannot be shipped out in due time and have to be stored in a shipping yard, it causes economical disadvantages. In Viet Nam, state-planned production will be carried out for the time being. However, it will soon become necessary to formulate a production plan by predicting with as high accuracy as possible with regard to the needed demand and its volume. For materials which pass through the annealing process, the required manufacturing time is at least about ten days and it is necessary to formulate a plan by considering this point. Further, in Viet Nam the total amount of hot coils, which are to be processed on the cold rolling mill, must be imported and, therefore, it is necessary to define the hot coils to be procured on the basis of predictions at much earlier time. Therefore, the forecast of products is very important.

1) In order to increase the accuracy of these production plans, it is recommended that in the Production Control Department, a system be established for investigating future production plans (production volume, kinds of products, etc.) of users and incorporating the results of such investigations in VSC' s production plans.

In the future, a change may occur from state-planned production to an order-based production. In that stage, it will become important to deliver manufactured cold-rolled coils at the delivery times required by users and to procure hot coils suited for manufacturing of the ordered cold-rolled products. Therefore, it will become more and more important to gather information on the prediction of production, and hence it will be necessary to organize a system as mentioned above at an early stage.

(2) Manufacturing department

If daily production deviates from production plans, this has a great effect on the procurement of hot coils, shipping plans, etc. Therefore, it is necessary for the manufacturing department to carry out stable operations in order to achieve production in accordance with the plan. For this reason, it is important to control the production volume, working ratio, etc., on daily basis, and to clarify the causes of failures in achieving the targeted production (for example, details of equipment troubles, occurrence of defects, etc.), and at the same time, to improve the equipment and methods of operation so that more stable production can be performed.

It is recommended that in order to enhance field workers' motivation to achieve a production volume, to keep and improve quality and to reduce manufacturing costs, the introduction of a system for incentive payments to field workers be examined. The following are examples of such activities in Japan. These activities are applied not only to items related to production volume, but also to quality, improvement of equipment, etc.

1) Jishu-kanri activity (small team activity)
2) Zero-defect activity

(3) Equipment control

In the steel industry, as it is called an equipment-intensive industry, production and the quality of products are essentially determined by the specifications and functions of the equipment.

1) Therefore, it is important to maintain and control the equipment in order to ensure the initial performance. To realize this, the equipment is monitored and repairs are made in case of abnormalities. However, preventive maintenance in which prior maintenance is conducted by life prediction, etc., is also important. Further, equipment abnormalities often affect quality, and equipment is often maintained on the basis of results of quality inspection.
2) Equipment troubles cause line stoppages, reducing the volume of production and, therefore, repairs must be made in the shortest possible time. For this reason, it is also important to have necessary spare parts.

The following measures are recommended:

① It is assumed that it will be difficult to procure all the spare parts within Viet Nam for the time being. Therefore, JICA proposes that spare parts manufacturing companies be fostered in a planed manner so that as many spare parts as possible can be procured within Viet Nam. It will be also necessary to examine this as a required state project.

② In general, equipment suppliers have no know-how on maintenance. Therefore, JICA proposes that with the education and training of operators, the workers of the maintenance department be also trained in a steelworks having the similar equipment with the one to be constructed in Viet Nam.

8.2.5 Cost

Manufacturing costs have a direct effect on the profitability of the Project. Manufacturing costs involve many factors and it is essential to make efforts to manufacture inexpensive products by carrying out daily control and improvement activities. A cost reduction is little expected from the cost calculation as the results of production. It is recommended that a planed value and target value control system be introduced. An outline of a concrete method of control is as follows:

1) Planned values are determined at intervals of six months, and results and counter-measures are examined every month.
2) Control items are divided into items capable of daily control and items to be controlled every month, and these two categories of control items are separately controlled.
3) Some items are selected for items which cannot be directly calculated every day.
4) Plans are formulated and control is conducted for each control department.
5) A review is carried out every six months and plans must be improved as time proceeds.

Problems consciousness can be fostered by carrying out the above planned value and target value control system and stable quality and production improvements can be ensured resulting in the competitiveness.

8.3 Manpower Requirement Plan

As mentioned above, in order to keep an international competitiveness in quality and price, it is necessary to make daily efforts for improvements. Besides, this mill is Viet Nam's first flat steel product mill meaning learning new technologies and improvements and introduction of control techniques being so important. Therefore, it is important to employ persons who fully understand this and have aspirations for their purpose whether they are technical staff, operators, maintenance personnel, etc.

It will be necessary to examine the following items in the future:

1) The Phu My district is somewhat distant from Ho Chi Minh city and it is necessary to pay attention to infrastructure such as dwelling environment in order to employ excellent workers. An investigation of actual example of enterprises which are branched in the areas near the Rhu My district will be helpful.
2) Selecting the human resources required in the cold rolling mill from existing VSC or from

associated companies should be considered due to the already acquired experiences of steel making.

Example a) Specialists in metallurgy can be selected from within VSC
Example b) Persons who have practical experience with the handling of hot coils and cold rolled coils can be selected from subsidiary metal companies of VSC.

9. Construction Schedule

The construction schedule of the planned cold rolling mill complex is shown in Fig.V-9-1. This schedule covers from the commencement of the civil work to that of the commercial operation, and is decided based on the past example of the construction of a cold rolling mill in South East Asia together with consideration of the scale of the mill complex planned in this FS. It is taken for granted that the land preparation and the construction of roads to the site is to be completed before this schedule. In addition, as the preparatory work before this schedule the following items are to be done ;

1) Investigation to decide the contractors for each equipment and for each work
2) Contracting
3) Detailed designing after contracting

It should be noted that the required time for detailed designing varies depending both on the content of the contract and on the capability of the contractors.

For each equipment the required time for construction and/or installation is nearly solely dependent on the content of the equipment itself. On the other hand, the construction schedule for ancillaries is decided automatically depending on the start-up of the relevant equipment. For reference, the construction schedule of the water treatment facilities is shown here as an example.

Construction Schedule

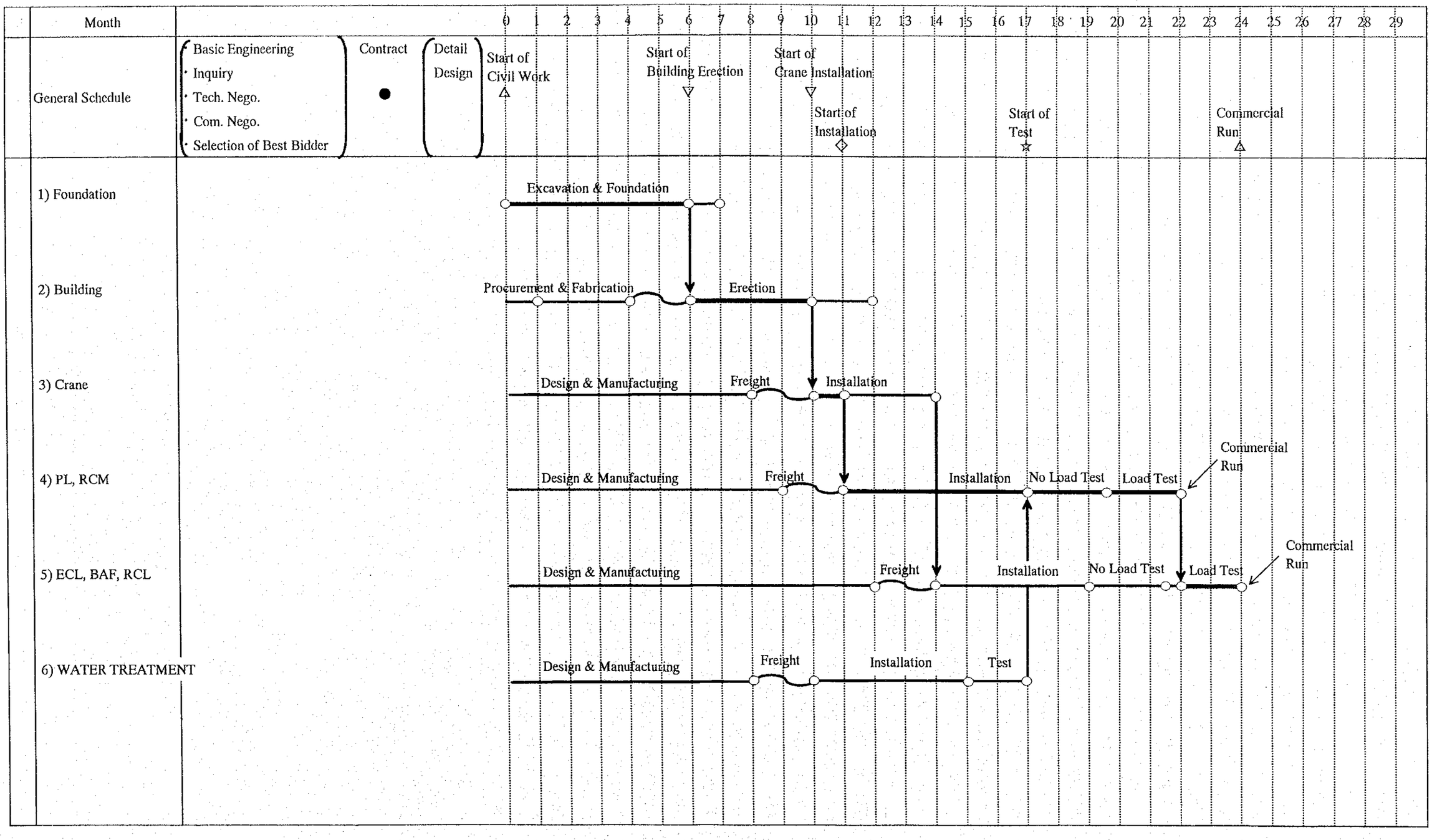


Fig. V - 9 - 1 Construction Schedule

10. Production Plan after Start-up

The production plan after start-up is made as follows. This plan is based on the recent example of the production increase after the start-up of the cold rolling mill complex with an approximately same production capacity.

1) For the first year after the commencement of commercial production, 60 % of the full capacity, namely 123,000 tons/year is to be realized.
2) For the second year, 90 % of the full capacity, namely 184,000 tons/year is to be realized.
3) For the third year, the full capacity, namely 205,000 tons/year is to be realized.

The production increase after the start-up is very much dependent on the workers as well as the equipment. As the planned cold rolling mill complex is the first mill in Viet Nam, the introduction of relevant technologies to staff and operators is a necessity for the realization of the above-mentioned schedule.

11. Construction Cost

11.1 Preconditions

The following principles are applied to the differentiation between the procurements for construction from overseas and that from domestic.

(1) The equipment is to be procured in principle from overseas with the exception of ;
   1) Steel fabrications such as simple tanks which can be manufactured without difficulty and decks to be attached to the equipment
   2) Power equipment such as high tension voltage panel which has been produced in Viet Nam.
(2) Construction work to be made by relevant companies in Viet Nam.
(3) Materials for construction work is to be procured from relevant companies in Viet Nam, if possible.

11.2 Standard for Cost Estimation

(1) Timing of cost estimation : July 2000
(2) Currency to be used for import : US dollar
    Currency to be used for domestic procurement : Viet Nam Dong (converted to US dollar)
(3) Exchange rate : 1 US dollar = 14,080 Viet Nam Dong

11.3 Cost for Construction

The required cost for the construction of the new cold rolling mill complex is shown in Table V-11-1. The cost for equipment and for civil and building work is estimated from the specifications and construction work volume studied in this FS with the result of the site surveys and the past similar examples taken into consideration.

The cost for inventory, pre-operational expense, contingency and engineering and technical assistance is estimated from the past similar examples. It should be noted that the cost for engineering and technical assistance varies quite a lot depending on the scope and manners of the contract. Refer to VI.1.3.1 for the estimated cost for the interest during the construction.

Table V-11-1 Cost for Construction

Items	Cost (Mil. US$)	Remarks
(1) Equipment	78.1	
①Production equipment, Ancillaries	57.9	Refer to V.2 for detail of the equipment
②Spare parts, SV	5.2	—
③Transportation, Insurance, Installation Work	15.0	—
(2)Civil and Building	22.2	Refer to V.5 for detail of the work
(3)Inventory	2.8	Initial cost for the procurement of consumable such as rolls
(4)Pre-operational expense	2.9	Cost required before the commercial production such as manning cost and operational expense for test run
(5)Contingency	2.4	—
(6) Engineering, Technical Assistance	5.6	—
(7) Interest during construction	11.8	Interest on the loan during construction
Total	125.8	(96.4 Mil. US$, 414.7 Bil. VND)

The equipment cost is estimated on the basis of international tender. However, there exists a possibility of further reduction in the equipment cost depending on the demand and supply conditions of equipment suppliers.

In addition to the above construction cost the working capital summing up to 2 million USD is to be prepared for the procurement of hot coils and consumable such as lubrications and packing materials and for the manning expense required at the initial stage of commercial operation. If the said working capital of 2 million UDS is prepared by loan, an interest of around 0.2 million USD would be borne.